

City of Kenai | 210 Fidalgo Ave, Kenai, AK 99611-7794 | 907.283.7535 | www.kenai.city

## Invitation to Bid

## Project: Sludge Press Replacement - Phase 1

Release: June 7, 2022

Last day for Questions: June 20, 2022 by 5:00 PM

Bids Due Date: June 28, 2022, no later than 12:00 PM
Kenai City Hall
210 Fidalgo Avenue
Kenai, AK 99611
ATTN: Director of Public Works

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## ADVERTISEMENT FOR BID

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Construction: Sludge Press Replacement - Phase 1 Last Day for Questions: June 20, 2022 by 5:00 PM
Bid Due Date and Time: June 28, 2022 by 12:00 PM
Scope of Work: Installation of an owner furnished sludge dewatering screw press, installation of screw press equipment support, access platforms, process piping, digested sludge pumps, polymer system, washwater booster pump system, screw conveyor, building ventilation upgrades, and building structural rehabilitation at the City of Kenai Wastewater Treatment Facility (WWTF).

Bidders should contact the Public Works Department at (907) 283-8236 to be placed on the plans holders list. Questions may be submitted to publicworks@kenai.city.

A pre-bid conference will be held at 11:00 AM local time on June 16, 2022 at Kenai City Hall with a site visit to follow. Meeting information will only be provided to those on the current plan holder's list.

Bids must be delivered in a sealed envelope clearly marked with the project name to the Public Works Department at the address above. Bid documents can be obtained on City of Kenai website at www.kenai.city or at City Hall for a non-refundable fee of $\$ 60.00$ including sales tax for each set of documents.

Publish: $\quad$ Anchorage Daily News - June 7, 2022
Peninsula Clarion - June 7, 2022

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## INSTRUCTIONS TO BIDDERS

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## CITY OF KENAI INSTRUCTIONS TO BIDDER

## 1. GENERAL

These instructions specify the form and procedures for the submission of a complete and acceptable bid. To obtain addenda in a timely manner, you should be on the City of Kenai's plan holder's list. Downloading project specifications and drawings from the City website or other online plans rooms does not place you on the City's plan holder's list. To be added to the plan holder's list, please contact the Public Works Department Administrative Assistant by phone (907) 2838236 or by email at publicworks@kenai.city.

Project Name: Sludge Press Replacement Project - Phase 1
Last Day for Questions: June 20, 2022 by 5PM
Bid Due Date and Time: June 28, 2022 by 12PM

## 2. EVIDENCE OF QUALIFICATIONS

Upon request of the City, a Bidder whose bid is under consideration for the award of the Agreement, shall submit promptly to the City, satisfactory evidence of the Bidder's financial resources, their experience, their performance in completing other projects of a similar nature, and the organization and equipment they have available for the performance of the Agreement.

## 3. BIDDER QUALIFICATIONS

Before the bid is considered for award, the City reserves the right to determine whether or not a Bidder is responsible and to require the Bidder to complete a Bidder Qualification Form and/or provide a current financial statement prepared by a Certified Public Accountant. The City shall determine whether a Bidder is responsible on the basis of the following criteria:

- The skill and experience demonstrated by the Bidder in performing Agreements of a similar nature.
- The Bidder's record for honesty and integrity.
- The Bidder's capacity to perform in terms of facilities, personnel, and financing.
- The Bidder's past performance under City Agreements. If the Bidder has failed in any material way to perform its obligations under any Agreement with the City, the Bidder may be determined as a non-responsible Bidder.
- A Bidder's representations concerning their qualifications will be construed as a covenant under the Agreement. Should it appear that the Bidder has made a material misrepresentation, the City shall have the right to terminate the Agreement for the Contractor's breach, and the City may then pursue such remedies as provided in the Agreement Documents or as provided by state statute, City code, or as appropriate.

Any final determination that a Bidder is non-responsible will be made by the City Manager. Such determination will be made in writing to the Bidder setting forth the reasons for such determination.

## 4. CONDITIONS AFFECTING THE WORK

The City assumes no responsibility for any understanding or representations concerning conditions made by any of its officers, agents, or employees prior to the execution of this Agreement, unless such understanding or representations are expressly stated in the bid documents or Addenda.

The Bidder shall include in their bid, sufficient sums to cover all items required by the Agreement and the conditions of the site(s), and shall rely entirely upon their own examination in making their bid. The submission of a bid shall be taken as prima facie evidence of compliance with this paragraph.

If information or documentation required for submitting an accurate and complete bid is absent from these documents, the Bidder is required to notify the Public Works Director by facsimile (907) 283-3014, or by e-mail to publicworks@kenai.city.

## 5. SECURITY TO BE FURNISHED BY BIDDER

If the bid exceeds $\$ 100,000$, a certified check, bank cashier's check, or bid bond, made payable to the City of Kenai amount equal to five (5\%) percent of the total bid, shall accompany each bid as evidence of good faith, a guarantee that if awarded the agreement, the Bidder will execute the agreement and give bond as required. All Bidder's checks or bid bonds will be retained until the successful Bidder has entered into a satisfactory agreement and furnished bonds, as required. The successful Bidder shall furnish the City a Performance and Payment bond in the full amount of the Agreement and shall maintain the Bond in force during the continuance of the Agreement. The bonds must be furnished prior to the City's execution of the Agreement. The Bond shall be for the faithful performance of the Agreement in all respects including, but not limited to, payments for all materials and labor. All alterations, extensions of time, additional work, and other changes authorized by the Agreement Documents may be made without securing the consent of the Surety or Sureties. Power-of-Attorney for the person signing the Bond for the Surety must be submitted with the Bond. These bonds, in whatever amount required by the specific agreement, shall be administered and deemed governed by the provisions of Alaska Statutes Title 36, Chapter 25, and shall comply with all requirements for payment and submission of claims as provided by that chapter.

## 6. LICENSING

Alaska State Statutes requires that all businesses wishing to engage in business in Alaska obtain license(s). All Bidders are required to furnish with their bid, the applicable, current licenses required to perform the work. Applicable licenses may include the following: Contractor's License, Specialty Contractor License, and Alaska Business License. Failure to submit license(s) with the bid may result in rejection of the Contractor's bid.

## 7. TAX COMPLIANCE CERTIFICATE

No agreement will be awarded to any individual or entity that is in violation of the tax laws of the City of Kenai or the Kenai Peninsula Borough unless the violation is cured within ten business days of notice. The Tax Compliance Certificate must be signed by the Bidder only and submitted with the bid. The City will obtain verification of tax compliance from the Kenai Peninsula Borough for the successful bidder. Bids submitted without a completed Tax Compliance Certificate may be considered non-responsive.

## 8. INTERPRETATION OR CORRECTIONS OF BID DOCUMENTS

Bidders shall notify the Public Works Director promptly of any error, omission, or inconsistency that may be discovered during examination of the bid documents and the proposed work site(s). Requests from Bidders for interpretation or clarification of the bid documents shall be made in writing to the Public Works Director and shall arrive no later than the time and date specified in Section 1 of these Instructions to Bidders. Questions may be faxed to (907) 283-3014 or emailed to publicworks@kenai.city. The subject line of the email or fax must include the name of the project.

Oral questions may be presented at a pre-bid conference if one is provided for in Section 1 of these Instructions to Bidders. Interpretations, corrections, or changes, if any, to the bid documents shall be made by Addendum. Bidders shall not rely upon interpretations, corrections, and changes made in any other manner, including orally, at the pre-bid conference. Interpretations, corrections, and changes shall not be binding unless included in an Addendum. All Addenda issued during the time of bidding shall become part of the Agreement Documents. Questions or requests for clarifications shall be directed to the Public Works Director. Only written interpretations or corrections by Addendum shall be binding, and no other forms of interpretation or correction will be binding on the City of Kenai.

It is the Bidder's sole responsibility to ascertain that they have received all Addenda issued by the City of Kenai. Addenda will be issued electronically and/or by facsimile. All Addenda must be acknowledged in the space provided on the Bid Form. If no Addenda have been issued, write or type "zero" or "N/A" on the Bid Form in the space provided.

## 9. PREPARATION AND SUBMISSION OF BIDS

- Bids must be received at City Hall prior to the time and date specified in Section 1 of these Instructions to Bidders.
- Bids must be submitted on the Bid Form furnished. Bids must be completed in ink or by typewriter, and must be manually signed by an authorized person. If erasures or other changes appear on the forms, the person signing the bid must initial each erasure or change in ink.
- Bids shall specify a unit or lump sum price, typed or written in ink in figures, for each bid item called for. In case of error in the extension of prices, the unit price will govern. Bids may be rejected if they show any omissions, alteration of the forms, additions not called for, conditional or alternate bids not called for, qualified bids, or irregularities of any kind.
- It is expressly agreed that the quantities shown in the Bid Form, whether for a "Unit Price Bid" or in connection with a "Lump Sum Bid" on the Bid Form are approximate only for use as a basis for comparison of bids and are not to be taken to be either representations or warranties. The City does not expressly, nor by implication, agree that the actual amount of work will correspond therewith.
- The Bid Form invites bids on definite plans and specifications. Only the amounts and information asked for on the Bid Form will be considered as the bid. Each Bidder shall bid upon the work exactly as specified and as requested on the Bid Form, and Bidders shall bid upon all alternates as indicated. When bidding on an alternate for which there is no charge, Bidder shall write the words "No Charge" in the space provided.
- One (1) complete bid package shall be completely sealed in an envelope clearly marked with the Bidder's company name, and the "Project Name" and "Bid Due Date" specified in Section 1 of these Instructions to Bidders. A complete bid package shall include the following documents:
- Bid Form
- Tax Compliance Certificate
- Applicable Licenses
- Non-Collusion Affidavit
- Bids received without all the required documents may be considered non-responsive. Bids received after the bid due date and time will be considered non-responsive and will not be accepted.
- No responsibility shall be attached to the City for the premature opening of, or the failure to open a bid not properly addressed and identified.
- Please note that overnight delivery from the Lower 48 States is generally not available. Prospective Bidders should anticipate a minimum of two to three days delivery time for express, priority or expedited delivery services.


## 10. MODIFICATION OF BIDS

Bid modifications will be accepted by the City at publicworks@kenai.city and binding upon the Bidder where the modification:

- is received at City Hall prior to the time and date specified in Section 1 of these Instructions to Bidders.
- does not identify the adjusted Bid Total price. Only adjustments to the sealed bid will be accepted. For example:
- CORRECT - Decrease the Unit Bid Price of Item 20.22 Leveling Course by $\$ 2.50$ per ton and the Bid Total by $\$ 2,500$.
- CORRECT - Increase the Unit Bid Price of Item 90.16 Mobilization and Demobilization and the Bid Total by $\$ 5,000$.
- INCORRECT - Decrease the Bid Total by $\$ 5,000$ for a new Total of $\$ 95,000$.
- is signed by the same individual who signed the original bid.

Should there be more than one bid modification from a Bidder, only the last modification received prior to the deadline shall be applied to the bid. All earlier modifications shall be disregarded.

Any modification which fails to meet any requirement of this section shall be rejected, and the bid shall be considered as if no modification had been attempted.

It is the Bidder's responsibility to confirm the City's receipt of any bid modification.

## 11. WITHDRAWAL OF BID

At any time prior to scheduled closing time for receipt of bids, any Bidder may withdraw their bid, either personally or by written request.

After the scheduled closing time for receipt of bids, no Bidder will be permitted to withdraw their bid unless Notice of Award is delayed for a period exceeding forty-five (45) days.

A bid may not be withdrawn after opening without the written consent of the City.

## 12. ACCEPTANCE - REJECTION OF BIDS

The City reserves the right to reject any or all bids, to waive minor irregularities in any bids or in the bidding procedure, and to accept any bid presented which meets or exceeds said specifications and which is deemed to be in the best interest of the City. However, the requirements for timeliness and manual signatures shall not be waived. The City is not obligated to accept the lowest bid and is not responsible for bid preparation costs. AIP Grant requirements do require acceptance of the lowest bid, if the City chooses to move forward with the Project as Bid.

## 13. EXECUTION OF AGREEMENTS

The successful Bidder shall be required to execute an Agreement for the work within ten (10) days after receiving the Notice of Award and Agreement documents from City; if Contractor does not return executed copies within this time, then, at the option of City, the bid may be rejected.

## 14. AWARD OF AGREEMENT

It is the intent of the City to award the bid to the lowest, qualified, responsive and responsible Bidder. Unless otherwise stated in the bid documents, the Agreement, if awarded, shall be awarded to the responsible Bidder who submits the lowest responsive bid. When bid documents contain a base bid and alternates, only the total of the base bid and the alternates to be awarded shall be used to determine the low Bidder.

The amount of the Agreement shall be the total sum of the amounts computed from the estimated quantities and unit prices and/or the lump sum awarded by the City and specified in the Agreement.

On all bids, Notice of Award or rejection will be given within forty-five (45) days of bid opening. The notice will be in writing and signed by the Public Works Director. A Notice of Intent to Award, and no other act of the City of Kenai or its representatives, constitutes an acceptance of a bid. The acceptance of a bid shall bind the successful Bidder to execute the Agreement.

## 15. AGREEMENT AND PERFORMANCE AND PAYMENT BOND SIGNATURE INSTRUCTIONS WHEN BONDS ARE REQUIRED

The successful Bidder shall insert the full name and business of the Contractor in the Agreement and on the Performance and Payment Bond, hereinafter the Bond.

If the Contractor is a partnership or joint venture, all partners or joint ventures shall sign the Agreement and the Bond except that one partner or one joint venturer may sign for the partnership or joint venture when all other partners or joint venturers have executed a Power-of-Attorney authorizing one partner or joint venturer to sign. The Power-of-Attorney shall accompany the executed Agreement and the Bond.

If the Contractor is a Limited Liability Company (LLC), a person with appropriate authority to bind the LLC shall execute the Agreement and Bond unless a Power-of-Attorney or Corporate Resolution accompanies the executed Agreement and Bond.

If the Contractor is a corporation, the President or Vice-President and Secretary or Treasurer of the corporation shall execute the Agreement and the Bond unless a Power-of-Attorney or Corporate Resolution accompanies the executed Agreement and Bond.

The Bond shall be returned undated as to Agreement Date. The Agreement Date shall be inserted on the Agreement when the City signs the Agreement and the Bond shall be dated the same as the Agreement Date.

## 16. SPECIAL PROVISIONS

If funded in part or in whole by a grant or grants, the contractor and their subcontractors will be required to comply with the requirements of these grants, including insurance and purchasing requirements, if any. If any permits are included with the bid documents, e.g. a U.S Corp of Engineers wetland permit, all conditions of this permit must be met by the Contractor and their Subcontractors.

## 17. APPEAL PROCEDURE

KMC 7.15.120 Appeal procedures.
(a) Any party submitting a bid or proposal for a contract with the City and who believes that they are adversely affected by the City's relevant ordinances, regulations, procurement process, or by any acts of the City in connection with the award of a City contract, may file a protest appeal with the City Clerk. All protest appeals must be to the City within five (5) calendar days of the issuance of the City's notice of its intent to award the contract. The appeal must be hand delivered, delivered by mail, or by facsimile and must comply with all requirements of this section. If the fifth day is a City-recognized holiday or a weekend, the deadline for appeal shall be the next work day. It is up to the protester to choose a method of delivery to assure timely receipt by the City.
(b) Rejection of Appeal. The Clerk shall reject an untimely or incomplete appeals. Such rejection shall be final and may be appealed to the Superior Court pursuant to the Court Rules of Appellate Procedure.
(c) The protest appeal must be in writing and shall include the following information:
(1) The name, address, e-mail, and telephone (and facsimile if available) numbers of the protester;
(2) The signature of the protester or the protester's representative;
(3) Identification of the contracting agency and the solicitation or contract at issue;
(4) A statement of the legal and factual grounds of the protest, including copies of relevant documents; and
(5) The form of relief requested.
(d) Stay of Award. If a timely and complete protest appeal is filed, the award of the contract shall be stayed until all administrative remedies have been exhausted, unless the City Manager determines in writing that award of the contract pending resolution of the appeal is in the best interests of the City.
(e) Notice and Response. Notice of the stay and protest appeal shall be delivered to any party who may be adversely affected by the City Manager's decision by facsimile, first class mail or in person within three (3) business days of receipt of a properly filed appeal.
(f) City Manager Decision. The City Manager shall issue a written decision to the appellant within ten (10) business days of the date the appeal is filed. If multiple appeals have been filed, they may be consolidated for purposes of the decision. Copies of the appeal and decision shall be
provided to any interested party requesting one. The decision may include any lawful action, including without limitation an amendment of all or any part of the recommended award. For good cause shown, the City Manager may extend the date for the decision for such additional period as may be necessary.
(g) If the City Manager sustains a protest in whole or in part, the City Manager shall implement an appropriate remedy. In determining an appropriate remedy, the City Manager shall consider the circumstances surrounding the solicitation or procurement including the seriousness of the procurement deficiencies, the degree of prejudice to other interested parties or to the integrity of the procurement system, the good faith of the parties, the extent the procurement has been accomplished, costs to the agency and other impacts on the agency of a proposed remedy, and the urgency of the procurement to the welfare of the City.
(h) Notwithstanding subsections (a) and (b) immediately above, if the City Manager sustains a bid protest appeal in whole or part, the protester's damages shall not exceed the reasonable bid or proposal preparation costs.
(i) Appeal to Superior Court. Appeals may be taken from the written decision of the City Manager within thirty (30) days of the date of the decision pursuant to Part VI of the Alaska Rules of Appellate Procedure.
(Ord. 2852-2015)

## 18. COMPLIANCE OR ACCEPTED ALTERNATES TO SPECIFICATIONS

Bidder hereby agrees that the material offered will meet all the requirements of the specifications in this solicitation unless alternates have been deemed acceptable by the City. Manufacturer's names, trade names, brand names, model and catalog numbers used in these specifications are for the purpose of describing and establishing general quality levels. Such references are not intended to be restrictive. Alternates will be approved via addenda, and only via addenda. Request for alternates must be submitted no later than the Last Day for Questions in the Advertisement for Bid. An alternate must be requested via email sent to the addresses in section 1 with an explanation giving in detail the extent of the alternate, the reason for which it is requested, and why the City should approve the alternate. Provide as much detail as possible. If multiple models or options are provided with your submittal data clearly indicate which you are requesting. The City of Kenai will be the sole judge of whether an alternative is acceptable to the items specified.

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## BID FORM

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# CITY OF KENAI <br> BID FORM 

TO: CITY OF KENAI<br>Public Works Department<br>210 Fidalgo Avenue<br>Kenai, Alaska 99611-7794

From:
Name of bidder's Company or Business Entity

## BIDDER'S DECLARATION \& UNDERSTANDING

The undersigned, hereinafter called the Bidder, declares that the Bidder has carefully examined the Addenda, Specifications and Drawings, Agreement, General Conditions, and Instructions to Bidders (hereinafter called "Bid Documents"), and the location(s) where work is to be performed for the project, and that the Bidder has satisfied themselves as to the quantity and condition of work involved.

It is expressly agreed that the quantities shown in the Bid Form, whether for a "Unit Price Bid" or in connection with a "Lump Sum Bid" on the Bid Form are approximate only for use as a basis for comparison of Bids and are not to be taken to be either representations or warranties. The City does not expressly, nor by implication, agree that the actual amount of work will correspond therewith.

The Bidder further declares that the only person or parties interested in the Bid are those named herein, that this Bid is, in all respects, fair and without fraud, that it is made without collusion with any official of the City of Kenai, and that the Bid is made without any connection or collusion with any person submitting another Bid.

The Bidder agrees not to withdraw this bid within forty-five (45) days after the actual date of the bid opening.

## DOCUMENTS TO SUBMIT WITH THIS BID

1. Bid Form (3 Pages)
2. Tax Compliance Certificate
3. Applicable Licenses
4. Non-Collusion Affidavit
5. Bid Bond with Power-of-Attorney (If Bid exceeds $\$ 100,000.00$ )

DOCUMENTS THE CITY OF KENAI IS TO RECEIVE WITHIN 10 DAYS AFTER NOTICE OF AWARD

The Bidder agrees that if this Bid is accepted he will deliver to the City of Kenai, within ten (10) calendar days of Notice of Award, the following:

1. Executed Agreement
2. Certificate(s) of Insurances*
3. Construction Schedule
4. List of Subcontracotrs
5. Performance and Payment Bond
6. Power of Attorney and/or Corporate Resolution (See Instructions to Bidders)
*The City shall be named as an additional insured on General Liability and Automobile Liability insurances with respect to the performance or failure to perform under this Agreement.

## TIME OF COMPLETION AND LIQUIDATED DAMAGES

Bidder agrees to commence and complete work as follows:

## SLUDGE PRESS REPLACEMENT - PHASE 1

All work, including administrative submittals must be 100\% complete on or before March 15, 2023.
TIME OF COMMENCEMENT AND COMPLETION: Work shall commence upon receipt of the Notice to Proceed (NTP). A Notice of Award (NOA) is anticipated on July 7 but may not be issued until as late as August 4, 2022. The contractor has ten days after NOA to provide the required paperwork per the bid documents. The NTP will be issued within 5 business days after receipt of contractor's paperwork. All work must be substantially completed on or before February 28, 2023. Liquidated damages will be charged against the Contractor as provided below.

LIQUIDATED DAMAGES. Liquidated damages will be charged as provided for in the Agreement Documents in the amount of Five Hundred Dollars (\$500.00) for each calendar day.

## BID TABULATION AND SUMMARY

Bidder agrees to perform all of the work described and per the conditions in the Bid Documents for the prices stated on this Bid Form.

Prices are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern. In case of error in the extension of prices, the unit price will govern. Bidder understands that the City reserves the right to reject any or all bids and to waive irregularities in the bidding.

BID GUARANTEE: The Undersigned further agrees that the check or bid bond accompanying the bid is left in escrow with the City, that the amount of the check or bond is the measure of damages which the City will sustain by failure of the Undersigned to deliver said documents within ten (10) days after written notice of the award of contract to him or her, and that check shall become the property of the City, or the bid bond shall remain in full effect, should he or she so fail. But if this bid is not accepted within forty-five (45) days of the date set for the opening thereof, or if accepted and the Undersigned delivers said Agreement, and performance, and labor, and material payment bonds as required, the check shall be returned to him or her and the bid bond shall become void.

## EXECUTION OF BID

Bidder shall complete and submit all pages of the Bid Form.
I have received the Bid Documents for the Project: SLUDGE PRESS REPLACEMENT - PHASE 1
I have received Addenda No(s) $\qquad$ and have included there provisions in my proposal.

I have examined both the Bid Documents and the work locations, and submit the following bid with the understanding that I agree:

1. To hold my bid open forty-five (45) consecutive calendar days.
2. To accept the provisions of the Bid Documents.
3. To enter into and execute an Agreement, if awarded, on the basis of my Bid.
4. To furnish all labor and materials and to accomplish the work in accordance with the Bid Documents.
5. To complete the project as specified above in TIME OF COMPLETION.

BASE BID - SLUDGE PRESS REPLACEMENT - PHASE 1: (All work as required in Schedule A in accordance with Specifications and Drawings)

| Item <br> Number | Pay Item Description | Unit | Estimated <br> Quantity | Unit Bid Price <br> (Figures only) | Amount Bid <br> (Figures only) |
| :--- | :--- | :--- | ---: | ---: | :---: |
|  | Sludge Press <br> Replacement - Phase 1, <br> Complete | Lump <br> Sum | 1 |  |  |
| A-1 | System Integrator Per <br> Specification Section <br> 409000 | Lump <br> Sum | 1 | $\$ 26,139.00$ |  |
| A-2 |  |  |  |  |  |

$\qquad$
\$ $\qquad$
(Amount Written in Words)

An Agreement shall not be formed and no rights shall exist under the Agreement until the final Agreement is fully executed by all parties. Bidder agrees to commence work immediately upon full execution of the Agreement or such later time as defined in a Notice To Proceed.

If provided a Notice of Award, Bidder agrees to execute and perform the Agreement in accordance with the Bid Documents.

By executing this Bid I certify that I have authority to bind the Company or Business Entity submitting this bid.

Name of Company or Business Entitiy

Signature

Print Name

Address

Address

Date

Title

Phone

## Fax

Email address

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KENAI PENINSULA BOROUGH TAX COMPLIANCE CERTIFICATION

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# Tax Compliance Certification Kenai Peninsula Borough <br> Finance Department 

| 144 N. Binkley Street | Phone: (907) 714-2197 |
| :--- | ---: |
| Soldotna, Alaska 99669-7599 | or: (907) 714-2175 |
| www.kpb.us | Fax: (907) 714-2376 |

or: (907) 714-2175
Fax: (907) 714-2376
1.) Fill in all information requested. 2.) Sign and date. 3.) Submit with solicitation, or other.

For Official Use Only

| Reason for Certificate:Solicitation Other: |  |  | For Department: |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Dept. Contact: |  |
| Business Name: |  |  |  |  |
| Business Type: | $\square$ Individual $\square$ Corporation $\square$ Partnership $\square$ Other: |  |  |  |
| Owner Name(s): |  |  |  |  |
| Business Mailing Address: |  |  |  |  |
| Business Telephone: |  |  | Business Fax: |  |
| Email: |  |  |  |  |

> As a business or individual, have you ever conducted business or owned real or personal property within the Kenai Peninsula Borough? (If yes, please supply the following account numbers and sign below. If no, please sign below.)
> $\square$ Yes $\square$ No Kenai Peninsula Borough Code of Ordinances, Chapter 5.28 .140 , requires that businesses/individuals contracting to do business with the Kenai Peninsula Borough be in compliance with Borough tax provisions. No contract will be awarded to any individual or business who is found to be in violation of the Borough Code of Ordinances in the several areas of taxation.


KPB Finance Department (signature required)

| SALES TAX ACCOUNTS |  |  |
| :--- | :--- | :--- |
| ACCT. NO. |  | ACCT. NAME |
|  | $\square$ |  |
|  |  |  |

## $\overline{\text { KPB Sales Tax Division (signature required) }}$

CERTIFICATION: I, $\qquad$ the $\qquad$ hereby certify that, to the (Name of Applicant) best of my knowledge, the above information is correct as of


Date


Date

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NON-COLLUSION AFFIDAVIT

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## NON - COLLUSION AFFIDAVIT

(To be executed and submitted with Bid Proposal)
I, $\qquad$ of $\qquad$ ,
Firm Name
being duly sworn, do depose and state:
I, or the firm, association, or corporation of which I am a member, who bid on the Contract to be executed by the City of Kenai, for the construction of that certain construction project designated as:

## Sludge Press Replacement - Phase 1

located at Kenai, Alaska in the State of Alaska, have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such Contract.

Signature

Name

Title

Date

## ACKNOWLEDGMENT

```
STATE OF ALASKA )
THIRD JUDICIAL DISTRICT )
```

The foregoing instrument was acknowledged before me this ___ day of
$\qquad$ , 202 by $\qquad$ .

NOTARY PUBLIC for State of Alaska
My Commission Expires: $\qquad$

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REQUEST FOR CONSIDERATION AS LOCAL BIDDER

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## REQUEST FOR CONSIDERATION AS LOCAL BIDDER

I declare that $\qquad$ meets the criteria listed below and therefore qualifies as "Local Bidder":

## LOCAL PREFERENCE

1. In awarding competitive bid purchases or construction contracts under KMC 7.15.045, preference may be given to an otherwise qualified "local bidder" unless such preference is prohibited by the funding source.
2. For purpose of this section, a "local bidder" is a person who:
a. Holds a current state business license, and in addition for construction contracts, holds a current, appropriate state contractor's registration certificate;
b. Submits a bid for a competitive purchase or construction contract under the name as appearing on the person's license and, where applicable, a certificate;
c. Has continuously maintained a physical place of business within the Kenai Peninsula Borough staffed by the bidder or an employee of the bidder for a period of one hundred eighty (180) days immediately preceding the date of the bid opening. Bidder must prove compliance with this requirement to the City's satisfaction. Mere maintenance of a mail box or telephone answering service, for example, is not sufficient to comply with this provision; and
d. If a joint venture, is composed entirely of venturers that qualify under this section.
3. An award shall be made to the lowest responsible bidder pursuant to KMC 7.15.045 except that a bid may be awarded to a local bidder if the local bidder's bid is not more than five percent higher than the lowest responsible non-local bidder's bid; provided, however, such preference shall never exceed twenty-five thousand dollars, and further provided that the other provisions of KMC 7.15.045 of this chapter as applicable, have been met and the City chooses to award the bid.
4. The City may require a bidder to provide additional information regarding his qualifications as a "Local Bidder."

COMPANY NAME
ADDRESS
$\qquad$
$\qquad$

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## BID BOND AND POWER OF ATTORNEY

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## BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, $\qquad$ as Principal, and $\qquad$
as Surety, are hereby held and firmly bound unto $\qquad$
as the OWNER, in the penal sum of $\qquad$
for the payment of which, well and truly made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed this $\qquad$ day of $\qquad$ , 2022. The Principal has submitted to , a certain BID, attached hereto and hereby made a part
hereof, to enter into a contract in writing for the $\qquad$

## NOW, THEREFORE,

(a) If said BID shall be rejected, or
(b) If said BID shall be accepted and the principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID), and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agree that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.
L.S.)

Principal

## Surety

$B y$ : $\qquad$
IMPORTANT- - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

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## AGREEMENT

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# CITY OF KENAI <br> AGREEMENT BETWEEN OWNER AND CONTRACTOR 

MADE AS OF THE $\qquad$ DAY OF $\qquad$ 202 $\qquad$ _.

BETWEEN the OWNER:
CITY OF KENAI
210 Fidalgo Avenue
Kenai, Alaska 99611-7794
AND the CONTRACTOR:

## FOR the PROJECT: Sludge Press Replacement Project - Phase 1

The Owner and Contractor agree as set forth below.

## ARTICLE 1 <br> THE WORK

The Contractor shall perform all the work required by the contract documents.

## ARTICLE 2

## ENUMERATION OF THE CONTRACT DOCUMENTS

The additional documents which are specifically incorporated into this Agreement by reference and which form the contract documents are:
A. Any and all later modifications, change orders, and written interpretations of the contract documents issued by the Owner
B. This Agreement
C. Addenda
D. Supplemental General Conditions (if any)
E. General Conditions
F. Drawings and Specifications Provided by Engineer. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided.
G. Drawings and Specifications in the latest edition of the Municipality of Anchorage Standard Specifications (M.A.S.S.) In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided. Contractor is responsible for obtaining the latest edition of the M.A.S.S
H. The Request for Proposals / Invitation to Bid
I. The Contractor's bid/proposal.

Any other attachments to this Agreement do not form a part of the Agreement but are for reference or proof of compliance with the requirements of the Agreement, except where the provisions of this Agreement provide such attachments will be or are a part of the Agreement.

These form the contract and what is required by any of the documents shall be as binding as if required by all. The intention of the contract documents is to require the furnishing of all labor, material, equipment, and other items necessary for the proper execution and completion of the work and to prescribe the terms and conditions of the contract and payment, so as to include work and materials which may be necessary to produce the intended results.
M.A.S.S. is the Municipality of Anchorage Standard Specifications, and Divisions 20 through 80 are hereby incorporated into these Contract Documents. Division 10 is specifically excluded. The Contractor is responsible for checking www.muni.org/projectmgmt/publications.cfm to ensure they have the most current version. Specifications, drawings, and general provisions provided by the Owner (City of Kenai) or their Agents (Engineers, Architects, or others as appointed by the City) take precedence over the M.A.S.S.

## ARTICLE 3 <br> TIME OF COMMENCEMENT AND COMPLETION

Work shall commence upon receipt of the Notice to Proceed. All work must be substantially completed within $\qquad$ days after the date of the notice to proceed. Liquidated damages will be charged against the Contractor as provided below.

## ARTICLE 4

## CONTRACT SUM

The Owner shall pay the Contractor as provided in this contract the total sum price of \$ $\qquad$ for the successful completion of the specified work.

## ARTICLE 5

PROGRESS PAYMENT
Progress payments shall be made per the General Conditions.

## ARTICLE 6

## FINAL PAYMENT

Final payment shall be made per the General Conditions. The Contractor shall request the final inspection at least five (5) days in advance of the anticipated date of inspection. If all work has not been satisfactorily completed, the Contractor shall be liable for all costs incurred by the Owner in making such inspection.

## ARTICLE 7

## NOTICES

All legal notices relating to this contract, including changes of address, shall be mailed to the Owner and the Contractor at the following addresses:

OWNER
CITY OF KENAI
Public Works Director
210 Fidalgo Avenue
Kenai, AK 99611

## CONTRACTOR

## ARTICLE 8

INDEMNIFICATION

No provision in the contract documents lessens, alters, or makes inapplicable the requirement for indemnification stated in the General Conditions or other documents incorporated into the contract by this Agreement.

## ARTICLE 9

## JURISDICTION: CHOICE OF LAW

This contract shall be governed by the laws of the State of Alaska, and any lawsuit brought thereon shall be filed in the Third Judicial District at Kenai, Alaska.

## ARTICLE 10

ATTACHMENTS
In the event there is any difference between an attachment to the original of this Agreement on file with the City of Kenai Public Works Department and any attachment to a copy of the Agreement, the attachments to the original filed with the Public Works Department shall control.

## ARTICLE 11

## LIQUIDATED DAMAGES

Owner and Contractor recognize that time is of the essence in performance of this contract and the Owner will suffer financial loss if the work is not substantially complete within the time specified above, plus any extensions thereof allowed in accordance with contract documents. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by Owner if the work is not substantially complete on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner Five Hundred Dollars (\$500.00) for each calendar day that expires after the contract time required for substantial completion to the actual date of substantial completion determined as set out in the Contract Documents. The Owner and Contractor agree that this amount is a reasonable forecast of just compensation for the harm that is caused by the delay.

## ARTICLE 12 NO THIRD-PARTY BENEFICIARY

This Agreement is intended solely for the benefit of each party hereto. Nothing contained herein shall be construed or deemed to confer any benefit or right upon any third party.

OWNER and CONTRACTOR each binds themselves, their partners, successors, assigns and legal representatives in respect to all covenants, Agreements and obligations contained in the Contract Documents.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed in their respective names or by their duly authorized representatives as of the date and year above written.

OWNER:
CITY OF KENAI
By:
Name:
Title:

STATE OF ALASKA ) )ss.
THIRD JUDICIAL DISTRICT )
THIS IS TO CERTIFY that on
this $\qquad$ day of $\qquad$ , 202
Paul Ostrander, City Manager, City of Kenai, Alaska, being personally known to me or having produced satisfactory evidence of identification, appeared before me and acknowledged the voluntary and authorized execution of the foregoing instrument on behalf of said City.

NOTARY PUBLIC FOR ALASKA
My Commission Expires: $\qquad$

Approved by Legal: Approved by Finance: $\qquad$

GENERAL CONDITIONS TO THE CONTRACT

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## GENERAL CONDITIONS OF THE CONTRACT BETWEEN OWNER AND CONTRACTOR

## ARTICLE 1 CONTRACT DOCUMENTS

1.1 The contract documents enumerated in the Agreement between Owner and Contractor form the final and completely integrated contract between the parties and supersede any prior statements, negotiations, agreements, documents or representations, written or oral. What is required by any one contract document is deemed to be required by all documents.
1.2 The contract documents consist of documents designated as contract documents and enumerated in the Agreement between Owner and Contractor.
1.3 The contract documents do not include any documents unless specifically enumerated in Agreement between Owner and Contractor.
1.4 Unless specifically provided otherwise in the contract documents the parties to this agreement intend that Contractor will obtain all permits, inspections, tests, bonds, and insurance required by state or federal law, rule, regulation or order, or local ordinance or rule or regulation or the contract documents, whichever requirement is greater, and provide all labor, equipment, transportation, water, heat, utilities, tools, scaffolding, materials, supplies, facilities, and services necessary for performance of the contract and that the cost of these requirements be included within the contract price. The parties further intend that the cost of all overhead, supervision, and other incidental expenses required or occasioned by the contract is included in the contract price. The parties also intend that minor items required to produce complete functional system(s) and sub-system(s) are deemed to be required by the contract documents at the contract price whether or not specifically expressed. The requirements stated in this provision apply whether or not the execution or completion of the work is temporary or permanent and whether or not it is incorporated or to be incorporated in the work or final product.
1.5 The requirements of the contract documents and the duties and rights of each party may be amended subsequent to execution of this contract only by:

1. A written amendment to the contract signed by both parties; or,
2. A change order issued pursuant to ARTICLE 9.1
1.6 The term "Work" includes all procurement, labor, materials, products, equipment, erection, installation, and alterations necessary to complete the construction envisioned by this contract. The term "Project" refers to the overall construction, of which the work required by the contract may be the whole or may be a part. The term "Architect" also refers to Registered Engineers as appropriate.
1.7 The contract between Owner and Contractor shall be executed and returned by Contractor within the time required in the instructions to bidders. A written Notice to Proceed with the work will be issued to Contractor within five (5) days after Owner has executed the contract, except as provided in ARTICLE 4.1.3.
1.8 Should any provision or requirement of one portion of the contract documents conflict with any other portion of the contract documents, unless otherwise provided herein, the conflict will be resolved by reference to the contract documents in the following order of priority:
A. Any and all later modifications, Change Orders, and written interpretations of the Contract Documents issued by the Owner
B. The Agreement
C. Addenda
D. Supplemental General Conditions (if any)
E. General Conditions

[^0]F. Drawings and Specifications Provided by Engineer. In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided.
G. Drawings and Specifications in the latest edition of the Municipality of Anchorage Standard Specifications (M.A.S.S.) In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided. Contractor is responsible for obtaining the latest edition of the M.A.S.S.
H. The Request for Proposals / Invitation to Bid
I. The contractor's bid/proposal.
1.9 In case of difference between small and large scale drawings, the large scale drawings shall govern. Schedules on any contract drawing shall take precedence over conflicting information on that or any other contract drawing. On any of the drawings where a portion of the work is detailed or drawn out and the remainder is shown in outline, the parts detailed or drawn out shall apply also to all other like portions of the work.
1.10 In the event Contractor believes a discrepancy exists in the contract documents, Contractor shall submit the issue to the Project Representative together with Contractor's proposed course of action for performance of the work. Project Representative shall respond within seven (7) working days or advise Contractor that a response cannot be given within that time. If response will take more than seven (7) working days, Project Representative shall take steps to provide a response within a reasonable time. Any action taken by Contractor prior to or without Owner's response shall be at Contractor's own risk and expense.
1.11 Words and abbreviations which are not defined in the contract documents, but which have well known technical or trade meanings, shall be construed in accordance with the common meaning established by sound architectural or engineering practice in the State of Alaska.
1.12 Drawings, Specifications, other documents prepared for this project, and copies of them that are furnished by Owner and/or Architect or Consultant for this project, whether or not the documents or project are completed, shall be the property of Owner. All rights of use are reserved to Owner for this project and any subsequent project in which Owner participates in construction. Owner specifically relieves Architect or Consultant of any responsibility or liability pertaining to any subsequent use of the documents, in whole or in part, where those documents bear the stamp of a subsequent Architect or Consultant and are used for a subsequent project.
1.13 An electronic version of contract documents, typically in pdf format on a disc, will be furnished to the Contractor without charge. Contractor shall check all documents furnished immediately upon receipt and shall promptly notify Owner of any discrepancies.
1.14 The contract documents shall not be construed in any way as limiting Contractor's responsibility to perform the work completely, nor shall any prior customs or trade practices be held to constitute a waiver of the requirements of the contract documents or any portion of them.
1.15 The individual(s) executing the contract represent that they have the legal authority to execute the contract as or on behalf of Contractor in accordance with the bid instructions and the contract documents.
1.16 Execution of the contract by Contractor is a representation that Contractor has visited the site, become familiar with the local conditions under which the work is to be performed, has correlated personal observations with the requirements of the contract documents and enters this contract with knowledge of those conditions.

## ARTICLE 2 ADMINISTRATION OF THE CONTRACT

2.1 The term "Project Representative" shall mean a person or entity employed by or under contract to Owner to be Owner's on-site designated representative. The term Project Representative shall include the Project Representative's employees.
2.2 The terms "Architect" or "Engineer" (hereinafter used interchangeably) shall mean the person or entity contracted by the City of Kenai to provide design services for the project. Architect or Engineer also includes employees of the Architect or Engineer. Architect shall provide professional services during construction as described herein below or as authorized by Owner.
2.3 Project Representative will provide administration of this contract and all communication made to Owner, Architect or Engineer by Contractor shall be made through Project Representative.
2.4 Project Representative will be Owner's primary representative during construction until final payment has been made and the project has been closed out. Owner's instructions to Contractor shall be made through Project Representative, who shall have authority to act on behalf of Owner to the extent set forth in this contract.
2.5 Project Representative shall not have the authority to require additional work, changes in the work, modifications or waivers of the rights, work or duties required by the contract documents or the right to bind Owner to any change in specifications or drawings without the written consent of Owner except as provided herein.
2.6 Project Representative shall have authority to allow minor deviation in the requirements of the contract documents by Field Order to a maximum cumulative amount of $\$ 5,000.00$ per each additional work item, change in work, modification or waiver in the work. Field Orders are to be incorporated into a subsequent Change Order.
2.7 Project Representative will render interpretations of the contract documents necessary for the proper execution or progress of the project. All interpretations and decisions of Project Representative shall be consistent with the intent of the contract documents and shall be in writing.
2.8 Matters relating to design intent will be referred to the design Architect whose decisions will be final, consistent with the intent of the contract documents.
2.9 Project Representative, Architect, and authorized representatives of Owner shall have access to the project site and to the work at all times and shall be afforded every reasonable facility for ascertaining whether or not the work is in accordance with the requirements and intent of the contract documents.
2.10 All claims, disputes and other matters in question between Contractor and Owner relating to the execution or progress of the work shall be resolved pursuant to ARTICLE 12.
2.11 Project Representative shall have the authority: 1) to reject work which does not conform to the contract documents; 2) to require additional inspections or testing of any work during, prior to, or after fabrication, installation, or completion; 3) to specify both remedial work necessary to correct defective work and the time within which such work must be performed.
2.12 On the basis of on-site observations and inspections Project Representative will keep Owner informed of the progress of the work, and will endeavor to guard Owner against defects and deficiencies in the work. If Project Representative determines that any construction method, sequence, material, technique, safety precaution, act or omission of Contractor, Contractor's subcontractors, suppliers, or any of their agents, is detrimental to the progress, quality or safety of the work or to Owner's interest, then Project Representative shall inform Owner promptly, and Owner may, among other things, stop the work and order remedial measures. This provision shall not eliminate or reduce the responsibilities or requirements placed upon contractor and/or subcontractors by the contract documents and shall not place any liability upon the owner for action or omission in regard to this provision.
2.13 In accordance with the requirements of ARTICLE 8.5, Project Representative will determine amounts owing to Contractor and will recommend that Owner issue payment in the amount determined due.
2.14 Project Representative, with the concurrence of Owner, will determine the dates of Substantial Completion and Final Completion. The Architect will receive and forward to Owner for Owner's review, written warranties and related documents required by the contract and assembled by Contractor.
2.15 Project Representative's duties, responsibilities, and limitations of authority will not be modified without written consent of Owner and Project Representative.

## ARTICLE 3 OWNER GENERAL RIGHTS AND DUTIES

3.1 At Owner's option, Owner may undertake any or all tasks of Project Representative described in ARTICLE 2.
3.2 Owner's directions to Contractor will be made in writing either directly or through Project Representative in accordance with ARTICLE 2. No verbal representation shall be binding upon any party unless confirmed in writing.
3.3 Owner shall have the right to perform work related to the project under separate contract(s) in accordance with the provisions of ARTICLE 6.
3.4 Owner shall have the right to issue change orders from time to time which may alter the scope of work required by the contract documents. All change orders will be subject to provisions of ARTICLE 9.
3.5 Owner will have the authority to reject work which does not conform to the requirements of the contract documents and to require such remedial work at no charge to Owner as is necessary to correct the defective work. Where defective work is being performed by Contractor and Contractor fails to correct the defective work within a reasonable period of time as set out in ARTICLE 10, or repeatedly fails to carry out the work in accordance with the contract documents, Owner shall have the authority to order an immediate halt to all defective work. Any losses suffered by Contractor as a result of the halt shall be borne by Contractor without recourse to Owner. Issuance of a stop-work order shall not be construed as constituting a breach of the agreement nor authorize Contractor to refuse to perform other portions of the work which Owner has not halted.
3.6 Owner shall have the right to terminate the contract or suspend performance of the contract as set out in these general conditions or other contract documents.
3.7 Owner shall promptly pay Contractor all sums properly due as provided by ARTICLE 8. If Owner fails to issue payment for a period of forty-five (45) days after the certificate of payment has been approved by Project Representative, without a written statement indicating why payment is being withheld, then Contractor may terminate the contract upon seven (7) days written notice to Owner and may recover from Owner payment for all work executed and for any proven losses sustained upon any materials, equipment and tools, including a reasonable profit and overhead.
3.8 Owner and Contractor warrant that neither party will maintain an action against the other for punitive or exemplary damages.

## ARTICLE 4 CONTRACTOR'S GENERAL RIGHTS AND DUTIES

### 4.1 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

4.1.1 The term "Contractor" means the person or entity identified in the Agreement which has contracted with Owner to perform the work of the contract. This definition includes a responsible officer of Contractor's organization or its authorized representative who shall be made known to Owner.
4.1.2 Contractor represents by execution of the Agreement that Contractor has carefully examined the contract documents and the site upon which the work is to be performed and has developed familiarity with the nature, extent, site access, and risks involved in the work and with all local conditions and applicable statutes, ordinances and regulations that may affect the performance of the work. Contractor assumes full responsibility for having correlated Contractor's study of the contract documents and observation of the site. Contractor represents that Contractor has studied all available surveys and investigation reports of subsoil and latent physical conditions of the site and has made such additional surveys and investigations as Contractor deemed necessary for the performance of the work at the contract price, within the time specified and in accordance with the requirements of the contract documents.
4.1.3 Contractor shall not begin work until given a Notice to Proceed, which will be issued as promptly as possible after the Agreement has been executed by all parties. If Owner is required to delay issuance of a Notice to Proceed for more than five (5) working days because of fault of Contractor or other reasons which Owner deems sufficient, then Contractor shall be notified in writing of the delay and when issuance of the Notice to Proceed is anticipated.
4.1.4 Before commencing any part of the work, and prior to undertaking each subsequent phase of the work, Contractor shall carefully study the plans and specifications and check and verify all previous work and pertinent dimensions, figures and amounts shown in them and shall make all applicable field measurements. Contractor shall at once report in writing to Owner any apparent conflict, ambiguity, discrepancy, error or other omissions which Contractor may discover. Contractor shall be liable to Owner for failure to notify Owner of any conflict, ambiguity, discrepancy, error or other omissions which Contractor discovered, but failed to report to Owner and shall be responsible for providing a remedy.
4.1.5 Contractor shall lay out the work from established base lines and bench marks indicated on the drawings and shall be responsible for all measurements in connection therewith. Contractor will be held responsible for the execution of the work to such lines and grades. It shall be the responsibility of Contractor to maintain, preserve, or replace all stakes and other marks.
4.1.6 Drawings showing location of equipment, piping, etc., are diagrammatic and job conditions will not always permit installation in the location shown. If a situation occurs which may require relocation of an item or system which substantially differs from the location called for in the contract documents, it shall be brought to Owner's attention immediately and the relocation determined with the concurrence of Architect or Engineer. If Contractor relocates such items without approval, Contractor will be responsible for any cost or expense for removal or further relocation necessitated by installation without approval.

### 4.2 SUBMITTALS

4.2.1 Within 10 days after the effective date of the notice to proceed and prior to commencement of work, Contractor shall submit to Owner the construction progress schedule and schedule of values required in Articles 4.2.2, 4.2.3 and 4.2.4. The schedule of values and progress schedule must be acceptable to owner and provide reasonable divisions of contract work with corresponding payment. No payment will be made under this contract prior to completion of this requirement. In cases of a unit bid project, the bid schedule on the bid form will be the schedule of values.
4.2.2 In accordance with the requirements governing submittals as provided in the contract documents, Contractor shall prepare and submit to Owner a detailed progress schedule for the work which reveals and identifies the critical path of progress, which is consistent with the work and time required by the contract, and which shall provide for the most expeditious and practicable execution of the work. Float time between work items is part of the project and not property of the Contractor. Float time is defined as the amount of time that spans from completion of one previously scheduled activity and extends to the point at which the next scheduled activity is set to begin.
4.2.3 Contractor shall also provide Owner with a proposed schedule of values upon submittal of a detailed progress schedule for the work. The schedule of values shall be allocated to various portions of the work and be prepared in such a form and supported by such data to substantiate its accuracy as reasonably required by Owner. Each item of work shall include all applicable profit and overhead. This schedule of values, unless objected to by owner shall be the basis for progress payments made to Contractor and shall include specific lump sum amounts for "Final Payment." This line item shall be in conformance with guidelines specified in ARTICLE 8. Contractor, at the request of Owner, shall amend the progress schedule and the schedule of values as the work progresses.
4.2.4 The schedule of values must show a complete breakdown of all phases of the work required by the contract documents. Payment will be in accordance with ARTICLE 8. Pay requests, schedules of value and progress schedules must correspond.
4.2.5 Contractor shall submit for Architect's and Owner's approval all product data required by the contract documents in conformance with the dates specified in the detailed progress schedule. Such data include illustrations, standards, schedules, performance charts, instructions, brochures, diagrams, or other
information necessary to assist Architect in determining whether a proposed product meets the intent of the contract documents.
4.2.6 Contractor shall also submit physical samples of materials, equipment or workmanship where required by the contract documents. After approval by Owner and Architect, the sample shall be established as the minimum standard of work, material, equipment or other quality which will be acceptable for work of which the sample is representative.
4.2.7 Submittal of shop drawings by contractor constitutes a representation by contractor that the submittal and work, or products required or to be used in accordance with that submittal, will meet or exceed the criteria and conditions of the contract documents and that performance of the work identified in those submittals will meet the progress schedule.
4.2.8 Before initiating any work for which shop drawings are required, Contractor shall obtain Architect's approval of the shop drawings, which include drawings, diagrams, schedules and other data specially prepared by Contractor, a subcontractor, a manufacturer, a supplier or distributor to illustrate in detail that portion of the work. Contractor shall review, approve, and submit all shop drawings, whether prepared by himself/herself or subcontractor or supplier. It shall be the duty of Contractor to provide a whole or complete system and to coordinate all work depicted by a particular shop drawing with the work required by other shop drawings for that portion of the work or for related or adjacent work.
4.2.9 Contractor shall provide a copy of all transmittal letters to Project Representative at the time the submittal is made to Architect. Architect will review Contractor's submittals only for conformance with the design concept of the work and the information given in the contract documents. Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component. Architect will return reviewed submittals to Contractor with written comments and forward one set to Project Representative with reasonable promptness so as to cause no delay. A minimum of five (5) sets of submittals shall be required.
4.2.10 Should Architect reject any proposed shop drawings, product data or sample, Contractor shall resubmit revised drawings, samples or product data and draw Architect's attention to any deviation or revisions other than those requested by Architect.
4.2.11 All of Contractor's submittals shall be made in conformance with the dates specified in the detailed progress schedule with reasonable promptness and in such sequence as to cause no delay in the work of Owner or any separate contractor.
4.2.12 The Contractor shall provide two (2) hard copies and an electronic .PDF file of the operation and maintenance manuals for equipment and systems incorporated in the work.

### 4.3 SAFETY AND CONTROL OF SITE

4.3.1 Contractor is deemed to be in physical control of the work site. Contractor shall confine Contractor's operations at the site to those areas described in the contract documents or permitted by applicable statutes, ordinances or permits.
4.3.2 Contractor shall not unreasonably encumber the site with materials, equipment or ancillary construction. Contractor shall be responsible for eliminating or minimizing to the extent reasonably possible, public hazards and inconveniences which might result from this work.
4.3.3 Contractor shall at all times keep the premises free from accumulation of excess snow, waste materials or rubbish and shall keep adjacent public road clear of mud and dust caused by Contractor's activities. At the completion of the work, Contractor shall remove all waste materials and rubbish from the project as well as Contractor's tools, equipment and surplus materials. The removal and disposal of waste materials, rubbish, or other material, shall be accomplished in accordance with all local, state and federal requirements.
4.3.4 Contractor shall be responsible for initiating, maintaining and supervising all necessary safety precautions in connection with this work and shall be responsible for ascertaining and adhering to all applicable federal, state, and local standards, laws, ordinances, regulations, requirements and any lawful order of any public authority bearing on the safety of persons or property or their protection from damage, injury, or loss.
4.3.5 Contractor's duty to maintain a safe and secure project site shall include all precautions necessary to assure the safety and protection against injury and damage, of all employees engaged in the work and any other person who may be affected by the work including Owner's agents and employees; Contractor's agents and employees; and members of the general public. Contractor shall assure the safety and protection of all work, materials and equipment which may be upon the site; utilities and other property of Owner including portions of structures and utilities not designated for removal or relocation, trees, shrubs, lawns, walks, pavements and roadways. Contractor duties include but are not limited to protection of project site from vandalism. Such precautions shall further include but not be limited to protection from dangers from hazardous materials.
4.3.6 Contractor shall take all necessary measures to prevent members of the general public from entering upon the site without the permission of Owner or Contractor.
4.3.7 Contractor shall comply with all OSHA requirements, give all safety notices, erect and maintain all reasonable safeguard notices and barriers, including danger signs and fences which may be required to protect the site and limit access to it.
4.3.8 In the event of an emergency, the Contractor will take all means necessary to minimize all damage to or exposure from effects of a catastrophic event. In such case, the Contractor may consult with Owner or seek Owner's assistance. The responsibility for protection of the site, work, and all material remains with the Contractor.
4.3.9 Contractor shall designate a person in Contractor's employ at the site to be primarily responsible for the prevention of accidents, identification of all applicable safety standards, statutes and regulations, including but not limited to those addressing hazardous material, and full compliance therewith. This person shall be Contractor's Superintendent unless otherwise designated by Contractor in writing to Owner.
4.3.10 Should Project Representative or other representative of Owner ascertain that a safety danger exists, Project Representative or Owner may order an immediate cessation of all dangerous activity and a correction of any safety hazard. Written notice of the order to stop work or to correct the safety hazard shall be made to Contractor as soon as practicable. Contractor shall have no recourse against Owner for any alleged losses or delays arising from this section unless the order to stop work or correct safety deficiency is wholly without basis.
4.3.11 Should Contractor elect to utilize explosives or other hazardous materials or equipment, or should Contractor be required to do so for the execution of the work, Contractor shall first give jurisdictional authorities and Owner notice of the intention to utilize hazardous materials, explosives or equipment at a particular time and date. Contractor shall use the utmost care in utilizing such materials and shall use only properly qualified and licensed personnel.
4.3.12 Contractor shall correct any damage to the property of Owner or other parties which arises out of the activities or omissions of Contractor, Contractor's agents, subcontractors, employees, personnel or suppliers. Contractor shall commence remedial activities within seven (7) days from the date of the damage. If Contractor fails to do so, Owner or the affected party may utilize his own forces to correct or replace the damaged property and Contractor shall promptly reimburse Owner or the affected party for all losses and costs thereupon. In the event Contractor fails to reimburse Owner as set forth herein, Owner may set off the amount due Owner from any amount due Contractor.

### 4.4 SUPERVISION AND QUALITY OF THE WORK

4.4.1 Contractor shall supervise and direct the work using the best skill and attention. Contractor is responsible for, and agrees to comply with all applicable local, state and federal ordinances, laws, regulations and statutes. Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for the schedule and coordination of all portions of the work to be performed under the contract. Contractor shall also be required to coordinate the work with that of any other contractor working on the project so as to minimize delay, inconvenience, and expense to both. Where identified in writing by Owner at any time, Contractor shall be required to coordinate the work with any partial use of the site that Owner deems necessary.
4.4.2 All materials and equipment shall be applied, installed, connected, erected, used, cleaned, prepared or conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processor except as otherwise provided in the plans and specifications.
4.4.3 Contractor shall keep on the job site at all times during work progress, a competent resident superintendent capable of reading and thoroughly understanding the plans and specifications. The superintendent will be Contractor's representative at the site and all communications given to the superintendent shall be as binding as if given to Contractor directly. In the event Contractor decides to replace the superintendent, Contractor shall submit to Owner a written notice including the proposed new superintendent's qualifications. The superintendent shall not be replaced without this written notice and a statement of nonobjection by the Owner.
4.4.4 Contractor shall provide sufficient, competent, and suitable qualified personnel to survey and lay out the work and to perform all construction required by the contract documents. Contractor is responsible for maintaining good discipline and order at the job site at all times and shall not employ any unfit person or anyone not skilled in the task assigned to that person.
4.4.5 Contractor shall be fully responsible to Owner for the acts and omissions of Contractor's employees and agents, Contractor's subcontractors and their employees and agents, and any other persons performing any of the work for the benefit of Contractor.
4.4.6 Contractor shall not permit the possession or use of alcohol or controlled substances on the site, and shall remove from the site any person who possesses, uses, or is under the influence of alcohol or controlled substances. Contractor shall require all Contractor's agents, subcontractors, employees or suppliers who perform work on site to sign a statement that they have been informed and will abide by the above policy. A copy of all such statements shall be kept at the job site throughout the duration of Contractor's work.
4.4.7 Contractor warrants to Owner that all work will be free from faults and defects and meeting or exceeding the requirements of the contract documents and all local, state, and federal legal requirements. All work not so conforming to these standards will be considered defective, and Owner may require its correction.

### 4.5 DIVISION OF THE WORK

4.5.1 The division of the work into various specialties and divisions in the contract specifications and drawings shall not bind Contractor in apportioning the work among various subcontractors, specialty contractors or workers, and Contractor's own employees.

### 4.6 TITLE 36 AND OTHER STATUTORY REQUIREMENTS

4.6.1 Contractor shall give and post all notices and comply with all federal, state, and local laws, ordinances, regulations, requirements and any lawful order of any public authority bearing on the performance of the work, and shall notify Owner in writing if the drawings and specifications or the contract documents are at variance therewith. If Contractor knows or should know that Contractor is performing work contrary to such legal requirements without giving written notice to Owner in time for Owner to give a stop work order, the Contractor shall bear all costs to remedy that work and to bring it into conformance with the applicable requirements. In the event Contractor fails to reimburse Owner as set forth herein, Owner may set off the amount due Owner from any amount due Contractor. This requirement does not lessen or alter the requirement for indemnification stated in ARTICLE 4.13.
4.6.2 Contractor and subcontractors shall strictly comply with all requirements of Title 8, Chapter 30 of the Alaska Administrative Code and Title 36 of the Alaska Statutes as applicable to this contract.
4.6.3 Contractor or subcontractors of the contractor shall pay all employees unconditionally as required by AS 36.05.040 and any other applicable laws or regulations. Wages may not be less than those stated in the advertised specifications, regardless of the contractual relationship between the Contractor or subcontractors and laborers, mechanics, or field surveyors. The wages are determined for the region in which the work is done and the rates are issued by the Alaska State Department of Labor (see attached Title 36 wage schedule). The scale of wages to be paid shall be posted by Contractor in a prominent and easily accessible place at the site of the work. If it is found that a laborer, mechanic or field surveyor employed by the Contractor or subcontractor has been or is being paid a rate of wages less than the rate
of wages required by this contract, Owner may, on written notice to Contractor hold Contractor in immediate default and terminate Contractor's right to proceed with the work or that part of the work for which there is a failure to pay the required wages, and Owner may prosecute the remaining work to completion by contract or otherwise, holding Contractor and Contractor's sureties liable for any costs in excess of the contract price. In the event Owner permits Contractor to pursue further work under the contract, Owner shall withhold so much of the accrued payments as is necessary to pay to laborers, mechanics, or field surveyors employed by the Contractor or subcontractors the difference between the rates of wages required by the contract to be paid laborers, mechanics, or field surveyors on the work and the rates of wages in fact received by laborers, mechanics, or field surveyors.
4.6.4 A copy of certified payrolls shall be provided to the Project Representative with each Progress Payment Request.

### 4.7 PROJECT RECORDS

4.7.1 Contractor shall maintain at the project site copies of plans and technical specifications, approved shop drawings and manufacturers' information sheets, and other contractor documents which are necessary for the expeditious and correct execution of the work.
4.7.2 Contractor shall maintain at the project site a complete daily job report showing job conditions, work activities started, in progress, interrupted and completed; work force, including identification and number of Contractor's employees and subcontractors by craft; receipt and disposition of materials and equipment; tests performed, visiting personnel and any accidents on a particular day. Owner shall have access to the daily report at all times. A copy of each daily report shall be provided to Project Representative at the end of each week.
4.7.3 Contractor shall keep one record copy of all specifications, drawings, addenda, modifications, and shop drawings at the job site in good order and annotated to show all changes made during the construction process. These shall be available to Owner during construction and turned over to Owner prior to final completion of the work.

### 4.8 ALLOWANCES

4.8.1 Contractor shall include in the contract sum all allowances stated in the specifications or plans, and all items covered by these allowances shall be supplied in such amounts, or by such a person, as Owner may direct. The allowance shall include the cost to Contractor, less applicable trade discounts, of materials and equipment required by the allowance; delivery at the site, applicable taxes; Contractor's cost for unloading and handling on the site, for labor, installation, overhead, profit and other expenses incurred by Contractor. Whenever the cost of the allowed item exceeds or is less than the allowance, the contract sum shall be adjusted equitably by change order.

### 4.9 NONDISCRIMINATION

4.9.1 Contractor must comply with all federal and state laws, rules, regulations and orders, and all local ordinances, regulations and rules concerning wages, taxes, social security, workers' compensation, nondiscrimination, licenses, registration requirements, and similar provisions governing employment of individuals.
4.9.2 Contractor will not discriminate against any employee or applicant for employment or refuse employment to a person, or bar a person from employment, or discriminate against a person in compensation or in a term, condition, or privilege of employment because of the person's race, religion, color, or national origin, or because of the person's age, physical or mental disability, sex, marital status, changes in marital status, pregnancy, or parenthood when the reasonable demands of the position do not require distinction on the basis of age, physical or mental disability, sex, marital status, changes in marital status, pregnancy, parenthood, or political affiliation. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause. Contractor further agrees to insert this provision in all subcontracts hereunder and to require the subcontractors to insert this provision in their subcontracts.

Notwithstanding the prohibition against employment discrimination on the basis of marital status or parenthood stated above, an employer may, without violating this provision, provide greater health and retirement benefits to employees who have a spouse or dependent children than are provided to other employees.
4.9.3 Contractor shall state, in all solicitations or advertisements for employees to work on contract jobs, that all qualified applicants will receive consideration for employment in accordance with the above referenced nondiscrimination clause.
4.9.4 Contractor shall comply with the reporting requirements which the State of Alaska may establish by regulation.
4.9.5 Contractor shall include the provisions of these paragraphs in this section in every subcontract or purchase order under this contract so as to be binding upon every such subcontractor or vendor of Contractor under this contract.

### 4.10 TAXES

4.10.1 Contractor shall pay all sales, consumer, use and other taxes for the work or portions thereof provided by Contractor which are legally enacted at the time bids are received, whether or not yet effective.
4.10.2 Contractor shall comply with Owner's requirements for payment of taxes. This contract is specifically subject to the provisions of City of Kenai Code, as it now stands or as it may be amended, including but not limited to termination of the contract for non-compliance. If the violation arises from failure to file or remit sales taxes, no payment will be made to Contractor until all filings have been made and all amounts due are paid.

### 4.11 PERMITS, FEES, AND NOTICES

4.11.1 Contractor shall secure the building permit from the City of Kenai at no cost. Unless otherwise provided in contract documents, Contractor shall secure and pay for all other legally required permits and government fees, licenses and inspections necessary for the proper execution and completion of the work. These are customarily secured after execution of the contract. These costs are part of the contract price. This provision does not lessen the requirements set out in ARTICLE 1.4.
4.11.2 Contractor is required to comply with all permits obtained by Owner for project, if any. Contractor is responsible for requesting information from Owner regarding any applicable permits obtained by Owner.

### 4.12 ROYALTIES AND PATENTS

4.12.1 Contractor shall pay for all royalties and license fees. Contractor shall defend all suits or claims for infringement of any patent rights and shall save Owner harmless from loss on account thereof.

### 4.13 INDEMNIFICATION

4.13.1 The contractor shall indemnify, hold harmless, and defend the City at its own expense from and against any and all claims, losses, damages or expenses, including reasonable attorney's fees, of, or liability for, any wrongful or negligent acts, errors, or omissions of the contractor, its officers, agents or employees, or any subcontractor under this contract. The contractor shall not be required to defend or indemnify the City for any claims of, or liability for, any wrongful or negligent act, error, or omission solely due to the independent negligence of the City. If there is a claim of, or liability for, the joint negligence of the contractor and the independent negligence of the City, the indemnification and hold harmless obligation shall be apportioned on a comparative fault basis. Apportionment shall be determined upon final determination of percentage of fault. If any such determination is by settlement, the percentage of fault attributed to each party for purposes of this indemnification provision shall only be binding upon the parties included in the settlement agreement. "Contractor" and "City" as used in this article include the employees, agents, officers, directors, and other contractors who are directly responsible, respectively, to each. The term "independent negligence of the City" is negligence other than in the City's selection, administration, monitoring, or controlling of the contractor and in approving or accepting the contractor's work.

## ARTICLE 5 SUBCONTRACTORS AND SUPPLIERS

### 5.1 DEFINITIONS AND RESPONSIBILITIES

5.1.1 A subcontractor is a person or entity having a direct contractual relationship with Contractor, or with one of Contractor's subcontractors, to perform any of the work at the site. A supplier is any manufacturer or person or firm providing materials, equipment or assemblies to Contractor or to one of the subcontractors for inclusion in this project.
5.1.2 All contracts between Contractor, subcontractors and suppliers (whether or not in privity with Contractor) shall be in accordance with the terms of this contract and shall incorporate the General Conditions of this contract. Contractor shall include in such contracts, and require its inclusion in any subcontracts, a provision holding any subcontractor or supplier (whether or not in privity with Contractor) directly accountable to Owner for work which fails to meet the requirements of the contract documents, or which prevents Contractor or any subcontractor from performing work. This direct accountability to the Owner shall be in addition to Contractor's liability for any such failure.
5.1.3 The provisions in this ARTICLE shall not be construed as creating a right of recourse, or any direct contractual relationship, between Owner or Owner's agents and any subcontractor, supplier, or manufacturer (whether or not in privity with Contractor).
5.1.4 Contractor shall make all necessary copies of these contract documents available to Owner and to each subcontractor and shall require each subcontractor to make copies of these contract documents available to each of Contractor's subcontractors, if any.
5.1.5 Contractor shall be fully responsible for enforcing discipline among subcontractors, their employees and their subcontractors, and for insuring that each subcontractor performs the work in accordance with the contract documents and all safety regulations.
5.1.6 Contractor shall have the discretion to require subcontractor(s) to provide payment or performance bonds for work of the subcontractor(s).

### 5.2 AWARDS TO SUBCONTRACTORS AND SUPPLIERS

5.2.1 At Owner's request Contractor shall submit to Owner a list of all principal subcontractors and material suppliers and shall not contract with any proposed person or organization to whom Owner voices a reasonable objection. This provision applies to substitution of subcontractors or suppliers subsequent to Owner's initial objection to a proposed person or entity. Such list shall be submitted in accordance with Division 1 requirements as provided in the contract specifications.
5.2.2 Rejection of a proposed subcontractor or material supplier shall not entitle Contractor to any increase in the contract sum or time.
5.2.3 At Owner's request Contractor shall submit to Owner a copy of any subcontract and any purchase orders for materials and equipment prior to purchase of such items.

### 5.3 CONTRACTOR PAYMENTS TO SUBCONTRACTORS AND SUPPLIERS

5.3.1 Recognizing the importance of maintaining the integrity of a public contract, Contractor warrants that Contractor will pay all subcontractors and material suppliers at least monthly on or about the 20th day of each month upon approval of the subcontractors' and materials suppliers' billing, for all apparently acceptable work performed on the site during the preceding month and for all apparently acceptable material incorporated into the project or delivered and properly stored at the site during any month for which Contractor has received payment from Owner. If Owner retains a percentage of sums due, Contractor may retain a like percentage, but when retainage is paid, Contractor must pay to the subcontractor or supplier interest on retainage equal to interest rate paid to Contractor by Owner.
5.3.2 In furtherance of Contractor's warranty under this ARTICLE and ARTICLE 8, Owner, may require Contractor to declare Contractor's status of accounts with any or all the subcontractors and suppliers. A proof of payment to subcontractors and suppliers shall be made in a form acceptable to Owner. If Contractor
breaches this warranty and fails to pay each subcontractor and materials supplier within 45 days after a monthly billing has been presented, then Owner reserves the right to withhold sufficient sums from Progress Payments due to Contractor and to issue payment to the subcontractors or material suppliers directly. This ARTICLE shall not be construed as creating a right in the subcontractors or material suppliers to have direct recourse against Owner for payment. Contractor expressly agrees that Owner will not be liable for any exercise of Owner's discretionary right under this section, and Contractor agrees to release and indemnify Owner for any claims arising therefrom, either by Contractor directly or by any subcontractor or material supplier. Likewise, this ARTICLE shall not be construed as creating a right in Contractor's surety or any other subrogated party to have direct recourse against Owner for failure to withhold sums pursuant to this section.

## ARTICLE 6 SEPARATE CONTRACTS

6.1 Owner has the right to award separate contracts for work on the project that is not included in this contract.
6.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the contract documents in each case shall mean the Contractor who executes each separate contract.
6.3 Contractor shall afford other contractors and Owner's own forces reasonable opportunity for the introduction and storage of materials and equipment and for the execution of their work and shall properly connect and coordinate Contractor's work with theirs as required by the contract documents.
6.4 Any costs caused by defective or ill-timed work under separate contracts shall be borne by the party responsible thereof and shall be paid promptly.
6.5 When separate contracts are let within the limits of any one project, each Contractor shall conduct the work so as not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his or her contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.
6.6 If any part of Contractor's work depends upon work performed by Owner or any separate contractor, prior to proceeding with the work, Contractor is required to report to Owner any apparent discrepancies, defects or delays in the other work which impede proper execution of the work required by this contract. If Contractor fails to report such unsuitable work by another contractor to Owner, then Contractor shall be deemed to have accepted the unsuitable work and any liability for all deficiencies, damages and costs which arise as a result of the defective work or of Contractor's use or covering of the unsuitable work.
6.7 Should Contractor or any subcontractor delay or cause damage to the work or property of any other contractor or person, Contractor shall repair the damage or settle the claim and shall further, to the extent allowed by law, indemnify, defend, and hold Owner harmless from any and all claims, costs, expenses, injury, damages, or loss of any kind, including attorneys' fees, court costs, or arbitration costs, which arise out of such delay or damage.
6.8 Should a dispute arise between Contractor and separate contractors as to the responsibility for completing, finishing or cleaning up particular work or a portion of the work, Owner may complete, finish or clean up the disputed portion and apportion the cost among Contractors responsible as Owner shall determine to be equitable.

## ARTICLE 7 BONDS AND INSURANCE

### 7.1 PERFORMANCE AND PAYMENT BONDS

7.1.1 For contracts with a contract sum of one hundred thousand dollars $(\$ 100,000)$ or greater, or as otherwise specified in the request for bid, Contractor shall provide as part of the basic contract sum, a performance bond and a payment bond, each in the amount of $100 \%$ of the contract amount, prior to Owner's execution
of the contract. Contractor shall have no recourse of any kind against Owner, if Owner declines to award a contract due to Contractor's failure to provide the required bonds. These bonds, in whatever amount required by the specific contract, shall be administered and deemed governed by the provisions of Alaska Statutes Title 36, Chapter 25 and shall comply with all requirements for payment and submission of claims as provided by that chapter.
7.1.2 All bonds shall name Owner as the beneficial party and shall protect Owner for a period of at least one year subsequent to the date of final payment upon this contract. All bonds shall be executed upon a form acceptable to Owner and by a surety company licensed to do business within the State of Alaska and acceptable to Owner. The form of the bond shall provide that Owner shall have at least thirty (30) days prior notice of any lapse in bond coverage. The bond payment shall be applicable to all subcontractors or material suppliers (whether or not in privity with Contractor) who might attempt to assert a claim against Owner.
7.1.3 Owner may inform the surety as to the general progress and status of the work. A copy of all communications with the surety company shall be provided promptly to Contractor upon request.
7.1.4 In the event Contractor refuses, or is unable to make payments to laborers, subcontractors or material suppliers, or to complete the work, or to correct defective work, within the times provided by this contract, Owner may elect to call upon Contractor's surety to rectify Contractor's default. Contractor shall first be given seven (7) calendar days written notice (effective when mailed) of Owner's intentions to call upon the surety company and Owner shall specify to Contractor the basis for the proposed course of action. If Contractor fails to correct the default within the time provided, Owner shall promptly call upon the surety.
7.1.5 Prior to final payment or reduction in retainage, Contractor shall provide written consent of each affected surety releasing Owner from any further claims arising from payment to Contractor and obligating the surety company to rectify any default, nonpayment, defective work, error, omission or deficiency of Contractor.
7.1.6 Contractor and Owner expressly agree that Owner shall be entitled to retain from payments to Contractor amounts in excess of normal retainage if these additional amounts may be necessary to indemnify Contractor's surety for any payment or corrective work which the surety might be required to undertake. This additional retainage will be made only upon written directive by Contractor's surety specifying the reason for retaining extra amounts, the amounts to be retained and agreement of the surety to reimburse Owner for any interest which may be due Contractor under the provisions of the Alaska Statutes.

### 7.2 CONTRACTOR'S INSURANCE

7.2.1 The services to be rendered under this contract are those of an independent Contractor.
7.2.2 Contractor and all subcontractors, if any, shall be responsible for the purchase and maintenance of all insurance required by law and at a minimum purchase the insurance coverage as specified in ARTICLE 7.2.5 and 7.2.6 below, and any other insurance coverage as may be specified in ARTICLE 7.2.11 SUPPLEMENTARY GENERAL CONDITIONS OF INSURANCE, if attached and forming a part of this contract. Such insurance shall be by a company/corporation currently rated "A-" or better by A.M. Best.
7.2.3 This insurance coverage required by ARTICLE 7.2.5 and 7.2.6, and ARTICLE 7.2 .11 if attached, shall be in acceptable form, and for the amounts specified by the City of Kenai, or as required by law, whichever is greater.
7.2.4 The insurance policies shall remain in force for the life of the contract and shall be a part of the contract price.
7.2.5 Commercial general liability with minimum coverage of $\$ 1,000,000$ and automobile liability insurance with minimum coverage of $\$ 1,000,000$ combined single limit bodily injury and property damage per occurrence. This insurance shall be primary and exclusive of any other insurance carried by the City of Kenai. The commercial general liability insurance shall be without limitation on the time within which the resulting loss, damage, or injury is actually sustained.
7.2.6 Per Alaska State Statutes, Worker's Compensation and Employers Liability Insurance shall be provided for all employees who are performing work under this contract.
7.2.7 Certificate(s) of Insurance shall be provided by Contractor and all subcontractors, or their Insurance Companies and/or their Agents, naming the City of Kenai as an additional insured for the work specified in this contract with a waiver of subrogation for commercial general liability insurance and automobile liability insurance. The certificates of insurance must reference the specific contract by name. Workers compensation insurance must be endorsed for waiver of subrogation against the City. Certificates of Insurance, acceptable in form and content, will be delivered to Owner at the address designated for legal service in the agreement, at or prior to presentation of the contract for execution by owner.
7.2.8 There shall be no cancellation or material change of the insurance coverage, or intent not to renew the insurance coverages as specified in this contract, without thirty (30) days prior written notice to the City of Kenai. Notice of cancellation, material change in coverage, or intent not to renew will be delivered to the address designated for legal notice in the agreement.
7.2.9 Upon renewal or change in policies during the contract, Certificates of Insurance shall be delivered to the address designated for legal notice in the agreement.
7.2.10 Owner shall have the option to purchase and maintain such insurance as will protect Owner against property losses or liability claims, which may arise from operations under the contract. Insurance providing coverage against fire and extended coverage perils, may, at Owner option, provide coverage to the full insurable value of the project and insure the interests of Contractor and all subcontractors as their interests may appear. Any recovery for loss insured pursuant to this General Condition is to be adjusted to Owner and made payable to Owner as trustee for the insured, as their interests may appear. This section does not modify the contractor or subcontractors' responsibility to provide insurance as required in ARTICLE 7.
7.2.11 May be added in supplementals as Supplementary General Conditions of Insurance.

## ARTICLE 8 MEASUREMENT, PAYMENT AND COMPLETION

### 8.1 SCOPE OF PAYMENT

8.1.1 Unless altered by change order, Contractor shall be paid only that sum set forth in the agreement between Owner and Contractor as Contractor's compensation for performance of all work required by the contract documents.

### 8.2 LUMP SUM PAY ITEMS

8.2.1 Each bid item is characterized as either a lump sum item or a unit price item in the bid documents. Where the item is bid at a lump sum price, no additional compensation shall be paid to Contractor for additional work required because Contractor failed to include items or quantities in Contractor's estimate or a subcontractor's estimate, or failed to utilize proper construction means, methods, procedures or sequence or by virtue of any decision of Contractor.
8.2.2 Contractor is required to provide and pay for all requirements necessary for the proper execution and completion of the contract unless specifically excluded by the contract documents. The costs are part of the contract price. The requirements include but are not limited to the requirements stated in ARTICLE 1.4.
8.2.3 All materials and equipment incorporated in the work shall be new except as otherwise provided in the contract documents. All materials and equipment shall meet or exceed the requirements of the plans and specifications and Contractor shall furnish, if requested, satisfactory evidence as to the source, kind and quality of any materials and equipment.

### 8.3 UNIT COST ITEMS

8.3.1 Quantities appearing in the bid schedule are approximate and are prepared for comparison of bids. Payment to Contractor will be for actual quantities of work performed and materials furnished in accordance with the contract documents. Scheduled quantities of work and materials may be increased, decreased or eliminated as provided herein.

### 8.4 APPLICATION FOR PAYMENT

8.4.1 Applications for payment shall be based on Contractor's submitted schedule of values, as approved by Owner per Section 4.2. Schedule of values shall be prepared in such form and supported by such data as may be required by Owner to substantiate its accuracy prior to Contractor's first application for payment.
8.4.2 The schedule of values shall include quantities of work, unit prices and other items comprising the contract price. It shall subdivide the work into each component part in sufficient detail to serve as the basis for progress payments during construction.
8.4.3 With each subsequent application for progress payment, Contractor shall provide a schedule of values to Owner showing all work which has been performed to date together with the value thereof, and the percentage of work completed.

### 8.5 PROGRESS PAYMENTS

8.5.1 Progress Payments shall be made monthly, based upon the amount of apparently acceptable work performed at the site and apparently acceptable materials purchased for the project and properly stored at the site during the previous month. Disbursement of progress payments will not effect a transfer of the risk of loss from the Contractor to the Owner for invoiced equipment or material. The risk of loss of the work and all material and equipment not yet incorporated in the work is the liability of the Contractor until substantial or final completion, whichever is earlier.
8.5.2 The value of work performed and materials stored shall be set forth in Contractor's revised schedule of values. If requested by Owner, Contractor shall promptly provide Owner any additional information necessary to ascertain the value of the work performed or the cost of materials stored at the site during the previous month. Each updated Schedule of Values shall be in the form of a notarized affidavit. Proof of certified payroll shall be provided per ARTICLE 4.
8.5.3 By application for payment, Contractor warrants and guarantees to Owner that title to all work, materials, and equipment for which payment is requested will pass to Owner either by incorporation in the construction and after substantial completion or upon receipt of payment, whichever occurs later, that such title will be clear of all liens, claims, security interests, and other encumbrances, except for liens to be released later prior to final payment and specifically identified on the application for payment, and that all such work, materials, and equipment are of acceptable quality.
8.5.4 Each application for payment shall be made no later than the tenth day of each month for work performed during the preceding month. Progress Payment requests shall be submitted to Project Representative for analysis and recommendation to Owner.
8.5.5 Project Representative will review Contractor's application for payment within seven (7) working days after receipt and if Project Representative ascertains that the amounts set forth therein are properly due and owing to Contractor, then Project Representative shall issue a Certificate of Payment to Owner. If Project Representative determines that only a portion of the sum requested is then properly due and owing to Contractor, then Project Representative may issue a Certificate of Payment in a lesser amount or may reject the application altogether. Project Representative will notify in writing both Contractor and Owner of the reasons for reduction or rejection of any application for Progress Payment.
8.5.6 Project Representative's issuance of a Certificate of Payment constitutes a representation that the work has progressed to the point indicated and that to the best of Project Representative's professional knowledge and information, Contractor is entitled to payment in the amounts certified.

### 8.6 RETAINAGE

8.6.1 After receipt from Project Representative of the Certificate for Payment, Owner shall make payment to Contractor within thirty (30) days. Owner shall have the option to retain up to $10 \%$ of the full amount of the Certificate for Payment plus lump sum amounts for material and equipment not properly stored, or subject to damage prior to use. Amounts retained by Owner may be held by Owner until project completion. If the project involves grant money or the City has entered into a written contract with the state to provide state funds, payment will be made in accordance with AS 36.90.200-270.
8.6.2 Owner may withhold additional sums of money from progress payments in an amount sufficient to safeguard and protect Owner against any apparently meritorious claims against Contractor by any party other than Owner, and for any work which Owner ascertains to be defective or not meeting the requirements of the contract documents.

### 8.7 CONDITIONS OF PAYMENT

8.7.1 Project Representative may refuse to approve all or any part of any request for progress payment if, in Project Representative's opinion, it would be incorrect to make the representation to Owner set out in ARTICLE 8. Project Representative may also refuse to approve all or any part of any request for progress payment, if subsequently discovered evidence or the results of subsequent inspections or tests nullify any payment previously approved.
8.7.2 Owner may withhold payment to the extent necessary to protect Owner from loss resulting from:
A. Defective or damaged work;
B. Claims or liens which have been filed or may be reasonably expected;
C. Contract price reduction by modifications or change orders;
D. Owner cost to correct or complete defective work;
E. Unsatisfactory prosecution of the work by Contractor, including but not limited to failure to furnish adequate submittals or to clean up the work or site;
F. Reasonable evidence that the work cannot be completed for the unpaid balance of the contract sum;
G. Failure of Contractor to make payment properly due to subcontractors, employees, suppliers or utilities;
H. Reasonable evidence to believe the work cannot be completed within the contract time.
I. Damage to Owner's property not replaced or repaired in timely manner.

When the grounds for withholding payment are removed, payment shall be made for amounts withheld.
8.7.3 Neither the issuance of a Certificate of Payment, nor the making of any progress payment, nor the partial or entire use of the project by Owner shall constitute an acceptance of any work not in accordance with the contract documents nor shall it constitute a waiver of any right accruing to Owner or of any duty of Contractor.

### 8.8 SUBSTANTIAL COMPLETION

8.8.1 Substantial Completion is defined as the state of construction at which the work is sufficiently complete and in accordance with the contract documents, so that Owner could occupy and utilize the work or a specific portion of it, for its intended use.
8.8.2 When Contractor considers the work substantially complete Contractor shall notify Project Representative in writing and request a Substantial Completion inspection. The request shall be made a minimum of three business days in advance. The notice shall include a comprehensive list of items to be completed, reasons they are not completed and a date of anticipated completion. The notice shall also include copies of all code compliance inspections, the Certificate of Occupancy, if applicable, and any other documents required by the contract.
8.8.3 Project Representative shall schedule the Substantial Completion inspection and notify Contractor. The inspection will be performed by Project Representative, Architect, Design Engineers, and Owner personnel in the presence of Contractor. Should this inspection find the work not substantially complete, Owner may terminate the inspection and promptly notify Contractor in writing of the conditions for reinspection. Any deficiencies identified by this inspection will be listed and promptly furnished to Contractor for remedial action.
8.8.4 If Contractor has requested that Project Representative and Owner make an inspection to ascertain Substantial Completion, and if the work is not then substantially complete, Contractor shall be liable for all costs Owner, Architect, and Project Representative have incurred in making the inspection.
8.8.5 If it is determined on the basis of inspection that the work is substantially complete, Project Representative will issue a Certificate of Substantial Completion. Included in the certificate shall be a list of items which must be completed or corrected before final payment and the time within which such items shall be complete and corrected. Failure to include an item on this list does not alter the responsibility of Contractor to complete all work in accordance with contract requirements.
8.8.6 Certificate of Substantial Completion shall state the date of Substantial Completion and the respective responsibilities of Owner and Contractor for the maintenance, insurance and security of the work. Certificate of Substantial Completion shall specifically authorize Owner to take possession of the premises and utilize them for their intended purpose. Owner's beneficial occupancy of the premises shall make reasonable allowance for the performance of the work which Contractor must complete prior to final completion.
8.8.7 If Contractor fails to complete or correct work required by the Certificate of Substantial Completion within the time allowed, then the Certificate of Substantial Completion shall be voided and the contract time expended by Contractor shall be counted, and the acceptability of the work shall be inspected as if a Certificate of Substantial Completion had not been issued.
8.8.8 Upon Substantial Completion of the work and upon application by Contractor and certification by Project Representative, Owner shall make payment, reflecting adjustment in retainage, if any, for such work as provided in the contract documents.

### 8.9 FINAL COMPLETION AND WARRANTY PERIOD

8.9.1 The terms Final Completion and Warranty Period refer to, respectively, the finalization of the construction phase and a one-year warranty period following the Substantial Completion. Final Completion shall be represented by a lump sum dollar amount identified on the schedule of values. Final Payment represents a sum of money to perform all tasks necessary from Substantial Completion to Final Completion, including completion of final punch list, completion of as-built data, turnover of all warranty information, notarized acknowledgments of payments, and relinquishment of claims against Owner.
8.9.2 When Contractor considers the work ready for Final Completion, Contractor shall forward to Project Representative an application for final payment including (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid or otherwise satisfied, (2) consent of surety, if any, to payment, (3) irrevocable, notarized proof of payment and relinquishment of claim against Owner, issued by every subcontractor (whether or not in privity with Contractor), material supplier and other party who might assert a claim against Owner, and (4) all other documentation required by the contract documents. Project Representative and Owner shall promptly inspect the work to see that it is fully performed and complete, that all portions of the work are acceptable and that the contract is fully performed aside from completion of the Warranty Period. After Project Representative has made a determination that these requirements have been met, Project Representative shall prepare and recommend that Owner issue a Certificate of Final Completion and Final Payment.
8.9.3 Project Representative's approval of Final Payment constitutes an additional representation by Project Representative to Owner that to the best of Project Representative's knowledge and information, all conditions which Contractor must fulfill prior to being entitled to Final Payment have in fact been fulfilled in accordance with the contract documents.
8.9.4 If any party refuses to relinquish its claim, or if Owner considers that any item or portion of the work: (1) is of doubtful acceptability under the contract documents; or (2) may diminish the value of the work; or (3) may prove to be ultimately unreliable; or (4) may prove to be less functional than required by the intent of the contract, then Owner, in lieu of refusing Final Payment to Contractor, may allow Contractor to furnish a bond in a form and in an amount satisfactory to indemnify Owner against losses occasioned thereby. If any additional costs to settle the claim or to correct work of doubtful quality accrue to Owner in excess of the indemnity available to Owner, Contractor shall refund to Owner all differences and costs which Owner might be compelled to pay, including all litigation costs and reasonable attorney fees.
8.9.5 Acceptance of final payment by Contractor constitutes an explicit waiver of all claims which Contractor might assert against Owner except those previously made in writing and identified by Contractor as unsettled at the time of the Application for Final Payment.
8.9.6 Final Payment to Contractor shall constitute a waiver of all claims which Owner might assert except those arising from: (1) unsettled claims; (2) faulty or defective work (3) failure of the work to comply with the requirements of the contract documents; (4) warranties required by this contract or that by their terms do not expire upon completion of the contract.
8.9.7 If, after Substantial Completion, Warranty Completion is delayed through no fault of Contractor, or by the issuance of change orders affecting Final Completion, Owner may, upon recommendation of the Project Representative, extend the contract time by a reasonable period and accept certified applications for further Progress Payments.
8.9.8 Upon completion of all requirements identified in ARTICLE 8 as "Final" the funds representing Final Payment shall be released to Contractor along with the Certificate of Final Completion. Upon issuance of Certificate of Final Completion all contract sums shall be accounted for to Contractor and shall be paid to Contractor. However, any and all applicable bonds shall not be released until after the Warranty Period.

### 8.10 TIME AND LIQUIDATED DAMAGES

8.10.1 The time permitted for construction of the work will run from issuance of Notice to Proceed through the dates for Substantial Completion as specified in Agreement between Owner and Contractor, unless a specific completion date is specified.
8.10.2 The term "day" as used in this contract shall mean "calendar day" unless specifically stated otherwise.
8.10.3 All warranty periods and obligations accruing to Contractor through completion of the work shall be considered to begin on the date of Substantial Completion, unless otherwise agreed to separately in writing by Owner and Contractor.
8.10.4 Contractor shall begin the work as soon as possible after the date identified in Notice to Proceed and shall prosecute the work expeditiously and with adequate labor and materials.
8.10.5 Liquidated damages will be applied in the amount set out in the Agreement.
8.10.6 Claims for extension of time will be considered only if they affect "critical path" items specifically identified in the detailed progress schedule or in any applicable Supplementary Conditions. Claims for extension of the contract time must be made in writing to Owner not more than twenty (20) days after the reason for requested extension appears.

## ARTICLE 9 CHANGES IN THE WORK, CONTRACT PRICE, AND TIME

### 9.1 CHANGE ORDERS

9.1.1 Without invalidating this contract, Owner may, at any time, order additions, deletions, or revisions in the work. All such changes must be authorized by written change order. Upon receipt of a change order, Contractor shall proceed with the work in accordance with applicable requirements of the contract documents. If any change order entails an increase or decrease in the contract price or an extension or curtailment of the contract time, adjustment will be made as provided herein.
9.1.2 Extra work will be paid for either at a fixed price specified in the change order (using unit prices or a lump sum amount) or on a time and materials basis.
9.1.3 Project Representative may authorize minor changes, alterations or deviations in the work in accordance with ARTICLE 2. These changes shall be authorized by written Field Order to be included in a subsequent Change Order.
9.1.4 Any additional work performed by Contractor without a properly executed change order will not entitle Contractor to an increase in the contract amount or to an extension of the contract time, except in the case of emergency threatening life, safety or property.

### 9.2 ISSUANCE OF CHANGE ORDER

9.2.1 The contract sum constitutes the total compensation to Contractor for the work required by this contract. The contract price may be changed only by a properly executed change order. Any request for increase in the contract price shall be based upon written notice delivered to Project Representative within ten (10) days after the reason for the proposed increase appears. Change order proposals must be accompanied by all pertinent data and documentation, including a detailed estimate showing costs, quantities, unit prices and markups for overhead and profit.
9.2.2 Project Representative shall analyze Contractor's change order proposal and shall make a recommendation to Owner within a reasonable period of time. If Owner accepts the proposal, Project Representative shall prepare the change order for execution by Contractor and Owner.
9.2.3 The value of any work added or deleted by change order shall be determined by one of the following methods:
A. Application of unit prices set forth in the bid: unit prices shall include all direct and indirect costs of the work, including labor, equipment (whether owned or rented), materials, home office expense, all overhead and profit.
B. Application of mutually accepted unit prices for work not covered by bid unit prices: unit prices shall include all direct and indirect costs of the work, including labor, equipment (whether owned or rented), materials, home office expense, all overhead and profit.
C. Mutual acceptance of a lump sum: Contractor's lump sum proposal must include an itemized breakdown of all costs of Contractor, subcontractors and suppliers. Breakdowns shall show quantities and prices of labor, materials, equipment and other direct costs. To direct costs shall be added the allowable combined overhead and profit as provided in ARTICLE 9.4.
D. At Owner's option, Contractor may be directed to proceed with additional work on a "time and materials" basis which may also stipulate a maximum "not to exceed" amount. Contractor will be required to maintain and submit detailed records showing all quantities and prices of labor, materials, equipment and other direct costs. To direct costs shall be added the allowable combined overhead and profit as provided in ARTICLE 9.4.
9.2.4 When both additions and credits for related work or substitutions are involved in any one change, the allowance for overhead and profit shall be based on the net change. All related items within a proposal shall be considered as a single item for purposes of computing overhead and profit.
9.2.5 When Contractor is directed to proceed on a time and materials basis, costs of the work shall be submitted daily for approval by Project Representative and may only include:
A. Actual payroll costs for employees, as substantiated by certified payroll, in the direct employ of Contractor for the times actually utilized in prosecution of the additional work, including allowance for benefits which Contractor customarily provides its employees;
B. The actual substantiated cost to Contractor for all material and equipment incorporated into the work, including transportation and storage expenses;
C. The actual substantiated amounts of payments by Contractor to subcontractors for work performed by the subcontractors;
D. Any costs of special consultants to the extent authorized by Owner:
E. Substantiated equipment rental costs at reasonable market rates;
F. Additional supervision and travel costs reasonably related to the work performed;
G. Increased bond premiums:
H. Additional license fees, permits, or applicable taxes;
I. Minor incidental expenses such as telegrams and long distance telephone charges.

To these direct costs shall be added the allowable combined overhead and profit as provided in ARTICLE 9.4.
9.2.6 Unless specifically agreed to by Owner in writing, the cost of additional work shall not include any portion of Contractor's general overhead, nor any sum attributable to Contractor's prosecution and supervision of the principal work at the site, nor any overtime expense, unless specifically agreed to by Owner in writing. Contractor shall not be compensated for any casualty or other losses or expenses attributable to negligence of Contractor or any person in its employ or any subcontractor or supplier.
9.2.7 Payment to Contractor shall be made only for the actual quantities of work performed and accepted or materials furnished, in conformance with the contract or applicable change order. When the accepted quantities of work or materials vary from the quantities stated in the bid schedule, Contractor shall accept as payment in full, payment at the original contract unit prices for the quantities of work and materials furnished, completed and accepted; except as provided in the contract documents.

### 9.3 UNIT PRICES

9.3.1 When unit prices are used, and where the final quantity of a major contract item varies more than $25 \%$ above or below the bid quantity, either party to the contract may request an equitable adjustment in the contract unit price of that item. A major contract item is an item equal to $10 \%$ or more of the total contract.
9.3.2 When the final quantity of work is less than $75 \%$ of the bid quantity, the equitable adjustment shall be made for those units of work done and accepted, except that the total payment for the item shall not exceed $75 \%$ of the total amount bid for the item.
9.3.3 To determine unit prices for authorized changes or additions in the work that alter the quantity of work under a lump sum pay item, adjustment to the pay item will be determined by multiplying the added or deleted quantity by the quotient of the contract lump sum price and the estimated quantity shown on the original plans. Payment will be made under a new contract item established for that purpose. Adjustments will be made as a change order to the contract.
9.3.4 No allowance shall be made for any increased expenses, loss of expected reimbursement or loss of anticipated profits suffered or claimed, either directly from such alterations in quantities or indirectly from unbalanced allocations among the contract items by Contractor, or any other causes.

### 9.4 ALLOWABLE OVERHEAD AND PROFIT

9.4.1 When the value of change order work is determined by the lump sum method or by the time and materials method, the following definitions and percentages shall apply.
9.4.2 Direct costs are defined as the net cost to Contractor to accomplish a given change. Costs of bonds and insurance associated with the change shall be applied after addition of indirect costs.
9.4.3 Indirect costs are defined as general operational charges relating to the accomplishment of a given change, including but not limited to small tools, incidental job burdens and general office expense.
9.4.4 Overhead and Profit: Allowances for all indirect costs shall be identified as combined overhead and profit and shall not exceed the percentages in the following schedule:
A. Additive work:
(1) Prime Contractor:
(a) $15 \%$ of the direct costs of own work in excess of $\$ 1,000.00 ; 20 \%$ when the total value of own work is equal to or less than $\$ 1,000.00$.
(b) 8\% of the direct costs of work performed by subcontractors not including subcontractor's overhead and profit.
(c) $8 \%$ of the direct costs of equipment.
(2) Subcontractors: percentages represented in subsections (a) and (b) are a maximum percentage
allowed regardless of the tier or number of subcontractor(s) performing the work:
(a) $15 \%$ total of the work performed by subcontractors in excess of $\$ 1,000.00 ; 20 \%$ total of the work performed by subcontractor equal to or less than $\$ 1,000.00$.
(b) $8 \%$ of the direct costs of equipment.
(3) In no case shall overhead and profit exceed $23 \%$ of the direct costs of work or $16 \%$ of the direct costs of equipment when the cost of the work exceeds $\$ 1,000.00$. In no case shall overhead and profit exceed $28 \%$ of the direct costs of work or $16 \%$ of the direct costs of equipment when the cost of the work is equal to or less than $\$ 1,000.00$.
B. Deductive work:
(1) Prime Contractor: $4 \%$ of the direct cost of deleted own work.

### 9.5 CONCEALED CONDITIONS

9.5.1 This ARTICLE applies only when concealed conditions substantially at variance with the conditions set forth in the contract documents are encountered and these conditions were not foreseeable by Contractor or reasonably inferable from information provided by Architect or Owner in the bidding documents.
9.5.2 If it is determined the Contractor could not predict the concealed conditions as set forth under ARTICLE 9.5.1, Owner may issue a change order for the performance of additional work required with an equitable adjustment in the contract sum. Contractor shall not begin work upon any concealed condition until Owner has approved a written change order

## ARTICLE 10 TESTING AND CORRECTION OF WORK

### 10.1 TESTS AND INSPECTIONS

10.1.1 Contractor shall be responsible for securing permits and approvals from entities having jurisdiction over the work. Contractor will provide any special testing or inspections required by the contract documents. Contractor shall notify Owner 48 hours prior to performing testing. Contractor shall not cover work that requires testing, inspection or approval until such testing, inspection, or approval has been completed. Owner reserves the right to approve the testing agency.
10.1.2 Neither observation by Owner nor inspections, tests, or approvals by Owner or Owner's testing agency shall relieve Contractor from Contractor's obligation to perform the work in accordance with the contract documents.

### 10.2 UNCOVERING OF WORK

10.2.1 If any work is covered or buried contrary to contract requirements or Owner's written request, such work shall be uncovered at Owner's request for inspections, tests or approvals. Uncovering and recovering shall be at Contractor's expense, unless Contractor has given notice of intent to cover the work and Owner has not acted with reasonable promptness to provide any necessary tests, inspections or approvals.
10.2.2 If any work has been covered which Owner has not specifically requested to observe prior to covering, or if Owner considers it necessary or advisable that covered work be inspected or tested by others, then Contractor shall, at Owner's request, uncover, expose or otherwise make available for observation, inspection, or testing, that portion of the work as Owner may require. Contractor shall furnish all necessary labor, materials and equipment. If such work is found to be defective, Contractor shall bear all expenses, including compensation for any additional professional services and testing. If, however, the uncovered work is found not to be defective, Contractor shall be allowed an equitable adjustment in the contract price or the contract time. Only Contractor's direct costs attributable to the uncovering of work and its recovering shall be allowed.

### 10.3 DEFECTIVE WORK

10.3.1 All work not meeting the requirements of the contract documents shall be considered defective.
10.3.2 Contractor shall promptly correct or replace any defective work. Any and all costs associated with correction or replacement shall be borne by Contractor. Contractor shall also bear the expense of making good all
work of others destroyed or damaged or required to be redone because of the correction or replacement of defective work.
10.3.3 If, after seven (7) days written notice to Contractor, Contractor fails to correct deficiencies or to provide Owner with an approved schedule for correcting defective work, Owner may, without prejudice to any other remedy it may have, make good deficiencies and deduct the cost thereof from the payment then or thereafter due Contractor. No extensions of time shall be allowed for correction of work that is defective.

## ARTICLE 11 WARRANTIES

11.1 Contractor unconditionally warrants for a period of one year from issuance of the Certificate of Substantial Completion the usability and quality of all work, labor and materials incorporated into the project, unless otherwise provided in the contract documents. After the approval of Final Payment and prior to the expiration of one year after the date of Final Completion, any work found to be defective shall be remedied promptly by Contractor within fourteen (14) days of written notice without cost to Owner and in accordance with Owner's written instructions. Contractor shall either correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace it with acceptable work. If Contractor does not promptly comply with the terms of Owner's instructions, Owner may have the defective work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, including compensation for additional professional services, shall be deducted from Warranty Period Payment, unless the surety elects to remedy deficiency.
11.2 In addition to other warranties set forth in this contract and in accordance with requirements stated in the contract documents, Contractor shall obtain and transmit to Architect all warranties on material and equipment incorporated into the work and either provided by the supplier or otherwise required by the contract documents. Transmittal of warranties to Owner shall be a prerequisite of the Certificate of Final Completion.
11.3 All material and equipment installed by Contractor shall have a manufacturer's warranty for a period of one year, except as otherwise provided by the contract documents. The period of warranty shall begin on the date of Substantial Completion unless otherwise noted on the Certificate of Substantial Completion. This article does not limit any manufacturer's warranty which extends for a period of time longer than that specified as minimum in the contract documents.
11.4 If a warranty period in excess of one year on a particular item or part of the work is required by the contract documents, the longer warranty period shall govern warranty obligations of Contractor.
11.5 Owner may accept defective work or materials found during the warranty period instead of requiring correction or removal and replacement. If acceptance occurs prior to approval of final payment, a change order shall be issued to reduce the contract price. If acceptance occurs after approval of final payment, an appropriate amount shall be paid by Contractor to Owner.
11.6 The provisions of this ARTICLE shall not be construed as limiting the right of Owner to make a claim against Contractor for work not constructed in accordance with the contract documents. Where a defect attributable to Contractor's or subcontractor's materials or workmanship appears after expiration of the one-year warranty period, Owner shall notify Contractor of the appearance of damages due to defective work or materials and shall offer Contractor the right to replace or repair all defective work and other work using Contractor's forces. If Contractor fails to correct the work and any consequentially damaged work within a reasonable time, or if Contractor refuses to correct the work, Owner may correct the work utilizing Owner's own forces. Contractor shall pay Owner all costs attributable to correction of the defective work and any consequential damages occasioned by the defective work.
11.7 Should Owner and Contractor agree to delay completion of any items, the one-year warranty period for those items shall commence upon written acceptance of each item by Owner.

## ARTICLE 12 CLAIMS AND LITIGATION

12.1 This contract shall be governed by the laws of the State of Alaska, and any lawsuit brought thereon shall be filed in the Third Judicial District at Kenai, Alaska.
12.2 No controversy or claim arising out of this contract shall be subject to binding arbitration unless both Owner and Contractor agree in writing to submit the question to arbitration at the time when the controversy arises.
12.3 All claims, disputes and other matters in question between Contractor and Owner relating to the execution or progress of the work shall be referred initially to Project Representative, who shall render a recommendation in writing to Owner within a reasonable time.
12.4 During pendency of any claim arising out of this contract, Contractor shall carry on the work and maintain the Progress Schedule approved by Owner unless otherwise agreed by Contractor and Owner in writing. Should Contractor cease work, Contractor shall be in breach of this contract and Owner shall have the right to terminate the contract and to prosecute the work to completion with Owner's own forces or with a replacement Contractor. Contractor shall be responsible for any increase in costs to Owner above the contract price.
12.5 Contractor may make claims for additional costs only if the additional cost involved has occurred because of:
A. A change order issued by Owner, where the additional sum due Contractor set forth in the change order is in dispute.
B. An order by Owner to stop the work where Contractor was not at fault.
C. Concealed conditions as set out in ARTICLE 9.
D. Failure of payment by Owner pursuant to ARTICLE 3.
E. Additional costs or delays caused by separate contractors' or Owner's forces in accordance with ARTICLE 6.
12.6 Contractor shall not make a claim for additional costs where the basis of the claim lies in an oversight or mistake made by Contractor during the bidding process or by reason of negligent acts or omissions of Contractor or any mistake in judgment or improper selection of construction means, methods, sequences and materials during the course of construction.
12.7 If Contractor is entitled to make claim for an increase in the contract sum, Contractor shall deliver to Owner written notice of Contractor's intention to assert each claim within twenty (20) days after occurrence of each event giving rise to the claim. Contractor must give this notice of claim and specify the full extent and nature of the claim(s) to Owner before proceeding to execute the work upon which a claim might be asserted. No claim for additional costs or compensation shall be valid unless the prior twenty (20) day notice has been given. Adherence to this provision shall be strict. Any adjustment in the contract sum resulting from settlement of claims shall be authorized by change order.

## ARTICLE 13 TERMINATION OF THE CONTRACT OR SUSPENSION OF THE WORK

### 13.1 TERMINATION BY OWNER

13.1.1 Owner shall have the right to terminate the contract if Contractor should file for bankruptcy, reorganization, otherwise be declared insolvent, or if Contractor makes a general assignment for the benefit of creditors. Exercise of these rights, where required by law, is contingent upon relief from the automatic stay provisions of the United States Bankruptcy Court or through other appropriate court order. This right of termination is in addition to the right of Owner to terminate for cause outlined below and other rights of termination as stated in the contract documents.
13.1.2 Termination for cause: If Contractor: (1) repeatedly refuses or fails to supply enough proper skilled workmen; or (2) fails to pay promptly all subcontractors, suppliers, or other parties as set out in the contract documents; or (3) fails to adhere in all respects to the provisions of Title 8, Chapter 30, of the Alaska Administrative Code and Title 36 of the Alaska Statutes as applicable to this contract and all other pertinent statutes, ordinances or regulations or orders of any local, state, or federal authority concerning payment; or (4) allows insurance to lapse; or (5) if after seven (7) days written notice, without prejudice to any other remedy of Owner, Contractor fails to correct to Owner's satisfaction deficiencies in work that does not conform to the contract documents; or (6) allows a situation that creates a danger to person or property to arise. Where an emergency situation creating a danger to person or property arises, Owner may at its option terminate the contract and take possession of the site and any of Contractor's equipment and material necessary to complete an emergency response or hire a separate contractor to complete the
emergency response. Contractor shall be paid the contract rate for the material used and shall be paid for the use of Contractor's equipment at the price shown in the contract documents or at the rate for such equipment listed in RENTAL RATE BLUE BOOK FOR CONSTRUCTION EQUIPMENT, published by Machinery Information Division of K-III Directory Corporation, 1735 Technology Drive, Suite 410, San Jose, California 95110. If the rate for such equipment is not so listed, reliable sources will be used to determine a reasonable rate.
13.1.3 In the event of termination for cause, Owner shall have the right of set-off, from any payment due Contractor, of all expenses, costs, and damages including but not limited to all professional and legal expenses and attorneys' fees and costs or other additional expenditures necessary to complete the projects that are occasioned by the termination. In the event such amounts exceed the amount of payment withheld, Contractor shall be liable to Owner for such amounts. No payment shall be made to Contractor prior to determination that a balance is due Contractor after the amount of set-off is determined.
13.1.4 Owner may terminate this contract at any time for the convenience of Owner for any reason deemed by Owner to be in the best interest of Owner.
13.1.5 If this contract is terminated for convenience, Contractor will be directed to make all necessary preparations for closing out the project and for safeguarding Owner's materials and the work already completed. Contractor will be paid for all conforming work done to date and for all materials delivered to the site and already paid for by Contractor, together with all reasonable costs directly attributed to termination, including fixed overhead. Contractor shall be responsible for minimizing the extent of such expenses and shall not be paid for expenses which could have been reasonably avoided. On the date that notice of termination or suspension for convenience is issued, Contractor shall immediately take all actions necessary to stop orders of material, rental of equipment or premises, employment of persons on the project, and shipment of materials not yet delivered to the site. The notice of termination or suspension for convenience shall specify a date by which all steps necessary for termination shall be completed and by which Contractor shall have removed any unused material and all Contractor's equipment and forces. Contractor shall leave the premises in a clean and safe condition on or prior to the date specified in the notice. Owner shall certify that all termination procedures have been completed and that the premises have been turned over to the possession of Owner. Within fifteen (15) days after that certification by Owner, Contractor shall render to Owner a bill for all expenses incurred in termination and for all work done subsequent to the last progress payment. Owner shall pay Contractor all sums properly due, together with any retainage not necessary to cover apparently nonconforming work or other changes, within fifteen (15) working days after the bill has been received by Owner, provided that Owner has received releases for all liens.
13.1.6 If Contractor is terminated for cause or default on this contract, the performance bond surety shall commence performance within fourteen (14) days of the termination or default. If the surety does not arrange for or commence performance by that date, Owner shall have the option to complete or arrange for performance and the surety shall not be relieved of any responsibility for payment of costs of performance.
13.1.7 Should Owner elect to terminate Contractor's services prior to final completion of the work, such termination shall not affect any rights Owner might assert against Contractor at time of termination or thereafter. Any retention or payment of monies by Owner to Contractor shall not release Contractor from that liability.

### 13.2 SUSPENSION OF THE WORK

13.2.1 Owner may, at any time and for any reason, suspend the work or any portion of it for a period not to exceed ninety (90) days, by written notice delivered to Contractor thirty (30) days prior to the date fixed for suspension. The notice of suspension shall fix the date on which the work is to be resumed and Contractor shall resume the work on the date so fixed. Equitable adjustment in the contract price, the contract time, or both shall be made for cost or delay directly attributable to suspension of the work.

### 13.3 TERMINATION BY CONTRACTOR

13.3.1 If through no act or fault of Contractor, Owner orders a suspension of work for a period of more than ninety (90) days, Contractor may, upon thirty (30) days written notice to Owner, terminate this contract and recover from Owner payment for work accepted to date plus purported overhead and profit in the manner provided in ARTICLE 9.4. Contractor shall also have the right to terminate this contract if Owner fails within forty-
five (45) days to pay amounts properly due Contractor for satisfactorily accomplished work, so certified by Project Representative, as due and payable. The provisions of this section do not include amounts ordinarily retained from Contractor's Application for Payment or amounts retained because of unsatisfactory, defective, or incomplete work, or for any other reason provided in the contract documents.

## ARTICLE 14 MISCELLANEOUS PROVISIONS

14.1 Whenever any provision of the contract documents requires written notice, such notice shall be deemed to have been given and binding when given by certified mail to the respective party at the address provided in the Legal Notice provision of the agreement section of the contract documents.
14.2 Neither party may assign this contract without the written consent of the other party and Contractor may not delegate duties under this contract other than as provided in the contract documents without the prior written consent of Owner.
14.3 In the event a provision of the contract documents is found to be unenforceable or void for any reason, it shall be considered as severed from the contract documents, and the remaining portions of the contract documents shall stand as if that provision had never been included in the contract documents. In the event the unenforceable or void provision is legally essential to the continuing existence of the contract, the parties shall attempt to substitute a reasonable replacement provision.

# 14.4 No general condition stated in these provisions or other provision in the contract documents lessens, alters, or makes inapplicable the requirement for indemnification stated in ARTICLE 4.13. In the event of conflict between any contract provisions, the requirements set out in ARTICLE 4.13 control. 

## END GENERAL CONDITIONS

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## SUBCONTRACTOR'S LIST

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## SUBCONTRACTORS LIST

PROJECT: Sludge Press Replacement - Phase 1

## PRIME CONTRACTOR

Name: $\qquad$
Address: $\qquad$
Phone: $\qquad$ Contractor's License: $\qquad$ Business License: $\qquad$
Note: Subcontractors will not be allowed to start work or be on the job site until the following information has been filled out and copies of Contractors' and Business Licenses have been attached. During this project, the City must be notified of any changes in this list.

## SUBCONTRACTORS

Name: $\qquad$ Amount of Contract: $\qquad$
Address: $\qquad$
Phone: $\qquad$ Contractor's License: $\qquad$ Business License: $\qquad$

Name: $\qquad$ Amount of Contract: $\qquad$

Address: $\qquad$
Phone: $\qquad$ Contractor's License: $\qquad$ Business License: $\qquad$

Name: $\qquad$ Amount of Contract: $\qquad$
Address: $\qquad$
Phone: $\qquad$ Contractor's License: $\qquad$ Business License: $\qquad$
*******************************************

Name: $\qquad$ Amount of Contract: $\qquad$
Address: $\qquad$
Phone: $\qquad$ Contractor's License: $\qquad$ Business License: $\qquad$

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TITLE 36 WAGE SCHEDULE

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## Laborers' \& Mechanics' Minimum Rates of Pay

Labor for the project must be paid at the prevailing wage rates listed in the Alaska Department of Labor \& Workforce Development, Laborers' \& Mechanics' Minimum Rates of Pay, Wage \& Hour Administration Pamphlet no 600.

The state of Alaska wage rates can be obtained at:
http://www.labor.state.ak.us/lss/pamp600.htm
Use the rates that are in effect ten days prior to Bid Opening.
A paper copy of the wage rates will be included in the executed Contract.

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## PERFORMANCE BOND

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## PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

|  | (Name of Contractor) |
| :--- | :--- |
|  | (Address of Contractor) |
| a (Corporation, Partnership, or Individual) |  |

(Name of Surety)
(Address of Surety)
hereinafter called Surety, are held and firmly bound unto $\qquad$
(Name of Owner)
(Address of Owner)
hereinafter called Owner, in the penal sum of $\qquad$ Dollars, (\$ $\qquad$ ) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the $\qquad$ day of $\qquad$ 202_, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay owner all outlay and expense which the owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect .

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any ways affects its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, who claims may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the $\qquad$ day of $\qquad$ 202 $\qquad$
$\overline{\text { (Principal) (SEAL) }}$
(Principal Secretary)
ATTEST:
$B Y$ $\qquad$
(Witness as to Principal)
(Address)

## (Address)

(Surety) (SEAL)

ATTEST:
BY
(Attorney-in-Fact)

## (Address)

## (Address)

NOTE: If Contractor is Partnership, all partners should execute bond.

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

## PAYMENT BOND

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## PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that
(Name of Contractor)
(Address of Contractor)
a
(Corporation, Partnership, or Individual)
$\qquad$
(Address of Surety)
hereinafter called Surety, are held and firmly bound unto $\qquad$
(Name of Owner)
(Address of Owner)
hereinafter called Owner, in the penal sum of $\qquad$ Dollars, (\$ $\qquad$ ) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the $\qquad$ day of $\qquad$ 202_, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of said work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or other-wise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any ways affects its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, who claims may be unsatisfied.

Payment Bond

IN WITNESS WHEREOF, this instrument is executed in three (3) counterparts, each one of which shall be deemed an original, this the $\qquad$ day of $\qquad$ 202 $\qquad$
$\overline{\text { (Principal) (SEAL) }}$
(Principal Secretary)
ATTEST:
$B Y$ $\qquad$
(Witness as to Principal)
(Address)

## (Address)

(Surety) (SEAL)

ATTEST:
BY
(Attorney-in-Fact)

## (Address)

## (Address)

NOTE: If Contractor is Partnership, all partners should execute bond.

IMPORTANT: Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

## CONTRACTOR'S RELEASE

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# CONTRACTOR'S RELEASE AND AFFIDAVIT OF PAYMENTS 

 OF DEBTS AND CLAIMS ("Release")
## PROJECT NAME: Sludge Press Replacement - Phase 1

The undersigned, being first duly sworn, deposes and says:

1. That pursuant to this contract for project
between the undersigned and the City of Kenai dated $\qquad$ the undersigned hereby certifies that, except as listed below, he has paid in full or has otherwise satisfied all obligations for materials and equipment furnished for all work, labor, and services performed and for all known indebtedness and claims for which the Contractor or the City of Kenai is or may become liable in connection with performance under this contract. The Contractor warrants that he has made diligent search and inquiry to determine the existence of any such claim, debt, or liability and that all such obligations, whether liquidated, unliquidated, or disputed, have been satisfied.
2. The Contractor further certifies he did not extend any loan, gratuity, or gift of money of any form whatsoever to any employee or agent of the City, that he did not rent or purchase any equipment or materials from any employee of the City, nor to the best of his knowledge, from any agent of any employee of the City, and that he has not made any promise to an employee or agent of the City to do or undertake any such action after completion of the subject contract.
3. Pursuant to the above-described contract and in consideration of the final payment in the amount of \$ $\qquad$ , the undersigned Contractor hereby releases and discharges the City of Kenai, its officers, agents and employees of and from any and all further claim, debt, charge, demand, liability, or other obligation whatsoever under or arising from said contract, whether known or unknown and whether or not ascertainable at the time of the execution of this instrument. This release is complete, final, binding and irrevocable.
4. The Contractor shall indemnify, defend, save and hold the City, its elected and appointed officers, agents and employees, harmless from any and all claims, demands, suits, or liability of any nature, kind or character including costs, expenses, and attorneys fees resulting from Contractor or Contractor's officers, agents, employees, partners, attorneys, suppliers, and subcontractors' performance or failure to perform this Agreement in any way whatsoever. This defense and indemnification responsibility includes claims alleging acts or omissions by the City or its agents which are said to have contributed to the losses, failure, violations, or damage. However, Contractor shall not be responsible for any damages or claim arising from the sole negligence or willful misconduct of the City, its agents, or employees. Contractor and subcontractors shall also not be required to defend or indemnify the City for damage or loss that has been found to be attributed to an independent contractor directly responsible to the City under separate written contract.

# CONTRACTOR'S RELEASE AND AFFIDAVIT OF PAYMENTS 

 OF DEBTS AND CLAIMS ("Release")If any portion of this Release is voided by law or court of competent jurisdiction, the remainder of this Release shall remain in full force and effect.

IN WITNESS WHEREOF, this Release has been executed this__day of $\qquad$ 202.
(Contractor's signature)
Title $\qquad$

## ACKNOWLEDGMENT

STATE OF ALASKA
THIRD JUDICIAL DISTRICT
)
SS
)

THIS IS TO CERTIFY that on this $\qquad$ day of $\qquad$ 202 $\qquad$ , before the undersigned, a Notary Public in and for the State of Alaska, duly commissioned and sworn, personally appeared $\qquad$ , who, having produced satisfactory evidence of identification, and having acknowledged the voluntary and authorized execution of the foregoing instrument for the purposes therein mentioned, executed the above and foregoing instrument.

Notary Public for Alaska
My Commission Expires: $\qquad$
(NOTE: In case of a corporation, the attached Certificate of Authority must be completed by a corporate officer other than the one who signs above.)

## CONSENT OF SURETY TO FINAL PAYMENT

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## CONSENT OF SURETY COMPANY TO FINAL PAYMENT

## PROJECT:

## CONTRACT DATE:

## CONTRACTOR:

## TO: CITY OF KENAI, OWNER <br> 210 Fidalgo Avenue <br> Kenai, AK 99611 <br> Attn: Public Works Department

In accordance with the provisions of the above-referenced Contract between Owner, City of Kenai, and Contractor, Surety (insert name and address of Surety),
$\qquad$
$\qquad$
$\qquad$
$\qquad$ ,
does hereby consent to and approve of the final payment to Contractor in the amount of \$ $\qquad$ , and in the case of Surety, it is further agrees as follows:

1. In giving this Consent, Surety has made its own investigation to determine whether said payment should be made to Contractor and Surety has not relied on any representation by the City of Kenai or its employees or agents which has induced it to consent to such payment.
2. Surety agrees that this payment shall not relieve Surety of any of its obligations to the City of Kenai as set forth in its Labor and Material Payment and Performance Bonds
and Surety waives any and all claims against City of Kenai for wrongful release of funds to Contractor.

IN WITNESS WHEREOF, said Surety Company has set its hand this $\qquad$ day of
$\qquad$ , 202 $\qquad$ .
(Surety)
(Signature of authorized representative)
(Printed name and title)

## ACKNOWLEDGMENT

STATE OF $\qquad$ )
) ss.
)
THIS IS TO CERTIFY that on the $\qquad$ day of $\qquad$ , 202 $\qquad$ , , Title: $\overline{\text { (Surety), being personally }}$ known to me or having produced satisfactory evidence of identification, appeared before me and acknowledged the voluntary and authorized execution of the foregoing instrument.

Notary Public for
My Commission Expires: $\qquad$

NOTE TO SURETY: ATTACH PROOF OF POWER OF ATTORNEY OR OTHER DOCUMENTATION DEMOSTRATING SIGNATORY MAY BIND SURETY

# CONTRACTOR'S BUSINESS LICENSE 

(To be Submitted)

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Alaska Department of Commerce, Community, and Economic Development P.O. Box 110806, Juneau, Alaska 99811-0806

## ALASKA BUSINESS LICENSE

The licensee named below holds Alaska Business License Number $\qquad$ Covering the period of: $\qquad$ through $\qquad$ Line of Business: $\qquad$

COMPANY NAME<br>ADDRESS<br>Owner:<br>NAME OF OWNER

This license shall not be taken as permission to do business in the state without having complied with The other requirements of the laws of the State of Alaska or of the United States.

Alaska Department of Commerce, Community, and Economic Development Commissioner: $\qquad$
This license must be posted in a conspicuous place at the business location. It is not transferable or assignable.

No.
Effective: Expires:
$\qquad$
$\qquad$

STATE OF ALASKA
DEPARTMENT OF COMMERCE, COMMUNITY \& ECONOMIC DEVELOPMENT
Division of Occupational Licensing
Division of Occupational Licensing
Certifies that
COMPANY NAME
Is a Registered

Specialty
Commissioner: $\qquad$

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SAMPLE INSURANCE CERTIFICATE
(Submit Original)

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THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES below. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.
IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

| Prooucer | CONTACT <br> NAMS: |  |
| :---: | :---: | :---: |
|  |  |  |
|  |  |  |
|  | INSURER(S) AFFORDING COVERAGE | NAIC \# |
|  | Insurer a i |  |
| InSURED | InSURER B: |  |
|  | INSURERC: |  |
|  | INSURER D: |  |
|  | INSURERE: |  |
|  | insurerf: |  |

COVERAGES
CERTIFICATE NUMBER:

## REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCHPOLICIEOTHMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.


DEsentr IION OF OPERATHENG \& LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
Re: PROJECT NAME
Tre-Certificatomolder is an Additional Insured On General Liability \& Automobile policies, but only with respect to work done oy or on ther of the named insured for the project referenced. The Certificate Holder is granted Waiver of Subrogation on the General Liability, Automobile and Workers' Compensation policies as respoote the rofowereot project

## CERTIFICATE HOLDER



210 Fidalgo Ave
Kenai, AK 99611

## CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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D. OWNER FURNISHED EQUIPMENT INFORMATION

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# City of Kenai Screw Press 

## Andritz Project No. 844944

## Screw Press Model C-5427

Factory:

Project Manager:

Andritz Separation, Inc.
1010 Commercial Blvd, South
Arlington, TX 76001
Taylor Dekle
Phone / Fax
(817) 419-1726 / (817) 465-5611

This manual is the confidential and proprietary information of Andritz Separation Inc. Any party accepting receipt of this manual does so on the express understanding and agreement that it will neither copy, reproduce, disclose to third parties or use this manual for any purpose other than those expressly agreed to by Andritz Separation Inc. in writing. Such party also agrees to indemnify Andritz Separation Inc. against any losses or damages suffered by Andritz Separation Inc. as a result of such parties improper reproduction, disclosure or use of this manual.
1.0 Expected Schedule
2.0 Scope of Supply
3.0 Design Criteria / Data Sheets
4.0 Warranty
5.0 Mechanical Drawings
6.0 Electrical Drawings
7.0 Sequence of Operation / Control System Description
8.0 Control Panel Component Cutsheets
9.0 Field Components Cutsheets
10.0 Motor Information
11.0 Compressor Information
12.0 Exceptions / Clarifications

### 1.0 Expected Schedule

Expected delivery to the project site is late-August/early-September, 2022.

### 2.0 Scope of Supply

| Item | Qty. | Description |
| :---: | :---: | :---: | :---: |
| ITEM 1 |  | SCREW PRESS EQUIPMENTSUPPLY |


| Item | Qty. | Description |
| :---: | :---: | :---: |
| 3 | 1 ea. | Screw Press Control Panel <br> - NEMA 4X 304 SS enclosure, air conditioned <br> - Power input: 460 VAC, 3 Phase, 60 Hz <br> - Allen Bradley Compactlogix PLC <br> - Allen-Bradley PanelView Plus 7-10" OIT touch screen <br> - Allen Bradley PF 755 VFD for screw press <br> - Allen Bradley PF525 for tank mixer <br> - Motor starter for air compressor <br> - Control voltage transformer <br> - Main power disconnect switch <br> - E-stop <br> - Grace port |
| 4 | 1 lot | Special Tools and Spare Parts Included: <br> - One (1) set of Special Tools <br> - One (1) set bearings and bushings <br> - One (1) set wipers and mounting hardware <br> - One (1) set shower spray nozzles |
| 5 | 1 lot | Drawings and Documentation: <br> ANDRITZ will supply the following drawings and documents (one e-copy): <br> - Arrangement drawings with dimensions for the ANDRITZ scope <br> - Motor list <br> - Written sequence of operation including all interlocks <br> - Control panel layout <br> - Electrical drawings <br> - Mechanical drawings <br> - Terminal box details <br> - Operating and maintenance manuals (1 e-copy and 3 hard copies) |
| 6 | 1 lot | Packing and Freight to Jobsite (not including unloading) <br> - Screw press, floc tank and control panel to be skidded and wrapped, with tools and spare parts packed in crates. |


| Item | Qty. | Description |
| :---: | :---: | :---: |
| ITEM |  | SITE SERVICES FOR COMMISSIONING |
| 7 | 1 lot | Manufacturer's Site Services for Commissioning <br> $\bullet \quad$ Installation checkout, startup and commissioning, testing and <br> training: allow 1 trip with 5 days on site |

(1) Screw Press Model C-5427

### 3.0 Design Criteria / Data Sheets

## DESIGN CRITERIA AND SCREW PRESS SIZING

## Design Criteria

| Application | Municipal Sludge Dewatering |
| :--- | :--- |
| Sludge description | Aerobically Digested Sludge |
| Feed solids concentration | 1.0 to 1.6 percent total solids |
| Feed solids capacity | $240 \mathrm{lb} / \mathrm{hr}$ |
| Minimum cake solids concentration | $>15 \%$ total solids |
| Minimum capture rate | $92 \%$ of feed total solids |
| Maximum polymer usage | 20 lbs active polymer per dry ton of feed solids |
| Allowable noise level while operating | 89 dBA at 3 feet |

Thickener Selection and Expected Performance

| Screw Press Model | ANDRITZ C-5427 Screw Press |
| :--- | :--- |
| Number of Units | One (1) |
| Cake Solids Concentration | $15-16 \%$ TS or passing Paint Filter Liquids Test |
| Solids Capture | $93-95 \%$ TS |
| Polymer Dosage (Emulsion) | $20-30$ active pounds per dry ton of feed solids |

Note:
Equipment sizing and performance based on ANDRITZ Lab Test L-14569
The sample that was received for lab testing had a feed solids concentration of $1.68 \%$ TS
Polymer dosage was higher than the specified dosage. Based on the lab test, we expect polymer dosage between 20-30 active lbs per ton dependng on the sludge characteristics at the time.

## General

The C-press specific robust design allows a high dewatering efficiency in a compact design. This technology mixes the advantages of different dewatering technologies such as fully automatic operation, completely enclosed design and compactness, low noise emission, low wash water consumption, high dryness efficiency, very low power consumption and low operating costs.

ANDRITZ specific basket design gives a strong advantage in terms of capture rate and maintenance costs. Mixing device allows to lower the power consumption. Unique washing system decreases water consumption.

The C-Press is an efficient dewatering technology for municipal and industrial applications.

## Weight and dimensions

| Size $(\mathrm{L} \times \mathrm{W} \times \mathrm{H})$ | $172.00 \times 46.68 \times 48.00$ in |
| :--- | :--- |
| Weight (empty) | $4,233 \mathrm{lbs}$ |
| Weight (in operation) | $6,834 \mathrm{lbs}$ |


| Materials of construction |  |
| :--- | :--- |
| Screen baskets | 1.4306 (AISI 304L) |
| Screw shaft | 1.4306 (AISI 304L) |

Frame
Carbon steel*
Carbon steel*
Carbon steel
Fiber glass
1.4306 (AISI 304L)

Polyurethane
1.4306 (AISI 304L)

Blue RAL 5015 (Epoxy system)
*(Inner face cladded with 1.4306)

Option:
Raw Material
1.4404 (AISI 316L)

Covers
1.4306 (AISI 304L)
or 1.4404 (AISI 316L)

Baskets
Inside diameter 540 mm

Number of baskets 3

Total length of baskets 2700 mm

Open area 30.6 / 21.5 / 13.5\%

Option:
Splitted basket on high pressure zone for easy maintenance in place

Screw
Pitch
500 mm
Number of screw flights
Frame
Profile
"C" folded plate
Anchors bolts
7/16 / 316
Lifting points
4
Counter pressure device
Cylinder type
ISO 15552 - VDMA24652
Number of pneumatic cylinders 2
Pressure range $0-87 \mathrm{psi}$
Air consumption
6.0-6.4 cfm*

Pneumatic panel
1
(*) Air consumption lasts for $5-10$ seconds to pressurize the pneumatic cylinders at start-up.

## Safety device

Pressure transmitter
4...20Ma

Washing spray pipe
Quantity 2

Pressure 87 psi
Water consumption rate 48 gpm
Water consumption per hour 132 Gal
(With thickening zone/each hour and dewatering zone/each two hours)
Water Quality $500 \mu \mathrm{~m}$ (100ppm) without Sulfite or / and Chloride
Washing sequence occurs during dewatering process
Sensor

## Gear Motor

See table 1
Lubrication
Bearing \& Spindle shalf (washing device)
with grease/ type: KP2K
Gear motor
Screw shaft Oil (synth. PAO iso VG 320 EP)
Washing device Oil (synth. PG 460)
Noise level
Noise $<70 \mathrm{~dB}(\mathrm{~A})$ at 1 meter

Inline Flocculator

C- 5427

## Connections



| ITEM | DESCRIPTION | SIZE | Detail |
| :---: | :--- | :---: | :---: |
| A | Inlet | $3 "-150 \#$ ANSI FLANGE | Flange |
| B | Cake outlet | $28.50 \times 9.38$ in $(8 \times \mathrm{M} 8)$ | Rectangular hole |
| C | Filtrate outlet | $8 "-150 \#$ ANSI FLANGE | Flange |
| D | Wash water inlet | $2 \times(1 "$ BSP Male $)$ | Threaded |
| E | Sample taking point (feed) | OD $1.57 "$ | Pipe |
| F | Pneumatic panel | $300 \times 200 \times 150-$ OD 8 mm | Pipe |

Cake Outlet


C-PRESS C-5427 Datasheet.doc

Pneumatic Panel(F)



Gear motor \& frequency inverter

|  |  | SCREW SHAFT | WASHING DEVICE |
| :---: | :---: | :---: | :---: |
| Gear motor |  |  |  |
| Type |  | Planetary | Helical worm gear |
| Power | kW | 1.5 | 0.12 |
| Voltage | V | 230/400 | 230/400 |
| Rated current | A | - | - |
| Frequency | Hz | 50 | 50 |
| Output speed gear motor | RPM | 0.5 at 50 Hz | 79 |
| Service factor |  | 1.5 | 1.75 |
| Hollow shaft | $\varnothing$ | 105 | 16 |
| Motor protection type | IP | 55 | 55 |
| Thermal Classification |  | F | F |
| Efficiency Class |  | IE3 | IE2 |
| Performance (50 / 75 / 100\%Pn) | \% | - | 55 / 62,9 / 62,5\% |
| Weight | Kg | 140 | 5.5 |
| Oil capacity | 1 | 3.5 | 0.16 |
| Coupling |  | Shrink disc | key |
| Option |  | Explos | proof |
| FREQUENCY INVENTOR OPTION |  |  |  |
| Nominal voltage | V | 380... 500 | N/A |
| Power (high overload) | KW | 1.5 | N/A |
| input frequency | Hz | 50...60 (+/-10\%) | N/A |
| Protection | IP | 21 (for electrical cabinet) Or <br> 54 (for external cabinet) | N/A |

Table 1

Flocculation mixing device
Inlet Concentration < 20g/L : Polymer injection ring


| VENTURI MIXER |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| TYPE | Dimensions (L/w/h) | Connection | Polymer <br> connection | Weight <br> (lbs) |  |
| $4 "$ injection ring | $9 " \times 9^{\prime \prime} \times 3^{\prime \prime}$ | ISO DN100 PN10* | 1" NPT Female <br> threaded | 20 |  |

Table 2

* The Venturi Mixer needs to be located 10 feet away from headbox.

Inlet Concentration >20g/L: Dynamic Flocculation tank


| DYNAMIC FLOCCULATOR |  |  |
| :--- | :---: | :---: |
| Material |  | Black HDPE |
| Capacity | Liters | 520 |
|  |  |  |
| Total Width | mm | OD 800 |
| Total Height | mm | 2151 |
| Empty weight | Kg | 120 |
| Load weight | Kg | 846 |
| GA Drawing | $\mathrm{N}^{\circ}$ Drw | 702519617 |
| Anchor |  | $\mathrm{x4}-\mathrm{M12} \mathrm{/A4-70}$ |
|  |  |  |
| Power | kW | 0,37 |
| Speed | RPM | 100 |
| Frequency inventers |  | On board |
|  |  |  |
| Inlet suldge | A | mm |
| Outlet Suldge | B | mm |
| ISO DN 100 PN 10* |  |  |
| Drain | C | mm |


*Option: Flange 6"ANSI B16.5-150 Lbs
**Option: Flange ANSI 8"ANSI B16.5-150 Lbs

Options:

- X2 Solenoid valves

- Air connection (suction) flange
- Splitted basket on high pressure zone for easy maintenance in place



### 4.0 Warranty

## 844944 City of Kenai

## Andritz Separation Inc. Limited Warranty

## 1. Warranty

(a) Seller warrants to Buyer that the Products manufactured by it will be delivered free from defects in material and workmanship. This warranty shall commence upon shipment of the Products and shall expire on the earlier to occur of 24 months from initial operation of the of the Products and 30 months from delivery thereof (the "Warranty Period"). If during the Warranty Period Buyer discovers a defect in material or workmanship of a Product and gives Seller written notice thereof within 10 days of such discovery, Seller will, at its option, either deliver to Buyer, on the same terms as the original delivery was made, according to INCOTERMS 2010, a replacement part or repair the defect in place. Any repair or replacement part furnished pursuant to this warranty are warranted against defects in material and workmanship for one period of 12 months from completion of such repair or replacement, with no further extension. Seller will have no warranty obligations for the Products under this Paragraph 3(a): (i) if the Products have not been stored, installed, operated and maintained in accordance with generally approved industry practice and with Seller's specific written instructions; (ii) if the Products are used in connection with any mixture or substance or operating condition other than that for which they were designed; (iii) if Buyer fails to give Seller such written 10 day notice; (iv) if the Products are repaired by someone other than Seller or have been intentionally or accidentally damaged; (v) for corrosion, erosion, ordinary wear and tear or in respect of any parts which by their nature are exposed to severe wear and tear or are considered expendable; or (vi) for expenses incurred for work in connection with the removal of the defective articles and reinstallation following repair or replacement.
(b) THE EXPRESS WARRANTIES SELLER MAKES IN THIS PARAGRAPH (a) ARE THE

ONLY WARRANTIES IT WILL MAKE. THERE ARE NO OTHER WARRANTIES, WHETHER STATUTORY, ORAL, EXPRESS OR IMPLIED. IN PARTICULAR, THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
(c) The remedies provided in Paragraph (a) are Buyer's exclusive remedy for breach of warranty.
(d) With respect to any Product or part thereof not manufactured by Seller, Seller shall pass on to Buyer only those warranties made to Seller by the manufacturer of such Product or part which are capable of being so passed on.
Remedy:
To report any problems or request for parts, contract our Spare Parts and Service Department at (817) 465-5611 or write to:

Andritz Separation Inc.
1010 Commercial Blvd. S.
Arlington, Texas 76001

### 5.0 Mechanical Drawings






### 6.0 Electrical Drawings

ANDRIZ Separation

|  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| SH | Location | sECTION | Drawing description | draming name |
| 1 |  | TRANSMITTALS | DRAWIN REPORT LIST | E849944．T1 |
| 2 | scp－．cp | BIL O F MATERALIS | BILL OF MATERALLS（SCP－CP） | E844944．EM11 |
| ${ }^{3}$ | scp－CP | bll of materals | BIL OF PATERALLS（SCP－CP） | E844944．8M12 |
| 4 | scP－FLD | Bill of Materlils | BIL O F MATERALLS ANCILARY EQUIP） | E844944．8M21 |
| 5 | scr．cp | Panel layout | Control Panel（Sc．CPP）Larout | E84994PP11 |
| 6 | scp－．cP | Panel larout | SCP－CP BACKPANELAAYOUT | E84994P的2 |
| 7 | scr．cP | Panellarout | SCP－CP TERMNAL B LOCK PLAN | E84944P13 |
| 8 | scr－CP | Panel layout | SCP－CP TERMNAL LILCK P PAN（CONT．） | E849494P14 |
| 9 |  | Panellarout | SCP．CP NAMEPLATES | E844944P15 |
| 10 | scp．JB1 | Panellarout | SCP Junction box 1 | E84994．P31 |
| 11 |  | SINSLELINE SCHEMATICS | SINGLELINE SCHEMATC | E844944．SL1 |
| 12 | scp－CP | SCHEMATICS | 3PHPOWER OISTRRBUTION | E844944．51 |
| 13 | scr．c．${ }^{\text {c }}$ | SCHEMATCS | 3PH Power ilitriution（CONT．） | E849444．S2 |
| 14 | scp－CP | SCHEMATCS | 3PH Power isitriution（ Cont．） | E84994．43 |
| 15 | scp－CP | Schematics | AC CTRL Power ilstriution | E844944．54 |
| 16 | scr．cP | Schematics | AC CTRL Power ilitriution（COovt） | E849944．55 |
| ${ }^{17}$ | scp－CP | Schematics | DC Power instibution | E84944．56 |
| 18 | scp－CP | SCHEMATICS | E．SToP INTERLOCKs | E844944．57 |
| 19 | scr－CP | SCHEMATCS | OIT SCHENATIC | E849444．48 |
| 20 | scp－CP | schematics | PLC Power supply | E84944．59 |
| 21 | scr．c．${ }^{\text {c }}$ | SCHEMATICS | BANK 1 SLOT OSCHEMATIC | E849444．510 |
| 22 | scr．cp | SCHEMATCS | BANK 1 SLOT 1 SCHEMATIC | E84994．511 |
| ${ }^{23}$ | scr．cp | Schematics | BANK 1 SLOTT 2 SCHEMATIC | E884944．512 |
| ${ }^{24}$ | scP．CP | SCHEMATICS | BANK1 1 LLOT 3 SCHEMATIC | E849444．513 |
| ${ }^{25}$ | sç．ç | schematics | BANK 1 SLOT 4 SCHEMATIC | E884944．514 |
| ${ }^{26}$ | scp－CP | Schematics | BANK1 1 LLOT 5 SCHEMATC | E844944．515 |
| 27 | scp．ç | SCHEMATICS | BANK 1 SLOT 6 SCHEMATC | E849944．516 |
| ${ }^{28}$ | scr．cP | SCHEMATICS | BANK 1 SLOT 7 SCHEMATIC | E849444．517 |
| 29 | scp－CP | SCHEMATICS | communcations | E884944．530 |
| 30 | scp．ç | Schematics | ORY Contact outruts | E844944－531 |
| ${ }^{31}$ | scr－．cP | SCHEMATICS | PNEUMATIC PANEL SCHEMATC | E849444．532 |
| 32 |  | NETWORK ARCHITECTURE | NETWORK ARCHITECTURE | E84994 ${ }^{\text {N1 }}$ |
| ${ }^{33}$ |  | point to Point | PONT TOPOANT（SP MOTOR LOADS） | E844944．PP1 |
| ${ }^{34}$ |  | point to pont | Point to Point（INSTRUMENTATON JB） | $\mathrm{EB844944.PP2}^{\text {a }}$ |
| ${ }_{35}^{35}$ |  | Ponvt to pont | PoInt To Pont PPeUMMATC B Bx） | ${ }_{\text {E E449944PP3 }}$ |
| ${ }^{36}$ |  | pont to point | Point To Point（sLUOEE EEED） | ${ }^{\text {E844944PP4 }}$ |
| ${ }^{37}$ |  | Poin To Point |  | ${ }^{\text {E844944．PP5 }}$ |
| 38 <br> 39 <br> 39 | scp．cp | $\underset{\text { Ponvt To Point }}{\text { REPORTS }}$ | Point To Point（ARWWMMXER） |  |
|  |  |  |  | E8494470M1 |


|  | Schematic Symbol | Descripion |
| :---: | :---: | :---: |
| ${ }^{\text {AB }}$ | _ | Alarm Beacon |
| АН | ？ | Alarm Hor |
| св | $\bigcirc$ | Circuit rreaker |
| CR | $\bigcirc$ | Reay Coil |
|  | － | Contact <br> N．O． |
|  | － | Contact <br> N． |
| D | － 5 | Diode |
| ds | －${ }_{-1}$ | Disconnect |
| ov | $\square$ | Analog Device |
| Esnd | 内 | Earth Ground |
| an | $\theta$ | Enclosure FanlExhaust |
| FLT | $\sigma_{0}^{0}$ | NC． |
|  | $-\infty 0^{\circ}$ | Level Switch N．O． |
| fs | ${ }^{-0}{ }_{\text {® }}$ | Flow Switch <br> N．O． |
|  | $\rightarrow \square^{\circ}$ | Flow Switch |
| FU |  | Fuse <br> Rating |
| vor | $\perp$ | Ground <br> $\mathrm{X}=$ Isolation Ground Number |
| เs | －osor | Limit Switch <br> N．C |
|  | $\bigcirc \sim_{0}$ | Limit Switch N．C．；Held Open |
|  | －${ }^{\circ}$ | Limit Switch N．O |
|  | －a， | Limit Switch <br> N．O．；Held Closed |
| LT | -' | Pilot Light <br> $\mathrm{X}=$ color（A＝amber， $\mathrm{B}=\mathrm{blue}$ |
|  | $\underset{\sim}{2} O_{-}^{\prime}$ | Pilot Light－Push to Test $\mathrm{X}=$ color（ $\mathrm{A}=$＝amber， $\mathrm{B}=$ blue $\mathrm{G}=$ green， $\mathrm{R}=$ red） |
| м | －○－ | Contactor Coil |
| мот | $3$ | Motor |
| от |  | Operator Interface Terminal |
| o | $\rightarrow x^{-}$ | Overload Relay |


| ${ }_{\text {Pb }}^{\text {Pode }}$ | shematic Symbal | Descripion |
| :---: | :---: | :---: |
|  | $\bigcirc$ | Pushbutton <br> N．O． |
|  | －010 | Pushbutton <br> N．C． |
|  | $\bigcirc{ }_{0}$ | Pushbutton <br> N．O．；Mushroom Head |
|  | － 0 To | Pushbutton <br> N．C．；Mushroom Head |
| Pcs |  | Pull Cord N．C． |
|  | $\rightarrow$－${ }^{\text {¢ }}$ | $\begin{aligned} & \text { Pull Cord } \\ & \text { N.o. } \end{aligned}$ |
| PE | $\begin{aligned} & \mathrm{O} \text { O } \\ & \mathrm{A}+\mathrm{r} \end{aligned}$ | Photo Eye <br> n．o |
|  | $\begin{array}{\|c\|} \hline 0 \times 1 \\ 0+1 \end{array}$ | $\begin{aligned} & \text { Photo Eye } \\ & \text { N.C. } \end{aligned}$ |
| PDB | 000 | Distribution Block <br> （Power or Ground） |
| PLue | 安 | Male Plug |
| ps | $\rightarrow$－ | Pressure Switch N．C． |
|  | $\mathrm{O}^{\text {人 }}$ | Pressure Switch N．O． |
| Px | $\Leftrightarrow$ | Proximity Switch N．C． |
|  | $\sim$ | Proximity Switch <br> N．O． |
| R | － | Resistor／Heater |
| cor | （0） | ${ }^{120 V A C}$ Receptacie |
| RTo | 譼 | RTD Transmitter |
| sol | －－W－ | Solenoid |
| ss | $\rightarrow 7000$ | Selector Switch <br> N．O．； 2 Pos；Maintained |
|  | －3 $0^{20}$ ox | Selector Switch N．C．； 2 Pos； Spring Le |
|  |  | Selector Switch N．C； 3 Pos；Keyed Maintained |
|  | $\xrightarrow{-3} 0$ | Selector Switch N．O．； 3 Pos；Spring Cente |
| sstr | $00^{-0.0 x}$ | lluminated Selector Switch N．O．； 2 Pos |
| tas | $\mathrm{Oa}_{5}{ }^{-}$ | Temperature Switch N．O． |
|  | －0－90 | Temperature Switch N．C． |
| т | $\sim^{-}$ | Timer |
| wLT | $\cdots$ | Work Lig |
| xF | ming | Transtormer |



COMPONENT TAGGING AND WIRE NUMBERS This drawing set was created based on a page
line number standard．All device numbers，wire Ine number standard．Ald device numbers，wian
numbers，
unless exisiting derencing olocos this stand or unless existing devices or wiring is being
documented The followng illustraions explain
how sention，sheet and row numbers are used．

Rung Numbers Wire Numbering

$$
\underset{\substack{\text { Sheet } \\ \text { Row }}}{ }
$$



$$
\begin{gathered}
\text { Cunction Code } \\
\text { Soset } \\
\text { Positiont } \\
\hline
\end{gathered}
$$

- Wire Gire Colore

| First Position Blank |
| :--- |
| $\begin{array}{l}\text { Hidden } \\ \text { wire number．}\end{array}$ | WIRING LINES

## —— wire

－Field Wiring
（Wired by otress
un
MISC．LEGENDS
A Supplied By Others
x $x^{\sim} \begin{aligned} & \text { Revision／Change } \\ & X=R e v i s i o n ~ N u m b e r ~\end{aligned}$

|  |
| :---: |
| APPROVED FOR CONSTRUCTION BY：RA DATE：03／09／22 PROJECT No． 84494 |


| Loc | ITEMS | QTY | Catalog | MFg | DESCRIPTION | tags |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ${ }^{\text {scp-CP }}$ | 1 | 1 |  | Hoffman | FREESTANDING ENCLOSURE, HEAVY DUTY STAINLESS STEEL, FOR FLANGE-MOUNT DISCONNECTS, NEMA × 18 " | ${ }^{*}{ }^{\text {NOft }} 2$ |
| scP-CP | 2 | 1 | A84PM40 | Hoffman | BACKPANL L For $8 \times 4 \times 0$ Enclosures | *NOTE 2 |
| ${ }_{\substack{\text { scrocp } \\ \text { scf.ce }}}$ | 4 | 2 | $100 \cdot$ SSO250 | ${ }^{\text {AB }}$ | SURGE SUPPRESSOR, IIOOE MOOULE, 12.2.25VOC | MCCR713 |
|  | 5 | ${ }^{2}$ | ${ }^{100 . S A 20}$ | ${ }^{\text {AB }}$ | AUXLIARY CONTACT, SIIE MOUNT 2 No | MCCR713 |
| ${ }_{\text {ScP-CP }}$ | ${ }^{6}$ | 1 | 1406-G-MTLL63. | ${ }^{\text {AB }}$ |  | ${ }^{\text {C8102 }}$ |
| scP.CP | 7 | 1 | 1406.G.FCX04 | ${ }^{\text {AB }}$ |  | C8102 |
| scr.CP | ${ }^{8}$ | 1 | ${ }^{1400 \cdot 6.9 .73 L}$ | ${ }^{\text {AB }}$ |  | C8102 |
| ${ }^{\text {scr.c. }}$ | $\stackrel{9}{9}$ | ${ }^{2}$ | 1406-6.tLC 13 | ${ }^{\text {AB }}$ |  | ${ }^{\text {c8102 }}$ |
| ScP.CP | ${ }^{10}$ | 1 | ${ }^{1400 \cdot 62233-30}$ | ${ }^{\text {AB }}$ |  | ${ }^{\text {CB102 }}$ |
| ${ }_{\text {scp-CP }}$ | ${ }^{12}$ | 1 | ${ }^{1992-A 188}$ | ${ }^{\text {AB }}$ | SINGLE P PASE EUS SAR 800,57 DEVICES PRR METER |  |
| $\underset{\substack{\text { scorcp } \\ \text { scp.cp }}}{ }$ | ${ }^{13}$ | 2 | ${ }^{1492-F 81 / 530-1}$ | ${ }^{\text {AB }}$ |  |  |
| Scp-.cP | 14 | 1 | 1492-f82c30-1 | ${ }^{\text {AB }}$ | 2 PoLE FUSE BLOCK- CLASS CC | FU344 |
|  | 15 | 5 | 1992-F83C30-L | ${ }^{\text {AB }}$ | ${ }^{3}$ POLE F USE ELCOCK - CLASS CC | (evios |
| $\square$ | ${ }^{16}$ | ${ }^{7}$ | ${ }^{1492-S P M 1 C 030}$ | ${ }^{\text {AB }}$ | SUPPLEmENTARY PROTECTORS, 1-POLE, TRRP CURVE C, 3 A, NO NEUTRAL |  |
| Scoct | ${ }^{17}$ | 2 | ${ }^{1929-S P M 1 C 050}$ | ${ }^{\text {AB }}$ | SUPPLEMENTARY PROTECTORS, 1.POLE, TRPP CURVE C, 5 A, No N EUTRAL |  |
| Scp-CP | ${ }^{18}$ | 1 | 1492-SPMMC100 | ${ }^{\text {AB }}$ | SUPPLEMENTARY PROTECTORS, 1 , POLE, TRIP CUVVEC, 10 A , No NEUTRAL | C8501 |
| scr.cP | 19 | 1 | ${ }^{1429-S P M 1 C 150}$ | AB | SUPPLEMENTARY PROTECTORS, 1 , 1 POLE, TRIP CURVE C, 15 A , , No NUUTRAL | ${ }^{\text {C8422 }}$ |
| ScP.CP | ${ }^{20}$ | 1 | 1006.XEE480EP | ${ }^{\text {AB }}$ |  | Pw608 |
| scp.cp | ${ }^{21}$ | 1 | $1769 . E C R$ | AB | COMPACTIO END CAP RIGHT SIIE |  |
| ScP.CP | ${ }^{22}$ | 1 | $1769.1{ }^{\text {P }}$ | ${ }^{\text {AB }}$ | 17681769 CoMPACLLOGIX SYSTEM, 8 CHANNEL ANALOG CURRENTNOLTAGE NPUT MOOULE | PLC1501 |
|  | ${ }^{23}$ | ${ }^{3}$ | 1769.1016 | ${ }^{\text {AB }}$ |  | (tactiol |
| ScP.CP | ${ }^{24}$ | 1 | 1769.30 ER | ${ }^{\text {AB }}$ | COMPACTLOGIX 5370 L3 CONTROLLER, DUAL ETHERNET W/DLR CAPABILITY, 1MB MEMORY, 8 I/O EXPANSION, 16 ETHERNET IP NODES, WITH 1GB SD CARD | CPU1001 |
|  | ${ }^{25}$ | 2 | 1789.054 | ${ }^{\text {AB }}$ | 178817769 ComPactiogix SYSTEM, 4 CHANNEL A ANLLOG CURENTNOLTAGE OUTPUT MOOULE |  |
|  | ${ }^{26}$ | 2 | ${ }^{1769.0 W 16}$ | ${ }^{\text {AB }}$ | 1769 ComPACTLOGIX RELAY OUTPUT MOOULE 16 Points |  |
| ${ }_{\text {scr.cp }}$ | ${ }^{27}$ | 1 | ${ }_{1769 . P A 4}$ | ${ }^{\text {AB }}$ | COMPACT LOGIX SSSTEM, Power supply 120240VAC INPUT AAMP@SVDC OUTPUT | Ps910 |
| ScP.CP | ${ }^{28}$ | 1 | 1783-US8T | ${ }^{\text {AB }}$ | STRATI 2000 UMMANAGED EHHERNET SWWTCH, R, R45, 8 P PRT | Етн3009 |
| scp-CP | 29 | 1 | 199.0R1 | AB | ZINCSTTEEL OIN RAL EN S0022 (35mm $\times$ 7.5mm $\times 1 \mathrm{~m}$ ) |  |
| ScP.CP | ${ }^{30}$ | 1 | 258.4PPON104 | ${ }^{\text {AB }}$ |  | VFP0105 |
| sç.cP | ${ }^{31}$ | 1 | ${ }^{2711 P-T 10 c 2298 P}$ | ${ }^{\text {AB }}$ | PANELVIEW PLUS 7 PERFORMANCE TERMINAL, TOUCH SCREEN, 10.4 INCHES, TFT COLOR, TWO ETHERNET PORTS, 24V DC WINDOWS CE OS LICENSE | 018814 |
| scp.cp | ${ }^{32}$ | 1 | 440-.31382 | ${ }^{\text {AB }}$ |  OUTPUT | SR702 |
| ScP.CP | ${ }^{33}$ | 1 | 49883.0 C 120.20 | ${ }^{\text {AB }}$ | SURGE AND FLLTER PROTECCTON, OIN RAL MOUNT, ComBo OL 14999UL 1283, 120V, 20A | sp423 |
| ScP.CP | ${ }^{34}$ | 1 | 700-ADLIR | ${ }^{\text {AB }}$ | DIODE WTH LED SURGE SUPRRESSOR, 6.24 VVO | ${ }^{\text {CR223 }}$ |
| ${ }^{\text {scp-.cp }}$ | ${ }^{35}$ | 1 | ${ }^{\text {700-HA33724.3.4 }}$ | ${ }^{\text {AB }}$ |  | CR223 |

SCREW PRESS CONTROL PANEL COMPONENTS (SCP-CP)

| Loc | Items | QTY | catalog | MFG | DESCRIPTION | tags |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ${ }^{36}$ | 14 | ${ }^{700+H L T 12224}$ | ${ }^{\text {AB }}$ | HL TYPE T TRMMNAL BLOCK RELAY, DPDT (COO), 10 A CONTACT RATIN, WISCREW T ERMNALS, 24 VOC, TOUCH SAFE, LIGHT INDICATOR, SURGE SUPPRESSOR |  |
| scr-.cP | ${ }^{37}$ | 1 | 700-HN20 | ${ }^{\text {AB }}$ | SCREN TERMINLL TUEE EASE SOCKET, GUARDED TERMINAL CONSTTRUCTION | ${ }^{\text {CR623 }}$ |
|  | ${ }^{38}$ | 2 | ${ }^{\text {700SCFFF620EJC }}$ | ${ }^{\text {AB }}$ |  |  |
| ${ }^{\text {scr.c.cP }}$ | ${ }^{39}$ | 1 | 2R68ax | ${ }^{\text {AB }}$ | 30.5MM TYPE 4/4X/13 SEL. SWITCH-ILLUM, 2 POS, UNIVERSAL LED, 12-120VAC 50/60HZ, WHITE, STD KNOB MAINT, KB6 MAINTAINED CAM, 1 NO 1 NC | ${ }_{\text {SSLTa3 }}$ |
| scp-CP | ${ }^{40}$ | 1 | ${ }^{\text {800HC-ORAR2B01 }}$ | ${ }^{\text {AB }}$ |  | P8LT711 |
| sç.CP | ${ }^{41}$ | 1 | 800CC-TFRXT 9 ASS | ${ }^{\text {AB }}$ | NON-ILLUMINATED PUSH BUTTON TRIGGER ACTION, TWO POSITION MAINTAINED, MUSHROOM HEAD, RED, FINGER GUARDS ON TERMINALS 2NCLB SELF MONITORING CONTACTS | P8707 |
| scp-cp | ${ }^{42}$ | 1 | $8007 \times 01$ | ${ }^{\text {AB }}$ | Boot Contact block, Shallow block, 1N.O. | P8707 |
| scr-.cP | ${ }^{42}$ | 2 | ${ }^{8007-\times 19}$ | ${ }^{\text {AB }}$ | CONTACT Block, MAX DUTY Block 1 N. . | SSLT436 |
| scp-CP | ${ }^{43}$ | 1 | ${ }^{85588-N 358 L 4}$ | ${ }^{\text {AB }}$ |  SELECTABL | ${ }^{\text {AB1313 }}$ |
| scp-cp | 4 | 1 | 300837153 | ANORIT | ANORITI SEPARATION STD LOGO |  |
| scp-cp | ${ }^{45}$ | 1 | FNor.30 | BuSSMANN | FUSE-CLASS CC 30 A | FU34 |
| scp-cp | 46 | 1 | FNO.R. 5 | Bussmann | FUSE-CLASS CC 5 S | Fu356 |
| scr.cp | 47 | 3 | LP-CC-1 | bussmann | FUSE- CLLASS CC P 1 A | Fu203 |
| scp-CP | ${ }^{48}$ | 3 | LP.C.C.1/2 | BUSSMANN | FuSE. -CLASS CC | Fu211 |
| scp-CP | 49 | 3 | LP.C.C-12 | Bussmann | FUSE-CLASS CCC 12A | FU105 |
| scr.cp | 50 | 2 | LP.CC. 15 | Bussmann | FUSE- CLASS CC 15A | FU344 |
| scr.cp | ${ }^{52}$ | 3 | LP.CC. 6.14 | Bussmann | FUSE - CLASS CC 6.25 A | fu223 |
| scp.cp | ${ }^{53}$ | 1 | vpCl-111 | CORTEC | CORROSION INHIBTTOR FOR MOISTURE, AIRBORNE CONTAMINANTS, H2S, SO2, NH3, ETC. 11 CUBIC FEET COVERAGE | ${ }^{\text {cP }}$ |
| scp.cp | 54 | 1 | ${ }^{\text {T32F771 }}$ | ENM | ELAPSEE TME METER 24VOC, DIN RAL Mount | EtM1310 |
| ${ }^{\text {scp-CP }}$ | ${ }^{55}$ | 1 | 450.024.31 | FEDERAL SIINAL |  CSA CERTIFIED | ${ }^{\text {AH1304 }}$ |
| scr.cp | ${ }^{56}$ | 1 | TR.RING | FEDEERALSISNAL | SUURFACE MOUNT TRM R ING (FOR TTPE 12 AND TTYE 4x SURFACE MOUNTING APPLICATONS) | ${ }^{\text {AHH1304 }}$ |
| scp-CP | 57 | 1 | P-.2.K2RFO | GRACE PORT | GFCI RECEPTACLE U LTYE 4X GFCIV R,45 ETHERNET | Porta32 |
| scp.cp | ${ }_{58}$ | 1 | ALLFSWD | Hoffman | DOOR SWTCH, CONTACTS RATEED 10, 1 , NO , 1 INC | L5623 |
| scp.cp | 59 | 1 | DAH2001A | Hoffman |  | HTR365 |
| scr.cp | ${ }^{60}$ | 1 | LEDA1535 | Hoffman |  | WLT402 |
| sç.CP | ${ }^{61}$ | 1 | LEDA20C | Hofrman | LED LGHT NPUT CONNECTORCACLE ASSEMSIY 2000mm For Ac Leo Lights | WLT402 |
| sç.CP | ${ }^{62}$ | 1 | S350-kIT | LUGS DiRECT | MECHANICALLUG S50.GAWG |  |
| scp.cp | ${ }^{63}$ | 1 | Rlw-33P405 | MTE | RIL LINELOAD REACTOR MPEDANCE 5\%, 3 . 4 A, OPEN REACTOR | LR105 |
| scr.cp | ${ }^{64}$ | 1 | 13382344300 | Pfanvenerg |  | ${ }^{\text {AR3366 }}$ |
|  | ${ }^{65}$ | ${ }^{13}$ | ${ }^{0223250}$ | PHOENX Contact | SCREW Center uumper fil 10.6 , 10 Poles, INSULATEE, For UK 5 | $\begin{gathered} \text { TRACD } \\ \hline \end{gathered}$ |
|  | ${ }^{71}$ | ${ }^{27}$ | ${ }^{0824589}$ | PHOENX CONTACT | MAARER F For terminal block, WITH 6. 2mm UT-4/UK5 |  |



| Loc | ITEMS | aty | Catalog | MFG | DESCRIPTION | tags |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ${ }^{67}$ | ${ }^{13}$ | ${ }^{0800886}$ | PHOENIX Contact | END BRACKET-ENS 35N | (ticl |
| scp-CP | ${ }^{68}$ | 1 | ${ }^{0888244}$ | PHOENIX CONTACT | NSERT STRIP WHTTE UNLAEELED | твAC |
| scr.cp | ${ }^{69}$ | 1 | ${ }^{0809735}$ | PHOENIX Contact | ZACK MARKERSTRPP, FLAT, UNLAEELED. 12 mm | C66614 |
| ScP.CP | 70 | 5 | ${ }^{0824591}$ | PHOENX CONTACT | MARKER FOR T TERMNAL BLOCC, WOTH 5.2m UT-2,5 | ${ }_{\text {fBal }}$ |
| scr.cp | ${ }^{72}$ | ${ }^{3}$ | ${ }^{0824597}$ | PHOENIX CONTACT | MAREER FOR T ERMINAL ELOCK, WIDTH 8.2mm UT-6 | tBAC1 |
|  | ${ }^{73}$ | ${ }^{12}$ | ${ }^{1004338}$ | PHOENI CONTACT | TERMNAL STRP MARKER CARRER | (taC1 |
|  | ${ }^{74}$ | ${ }^{3}$ | 2771023 | PHOENX Contact | END Cover doukk 3 35 | (tich |
|  | ${ }^{75}$ | 5 | 2771065 | PHOENX CONTACT | PARTTITON PLATE ATP-UKKB 3 |  |
| scop cop | ${ }^{76}$ | ${ }^{95}$ | 2771146 | PHOENX Contact | 2 2LVVL L TeRninal block - ukk 5 Grar | (tioci |
|  | ${ }^{77}$ | ${ }^{9}$ | 2800837 | PHOENI CONTACT | THERMOMAGNETC DEVCEE CIRCUIT PREAKER 1 Position 2 A SFB Curve |  |
|  | ${ }^{78}$ | ${ }^{2}$ | ${ }^{2800388}$ | Phoenl Contact |  | Cib614 |
| screcp | ${ }^{79}$ | 2 | 280089 | PHOENX CONTACT | THERMOMAGNETC DEVICE CIRCUIT PREAKER 1 Position an sfe curve | C8642 |
|  | ${ }^{80}$ | ${ }^{13}$ | 2801305 | PHOENIX Contact | BASE ELEMENT SCREW Connection |  |
|  | ${ }^{81}$ | 5 | ${ }^{300320}$ | PHOENX Contact | END Cover -UUK 410 | (tact |

SCREW PRESS CONTROL PANEL COMPONENTS (SCP-CP)

| Loc | Items | aty | Catalog | MFg | DESCRIPTION | tags |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} \text { scco.cp } \\ \text { scocp } \\ \text { scocpor } \end{gathered}$ | ${ }^{82}$ | ${ }^{45}$ | ${ }^{300462}$ | PHOENX Contact | 'NVERSAL T TRMNAL L LICCK- UK 5 N GRAY |  |
| ${ }_{\text {scr.cp }}$ | ${ }^{83}$ | 5 | ${ }^{3004524}$ | phtenx Contact | UNIVERSAL TeRMINAL Llock UK6 6 N GRAY | ${ }_{\text {TBAC1 }}$ |
| ScP.CP | ${ }^{84}$ | 3 | ${ }^{3030226}$ | Phoenx Contact |  | teal |
| scP.CP | ${ }^{85}$ | 1 | ${ }^{303271}$ | Phoenx Contact | BASE ELEMENT JUMPER 10 Postitions | C8614 |
| ScP.CP | ${ }^{86}$ | 1 | ${ }^{3030323}$ | Phoenx Contact | PLUG-IN JUMPER FOR UT 6 TERMNAL ALOCKS, 10 Postions, RED | tbact $^{\text {d }}$ |
| scP.CP | ${ }^{87}$ | ${ }^{8}$ | ${ }^{3035467}$ | PHoEnx Contact |  | teext |
| scr.cP | ${ }^{9}$ | 1 | ${ }^{3047293}$ | Phoenx Contact | End Cover ut double Levelo outit 2,544 Gray | teext |
|  | ${ }^{92}$ | ${ }^{22}$ | ${ }^{3274301}$ | Phoenx Contact |  | $\underset{\substack{\text { TraAl } \\ \text { TBAO }}}{\text { cta }}$ |
|  | ${ }^{93}$ | ${ }^{2}$ | ${ }^{3214314}$ | Phoenl Contact | ENN COVER UT THREELEVELL D-UT 2.5.3l GRAV | ${ }_{\substack{\text { TBAAI } \\ \text { TBAO }}}^{\text {teat }}$ |
|  | ${ }^{94}$ | ${ }^{10}$ | LAO40DL | SCHNEIER ELECTRIC |  |  |
| ${ }_{\text {ScF-CP }}$ | ${ }^{95}$ | 1 | LROO | SCHNEIDER ELECTREC | THERMAL OVERLOAD RELAY For motor tests -0.10.16 A - CIASS 10 A | 0.211 |
| ScP.CP | ${ }^{96}$ | 1 | LRO04 | SCHNEIER ELECTREC | THERNAL OVERLOAD RELAY FOR MOTOR TESYS -0.40.0.3 A - CLASS 10 A | 0.203 |
| scr.cp | ${ }^{97}$ | 1 | ${ }^{\text {LROO7 }}$ | SCHHEIDR ELECTRIC | THERMAL OVERLOAD RELAY FOR MOTOR TESYS - 1.6-2.5 A - CLASS 10A -FOR DIRECT MOUNTING TO SIZE | 01217 |
|  | 100 | 3 | To28N1380 | SCHNEIER LILCTRTC |  | $\begin{aligned} & \text { M14101 } \\ & \hline 141313 \end{aligned}$ |
| Scr.cp | 101 | 1 | To28N2380 | SCHNEIERELECTRRC |  | M1404 |
| ScP.CP | 102 | 1 | HSSFFAS4X | SOLA |  | x5347 |
| scr.cp | ${ }^{103}$ | 1 | PK236TA | SQuare d | EQuIPMENT GROUND Bar 23 Teruninals | ${ }^{6 N D}$ |
| ScP.CP | 104 | 1 | 1489.M1030 | ${ }^{\text {AB }}$ | CIRCUT PREAKER, BRANCH, 3 , | ${ }^{\text {C8365 }}$ |
| ScP.CP | 116 | 1 | SSSAP0400 | Square ${ }^{\text {d }}$ |  | SP125 |
| ScP-.cP | ${ }^{117}$ | 1 | 258.0194 Na 104 | ${ }^{\text {AB }}$ | AC DRIVE POWERRLEE 525, WEMBEDDED ETHERNETIP AND SAFETY 480VAC, 0.5HP/0.4KW, 1.4 A 3PH, FRAME A , NO FILTER | 2028 |
| ScP-.cP | ${ }^{118}$ | ${ }^{3}$ | LP.cc. 6 | BuSSMANV | FUSE -CLASS CC 6 A | FU238 |
| ScP.CP | 119 | 1 | S605001T00 | CALBRIT | STAILESS STEEL 316 Conout HUB $12^{\prime \prime}$ | AB1313 |
| ScP.CP | 120 | 1 | S405200 Noo | CALBRITE | STANLESS STEEL 316 NPPLEL 12 NPT X $2^{\prime \prime}$ | ${ }_{\text {AB1313 }}$ |



8

| 7 | 6 |
| :--- | :--- |


| Loc | Items | aty | catalog | mFg | DESCRIPTION | tags |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 107 | 2 | EFF21006094 | Asco |  |  |
| Scoremb | ${ }^{11}$ | 40 | RS.26 | ccc | 332 orange nlon coate cable, (foot) |  |
|  | ${ }^{112}$ | 2 | RS.5E | ccc |  |  |
| Scoffle | ${ }^{113}$ | 2 | ss-450 | CRosbr | WiRe Ropp clup, stailess stel | ${ }_{\substack{\text { PcSis7 } \\ \text { PCSTO2 }}}$ |
|  | ${ }^{114}$ | 2 | 11587 | IFm FFECTOR | NOUCTVE SEESOOR 2-WIRE DC, SHORT BARREL. SOM DIA. DC PNPNPN, NONC PROGRAMMAGLE, OPERATING | $\underset{\substack{\text { PRSR127 } \\ \text { PRSI210 }}}{\text { Pr }}$ |
| scP.fı0 | 115 | 1 | ${ }^{\text {PL2657 }}$ | IFM FFECTOR | PRESSURE TRANSMITTER 0.7...14.5PSI, 4-20mA; 2-WIRE DC AND 3-WIRE DC, PROCESS CONNECTION SEALING CONE G1 MALE, PROGRAMMABLE EPS INTERFACE | PT1509 |

ON-SITE INSTALLED PROGRAMMING SOFTWARE (PROVIDED BY OTHERS)

 C-5427 SCREW PRESS MATERIALS (ANCILLARY EQUIP)
 $\qquad$ E844944-BM2

NOTES:


LEFT SIDE VIEW

## c) UL LISTED





RIGHT SIDE VIEW
©


ANGLE TYPE 2
QTY 2
$\xrightarrow{\text { QTY } 2}$

-


## NOTES:

ALL WIRING TO CONFORM TO NATIONAL ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
PANEL IS UL 508A LISTED.
3. ALL CONTROL PANEL COMPONENTS WITH GROUND SYMBOLS OR GROUND SCREWS 4. PROVIDE $10 \%$ SPARE TERMINALS
5. ALL EXPOSED ELECTRICAL TERMINATIONS IN THE ENCLOSURE SHALL BE GUARDED OR COVERED TO ELIMINATE THE POSSIBLIITY OF ACCIDENTAL CONTACT BY AN OBJECT THE SIZE OF AN AVERAGE FINGER. PROVIDE APPROPRIATE ADDITIONAL
PROTECTION WHERE THIS REQUIREMENT IS NOT MET. PROVIDE APPROPRIATE WARNING LABELS FOR VOLTAGE LEVELS USED WITHIN THE ENCLOSURE.
6. ALL WIRING SHALL CONFORM TO THE FOLLOWING COLOR CODE
6.1. 480 VAC POWER, 3-PHASE: BLACK
62. 120 VAC POWER, 1 -PHASE: LINE-BLACK - NEUTRAL-WHITE
6.3. 120 VAC CONTROL WIRES: RED
6.4. 24 VAC EXTERNALLY POWERED: YELLOW
6.6. GROUND - GREEN (-) OR COMMON: WHITE WITH BLUE STRIP

IN ORDER TO AVOID INDUCTIVE PICKUP, AC POWER WIRING (208V OR MORE) SHALL HAVE A MAXIMUM POSSIBLE SEPARATION FROM DC ANALOG SIGNAL AND DC/AC CONTROL WIRING OPERATING AT 120 V OR LESS. A PRACTICAL DISTANCE IS NO CROSSING SHOUUD BE AS CLOSE TO A RIGHT ANG THE SIGNAL WIRING, THE
8. A MAXIMUM OF TWO CONDUCTORS SHALL BE CONNECTED TO ANY ONE TERMINAL.

WIRE SPLICES ARE NOT PERMITTED WITHIN THE ENCLOSURE.
10. WHERE WIRE IS REQUIRED TO FLEX OFTEN (IIE. AROUND DOOR HINGES) OR SUSCEPTIBLE TO DAMAGE: HIGH STRAND WIRE AND SPIRAL WRAP SHAL BE USED. ROUTE AND SECURE WIRES SO THAT THEY WILL TWIST AND NOT BEND AROUND THE HINGE.
SAME COLOR AND LABELED WITH AED BY THE MAIN BREAKER SHALL BE OF THE
SAME COLOR AND LABELED WITH A WARNING LABEL STATING SAME
12. WIRE MARKERS. ALL WIRE MARKERS AND TAGS SHALL CONFORM ISA-RP60.6. AND
12.1. EACH WIRE SHALL BE IDENTIFIED ON BOTH ENDS OF WIRE
12.2. THE WIRE MARKERS SHALL BE WHITE WITH BLACK LETTERING. HAND MARKING
12.3. THE WIRE MARKER NUMBER SHALL BE A UNIQUE NUMBER, INCORPORATES THE INSTRUMENT/EQUIPMENT TAG NUMBER IF APPLICABLE, SHALL BE EASILY
CROSS REFERENCED WITH SCHEMATIC DRAWINGS, AND SHALL HAVE THE CROSS REFERENCED WITH SCHEMATIC DRAWINGS, AND SHALL HAVE TH
3. LAN CABLE SHALL BE SHIELDED TWISTED PAIR (UTP) CATEGORY 6 LAN CABLES FOR 3. LAN CABLE SHALL BE SHIELDED TWISTED PAIR (UTP) CATEGORY 6 LAN CABLES FOR
ALL ETHERNET 10BASET AND 100BASETX LAN CONNECTIONS, CABLES SHALL BE SUPPLIED WITH APPROPRIATE CONNECTORS.
14. OVERALL SHIELD CABLES SHALL BE USED FOR ALL ANALOG SIGNAL WIRING, CONDUCTORS SHALL BE SINGLE TWISTED OR TRIAD TINNED COPPER WITH AN
OVERALL SHIELD. THE INSULATION SHALL BE RATED AT $600 V$. OVERALL JACKET SHALL BE FLAME RETARDANT, 90C TEMPERATURE RATED AND UL LISTED. THE MINIMUM SIZE CONDUCTOR SHALL BE 16AWG UNLESS OTHERWISE NOTED.

 $1 /$ |  |  |
| :--- | :--- | :--- |
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|  |  |

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## LARGEST 1" LTRS

TO FIT ON 1 LINE
BLACK BACKGROUND W/WHITE LETTERS
QTY. 1 EA.


FURNISH NAMEPLATES AS INOICATED on drawings





CITY OF KENAI, WWTP C-5427 SCREW PRESS SCP-CP NAMEPLATES
$\underset{\text { PREV. SHI }}{\text { SIE }}$ E844944-P15













CITY OF KENAI, WWTP C-5427 SCREW PRESS PLC POWER SUPPLY
$\underset{\text { REV. SHEEIF }}{\text { I9 }}$


INTENTIONALLY LEFT BLANK




CITY OF KENAI, WWTP C-5427 SCREW PRESS
BANK 1 SLOT 2 SCHEMATIC
$\square$ BANK 1 SLOT 2 SCHEMATIC












| Satov: SCP-CP |  |  | TTLE | CITY OF KENAI, WWTP C-5427 SCREW PRESS DRY CONTACT OUTPUTS |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Mill | DRAWN BY: $R A$ | DATE <br> 09/21/21 |  |  |  |  |
|  | Checkedre: | DATE | ${ }^{\text {SIIE }}$ | UMEER |  |  |
|  | ${ }_{\text {JLR }}$ | 09/21/21 | B | E844944 |  | 6 |
|  | ${ }_{\text {BK }}$ | ${ }^{\text {doate }}$ O9/21/21 |  | NEET SHEETIT | ${ }_{\text {SHEI }}$ | 39 |













| Location | MODULE | catalog | ADDR | DESCRIPTION | COMMENT | RUNG |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| scr.ç | ${ }^{\text {PLCC101 }}$ | ${ }_{1769.1016}$ | \|No | Control PaNEL E.STOP | $0=$ PRESSED | 1101 |
| scr.cp | PLCC101 |  | ${ }^{\mathbb{N} 1}$ | MASTER Control relavs Enabled | 1 EENABLED | 1104 |
| scp-cp | PLCC101 |  | iN2 | SPARE |  | 1107 |
| scP-CP | PLCC101 |  | ${ }^{1 \times 3}$ | SCREW PRESS SPRAX ARM RUN FWD ConFrin | 1 R RUNNING Fwo | 1110 |
| scr.cp | PLCC101 |  | IN4 | SCREW PRESS SPRAY ARM RUN REV Confrim | 1 =RUNNING REV | ${ }^{1113}$ |
| scr.cP | PLCC101 |  | in5 | SCREW PRESS SPRAY ARM FAUTTED | 1 1FAULTED | ${ }^{1116}$ |
| scr.cP | PLCC101 |  | in6 | SCREW PRESS MOTOR COOLING FAN RUN CONFRRM | 1 1 RUUNNM | 1119 |
| scp.CP | PLCC101 |  | ${ }^{1 N 7}$ | SCREW PRESS MOTOR COOLING EAN FAULTED | 1 1FAULTED | ${ }^{1122}$ |
| scr.cP | PLCC101 |  | \|N8 | WASH WATE R Booster Pumps Run Conerm | 1 - RUNNM ${ }^{\text {a }}$ | ${ }^{1136}$ |
| scr.cP | PLCC101 |  | N99 | WASH Water booster fump common alarm | $0=$ ALARM | ${ }^{1139}$ |
| scr.cP | PLCC101 |  | \|10 | AR ComPRESSOR ENABLED | 1 EENABLED | ${ }^{1142}$ |
| scr.cP | PLCC101 |  | \|11 | AIR COMPRESSOR FAUTTED | 1-FAULTED | 1145 |
| scr.cP | PLCC101 |  | W12 | SPARE |  | 1148 |
| scr-.cP | PLC1101 |  | ${ }^{1 / 13}$ | CONVEYOR IN REMOTE | 1=REMOTE | 1151 |
| scr.cP | PLCC101 |  | W14 | CONVEYOR RUNWING | $1=$ RUNNM ${ }^{\text {a }}$ | 1154 |
| sç.CP | ${ }^{\text {PLCC101 }}$ |  | N15 | Converor faulteo | 0 F FAulted | 1157 |
| scr.cp | PLCL121 | 1789.1016 | ino | SCREW PRESS PULL Coro 1 ACTVA ED 1 P PULLED | 1 =PuLEED | ${ }^{1201}$ |
| scr.cp | ${ }^{\text {PLCC1201 }}$ |  | \|N1 | SCREW PRESS PULL Coro 2 ACTVA ED 1 I PUULED | 1 =PuLEED | ${ }^{1204}$ |
| scr.cp | PLCL201 |  | \|N2 | SCREW PRESS SPR Y ARM RETRACTEEO 0 | $0=$ Retracteo | ${ }^{1207}$ |
| sç.CP | PLCL121 |  | NW3 | SCREW PRESS SPRAM ARM EX ENDEE 0 0 ExTENDED | $0=$ ExTENOED | 1210 |
| scr.cp | PLCL120 |  | IN4 | SPARE |  | ${ }^{1213}$ |
| scr.cp | PLCL201 |  | \|N5 | SPARE |  | ${ }^{1216}$ |
| ScP-CP | PLCL120 |  | N06 | SPARE |  | ${ }^{1219}$ |
| sç.CP | ${ }^{\text {PLCC1201 }}$ |  | N7 | SPARE |  | ${ }^{1222}$ |
| scr.cp | PLCL121 |  | N88 | Booster pumps in remoteauto | 1=N REMOTE | ${ }^{1236}$ |
| SCP-CP | PLCL120 |  | in9 | SPARE |  | ${ }^{1239}$ |
| scp.cp | PLCL201 |  | \|10 | Potinmersstem in remoteauto | 1=N REMOTE | ${ }^{1242}$ |
| scr.cp | PLCL201 |  | \|N11 | Polrmer shstem Ruv confirm | 1 12UUNING | ${ }^{1245}$ |
| scr.cp | ${ }^{\text {PLCC1201 }}$ |  | ${ }^{1012}$ | Polimer Srsten Common alarm | $0=$ ComMon ALARM | ${ }^{1248}$ |
| scr.cp | PLCL120 |  | N13 | POLYMER SYSTEM FLow Low ALARM | 1=LOW FLOW ALARM | ${ }^{1251}$ |
| scr.cP | PLC1201 |  | [1/14 | SPARE |  | ${ }^{1254}$ |
| scP.CP | PLCL121 |  | N15 | SPARE |  | ${ }^{1257}$ |
| scr-CP | PLC1301 | 1769.0W16 | OUT0 | ALARM HoRN |  | 1304 |
| scr.cP | PLC1301 |  | OUT1 | PlC Falut |  | 1307 |
| scP.CP | PLCI301 |  | OUT 2 | ELAPSED TIM METTR |  | 1310 |
| ScP.CP | PLC1301 |  | оит 3 | ALARMEACOON |  | ${ }^{1313}$ |
| scr.cP | PLC1301 |  | OUT4 | COMMONALARM |  | ${ }^{1316}$ |
| scr.cp | PLCI1301 |  | OUT5 | SPARE |  | ${ }^{1319}$ |
| scr-.cP | PLC1301 |  | Out6 | SPARE |  | ${ }^{1322}$ |
| scr.cP | PLCI1301 |  | OUT7 | SPARE |  | ${ }^{1325}$ |
| scp-CP | ${ }^{\text {PLCC1301 }}$ |  | OUT 8 | SCREW PRESS WW Solenoli valve 1 Pen command | 1 OPen Command | ${ }^{1339}$ |
| scp.cP | PLC1301 |  | оит9 | SCREW PRESS WW Solenoli valve O Oeen command | 1 OPEN Command | ${ }^{1342}$ |
| scr.cp | PLC1301 |  | OUT 10 | CHoke Ar Pressure valv open command |  | 1345 |
| scr.cp | PLC1301 |  | OUT 11 | CHoke AR Pressure valve close commano |  | 1348 |
| scP-CP | PLCI301 |  | OUT 12 | Converor run commano |  | 1351 |
| scP.CP | ${ }^{\text {PLCC1301 }}$ |  | OUT 13 | Polvmer sstem run comman |  | ${ }^{1354}$ |
| scr.cp | PLC1301 |  | OUT 14 | Booster Pump sun Command |  | ${ }_{1357}$ |
| SCP.CP | PLCC1301 |  | OUT 15 | SPARE |  | 1360 |


| Location | MODULE | Catalog | ADDR | DESCRIPTION | COMMENT | RUNG |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| scp-CP | PLC1401 | $1769.0 W 16$ | OUT0 | SCREW PRESS SPRAA ARM RUN FWD |  | 1404 |
| scp-CP | PCCL1401 |  | OUT1 | SCREW PRESS SPRA ARM RUN REV |  | 1407 |
| scp-CP | PLCC1401 |  | out2 | SCREW PRESS MOTOR Coollv fan run command |  | 1410 |
| scP-CP | PCCC1401 |  | OUT3 | SPARE |  | ${ }^{1413}$ |
| ScP-CP | PLC1401 |  | OUT4 | AR Compressor enable comman |  | ${ }^{1416}$ |
| scP-CP | PLC1401 |  | OUT5 | SLUDCE FEED PUMPS RUN COMMAND |  | ${ }^{1419}$ |
| scp-CP | PLCC1401 |  | OUT6 | SPARE |  | 1422 |
| scp-CP | PLCC1401 |  | out7 | SPARE |  | 1425 |
| scP-CP | PLC1401 |  | OUT 8 | SPARE |  | 1439 |
| scP-CP | PLC1401 |  | OUT9 | SPARE |  | ${ }_{1442}$ |
| ScP-CP | PLC1401 |  | OUT 10 | SPARE |  | ${ }^{1445}$ |
| scp-CP | PLC1401 |  | OUT11 | SPARE |  | 1448 |
| scP-CP | PLC1401 |  | OUT 12 | SPARE |  | 1451 |
| ScP-CP | PLCC1401 |  | OUT 13 | SPARE |  | ${ }^{1454}$ |
| scP-CP | PLC1401 |  | OUT 14 | SPARE |  | 1457 |
| ScP-CP | PLC1401 |  | OUT 15 | SPARE |  | 1480 |
| ScP-CP | PLC1501 | 1769.178 | 1N0 | CHơE AIR PRESSURE FEEDBACK |  | 1503 |
| scr.cp | PLC1501 |  | N1 | SLUDGE FEEE PREESURE |  | 1510 |
| scr.cp | PLC1501 |  | \|N2 | SPARE |  | 1518 |
| scp-CP | PLC1501 |  | \|N3 | SPARE |  | 1525 |
| scP-CP | PCC1501 |  | iN4 | sluoge fee flow rate |  | 1538 |
| scr.cp | PLC1501 |  | N5 | Polverer flow rate |  | 1545 |
| scr.cp | PLC1501 |  | N6 | SPARE |  | ${ }_{1553}$ |
| SCP-CP | PLC1501 |  | [17 | SPARE |  | 1560 |
| ScP-CP | PLC1601 | 1769.0F4 | outo | CHoke AR PRESSURE SETPONT |  | 1003 |
| scr.cp | PLC1601 |  | OUT1 | SPARE |  | 1611 |
| scr.cp | PLC1601 |  | out2 | Polvmer svstem flow setpoint |  | 1619 |
| scP-CP | PLC1601 |  | оит 3 | SPARE |  | 1627 |
| scP-CP | ${ }_{\text {PLCO601B }}$ | 1769.0F4 | outo | SLUDEEE FEED PUMPS F Low setpoint |  | 1138 |
| scr.cp | ${ }^{\text {PLCCOO1B }}$ |  | out 1 | SPARE |  | 1646 |
| scr.cp | ${ }_{\text {PLC1601B }}$ |  | OUT2 | SPARE |  | ${ }_{1654}$ |
| scp-CP | PLC1601B |  | оит 3 | SPARE |  | 1682 |
| ScP-CP | PLC1701 | 1769.1016 | ino | SUUDEE FEED PUMPS INREMOTE | 1=REmOTE | 1701 |
| scr.cP | PLC1701 |  | N1 | SLUOGE FEED PUMPS RUN CONFRM | 1 1-RUNMNG | 1704 |
| scr.cp | PLC1701 |  | \|N2 | SLUOGE EEED PUMPS ComMON ALARM | $0=$ ALARM | 1707 |
| scr.c. | PLC1701 |  | \|N3 | SLUDEE FEEED PUMPS FLow Low ALARM | 1 =FLow Low | 1710 |
| scP-CP | PLC1701 |  | in4 | SPARE |  | 1713 |
| ScP-CP | PLC1701 |  | N5 | SPARE |  | 1716 |
| scr.cP | PLC1701 |  | in6 | SPARE |  | 1719 |
| scr.cP | PLC1701 |  | \|N7 | SPARE |  | 1722 |
| ScP-CP | PLC1701 |  | N1 8 | SPARE |  | 1736 |
| scp-CP | PLC1701 |  | 1N9 | SPARE |  | 1739 |
| scr.cp | PLC1701 |  | \|10 | SPARE |  | ${ }^{1742}$ |
| scr.cp | PLC1701 |  | \|11 | SPARE |  | 1745 |
| scr.CP | PLC1701 |  | N12 | SPARE |  | 1748 |
| scP-CP | PCC1701 |  | N13 | SPARE |  | ${ }^{1751}$ |
| scr.cP | PLC1701 |  | N14 | SPARE |  | 1754 |
| scr.CP | PLC1701 |  | N15 | SPARE |  | 1757 |


|  |  |  |  |  |  |  |  | ANPRIZ <br> ANDRITZ SEPARATION INC. ARLINGTON, TEXAS 76001 PHONE: (817) 465-5611 | Locatov: SCP-CP |  |  | CITY OF KENAI, WWTPC-5427 SCREW PRESSITLI MAP LIST |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  | Mileso | $\underset{\substack{\text { DRAMW } \\ \text { RA: }}}{ }$ | DATE 09/21/21 |  |  |  |
|  |  |  |  |  |  |  |  |  |  | CHECKED BY: | Date | size ${ }_{\text {DRa }}$ | number |  |
|  |  |  |  |  |  |  |  |  |  | JLR | 09/21/21 | B | E844944-IOM1 | 6 |
|  |  | Rev | Eir |  | RA | WEK |  |  |  |  |  | $\underbrace{\text { 38 }}_{\text {PREV. SHEET }}$ | $\left.\left.\right\|_{\text {NEXT SHEET: }}\right\|_{\text {SHEEET }} ^{39}$ | 39 |

### 7.0 Sequence of Operation (SEQ) / Control System Description (CSD)

# ANPRIL Separation 

## SEQUENCE OF OPERATION

The C-press control system consists of a C-Press Main Control Panel (SCP-CP) which houses the variable frequency drive, PLC, and the operator interface terminal (OIT) as well as interlocking components. It is important to ensure that all control switches are in the proper position and equipment is ready to operate from the SCP-CP.

The SCP-CP or field mounted emergency stop(s) will de-energize the Safety Relay and Master Control Relays to interrupt all run commands for immediate shutdown.

To restart the system, the emergency stop must be manually reset and the Safety Reset button pressed.

## OIT SCREENS

- Main - this screen provides a system overview with operational status indicators, mode selection touch zones, sequence start and stop touch zones, and access to other system screens.
- Manual Control - this screen provides start and stop touch zones and status indicators for each piece of equipment.
- Feed setup - This screen provides set-point entry for the sludge feed pump and polymer systems speed references along with numerical and bar graph representations of both speed set-point and actual speed.
- System Monitor - This screen provides numerical and bar graph representations of set-points and actual values of all system-monitored values along with C-press runtime.
- Alarms - This screen provides indication for all system alarms.
- Setup1 - this screen is password protected and provides entry for C-Press specific machine and motor data for PLC program use.
- Setup2 - this screen is password protected and provides entry for C-Press sequence timer setpoints.
- Trends- This screen provides short term trending for process control use. Trends for torque \%, sludge flow, C-press speed, and sludge feed pressure are available.
- C-press Setup- This screen provides setting of the torque, choke setpoint, and screw speed.
- Mixer - This screen provides set-point entry for the tank mixer.


## STARTING/STOPPING MODES

- On the "Main" screen, select the system-operating mode by touching one of the mode select touch zones. All equipment must be stopped to change modes; this will be indicated by the mode select enabled indicator. This screen also provides the operator with a visual of the auto stop countdown as well as a countdown to the next automatic washing, if enabled.
- Manual mode - In this mode, system components can be started with their respective start pushbuttons on the "Manual Control" screen. Maintained running of components shall be allowed
when interlocks are satisfied. System components are stopped with their respective stop pushbuttons. Emergency stop will always stop all equipment.
This mode of operation is provided for maintenance purposes only and should not be left unattended.
- Auto mode - In this mode, start-up and shutdown can be controlled from the auto start/auto stop pushbuttons. Operating the auto start pushbutton will initiate the sequence of events described below. At any time while in the Auto mode the operator can begin a start-up or shutdown.

Operating the Auto Start pushbutton will initiate the following sequence of events:
While Auto start is in progress the Auto start indicator light will flash "STARTING IN AUTO". After startup is complete the indicator light will stay on steady "RUNNING IN AUTO".

| 1. | Air compressor starts | Instantly |
| :---: | :--- | :--- |
| 2. | Choke air solenoid actuates | Instantly |
| 3. | C-press main drive starts | After adjustable delay |
| 4. | Cooling fan starts | After C-press drive starts |
| 5. | Conveyor starts | After C-press drive starts |
| 6. | Polymer blending system starts | After an operator settable <br> time delay |
| 7. | WAS pump starts | xx second delay from polymer <br> starting |
| 8. | Flocculent mixer starts | After sludge pump starts |
| 9. | Solenoid valves 1 \& 2 open/close | See washing during run <br> below |
| 10. | Wash water booster pump starts/stops | See washing during run <br> below |
| 11. | Spray arm extends/retracts | See washing during run <br> below |

Operating the Auto Stop pushbutton will initiate the following sequence of events:

| 1. | Sludge pump stops | Instantly |
| :---: | :--- | :--- |
| 2. | Polymer system stops | Instantly |
| 3 | C-press switches to speed control if not <br> automatically selected | Instantly |
| 4. | Air solenoid closes (opens choke plate) | After an operator settable <br> time delay |
| 5. | Wash solenoid valves 1 and 2 open | When air solenoid closes |
| 6. | Wash water booster pump runs | After solenoid valves 1 and 2 <br> open |
| 7. | Spray arm extends and then retracts | After wash water pump starts, <br> spray arm will move to extend <br> limit and then retract limit <br> repeatedly |
| 8. | Conveyor stops/starts in reverse | After an operator settable <br> delay. (Dependent on <br> customer specific installation) |
| 9. | C-press stops | After completion of auto stop <br> countdown |
| 10. | Cooling fan stops | Spray arm stops |
| 12. | Waster adjustable off delay solenoid valves 1 and 2 close | After completion of auto stop <br> countdown |
| 13. | After completion of auto stop <br> countdown and the Arm has <br> returned to the retracted <br> position |  |
| Cafter completion of auto stop |  |  |
| countdown |  |  |

Auto stop indicator light will flash "STOPPING IN AUTO" while in progress and go on steady "STOPPED IN AUTO" when complete.

The operator may skip the washing sequence and complete the shutdown by holding the auto stop pushbutton on the main C-press screen for 10 seconds.

## Washing during automatic operation:

During automatic or manual operation, the operator may choose to do a one-time wash of the C-press. The operator may elect to wash the length of the C-press, one pass of the spray arm with both solenoid valve 1 open, solenoid valve 2 open, and the booster pump running.
During automatic operation the operator may choose to select a timed mode of washing, this mode is selected from the C-press main page. During the timed mode the C-press will wash the feed end and discharge end based on an operator settable run time.

## OPERATING MODE

## Speed control

The C-Press operates in speed control. The set-point is entered by touching the numeric display button, which brings up a numeric entry keypad. The set-point range is $0-1$ RPM * for speed control.

*     - C-press speed maximum is limited on "Setup 1" screen.


## Choke

The C-press choke has a pressure setpoint entry. To access set point entry, touch the C-press graphic on the main page, this will display the C-press control screen.

## Feed Control

The speed set-points for the WAS pump and polymer system can be accessed by touching the WAS pump graphic on the main screen. This will display the "Feed Setup" screen. The set-point is entered by touching the numeric displays below the word set-point. This will bring up a numeric entry keypad. The set-point range will be determined at start up.

## Feed Control Pause

There is a pause push-button located on the Main screen and the Feed Setup screen. These buttons when depressed will cause a temporary feed shutdown. To reactivate the feed system, depress the appropriate Resume pushbutton. When a centrifuge has been paused for 10 minutes the alarm horn will sound 3 times to draw attention to a "none processing" machine. The machine will auto stop after one hour in pause.

## Software-manual/Hardware-manual Operation

It is considered Software-manual operation when all Hand-Off-Auto (HOA) switches are located in the auto position, and the manual mode of operation is selected from the C-press main page. When Software-manual operation is used all device start and stops will be from the C-press manual screen.

Hardware-manual operation is via the Hand-Off-Auto (HOA) switches located on the SCP-CP, operation in this mode has no interlocks except for the E-stops.

Both Software/Hardware-manual modes are intended for use in maintenance mode only.

## ALARMS

Alarm conditions are indicated on the alarm screen and will cause the alarm horn to sound and beacon to flash. Pressing the silence pushbutton will silence the horn. Pressing the reset button will clear alarm indicator and allow system start-up if condition has been cleared. All alarms from the SCP-CP will be provided to Plant SCADA System via Ethernet /IP Connection.

The following fault conditions will immediately shutdown the complete system, and cause the alarm horn and the alarm beacon to flash this will happen in both auto and manual operation:

- Panel emergency stop
- Pullcord emergency stop
- MCR fault
- C-press VFD fault
- Air compressor fault
- Loss of air fault
- Conveyor fault
- High torque*
- Spray arm fault
- Cooling fan fault

The following fault conditions will cause the alarm horn to sound and the alarm beacon to illuminate and will initiate a feed pause in the auto mode, in manual mode the associated device will stop:

- Polymer system fault
- WAS pump fault
- High feed pressure fault
- Flocculent mixer fault
- Flocculent tank high level
- Wash water booster pump fault
*- These alarm set-points are set on "Setup 1" screen.
The following fault conditions will cause the alarm beacon to illuminate and the horn to sound but will otherwise not affect operation:
- Low water pressure alarm


## CONTROL SYSTEM DESCRIPTION

One Screw Press Machine will be supplied, which includes the following electrical controls.

## ENCLOSURES

1. Control Panel (SCP-CP) Qty: 1

- Enclosure Type Floor-mount, Nema 4X
- Certification: UL Listed

The following major components will be mounted within the SCP-CP:

- Main power circuit breaker disconnect switch
- VFD fuse blocks with fuses.
- Power Distribution Block
- Motor Controls:
$\Rightarrow$ Variable Frequency Drives:
$\diamond$ Screw Motor Drive with Line Reactor
$\diamond$ Flocculent Mixer Drive
$\Rightarrow$ Motor Starters:
$\diamond$ Spray Arm Motor (FVR)
$\diamond$ Screw Motor Cooling Fan (FVNR)
$\checkmark$ Air Compressor (FVNR)
- Control voltage transformer
- Primary control voltage fuses
- 24VDC Power Supply
- PLC CompactLogix with I/O Cards
- Control relays
- Master Control Relays
- Safety Relay
- Line Surge Protector
- Unmanaged Ethernet Switch
- Screw Press Hour Meter
- Miniature circuit breakers
- Terminal strips for all external connections with other equipment
- Ground Bar
- Enclosure Lighting
- Enclosure Door Switch
- Enclosure Space Heater


## The following controls will be mounted on the SCP-CP Enclosure door.

- System Control ON/OFF Selector Switch
- Safety Reset Pushbutton
- GFCI duplex power receptacle for Laptop use connection
- Emergency Stop: Maintained position, mushroom head pushbutton non-illuminated
- Main disconnect: Circuit breaker operator handle, lockable in off position
- Alarm Horn
- Operator Interface Terminal (Touch Screen)

The following controls will be mounted on the right side of SCP-CP Enclosure.

- Air Conditioner

The following controls will be mounted on top of SCP-CP Enclosure.

- Alarm Beacon

2. Screw Press Instrumentation Junction Box (SCP-JB1) Qty: 1

- Enclosure: Nema 4X
- Spray Arm Position Switches (2), Sludge Feed Pressure Transmitter, Safety Pull Cord Switches (2) will be wired complete to the Junction Box
- Mounted on Screw Press

3. Screw Press Pneumatic Box (SCP-PB) Qty: 1

- Enclosure: Nema 4
- Choke Pressure Controller, Choke Air On/Off Valve
- Mounted on Screw Press


## OPERATOR INTERFACE

1. Operator Interface Terminal in SCP-CP:

The OIT will provide the following system controls and status indicators:

- Screw Press
- Screw Press
- Screw Drive
- Screw Drive
- Screw Drive
- Screw Drive
- Screw Drive
- Screw Drive
- Screw Drive
- Spray Arm

Panel E-Stop Active
Pull Cords activated
Hand/Off/Auto
Drive Speed (From VFD)
Running
Fault
Motor Current
Drive Motor Temperature High
Off/Ready
Extend/Retract

- Spray Arm
- Spray Arm
- Choke
- Choke
- Choke
- Screw Press WW Valve 1
- Screw Press WW Valve 1
- Screw Press WW Valve 2
- Screw Press WW Valve 2
- Sludge Flowmeter
- Sludge Pressure Transmitter
- Sludge Pump
- Sludge Pump
- Sludge Pump
- Polymer Flowmeter
- Polymer System
- Polymer System
- Polymer System
- Polymer System
- Polymer System
- Polymer System
- WAS Pump
- WAS Pump
- WAS Pump
- Sludge Transfer Auger
- Sludge Transfer Auger
- Air Compressor
- Air Compressor
- Air Compressor
- Flocculent Tank Mixer
- Flocculent Tank Mixer
- Alarm
- Alarm

Extended
Retracted
On/Off
Pressure Setpoint
Pressure Feedback
Hand/Off/Auto
Open-Close
Hand/Off/Auto
Open-Close
Flow Rate
Inlet Pressure
Running
Remote
Fault
Flow Rate
Running
Remote
Fault
Start/Stop
Speed Command
Flow Rate
Running
Remote
Fault
Running
Remote
Start/Stop
Running
Fault
Running
Fault
Silence
Reset

The following process status indicators shall be provided for the Screw Press control system via the Control Panel OIT:

- "Auto-Start"
- "Starting in Auto"
- "Running in Auto"
- "Stopping in Auto"
- "Paused for Process repairs"
- "Stopped in Manual"
- "Running in Manual"
- "Auto-Stop"
- Emergency stop "Fault"

The following quantifying indicators shall be provided for the Screw Press control system via the panel mounted OIT:

- Screw Press drive motor amps and \% of full load
- Screw Press speed in "RPM" (Actual and Setpoint)
- Screw Press pressure in "PSI"
- Flocculent Tank Level
- Wake Time
- Torque PID Settings


## SCREW PRESS CONTROL PANEL INTERFACE REQUIREMENTS

1. Power Requirements:

- SCP-CP Power input from customer supply:
$\Rightarrow$ 480VAC, 3 Phase, $60 \mathrm{HZ}, 30 \mathrm{Amps}$
$\Rightarrow$ Maximum Available Short Circuit Current: 25KAIC
- Power output from SCP-CP to motors loads (480 VAC):
$\Rightarrow$ Screw Drive Motor (2HP)
$\Rightarrow$ Spray Arm Motor (1/5HP)
$\Rightarrow$ Screw Drive Motor Cooling Fan (43W)
$\Rightarrow$ Flocculent Mixer Motor (0.5HP)
$\Rightarrow$ Air Compressor (2HP)
- Power Output from SCP-CP to Field Components
$\Rightarrow \quad$ Sludge Flow Transmitter (120VAC)
$\Rightarrow$ Polymer Flow Transmitter (120VAC)


## 2. Network Interface

- Ethernet/IP For Screw Press and other non-Screw Press Equipment


## 3. Inputs/Outputs

- Discrete Inputs
$\Rightarrow \quad$ From Dry Contacts
$\diamond$ E-Stop Pull Cord (2)
$\diamond$ Polymer System Running
$\diamond$ Polymer System Faulted
$\diamond$ Polymer System in Remote
$\diamond$ Polymer System Running
$\diamond$ Polymer System Faulted
$\diamond$ Polymer System in Remote
$\Rightarrow$ From 120VAC Wetted Contacts
$\diamond$ None.
$\Rightarrow \quad$ From 24VDC Wetted Contacts
$\diamond$ Spray Arm Retracted Switch
$\diamond$ Spray Arm Extended Switch
- Analog Inputs
$\Rightarrow \quad 4-20 \mathrm{~mA}$
$\diamond$ Choke Air Pressure Feedback
$\diamond$ Sludge Feed Pressure
$\checkmark$ Sludge Flow
$\diamond$ Polymer Flow
- Discrete Outputs
$\Rightarrow$ Dry Contacts:
$\diamond$ PLC Fault (For Customer use if required)
$\diamond$ Common Alarm (For Customer use if required)
$\checkmark$ Polymer System Run Command
$\Rightarrow \quad$ 24VDC Wetted Contacts:
$\diamond$ Choke Air Valve Open
$\diamond$ Choke Air Valve Closed
$\Rightarrow \quad$ 120VAC Wetted Contacts:
$\diamond$ Screw Press Wash Water Valve Open Command (2)
- Analog Outputs
$\Rightarrow \quad 4-20 \mathrm{~mA}$ Outputs
$\diamond$ Choke Air Pressure Setpoint
$\diamond$ Polymer System Speed Setpoint


## 4. Ethernet Communications

- The following Equipment will be communicated via Ethernet
$\Rightarrow$ Sludge Feed Pump VFD
$\Rightarrow$ Discharge Conveyor


## SOFTWARE

1. The following Software versions will be used for Programming.

- PLC
$\Rightarrow \quad$ Studio 5000 v 30
- Touch Screen
$\Rightarrow$ FactoryTalk View ME 10


### 8.0 Control Panel Component Cutsheets

## ANPRIZ

## SCREW PRESS CONTROL PANEL CUTSHEETS

CONTINUOUS HINGE WITH 3-POINT LATCH, TYPE 4X


INDUSTRY STANDARDS
UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997
cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No. E61997
NEMA/EEMAC Type 3R, 4, 4X, 12, 13
IEC 60529, IP66
Meets NEMA Type $3 R X$ requirements

## APPLICATION

These enclosures feature Hoffman's exclusive POWERGLIDE Handle with 3-point latching, ideal for indoor or outdoor applications that require corrosion protection, convenient access, and padlocking security.

## SPECIFICATIONS

- 14 gauge Type 304 or 316L stainless steel bodies and doors
- Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- Rolled lip around three sides of door
- Internal 3-point latch and Type 316L stainless steel padlocking POWERGLIDE Handle
- Remove door by pulling stainless steel continuous hinge pin
- Data pocket is high-impact thermoplastic
- Collar studs provided for mounting optional panels
- Exterior hardware on Type 316L stainless steel enclosures matches enclosure material
- Bonding provision on door; grounding stud on body


## FINISH

Door, sides, top and bottom have smooth \#4 brushed finish. Handle is electropolished.

## ACCESSORIES

Panels for Type 3R, 4, 4X, 12 and 13 Enclosures
Steel and Stainless Steel Window Kits
H2OMIT Vent Drains, Type 4X
H2OMIT Thermoelectric Dehumidifier

## MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.
BULLETIN: A4SW3

Standard Product

|  |  |  |  |  |  | Panel Size |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Stainless | Steel | Conductive | Stainless | D X E |  |
| Catalog Number | AxBxC in./mm | Steel Type | Panel | Panel | Steel Panel | in./mm | Pocket |
| A24H2006SSLP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 6.00 \\ & 610 \times 508 \times 152 \end{aligned}$ | 304 | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |
| A24H2006SS6LP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 6.00 \\ & 610 \times 508 \times 152 \end{aligned}$ | 316L | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |
| A24H2008SSLP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 8.00 \\ & 610 \times 508 \times 203 \end{aligned}$ | 304 | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |
| A24H2008SS6LP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 8.00 \\ & 610 \times 508 \times 203 \end{aligned}$ | 316L | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |
| A24H2408SSLP3PT | $\begin{aligned} & 24.00 \times 24.00 \times 8.00 \\ & 610 \times 610 \times 203 \end{aligned}$ | 304 | A24P24 | A24P24G | A24P24SS6 | $\begin{aligned} & 21.00 \times 21.00 \\ & 533 \times 533 \end{aligned}$ | Small |
| A24H2408SS6LP3PT | $\begin{aligned} & 24.00 \times 24.00 \times 8.00 \\ & 610 \times 610 \times 203 \end{aligned}$ | 316L | A24P24 | A24P24G | A24P24SS6 | $\begin{aligned} & 21.00 \times 21.00 \\ & 533 \times 533 \end{aligned}$ | Small |
| A30H2408SSLP3PT | $\begin{aligned} & 30.00 \times 24.00 \times 8.00 \\ & 762 \times 610 \times 203 \end{aligned}$ | 304 | A30P24 | A30P24G | A30P24SS6 | $\begin{aligned} & 27.00 \times 21.00 \\ & 686 \times 533 \end{aligned}$ | Large |
| A30H2408SS6LP3PT | $\begin{aligned} & 30.00 \times 24.00 \times 8.00 \\ & 762 \times 610 \times 203 \end{aligned}$ | 316L | A30P24 | A30P24G | A30P24SS6 | $\begin{aligned} & 27.00 \times 21.00 \\ & 686 \times 533 \end{aligned}$ | Large |
| A30H3008SSLP3PT | $\begin{aligned} & 30.00 \times 30.00 \times 8.00 \\ & 762 \times 762 \times 203 \end{aligned}$ | 304 | A30P30 | A30P30G | A30P30SS6 | $\begin{aligned} & 27.00 \times 27.00 \\ & 686 \times 686 \end{aligned}$ | Large |
| A30H3008SS6LP3PT | $\begin{aligned} & 30.00 \times 30.00 \times 8.00 \\ & 762 \times 762 \times 203 \end{aligned}$ | 316L | A30P30 | A30P30G | A30P30SS6 | $\begin{aligned} & 27.00 \times 27.00 \\ & 686 \times 686 \end{aligned}$ | Large |
| A36H2408SSLP3PT | $\begin{aligned} & 36.00 \times 24.00 \times 8.00 \\ & 914 \times 610 \times 203 \end{aligned}$ | 304 | A36P24 | A36P24G | A36P24SS6 | $\begin{aligned} & 33.00 \times 21.00 \\ & 838 \times 533 \end{aligned}$ | Large |
| A36H2408SS6LP3PT | $\begin{aligned} & 36.00 \times 24.00 \times 8.00 \\ & 914 \times 610 \times 203 \end{aligned}$ | 316L | A36P24 | A36P24G | A36P24SS6 | $\begin{aligned} & 33.00 \times 21.00 \\ & 838 \times 533 \end{aligned}$ | Large |
| A36H3008SSLP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 8.00 \\ & 914 \times 762 \times 203 \end{aligned}$ | 304 | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A36H3008SS6LP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 8.00 \\ & 914 \times 762 \times 203 \end{aligned}$ | 316L | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A48H3608SSLP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 8.00 \\ & 1219 \times 914 \times 203 \end{aligned}$ | 304 | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A48H3608SS6LP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 8.00 \\ & 1219 \times 914 \times 203 \end{aligned}$ | 316L | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A24H2010SSLP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 10.00 \\ & 610 \times 508 \times 254 \end{aligned}$ | 304 | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |


| Catalog Number | AxBxC in./mm | Stainless <br> Steel Type | Steel <br> Panel | Conductive Panel | Stainless <br> Steel Panel | $\begin{aligned} & \text { Panel Size } \\ & \mathrm{DxE} \\ & \text { in. } / \mathrm{mm} \end{aligned}$ | Data <br> Pocket |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A24H2010SS6LP3PT | $\begin{aligned} & 24.00 \times 20.00 \times 10.00 \\ & 610 \times 508 \times 254 \end{aligned}$ | 316L | A24P20 | A24P20G | A24P20SS6 | $\begin{aligned} & 21.00 \times 17.00 \\ & 533 \times 432 \end{aligned}$ | Small |
| A36H3010SSLP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 10.00 \\ & 914 \times 762 \times 254 \end{aligned}$ | 304 | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A36H3010SS6LP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 10.00 \\ & 914 \times 762 \times 254 \end{aligned}$ | 316L | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A42H3010SSLP3PT | $\begin{aligned} & 42.00 \times 30.00 \times 10.00 \\ & 1067 \times 762 \times 254 \end{aligned}$ | 304 | A42P30 | A42P30G | A42P30SS6 | $\begin{aligned} & 39.00 \times 27.00 \\ & 991 \times 686 \end{aligned}$ | Large |
| A48H3610SSLP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 10.00 \\ & 1219 \times 914 \times 254 \end{aligned}$ | 304 | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A48H3610SS6LP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 10.00 \\ & 1219 \times 914 \times 254 \end{aligned}$ | 316L | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A24H2412SSLP3PT | $\begin{aligned} & 24.00 \times 24.00 \times 12.00 \\ & 610 \times 610 \times 305 \end{aligned}$ | 304 | A24P24 | A24P24G | A24P24SS6 | $\begin{aligned} & 21.00 \times 21.00 \\ & 533 \times 533 \end{aligned}$ | Small |
| A24H2412SS6LP3PT | $\begin{aligned} & 24.00 \times 24.00 \times 12.00 \\ & 610 \times 610 \times 305 \end{aligned}$ | 316L | A24P24 | A24P24G | A24P24SS6 | $\begin{aligned} & 21.00 \times 21.00 \\ & 533 \times 533 \end{aligned}$ | Small |
| A3OH2412SSLP3PT | $\begin{aligned} & 30.00 \times 24.00 \times 12.00 \\ & 760 \times 610 \times 305 \end{aligned}$ | 304 | A30P24 | A30P24G | A30P24SS6 | $\begin{aligned} & 27.00 \times 21.00 \\ & 686 \times 533 \end{aligned}$ | Large |
| A30H2412SS6LP3PT | $\begin{aligned} & 30.00 \times 24.00 \times 12.00 \\ & 762 \times 610 \times 305 \end{aligned}$ | 316L | A30P24 | A30P24G | A30P24SS6 | $\begin{aligned} & 27.00 \times 21.00 \\ & 686 \times 533 \end{aligned}$ | Large |
| A36H3012SSLP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 12.00 \\ & 914 \times 762 \times 305 \end{aligned}$ | 304 | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A36H3012SS6LP3PT | $\begin{aligned} & 36.00 \times 30.00 \times 12.00 \\ & 914 \times 762 \times 305 \end{aligned}$ | 316L | A36P30 | A36P30G | A36P30SS6 | $\begin{aligned} & 33.00 \times 27.00 \\ & 838 \times 686 \end{aligned}$ | Large |
| A36H3612SSLP3PT | $\begin{aligned} & 36.00 \times 36.00 \times 12.00 \\ & 914 \times 914 \times 305 \end{aligned}$ | 304 | A36P36 | A36P36G | A36P36SS6 | $\begin{aligned} & 33.00 \times 33.00 \\ & 838 \times 838 \end{aligned}$ | Large |
| A36H3612SS6LP3PT | $\begin{aligned} & 36.00 \times 36.00 \times 12.00 \\ & 914 \times 914 \times 305 \end{aligned}$ | 316L | A36P36 | A36P36G | A36P36SS6 | $\begin{aligned} & 33.00 \times 33.00 \\ & 838 \times 838 \end{aligned}$ | Large |
| A42H3612SSLP3PT | $\begin{aligned} & 42.00 \times 36.00 \times 12.00 \\ & 1067 \times 914 \times 305 \end{aligned}$ | 304 | A42P36 | A42P36G | A42P36SS6 | $\begin{aligned} & 39.00 \times 33.00 \\ & 991 \times 838 \end{aligned}$ | Large |
| A48H3612SSLP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 12.00 \\ & 1219 \times 914 \times 305 \end{aligned}$ | 304 | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A48H3612SS6LP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 12.00 \\ & 1219 \times 914 \times 305 \\ & \hline \end{aligned}$ | 316L | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A60H3612SSLP3PT | $\begin{aligned} & 60.00 \times 36.00 \times 12.00 \\ & 1524 \times 914 \times 305 \end{aligned}$ | 304 | A60P36 | A60P36G | A60P36SS6 | $\begin{aligned} & 57.00 \times 33.00 \\ & 1448 \times 838 \\ & \hline \end{aligned}$ | Large |
| A60H3612SS6LP3PT | $\begin{aligned} & 60.00 \times 36.00 \times 12.00 \\ & 1524 \times 914 \times 305 \end{aligned}$ | 316L | A60P36 | A60P36G | A60P36SS6 | $\begin{aligned} & 57.00 \times 33.00 \\ & 1448 \times 838 \end{aligned}$ | Large |
| A48H3616SSLP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 16.00 \\ & 1219 \times 914 \times 406 \end{aligned}$ | 304 | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A48H3616SS6LP3PT | $\begin{aligned} & 48.00 \times 36.00 \times 16.00 \\ & 1219 \times 914 \times 406 \end{aligned}$ | 316L | A48P36 | A48P36G | A48P36SS6 | $\begin{aligned} & 45.00 \times 33.00 \\ & 1143 \times 838 \end{aligned}$ | Large |
| A60H3616SSLP3PT | $\begin{aligned} & 60.00 \times 36.00 \times 16.00 \\ & 1524 \times 914 \times 406 \end{aligned}$ | 304 | A60P36 | A60P36G | A60P36SS6 | $\begin{aligned} & 57.00 \times 33.00 \\ & 1448 \times 838 \end{aligned}$ | Large |
| A60H3616SS6LP3PT | $\begin{aligned} & 60.00 \times 36.00 \times 16.00 \\ & 1524 \times 914 \times 406 \end{aligned}$ | 316L | A60P36 | A60P36G | A6OP36SS6 | $\begin{aligned} & 57.00 \times 33.00 \\ & 1448 \times 838 \end{aligned}$ | Large |

Purchase panels separately. Optional stainless steel, composite and aluminum panels are available for most sizes.


| Catalog Number | Material | $\begin{aligned} & \text { Panel Size } \\ & \text { D x (in.) } \end{aligned}$ | $\begin{aligned} & \text { Panel Size } \\ & \text { DxE (mm) } \end{aligned}$ | Panel Gauge or Thickness | Edge Flanges | T (in.) | T (mm) | Number of Holes |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A42P42G | Conductive steel | $39.00 \times 39.00$ | $991 \times 991$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P24 | Painted steel | $45.00 \times 21.00$ | $1143 \times 533$ | 12 ga . | 2 | 0.75 | 19 | 6 |
| A48P24G | Conductive steel | $45.00 \times 21.00$ | $1143 \times 533$ | 12 ga . | 2 | 0.75 | 19 | 6 |
| A48P30 | Painted steel | $45.00 \times 27.00$ | $1143 \times 686$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A48P30G | Conductive steel | $45.00 \times 27.00$ | $1143 \times 686$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A48P36 | Painted steel | $45.00 \times 33.00$ | $1143 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P36G | Conductive steel | $45.00 \times 33.00$ | $1143 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P36SS6 | Stainless Steel | $45.00 \times 33.00$ | $1143 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P36AL | Aluminum | $45.00 \times 33.00$ | $1143 \times 838$ | $0.10 \mathrm{in} . / 3 \mathrm{~mm}$ | 4 | 0.75 | 19 | 8 |
| A48P42 | Painted steel | $45.00 \times 39.00$ | $1143 \times 991$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P42G | Conductive steel | $45.00 \times 39.00$ | $1143 \times 991$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A48P48 | Painted steel | $44.00 \times 44.00$ | $1118 \times 1118$ | 10 ga . | 4 | 0.88 | 22 | 8 |
| A48P48G | Conductive steel | $44.00 \times 44.00$ | $1118 \times 1118$ | 10 ga . | 4 | 0.88 | 22 | 8 |
| A54P42 | Painted steel | $50.00 \times 38.00$ | $1270 \times 965$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A54P42G | Conductive steel | $50.00 \times 38.00$ | $1270 \times 965$ | 10 ga . | 4 | 0.75 | 19 | 8 |
| A60P24 | Painted steel | $57.00 \times 21.00$ | $1448 \times 533$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A60P24G | Conductive steel | $57.00 \times 21.00$ | $1448 \times 533$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A60P30 | Painted steel | $57.00 \times 27.00$ | $1448 \times 686$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A60P30G | Conductive steel | $57.00 \times 27.00$ | $1448 \times 686$ | 12 ga . | 4 | 0.75 | 19 | 6 |
| A60P36 | Painted steel | $57.00 \times 33.00$ | $1448 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A60P36G | Conductive steel | $57.00 \times 33.00$ | $1448 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A60P36SS6 | Stainless Steel | $57.00 \times 33.00$ | $1448 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A60P36AL | Aluminum | $57.00 \times 33.00$ | $1448 \times 838$ | $0.10 \mathrm{in} . / 3 \mathrm{~mm}$ | 4 | 0.75 | 19 | 8 |
| A60BFP42 | Painted steel | $56.00 \times 38.00$ | $1422 \times 965$ | 10 ga . | 4 | 0.88 | 22 | 10 |
| A60BFP42G | Conductive steel | $56.00 \times 38.00$ | $1422 \times 965$ | 10 ga . | 4 | 0.88 | 22 | 10 |
| A60P48 | Painted steel | $56.00 \times 44.00$ | $1422 \times 1118$ | 10 ga . | 4 | 0.88 | 22 | 12 |
| A60P48G | Conductive steel | $56.00 \times 44.00$ | $1422 \times 1118$ | 10 ga . | 4 | 0.88 | 22 | 12 |
| A60P60 | Painted steel | $56.00 \times 56.00$ | $1422 \times 1422$ | 10 ga . | 4 | 0.88 | 22 | 10 |
| A60P60G | Conductive steel | $56.00 \times 56.00$ | $1422 \times 1422$ | 10 ga . | 4 | 0.88 | 22 | 10 |
| A72P36 | Painted steel | $69.00 \times 33.00$ | $1753 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A72P36G | Conductive steel | $69.00 \times 33.00$ | $1753 \times 838$ | 12 ga . | 4 | 0.75 | 19 | 8 |
| A72P60 | Painted steel | $68.00 \times 56.00$ | $1727 \times 1422$ | 10 ga . | 4 | 0.88 | 22 | 12 |
| A72P60G | Conductive steel | $68.00 \times 56.00$ | $1727 \times 1422$ | 10 ga . | 4 | 0.88 | 22 | 12 |
| A72P72 | Painted steel | $68.00 \times 68.00$ | $1727 \times 1727$ | 10 ga . | 4 | 0.88 | 22 | 10 |
| A72P72G | Conductive steel | $68.00 \times 68.00$ | $1727 \times 1727$ | 10 ga . | 4 | 0.88 | 22 | 10 |



AFK1212SS

## FLOOR STAND KIT, STAINLESS STEEL

Use to raise free-stand enclosure. To install, drill holes in the bottom of the enclosure and bolt the floor stands to the enclosure. Each kit includes two stands. Type 304 stainless steel. Maintains UL/cUL Type 4X rating when properly installed on a Hoffman Type 4X enclosure.
BULLETIN: A4SY

|  | H | C | L |
| :--- | :--- | :--- | :--- |
| Catalog Number | in./mm | in./mm | in./mm |
| AFK0612SS | 6.00 | 12.06 | 9.09 |
|  | 152 | 306 | 231 |
| AFK0618SS | 6.00 | 18.06 | 9.09 |
|  | 152 | 459 | 231 |
| AFK0624SS | 6.00 | 24.06 | 9.09 |
|  | 152 | 611 | 231 |
| AFK1212SS | 12.00 | 12.06 | 9.09 |
|  | 305 | 306 | 231 |
| AFKIZI8SS | 12.00 | 18.06 | 9.09 |
|  | 305 | 259 | 231 |
| AFK1224SS | 12.00 | 24.06 | 9.09 |
|  | 305 | 611 | 231 |
| AFK1812SS | 18.00 | 12.06 | 9.09 |
|  | 457 | 306 | 231 |
| AFK1818SS | 18.00 | 18.06 | 9.09 |
|  | 457 | 459 | 231 |
| AFK1824SS | 18.00 | 24.06 | 9.09 |
|  | 457 | 611 | 231 |
| AFK2412SS | 24.00 | 12.06 | 9.09 |
|  | 610 | 306 | 231 |
| AFK2418SS | 24.00 | 18.06 | 9.09 |
|  | 610 | 459 | 231 |
| AFK2424SS | 24.00 | 24.06 | 9.09 |
|  | 610 | 611 | 231 |

## 100-FSD250

The cat. no. as listed is incomplete. Select a voltage suffix code from the table below to complete the cat. no. Example: 120V, 60 Hz :
Cat. No. $100-$ FL11 $\otimes$ becomes Cat. No. 100-FL11D.

| Voltage^[V] | 24 | 48 | 100 | 110 | 120 | $230 \ldots 240$ | 240 | 277 | $380 \ldots 400$ | $400 \ldots 415$ | 440 | 480 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 50 Hz | K | Y | KP | D | - | VA | KA | - | N | G | B | - |
| 60 Hz | J | - | - | - | D | - | KA | T | - | - | N | B |

* For special voltages, consult your local Rockwell Automation sales office or Allen-Bradley distributor.


## Control Modules (For 100-C09...C97 contactors), Continued


§ For screwless terminals, insert "CR" after the "100-" in the catalog number. Example: Cat. No. 100-FSC48 becomes Cat. No. 100-CRFSC48.

## Auxiliary Contacts（For 100－C09．．．C97 contactors）

|  | Description | $\frac{1}{1}$ | $\frac{4}{4}$ | Connection Diagrams | For Use With | Standard Auxiliary Contact Cat．No．$\ddagger$ | Bifurcated Auxiliary Contact Cat．No． |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Auxiliary Contact Blocks for Front Mounting＊ <br> －2－and 4－pole <br> －Quick and easy mounting without tools <br> －Electronic－compatible contacts down to $17 \mathrm{~V}, 5 \mathrm{~mA}$ <br> －Mechanically linked performance between N．O．and N．C．poles and to the main contactor poles（except for L types） <br> －Models with equal function with several terminal numbering choices <br> － 1 L ＝Late break N．C．／early make N．O． <br> －Bifurcated version for switching down to $5 \mathrm{~V}, 3 \mathrm{~mA}$ also available | 0 | 2 |  | 100－C all | 100－FA02 | 100－FAB02 |
|  |  |  |  |  | C30®00．．．C97＊00 | 100－FB02 | 100－FBB02 |
|  |  | 1 | 1 |  | 100－C all | 100－FA11 | 100－FAB11 |
|  |  |  |  |  | C30 $\otimes 00 \ldots \mathrm{C} 97 \otimes 00$ | 100－FB11 | 100－FBB11 |
|  |  |  |  |  | $\mathrm{C} 09 \otimes 10 \ldots \mathrm{C} 23 \otimes 10$ | 100－FC11 | 100－FCB11 |
|  |  | 2 | 0 |  | 100－C all | 100－FA20 | 100－FAB20 |
|  |  |  |  |  | C30 $\otimes 00 \ldots \mathrm{C} 97 \otimes 00$ | 100－FB20 | 100－FBB20 |
|  |  | 1 L | 1L | －FB20－FAL11－FBLII | 100－C all | 100－FAL11 | － |
|  |  |  |  |  | C30 $\otimes 00 \ldots \mathrm{C} 97 \otimes 00$ | 100－FBL11 | － |
|  |  | 0 | 4 |  | 100－C all | 100－FA04 | 100－FAB04 |
|  |  | 1 | 3 |  | 100－C all | 100－FA13 | 100－FAB13 |
|  |  | 2 | 2 |  | 100－C all | 100－FA22 | 100－FAB22 |
|  |  |  |  |  | C30 $\otimes 00 \ldots \mathrm{C} 97 \otimes 00$ | 100－FB22 | 100－FBB22 |
|  |  |  |  |  | $\mathrm{C} 09 \otimes 10 \ldots \mathrm{C} 23 \otimes 10$ | 100－FC22 | 100－FCB22 |
|  |  |  |  |  | $100-\mathrm{C}$ all | 100－FA31 | 100－FAB31 |
|  |  |  | 1 |  | C09＊10．．．C23＊10 | 100－FC31 | 100－FCB31 |
|  |  | 4 | 0 |  | 100－C all | 100－FA40 | 100－FAB40 |
|  |  | 1＋1L | 1＋1L |  | 100－C all | 100－FAL22 | － |
|  | Auxiliary Contact Blocks for Side <br> Mounting without Sequence <br> Terminal Designations＊ <br> －1－and 2－pole <br> －Two－way numbering for right or left mounting on the contactor <br> －Quick and easy mounting without tools <br> －Electronic－compatible contacts down to $17 \mathrm{~V}, 10 \mathrm{~mA}$ <br> －Mirror contact performance to the main contactor poles <br> － $1 \mathrm{~L}=$ Late break N．C．／early make N．O． | 0 | 1 |  | $100-\mathrm{C}$ all | 100－SA01 | － |
|  |  | 1 | 0 |  | 100－C all | 100－SA10 | － |
|  |  | 0 | 2 |  | 100－C all | 100－SA02 | － |
|  |  | 1 | 1 |  | $100-\mathrm{C}$ all | 100－SA11 | － |
|  |  | 2 | 0 |  | 100－C all | 100－SA20 | － |
|  |  | 1L | 1L |  | 100－C all | 100－SAL11 | － |
| $8$ | Auxiliary Contact Blocks for Side Mounting with Sequence Terminal Designations＊ <br> －1－and 2－pole <br> －Two－way numbering for right or left mounting on the contactor <br> －Quick and easy mounting without tools <br> －Electronic－compatible contacts down to $17 \mathrm{~V}, 10 \mathrm{~mA}$ <br> －Mirror contact performance to the main contactor poles <br> － 1 L ＝Late break N．C．／early make N．O． | 0 | 1 | $\begin{array}{\|cc} \left.\right\|_{\frac{22}{z \varepsilon}} ^{\frac{21}{\varepsilon \varepsilon}} & -\left.\right\|_{\frac{14}{\varepsilon t}} ^{\frac{13}{\mid t}} \\ -S B 01 & -S B 10 \end{array}$ | 100－C | 100－SB01 | － |
|  |  | 1 | 0 |  | 100－C乗 | 100－SB10 | － |
|  |  | 0 | 2 |  | 100－C缐 | 100－SB02 | － |
|  |  | 1 | 1 |  | 100－C秉 | 100－SB11 | － |
|  |  | 2 | 0 | $\left.\left.\left.\left.\right\|^{\frac{13}{\mid \hbar}}\right\|^{\frac{23}{\nabla \varepsilon}} \quad\right\|^{\frac{17}{8 \dagger}}\right\|^{\frac{25}{9 \varepsilon}}$ | 100－C㳫 | 100－SB20 | － |
|  |  | 1 L | 1L | $\begin{array}{lc} \overline{\varepsilon \hbar} ' \overline{\varepsilon \varepsilon} & \quad \overline{L D} \cdot \overline{\varsigma \varepsilon} \\ -S B 20 & -S B L 11 \end{array}$ | 100－C 楽 | 100－SBL11 | － |

＊Max．number of auxiliary contacts that may be mounted：
AC and 24V DC electronic coil contactors－max． 4 N．O．contacts on the front of the contactor， 2 N．O．contacts on the side， 4 N．C．front or side， 6 total．
DC coil contactors－max． 4 N．O．contacts on the front of the contactor or max 2 N．O．contacts on the side， 4 N．C．front or side， 4 total．
蛒 Double numbering－Left－side mounting only is recommended for Cat．No．100－C09．．．100－C23 due to double numbering．
$\ddagger$ For screwless terminals（front mount only），insert＂CR＂after the＂100－＂in the catalog number．Example：Cat．No．100－FA02 becomes Cat．No．100－CRFA02．

## Bulletin 140G

## Molded Case Circuit Breakers

## Accessories

Current Transformer for Neutral Current

|  | Rated Current [ A ] | Frame Size | Cat. No. |
| :---: | :---: | :---: | :---: |
|  | 300 | K * | 140G-K-NCTD30 |
|  | 400 | K * | 140G-K-NCTD40 |
|  | 600 | M ᄎ | 140G-M-NCTD60 |
|  | 800 | M 太 | 140G-M-NCTD80 |
|  | 400... 1600 | N, NS | 140G-N-NCTE16 |
| Representative Photo | 1000... 3200 | R | 140G-R-NCTE30 |

$\star$ Order with connector (Cat. No. 140G-K-CC).
Mechanical Accessories
Terminal Lugs

| Description | Frame Size | Cat. No. (Pkg. Qty. 3) | Cat. No. (Pkg. Qty. 4) |
| :--- | :--- | :--- | :--- | :--- | :--- |

## Variable Depth Rotary Operating Kits

## Rotary, Variable Depth Operators

- Supplied with external handle, operating shaft, and MCCB mounted operating mechanism.
- Refer to page 56 to select as components.
- Frames G, H, I, and J use a Bul. 140U P-style handle.
- Frames K, M, and N use a Bul. 140 U medium style handle.

|  | Frame Size | Handle Color | Shaft Length | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | G, I | Black | $12 \mathrm{in} .(30.48 \mathrm{~mm})$ | 140G-G-RVM12B |
|  |  | Red/Yellow |  | 140G-G-RVM12R |
| , |  | Black | $21 \mathrm{in}.(53.34 \mathrm{~mm})$ | 140G-G-RVM21B |
|  |  | Red/yellow |  | 140G-G-RVM21R |
|  | H, J | Black | $12 \mathrm{in}$. ( 30.48 mm ) | 140G-H-RVM12B |
|  |  | Red/yellow |  | 140G-H-RVM12R |
|  |  | Black | $21 \mathrm{in}$. ( 53.34 mm ) | 140G-H-RVM21B |
| Representative Photo |  | Red/yellow |  | 140G-H-RVM21R |
|  | K | Black | 12.6 in. (320 mm) | 140G-K-RVM12B |
|  |  | Red/yellow |  | 140G-K-RVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-K-RVM21B |
|  |  | Red/yellow |  | 140G-K-RVM21R |
|  | M | Black | 12.6 in. (320 mm) | 140G-M-RVM12B |
|  |  | Red/yellow |  | 140G-M-RVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-M-RVM21B |
|  |  | Red/yellow |  | 140G-M-RVM21R |
|  | N | Black | 12.6 in. (320 mm) | 140G-N-RVM12B |
|  |  | Red/yellow |  | 140G-N-RVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-N-RVM21B |
| Representative Photo |  | Red/yellow |  | 140G-N-RVM21R |

Rotary, Variable Depth Operators with Internal NFPA 79 Operating Handle

- Supplied with external handle, NFPA handle with operating shaft, support bracket, and MCCB mounted operating mechanism.
- Refer to page 58 to select as components.
- Frames G, H, I, and J use a Bul. 140U P-style handle.
- Frames K, M, and N use a Bul. 140U medium style handle.

|  | Frame Size | Handle Color | Shaft Length | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | G, I | Black | $12 \mathrm{in}$. ( 30.48 mm ) | 140G-G-NVM12B |
| (2) |  | Red/yellow |  | 140G-G-NVM12R |
|  |  | Black | $21 \mathrm{in} .(53.34 \mathrm{~mm})$ | 140G-G-NVM21B |
|  |  | Red/yellow |  | 140G-G-NVM21R |
|  | H, J | Black | $12 \mathrm{in}. \mathrm{(30.48} \mathrm{mm)}$ | 140G-H-NVM12B |
|  |  | Red/yellow |  | 140G-H-NVM12R |
|  |  | Black | $21 \mathrm{in}$. ( 53.34 mm ) | 140G-H-NVM21B |
| Representative Photo |  | Red/yellow |  | 140G-H-NVM21R |
|  | K | Black | 12.6 in. (320 mm) | 140G-K-NVM12B |
|  |  | Red/yellow |  | 140G-K-NVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-K-NVM21B |
|  |  | Red/yellow |  | 140G-K-NVM21R |
|  | M | Black | 12.6 in. (320 mm) | 140G-M-NVM12B |
|  |  | Red/yellow |  | 140G-M-NVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-M-NVM21B |
|  |  | Red/yellow |  | 140G-M-NVM21R |
|  | N | Black | 12.6 in. (320 mm) | 140G-N-NVM12B |
|  |  | Red/yellow |  | 140G-N-NVM12R |
|  |  | Black | 22.8 in. (580 mm) | 140G-N-NVM21B |
| Representative Photo |  | Red/yellow |  | 140G-N-NVM21R |

## Phase Barriers

Phase barriers allow you to increase the insulation characteristics between the phases at the connections. Phase barriers provide additional electrical clearance between each phase when special connections extend past the circuit breaker housing. They are mounted from the front, even with the circuit breaker already installed.

|  | Description | Frame Size | Length | 3-Pole Cat. No. (Pkg. Qty. 4) | 4-Pole Cat. No. (Pkg. Qty. 6) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 1 in. (25 mm) | 140G-G-PB3M | 140G-G-PB4M |
|  |  | G, I | 4 in. (100 mm) | 140G-G-PB3L | 140G-G-PB4L |
|  |  |  | 8 in. (200 mm) | 140G-G-PB3H | 140G-G-PB4H |
|  |  |  | 1 in. (25 mm) | 140G-H-PB3M | 140G-H-PB4M |
|  | special connectionsthat extend beyond | H, J | 4 in. ( 100 mm ) | 140G-H-PB3L | 140G-H-PB4L |
|  | the frame of the MCCB are used. |  | 8 in. (200 mm) | 140G-H-PB3H | 140G-H-PB4H |
|  | - Frames G, H, I, J, and K are supplied | N NS | $4 \mathrm{in} .(100 \mathrm{~mm})$ | 140G-K-PB3L | 140G-K-PB4L |
|  | with 25 mm barriers as stan | K, N, NS | 8 in. ( 200 mm ) | 140G-K-PB3H | 140G-K-PB4H |
|  |  | M | 4 in. (100 mm) | 140G-M-PB3L | 140G-M-PB4L |
|  |  |  | 4 in. ( 100 mm ) | 140G-R-PB3L ${ }^{(1)}$ | 140G-R-PB4L ${ }^{(2)}$ |
|  |  | R | 8 in. (200 mm) | 140G-R-PB3H ${ }^{(1)}$ | $140 \mathrm{G}-\mathrm{R}-\mathrm{PB4H}{ }^{(2)}$ |

(1) Package Qty 2. Supplied for the line side only.
(2) Package Qty 3. Supplied for the line side only

## Terminal Covers

The terminal shield prevents accidental contact with live parts, they also provide phase-to-phase insulation.


## Ingress Protection

The table indicates the degrees of protection against intrusion and accidental contact according to IEC 60529.

| Location | Without Terminal Covers | With High Terminal Covers ${ }^{(1)}$ |
| :---: | :---: | :---: |
| A | $\mathbb{P} 40^{(2)}$ | - |
| B | $\mathbb{P} 20^{(3)}$ | $\mathbb{P} 40^{(2)}$ |
| C | - | $\mathbb{P} 40^{(4)}$ |

(1) High terminal covers have a height of 60 mm and are designated with a suffix " H " in the catalog number (140G-G-TC3H)
(2) Also with direct or variable depth rotary operator.
(3) G through $M$ frames.
(4) After installation.


## Variable Depth Rotary Operating Kits

When you install MCCBs as the main or feeder circuit breaker in an industrial control panel and you use a non-flanged enclosure, a common method of operating the circuit breaker using a rotary operator mechanism. The use of a rotary operator converts a rotary motion to a vertical motion that "toggles" the MCCB. In this situation, the rotary operator kit consists of:

- External operating handle
- Operating shaft
- Circuit breaker-mounted rotary operating mechanism

Using these kits allows external operation of the circuit breaker with the capability of turning the circuit breaker on/off, or resetting it without having to open the enclosure. Traditionally, these kits are sold with an operating shaft that allows you to use the kit with enclosures of various depths. The operating handles will also provide status indication when the circuit breakers trip.

## NFPA 79 Operators

A NFPA 79-compliant Internal Rotary Operating Handle Kit for Bulletin 140G MCCBs, and Bulletin 140MG MCPs and MPCBs is available to address current requirements of the NFPA 79 standard. The NFPA 79 kits are available for $\mathrm{G}-, \mathrm{H}-, \mathrm{I}-, \mathrm{J}-\mathrm{K}, \mathrm{K}-\mathrm{M}-$, and N Frame Circuit Breaker product lines.

Compliance with the current NFPA 79 standard enables you to maintain control of the main disconnecting means when the door is open; an issue for rotary-operated through-the-door disconnect switches and circuit breakers.

This standard requires that the rotary main disconnecting means be operable without the use of accessory tools or devices (independent of door position) and restates the requirement for an interlocking provision to prevent the closing of the disconnecting means while the enclosure door is open, unless the interlock is operated by a deliberate action. Without this requirement, rotary-operated devices may have a shaft protruding from the panel when the door is open. If the panel is powered and it is necessary to turn power off, it is difficult to de-energize the panel with the operating shaft alone. This standard is to reduce the possibility of personnel not being able to turn an energized panel off with the door opened.

## Why is This Relatively Simple Product Important to You?

The trend in the market is moving toward building smaller and less-expensive control panels. To achieve this, many panel builders and OEMs have started using rotary operators because they are easier to install and the non-flanged enclosure is

## Bulletin 140G

## Molded Case Circuit Breakers

## Accessories

Current Transformer for Neutral Current

|  | Rated Current [ A ] | Frame Size | Cat. No. |
| :---: | :---: | :---: | :---: |
|  | 300 | K * | 140G-K-NCTD30 |
|  | 400 | K * | 140G-K-NCTD40 |
|  | 600 | M ᄎ | 140G-M-NCTD60 |
|  | 800 | M 太 | 140G-M-NCTD80 |
|  | 400... 1600 | N, NS | 140G-N-NCTE16 |
| Representative Photo | 1000... 3200 | R | 140G-R-NCTE30 |

$\star$ Order with connector (Cat. No. 140G-K-CC).
Mechanical Accessories
Terminal Lugs

| Description |  | Frame Size | Cat. No. (Pkg. Qty. 3) | Cat. No. (Pkg. Qty. 4) |
| :---: | :---: | :---: | :---: | :---: |
| Representative Photo | Cu wire, MCCB only <br> (1) $14 \ldots . .1 / 0$ AWG or $2.5 \ldots 70 \mathrm{~mm}^{2}$ | G | 140G-G-TLC13 |  |
|  | Cu wire, MCP only <br> (1) $14 \ldots 1 / 0$ AWG or $1.5 \ldots 70 \mathrm{~mm}^{2}$ |  | 140G-G-TLC13A |  |
|  | Multiple cable - Cu wire <br> (6) $14 \ldots 2$ AWG or $2.5 \ldots 35 \mathrm{~mm}^{2}$ |  | 140G-G-MTL63 |  |
|  | Cu wire only <br> (1) $14 \ldots 1 / 0$ AWG or $2.5 \ldots 95 \mathrm{~mm}^{2}$ | H | 140G-H-TLC13 | 140G-H-TLC14 |
|  | Multiple cable - Cu wire (6) 14...2 AWG or $2.5 \ldots 35 \mathrm{~mm}^{2}$ |  | 140G-H-MTL63 | 140G-H-MTL64 |
| Representative Photo | Al or Cu wire <br> (1) $14 \ldots 1 / 0$ AWG or $2.5 \ldots 50 \mathrm{~mm}^{2}$ | 1 | 140G-I-TLA13 | 140G-I-TLA14 |
|  | Al or Cu wire <br> (1) $4 \ldots 300 \mathrm{MCM}$ or $25 \ldots 150 \mathrm{~mm}^{2}$ |  | 140G-I-TLA1A3 | 140G-I-TLA1A4 |
|  | Cu wire only <br> (1) $10 \ldots . .250$ MCM or $6 \ldots . .185 \mathrm{~mm}^{2}$ |  | 140G-I-TLC13 | 140G-I-TLC14 |
|  | Multiple cable - Cu wire <br> (6) 12... 2 AWG or $2.5 \ldots 35 \mathrm{~mm}^{2}$ |  | 140G-I-MTL63 | 140G-I-MTL64 |
| Representative Photo | Al or Cu wire <br> (1) $14 \ldots 1 / 0$ AWG or $2.5 \ldots 50 \mathrm{~mm}^{2}$ | J | 140G-J-TLA13 | 140G-J-TLA14 |
|  | Al or Cu wire <br> (1) $4 \ldots 300 \mathrm{MCM}$ or $25 \ldots 150 \mathrm{~mm}^{2}$ |  | 140G-J-TLA1A3 | 140G-J-TLA1A4 |
|  | AI or Cu wire <br> (1) 6 (Al)/10 (Cu)... 350 MCM or $2.5 \ldots 185 \mathrm{~mm}^{2}$ (Al) |  | 140G-J-TLA1B3 | 140G-J-TLA1B4 |
|  | Cu wire only <br> (1) $10 \ldots 350$ MCM or $6 \ldots 185 \mathrm{~mm}^{2}$ |  | 140G-J-TLC13 | 140G-J-TLC14 |
|  | Multiple cable - Cu wire <br> (6) 12... 2 AWG or $2.5 \ldots 35 \mathrm{~mm}^{2}$ |  | 140G-J-MTL63 | 140G-J-MTL64 |
| $\mathrm{B}_{4}^{\mathrm{O}}$ <br> Representative Photo | Al or Cu wire <br> (1) $250 \ldots 500$ MCM or $120 \ldots . .240 \mathrm{~mm}^{2}$ | K | 140G-K-TLA13 | 140G-K-TLA14 |
|  | AI or Cu wire <br> (2) $2 / 0 . . .250$ MCM or $95 \ldots 120 \mathrm{~mm}^{2}$ |  | 140G-K-TLA23 | 140G-K-TLA24 |
|  | Cu wire only <br> (1) $250 \ldots 500$ MCM or $120 \ldots 240 \mathrm{~mm}^{2}$ |  | 140G-K-TLC13 | 140G-K-TLC14 |
|  | Cu wire only <br> (2) $2 / 0 . . .250$ MCM or $95 \ldots 120 \mathrm{~mm}^{2}$ |  | 140G-K-TLC23 | 140G-K-TLC24 |
|  | Multiple cable - Cu wire <br> (6) $6 \ldots 1 / 0$ AWG or $16 \ldots 50 \mathrm{~mm}^{2}$ |  | 140G-K-MTL63 | 140G-K-MTL64 |
| Representative Photo | Al or Cu wire <br> (2) $250 \ldots 500 \mathrm{MCM}$ or $120 \ldots 240 \mathrm{~mm}^{2}$ | M | 140G-M-TLA23 | 140G-M-TLA24 |
|  | Al or Cu wire <br> (3) $2 / 0 \ldots 400$ MCM or $70 \ldots 185 \mathrm{~mm}^{2}$ |  | 140G-M-TLA33 | 140G-M-TLA34 |
|  | Cu wire only <br> (2) $3 / 0 \ldots 350$ MCM or $85 \ldots 185 \mathrm{~mm}^{2}$ |  | 140G-M-TLC23 | 140G-M-TLC24 |
|  | Cu wire only <br> (3) $2 / 0 \ldots 350$ MCM or $70 \ldots 185 \mathrm{~mm}^{2}$ |  | 140G-M-TLC33 | 140G-M-TLC34 |
|  | Al or Cu wire <br> (4) $4 / 0 \ldots 500$ MCM or $70 \ldots 240 \mathrm{~mm}^{2}$ | N, NS | 140G-N-TLA43 | 140G-N-TLA44 |
|  | Cu wire only <br> (4) $4 / 0 \ldots 500$ MCM or $70 \ldots 240 \mathrm{~mm}^{2}$ |  | 140G-N-TLC43 | 140G-N-TLC44 |
|  | Al or Cu wire <br> (6) $1 / 0 \ldots 750 \mathrm{MCM}$ or $50 \ldots 400 \mathrm{~mm}^{2}$ | R | 140G-R-TLA63 | - |
| Representative Photo | Cu wire only <br> (6) $1 / 0 \ldots 750$ MCM or $50 \ldots 400 \mathrm{~mm}^{2}$ |  | 140G-R-TLC63 | - |

Selection Guide

## 140G-G2C3-C30

## Molded Case Circuit Breakers

Bulletin 140G/140MG


## Bulletin 140G

## Molded Case Circuit Breakers

Catalog Number Explanation - 125 A, G-Frame

Complete Circuit Breaker Assemblies with Factory-Installed Options
Examples given in this section are not intended to be used for product selection. Use ProposalWorks to configure the molded case circuit breaker. Use these configurations only to select all factory-installed options for shunt trips, undervoltage release units, auxiliary contacts, and alarm contacts. Use the codes from Table g to add on to the molded case circuit breaker cat. no. selected on the orevious nages to form a comolete cat no. for a comolete assembly with factory-installed options


| 2 | C |
| :--- | :--- |
| $\frac{6}{c}$ |  |
|  |  |


| 3 |
| ---: |
| 4 |
| $e$ |

c
d
e
$\square$ -
$g$


Cat. No. 140G-G6C3-D12
a

| Bulletin No. |  |
| :---: | :---: |
| Code | Description |
| 140G | Global Molded Case Circuit Breaker |

b

c

d

| Protection Type |  |
| :---: | :---: |
| Code | Description |
| C | Fixed thermal/fixed magnetic |
| E | Adjust thermal/fixed magnetic |
| S | Molded case switch (Isolator) |

e

| Poles |  |
| :---: | :---: |
| Code | Description |
| 3 | 3 poles |
| 4 | 4 poles |


| Current Range |  |
| :---: | :---: |
| Code | Description |
| C | e.g., C30 $=30 \mathrm{~A}$ |
| D | e.g., D16 $=160 \mathrm{~A}$ |

$g$

| Factory-Installed Internal Options |  |
| :---: | :---: |
| Shunt Trip and Undervoltage Release Units |  |
| Code | Description |
| SJ | Shunt Trip, 24...30V AC/DC |
| SK | Shunt Trip, 48...60V AC/DC |
| SD | Shunt Trip, 110...127V AC; 110...125V <br> DC |
| SA | Shunt Trip, 220...240V AC; 220...250V |
| DC |  |

- Select up to two internal options: 1 for left side mounting (shunt trip or undervoltage release), 1 for right (auxiliary or alarm contact). Consult your local Rockwell automation sales office or Allen-Bradley distributor for further assistance.

Assembled Molded Case Circuit Breakers - 125 A, G-Frame


Interrupting Rating/Breaking Capacity — Thermal-Magnetic Circuit Breakers

| Interrupting Rating ( $50 / 60 \mathrm{~Hz}$ ), UL 489/CSA C22.2-5, No. 5-02 [kA] |  |  | Breaking Capacity ( $50 / 60 \mathrm{~Hz}$ ), IEC 60947-2 $I_{\mathrm{cu}}[\mathrm{kA}] / I_{\mathrm{cs}} \%$ |  |  |  |  |  |  |  | Breaking Capacity (DC), IEC 60947-2 |  |  |  | Interrupting Code $\ddagger$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & 600 \mathrm{Y} / \\ & 347 \mathrm{~V} \end{aligned}$ | 220V ${ }^{\text {* }}$ |  | 415 V |  | 440V $\star$ |  | 690V |  | 250V DC (2- <br> pole in series) |  | 500V DC (3pole in series) |  |  |
| 240 V | 480 V |  | $I_{\text {cu }}[\mathrm{kA}]$ | $\begin{gathered} I_{\mathrm{cs}} \\ {\left[\% I_{\mathrm{cu}}\right]} \end{gathered}$ | $I_{\text {cu }}[\mathrm{kA}]$ | $I_{\text {cs }}\left[\% I_{\text {cu }}\right]$ | $I_{\text {cu }}[\mathrm{kA}]$ | $I_{\text {cs }}\left[\% I_{\mathrm{cu}}\right]$ | $I_{\text {cu }}[\mathrm{kA}]$ | $\begin{gathered} I_{\mathrm{cs}} \\ {\left[\% I_{\mathrm{cu}}\right]} \end{gathered}$ | $I_{\text {cu }}[\mathrm{kA}]$ | $\begin{gathered} I_{\mathrm{cs}} \\ {\left[\% I_{\mathrm{cu}}\right]} \end{gathered}$ | $I_{\text {cu }}[\mathrm{kA}]$ | $\begin{gathered} I_{\mathrm{cs}} \\ {\left[\% I_{\mathrm{cu}}\right]} \end{gathered}$ |  |
| 50 | 25 | 10 | 65 | 75 | 36 | 100 | 36 | 50 | 6 | 75 | 36 | 100 | 36 | 100 | G2 |
| 65 | 35 | 14 | 85 | 75 | 50 | 75 | 50 | 50 | 8 | 50 | 50 | 100 | 50 | 100 | G3 |
| 100 | 65 | 25 | 100 | 75 | 70 | 50 | 65 | 50 | 10 | 50 | 70 | 75 | 70 | 75 | G6 |

$\star$ These ratings have not been tested for the CCC listing.
$\ddagger$ See table below for Cat. No. selection
Thermal-Magnetic, Fixed Thermal-Fixed Magnetic

| Rated Current $I_{\mathrm{n}}$ [A] | $\begin{aligned} & \text { Thermal Trip } \\ & {[\mathrm{A}]} \\ & I_{\mathrm{r}}=I_{\mathrm{n}} \text { (Fixed) } \end{aligned}$ | Magnetic Trip <br> [A] <br> $I_{\mathrm{m}}$ | Interrupting Code G2 |  | Interrupting Code G3 |  | Interrupting Code G6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Cat. No. |  | Cat. No. |  | Cat. No. |  |
|  |  |  | 3 Poles | 4 Poles | 3 Poles | 4 Poles | 3 Poles | 4 Poles |
| 15 | 15 | 500 | 140G-G2C3-C15 | 140G-G2C4-C15 | 140G-G3C3-C15 | 140G-G3C4-C15 | 140G-G6C3-C15 | 140G-G6C4-C15 |
| 16 | 16 | 500 | 140G-G2C3-C16 | 140G-G2C4-C16 | 140G-G3C3-C16 | 140G-G3C4-C16 | 140G-G6C3-C16 | 140G-G6C4-C16 |
| 20 | 20 | 500 | 140G-G2C3-C20 | 140G-G2C4-C20 | 140G-G3C3-C20 | 140G-G3C4-C20 | 140G-G6C3-C20 | 140G-G6C4-C20 |
| 25 | 25 | 500 | 140G-G2C3-C25 | 140G-G2C4-C25 | 140G-G3C3-C25 | 140G-G3C4-C25 | 140G-G6C3-C25 | 140G-G6C4-C25 |
| 30 | 30 | 500 | 140G-G2C3-C30 | 140G-G2C4-C30 | 140G-G3C3-C30 | 140G-G3C4-C30 | 140G-G6C3-C30 | 140G-G6C4-C30 |
| 32 | 32 | 500 | 140G-G2C3-C32 | 140G-G2C4-C32 | 140G-G3C3-C32 | 140G-G3C4-C32 | 140G-G6C3-C32 | 140G-G6C4-C32 |
| 35 | 35 | 500 | 140G-G2C3-C35 | 140G-G2C4-C35 | 140G-G3C3-C35 | 140G-G3C4-C35 | 140G-G6C3-C35 | 140G-G6C4-C35 |
| 40 | 40 | 500 | 140G-G2C3-C40 | 140G-G2C4-C40 | 140G-G3C3-C40 | 140G-G3C4-C40 | 140G-G6C3-C40 | 140G-G6C4-C40 |
| 45 | 45 | 500 | 140G-G2C3-C45 | 140G-G2C4-C45 | 140G-G3C3-C45 | 140G-G3C4-C45 | 140G-G6C3-C45 | 140G-G6C4-C45 |
| 50 | 50 | 500 | 140G-G2C3-C50 | 140G-G2C4-C50 | 140G-G3C3-C50 | 140G-G3C4-C50 | 140G-G6C3-C50 | 140G-G6C4-C50 |
| 60 | 60 | 600 | 140G-G2C3-C60 | 140G-G2C4-C60 | 140G-G3C3-C60 | 140G-G3C4-C60 | 140G-G6C3-C60 | 140G-G6C4-C60 |
| 63 | 63 | 630 | 140G-G2C3-C63 | 140G-G2C4-C63 | 140G-G3C3-C63 | 140G-G3C4-C63 | 140G-G6C3-C63 | 140G-G6C4-C63 |
| 70 | 70 | 700 | 140G-G2C3-C70 | 140G-G2C4-C70 | 140G-G3C3-C70 | 140G-G3C4-C70 | 140G-G6C3-C70 | 140G-G6C4-C70 |
| 80 | 80 | 800 | 140G-G2C3-C80 | 140G-G2C4-C80 | 140G-G3C3-C80 | 140G-G3C4-C80 | 140G-G6C3-C80 | 140G-G6C4-C80 |
| 90 | 90 | 900 | 140G-G2C3-C90 | 140G-G2C4-C90 | 140G-G3C3-C90 | 140G-G3C4-C90 | 140G-G6C3-C90 | 140G-G6C4-C90 |
| 100 | 100 | 1000 | 140G-G2C3-D10 | 140G-G2C4-D10 | 140G-G3C3-D10 | 140G-G3C4-D10 | 140G-G6C3-D10 | 140G-G6C4-D10 |
| 110 | 110 | 1100 | 140G-G2C3-D11 | 140G-G2C4-D11 | 140G-G3C3-D11 | 140G-G3C4-D11 | 140G-G6C3-D11 | 140G-G6C4-D11 |
| 125 | 125 | 1250 | 140G-G2C3-D12 | 140G-G2C4-D12 | 140G-G3C3-D12 | 140G-G3C4-D12 | 140G-G6C3-D12 | 140G-G6C4-D12 |
| 160 * | $\ddagger$ | 1600 | 140G-G2E3-D16 | 140G-G2E4-D16 | 140G-G3E3-D16 | 140G-G3E4-D16 | 140G-G6E3-D16 | 140G-G6E4-D16 |

* IEC only.
$\ddagger$ Adjustable thermal trip. 112 A min., 136 A med., 160 A max.
Molded Case Switch — UL489§

| Rated | Magnetic Trip | Cat. No. |  |
| :---: | :---: | :---: | :---: |
| Current | I |  |  |
| $I_{\mathrm{n}}[\mathrm{A}]$ |  |  |  |

§ Does not provide overcurrent protection; may open above 1250 A.


Cat. No. 140G-G6C3-D12

## Bulletin 140G

## Molded Case Circuit Breakers

Specifications - G- and H-Frame

|  | G-Frame |  |  |  | H-Frame $\ddagger$ |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Max. Rated Current [A] |  | 125 |  | 160* |  |  | 125 |  |  | 160 * |
| Rated insulation voltage, $\mathrm{U}_{\mathrm{i}}$, IEC | 800 |  |  |  | 1000 |  |  |  |  |  |
| NEMA, UL, CSA |  |  |  |  |  |  |  |  |  |  |
| Interrupting Rating Code | G2 | G3 | G6 | G2 G3 G6 | H2 | H3 | H6 | H0 | H15 | H2 H3 H6 H0 H15 |
| $240 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz}$ [kA] | 50 | 65 | 100 | 5065100 | 65 | 100 | 150 | 200 | 200 | 65100150200200 |
| $480 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz} \quad[\mathrm{kA}]$ | 25 | 35 | 65 | 253565 | 25 | 35 | 65 | 100 | 150 | 253565100150 |
| $600 \mathrm{Y} / 347 \mathrm{~V} \mathrm{AC}$, $\quad \mathrm{kA}]$ <br> $50 / 60 \mathrm{~Hz}$  | 10 | 14 | 25 | 101425 | - | - | - | - | - | - |
| $\begin{array}{ll} \hline 600 \mathrm{VAC}, 50 / 60 \\ \mathrm{~Hz} & {[\mathrm{kA}]} \end{array}$ | - | - | - | - | 14 | 18 | 25 | 35 | 42 | 1418353542 |
| IEC 60947-2 |  |  |  |  |  |  |  |  |  |  |
| Rated ultimate short-circuit breaking capacity, $I_{\text {cu }}$ |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { 220/230/240V AC, } \quad[\mathrm{kA}] \\ & 50 / 60 \mathrm{~Hz} \end{aligned}$ | 65 | 85 | 100 | 6585100 | 65 | 85 | 100 | 150 | 200 | 6585100150200 |
| $380 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz}$ [kA] | 36 | 50 | 70 | 366070 | 36 | 50 | 70 | 120 | 150 | 265070120150 |
| $415 \mathrm{~V} \mathrm{AC}, 50 / 60 \mathrm{~Hz} \quad[\mathrm{kA}]$ | 36 | 50 | 70 | 365070 | 36 | 50 | 70 | 120 | 150 | 365070120150 |
| $440 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz} \quad[\mathrm{kA}]$ | 36 | 50 | 65 | 365065 | 36 | 50 | 65 | 100 | 150 | 365065100150 |
| $500 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz}$ [kA] | 30 | 36 | 50 | 365065 | 30 | 36 | 50 | 60 | 70 | 3036506070 |
| $525 \mathrm{~V} \mathrm{AC} ,50 / 60 \mathrm{~Hz} \quad[\mathrm{kA}]$ | 22 | 35 | 35 | 223535 | 20 | 25 | 30 | 36 | 50 | 2025303650 |
| 690 V AC, $50 / 60 \mathrm{~Hz} \quad[\mathrm{kA}]$ | 6 | 8 | 10 | 6810 | 10 | 12 | 15 | 18 | 20 | 1012151820 |
| 250 V DC, 2 Poles [kA] in Series | 36 | 50 | 70 | 365070 | 36 | 50 | 70 | 85 | 100 | 36507085100 |
| 500 V DC, 2 Poles [kA] in Series | - | - | - | - | - | - | - | - | - | - |
| 500 V DC, 3 Poles [kA] in Series | 36 | 50 | 70 | 365070 | 36 | 50 | 70 | 85 | 100 | 36507085100 |
| 750 V DC, 3 Poles [kA] in Series | - | - | - | - | - | - | - | - | - | - |


| $\begin{aligned} & \text { 220/230/240V AC, } \\ & 50 / 60 \mathrm{~Hz} \end{aligned}$ | [kA] | $\begin{gathered} 75 \% \\ (50) \end{gathered}$ | 75\% | 75\% | 75\% 75\% 75\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 380 V AC, $50 / 60 \mathrm{~Hz}$ | [kA] | 100\% | 100\% | 75\% | 100\% 100\% 75\% | 100\% | $\begin{aligned} & \hline 100 \% \\ & 100 \% \end{aligned}$ | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 415 V AC, 50/60Hz | [kA] | 100\% | 75\% | 50\% | 100\% 75\% 50\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 440 V AC, $50 / 60 \mathrm{~Hz}$ | [kA] | 50\% | 50\% | 50\% | 50\% 50\% 50\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 500 V AC, $50 / 60 \mathrm{~Hz}$ | [kA] | 50\% | 50\% | 50\% | 50\% 50\% 50\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 525 V AC, $50 / 60 \mathrm{~Hz}$ | [kA] | 50\% | 50\% | 50\% | 50\% 50\% 50\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 690 V AC, $50 / 60 \mathrm{~Hz}$ | [kA] | 75\% | 50\% | 50\% | 7550 50\% | 100\% | 100\% | 100\% | 75\% | 75\% | $\begin{gathered} 100 \% 100 \% 100 \% 75 \% \\ 75 \% \end{gathered}$ |
| 250V DC, 2 Poles in Series | [kA] | 100\% | 100\% | 75\% | 100\% 100\% 75\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 500 V D, 2 Poles in Series | [kA] | - | - | - | - | - | - | - | - | - | - |
| 500V DC, 3 Poles in Series | [kA] | 100\% | 100\% | 75\% | 100\% 100\% 75\% | 100\% | 100\% | 100\% | 100\% | 100\% | $\begin{gathered} 100 \% 100 \% 100 \% 100 \% \\ 100 \% \end{gathered}$ |
| 750V DC, 3 Poles in Series | [kA] | - | - | - | - | - | - | - | - | - | - |
| Mechanical Life | $\begin{aligned} & {[\mathrm{No.}} \\ & \mathrm{Ops}] \end{aligned}$ | 25000 |  |  |  | 25000 |  |  |  |  |  |
|  | [Ops/hr] | 240 |  |  |  | 240 |  |  |  |  |  |
| Electrical Life @ | [No. Ops] | 8000 |  |  |  | 8000 |  |  |  |  |  |
|  | [Ops/hr] | 120 |  |  |  | 120 |  |  |  |  |  |
| Ambient Temp. w/out derating | ${ }^{\circ} \mathrm{F}\left[{ }^{\circ} \mathrm{C}\right]$ | $104{ }^{\circ} \mathrm{F}\left[40^{\circ} \mathrm{C}\right]$ |  |  |  | $104{ }^{\circ} \mathrm{F}\left[40^{\circ} \mathrm{C}\right]$ |  |  |  |  |  |
| Storage Temperature | ${ }^{\circ} \mathrm{F}\left[{ }^{\circ} \mathrm{C}\right]$ | $-40 . . .+176{ }^{\circ} \mathrm{F}\left[-40 \ldots+80^{\circ} \mathrm{C}\right]$ |  |  |  | $-40 . . .+176{ }^{\circ} \mathrm{F}\left[-40 \ldots+80^{\circ} \mathrm{C}\right]$ |  |  |  |  |  |
| Dimensions | [mm] | 3 poles: $76.2 \times 70 \times 130$ |  |  |  | 3 poles: $90 \times 82.5 \times 130$ |  |  |  |  |  |
| [Width/Depth/Height] | [mm] | 4 poles: $101.6 \times 70 \times 130$ |  |  |  | 4 poles: $120 \times 82.5 \times 130$ |  |  |  |  |  |

* IEC version with a $160 \mathrm{~A} I_{\mathrm{cu}}$ rating
$\ddagger$ Cannot be reverse fed above 480V

Dimensions are in millimeters. Dimensions are not intended to be used for manufacturing purposes.
Panel Mounted Molded Case Circuit Breaker


| Description | No. of Poles | A |
| :---: | :---: | :---: |
| With flange | $3 \ldots 4$ | 74 |
| Without flange | $3 \ldots 4$ | 71 |
|  | $3 \ldots 4$ | 79 |

$\ddagger$ Overall dimensions of optional wiring ducts
§ Required 25 mm insulating phase barriers provided

DIN Rail Mounted Molded Case Circuit Breaker


[^1]
## Catalog Number Explanation

Note: Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; some combinations may not produce a valid catalog number.



| d |  | $<$ |
| :---: | :---: | :---: |
|  | Current ( ${ }_{\mathrm{n}}$ ) |  |
| Code | Current [ A ] |  |
| 005 | 0.5 |  |
| 010 | 1 |  |
| 016 | 1.6 |  |
| 020 | 2 |  |
| 030 | 3 |  |
| 040 | 4 |  |
| 050 | 5 |  |
| 060 | 6 |  |
| 070 | 7 |  |
| 080 | 8 |  |
| 100 | 10 |  |
| 130 | 13 |  |
| 150 | 15 |  |
| 160 | 16 |  |
| 200 | 20 |  |
| 250 | 25 |  |
| 300 | 30 |  |
| 320 | 32 |  |
| 350 | 35 |  |
| 400 | 40 |  |
| 500 | 50 |  |
| 600 | 60 |  |
| 630 | 63 |  |

## Product Selection

## 1-Pole Circuit Breakers

| Photo/Wiring Diagram | UL/CSA Max. Voltage | IEC/EN Max. Voltage | Continuous Current Rating $\left(I_{\mathrm{n}}\right)[\mathrm{A}]$ | Trip Curve C Inductive $5 \ldots 10 I_{n}$ Cat. No. | Trip Curve D Highly Inductive $10 . .20 I_{\mathrm{n}}$ <br> Cat. No. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 -pole | 277 VAC , 48 V DC | 230 V AC | 0.5 | 1489-M1C005 | 1489-M1D005 |
|  |  |  | 1 | 1489-M1C010 | 1489-M1D010 |
|  |  |  | 1.6 | 1489-M1C016 | 1489-M1D016 |
|  |  |  | 2 | 1489-M1C020 | 1489M11D020 |
|  |  |  | 3 | 1489-M1C030 | <1489-M1D030 |
|  |  |  | 4 | 1489-M1C040 | 1489-M1D040 |
|  |  |  | 5 | 1489-M1C050 | 1489-M1D050 |
|  |  |  | 6 | 1489-M1C060 | 1489-M1D060 |
|  |  |  | 7 | 1489-M1C070 | 1489-M1D070 |
|  |  |  | 8 | 1489-M1C080 | 1489-M1D080 |
|  |  |  | 10 | 1489-M1C100 | 1489-M1D100 |
|  |  |  | 13 | 1489-M1C130 | 1489-M1D130 |
|  |  |  | 15 | 1489-M1C150 | 1489-M1D150 |
|  |  |  | 16 | 1489-M1C160 | 1489-M1D160 |
|  |  |  | 20 | 1489-M1C200 | 1489-M1D200 |
|  |  |  | 25 | 1489-M1C250 | 1489-M1D250 |
|  |  |  | 30 | 1489-M1C300 | 1489-M1D300 |
|  |  |  | 32 | 1489-M1C320 | 1489-M1D320 |
|  |  |  | 35 | 1489-M1C350 | 1489-M1D350 |
|  | C Curve: 277V AC, 48 V DC D Curve: 240V AC, 48V DC |  | 40 | 1489-M1C400 | 1489-M1D400 |
|  | 240 V AC, 48 V DC |  | 50 | 1489-M1C500 | 1489-M1D500 |
|  |  |  | 60 | 1489-M1C600 | 1489-M1D600 |
|  |  |  | 63 | 1489-M1C630 | 1489-M1D630 |

## Bus Bars

## 1492-SP Bus Bars

| Description | Pins | Rated Current [A] $\ddagger$ | Pkg. Qty. | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
| 1-Phase | 57 | 100 A | 1 | 1492-A1B1 |
|  | 57 | 80 A | 1 | 1492-A1B8 |
| 1-Phase with aux. contact | 37 | 100 A | 1 | 1492-A1B1H |
|  | 37 | 80 A | 1 | 1492-A1B8H |
| 2-Phase | 56 | 100 A | 1 | 1492-A2B1 |
|  | 56 | 80 A | 1 | 1492-A2B8 |
| 2-Phase with aux. contact | 46 | 100 A | 1 | 1492-A2B1H |
|  | 46 | 80 A | 1 | 1492-A2B8H |
| 3-Phase | 57 | 100 A | 1 | 1492-A3B1 |
|  | 57 | 80 A | 1 | 1492-A3B8 |
| 3-Phase with aux. contact | 48 | 100 A | 1 | 1492-A3B1H |
|  | 48 | 80 A | 1 | 1492-A3B8H |

## 1492-SP Bus Bar Accessories

| Description | Pkg. Qty. | Cat. No. <br> $\star$ |
| :--- | :---: | :---: |
| Terminal Power Feed, 35 mm², offset lug | 10 | 1492-AAT1 |
| Terminal Power Feed, $35 \mathrm{~mm}^{2}$, straight lug | 10 | 1492-AAT1S |
| Terminal Power Feed, 35 mm², offset lug, low profile | 10 | 1492-AAT1LP |
| Dedicated Power Feed, 50 $\mathrm{mm}^{2}$ | 10 | 1492-AAT2 |
| End Cover for 1-phase bus bar | 10 | 1492-A1E |
| End Cover for 2- or 3-phase bus bar | 10 | 1492-AME |
| Protective Shroud for unused pins | 10 | 1492-AAP |

* CULUs, ULL508, EN 60947-1, CE Marked
$\star$ cULus, UL508, EN 60947-1, CE Marked
$\ddagger$ Refer to the diagrams below for Feeder Terminal \& Bus Bar Current Distribution


## Feeder Terminal \& Bus Bar Current Distribution

100 A
End Feed

$\mathrm{le}=\mathrm{l} \mathrm{s} \leq 100 \mathrm{~A} / \varnothing$


## Bus Bar Approximate Dimensions

Note: Dimensions are shown in millimeters (inches). Dimensions are not intended for manufacturing purposes.

## 1-Phase Bus Bars



1492-A1B1


1492-A1B1H


1492-A1B8H

|  | Bulletin 1492-FB — DIN Rail Mounting Fuse Holders <br> - Compact size requiring less panel space than open-style fuse holders <br> - Handle isolates the fuse from power when installing or removing fuse <br> - IP2 - Front-finger protection per IEC/EN 60529 <br> - Optional blown fuse indicators - allow easy troubleshooting of electrical circuits <br> - Easy insertion/removal of fuses, no special tools required <br> - Mounts on standard 35 mm DIN Rail <br> - Marker-ready <br> - Terminals shipped in open position and are ready for wiring | Table of Contents <br> Product Selection $\qquad$ this page <br> Specifications. $\qquad$ 7-40 <br> Approximate $\qquad$ 7-40 <br> Standards Compliance <br> UL 512 <br> CSA 22.2 No. 39 <br> EN/IEC 60947-3 <br> EN/IEC 60269-2-1 <br> Certifications <br> UL Listed E34648 <br> UR Recognized Component CSA Certified CE Marked |
| :---: | :---: | :---: |

Bulletin 1492-FB fuse holders provide a safe and convenient means for installation of class CC, J, and midget fuses. The class CC fuse holder is designed to reject a midget fuse or international $10 \times 38 \mathrm{~mm}$ fuse. The class J fuse holder will reject all fuses other than a class J fuse.

The class CC and J holders are UL Listed and CSA Certified for branch circuit protection. Class CC and J fuses are excellent for wire protection, small motor loads, and group protection of small motor loads. The midget holders are UL Recognized and CSA Certified when supplementary ( $1-1 / 2 \mathrm{in} . \times 13 / 32 \mathrm{in}$.) fuses are applied. The midget fuse holder is also CE Marked for $10 \times 38 \mathrm{~mm}$ IEC midget fuses.
The 1492-FB fuse holder family is designed for use in many OEM applications, such as power supplies, equipment protection, primary and secondary control transformers, solenoids, lighting and heater loads, and drives.

## Product Selection

| Description |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A* | 30 A | 60 A | 30 A |
|  |  | Cat. No. | Cat. No. | Cat. No. | Cat. No. |
| One-Pole | 1-Pole Fuse Block | 1492-FB1C30 | 1492-FB1J30 | 1492-FB1J60 | 1492-FB1M30 |
|  | 1-Pole Fuse Block with Indication, 110...600V | 1492-FB1C30-L | 1492-FB1J30-L | 1492-FB1J60-L | 1492-FB1M30-L |
|  | 1-Pole Fuse Block with Indication, 12...72V | 1492-FB1C30-D1 | - | - | 1492-FB1M30-D1 |
|  | Pieces per Carton | 6 |  |  |  |
| Two-Pole | 2-Pole Fuse Block | 1492-FB2C30 | 1492-FB2J30 | 1492-FB2J60 | 1492-FB2M30 |
|  | 2-Pole Fuse Block with Indication | 1492-FB2C30-L | 1492-FB2J30-L | 1492-FB2J60-L | 1492-FB2M30-L |
|  | Pieces per Carton | 3 |  |  |  |
| Three-Pole | 3-Pole Fuse Block | 1492-FB3C30 | 1492-FB3J30 | 1492-FB3J60 | 1492-FB3M30 |
|  | 3-Pole Fuse Block with Indication | 1492-FB3C30-L | 1492-FB3J30-L | 1492-FB3J60-L | 1492-FB3M30-L |
|  | Pieces per Carton | 2 |  |  |  |

[^2]Accessories/Specifications/Approximate Dimensions

## Accessories

| Description | Pkg. Quantity | Cat. No. |
| :---: | :---: | :---: |
| Fuseholder Identification Slide-in Markers䏮 | 5 | 1492-MC5X5 |
| The following are blank cards. Squares slip into molded slot. | 1492-MC6X5 |  |

事 Refer to terminal block marking systems on page 12-90.

Specifications

|  | CC | M | J30 | J60 |
| :---: | :---: | :---: | :---: | :---: |
| Product Type ( $n=$ number of poles) | $\begin{gathered} \text { 1492-FBnC30 "B" } \\ \text { 1492-FB1C30-D1 "B" } \\ \text { 1492-FBnC30-L "B" } \end{gathered}$ | 1492-FBnM30 "B" 1492-FB1M30-D1 "B" 1492-FBnM30-L "B" | $\begin{gathered} \text { 1492-FBnJ30 "B" } \\ \text { 1492-FBnJ30-L "B" } \end{gathered}$ | $\begin{gathered} \text { 1492-FBnJ60 "B" } \\ \text { 1492-FBnJ60-L "B" } \end{gathered}$ |
| For Fuse Type: | Class CC | $\begin{gathered} \text { Midget } \\ 13 / 32^{\prime \prime} \times 1-1 / 2^{\prime \prime} \\ (10 \times 38 \mathrm{~mm}) \end{gathered}$ | Class J |  |
| Approvals | UL, CSA, CE | UR, CSA, CE | UL, CSA, CE |  |
| Maximum Voltage | 600 V | $\begin{gathered} 600 \mathrm{~V} \\ 690 \mathrm{~V}(\mathrm{IEC}) \\ \hline \end{gathered}$ | 600 V |  |
| Maximum Current | 30 A | $\begin{gathered} 30 \mathrm{~A} \\ 32 \mathrm{~A}(\mathrm{IEC}) \end{gathered}$ | 30 A | 60 A |
| Maximum Current Withstand (UL/CSA) | 200 kA sym | Fuse dependant 50 kA max UL | 200 kA sym |  |
| Operating Temperature Range | $\begin{aligned} & -4 \ldots+130{ }^{\circ} \mathrm{F} \\ & -20 \ldots+55^{\circ} \mathrm{C} \end{aligned}$ |  |  |  |
| Conductor Material | Copper, stranded |  |  |  |
| Conductor Strip Length | 0.43 in . <br> ( 11 mm ) |  | $0.79 \mathrm{in} .$$(20 \mathrm{~mm})$ |  |
| Conductor Range 1 Wire per Terminal: | $\begin{gathered} \# 18 \ldots . .4 \text { AWG } \\ \left(0.75 . . .25 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | \#18... 1 AWG $\left(0.75 \ldots . .50 \mathrm{~mm}^{2}\right)$ | \#14... 1 AWG (2.5... $50 \mathrm{~mm}^{2}$ ) |
| Conductor Range 2 Wires* per Terminal: | $\begin{gathered} \# 18 \ldots 8 \mathrm{AWG} \\ \left(0.75 \ldots 10 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | $\begin{gathered} \# 18 \ldots 6 \mathrm{AWG} \\ \left(0.75 \ldots . .16 \mathrm{~mm}^{2}\right) \\ \hline \end{gathered}$ | $\begin{gathered} \text { \#14... } 6 \text { AWG } \\ \left(2.5 \ldots 16 \mathrm{~mm}^{2}\right) \end{gathered}$ |
| Terminal Tightening Torque | \#18... 8 AWG: $22 \mathrm{lb} \cdot \mathrm{in}$ \#6... 4 AWG: $26 \mathrm{lb} \bullet$ in $0.75 \ldots 25 \mathrm{~mm} 2: 2.5 \mathrm{~N} \bullet \mathrm{~m}$ |  | $35 \mathrm{lb} \cdot \mathrm{in}^{2}$ ( $4 \mathrm{~N} \bullet \mathrm{~m}$ ) |  |

* Both wires must be same size

Approximate Dimensions
Dimensions are in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.


| Dimension |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A | 30 A | 60 A | 30 A |
| Height |  | 3.19 in. (81 mm) | 4.65 in. (118 mm) | 4.65 in. (118 mm) | 3.19 in. (81 mm) |
| Depth |  | 2.51 in. (64 mm) | 2.76 in. (70 mm) | 3.23 in. (82 mm) | 2.51 in. (64 mm) |
|  | One-Pole | 0.71 in. ( 18 mm ) | $1.41 \mathrm{in}.(36 \mathrm{~mm})$ | $1.57 \mathrm{in}.(40 \mathrm{~mm})$ | 0.71 in . 18 mm ) |
| Width | Two-Pole | 1.41 in. ( 36 mm ) | 2.83 in. (72 mm) | 3.15 in. (80 mm) | 1.41 in. ( 36 mm ) |
|  | Three-Pole | 2.13 in. ( 54 mm ) | 4.25 in. (108 mm) | 4.72 in. (120 mm) | 2.13 in. ( 54 mm ) |


|  | Bulletin 1492-FB — DIN Rail Mounting Fuse Holders <br> - Compact size requiring less panel space than open-style fuse holders <br> - Handle isolates the fuse from power when installing or removing fuse <br> - IP2 - Front-finger protection per IEC/EN 60529 <br> - Optional blown fuse indicators - allow easy troubleshooting of electrical circuits <br> - Easy insertion/removal of fuses, no special tools required <br> - Mounts on standard 35 mm DIN Rail <br> - Marker-ready <br> - Terminals shipped in open position and are ready for wiring | Table of Contents <br> Product Selection $\qquad$ this page <br> Specifications. $\qquad$ 7-40 <br> Approximate $\qquad$ 7-40 <br> Standards Compliance <br> UL 512 <br> CSA 22.2 No. 39 <br> EN/IEC 60947-3 <br> EN/IEC 60269-2-1 <br> Certifications <br> UL Listed E34648 <br> UR Recognized Component CSA Certified CE Marked |
| :---: | :---: | :---: |

Bulletin 1492-FB fuse holders provide a safe and convenient means for installation of class CC, J, and midget fuses. The class CC fuse holder is designed to reject a midget fuse or international $10 \times 38 \mathrm{~mm}$ fuse. The class J fuse holder will reject all fuses other than a class J fuse.

The class CC and J holders are UL Listed and CSA Certified for branch circuit protection. Class CC and J fuses are excellent for wire protection, small motor loads, and group protection of small motor loads. The midget holders are UL Recognized and CSA Certified when supplementary ( $1-1 / 2 \mathrm{in} . \times 13 / 32 \mathrm{in}$.) fuses are applied. The midget fuse holder is also CE Marked for $10 \times 38 \mathrm{~mm}$ IEC midget fuses.
The 1492-FB fuse holder family is designed for use in many OEM applications, such as power supplies, equipment protection, primary and secondary control transformers, solenoids, lighting and heater loads, and drives.

Product Selection

| Description |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A* | 30 A | 60 A | 30 A |
|  |  | Cat. No. | Cat. No. | Cat. No. | Cat. No. |
| One-Pole | 1-Pole Fuse Block | 1492-FB1C30 | 1492-FB1J30 | 1492-FB1J60 | 1492-FB1M30 |
|  | 1-Pole Fuse Block with Indication, 110...600V | 1492-FB1C30-L | 1492-FB1J30-L | 1492-FB1J60-L | 1492-FB1M30-L |
|  | 1-Pole Fuse Block with Indication, 12...72V | 1492-FB1C30-D1 | - | - | 1492-FB1M30-D1 |
|  | Pieces per Carton | 6 |  |  |  |
| Two-Pole | 2-Pole Fuse Block | 1492-FB2C30 | 1492-FB2J30 | 1492-FB2J60 | 1492-FB2M30 |
|  | 2-Pole Fuse Block with Indication | 1492-FB2C30-L | 1492-FB2J30-L | 1492-FB2J60-L | 1492-FB2M30-L |
|  | Pieces per Carton | 3 |  |  |  |
| Three-Pole | 3-Pole Fuse Block | 1492-FB3C30 | 1492-FB3J30 | 1492-FB3J60 | 1492-FB3M30 |
|  | 3-Pole Fuse Block with Indication | 1492-FB3C30-L | 1492-FB3J30-L | 1492-FB3J60-L | 1492-FB3M30-L |
|  | Pieces per Carton | 2 |  |  |  |

* All major fuse brands and current ranges have been evaluated for this fuse holder. Due to the heat they generate, the following fuses must be derated: Ferraz Shamut ATQR $1.25 I=0.42$ A max.
Ferraz Shamut ATQR $1.40 I=0.47 \mathrm{~A}$ max.

Accessories/Specifications/Approximate Dimensions

## Accessories

| Description | Pkg. Quantity | Cat. No. |
| :---: | :---: | :---: |
| Fuseholder Identification Slide-in Markers䏮 | 5 | 1492-MC5X5 |
| The following are blank cards. Squares slip into molded slot. | 1492-MC6X5 |  |

事 Refer to terminal block marking systems on page 12-90.

Specifications

|  | CC | M | J30 | J60 |
| :---: | :---: | :---: | :---: | :---: |
| Product Type ( $n=$ number of poles) | $\begin{gathered} \text { 1492-FBnC30 "B" } \\ \text { 1492-FB1C30-D1 "B" } \\ \text { 1492-FBnC30-L "B" } \end{gathered}$ | 1492-FBnM30 "B" 1492-FB1M30-D1 "B" 1492-FBnM30-L "B" | $\begin{gathered} \text { 1492-FBnJ30 "B" } \\ \text { 1492-FBnJ30-L "B" } \end{gathered}$ | $\begin{gathered} \text { 1492-FBnJ60 "B" } \\ \text { 1492-FBnJ60-L "B" } \end{gathered}$ |
| For Fuse Type: | Class CC | $\begin{gathered} \text { Midget } \\ 13 / 32^{\prime \prime} \times 1-1 / 2^{\prime \prime} \\ (10 \times 38 \mathrm{~mm}) \end{gathered}$ | Class J |  |
| Approvals | UL, CSA, CE | UR, CSA, CE | UL, CSA, CE |  |
| Maximum Voltage | 600 V | $\begin{gathered} 600 \mathrm{~V} \\ 690 \mathrm{~V}(\mathrm{IEC}) \\ \hline \end{gathered}$ | 600 V |  |
| Maximum Current | 30 A | $\begin{gathered} 30 \mathrm{~A} \\ 32 \mathrm{~A}(\mathrm{IEC}) \end{gathered}$ | 30 A | 60 A |
| Maximum Current Withstand (UL/CSA) | 200 kA sym | Fuse dependant 50 kA max UL | 200 kA sym |  |
| Operating Temperature Range | $\begin{aligned} & -4 \ldots+130{ }^{\circ} \mathrm{F} \\ & -20 \ldots+55^{\circ} \mathrm{C} \end{aligned}$ |  |  |  |
| Conductor Material | Copper, stranded |  |  |  |
| Conductor Strip Length | 0.43 in . <br> ( 11 mm ) |  | $0.79 \mathrm{in} .$$(20 \mathrm{~mm})$ |  |
| Conductor Range 1 Wire per Terminal: | $\begin{gathered} \# 18 \ldots . .4 \text { AWG } \\ \left(0.75 . . .25 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | \#18... 1 AWG $\left(0.75 \ldots . .50 \mathrm{~mm}^{2}\right)$ | \#14... 1 AWG (2.5... $50 \mathrm{~mm}^{2}$ ) |
| Conductor Range 2 Wires* per Terminal: | $\begin{gathered} \# 18 \ldots 8 \mathrm{AWG} \\ \left(0.75 \ldots 10 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | $\begin{gathered} \# 18 \ldots 6 \mathrm{AWG} \\ \left(0.75 \ldots . .16 \mathrm{~mm}^{2}\right) \\ \hline \end{gathered}$ | $\begin{gathered} \text { \#14... } 6 \text { AWG } \\ \left(2.5 \ldots 16 \mathrm{~mm}^{2}\right) \end{gathered}$ |
| Terminal Tightening Torque | \#18... 8 AWG: $22 \mathrm{lb} \cdot \mathrm{in}$ \#6... 4 AWG: $26 \mathrm{lb} \bullet$ in $0.75 \ldots 25 \mathrm{~mm} 2: 2.5 \mathrm{~N} \bullet \mathrm{~m}$ |  | $35 \mathrm{lb} \cdot \mathrm{in}^{2}$ ( $4 \mathrm{~N} \bullet \mathrm{~m}$ ) |  |

* Both wires must be same size

Approximate Dimensions
Dimensions are in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.


| Dimension |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A | 30 A | 60 A | 30 A |
| Height |  | 3.19 in. (81 mm) | 4.65 in. (118 mm) | 4.65 in. (118 mm) | 3.19 in. (81 mm) |
| Depth |  | 2.51 in. (64 mm) | 2.76 in. (70 mm) | 3.23 in. (82 mm) | 2.51 in. (64 mm) |
|  | One-Pole | 0.71 in. ( 18 mm ) | $1.41 \mathrm{in}.(36 \mathrm{~mm})$ | $1.57 \mathrm{in}.(40 \mathrm{~mm})$ | 0.71 in . 18 mm ) |
| Width | Two-Pole | 1.41 in. ( 36 mm ) | 2.83 in. (72 mm) | 3.15 in. (80 mm) | 1.41 in. ( 36 mm ) |
|  | Three-Pole | 2.13 in. ( 54 mm ) | 4.25 in. (108 mm) | 4.72 in. (120 mm) | 2.13 in. ( 54 mm ) |


|  | Bulletin 1492-FB — DIN Rail Mounting Fuse Holders <br> - Compact size requiring less panel space than open-style fuse holders <br> - Handle isolates the fuse from power when installing or removing fuse <br> - IP2 - Front-finger protection per IEC/EN 60529 <br> - Optional blown fuse indicators - allow easy troubleshooting of electrical circuits <br> - Easy insertion/removal of fuses, no special tools required <br> - Mounts on standard 35 mm DIN Rail <br> - Marker-ready <br> - Terminals shipped in open position and are ready for wiring | Table of Contents <br> Product Selection $\qquad$ this page <br> Specifications. $\qquad$ 7-40 <br> Approximate $\qquad$ 7-40 <br> Standards Compliance <br> UL 512 <br> CSA 22.2 No. 39 <br> EN/IEC 60947-3 <br> EN/IEC 60269-2-1 <br> Certifications <br> UL Listed E34648 <br> UR Recognized Component CSA Certified CE Marked |
| :---: | :---: | :---: |

Bulletin 1492-FB fuse holders provide a safe and convenient means for installation of class CC, J, and midget fuses. The class CC fuse holder is designed to reject a midget fuse or international $10 \times 38 \mathrm{~mm}$ fuse. The class J fuse holder will reject all fuses other than a class J fuse.

The class CC and J holders are UL Listed and CSA Certified for branch circuit protection. Class CC and J fuses are excellent for wire protection, small motor loads, and group protection of small motor loads. The midget holders are UL Recognized and CSA Certified when supplementary ( $1-1 / 2 \mathrm{in} . \times 13 / 32 \mathrm{in}$.) fuses are applied. The midget fuse holder is also CE Marked for $10 \times 38 \mathrm{~mm}$ IEC midget fuses.
The 1492-FB fuse holder family is designed for use in many OEM applications, such as power supplies, equipment protection, primary and secondary control transformers, solenoids, lighting and heater loads, and drives.

Product Selection

| Description |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A* | 30 A | 60 A | 30 A |
|  |  | Cat. No. | Cat. No. | Cat. No. | Cat. No. |
| One-Pole | 1-Pole Fuse Block | 1492-FB1C30 | 1492-FB1J30 | 1492-FB1J60 | 1492-FB1M30 |
|  | 1-Pole Fuse Block with Indication, 110...600V | 1492-FB1C30-L | 1492-FB1J30-L | 1492-FB1J60-L | 1492-FB1M30-L |
|  | 1-Pole Fuse Block with Indication, 12...72V | 1492-FB1C30-D1 | - | - | 1492-FB1M30-D1 |
|  | Pieces per Carton | 6 |  |  |  |
| Two-Pole | 2-Pole Fuse Block | 1492-FB2C30 | 1492-FB2J30 | 1492-FB2J60 | 1492-FB2M30 |
|  | 2-Pole Fuse Block with Indication | 1492-FB2C30-L | 1492-FB2J30-L | 1492-FB2J60-L | 1492-FB2M30-L |
|  | Pieces per Carton | 3 |  |  |  |
| Three-Pole | 3-Pole Fuse Block | 1492-FB3C30 | 1492-FB3J30 | 1492-FB3J60 | 1492-FB3M30 |
|  | 3-Pole Fuse Block with Indication | 1492-FB3C30-L | 1492-FB3J30-L | 1492-FB3J60-L | 1492-FB3M30-L |
|  | Pieces per Carton | 2 |  |  |  |

* All major fuse brands and current ranges have been evaluated for this fuse holder. Due to the heat they generate, the following fuses must be derated:

Ferraz Shamut ATQR $1.25 I=0.42$ A nax.
Ferraz Shamut ATQR $1.40 I=0.47 / A \max$.

Accessories/Specifications/Approximate Dimensions

## Accessories

| Description | Pkg. Quantity | Cat. No. |
| :---: | :---: | :---: |
| Fuseholder Identification Slide-in Markers䏮 | 5 | 1492-MC5X5 |
| The following are blank cards. Squares slip into molded slot. | 1492-MC6X5 |  |

事 Refer to terminal block marking systems on page 12-90.

Specifications

|  | CC | M | J30 | J60 |
| :---: | :---: | :---: | :---: | :---: |
| Product Type ( $n=$ number of poles) | $\begin{gathered} \text { 1492-FBnC30 "B" } \\ \text { 1492-FB1C30-D1 "B" } \\ \text { 1492-FBnC30-L "B" } \end{gathered}$ | 1492-FBnM30 "B" 1492-FB1M30-D1 "B" 1492-FBnM30-L "B" | $\begin{gathered} \text { 1492-FBnJ30 "B" } \\ \text { 1492-FBnJ30-L "B" } \end{gathered}$ | $\begin{gathered} \text { 1492-FBnJ60 "B" } \\ \text { 1492-FBnJ60-L "B" } \end{gathered}$ |
| For Fuse Type: | Class CC | $\begin{gathered} \text { Midget } \\ 13 / 32^{\prime \prime} \times 1-1 / 2^{\prime \prime} \\ (10 \times 38 \mathrm{~mm}) \end{gathered}$ | Class J |  |
| Approvals | UL, CSA, CE | UR, CSA, CE | UL, CSA, CE |  |
| Maximum Voltage | 600 V | $\begin{gathered} 600 \mathrm{~V} \\ 690 \mathrm{~V}(\mathrm{IEC}) \\ \hline \end{gathered}$ | 600 V |  |
| Maximum Current | 30 A | $\begin{gathered} 30 \mathrm{~A} \\ 32 \mathrm{~A}(\mathrm{IEC}) \end{gathered}$ | 30 A | 60 A |
| Maximum Current Withstand (UL/CSA) | 200 kA sym | Fuse dependant 50 kA max UL | 200 kA sym |  |
| Operating Temperature Range | $\begin{aligned} & -4 \ldots+130{ }^{\circ} \mathrm{F} \\ & -20 \ldots+55^{\circ} \mathrm{C} \end{aligned}$ |  |  |  |
| Conductor Material | Copper, stranded |  |  |  |
| Conductor Strip Length | 0.43 in . <br> ( 11 mm ) |  | $0.79 \mathrm{in} .$$(20 \mathrm{~mm})$ |  |
| Conductor Range 1 Wire per Terminal: | $\begin{gathered} \# 18 \ldots . .4 \text { AWG } \\ \left(0.75 . . .25 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | \#18... 1 AWG $\left(0.75 \ldots . .50 \mathrm{~mm}^{2}\right)$ | \#14... 1 AWG (2.5... $50 \mathrm{~mm}^{2}$ ) |
| Conductor Range 2 Wires* per Terminal: | $\begin{gathered} \# 18 \ldots 8 \mathrm{AWG} \\ \left(0.75 \ldots 10 \mathrm{~mm}^{2}\right) \end{gathered}$ |  | $\begin{gathered} \# 18 \ldots 6 \mathrm{AWG} \\ \left(0.75 \ldots . .16 \mathrm{~mm}^{2}\right) \\ \hline \end{gathered}$ | $\begin{gathered} \text { \#14... } 6 \text { AWG } \\ \left(2.5 \ldots 16 \mathrm{~mm}^{2}\right) \end{gathered}$ |
| Terminal Tightening Torque | \#18... 8 AWG: $22 \mathrm{lb} \cdot \mathrm{in}$ \#6... 4 AWG: $26 \mathrm{lb} \bullet$ in $0.75 \ldots 25 \mathrm{~mm} 2: 2.5 \mathrm{~N} \bullet \mathrm{~m}$ |  | $35 \mathrm{lb} \cdot \mathrm{in}^{2}$ ( $4 \mathrm{~N} \bullet \mathrm{~m}$ ) |  |

* Both wires must be same size

Approximate Dimensions
Dimensions are in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.


| Dimension |  | For Class CC Fuse | For Class J Fuse |  | For Midget Fuse |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 30 A | 30 A | 60 A | 30 A |
| Height |  | 3.19 in. (81 mm) | 4.65 in. (118 mm) | 4.65 in. (118 mm) | 3.19 in. (81 mm) |
| Depth |  | 2.51 in. (64 mm) | 2.76 in. (70 mm) | 3.23 in. (82 mm) | 2.51 in. (64 mm) |
|  | One-Pole | 0.71 in. ( 18 mm ) | $1.41 \mathrm{in}.(36 \mathrm{~mm})$ | $1.57 \mathrm{in}.(40 \mathrm{~mm})$ | 0.71 in . 18 mm ) |
| Width | Two-Pole | 1.41 in. ( 36 mm ) | 2.83 in. (72 mm) | 3.15 in. (80 mm) | 1.41 in. ( 36 mm ) |
|  | Three-Pole | 2.13 in. ( 54 mm ) | 4.25 in. (108 mm) | 4.72 in. (120 mm) | 2.13 in. ( 54 mm ) |

## Supplementary Protector/Miniature Circuit Breaker

## Bulletin 1492-SP — Supplementary Protectors



Bulletin 1492-SP thermal magnetic Supplementary Protectors provide overcurrent protection for equipment where branch circuit protection is already provided, or is not required. These devices are also Miniature Circuit Breakers as defined by IEC Standards.

These supplementary protectors are offered as a broad portfolio of pole variants, current ratings, and trip curves to match the appropriate level of protection for your application. They may be used with UL 508 Listed bus bars for convenience in panel assembly, a wide range of left-, right- and space saving bottom-mount accessories, and lock out attachments for safety during maintenance.

## Features

- Current limiting
- Fast breaking time
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options, which require no DIN Rail space
- $40^{\circ} \mathrm{C}$ calibration temperature (UL/CSA) eliminates need to derate for 508 A industrial control panel installations
- Installation of up to six accessories on the same circuit breaker
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Superior shock and vibration resistance to prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device
- Suitable for extreme ambient conditions

Trip Curve C Trip Curve D
Resistive or Sightly inductive
$3 \ldots I_{\mathrm{n}}$
Cat. No. Inductive Highly Inductive $5 . .10 I_{n} \quad 10 \ldots 20 I_{n}$ Cat. No. Cat. No.

|  | 0.5 | 1492-SPM1B005 | 1492-SPM1C005 | 1492-SPM1D005 |
| :---: | :---: | :---: | :---: | :---: |
|  | 1 | 1492-SPM1B010 | 1492-SPM1C010 | 1492-SPM1D010 |
|  | 2 | 1492-SPM1B020 | 1492-SPM1C020 | 1492-SPM1D020 |
|  | 3 | 1492-SPM1B030 | 1492-SPM1C030 | 1492-SPM1D030 |
|  | 4 | 1492-SPM1B040 | 1492-SPM1C040 | 1492-SPM1D040 |
|  | 5 | 1492-SPM1B050 | 1492-SPM1C050 | 1492-SPM1D050 |
|  | 6 | 1492-SPM1B060 | 1492-SPM1C060 | 1492-SPM1D060 |
|  | 7 | 1492-SPM1B070 | 1492-SPM1C070 | 1492-SPM1D070 |
|  | 8 | 1492-SPM1B080 | 1492-SPM1C080 | 1492-SPM1D080 |
|  | 10 | 1492-SPM1B100 | 1492-SPM1C100 | 1492-SPM1D100 |
|  | 13 | 1492-SPM1B130 | 1492-SPM1C130 | 1492-SPM1D130 |
|  | 15 | 1492-SPM1B150 | 1492-SPM1C150 | 1492-SPM1D150 |
|  | 16 | 1492-SPM1B160 | 1492-SPM1C160 | 1492-SPM1D160 |
|  | 20 | 1492-SPM1B200 | 1492-SPM1C200 | 1492-SPM1D200 |
|  | 25 | 1492-SPM1B250 | 1492-SPM1C250 | 1492-SPM1D250 |
| $5 \overbrace{1-\text { pole }}^{11}$ | 30 | 1492-SPM1B300 | 1492-SPM1C300 | 1492-SPM1D300 |
|  | 32 | 1492-SPM1B320 | 1492-SPM1C320 | 1492-SPM1D320 |
|  | 40 | 1492-SPM1B400 | 1492-SPM1C400 | 1492-SPM1D400 |
|  | 50 | 1492-SPM1B500 | 1492-SPM1C500 | 1492-SPM1D500 |
|  | 63 | 1492-SPM1B630 | 1492-SPM1C630 | 1492-SPM1D630 |

1-Pole + Neutral Supplementary Protectors $\star$

| Photo/Wiring Diagram | Continuous Current Rating ( $\mathrm{In}_{\mathrm{n}}$ [A] | Trip Curve B Resistive or Slightly Inductive 3... $5 I_{n}$ <br> Cat. No. | Trip Curve C Inductive 5... $10 I_{n}$ Cat. No. | Trip Curve D Highly Inductive $10 . . .20 I_{n}$ <br> Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | 0.5 | 1492-SPM1B005-N | 1492-SPM1C005-N | 1492-SPM1D005-N |
|  | 1 | 1492-SPM1B010-N | 1492-SPM1C010-N | 1492-SPM1D010-N |
|  | 2 | 1492-SPM1B020-N | 1492-SPM1 CO2O-N | 1492-SPM1D020-N |
|  | 3 | 1492-SPM1B030-N | 1492-SPM1C030-N | 1492-SPM1D030-N |
|  | 4 | 1492-SPM1B040-N | 1492-SPM1CO40-N | 1492-SPM1D040-N |
| $\bullet$ | 5 | 1492-SPM1B050-N | 1492-SPM1C050-N | 1492-SPM1D050-N |
|  | 6 | 1492-SPM1B060-N | 1492-SPM1 C060-N | 1492-SPM1D060-N |
|  | 7 | 1492-SPM1B070-N | 1492-SPM1C070-N | 1492-SPM1D070-N |
|  | 8 | 1492-SPM1B080-N | 1492-SPM1 C080-N | 1492-SPM1D080-N |
|  | 10 | 1492-SPM1B100-N | 1492-SPM1C100-N | 1492-SPM1D100-N |
|  | 13 | 1492-SPM1B130-N | 1492-SPM1C130-N | 1492-SPM1D130-N |
|  | 15 | 1492-SPM1B150-N | 1492-SPM1C150-N | 1492-SPM1D150-N |
|  | 16 | 1492-SPM1B160-N | 1492-SPM1C160-N | 1492-SPM1D160-N |
|  | 20 | 1492-SPM1B200-N | 1492-SPM1C200-N | 1492-SPM1D200-N |
|  | 25 | 1492-SPM1B250-N | 1492-SPM1C250-N | 1492-SPM1D250-N |
| 11.1 | 30 | 1492-SPM1B300-N | 1492-SPM1C300-N | 1492-SPM1D300-N |
|  | 32 | 1492-SPM1B320-N | 1492-SPM1C320-N | 1492-SPM1D320-N |
| 1-pole +N | 40 | 1492-SPM1B400-N | 1492-SPM1C400-N | 1492-SPM1D400-N |
|  | 50 | 1492-SPM1B500-N | 1492-SPM1C500-N | 1492-SPM1D500-N |
|  | 63 | 1492-SPM1B630-N | 1492-SPM1C630-N | 1492-SPM1D630-N |

* $1+\mathrm{N}$ configurations are not UL or CSA certified.


## Supplementary Protector/Miniature Circuit Breaker

## Bulletin 1492-SP — Supplementary Protectors



Bulletin 1492-SP thermal magnetic Supplementary Protectors provide overcurrent protection for equipment where branch circuit protection is already provided, or is not required. These devices are also Miniature Circuit Breakers as defined by IEC Standards.

These supplementary protectors are offered as a broad portfolio of pole variants, current ratings, and trip curves to match the appropriate level of protection for your application. They may be used with UL 508 Listed bus bars for convenience in panel assembly, a wide range of left-, right- and space saving bottom-mount accessories, and lock out attachments for safety during maintenance.

## Features

- Current limiting
- Fast breaking time
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options, which require no DIN Rail space
- $40^{\circ} \mathrm{C}$ calibration temperature (UL/CSA) eliminates need to derate for 508 A industrial control panel installations
- Installation of up to six accessories on the same circuit breaker
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Superior shock and vibration resistance to prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device
- Suitable for extreme ambient conditions

Trip Curve C Trip Curve D
Resistive or Sightly inductive
$3 \ldots I_{\mathrm{n}}$
Cat. No. Inductive Highly Inductive $5 . .10 I_{n} \quad 10 \ldots 20 I_{n}$ Cat. No. Cat. No.

|  | 0.5 | 1492-SPM1B005 | 1492-SPM1C005 | 1492-SPM1D005 |
| :---: | :---: | :---: | :---: | :---: |
|  | 1 | 1492-SPM1B010 | 1492-SPM1C010 | 1492-SPM1D010 |
|  | 2 | 1492-SPM1B020 | 1492-SPM1 CO20 | 1492-SPM1D020 |
|  | 3 | 1492-SPM1B030 | 1492-SPM1C030 | 1492-SPM1D030 |
|  | 4 | 1492-SPM1B040 | 1492-SPM1 C040 | 1492-SPM1D040 |
|  | 5 | 1492-SPM1B050 | 1492-SPM1C050 | 1492-SPM1D050 |
|  | 6 | 1492-SPM1B060 | 1492-SPM1 C060 | 1492-SPM1D060 |
|  | 7 | 1492-SPM1B070 | 1492-SPM1C070 | 1492-SPM1D070 |
|  | 8 | 1492-SPM1B080 | 1492-SPM1C080 | 1492-SPM1D080 |
|  | 10 | 1492-SPM1B100 | 1492-SPM1C100 | 1492-SPM1D100 |
|  | 13 | 1492-SPM1B130 | 1492-SPM1C130 | 1492-SPM1D130 |
|  | 15 | 1492-SPM1B150 | 1492-SPM1C150 | 1492-SPM1D150 |
|  | 16 | 1492-SPM1B160 | 1492-SPM1C160 | 1492-SPM1D160 |
|  | 20 | 1492-SPM1B200 | 1492-SPM1C200 | 1492-SPM1D200 |
|  | 25 | 1492-SPM1B250 | 1492-SPM1C250 | 1492-SPM1D250 |
| $5 \overbrace{1-\text { pole }}^{11}$ | 30 | 1492-SPM1B300 | 1492-SPM1C300 | 1492-SPM1D300 |
|  | 32 | 1492-SPM1B320 | 1492-SPM1C320 | 1492-SPM1D320 |
|  | 40 | 1492-SPM1B400 | 1492-SPM1C400 | 1492-SPM1D400 |
|  | 50 | 1492-SPM1B500 | 1492-SPM1C500 | 1492-SPM1D500 |
|  | 63 | 1492-SPM1B630 | 1492-SPM1 C630 | 1492-SPM1D630 |

1-Pole + Neutral Supplementary Protectors $\star$

| Photo/Wiring Diagram | Continuous Current Rating ( $\mathrm{In}_{\mathrm{n}}$ [ A ] | Trip Curve B Resistive or Slightly Inductive $3 \ldots 5 I_{n}$ <br> Cat. No. | Trip Curve C Inductive 5... $10 I_{n}$ <br> Cat. No. | Trip Curve D Highly Inductive $10 . . .20 I_{n}$ <br> Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | 0.5 | 1492-SPM1B005-N | 1492-SPM1C005-N | 1492-SPM1D005-N |
|  | 1 | 1492-SPM1B010-N | 1492-SPM1C010-N | 1492-SPM1D010-N |
|  | 2 | 1492-SPM1B020-N | 1492-SPM1C020-N | 1492-SPM1D020-N |
|  | 3 | 1492-SPM1B030-N | 1492-SPM1C030-N | 1492-SPM1D030-N |
|  | 4 | 1492-SPM1B040-N | 1492-SPM1C040-N | 1492-SPM1D040-N |
|  | 5 | 1492-SPM1B050-N | 1492-SPM1C050-N | 1492-SPM1D050-N |
|  | 6 | 1492-SPM1B060-N | 1492-SPM1C060-N | 1492-SPM1D060-N |
|  | 7 | 1492-SPM1B070-N | 1492-SPM1C070-N | 1492-SPM1D070-N |
|  | 8 | 1492-SPM1B080-N | 1492-SPM1C080-N | 1492-SPM1D080-N |
|  | 10 | 1492-SPM1B100-N | 1492-SPM1C100-N | 1492-SPM1D100-N |
|  | 13 | 1492-SPM1B130-N | 1492-SPM1C130-N | 1492-SPM1D130-N |
|  | 15 | 1492-SPM1B150-N | 1492-SPM1C150-N | 1492-SPM1D150-N |
|  | 16 | 1492-SPM1B160-N | 1492-SPM1C160-N | 1492-SPM1D160-N |
|  | 20 | 1492-SPM1B200-N | 1492-SPM1C200-N | 1492-SPM1D200-N |
|  | 25 | 1492-SPM1B250-N | 1492-SPM1C250-N | 1492-SPM1D250-N |
| 1 | 30 | 1492-SPM1B300-N | 1492-SPM1C300-N | 1492-SPM1D300-N |
|  | 32 | 1492-SPM1B320-N | 1492-SPM1C320-N | 1492-SPM1D320-N |
| $\text { 1-pole }+\mathrm{N}$ | 40 | 1492-SPM1B400-N | 1492-SPM1C400-N | 1492-SPM1D400-N |
|  | 50 | 1492-SPM1B500-N | 1492-SPM1C500-N | 1492-SPM1D500-N |
|  | 63 | 1492-SPM1B630-N | 1492-SPM1C630-N | 1492-SPM1D630-N |

* $1+\mathrm{N}$ configurations are not UL or CSA certified.


## Supplementary Protector/Miniature Circuit Breaker

## Bulletin 1492-SP — Supplementary Protectors



Bulletin 1492-SP thermal magnetic Supplementary Protectors provide overcurrent protection for equipment where branch circuit protection is already provided, or is not required. These devices are also Miniature Circuit Breakers as defined by IEC Standards.

These supplementary protectors are offered as a broad portfolio of pole variants, current ratings, and trip curves to match the appropriate level of protection for your application. They may be used with UL 508 Listed bus bars for convenience in panel assembly, a wide range of left-, right- and space saving bottom-mount accessories, and lock out attachments for safety during maintenance.

## Features

- Current limiting
- Fast breaking time
- Existing installations can be easily upgraded to include an auxiliary using the bottom mounted auxiliary contact options, which require no DIN Rail space
- $40^{\circ} \mathrm{C}$ calibration temperature (UL/CSA) eliminates need to derate for 508 A industrial control panel installations
- Installation of up to six accessories on the same circuit breaker
- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
- Superior shock and vibration resistance to prevent nuisance tripping
- Terminal design helps prevent wiring misses by directing wires into the terminal openings, even while tightening
- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device
- Suitable for extreme ambient conditions

Trip Curve C Trip Curve D
Resistive or Sightly inductive
$3 \ldots I_{\mathrm{n}}$
Cat. No. Inductive Highly Inductive $5 . .10 I_{n} \quad 10 \ldots 20 I_{n}$ Cat. No. Cat. No.

| $\checkmark$ | 0.5 | 1492-SPM1B005 | 1492-SPM1C005 | 1492-SPM1D005 |
| :---: | :---: | :---: | :---: | :---: |
| - | 1 | 1492-SPM1B010 | 1492-SPM1C010 | 1492-SPM1D010 |
|  | 2 | 1492-SPM1B020 | 1492-SPM1C020 | 1492-SPM1D020 |
|  | 3 | 1492-SPM1B030 | 1492-SPM1C030 | 1492-SPM1D030 |
|  | 4 | 1492-SPM1B040 | 1492-SPM1C040 | 1492-SPM1D040 |
|  | 5 | 1492-SPM1B050 | 1492-SPM1C050 | 1492-SPM1D050 |
|  | 6 | 1492-SPM1B060 | 1492-SPM1C060 | 1492-SPM1D060 |
|  | 7 | 1492-SPM1B070 | 1492-SPM1C070 | 1492-SPM1D070 |
|  | 8 | 1492-SPM1B080 | 1492-SPM1C080 | 1492-SPM1D080 |
|  | 10 | 1492-SPM1B100 | 1492-SPM1C100 | 1492-SPM1D100 |
|  | 13 | 1492-SPM1B130 | 1492-SPM1C130 | 1492-SPM1D130 |
|  | 15 | 1492-SPM1B150 | 1492-SPM1C150 | 1492-SPM1D150 |
|  | 16 | 1492-SPM1B160 | 1492-SPM1C160 | 1492-SPM1D160 |
|  | 20 | 1492-SPM1B200 | 1492-SPM1C200 | 1492-SPM1D200 |
|  | 25 | 1492-SPM1B250 | 1492-SPM1C250 | 1492-SPM1D250 |
| 1 | 30 | 1492-SPM1B300 | 1492-SPM1C300 | 1492-SPM1D300 |
| $52$ | 32 | 1492-SPM1B320 | 1492-SPM1C320 | 1492-SPM1D320 |
|  | 40 | 1492-SPM1B400 | 1492-SPM1C400 | 1492-SPM1D400 |
|  | 50 | 1492-SPM1B500 | 1492-SPM1C500 | 1492-SPM1D500 |
|  | 63 | 1492-SPM1B630 | 1492-SPM1C630 | 1492-SPM1D630 |

1-Pole + Neutral Supplementary Protectors ${ }^{\star}$

| Photo/Wiring Diagram | Continuous Current Rating ( $\mathrm{I}_{\mathrm{n}}$ ) [A] | Trip Curve B Resistive or Slightly Inductive 3... $5 I_{n}$ <br> Cat. No. | Trip Curve C Inductive 5... $10 I_{n}$ Cat. No. | Trip Curve D Highly Inductive $10 . . .20 I_{n}$ <br> Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | 0.5 | 1492-SPM1B005-N | 1492-SPM1C005-N | 1492-SPM1D005-N |
|  | 1 | 1492-SPM1B010-N | 1492-SPM1C010-N | 1492-SPM1D010-N |
|  | 2 | 1492-SPM1B020-N | 1492-SPM1CO20-N | 1492-SPM1D020-N |
|  | 3 | 1492-SPM1B030-N | 1492-SPM1 CO30-N | 1492-SPM1D030-N |
|  | 4 | 1492-SPM1B040-N | 1492-SPM1C040-N | 1492-SPM1D040-N |
|  | 5 | 1492-SPM1B050-N | 1492-SPM1C050-N | 1492-SPM1D050-N |
|  | 6 | 1492-SPM1B060-N | 1492-SPM1C060-N | 1492-SPM1D060-N |
|  | 7 | 1492-SPM1B070-N | 1492-SPM1C070-N | 1492-SPM1D070-N |
|  | 8 | 1492-SPM1B080-N | 1492-SPM1C080-N | 1492-SPM1D080-N |
|  | 10 | 1492-SPM1B100-N | 1492-SPM1C100-N | 1492-SPM1D100-N |
|  | 13 | 1492-SPM1B130-N | 1492-SPM1C130-N | 1492-SPM1D130-N |
|  | 15 | 1492-SPM1B150-N | 1492-SPM1C150-N | 1492-SPM1D150-N |
|  | 16 | 1492-SPM1B160-N | 1492-SPM1C160-N | 1492-SPM1D160-N |
|  | 20 | 1492-SPM1B200-N | 1492-SPM1C200-N | 1492-SPM1D200-N |
|  | 25 | 1492-SPM1B250-N | 1492-SPM1C250-N | 1492-SPM1D250-N |
| 1 | 30 | 1492-SPM1B300-N | 1492-SPM1C300-N | 1492-SPM1D300-N |
|  | 32 | 1492-SPM1B320-N | 1492-SPM1C320-N | 1492-SPM1D320-N |
| $\text { 1-pole }+N$ | 40 | 1492-SPM1B400-N | 1492-SPM1C400-N | 1492-SPM1D400-N |
|  | 50 | 1492-SPM1B500-N | 1492-SPM1C500-N | 1492-SPM1D500-N |
|  | 63 | 1492-SPM1B630-N | 1492-SPM1C630-N | 1492-SPM1D630-N |

* $1+\mathrm{N}$ configurations are not UL or CSA certified.


## Supplementary Protector/Miniature Circuit Breaker

## Bulletin 1492-SP — Supplementary Protectors



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## Features

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- Dual terminals provide a more secure connection of up to four wires, or two wires and a bus bar
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- Reversible line and load connections
- Single and multi-pole toggle mount lock out attachments available for Lockout/Tagout (LOTO)
- RoHS compliant and fully-recyclable device
- Suitable for extreme ambient conditions

1-Pole Supplementary Protectors

| Photo/Wiring Diagram | Continuous Current Rating ( $I_{\mathrm{n}}$ ) [A] | Trip Curve B Resistive or Slightly Inductive $3 . .5 I_{n}$ Cat. No. | Trip Curve C Inductive 5... $10 I_{n}$ Cat. No. | Trip Curve D Highly Inductive $10 \ldots 20 I_{n}$ <br> Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | 0.5 | 1492-SPM1B005 | 1492-SPM1C005 | 1492-SPM1D005 |
|  | 1 | 1492-SPM1B010 | 1492-SPM1C010 | 1492-SPM1D010 |
|  | 2 | 1492-SPM1B020 | 1492-SPM1C020 | 1492-SPM1D020 |
|  | 3 | 1492-SPM1B030 | 1492-SPM1C030 | 1492-SPM1D030 |
|  | 4 | 1492-SPM1B040 | 1492-SPM1C040 | 1492-SPM1D040 |
|  | 5 | 1492-SPM1B050 | 1492-SPM1C050 | 1492-SPM1D050 |
|  | 6 | 1492-SPM1B060 | 1492-SPM1C060 | 1492-SPM1D060 |
|  | 7 | 1492-SPM1B070 | 1492-SPM1C070 | 1492-SPM1D070 |
|  | 8 | 1492-SPM1B080 | 1492-SPM1C080 | 1492-SPM1D080 |
|  | 10 | 1492-SPM1B100 | 1492-SPM1C100 | 1492-SPM1D100 |
|  | 13 | 1492-SPM1B130 | 1492-SPM1C130 | 1492-SPM1D130 |
|  | 15 | 1492-SPM1B150 | 1492-SPM1C150 | 1492-SPM1D150 |
|  | 16 | 1492-SPM1B160 | 1492-SPM1C160 | 1492-SPMTD160 |
|  | 20 | 1492-SPM1B200 | 1492-SPM1C200 | 1492-SPM1D200 |
|  | 25 | 1492-SPM1B250 | 1492-SPM1C250 | 1492-SPM1D250 |
| 11 | 30 | 1492-SPM1B300 | 1492-SPM1C300 | 1492-SPM1D300 |
| $y$ | 32 | 1492-SPM1B320 | 1492-SPM1C320 | 1492-SPM1D320 |
|  | 40 | 1492-SPM1B400 | 1492-SPM1C400 | 1492-SPM1D400 |
|  | 50 | 1492-SPM1B500 | 1492-SPM1C500 | 1492-SPM1D500 |
|  | 63 | 1492-SPM1B630 | 1492-SPM1C630 | 1492-SPM1D630 |

1-Pole + Neutral Supplementary Protectors $\star$

| Photo/Wiring Diagram | Continuous Current Rating ( $I_{\mathrm{n}}$ ) [A] | Trip Curve B Resistive or Slightly Inductive 3... $5 I_{n}$ Cat. No. | Trip Curve C Inductive 5... $10 I_{n}$ Cat. No. | Trip Curve D Highly Inductive $10 \ldots 20 I_{n}$ Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  | 0.5 | 1492-SPM1B005-N | 1492-SPM1C005-N | 1492-SPM1D005-N |
|  | 1 | 1492-SPM1B010-N | 1492-SPM1C010-N | 1492-SPM1D010-N |
|  | 2 | 1492-SPM1B020-N | 1492-SPM1C020-N | 1492-SPM1D020-N |
|  | 3 | 1492-SPM1B030-N | 1492-SPM1C030-N | 1492-SPM1D030-N |
|  | 4 | 1492-SPM1B040-N | 1492-SPM1C040-N | 1492-SPM1D040-N |
|  | 5 | 1492-SPM1B050-N | 1492-SPM1C050-N | 1492-SPM1D050-N |
|  | 6 | 1492-SPM1B060-N | 1492-SPM1C060-N | 1492-SPM1D060-N |
|  | 7 | 1492-SPM1B070-N | 1492-SPM1C070-N | 1492-SPM1D070-N |
|  | 8 | 1492-SPM1B080-N | 1492-SPM1C080-N | 1492-SPM1D080-N |
|  | 10 | 1492-SPM1B100-N | 1492-SPM1C100-N | 1492-SPM1D100-N |
|  | 13 | 1492-SPM1B130-N | 1492-SPM1C130-N | 1492-SPM1D130-N |
|  | 15 | 1492-SPM1B150-N | 1492-SPM1C150-N | 1492-SPM1D150-N |
|  | 16 | 1492-SPM1B160-N | 1492-SPM1C160-N | 1492-SPM1D160-N |
|  | 20 | 1492-SPM1B200-N | 1492-SPM1C200-N | 1492-SPM1D200-N |
|  | 25 | 1492-SPM1B250-N | 1492-SPM1C250-N | 1492-SPM1D250-N |
| $\left.1{ }^{1}\right\|^{N}$ | 30 | 1492-SPM1B300-N | 1492-SPM1C300-N | 1492-SPM1D300-N |
| $\lambda$ | 32 | 1492-SPM1B320-N | 1492-SPM1C320-N | 1492-SPM1D320-N |
| $\text { 1-pole }+N$ | 40 | 1492-SPM1B400-N | 1492-SPM1C400-N | 1492-SPM1D400-N |
|  | 50 | 1492-SPM1B500-N | 1492-SPM1C500-N | 1492-SPM1D500-N |
|  | 63 | 1492-SPM1B630-N | 1492-SPM1C630-N | 1492-SPM1D630-N |

[^3]

## General Description

The Allen-Bradley Bulletin 1606-XLE power supplies are cost optimized without compromising quality, reliability and performance. Cat. No. 1606-XLE480EP offers high efficiency, electronic inrush current limitation, active PFC, and a wide operational temperature range. The small size is achieved by a synchronous rectification and further technological design details.

The Bulletin 1606-XLE line of power supplies includes all the essential basic functions. The devices have a power reserve of $20 \%$ included, which may even be used continuously at temperatures up to $+45^{\circ} \mathrm{C}$. Additionally, Cat. No. 1606-XLE480EP can deliver approximately 4 times the nominal output current for 15 ms which helps to trip fuses on faulty output branches.

High immunity to transients and power surges as well as low electromagnetic emission, a DC-OK relay contact and a large international approval package for a variety of applications makes this unit suitable for nearly every situation.

| CATALOG NUMBERS |  | 24-28V Standard unit |
| :---: | :---: | :---: |
| Power Supply | 1606-XLE480EP |  |
| Accessories | 1606-XLE480EPC | Conformal coated |
|  | 1606-XLC | Wall Mount Bracket |
|  | 1606-XLSRED4OHE | Redundancy Module |
|  | 1606-XLSREDS40HE | Redundancy Module |
|  | 1606-XLSRED40 | Redundancy Module |

## Power Supply

- AC $100-240 \mathrm{~V}$ Wide-range Input
- Width only 65 mm
- Efficiency up to $94.0 \%$
- Excellent Partial Load Efficiency
- $20 \%$ Output Power Reserves
- Safe Hiccup ${ }^{P L U S}$ Overload Mode
- Easy Fuse Breaking due to High Overload Current (typ. 80A for 15ms)
- Active Power Factor Correction (PFC)
- Minimal Inrush Current Surge
- Full Power Between $-25^{\circ} \mathrm{C}$ and $+60^{\circ} \mathrm{C}$
- DC-OK Relay Contact
- Current Sharing Feature for Parallel Use
- 3 Year Warranty

Specifications

| Output voltage | DC 24V |  |
| :---: | :---: | :---: |
| Adjustment range | 24-28V |  |
| Output current | 20A | at $24 \mathrm{~V}, \mathrm{amb}<60^{\circ} \mathrm{C}$ |
|  | 24A | at $24 \mathrm{~V}, \mathrm{amb}<45^{\circ} \mathrm{C}$ |
|  | 17.1A | at $28 \mathrm{~V}, \mathrm{amb}<60^{\circ} \mathrm{C}$ |
|  | 20.6A | at $28 \mathrm{~V}, \mathrm{amb}<45^{\circ} \mathrm{C}$ |
| Output power | 480W | ambient $<60^{\circ} \mathrm{C}$ |
|  | 576W | ambient $<45^{\circ} \mathrm{C}$ |
| Output ripple | <50mVpp | 20 Hz to 20MHz |
| AC Input voltage | AC 100-240V | -15\%/+10\% |
| Mains frequency | $50-60 \mathrm{~Hz}$ | $\pm 6 \%$ |
| AC Input current | 4.36/2.33A | at $120 / 230 \mathrm{Vac}$ |
| Power factor | 0.99/0.95 | at 120 / 230Vac |
| AC Inrush current | typ. 9/7A peak | at $120 / 230 \mathrm{Vac}$ |
| Efficiency | 92.7/94.0\% | at $120 / 230 \mathrm{Vac}$ |
| Losses | 37.8 / 30.6W | at $120 / 230 \mathrm{Vac}$ |
| Temperature range | $-25^{\circ} \mathrm{Cto}+70^{\circ} \mathrm{C}$ | operational |
| Derating | $12 \mathrm{~W} /{ }^{\circ} \mathrm{C}$ | +60 to $+70^{\circ} \mathrm{C}$ |
|  | between $100-85 \mathrm{Vac}$, see chapter 15 , Environment on page 13 |  |
| Hold-up time | typ. $26 / 26 \mathrm{~ms}$ | at 120 / 230Vac |
| Dimensions | $65 \times 124 \times 127 \mathrm{~mm}$ | WxHxD |
| Weight | $1000 \mathrm{~g} / 2.2 \mathrm{lb}$ |  |

## Certifications

## C. $\begin{aligned} & \text { UL } \\ & \text { US LISTED } \\ & \text { IND CONT. EQ. }\end{aligned}$ <br> UL 508



EMC, LVD, RoHS

## 3.AC-Input


*) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.
${ }^{* *}$ ) The crest factor is the mathematical ratio of the peak value to RMS value of the input current waveform.

Fig. 3-1: Input voltage range


Fig. 3-3: Input current vs. output load at 24V


Fig. 3-2: Turn-on behaviour, definitions


Fig. 3-4: Power factor vs. output load


## 6. Output

| Output voltage | nom. | 24 V |  |
| :---: | :---: | :---: | :---: |
| Adjustment range | min. | 24-28V | guaranteed |
|  | max. | $30{ }^{* * * *}$ | at clockwise end position of potentiometer |
| Factory settings | typ. | 24.1 V | $\pm 0.2 \%$, at full load, cold unit, in "single use" mode |
|  | typ. | 24.1V | $\pm 0.2 \%$, at full load, cold unit, in "parallel use" mode |
|  | typ. | 25.1V | at no load, cold unit, in "parallel use" mode |
| Line regulation | max. | 10 mV | $85-300 \mathrm{Vac}$ |
| Load regulation | max. | 100 mV | in "single use" mode: static value, $0 \mathrm{~A} \rightarrow 20 \mathrm{~A}$; |
|  |  |  | see Figure 6-1 |
|  | typ. | 1000 mV | in "parallel use" mode: static value, $0 \mathrm{~A} \rightarrow 2 \mathrm{~A}$, |
|  |  |  | see Figure 6-2 |
| Ripple and noise voltage | max. | 50 mVpp | 20 Hz to 20MHz, 500 hm |
| Output current | nom. | 20A | at 24 V , ambient temperature $<60^{\circ} \mathrm{C}$, see Figure 6-1 |
|  | nom. | $24 A^{*}{ }^{\text {( }}$ | at 24V, ambient temperature $<45^{\circ}$, seeFigure 6-1 |
|  | nom. | 17.1A | at 28 V , ambient temperature $<60^{\circ} \mathrm{C}$, see Figure 6-1 |
|  | nom. | $20.6 \mathrm{~A}^{*}$ | at 28 V , ambient temperature $<45^{\circ} \mathrm{C}$, see Figure 6-1 |
|  | typ. | 80A | up to 15 ms , output voltage stays above 20 V , see Figure $6-4$, This peak current is available once every five seconds. Refer to Peak Current Capability on page 19 for more peak current measurements. |
| Output power | nom. | 480W | continuously available |
|  | nom. | 576W*) | Power Boost ${ }^{\text {* }}$ ) |
| Overload behaviour |  | cont. current | output voltage > 13Vdc, see Figure 6-1 |
|  |  | Hiccup ${ }^{\text {PLUS }}$ mode ${ }^{* * *}$ | output voltage $<13 \mathrm{Vdc}$, see Figure 6-1 |
| Short-circuit current | min. | 35A**) | load impedance <10m0hm, see Figure 6-3 |
|  | max. | 45A**) | load impedance < 10 mOhm , see Figure 6-1 |
|  | max. | $15 A^{* * *)}$ | average (R.M.S.) current, load impedance 50 m 0 hm , see Figure 6-3 |
|  | min. | 70A | up to 15 ms , load impedance $<10 \mathrm{mOhm}$, see Figure 6-4 |
|  | typ. | 100A | up to 15 ms , load impedance $<10 \mathrm{~m} 0 \mathrm{hm}$, see Figure 6-4 |
| Output capacitance | typ. | 70004F | included inside the power supply |

*) Power Boost This power/ current is continuously allowed up to an ambient temperature of $45^{\circ} \mathrm{C}$. Above $45^{\circ} \mathrm{C}$, do not use this power/ current longer than a duty cycle of $10 \%$ and or not longer than 1 minute every 10 minutes.
${ }^{* *}$ ) Hiccup ${ }^{\text {PLUS }}$ Mode At heavy overloads (when output voltage falls below 13 V ), the power supply delivers continuous output current for 2 s. After this, the output is switched off for approx. 18 s before a new start attempt is automatically performed. This cycle is repeated as long as the overload exists. If the overload has been cleared, the device will operate normally. See Figure 6-3
***) Discharge current of output capacitors is not included.
${ }^{* * * *)}$ ) This is the maximum output voltage which can occur at the clockwise end position of the potentiometer due to tolerances. It is not guaranteed value which can be achieved. The typical value is about 28.5 V (in "single use" mode).

Fig. 6-1: Output voltage vs. output current, typ.


Fig. 6-3: Short-circuit on output, Hiccup ${ }^{P L U S}$ mode, typ.

Fig. 6-2: Output voltage in "parallel use" mode, typ.


Fig. 6-4: Dynamic overcurrent capability, typ.


## 7. Hold-up Time

|  | AC 100V | AC 120V | AC 230V |  |
| :---: | :---: | :---: | :---: | :---: |
| Hold-up Time | typ. | 65 ms | 65 ms | 65 ms |
|  | min. | 54 ms | 54 ms | at 24V, 10A, see Figure 7-1 |
|  | typ. | 26 ms | 26 ms | 26 ms |
|  | min. | 21 ms | 21 ms | at 24V, 10A, see Figure 7-1 |
|  |  | at 24V, 20A, see Figure 7-1 |  |  |
|  |  | at 24V, 20A, see Figure 7-1 |  |  |

Fig. 7-1: Hold-up time vs. input voltage

| Hold-up Time |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |
| $70----L---L-24 \mathrm{~V}, 10 \mathrm{~A}, \text { typ. }$ |  |  |  |  |
|  |  |  |  |  |
|  |  | $-\vdash-\overline{2} \overline{4 V}, 1 \overline{0} \bar{A}, \overline{\text { min }}{ }^{+} .--$ |  |  |
|  |  |  |  |  |
| $30--------24 \mathrm{~V}, 20 \mathrm{~A}$, typ. -- |  |  |  |  |
|  |  |  |  |  |
|  |  | - | V, 20 | min |
| 0 |  | Input | oltag |  |
| 90 | 120 | 155 | 190 | 230Vac |

Fig. 7-2: Shut-down behavior, definitions


## 8. DC-OK Relay

This feature monitors the output voltage, which is produced by the power supply itself. It is independent of a back-fed voltage from a unit connected in parallel to the power supply output.

| Contact closes | As soon as the output voltage reaches $90 \%$ of the adjusted output voltage level. |  |
| :--- | :--- | :--- |
| Contact opens | As soon as the output voltage dips more than 10\% below the adjusted output voltage. |  |
|  | Short dips will be extended to a signal length of 100 ms. Dips shorter than 1ms will be ignored. |  |
| Contact ratings | max. | $60 \mathrm{Vdc} 0.3 \mathrm{~A}, 30 \mathrm{Vdc} 1 \mathrm{~A}, 30 \mathrm{Vac} 0.5 \mathrm{~A}$ |
|  | min. | resistive load |
|  | Refer to Dielectric Strength on page 14. | min. permissible load |
| Isolation voltage |  |  |

Fig. 8-1: DC-ok relay contact behavior


## 9. Efficiency and Power Losses

|  |  | AC 100V | AC 120V | AC 230V |  |
| :--- | :---: | :---: | :---: | :---: | :--- |
| Efficiency | typ. | $92.0 \%$ | $92.7 \%$ | $94.0 \%$ | at 24V, 20A |
|  | typ. | $91.6 \%$ | $92.4 \%$ | $94.0 \%$ | at 24V, 24A (Power Boost) |
| Average efficiency ${ }^{*}$ ) | typ. | $91.3 \%$ | $92.0 \%$ | $93.3 \%$ | $25 \%$ at $5 \mathrm{~A}, 25 \%$ at 10 A, |
|  |  |  |  |  | $25 \%$ at 15A. 25\% at 20A |
| Power losses | typ. | 6.5 W | 3.9 W | 2.6 W | at 24V, 0A |
|  | typ. | 21.1 W | 20.1 W | 17.0 W | at 24V, 10A |
|  | typ. | 41.7 W | 37.8 W | 30.6 W | at 24V, 20A |
|  | typ. | 52.8 W | 47.4 W | 36.8 W | at 24V, 24A (Power Boost) |

${ }^{*}$ ) The average efficiency is an assumption for a typical application where the power supply is loaded with $25 \%$ of the nominal load for $25 \%$ of the time, $50 \%$ of the nominal load for another $25 \%$ of the time, $75 \%$ of the nominal load for another $25 \%$ of the time and with $100 \%$ of the nominal load for the rest of the time.

Fig. 9-1: Efficiency vs. output current at 24V, typ


Fig. 9-3: Efficiency vs. input voltage at 24V, 20A, typ.


Fig. 9-2: Losses vs. output current at 24V, typ.


Fig. 9-4: Losses vs. input voltage at 24V, 20A, typ.


## Compact I/O Accessories

| Category | Cat. No. | Description |
| :---: | :---: | :---: |
| End cap | 1769-ECL | Left-end cap for Compact I/0 system |
|  | 1769-ECR | Right-end cap for Compact I/O system |
| Expansion cable | 1769-CLL1 | Left bank-to-left bank expansion 305 mm (1 ft) |
|  | 1769-CLL3 | Left bank-to-left bank expansion 1 m ( 3.28 ft ) |
|  | 1769-CRR1 | Right bank-to-right bank expansion 305 mm (1 ft) |
|  | 1769-CRR3 | Right bank-to-right bank expansion 1 m ( 3.28 ft ) |
|  | 1769-CRL1 | Right bank-to-left bank expansion 305 mm (1 ft) |
|  | 1769-CRL3 | Right bank-to-left bank expansion 1 m (3.28 ft) |
| Replacement terminal block | 1769-RTBN10 | 10-pin NEMA terminal block |
|  | 1769-RTBN18 | 18-pin NEMA terminal block |
| Replacement door labels | 1769-RL1 | Replacement door labels for digital I/0, 2 per kit |
|  | 1769-RL2 | Replacement door labels for analog and specialty $\mathrm{I} / 0,2$ per kit |
| Replacement doors | 1769-RD | Door replacement kit, 2 per kit |
| Replacement connector kit | 1746-N3 | Connector kit to terminate a cable, which connects field I/0 devices to 32-point I/0 modules, 1 connector and 40 terminals |

## End Caps

The final I/O bank in Compact system needs an end cap on the end without the expansion cable. The 1769-L23x controller comes with a right-end cap, so you do not need to order one separately.


## Table 114 - Technical Specifications - 1769-ECL, 1769-ECR

| Attribute | 1769-ECL | 1769-ECR |
| :--- | :--- | :--- | :--- |
| Current draw @ 5.1V | 5 mA |  |
| Current draw @ 24V | 0 mA |  |
| Weight, approx | $130 \mathrm{~g}(0.286 \mathrm{lb})$ | Right end |
| Location | Left end |  |
| North American temperature code | T3C | T4 |
| IEC temperature code | N/A | None (open-style) |
| Enclosure type rating | None (open-style) |  |

## 1769-IF8



Compact voltage/current analog input module
1769-IF8 Differential Inputs


1769-IF8 Single-ended Sensor/Transmitter Inputs The sensor power supply must be rated Class 2.


Wiring for channels 4... 7 are identical.


Wiring for channels 4...7 are identical.

Table 22 - Technical Specifications - 1769-IF8

| Attribute | 1769-IF8 |
| :---: | :---: |
| Inputs | 8 differential or single-ended |
| Input range | $\begin{aligned} & \pm 10 \mathrm{~V} \\ & 0 \ldots 10 \mathrm{~V} \\ & 0 \ldots . \ldots \mathrm{V} \\ & 1 \ldots . .5 \mathrm{~V} \\ & 0 \ldots 20 \mathrm{~mA} \\ & 4 \ldots . .20 \mathrm{~mA} \end{aligned}$ |
| Full scale range ${ }^{(1)}$ | $\begin{aligned} & \pm 10.5 \mathrm{~V} \\ & -0.5 \ldots 10.5 \mathrm{~V} \\ & -0.5 \ldots 5.25 \mathrm{~V} \\ & 0.5 \ldots .5 .25 \mathrm{~V} \\ & 0 \ldots .21 \mathrm{~mA} \\ & 3.2 \ldots .21 \mathrm{~mA} \end{aligned}$ |
| Current draw @ 5.1V | 120 mA |
| Current draw @ 24V | 70 mA |
| Converter type | Delta Sigma |
| Heat dissipation, max | 3.24 W |
| Resolution ${ }^{(2)}$ | 16 bits (unipolar) 15 bits plus sign (bipolar) |
| Rated working voltage ${ }^{(3)}$ | $30 \mathrm{VAC} / 30 \mathrm{VDC}$ |
| Common mode voltage range ${ }^{(4)}$ | $\pm 10 \mathrm{~V}$ DC max per channel |
| Common mode rejection | $>60 \mathrm{~dB}$ @ 50 and 60 Hz with the 10 Hz filter selected |
| Normal mode rejection ratio | $-50 \mathrm{~dB} @ 50$ and 60 Hz with the 10 Hz filter selected |
| Input impedance | Voltage: $220 \mathrm{k} \Omega$ <br> Current: $250 \Omega$ |
| Accuracy ${ }^{(5)}$ | Voltage: $\pm 0.2 \%$ full scale @ $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ Current: $\pm 0.35 \%$ full scale @ $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ |

Table 22 - Technical Specifications - 1769-IF8

| Attribute | 1769-IF8 |
| :---: | :---: |
| Accuracy drift with temperature | Voltage: $\pm 0.003 \%$ per ${ }^{\circ} \mathrm{C}$ Current: $\pm 0.0045 \%$ per ${ }^{\circ} \mathrm{C}$ |
| Nonlinearity | $\pm 0.03 \%$ |
| Repeatability ${ }^{(6)}$ | $\pm 0.03 \%$ |
| Module error | Voltage: $\pm 0.3 \%$ Current: $\pm 0.5 \%$ |
| Overload at input terminals, max ${ }^{(7)}$ | Voltage: $\pm 30 \mathrm{~V}$ DC continuous, 0.1 mA Current: $\pm 32 \mathrm{~mA}$ continuous, $\pm 7.6 \mathrm{~V}$ DC |
| Isolation voltage | 500V AC or 710 V DC for 1 minute (qualification test), group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation) |
| Weight, approx | $450 \mathrm{~g}(0.99 \mathrm{lb})$ |
| Dimensions (HxWxD), approx | $118 \times 52.5 \times 87 \mathrm{~mm}$ ( $4.65 \times 2.07 \times 3.43$ in.) Height with mounting tabs 138 mm ( 5.43 in.) |
| Slot width | 1.5 |
| Module location | DIN rail or panel mount |
| Power supply | 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4 |
| Power supply distance rating | 8 modules |
| Terminal screw torque | 0.68 Nom (61boin) |
| Retaining screw torque | 0.46 Nom (4.1 l boin) |
| Wire size | (22... 14 AWG) solid <br> (22...16 AWG) stranded |
| Wire type | $\mathrm{Cu}-90^{\circ} \mathrm{C}\left(194{ }^{\circ} \mathrm{F}\right)$ |
| Replacement terminal block | 1769-RTBN18 (1 per kit) |
| Replacement door label | 1769-RLL series B (2 per kit) |
| Replacement door | 1769-RD (2 per kit) |
| Vendor ID code | 1 |
| Product type code | 10 |
| Product code | 38 |
| Enclosure type rating | None (open-style) |

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Resolution is dependent upon your filter selection. The maximum resolution is achieved with either the 50 or 60 Hz filter selected.
(3) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential. For example, a 10 V DC input signal and 2OV DC potential above ground at the input terminal.
(4) For proper operation, both the plus and minus input terminals must be within $\pm 10 \mathrm{~V} D$ of analog common.
(5) Includes offset, gain, nonlinearity, and repeatability error terms.
(6) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.
(7) Damage can occur to the input circuit if this value is exceeded.

## Table 23 - Response Speed - 1769-IF8

| Filter Frequency | Update Time Per Channel | Update Time Per Module |
| :--- | :--- | :--- |
| 10 Hz | 100 ms | 400 ms |
| 50 Hz | 30 ms | 120 ms |
| 60 Hz | 30 ms | 120 ms |
| 250 Hz | 9 ms | 36 ms |
| 500 Hz | 6 ms | 24 ms |

## Table 24 - Certifications - 1769-IF8

| Certification $^{(1)}$ | $\mathbf{1 7 6 9 - I F 8}$ |
| :--- | :--- |
| c-UL | C-UL certified (under CSA C22.2 No. 142) <br> UL 508 listed <br> Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213) |
| CE | CE compliant for all applicable directives |
| C-Tick | Australian Radiocommunications Act, compliant with: <br> AS/NZS CISPR 11; Industrial Enclosure |

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

## 1769-IQ16



Compact 24V DC sink/source input module


Table 35 - Technical Specifications - 1769-IQ16

| Attribute | 1769-IQ16 |
| :---: | :---: |
| Inputs | 16 (8 points/group) |
| Voltage category | 24V DC sink/source |
| Operating voltage range | $\begin{aligned} & 10 \ldots 30 \mathrm{VCC} @ 30^{\circ} \mathrm{C}\left(86^{\circ} \mathrm{F}\right) \\ & 10 \ldots 26.4 \mathrm{VC} @ 60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right) \end{aligned}$ |
| Input delay, on | 8 ms |
| Input delay, off | 8 ms |
| Current draw @ 5.1V | 115 mA |
| Heat dissipation, max | 3.55 W |
| Off-state voltage, max | 5 V DC |
| Off-state current, max | 1.5 mA |
| On-state voltage, min | 10 VDC |
| On-state current, min | 2 mA |
| Inrush current, max | 250 mA |
| Input impedance, nom | $3 \mathrm{k} \Omega$ |
| Isolation voltage | Verified by one of the following dielectric tests: 1200V AC for 1 s or 1697V DC for 1 s, input point to bus and group to group <br> $75 V$ DC working voltage (IEC Class 2 reinforced insulation) |
| Weight, approx | $270 \mathrm{~g}(0.60 \mathrm{lb})$ |
| Dimensions (HxWxD), approx | $118 \times 35 \times 87 \mathrm{~mm}$ ( $4.65 \times 1.38 \times 3.43 \mathrm{in}$.) Height with mounting tabs 138 mm (5.43 in.) |
| Slot width | 1 |

Table 35-Technical Specifications - 1769-IQ16

| Attribute | 1769-1016 |
| :---: | :---: |
| Module location | DIN rail or panel mount |
| Power supply | 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4 |
| Power supply distance rating | 8 modules |
| Terminal screw torque | 0.68 Nom (6 lboin) |
| Retaining screw torque | 0.46 Nom (4.1 lboin) |
| Wire size | (22... 14 AWG) solid <br> (22...16 AWG) stranded |
| Wire type | $\mathrm{Cu}-90^{\circ} \mathrm{C}\left(194{ }^{\circ} \mathrm{F}\right)$ |
| IEC input compatibility | Type 1+ |
| Replacement terminal block | 1769-RTBN18 (1 per kit) |
| Replacement door label | 1769-RL1 (2 per kit) |
| Replacement door | 1769-RD (2 per kit) |
| Vendor ID code | 1 |
| Product type code | 7 |
| Product code | 67 |
| Enclosure type rating | None (open-style) |

Table 36 - Certifications - 1769-IQ16

| Certification $^{(1)}$ | $\mathbf{1 7 6 9 - I Q 1 6}$ |
| :--- | :--- |
| c-UL | C-UL certified (under CSA C22.2 No. 142) <br> UL 508 listed <br> Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213) |
| CE | CE compliant for all applicable directives |
| C-Tick | Australian Radiocommunications Act, compliant with: <br> AS/NZS CISPR 11; Industrial Enclosure |

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

## CompactLogix System

Catalog Numbers:

- Armor Compact GuardLogix 5370
- Armor CompactLogix 5370
- Compact GuardLogix 5370
- CompactLogix 5370
- CompactLogix 5380


| Characteristic | CompactLogix ${ }^{\text {TM }} 5380$ Controllers |  | CompactLogix 5370 L3 Controllers Compact GuardLogix 5370 L3 Controllers Armor CompactLogix 5370 L3 Controllers Armor Compact GuardLogix 5370 Controllers |  |
| :---: | :---: | :---: | :---: | :---: |
| Controller taks: <br> - Continuous <br> - Periodic <br> - Event | - 32 <br> - 1000 programs/task |  | - 32 <br> - 1000 programs/task |  |
| Event tasks | Consumed tag, EVENT instruction triggers, Module Input Data changes, and motion events |  | Consumed tag, EVENT instruction triggers and motion events |  |
| User memory | 5069-L306ER, 5069-L306ERM | 0.6 MB | 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM | 1 MB |
|  | 5069-L310ER, 5069-L310ERNSE, 5069-L310ERM | 1 MB | 1769-L33ER, 1769-L33ERM, 1769-L33ERM0 | 2 MB |
|  | 5069-L320ER, 5069-L320ERM | 2 MB | 1769-L36ERM, 1769-L36ERM0, 1769-L37ERM0 | 3 MB |
|  | 5069-L330ER, 5069-L330ERM | 3 MB | 1769-L30ERMS | $1 \mathrm{MB}+0.5 \mathrm{MB}$ safety |
|  | 5069-L340ER, 5069-L340ERM | 4MB | 1769-L33ERMS, 1769-L33ERMOS | $2 \mathrm{MB}+1 \mathrm{MB}$ safety |
|  | 5069-L350ERM | 5 MB | 1769-L36ERMS, 1769-L36ERMOS, 1769-L37ERM0S | $3 \mathrm{MB}+1.5 \mathrm{MB}$ safety |
|  | 5069-L380ERM | 8 MB |  |  |
|  | 5069-L3100ERM | 10 MB |  |  |
| Built-in ports | - 2 - EtherNet//IP ports, 10 Mpbs/100 Mbps/1 Gbps <br> - 1 port USB client |  | - Dual-port EtherNet/IP <br> - 1 port USB Client |  |
| Communication options | - EtherNet/IP <br> - USB Client |  | - EtherNet/P <br> - Embedded switch <br> - Single IP address <br> - DeviceNet <br> - USB Client |  |
| Controller connections | - |  | 256 connections |  |
| Network nodes | Studio 5000 Logix Designer application, version 30 or later |  |  |  |
|  | 5069-L306ER, 5069-L306ERM | 16 | 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMS | 8 |
|  | 5069-L310ER, 5069-L310ERNSE, 5069-L310ERM | 24 | 1769-L33ER, 1769-L33ERM, 1769-L33ERMS, 1769-L33ERM0, 1769-L33ERMOS | 16 |
|  | 5069-L320ER, 5069-L320ERM | 40 | 1769-L36ERM, 1769-L36ERMS, 1769-L36ERM0, 1769-L36ERMOS | 48 |
|  | 5069-L330ER, 5069-L330ERM | 50 | 1769-L37ERM0, 1769-L37ERMOS | 64 |
|  | 5069-L340ER, 5069-L340ERM | 55 |  |  |
|  | 5069-L350ERM | 60 |  |  |
|  | 5069-L380ERM | 70 |  |  |
|  | 5069-L3100ERM | 80 |  |  |
| Controller redundancy | None |  | Backup via DeviceNet - CompactLogix 5370 L3 Controllers and Compact GuardLogix 5370 L3 controllers only |  |
| Integrated motion | EtherNet/IP |  | EtherNet/IP |  |
| Conformal coating | Custom ${ }^{(1)}$ |  | Custom ${ }^{(1)}$ |  |

## CompactLogix Controllers

The CompactLogix platform brings together the benefits of a common programming environment, common networks, and common control engine in a small footprint with high performance. Combined with 1769 Compact I/O or COMPACT 5000 I/O modules, the CompactLogix platform is perfect for tackling smaller, machine-level control applications, with or without simple motion, with unprecedented power and scalability. A CompactLogix
 platform is ideal for systems that require standalone and system-connected control over EtherNet/IP, ControlNet, or DeviceNet networks.

For detailed specifications, see the following publications:

- CompactLogix 5380 Controllers Specifications Technical Data, publication 5069-TD002
- CompactLogix Controllers Specifications Technical Data, publication 1769-TD005

| Characteristic | CompactLogix 5380 Controllers | CompactLogix 5370 L1 Controllers | CompactLogix 5370 L2 Controllers | CompactLogix 5370 L3 Controllers | Armor CompactLogix Controllers | Armor Compact GuardLogix Controllers |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Controller application | High-performance applications Local COMPACT 5000 1/0 modules | Small applications Embedded 1734 I/0 modules | Small applications Embedded 1769 Compact 1/0 modules | General-purpose | On-Machine ${ }^{\text {mm }}$ | On-Machine |
| Controller tasks | 32; 1000 programs/task | 32; 1000 programs/task | 32; 1000 programs/task | 32; 1000 programs/task | 32; 1000 programs/task | 32; 1000 programs/task |
| Event tasks | Consumed tag, EVENT instruction triggers, Module Input Data changes, and motion events | Consumed tag, EVENT instruction, embedded inputs, axis, and motion event triggers | Consumed tag, EVENT instruction, axis, and motion event triggers | Consumed tag, EVENT instruction, axis, and motion event triggers | Consumed tag, EVENT instruction, axis, and motion event triggers | Consumed tag, EVENT instruction, axis, and motion event triggers |
| User memory | - 5069-L306ER, 5069-L306ERM: 0.6 MB <br> - 5069-L310ER, 5069-L310ER-NSE, 5069-L310ERM: 1 MB <br> - 5069-L320ER, 5069-L320ERM: 2 MB <br> - 5069-L330ER, 5069-L330ERM: 3 MB <br> - 5069-L340ER, 5069-L340ERM: 4 MB <br> - 5069-L350ERM: 5 MB <br> - 5069-L380ERM: 8 MB <br> - 5069-L3100ERM: 10 MB | - 1769-L16ER-BB1B: 384 KB <br> - 1769-L18ER-BB1B, 1769-L18ERM-BB1B: 512 KB <br> - 1769-L19ER-BB1B: 1 MB | - 1769-L24ER-0B1B, 1769-L24ER-QBFC1B: 750 KB <br> - 1769-L27ERM-QBFC1B: 1 MB |  | - 1769-L33ERMO: 2MB <br> - 1769-L36ERM0, 1769-L37ERMO: 3 MB | - 1769-L33ERMOS: <br> $2 \mathrm{MB}+1 \mathrm{MB}$ safety <br> - 1769-L36ERMOS, <br> 1769-L37ERMOS: <br> $3 \mathrm{MB}+1.5 \mathrm{MB}$ safety |
| Built-in ports | - 2 EtherNet $/ \mathrm{P}^{(1)}$ <br> - 1 USB | - 2 EtherNet $/ \mathrm{P}^{(2)}$ <br> - 1 USB | - 2 EtherNet $/ \mathrm{P}^{(2)}$ <br> - 1 USB | - 2 EtherNet $/ \mathrm{P}^{(2)}$ <br> - 1 USB | - 2 EtherNet $/ \mathrm{P}^{(2)}$ <br> - 1 USB | - 2 EtherNet $/ \mathrm{P}^{(2)}$ <br> - 1 USB |
| Communication options | - Dual-port EtherNet/IP <br> - USB Client | - Dual-port EtherNet/IP <br> - USB Client | - Dual-port EtherNet/IP <br> - DeviceNet <br> - USBClient | - Dual-portEtherNet/IP (standard and safety) <br> - DeviceNet (standard) <br> - USB Client | - Dual-port EtherNet/ IP (standard and safety) <br> - DeviceNet (standard) | - Dual-port EtherNet/IP (standard and safety) <br> - DeviceNet (standard) |

(1) CompactLogix 5380 controllers support Dual-IP mode and DLR/Linear mode. Mode use is user-configurable.
(2) CompactLogix 5370 controllers have two EtherNet//P ports to connect to an EtherNet//P network. The ports carry the same network traffic as part of the embedded switch of the controller. The controller uses only one IP address.

## CompactLogix 5370 L3 Controllers

In a CompactLogix 5370 L3 controller system, the 1769 Compact I/O modules can be placed to the left and the right of the power supply. As many as eight modules can be placed on each side of the power supply. The CompactLogix 5370 L3 controller comes with:


- Dual EtherNet/IP ports for linear and ring topologies.
- USB port for firmware updates and programming.
- Support for 1769 Compact I/O.

Use the 1769-L30ER-NSE controller for mining applications. You can deplete the residual stored energy of the 1769-L30ER-NSE controller to $200 \mu \mathrm{~J}$ or less before you transport it into or out of a mine. The 1769-L30ER-NSE controller does not maintain the real-time clock on power cycle.

| Characteristic | 1769-L30ER | 1769-L30ERM | 1769-L30ER-NSE | 1769-L33ER | 1769-L33ERM | 1769-L36ERM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Available user memory | 1 MB | 1 MB | 1 MB <br> No capacitor | 2 MB | 2 MB | 3 MB |
| Memory card | 1784-SD1 ( 1 GB ), shipped with controller 1784-SD2 (2 GB) |  |  |  |  |  |
| Communication ports | - 2 EtherNet/IP <br> - 1 USB |  |  |  |  |  |
| EtherNet/IP connections | - 256 EtherNet/IP <br> - 120 TCP | - 256 EtherNet/IP <br> - 120 TCP | - 256 EtherNet/P <br> - 120 TCP | - 256 EtherNet/IP <br> - 120 TCP | - 256 EtherNet/IP <br> - 120 TCP | - 256 EtherNet/IP <br> - 120 TCP |
| EtherNet/P nodes in one Logix Designer application, max | 16 |  |  | 32 |  | 48 |
| Integrated motion on an EtherNet/IP network | - | Supports up to 4 axes | - | - | Supports up to 8 axes | Supports up to 16 axes |
| Module expansion capacity | 81769 modules <br> 1 bank of modules |  |  | 161769 modules 2 banks of modules |  | 301769 modules <br> 3 banks of modules |
| Battery | None |  |  |  |  |  |
| Power supply distance rating | 4 modules |  |  | 4 modules |  | 4 modules |
| Programming software support | - Version 20 - For controllers that use firmware revision 20. <br> - Version 21 or later - For controllers that use firmware revision 21 or later. |  |  |  |  |  |

These controllers replace previous catalog numbers.

| New Controller ${ }^{(1)}$ | Replaces Previous Controller | Differences |
| :---: | :---: | :---: |
| $\begin{aligned} & \text { 1769-L30ER } \\ & \text { 1769-L30ERM } \\ & \text { 1769-L30ER-NSE } \end{aligned}$ | $\begin{array}{\|l\|l\|} \hline 1769-L 31 \\ \left.1769-L 322^{(2)}\right) \\ 1769-L 32 E \end{array}$ | - Additional memory <br> - Integrated motion on EtherNet/IP support (1769-L30ERM, 1769-L33ERM, 1769-L36ERM) <br> - USB port instead of RS-232 port <br> - Dual-port EtherNet/IP support <br> - SD card instead of CompactFlash card |
| $\begin{aligned} & \text { 1769-L33ER } \\ & \text { 1769-L33ERM } \end{aligned}$ | $\begin{aligned} & \text { 1769-L35CR } R^{(2)} \\ & \text { 1769-L35E } \end{aligned}$ |  |
| 1769-L36ERM | Any previous 1769-L3x controller |  |

(1) IMPORTANT: Typically, you can use any of the new controllers that are listed in each row as replacements for any of the previous controllers that are listed in the corresponding cell to the right. For example, you can replace a 1769-L32E controller with a 1769-L30ER, 1769-L30ERM, or 1769-L30ER-NSE controller.
In some rare cases, system configuration helps to prevent controller replacement as shown in the previous table. For example, if your system uses a 1769-L32E controller with 12 expansion modules, you cannot replace that controller with a 1769-L30ER, 1769-L30ERM, or 1769-L30ER-NSE controller. Those controllers support no more than 8 expansion modules. You must replace the 1769-L32E controller with a 1769-L33ER, 1769-L33ERM, or 1769-L36ERM controller.
We recommend that before you upgrade your controllers, consider your application requirements to verify that the replacements that are listed previously apply.
(2) Requires converting from ControlNet connections to EtherNet/IP connections.

## 1769-0F4

Compact voltage/current output analog module


Table 66-Technical Specifications - 1769-0F4

| Attribute | 1769-0F4 |
| :---: | :---: |
| Outputs | 4 single-ended |
| Output range | $\pm 10 \mathrm{~V}$ $0 \ldots .10 \mathrm{~V}$ $0 \ldots .5 \mathrm{~V}$ $1 \ldots 5 \mathrm{~V}$ $0 \ldots .20 \mathrm{~mA}$ $4 \ldots .20 \mathrm{~mA}$ |
| Full scale range ${ }^{(1)}$ | $\begin{aligned} & \pm 10.5 \mathrm{~V} \\ & -0.5 \ldots 10.5 \mathrm{~V} \\ & -0.5 \ldots 5.25 \mathrm{~V} \\ & 0.5 \ldots . .5 .25 \mathrm{~V} \\ & 0 \ldots .21 \mathrm{~mA} \\ & 3.2 \ldots .21 \mathrm{~mA} \end{aligned}$ |
| Resolution | 15 bits plus sign unipolar and bipolar |
| Current draw @ 5.1V | 120 mA |
| Current draw @ 24V | 170 mA |
| Heatt dissipation, max | 2.86 W |
| Conversion rate (all channels), max | Interrupts not enabled: 2.5 ms Interrupts enabled: 3.8 ms |
| Step response to $63 \%{ }^{(2)}$ | 2.9 ms |
| Resistive load | Current: $0 \ldots 600 \Omega$ (includes wire resistance) Voltage: $1 \mathrm{~K} \Omega$ or greater |
| Inductive load, max | 0.1 mH (current load) $1.0 \mu \mathrm{~F}$ (voltage load) |
| Field calibration | None required |
| Accuracy ${ }^{(3)}$ | $0.5 \%$ full scale at $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ |
| Accuracy drift with temperature | $\pm 0.0086 \%$ of full scale per ${ }^{\circ} \mathrm{C}$ |
| Outputripple ${ }^{(4)}$ | $\pm 0.05 \%$ @ 0... 50 kHz |

## Table 66 - Technical Specifications - 1769-0F4

| Attribute | 1769-0F4 |
| :---: | :---: |
| Nonlinearity | $\pm 0.05 \%$ |
| Repeatability ${ }^{(5)}$ | $\pm 0.05 \%$ |
| Module error $0 \ldots 60^{\circ} \mathrm{C}\left(32 \ldots 140^{\circ} \mathrm{F}\right)$ | +/-0.8\% of full scale |
| Output impedance | $\begin{aligned} & \text { Voltage output: }<1 \Omega \\ & \text { Current output: }>1 \mathrm{M} \Omega \end{aligned}$ |
| Open and short-circuit protection | Yes |
| Short-circuit protection, max | 40 mA |
| Output overvoltage protection | Yes |
| Output response at system power up and power down | 2.5...-1.0V DC spike for < 15 ms |
| Rated working voltage ${ }^{(6)}$ | 30V AC/30V DC |
| Isolation voltage | 510 V AC or 720 V DC for 1 minute (qualification test), output group to bus 30V AC/30V DC working voltage (IEC Class 2 reinforced insulation) |
| Weight, approx | $280 \mathrm{~g}(0.61 \mathrm{lb})$ |
| Dimensions (HxWxD), approx | $118 \times 35 \times 87 \mathrm{~mm}$ ( $4.65 \times 1.38 \times 3.43$ in.) Height with mounting tabs 138 mm ( 5.43 in .) |
| Slot width | 1 |
| Module location | DIN rail or panel mount |
| Power supply | 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4 |
| Optional 24V DC Class 2 power supply voltage range ${ }^{(7)}$ | 20.4...26.4V DC |
| Power supply distance rating | 8 modules |
| Terminal screw torque | 0.68 Nom (6 lboin) |
| Retaining screw torque | 0.46 Nom ( 4.1 lb -in) |
| Wire size | (22...14 AWG) solid <br> (22...16 AWG) stranded |
| Wire type | Cu-90 ${ }^{\circ}$ ( $194{ }^{\circ} \mathrm{F}$ ) |
| Replacement terminal block | 1769-RTBN18 (1 per kit) |
| Replacement door label | 1769-RL2 (2 per kit) |
| Replacement door | 1769-RD (2 per kit) |
| Vendor ID code | 1 |
| Product type code | 10 |
| Product code | 48 |
| Input words | 5 |
| Output words | 5 |
| Configuration words | 32 |
| Enclosure type rating | None (open style) |

(1) The over- or under-range flag will come on when the normal operating range (over/under) is exceeded. The module will continue to convert the analog input up to the maximum full scale range. The flag automatically resets when within the normal operating range.
(2) Step response is the period of time between when the $D / A$ converter was instructed to go from minimum to full range until the device is $\mathrm{at} 63 \%$ of full range.
(3) Includes offset, gain, drift, nonlinearity, and repeatability error terms.
(4) Output ripple is the amount a fixed output varies with time, assuming a constant load and temperature.
(5) Repeatability is the ability of the output module to reproduce output readings when the same controller value is applied to it consecutively, under the same conditions and in the same direction.
(6) Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential (for example, 10 V DC input signal and 2OV D( potential above ground).
(7) If the optional 24V DC Class 2 power supply is used, the 24 V DC current draw from the bus is 0 mA .

Table 67 - Certifications - 1769-0F4

| Certification $^{(1)}$ | 1769-0F4 |
| :--- | :--- |
| C-UL | C-UL certified (under CSA C22.2 No. 142) <br>  <br>  <br>  <br>  <br> UL 508 listed <br> Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213) |
| CE | CE compliant for all applicable directives |
| C-Tick | C-Tick compliant for all applicable directives <br> AustralianRadiocommunications Act, compliant with: <br> ••AS/NZS cispr 11; Industrial Enclosure |

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

## 1769-0W16



Compact AC/DC relay contact module

Simplified Output Circuit Diagram


## 1769-0W816



Table 98 - Technical Specifications - 1769-0W16

| Attribute | 1769-OW16 |
| :---: | :---: |
| Outputs | 16 normally open (8 points/group) |
| Operating voltage range | $\begin{aligned} & \text { 5...265V AC } \\ & 5 \ldots .125 \mathrm{~V} \text { DC } \end{aligned}$ |
| Delay, on | 10 ms |
| Delay, off | 10 ms |
| Current draw @ 5.1V | 205 mA |
| Current draw @ 24V | 180 mA |
| Heat dissipation, max | 4.75 W |
| Off-state leakage, max | 0 mA |
| On-state current, min | 10 mA @ 5V DC |
| Current per point, max | 2.5 A |
| Current per module, max | 20 A |
| Isolation voltage | Verified by one of the following dielectric tests: 1836 V AC for 1 s or 2596 V DC for 1 s , output point to bus 265 V AC working voltage (IEC Class 2 reinforced insulation) <br> Verified by one of the following dielectric tests: 1836 V AC for 1 s or 2596 V DC for 1 s , group to group <br> 265V AC working voltage (basic insulation) <br> 150V AC working voltage (IEC Class 2 reinforced insulation) |
| Weight, approx | $450 \mathrm{~g}(0.99 \mathrm{lb})$ |
| Dimensions (HxWxD), approx | $118 \times 52.5 \times 87 \mathrm{~mm}$ ( $4.65 \times 2.07 \times 3.43 \mathrm{in}$.) <br> Height with mounting tabs 138 mm ( 5.43 in .) |
| Slot width | 1.5 |
| Module location | DIN rail or panel mount |
| Power supply | 1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4 |
| Power supply distance rating | 8 modules |
| Terminal screw torque | 0.68 Nom (6 lboin) |
| Retaining screw torque | 0.46 Nom (4.1 lboin) |
| Wire size | (22... 14 AWG) solid <br> (22...16 AWG) stranded |
| Wire type | $\mathrm{Cu}-90^{\circ} \mathrm{C}\left(194{ }^{\circ} \mathrm{F}\right)$ |

Table 98-Technical Specifications - 1769-0W16

| Attribute | 1769-OW16 |
| :--- | :--- |
| Replacement terminal block | 1769-RTBN18 (1 per kit) |
| Replacement door label | 1769-RL1 (2 per kit) |
| Replacement door | $1769-$ RD (2 per kit) |
| Vendor ID code | 1 |
| Product type code | 7 |
| Product code | 85 |
| Enclosure type rating | None (open style) |

Table 99-Relay Contact Ratings - 1769-0W16

| Volts, max | Continuous Amps per <br> Point, max | Amperes <br> (1) <br> Make | Break | Voltamperes | Make | Break |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

(1) If you connect surge suppressors across your external inductive load, you extend the life of the relay contacts.
(2) For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28 VA by the applied DC voltage. For example, $28 \mathrm{VA} / 48 \mathrm{~V} D C=0.58 \mathrm{~A}$. For $D C$ voltage applications less than 48 V , the make/break ratings for relay contacts cannot exceed 2 A .

## Table 100-Certifications - 1769-0W16

| Certification $^{(1)}$ | $\mathbf{1 7 6 9 - 0 W 1 6}$ |
| :--- | :--- |
| c-UL | C-UL certified (under CSA C22.2 No. 142) <br> UL 508 listed <br> Class I, Division 2 Group A,B,C,D Hazardous Locations (UL 1604, C-UL under CSA C22.2 No. 213) |
| CE | CE compliant for all applicable directives |
| C-Tick | C-Tick compliant for all applicable directives <br> Australian Radiocommunications Act, compliant with: <br>  |

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

# 1769 Compact l/O Power Supplies 

Each 1769-L3x controller and additional bank of I/O modules requires a 1769 power supply. Place 1769 I/O modules to the left or right of the 1769 power supply. As many as eight I/O modules can be placed on each side of the power supply.

Each 1769 module also has a power supply distance rating (the number of modules from the power supply). Each module must be located within its distance rating. See the specifications for the module to determine its distance rating.

Technical Specifications - 1769 Compact I/O Power Supplies


| Attribute | 1769-PA2 | 1769-PB2 | 1769-PA4 | 1769-PB4 |
| :---: | :---: | :---: | :---: | :---: |
| Input voltage range | 85...265V AC | 19.2...31.2V DC | $\begin{aligned} & 85 \ldots 265 \mathrm{~V} \text { AC or } \\ & 170 . . .265 \mathrm{~V} \text { AC, } \\ & \text { switch selectable } \end{aligned}$ | 19.2...31.2V DC |
| Input voltage, nom | 120V/220V AC | 24V DC | 120V/220V AC | 24V DC |
| Power consumption | 100 VA @ 120V AC 130 VA @ 240 V AC | 50 VA @ 24V DC | 200 VA @ 120V AC <br> 240 VA @ 240V AC | 100 VA @ 24V DC |
| Power dissipation | $8 \mathrm{~W} @ 60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ | 7.5 W @ 60 ${ }^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ | 18 W @ 60 ${ }^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ | 14.5 W @ 60 $\mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ |
| Current capacity @ 5V | 2.0 A | 2.0 A | 4.0 A | 4.0 A |
| Current capacity @ 24V | 0.8 A | 0.8 A | 2.0 A | 2.0 A |
| Inrush current, max | 25A @ 132V AC | $30 \mathrm{~A} @ 31.2 \mathrm{~V}$ DC | 25A @ 132V AC | 30 A @ 31.2V DC |
| Isolation voltage | 265 V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested @ 2596V DC for 1 s , AC power input to system and AC power input to 24V DC user power | 75 V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 1697V DC for 1 s, DC power input to system | 265V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 2596V DC for 1 s, AC power input to system | 75 V (continuous), reinforced insulation type (IEC Class 1 grounding required) Routine tested at 1697V DC for 1 s, DC power input to system |
| Fuse type | Wickmann 19195-3.15A <br> Littelfuse 02183.15MXP | Wickmann 19193-6.3A <br> Littelfuse 021706.3MXP | Wickmann 19195-3.15A <br> Littelfuse 02183.15MXP | Wickmann 19193-6.3A <br> Littelfuse 021706.3MXP |
| Weight, approx. | $525 \mathrm{~g}(1.16 \mathrm{lb})$ |  | $630 \mathrm{~g}(1.39 \mathrm{lb})$ |  |
| Dimensions (HxWxD), approx. | $118 \times 70 \times 87 \mathrm{~mm}(4.65 \times 2.76 \times 3.43 \mathrm{in}$.) |  |  |  |
| Module location | DIN rail or panel mount |  |  |  |
| Mounting screw torque | 1.16 N•m (10 lb•in) - use M4 or \#8 screws |  |  |  |
| Power supply distance rating | 8 <br> $8 \mathrm{I} / 0$ modules can be connected on either side of the power supply for a maximum of 16 modules |  |  |  |
| Wire category ${ }^{(1)}$ | 1 - on power ports | 2 - on power ports | 1 - on power ports | 2 - on power ports |
| Wire size | 14 AWG (2.5 mm²) solid copper wire rated at $90^{\circ} \mathrm{C}\left(194{ }^{\circ} \mathrm{F}\right)$ or greater, $1.2 \mathrm{~mm}(3 / 64$ in.) insulation max |  |  |  |
| North American temperature code | T3C |  |  |  |
| IEC temperature code | - | T4 | - | T4 |
| Enclosure type rating | None (open-style) |  |  |  |

[^4]
## Certifications - 1769 Compact Power Supplies



| Certification ${ }^{\text {(1) }}$ | 1769-PA2, 1769-PA4 | 1769-PB2, 1769-PB4 |
| :--- | :--- | :--- |
| c-UL-us | UL Listed for Class 1, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File <br> E10314 |  |
| CE | European Union 2004/108/EC EMC Directive, compliant with: <br> $\bullet$ •EN 61000-6-2; Industrial Immunity <br> $\bullet$ •EN 61000-6-4; Industrial Emissions |  |
| C-Tick | Australian Radiocommunications Act, compliant with: <br> AS/NZS CISPR 11; Industrial Emissions |  |

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

## Power Requirements and Transformer Sizing - 1769 CompactLogix Power Supplies

1769-PA2 Output Derating



## 1769-PB2 Output Derating


+24 V Bus Load (A)


1769-PB2 Power Dissipation


## 1769-PA4 Output Derating

Total Output: 68 W @ $55^{\circ} \mathrm{C}\left(131^{\circ} \mathrm{F}\right)$ or below 61 W @ $60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ or below


1769-PA4 Power Disspation


Bus $+5 \mathrm{~V},+24 \mathrm{~V}$, and User Load (Watts)

## 1769-PB4 Output Derating

Total Output: $68 \mathrm{~W} @ 55^{\circ} \mathrm{C}\left(131^{\circ} \mathrm{F}\right)$ or below 61 W @ $60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ or below


## 1769-PB4 Power Disspation



Bus $+5 \mathrm{~V},+24 \mathrm{~V}$, and User Load (Watts)

## Mounting Dimensions - 1769 CompactLogix Power Supplies



## Notes:

## Stratix Ethernet Device Specifications

Stratix 5400 Catalog Numbers 1783-HMS4C4CGN, 1783-HMS8T4CGN, 1783-HMS8S4CGN, 1783-HMS4T4E4CGN, 1783-HMS16T4CGN, 1783-HMS4S8E4CGN, 1783-HMS8TG4CGN, 1783-HMS8SG4CGN, 1783-HMS4EG8CGN, 1783-HMS16TG4CGN, 1783-HMS8TG8EG4CGN, 1783-HMS4SG8EG4CGN, 1783-HMS8TG4CGR, 1783-HMS8SG4CGR, 1783-HMS4EG8CGR, 1783-HMS16TG4CGR, 1783-HMS8TG8EG4CGR, 1783-HMS4SG8EG4CGR, Stratix 5410 Catalog Numbers 1783-IMS28NDC, 1783-IMS28NAC, 1783-IMS28RDC, 1783-IMS28RAC, 1783-IMXDC, 1783-IMXAC, Stratix 5700 Catalog Numbers 1783-BMS4S2SGL, 1783-BMS4S2SGA, 1783-BMS06SL, 1783-BMSO6SA, 1783-BMS06TL, 1783-BMS06TA, 1783-BMS06SGL, 1783-BMS06SGA, 1783-BMS06TGL, 1783-BMS06TGA, 1783-BMS10CL, 1783-BMS10CA, 1783-BMS10CGL,1783-BMS10CGA, 1783-BMS10CGP, 1783-BMS10CGN, 1783-BMS12T4E2CGL, 1783-BMS12T4E2CGP, 1783-BMS12T4E2CGNK, 1783-BMS20CL, 1783-BMS20CA, 1783-BMS20CGL, 1783-BMS20CGP, 1783-BMS20CGN, 1783-BMS20CGPK, ArmorStratix 5700 Catalog Numbers 1783-ZMS8TA, 1783-ZMS16TA, 1783-ZMS24TA, 1783-ZMS4T4E2TGP, 1783-ZMS8T8E2TGP, 1783-ZMS4T4E2TGN, 1783-ZMS8T8E2TGN, Stratix 8000 and Stratix 8300 Catalog Numbers 1783-MS06T, 1783-MS10T, 1783-RMS06T, 1783-RMS10T, 1783-MX04E, 1783-MX04T04E, 1783-MX04S, 1783-MX08S, 1783-MX08T, 1783-MX08F, Stratix 6000 Catalog Numbers 1783-EMS08T, 1783-EMS04T, Embedded Switch Technology Catalog Numbers 1783-ETAP, 1783-ETAP1F, 1783-ETAP2F, Configurable NAT Router Catalog Number 1783-NATR, Stratix 2000 Catalog Numbers 1783-US4T1F, 1783-US4T1H, 1783-US5T, 1784-US5TG, 1783-US6T2F, 1783-US6T2H, 1783-US6TG2CG, 1783-US7T1F, 1783-US7T1H, 1783-US8T, 1783-US14T2S, 1783-US16T, Stratix 5100 Catalog Numbers 1783-WAPAK9, 1783-WAPEK9, 1783-WAP2K9, 1783-WAPCK9, Stratix 5900 Catalog Number 1783-SR

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## Stratix 2000 Ethernet Unmanaged Switches

| Cat. No. | Description | Total Ports | RJ45 Ports | Fiber Ports | SFP Slots |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1783-US4T1F | 4 ports RJ45 10/100 <br> 1 port fiber multi mode | 5 | 4 | 1 multi mode | 1 |
| 1783-US4T1H | 4 ports RJ45 10/100 <br> 1 port fiber single mode | 5 | 4 | 1 single mode | 1 |
| 1783-US5T | 5 ports RJ45 10/100 | 5 | 5 | - | - |
| 1783-US5TG | 5 ports RJ45 10/100/1000 | 5 | 5 | - | - |
| 1783-US6T2F | 6 ports RJ45 10/100 <br> 2 port fiber multi mode | 8 | 6 | 2 multi mode | 2 |
| 1783-US6T2H | 6 ports RJ45 10/100 <br> 2 port fiber single mode | 8 | 6 | 2 single mode | 2 |
| 1783-US6TG2CG | 6 ports RJ45 10/100/1000 | 8 | 6 | 2 GB combo | 2 |
| 1783-US7T1F | 7 ports RJ45 10/100 <br> 1 port fiber multi mode | 8 | 7 | 1 multi mode | 1 |
| 1783-US7T1H | 7 ports RJ45 10/100 <br> 1 port fiber single mode | 8 | 7 | 1 single mode | 1 |
| 1783-US8T | 8 ports RJ45 10/100 | 8 | 8 | - | - |
| 1783-US14T2S | 14 ports RJ45 10/100 | 16 | 14 | 2 | 2 |
| 1783-US16T | 16 ports RJ45 10/100 | 16 | 16 | - | - |

Table 33-Technical Specifications - Stratix 2000 Switches

| Attribute | $\begin{array}{l\|l\|} \hline \text { 1783-US4T1F } \\ \text { 1783-US4T1H } \end{array}$ | 1783-US5TG | $\begin{aligned} & \hline 1783 \text {-US6T2F } \\ & \text { 1783-US6T2H } \\ & \text { 1783-US7T1F } \\ & \text { 1783-US7T1H } \end{aligned}$ | 1783-US6TG2CG | 1783-US14T2S | 1783-US16T | 1783-US5T | 1783-US8T |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Inrush current, max | - |  |  |  |  |  | 2.2 A |  |
| Power supply voltage | 24V (18...60V DC, 18...30V AC 50/60 Hz), Class 2/SELV |  |  |  |  |  |  |  |
| Current rating | 230.5 mA | 432.1 mA | 442.3 mA | 1242.7 mA | 663.2 mA | 555.5 mA | 250 mA | 361 mA |
| Power dissipation, max | 2.841 W | 5.491 W | 5.927 W | 13.643 W | 7.991 W | 6.72 W | $\begin{aligned} & \text { 2W @ 24V AC/ } \\ & \text { DC } \end{aligned}$ | $\begin{aligned} & \text { 4.04W @ 24V } \\ & \text { AC/DC } \end{aligned}$ |
| Isolation voltage | 30 V (continuous), basic insulation type, power to network channels No isolation between individual network channels Type tested at 500V AC for 60 s |  |  |  |  |  |  |  |
| Ethernet connections ${ }^{(1)}$ | RJ45 connector according to IEC 60603-7, 2-pair or 4-pair Category 5e minimum cable according to TIA 568-B. 1 or Category 5 cable according to ISO/IEC 24702 rated $82^{\circ} \mathrm{C}\left(180^{\circ} \mathrm{F}\right)$ min |  |  |  |  |  | RJ45 connector according to IEC 60603-7, 2-pair or 4-pair Category 5e minimum cable according to TIA 568-B. 1 or Category 5 cable according to ISO/IEC 24702 |  |
| DC power connections | $0.82 \ldots .2 .5 \mathrm{~mm}^{2}$ <br> ( $18 . . .14 \mathrm{AWG}$ ) twisted-pair copper wire suitable for $82^{\circ} \mathrm{C}\left(180^{\circ} \mathrm{F}\right)$ above surrounding ambient temperature outside the enclosure |  |  |  |  |  | $0.75 \ldots 2.5 \mathrm{~mm}^{2}$ (18... 14 AWG) twisted-pair copper wire suitable for $30^{\circ} \mathrm{C}$ $\left(86{ }^{\circ} \mathrm{F}\right.$ ) above surrounding ambient temperature outside the enclosure |  |

## Table 33 - Technical Specifications - Stratix 2000 Switches

| Attribute | 1783-US4T1F <br> 1783-US4T1H | 1783-US5TG | $\begin{aligned} & \hline \text { 1783-US6T2F } \\ & \text { 1783-US6T2H } \\ & \text { 1783-US7T1F } \\ & \text { 1783-US7T1H } \end{aligned}$ | 1783-US6TG2CG | 1783-US14T2S | 1783-US16T | 1783-US5T | 1783-US8T |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Functional earth connection | $2.5 \mathrm{~mm}^{2}(14 \mathrm{AWG})$ copper wire suitable for $82^{\circ} \mathrm{C}\left(180^{\circ} \mathrm{F}\right)$ above surrounding ambient temperature outside the enclosure, with a suitable ring terminal |  |  |  |  |  | $2.5 \mathrm{~mm}^{2}$ (14 AWG) copper wire suitable for $30^{\circ} \mathrm{C}\left(86^{\circ} \mathrm{F}\right)$ above surrounding ambient temperature outside the enclosure, with a suitable ring terminal |  |
| Torque, max recommended | $1.82 \mathrm{~N} \cdot \mathrm{~m}(16 \mathrm{lb} \cdot \mathrm{in})$ on power /functional earth connector |  |  |  |  |  |  |  |
| Wiring category ${ }^{(2)}$ | 1 - on power ports <br> 2 - on communication ports |  |  |  |  |  |  |  |
| Enclosure type rating | None (open-style) |  |  |  |  |  |  |  |
| North American temp code | T4 |  |  |  |  |  | T5 |  |
| IEC temp code | T4 |  |  |  |  |  | T5 |  |

(1) See page 55 for recommended products.
(2) Use this conductor category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

## Table 34 - Environmental Specifications - Stratix 2000 Switches

| Attribute | 1783-US4T1F, 1783-US4T1H, 1784-US5TG, 1783-US6T2F, 1783-US6T2H, 1783-US6TG2CG, 1783-US7T1F, 1783US7T1H, 1783-US14T2S, 1783-US16T | 1783-US5T | 1783-US8T |
| :---: | :---: | :---: | :---: |
| Temperature, operating <br> IEC 60068-2-1 (Test Ad, Operating Cold), <br> IEC 60068-2-2 (Test Bd, Operating Dry Heat), <br> IEC 60068-2-14 (Test Nb, Operating Thermal Shock) | $-40 \ldots . .70^{\circ} \mathrm{C}\left(-40 \ldots 158^{\circ} \mathrm{F}\right)$ | $0 \ldots 60^{\circ} \mathrm{C}\left(32 \ldots 140{ }^{\circ} \mathrm{F}\right)$ |  |
| Temperature, surrounding air, max | $70^{\circ} \mathrm{C}\left(158^{\circ} \mathrm{F}\right)$ | $60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ |  |
| Temperature, nonoperating <br> IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold) <br> IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat) <br> IEC 60068-2-14 (Test Na, Unpackaged Nonoperating <br> Thermal Shock) | $-40 \ldots 85^{\circ} \mathrm{C}\left(-40 \ldots 185^{\circ} \mathrm{F}\right)$ | $-40 \ldots 85^{\circ} \mathrm{C}\left(-40 \ldots 185^{\circ} \mathrm{F}\right)$ |  |
| Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat) | 5... $95 \%$ noncondensing | 5...95\% noncondensing |  |
| Vibration <br> IEC 60068-2-6 (Test Fc, Operating) | $2 \mathrm{~g} @ 10 \ldots 150 \mathrm{~Hz}$ | 2g@10... 150 Hz | 2g@ 10... 500 Hz |
| Operating shock <br> IEC 60068-2-27 (Test Ea, Unpackaged Shock) | 15 g |  |  |
| Nonoperating shock IEC 60068-2-27 (Test Ea, Unpackaged Shock) | 30 g |  |  |
| Emissions <br> CISPR11 (IEC 61000-6-4) | Class A |  |  |
| ESD immunity IEC 61000-4-2 | 8 kV contact discharges 15 kV air discharges | 8 KV contact discharges 15 kV air discharges | 6 kV contact discharges 8 kV air discharges |
| Radiated RF immunity IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ with 1 kHz sine-wave $80 \%$ AM from $80 \ldots 2000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ with 1 kHz sine-wave $80 \%$ AM from 2000 . . 2700 MHz |  |  |

1783-US6T2F, 1783-US6T2H, 1783-US7T1F, 1783-US7T1H Switch Dimensions


1783-US8T Switch Dimensions


# PowerFlex Low Voltage Drives <br> Selection Guide 

Powerful Performance. Flexible Control.


## Additional Information

PowerFlex 520-Series Technical Data, publication 520-TD001
PowerFlex 520-Series User Manual, publication 520-UM001

## Catalog Number Explanation


$1 \quad \frac{1}{\substack{\text { Inematenc } \\ \text { filer } \\ 0=\text { No } \\ 1=\text { ves }}}$
4

## Product Selection

100...120V AC, Single-Phase Input, Three-Phase Output Drives, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size |  |  |
| kW | Hp | kW | Hp | A |  | Cat. No. | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 2.5 | A | 25B-V2P5N104 | - |
| 0.75 | 1 | 0.75 | 1 | 4.8 | B | 25B-V4P8N104 | - |
| 1.1 | 1.5 | 1.1 | 1.5 | 6 | B | 25B-V6PON104 | - |

200...240V AC, Single-Phase Input, Three-Phase Output Drives, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current |  |  | Cat. No. |

(1) This filter is suitable for use with cable lengths up to 10 meters ( 32.8 feet) for $\mathbf{C} 2$ spec and 20 meters ( 65.6 feet) for $\mathbf{C} 3$ spec.
200...240V AC, Three-Phase, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  |  | No Filter |  | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current |  |  | Cat. No. |  |  |

380...480V AC, Three-Phase, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size | Cat. No. |  |
| kW | Hp | kW | Hp | A |  |  | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 1.4 | A | 25B-D1P4N104 | 25B-D1P4N114 |
| 0.75 | 1 | 0.75 | 1 | 2.3 | A | 25B-D2P3N104 | 25B-D2P3N114 |
| 1.5 | 2 | 1.5 | 2 | 4 | A | 25B-DAPON104 | 25B-D4PON114 |
| 2.2 | 3 | 2.2 | 3 | 6 | A | 25B-D6PON104 | 25B-D6PON114 |
| 4 | 5 | 4 | 5 | 10.5 | B | 25B-D010N104 | 25B-D010N114 |
| 5.5 | 7.5 | 5.5 | 7.5 | 13 | C | 25B-D013N104 | 25B-D013N114 |
| 7.5 | 10 | 7.5 | 10 | 17 | C | 25B-D017N104 | 25B-D017N114 |
| 11 | 15 | 11 | 15 | 24 | D | 25B-D024N104 | 25B-D024N114 |
| 15 | 20 | 11 | 15 | 30 | D | 25B-D030N104 | 25B-D030N114 |
| 18.5 | 25 | 15 | 20 | 37 | E | 25B-D037N114 ${ }^{(2)}$ | 25B-D037N114 |
| 22 | 30 | 18.5 | 25 | 43 | E | 25B-D043N114 ${ }^{(2)}$ | 25B-D043N114 |

(1) This filter is suitable for use with cable lengths up to 10 meters ( 32.8 feet) for C 2 spec and 20 meters ( 65.6 feet) for C 3 spec.
(2) With EMC filter.
525...600V AC, Three-Phase, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size |  |  |
| kW | Hp | kW | Hp | A |  | Cat. No. | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 0.9 | A | 25B-EOP9N104 | - |
| 0.75 | 1 | 0.75 | 1 | 1.7 | A | 25B-E1P7N104 | - |
| 1.5 | 2 | 1.5 | 2 | 3 | A | 25B-E3PON104 | - |
| 2.2 | 3 | 2.2 | 3 | 4.2 | A | 25B-E4P2N104 | - |
| 4 | 5 | 4 | 5 | 6.6 | B | 25B-E6P6N104 | - |
| 5.5 | 7.5 | 5.5 | 7.5 | 9.9 | C | 25B-E9P9N104 | - |
| 7.5 | 10 | 7.5 | 10 | 12 | C | 25B-E012N104 | - |
| 11 | 15 | 11 | 15 | 19 | D | 25B-E019N104 | - |
| 15 | 20 | 11 | 15 | 22 | D | 25B-E022N104 | - |
| 18.5 | 25 | 15 | 20 | 27 | E | 25B-E027N104 | - |
| 22 | 30 | 18.5 | 25 | 32 | E | 25B-E032N104 | - |

## Approximate Dimensions and Weights

Dimensions are in mm (in.) - weights are in kg (lb)
IP20, NEMA/UL Type Open

| Frame | $\mathbf{H}$ | W | $\mathbf{D}$ | Weight |
| :---: | :---: | :---: | :---: | :---: |
| A | $152.0(5.98)$ | $72.0(2.83)$ | $172.0(6.77)$ | $1.10(2.4)$ |
| B | $180.0(7.08)$ | $87.0(3.42)$ | $172.0(6.77)$ | $1.60(3.5)$ |
| C | $220.0(8.66)$ | $109.0(4.29)$ | $184.0(7.24)$ | $2.30(5.1)$ |
| D | $260.0(10.23)$ | $130.0(5.11)$ | $212.0(8.34)$ | $3.20(7.1)$ |
| E | $300.0(11.81)$ | $185.0(7.28)$ | $279.0(10.98)$ | $12.90(28.4)$ |



## 2711P-T10C22D9P

## PanelView Plus 7 Performance Terminals

Catalog Numbers 2711P-T7C22D9P, 2711P-T7C22D9P-B, 2711P-T7C22A9P, 2711P-T7C22A9P-B, 2711P-B7C22D9P, 2711P-B7C22D9P-B, 2711P-B7C22A9P, 2711P-B7C22A9P-B, 2711P-T9W22D9P, 2711P-T9W22D9-B, 2711P-T9W22A9P, 2711P-T9W22A9P-B, 2711P-T10C22D9P, 2711P-T10C22D9P-B, 2711P-T10C22A9P, 2711P-T10C22A9P-B, 2711P-B10C22D9P, 2711P-B10C22D9P-B, 2711P-B10C22A9P, 2711P-B10C22A9-B, 2711P-T12W22D9P, 2711P-T12W22D9P-B, 2711P-T12W22A9P, 2711P-T12W22A9P-B, 2711P-T15C22D9P, 2711P-T15C22D9P-B, 2711P-T15C22A9P, 2711P-T15C22A9P-B, 2711P-B15C22D9P, 2711P-B15C22D9P-B, 2711P-B15C22A9P, 2711P-B15C22A9P-B, 2711P-T19C22D9P, 2711P-T19C22D9P-B, 2711P-T19C22A9P, 2711P-T19C22A9P-B

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## Summary of Changes

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| Updated system memory to 512 MB RAM and 512 MB storage. <br> Updated user memory to 80 MB, approx, nonvolatile storage for applications. | $4,5,6$ |

The PanelView ${ }^{\text {mi }}$ Plus 7 Performance terminals are operator interface devices. They monitor and control devices that are attached to ControlLogix and CompactLogix ${ }^{\text {ma }} 5370$ controllers on an EtherNet/IP network. Animated graphic and text displays provide operators a view into the operating state of a machine or process. Operators interact with the control system by using touch screen or keypad input.


Features include the following:

- FactoryTalk ${ }^{\circ}$ View Machine Edition software, version 8.1, provides a familiar environment for creating HMI applications
- Windows CE operating system with desktop access for configuration and third-party applications
- Connection to ControlLogix or CompactLogix 5370 controllers
- Ethernet communication that can support Device Level Ring (DLR), linear, or star network topologies
- Web browser, Microsoft file viewers, text editor, PDF viewer, remote desktop connection, and media player on the terminal desktop


## Environmental Specifications

This table lists environmental specifications for the PanelView Plus 7 Performance terminals.

| Attribute | Value |
| :---: | :---: |
| Temperature, operating ${ }^{(1)}$ | $0 . . .55^{\circ} \mathrm{C}\left(32 \ldots 131{ }^{\circ} \mathrm{F}\right)$ |
| Temperature, nonoperating | $-25 \ldots+70^{\circ} \mathrm{C}\left(-13 \ldots+158^{\circ} \mathrm{F}\right)$ |
| Heat dissipation ${ }^{(2)}$ | 7-in. DC (touch, and touch with keypad), 51 BTU (typical) <br> 7-in. AC (touch, and touch with keypad), 53 BTU (typical) <br> 9-in. DC, 55 BTU (typical) <br> 9-in. AC, 58 BTU (typical) <br> 10-in. DC (touch, and touch with keypad), 51 BTU (typical) <br> 10-in. AC (touch, and touch with keypad), 56 BTU (typical) <br> 12-in. DC, 60 BTU (typical) <br> 12-in. AC, 67 BTU (typical) <br> 15-in. DC (touch, and touch with keypad), 61 BTU (typical) <br> 15-in. AC (touch, and touch with keypad), 68 BTU (typical) <br> 19-in. DC, 114 BTU (typical) <br> 19-in. AC, 119 BTU (typical) |
| Altitude, operating | 2000M |
| Relative humidity | 5...95\% without condensation |
| Vibration | $0.012 \mathrm{pk}-\mathrm{pk}, 10 \ldots 57 \mathrm{~Hz}$ 2 g peak at $57 \ldots . .500 \mathrm{~Hz}{ }^{(3)}$ |
| Shock, operating | 15 g at 11 ms |
| Shock, nonoperating | 30 gat 11 ms |
| Enclosure ratings | NEMA and UL Type 12, 13, 4X, also rated IP66 as Classified by UL |

(1) The 19 -inch terminals ( $2711 \mathrm{P}-\mathrm{T} 19 \mathrm{C} 22 \mathrm{D} 9 \mathrm{P}, 2711 \mathrm{P}-\mathrm{T} 19 \mathrm{C} 22 \mathrm{D} 9 \mathrm{P}-\mathrm{B}, 2711 \mathrm{P}-\mathrm{T} 19 \mathrm{C} 22 \mathrm{~A} 9 \mathrm{P}$, and $2711 \mathrm{P}-\mathrm{T} 19 \mathrm{C} 22 \mathrm{~A} 9 \mathrm{P}-\mathrm{B}$ ) are rated up to $50^{\circ} \mathrm{C}\left(122^{\circ} \mathrm{F}\right.$ ) operating temperature.
(2) Typical BTU measurements were taken at $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$.
(3) The 15-inch and 19-inch terminals (2711P-T15C22D9P, 2711P-T15C22D9P-B, 2711P-T15C22A9P, 2711P-T15C22A9P-B, 2711P-B15C22D9P, 2711P-B15C22D9P-B, 2711P-B15C22A9P, 2711P-B15C22A9P-B, 2711P-T19C22D9P, 2711P-T19C22D9P-B, 2711P-T19C22A9P, 2711P-T19C22A9P-B) are rated to: $0.006 \mathrm{in} . \mathrm{pk}-\mathrm{pk}, 10 \ldots . .57 \mathrm{~Hz}, 1 \mathrm{~g} \mathrm{peak}$ at $57 \ldots . .640 \mathrm{~Hz}$.

## Certifications

This table lists certifications for the PanelView Plus 7 Performance terminals.

| Certification ${ }^{(1)}$ | Value |
| :--- | :--- |
| CULus | CULus Listed Industrial Control Equipment for use in Hazardous Locations (E10314) per standards ANSI / ISA 12.12.01 <br> and ClA C22.2 No. 213. rated: <br> - Class I, Div 2, Groups A, B, C, D <br> Enclosure type ratings per UL50 and CSA C22.2 No. 94.2-07. <br> Enclosure ingress protection classified by UL per IEC 60529. |
| CE (EMC) | European Union 2004/108/EC EMC Directive, compliant with: <br> - EN 60000-6-2; Industrial Immunity <br> - EN 61000--6;-IIndustial Emissions <br> - EN 61131-2; Programmable Controllers |
| CE (LVD) | European Union 2006/95/EC Low Voltage Directive, compliant with: <br> - EN 61131-2; Programmable Controllers |
| RCM | Australian Radiocommunications Act, compliant with: <br> - AS/NZS CISPR 11; Industrial Emissions |
| RoHS | China RoHS, Turkey RoHS, European RoHS |
| KCC | Certificate of compliance |
| EtherNet/IP | ODVA conformance tested to EtherNet/IP specifications |

(1) When marked. See the Product Certification link at http://www.rockwellautomation.com/global/certification/overview.page for Declarations of Conformity, Certificates, and other certification details.

## Technical Specifications

The tables in this section provide technical specifications for the PanelView Plus 7 Performance terminals.
PanelView Plus 7 Performance 7-in and 9-in Terminals

| Attribute | 7-in. Touch2711P--T7C22D9P, 2711P--T7C22D9P-B ${ }^{(1)}$2711P-T7C22A9P, 2711P-T7C22A9P-B |  | $\begin{aligned} & \text { 7-in. Touch with Keypad } \\ & \text { 2711P-B7C22D9P, 2711P-B7C22D9P-B }{ }^{(1)} \\ & \text { 2711P-B7C22A9P, 2711P-B7C22A9P-B } \end{aligned}$ |  | 9-in. Touch2711P-T9W22D9P, 2711P-T9W22D9P-B ${ }^{(1)}$2711P-T9W22A9P, 2711P-T9W22A9P-B |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Operator input | Touch |  | Touch with keypad |  | Touch |  |
| Display type | TFT Color |  |  |  |  |  |
| Display size, diagonal | 6.5-in. |  |  |  | 9-in. widescreen |  |
| Viewing area ( $\mathrm{W} \times \mathrm{H}$ ) | $132 \times 99 \mathrm{~mm}$ ( $5.2 \times 3.9 \mathrm{in}$.) |  |  |  | $196 \times 118 \mathrm{~mm}$ ( $7.7 \times 4.6 \mathrm{in}$.) |  |
| Display resolution | $640 \times 480$ VGA, 18-bit color graphics |  |  |  | $800 \times 480$ WVGA, 18-bit color graphics |  |
| Aspect ratio | 4:3 |  |  |  | 5:3 |  |
| Brightness, typical | $300 \mathrm{~cd} / \mathrm{m}^{2}$ (Nits) |  |  |  |  |  |
| Backlight life | White light-emitting diode, solid-state <br> Life: $50,000 \mathrm{~h}$ min at $40^{\circ} \mathrm{C}\left(104^{\circ} \mathrm{F}\right)$ to half-brightness, backlight is not replaceable |  |  |  |  |  |
| Touch screen | Analog resistive Actuation rating: 1 million presses Operating force: 100 grams |  |  |  |  |  |
| Battery (real-time clock backup) | Accuracy: +/-2 minutes per month. <br> Battery life: 4 years min at $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ <br> Replacement: CR2032 lithium coin cell |  |  |  |  |  |
| Memory: <br> - System <br> - User | - 512 MB RAM and 512 MB storage <br> - 80 MB , approx, nonvolatile storage for applications |  |  |  |  |  |
| Secure Digital (SD) card slot | One SD card slot for external storage; supports cat. no. 1784-SDx cards |  |  |  |  |  |
| USB ports: <br> - Host <br> - Device | - Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage <br> - One high-speed 2.0 device port (type B) that will be functional in a future release |  |  |  |  |  |
| Operating system | Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support) |  |  |  |  |  |
| Ethernet ports | Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies |  |  |  |  |  |
| Software | FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later |  |  |  |  |  |
| Electrical |  |  |  |  |  |  |
| Input voltage | $\begin{aligned} & \text { 24V DC nom } \\ & (18 \ldots 30 V ~ D C) \end{aligned}$ | 100...240V AC | $\begin{aligned} & 24 \mathrm{~V} \text { DC nom } \\ & (18 \ldots 30 \mathrm{~V} \text { DC) } \end{aligned}$ | 100... 240 V AC | $\begin{aligned} & \text { 24V DC nom } \\ & \text { (18...30V DC) } \end{aligned}$ | 100... 240 V AC |
| Power consumption | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & \text { (2.1 A at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA | 50 W max <br> (2.1 A at 24V DC) | 105VA | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & \text { (2.1 A at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA |
| Power supply | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - |
| Mechanical |  |  |  |  |  |  |
| Weight, approx | $1.2 \mathrm{~kg}(2.65 \mathrm{lb})$ |  | $1.47 \mathrm{~kg}(3.25 \mathrm{lb})$ |  | $1.58 \mathrm{~kg}(3.48 \mathrm{lb})$ |  |
| Dimensions, approx ( $\mathrm{H} \times \mathrm{W} \times \mathrm{D}$ ) | $\begin{aligned} & 170 \times 212 \times 69.6 \mathrm{~mm} \\ & 6.69 \times 8.35 \times 2.74 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 179 \times 285 \times 69.6 \mathrm{~mm} \\ & 7.05 \times 11.22 \times 2.74 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 190 \times 280 \times 69.6 \mathrm{~mm} \\ & 7.48 \times 11.02 \times 2.74 \mathrm{in} . \end{aligned}$ |  |
| Cutout dimensions, approx (H xW) | $\begin{aligned} & 142 \times 184 \mathrm{~mm} \\ & 5.59 \times 7.24 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 142 \times 237 \mathrm{~mm} \\ & 5.59 \times 9.33 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 162 \times 252 \mathrm{~mm} \\ & 6.38 \times 9.92 \mathrm{in} . \end{aligned}$ |  |

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

## PaneIView Plus 7 Performance 10-in and 12-in Terminals

| Attribute | $\begin{gathered} \text { 10-in. Touch } \\ \text { 2711P-T10C22D9P, 2711P-T10C22D9P-B }{ }^{(1)} \\ \text { 2711P-T10C22A9P, 2711P-T10C22A9P-B } \end{gathered}$ |  | $\begin{aligned} & \text { 10-in. Touch with Keypad } \\ & \text { 2711P-B10C22D9P, 2711P-B10C22D9P-B }{ }^{(1)} \\ & \text { 2711P-B10C22A9P, 2711P-B10C22A9P-B } \end{aligned}$ |  | 12-in. Touch2711P-T12W22D9P, 2711P-T12W22D9P-B ${ }^{(1)}$2711P-T12W22A9P, 2711P-T12W22A9P-B |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Operator input | Touch |  | Touch with keypad |  | Touch |  |
| Display type | TFT Color |  |  |  |  |  |
| Display size, diagonal | 10.4-in. |  |  |  | 12.1-in. |  |
| Viewing area ( $\mathrm{W} \times \mathrm{H}$ ) | $211 \times 158 \mathrm{~mm}$ ( $8.3 \times 6.2 \mathrm{in}$.) |  |  |  | $261 \times 163 \mathrm{~mm}$ ( $10.3 \times 6.4 \mathrm{in}$.) |  |
| Display resolution | $800 \times 600$ SVGA, 18-bit color graphics |  |  |  | $1280 \times 800$ WXGA, 18-bit color graphics |  |
| Aspect ratio | 4:3 |  |  |  | 16:10 |  |
| Brightness, typical | $300 \mathrm{~cd} / \mathrm{m}^{2}$ (Nits) |  |  |  |  |  |
| Backlight life | White light-emitting diode, solid-state <br> Life: $50,000 \mathrm{~h} \min$ at $40^{\circ} \mathrm{C}\left(104{ }^{\circ} \mathrm{F}\right)$ to half-brightness, backlight is not replaceable |  |  |  |  |  |
| Touch screen | Analog resistive <br> Actuation rating: 1 million presses <br> Operating force: 100 grams |  |  |  |  |  |
| Battery (real-time clock backup) | Accuracy: +/-2 minutes per month. Battery life: 4 years min at $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ Replacement: CR2032 lithium coin cell |  |  |  |  |  |
| Memory: <br> - System <br> - User | - 512 MB RAM and 512 MB storage <br> - 80 MB , approx, nonvolatile storage for applications |  |  |  |  |  |
| Secure Digital (SD) card slot | One SD card slot for external storage; supports cat. no. 1784-SDx cards |  |  |  |  |  |
| USB ports: <br> - Host <br> - Device | - Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage <br> - One high-speed 2.0 device port (type $B$ ) that will be functional in a future release |  |  |  |  |  |
| Operating system | Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support) |  |  |  |  |  |
| Ethernet ports | Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies |  |  |  |  |  |
| Software | FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later |  |  |  |  |  |
| Electrical |  |  |  |  |  |  |
| Input voltage | $\begin{aligned} & \text { 24V DC nom } \\ & (18 \ldots 30 V D C) \end{aligned}$ | 100... 240 V AC | $\begin{aligned} & \text { 24V DC nom } \\ & (18 \ldots 30 V D C) \end{aligned}$ | 100... 240 V AC | $\begin{aligned} & \text { 24V DC nom } \\ & (18 \ldots 30 V D C) \end{aligned}$ | 100... 240 V AC |
| Power consumption | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & (2.1 \mathrm{~A} \text { at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & (2.1 \mathrm{~A} \text { at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & (2.1 \mathrm{~A} \text { at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA |
| Power supply | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - |
| Mechanical |  |  |  |  |  |  |
| Weight, approx | $2.28 \mathrm{~kg}(5.03 \mathrm{lb})$ |  | $2.58 \mathrm{~kg}(5.69 \mathrm{lb})$ |  | $2.54 \mathrm{~kg}(5.60 \mathrm{lb})$ |  |
| Dimensions, approx ( $\mathrm{H} \times \mathrm{W} \times \mathrm{D}$ ) | $\begin{aligned} & 252 \times 297 \times 69.6 \mathrm{~mm} \\ & 9.92 \times 11.69 \times 2.74 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 252 \times 385 \times 69.6 \mathrm{~mm} \\ & 9.92 \times 15.16 \times 2.74 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 240 \times 340 \times 69.6 \mathrm{~mm} \\ & 9.69 \times 13.39 \times 2.74 \mathrm{in} . \end{aligned}$ |  |
| Cutout dimensions, approx (H xW) | $\begin{aligned} & 224 \times 269 \mathrm{~mm} \\ & 8.82 \times 10.59 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 224 \times 335 \mathrm{~mm} \\ & 8.82 \times 13.19 \mathrm{in} . \end{aligned}$ |  | $\begin{aligned} & 218 \times 312 \mathrm{~mm} \\ & 8.58 \times 12.28 \mathrm{in} . \end{aligned}$ |  |

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24 V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

## PanelView Plus 7 Performance 15 -in and 19-in Terminals

| Attribute | $\begin{gathered} \text { 15-in. Touch } \\ \text { 2711P-T15C22D9P, 2711P-T15C22D9P-B }{ }^{(1)} \\ \text { 2711P-T15C22A9P, 2711P-T15C22A9P-B } \end{gathered}$ |  | 15-in. Touch with Keypad <br> 2711P-B15C22D9P, 2711P-B15C22D9P-B ${ }^{(1)}$ <br> 2711P-B15C22A9P, 2711P-B15C22A9P-B |  | $\begin{gathered} \text { 19-in. Touch } \\ \text { 2711P-T19C22D9P, 2711P-T19C22D9P-B }{ }^{(1)} \\ \text { 2711P-T19C22A9P, 2711P-T19C22A9P-B } \end{gathered}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Operator input | Touch |  | Touch with keypad |  | Touch |  |
| Display type | TFT Color |  |  |  |  |  |
| Display size, diagonal | 15-in. |  |  |  | 19-in. |  |
| Viewing area ( $\mathrm{W} \times \mathrm{H}$ ) | $304 \times 228 \mathrm{~mm}$ (12.0 $\times 9.0 \mathrm{in}$. |  |  |  | $376 \times 301 \mathrm{~mm}$ ( $14.8 \times 11.9 \mathrm{in}$.) |  |
| Display resolution | $1024 \times 768$ XGA, 18-bit color graphics |  |  |  | $1280 \times 1024$ SXGA, 18-bit color graphics |  |
| Aspect ratio | 4:3 |  |  |  | 5:4 |  |
| Brightness, typical | $300 \mathrm{~cd} / \mathrm{m}^{2}$ (Nits) |  |  |  |  |  |
| Backlight life | White light-emitting diode, solid-state <br> Life: $50,000 \mathrm{~h} \mathrm{~min}$ at $40^{\circ} \mathrm{C}\left(104^{\circ} \mathrm{F}\right)$ to half-brightness, backlight is not replaceable |  |  |  |  |  |
| Touch screen | Analog resistive <br> Actuation rating: 1 million presses <br> Operating force: 100 grams |  |  |  |  |  |
| Battery (real-time clock backup) | Accuracy: +/-2 minutes per month. <br> Battery life: 4 years min at $25^{\circ} \mathrm{C}\left(77^{\circ} \mathrm{F}\right)$ <br> Replacement: CR2032 lithium coin cell |  |  |  |  |  |
| Memory: <br> - System <br> - User | - 512 MB RAM and 512 MB storage <br> - 80 MB , approx, nonvolatile storage for applications |  |  |  |  |  |
| Secure Digital (SD) card slot | One SD card slot for external storage; supports cat. no. 1784-SDx cards |  |  |  |  |  |
| USB ports: <br> - Host <br> - Device | - Two USB high-speed 2.0 host ports (type A) support removable flash drives for external storage <br> - One high-speed 2.0 device port (type B) that will be functional in a future release |  |  |  |  |  |
| Operating system | Windows CE with Extended Features and MS Office Viewers (includes FTP, VNC client server, ActiveX controls, PDF reader, third-party device support) |  |  |  |  |  |
| Ethernet ports | Two 10/100Base-T, Auto MDI/MDI-X Ethernet ports that support Device Level Ring (DLR), linear, or star network topologies |  |  |  |  |  |
| Software | FactoryTalk View Studio for Machine Edition, FactoryTalk ViewPoint, version 2.6 or later |  |  |  |  |  |
| Electrical |  |  |  |  |  |  |
| Input voltage, DC | $\begin{aligned} & 24 \mathrm{~V} \text { DC nom } \\ & (18 \ldots 30 \mathrm{~V} \text { DC) } \end{aligned}$ | 100... 240 V AC | $\begin{aligned} & \text { 24V DC nom } \\ & (18 \ldots 30 V D C) \end{aligned}$ | 100...240V AC | $\begin{aligned} & 24 \mathrm{~V} \text { DC nom } \\ & \text { (18 ...30V DC) } \end{aligned}$ | 100... 240 V AC |
| Power consumption, DC | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & (2.1 \mathrm{~A} \text { at } 24 \mathrm{~V} \text { D) } \end{aligned}$ | 105VA | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & (2.1 \mathrm{~A} \text { at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA | $\begin{aligned} & 50 \mathrm{~W} \text { max } \\ & \text { (2.1 A at } 24 \mathrm{~V} \text { DC) } \end{aligned}$ | 105VA |
| Power supply | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - | Supports (SELV) and (PELV) 24V DC supplies ${ }^{(2)}$ | - |
| Mechanical |  |  |  |  |  |  |
| Weight, approx | 3.69 kg ( 8.14 lb ) |  | $4.14 \mathrm{~kg}(9.13 \mathrm{lb})$ |  | 5.62 kg ( 12.40 lb ) |  |
| Dimensions, approx ( $\mathrm{H} \times \mathrm{W} \times \mathrm{D}$ ) | $318 \times 381 \times 69.6 \mathrm{~mm}$ $12.52 \times 15.00 \times 2.74$ in |  | $329 \times 484 \times 69.6 \mathrm{~mm}$ $12.95 \times 19.06 \times 2.74$ in |  | $411 \times 485 \times 69.6 \mathrm{~mm}$ $16.18 \times 19.09 \times 2.74$ in |  |
| Cutout dimensions, approx (HxW) | $\begin{aligned} & 290 \times 353 \mathrm{~mm} \\ & 11.42 \times 13.90 \mathrm{in} \end{aligned}$ |  | $\begin{aligned} & 290 \times 418 \mathrm{~mm} \\ & 11.42 \times 16.46 \mathrm{in} \end{aligned}$ |  | $\begin{aligned} & 383 \times 457 \mathrm{~mm} \\ & 15.08 \times 17.99 \mathrm{in} \end{aligned}$ |  |

(1) Catalog numbers with a -B extension denote terminals that exclude the Allen-Bradley brand marking. Customers can put their own brand labels on these terminals.
(2) DC-powered terminals support safety extra low voltage (SELV) and protective extra low voltage (PELV) 24 V DC power supplies such as cat. nos. 1606-XLP95E, 1606-XLP100E, 2711P-RSACDIN.

## Product Dimensions

The table provides product dimensions. The 10.4 -inch touch and combination keypad with touch devices are shown for illustrative purposes. All other terminal sizes look similar.

PaneIView Plus 7 Performance Dimensions - 10.4-in. Model


Product Dimensions - PanelView Plus 7 Performance Terminals

| $\begin{gathered} \text { Terminal } \\ \text { Size } \end{gathered}$ | $\begin{aligned} & \hline \text { Input } \\ & \text { Type } \end{aligned}$ | Height (a) mm (in.) | Width (b) mm (in.) | $\begin{aligned} & \text { Overall Depth (c) } \\ & \mathrm{mm} \text { (in.) } \end{aligned}$ | Mounted Depth (d) mm (in.) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 6.5-in. | Key/touch | 179 (7.05) | 285 (11.22) | 69.6 (2.74) | 63.6 (2.50) |
|  | Touch | 170 (6.69) | 212 (8.35) |  |  |
| 9-in. | Touch | 190 (7.48) | 280 (11.02) |  |  |
| 10.4-in. | Key/touch | 252 (9.92) | 385 (15.16) |  |  |
|  | Touch | 252 (9.92) | 297 (11.69) |  |  |
| 12.1-in. | Touch | 246 (9.69) | 340 (13.39) |  |  |
| 15-in. | Key/touch | 329 (12.95) | 484 (19.06) |  |  |
|  | Touch | 318 (12.52) | 381 (15.00) |  |  |
| 19-in. | Touch | 411 (16.18) | 485 (19.09) |  |  |

TIP When mounted in a panel, the front of the bezel extends less than $6.36 \mathrm{~mm}(0.25 \mathrm{in}$.) from the front of the panel.

## Accessories

The tables in this section list accessories for the PanelView Plus 7 Performance terminals.

## Protective Overlays

| Cat. No. ${ }^{(1)}$ | Display Size | Operator Input |  |
| :---: | :---: | :---: | :---: |
|  |  | Touch | Key and Touch |
| 2711P-RGT7SP | 6.5-in. | - |  |
| 2711P-RGB7P |  |  | - |
| 2711P-RGT9SP | 9-in. (wide) | - |  |
| 2711P-RGT10SP | 10.4-in. | - |  |
| 2711P-RGB10P |  |  | - |
| 2711P-RGT12SP | 12.1-in. (wide) | - |  |
| 2711P-RGT15SP | 15-in. | - |  |
| 2711P-RGB15P |  |  | - |
| 2711P-RGT19P | 19-in. | - |  |

(1) Three overlays are shipped with each catalog number.

## Power Supplies and Power Terminal Blocks

| Cat. No. | Description | Quantity |
| :--- | :--- | :--- |
| 1606-XLP95E | DIN rail power supply, 24 ...28V DC output voltage, 95 W | 1 |
| 1606-XLP100E | DIN rail power supply, 24...28V DC output voltage, 100 W | 1 |
| 2711P-RSACDIN | DIN rail power supply, AC-to-DC, 85 . .265V AC, $47 \ldots 63 \mathrm{~Hz}$ | 1 |
| 2711P-RTBAP | 3-pin AC power terminal block | 10 |
| 2711P-RTBDSP | 3-pin DC power terminal block | 10 |

## Mounting Hardware

| Cat. No. | Description | Quantity |
| :--- | :--- | :---: |
| 2711P-RMCP ${ }^{(1)}$ | Mounting levers (black) | 16 |

(1) Catalog number 2711P-RMCP mounting levers are used with PanelView Plus 7 Performance terminals. Do not use gray mounting levers; they are not compatible with PanelView Plus 7 Performance terminals.

Secure Digital (SD) Cards

| Cat. No. | Description |
| :--- | :--- |
| 1784-SD1 | 1GB SD card |
| 1784-SD2 | 2GB SD card |
| 2711C-RCSD | USB to SD adapter for SD card |

## Battery Replacement

| Cat. No. | Description | Quantity |
| :--- | :--- | :---: |
| 2711P-RY2032 | Lithium coin cell battery, CR2032 equivalent | 1 |

## HMI Software

All PanelView Plus 7 terminals are configured with FactoryTalk View Studio software and have an integrated runtime system called FactoryTalk View Machine Edition Station.

Machine Edition Station runs projects that are developed with FactoryTalk View Studio software and is included on all PanelView Plus 7 terminals.

Two versions of FactoryTalk View Studio software support application development for PanelView Plus 7 terminals.


| Cat. No. ${ }^{(1)}$ | Description |
| :--- | :--- |
| $9701-$ VWSTMENE | FactoryTalk View Studio for Machine Edition software - Configuration software for developing and testing <br> machine-level human machine interface (HMI) applications. Includes RSLinx ${ }^{\text {E Enterprise and KEPServer Enterprise }}$ <br> software. |
| $9701-$ VWSTENE | FactoryTalk View Studio soffware - Configuration software for developing and testing machine-level and <br> supervisory-level human machine interface (HMI) applications. |

(1) To order localized versions of the software, replace EN in the catalog number with DE for German, FR for French, JP for Japanese, or ZH for Chinese.

You can import PanelView Standard/PanelBuilder 32 and PanelView applications into FactoryTalk View Studio software as Machine Edition applications by using the Machine Edition Import Wizard. The Import Wizard steps you through a few options such as scaling to a new screen resolution size, and then converts objects, text, tags, and communication configurations to ones that are available in Machine Edition.


FactoryTalk ViewPoint software, an add-on to FactoryTalk View Studio software, allows plant managers, production supervisors, system integrators, and other key stakeholders to view and control real-time plant floor operations remotely from a web browser. FactoryTalk ViewPoint enabled displays are fully scalable and animated in the browser. The remote user can also view displays that are not the active display of the terminal.

Each PanelView Plus 7 terminal contains one license that supports one client connection to the terminal. No additional software is required.

For a complete list of available HMI software, visithttp://www.rockwellautomation.com/rockwellsoftware.

## Additional Resources

These documents contain more information about related products from Rockwell Automation.

| Resource | Description |
| :--- | :--- |
| PanelView Plus 7 Performance Terminals User Manual, publication 2711P-UM008 |  |$\quad$| Provides instructions on how to install, configure, and operate the PanelView Plus 7 |
| :--- |
| Performance terminals. |.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/ overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

## Rockwell Automation Support

Use the following resources to access support information.

| Technical Support Center | Knowledgebase Articles, How-to Videos, FAQs, Chat, <br> User Forums, and Product Notification Updates. | www.rockwellautomation.com/knowledgebase |
| :--- | :--- | :--- |
| Local Technical Support Phone Numbers | Locate the phone number for your country. | www.rockwellautomation.com/global/support/get-support- <br> now.page |
| Direct Dial Codes | Find the Direct Dial Code for your product. Use the <br> code to route your call directly to a technical support <br> engineer. | www.rockwellautomation.com/global/support/direct- <br> dial.page |
| Literature Library | Installation Instructions, Manuals, Brochures, and <br> Technical Data. | www.rockwellautomation.com/literature |
| Product Compatibility and Download Center <br> (PCDC) | Get help determining how products interact, check <br> features and capabilities, and find associated <br> firmware. | www.rockwellautomation.com/global/support/pcdc.page |

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

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# Bul. 440R - Guardmaster®Safety Relays (DI, DIS, SI, CI, GLP, EM, and EMD) 

Selection Guide



Description
The new generation of Guardmaster® safety relays addresses the broad scope of applications in the intricate safety world with a range of devices. Designed to meet new functional safety standards, such as EN ISO 13849-1 and EN 62061, the new family offers key functions to simplify installation and system complexity. A broad range of safety devices such as safety interlock switches, emergency stop devices, pressure sensitive safety mats, and OSSD devices such as safety light curtains are all compatible with the same relay without additional configuration. The functionality of two standard safety relays can be achieved in one Dual Input (DI) device, allowing connection of two dual-channel input devices into one safety relay.
A TÜV-approved single rotary switch sets the required function of the safety relay and eliminates the typical redundant switch setting process. Selectable functions include simple logic, reset, timing, and diagnostics.
The single-wire safety connection simplifies cascading and expanding safety functions by linking relays with a single-wire connection. A dynamic signal from device to device provides a linkage in accordance with SIL 3, PLe, allowing easy addition of extra I/O, which can be configured with simple logic combinations. Flexible AND/OR logic can be configured simply in a single relay or through a combination of relays via single-wire connection.
The family includes a module designed specifically for guardlocking applications. The GLP uses two proximity sensors to monitor machine motion, and unlocks the gate when safe speed is attained.
Expansion modules are available with four immediate or timedelayed outputs. The time delay module can be configured for on delay, off delay, or jog.

## Features

- Suitable for applications up to PLe, SIL 3 Per ISO13849-1
- Stop Category 0 and Stop Category 1
- One or two dual-channel inputs
- Two or three safety contacts
- One auxiliary contact
- Cross-fault monitoring
- Rotary switch configures auto/manual or monitored manual reset
- Same rotary switch configures AND/OR logic of input to device
- Removable terminals
- Can be used with interlocks, light curtains, safety mats, E-stops, and SensaGuard ${ }^{\text {TM }}$ switches
- Single-wire safety output connects to single-wire safety input relays while maintaining SIL 3, PLe
- Guardlocking with proximity sensors
- Timed ON delay, OFF delay, and Jog outputs on EMD

Specifications
Safety Ratings

| Standards | IEC 60204-1, EN ISO 13849-1, EN ISO 12100, IEC 61508 |
| :---: | :---: |
| Safety Classification | DI/DIS/CI/SI/EM/EMD: Suitable up to PLe and CAT4 per EN ISO 13849-1:2006, SIL CL3 per IEC 61508:2010/IEC62061:2006 depending on architecture and application characteristics GLP: Suitable up to PLd and CAT3 per EN ISO 13849-1:2006, SIL CL2 per IEC 61508:2010 /IEC62061:2006 depending on architecture and application characteristics |
| Certifications | CE Marked for all applicable directives, cULus Listed and TÜV |
| Functional Safety Data | See next page |
| Power Supply |  |
| Input Power Entry | 24V DC (-15...+10\%) |
| Power Consumption | DI/SI: 2.5 W <br> DIS: 2 W <br> CI/EM/EMD: 3.5 W <br> GLP: 2.5 W |
| Inputs |  |
| Safety Inputs | DI/DIS: 2 dual N.C., 2 dual OSSD, or safety mats and 1 single-wire safety input <br> SI/CI: 1 dual N.C., 1 dual OSSD, or safety mats GLP: 1 dual N.C. or 1 dual OSSD and 1 single/wire safety <br> EM/EMD: 1 single-wire safety input |
| Input Simultaneity | Infinite |
| Input Resistance, Max. | $900 \Omega$ |
| Reset | Configured automatic/manual or monitored manual |
| Reset Pulse Duration | $250 \mathrm{~ms} . .3 \mathrm{~s}$ |
| Power ON Delay Time | $\begin{aligned} & \text { DI/DIS/SI/CI/EM/EMD: } 5.5 \mathrm{~s} \\ & \text { GLP: } 11 \mathrm{~s} \end{aligned}$ |
| Recovery Time | DI/DIS/SI/CI: 100 ms EM/EMD: 150 ms |
| Response Time (Safety Outputs) | DI: 35 ms ( 40 ms with mat input) <br> DIS: 25 ms ( 30 ms with mat input) <br> SI/CI: 35 ms ( 45 ms with mat input) <br> GLP: overspeed detection time $=3 /$ speed limit [Hz]) <br> EM/EMD: 35 ms |
| Response Time (SingleWire Safety Outputs) | DI/DIS: 25 ms ( 30 ms with mat input) SI/CI: 25 ms ( 35 ms with mat input) GLP/EM/EMD: 25 ms |
| Outputs |  |
| Safety Outputs | DI/SI: 2 N.O. <br> CI: 3 N.O. <br> DIS: 2 PNP (14, 24); 2 Decoupled (34, 44) <br> EM: 4 N.O. <br> EMD: 4 N.O. delayed <br> DIS/GLP: 2 PNP safety, 2 PNP Lock |
| Solid State Output Rating | DIS: $2 \times 1.5 \mathrm{~A} ; 2 \times 0.5 \mathrm{~A}$; Total: max. 4 A GLP: $2 \times 0.5$ A; $2 \times 0.3$ A; Total: $\max 1.5 \mathrm{~A}$ |
| Contact Material | DI: $\mathrm{AgNi}+0.2 \mu \mathrm{Au}$ SI/CI/EM/EMD: AgNi |
| Auxiliary Contacts | DI/DIS/SI/GLP/EM/EMD: 1 PNP; 50 mA max CI: 1 N.C. |
| Thermal Currentl ${ }_{\text {th }}$ | $1 \times 6$ A |
| Rated Impulse withstand Voltage | 2500V |
| Switching Current @ Voltage, Min. | DI/SI/CI/EM/EMD: $10 \mathrm{~mA} / 10 \mathrm{~V}$ |
| Fuses, Output | Relay Outputs: 6 A low blow or 10 A quick blow <br> Power Supply GLP: 4A gG, tripping characteristic B or C |
| Mechanical Life | DI/SI/CI/EM/EMD: 10,000,000 operations |

Specifications, continued

| Utilization Category |  |
| :---: | :---: |
| Inductive: AC-15 | DI: 3 A/250V AC <br> SI/CI: 1.5 A/250V AC <br> EM/EMD: $1.5 \mathrm{~A} / 250 \mathrm{~V}$ AC |
| Inductive: DC-13 | DI: 4 A/24V DC ( 0.1 Hz ) <br> SI/CI: $2 \mathrm{~A} / 24 \mathrm{~V}$ DC ( 0.1 Hz ) <br> EM/EMD: 2 A/24V DC |
| Output Rating | DIS: 14, 24: 1.5 A each 34, 44: 0.5 A each GLP: X14, X24: 0.5 A each 51, L61: 0.3 A each |
| Environmental and Physical Characteristics |  |
| Enclosure Type Rating/ Terminal Protection | IP40 (NEMA 1)/IP20 |
| Operating Temperature [C (F)] | $-5 \ldots+55^{\circ}\left(23 \ldots 131^{\circ}\right)$ |
| Vibration | $10 . . .55 \mathrm{~Hz}, 0.35 \mathrm{~mm}$ |
| Shock | $10 \mathrm{~g}, 16 \mathrm{~ms} 100$ shocks |
| Mounting | 35 mm DIN Rail |
| Weight [g (lb)] | DI: 180 (0.40) DIS: 150 (0.33) SI: 150 (0.33) CI: 225 (0.5) GLP: 150 (0.33) EM: 225 (0.50) EMD: 220 (0.49) |
| Terminals | Removable (Screw) |
| Conductor Size, Max. | 0.2... $4 \mathrm{~mm}^{2}$ (24...12 AWG) |

## Product Selection

Safety Relays

| Relay Type | No. of Inputs | Inputs | Immediate Safety Outputs | Delayed Safety Outputs | Time Delay | Immediate Auxiliary Outputs | Power Supply | Cat. No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Dual Input (DI) | 2 dualchannel | $\begin{gathered} 1 \text { N.C., } 2 \\ \text { N.C., OSSD, } \\ \text { Safety Mat } \end{gathered}$ | 2 N.O. | - | - | 1 S.S. | 24V | 440R-D22R2 |
| Dual Input Solid-State Output (DIS) |  |  | 2 S.S. |  |  |  |  | 440R-D22S2 |
| Single Input (SI) | 1 dualchannel | $\begin{gathered} 1 \text { N.C., } 2 \\ \text { N.C., OSSD, } \\ \text { Safety Mat } \end{gathered}$ | 2 N.O. | - | - | 1 S.S. | 24 V | 440R-S12R2 |
| Compatible Input (CI) |  |  | 3 N.O. |  |  |  |  | 440R-S13R2 |
| Guardlocking Proximity (GLP) | 1 dualchannel 2 PNP | $\begin{aligned} & 2 \text { N.C., } \\ & \text { OSSD } \end{aligned}$ | 2 S.S. | - | - | 1 S.S. | 24V | 440R-GL2S2P |
| Expansion Module (EM) | 1 single-wire safety | - | 4 N.O. | - | - | 1 S.S. | 24V | 440R-EM4R2 |
| Expansion Module Time Delayed (EMD) |  |  | - | - | $\begin{gathered} 100 \mathrm{~ms} \ldots 300 \mathrm{~s} \\ \text { on or off delay } \\ 100 \mathrm{~ms} \ldots 20 \mathrm{~s} \\ \text { jog } \end{gathered}$ |  |  | 440R-EM4R2D |

## Accessories

| Description | Cat. No. |
| :---: | :---: |
| Bag of four, 4-pin screw terminals | 440R-ATP4 |

Functional Safety Data $\star$
Note: Subject to change. For up-to-date information, visit http://www.ab.com/safety/

| MTTFd |  | PFH $_{\text {D }}$ |
| :---: | :---: | :---: |
| DI | 355 yr | $4.35 \times 10^{-9}$ |
| DIS | 484 yr | $4.39 \times 10^{-9}$ |
| SI | 262 yr | $3.98 \times 10^{-9}$ |
| Cl | 164 yr | $4.26 \times 10^{-9}$ |
| GLP | 395 yr | $7.18 \times 10^{-9}$ |
| EM | 190 yr | $1.81 \times 10^{-9}$ |
| EMD | 165 yr | $4.4 \times 10^{-9}$ |

* Usable for ISO 13849-1: 2006 and IEC 62061. Data is based on the following assumptions:
- Mission time/proof test interval of 20 yr
- Functional test at least once within six-month period
- The PFH D given is the sum of the $\mathrm{PFH}_{D}$ of the electronic aspects and the $\mathrm{PFH}_{\mathrm{D}}$ resulting from the B10d values of the two output relays based on 1 operation/hour, 365 days a year, 24 hours a day ( 8760 operations/year) at AC15 1 A 230V AC or at DC13 1.5 A 24V DC.

Bulletin 440R
Next Generation Guardmaster® Safety Relays
DI, DIS, SI, CI, GLP, EM, and EMD
Approximate Dimensions
Dimensions are shown in mm . Dimensions are not intended to be used for installation purposes.


Block Diagrams
Dual Input Relay (DI)
Safety Outputs (N.O.): 13-14, 23-24


Dual Input Solid State Output Relay (DIS)
Safety Outputs (PNP N.O.): 14 \& 24 (1.5 A each max), $34 \& 44$ ( 0.5 A each max, for high capacitive loads)


Single Input Relay (SI)
Safety Outputs (N.O.): 13-14, 23-24


Single Input Relay Compatible Layout (CI)
Safety Outputs (N.O.): 13-14, 23-24, 33-34


Block Diagrams, continued
Guardlocking with Proximity Sensors (GLP)
Safety Outputs (PNP N.O.): L11 (Single Wire Safety)


## Expansion Module Relay (EM)

Safety Outputs (N.O.): 13-14, 23-24, 33-34, 43-44


Common Terminals

| Terminals | Relay | Description |
| :---: | :---: | :---: |
| A1, A2 | All | Power |
| S12, S22 | DI, DIS, SI, CI | IN1: Safety input 1 |
| S32, S42 | DI, DIS | IN2: Safety input 2 |
| S11, S21 | DI, DIS, SI, CI | Test outputs for safety inputs |
| S34 | DI, DIS, SI, CI | Monitoring feedback loop for reset |
| S44 | GLP | Lock request and reset |
| S54 | GLP | Unlock request |
| Y32 | DI, DIS, SI, GLP | Auxiliary PNP semiconductor output |
| $41-42$ | CI | Auxiliary N.C. relay output |
| X32 | EM, EMD | Feedback PNP semiconductor output |
| L12 | DI, DIS, EM, EMD | Single wire safety input |
| L11 | All | Single wire safety output |
| B1, B2 | EMD | Configuration for retriggering/jogging |
| 51, L61 | GLP | Lock command to solenoid |
| X14, X24 | GLP | Multifunction safety outputs |
| AP, P12, P22 | GLP | Proximity sensor power and inputs |

[^5]Expansion Module Delayed Output Relay (EMD)
Delayed Safety Outputs (N.O.): 17-18, 27-28, 37-38,47-48


Auxiliary/Feedback Output Behavior

| Unit Status | DI, DIS, SI | Cl | EM, EMD |
| :---: | :---: | :---: | :---: |
|  | Y32 | 41-42 | X32 |
| Active \& healthy | Off | Open | Off |
| Inactive \& healthy | 24 V DC | Closed | 24 V DC |
| Fault | 24 V DC | Closed | Off |
| Unit Status | GLP |  |  |
|  | Y32 |  |  |
| Cat 1 Stop | Off upon unlock request |  | 24V DC active \& healthy |
| Safe Limited Speed | 24V DC upon unlock request |  | Off active \& healthy |
| Fault | Off |  | Off |

## Logic

The logic between the two safety inputs IN1 (S12, S22) and IN2 (S32, S42) and the single-wire safety input (L12) can be configured to the four options shown below, in either manual monitored or automatic/manual reset configurations (yielding eight settings total). L12 will only recognize a valid test pattern from the L11 output of a Guardmaster device. Any other signal to that port will be detected as a fault. (A high signal is considered to be true in this logic. So if an input is to be ignored or muted, OR logic should be used).
Note: In case only one safety input is used the second one can be left open if it is configured for OR. An AND conjunction requires this input to be wired to S 11 and S 21 . In case L12 is not in use, this input needs to be configured for OR.

## Manual Monitored Reset Automatic/Manual Reset

 1 (IN1 OR IN2) OR L12 5 (IN1 OR IN2) OR L12 2 (IN1 AND IN2) OR L12 6 (IN1 AND IN2) OR L12 3 (IN1 OR IN2) AND L12 7 (IN1 OR IN2) AND L12 4 (IN1 AND IN2) AND L12 8 (IN1 AND IN2) AND L12

## Configuration

## Setting the Logic Function/Reset Mode - DI, DIS, SI, and CI

1. Start configuration/overwrite: with power off, turn rotary switch to position 0 and unit is powered up. After power-up test, PWR LED will flash red.
2. Set configuration: turn rotary switch to desired position. IN1 LED blinks new setting.

Note: Position is not stored until PWR LED is solid green.
3. Lock in configuration by cycling unit power.
4. Configuration must be confirmed before operation. A white rectangle on face of device is provided to record unit setting.
(1) Enable program mode
(3) Cycle power to store
(4) Record setting


## Setting the Time Delay - EMD

1. Start configuration/overwrite: with power off , turn rotary switch RANGE to position 0 and power unit up. After power-up test, PWR LED will flash red.
2. Set configuration: turn rotary switch to desired position, both RANGE and TIME. LED B1 indicates position of RANGE and Logic IN of TIME.
Note: Position is set when "PWR" LED is solid green.
3. Lock in configuration by cycling unit power.
4. Configuration must be confirmed before operation. A white space on face of device is provided to record unit setting.

Note: When in off-delay mode, terminals B1 and B2 are used to modify the settings of retriggering. The terminals are not used in on-delay mode. Terminal B1 is used for the pulse source when the relay is in single pulse jogging mode.

OFF-DELAY (RANGE 1, 2, 3, 4): Time delay starts when single-wire safety input L12 changes from HIGH to LOW. Delayed safety outputs remain active until the set time has lapsed. The unit is safe against time extension. Restart the unit by cycling the safety input L12, LOW to HIGH.

- RETRIGGERABLE (JUMPER B1-B2): In off-delay mode, the device can be set to retriggerable setting. In retrigger mode, if the safety input is triggered and cleared within the duration of the time delay then the timing request is ignored and the safety output contacts will remain closed. Retrigger setting can only be done in off-delay mode and can be set by running a jumper wire from terminal B1 to B2 (corresponds with MSR178 and MSR132ED delayed outputs).
- NON-RETRIGGERABLE (NO JUMPER): In off-delay mode, if retriggerable setting is not configured (terminals B1 and B2 are left vacant) the full time delay will lapse and the safety output contacts will open before the relay can be reset (corresponds with MSR178 and MSR132ED delayed outputs).
ON-DELAY (RANGE 5, 6, 7): Time delay starts when the single-wire safety input changes from LOW to HIGH. Safety outputs are activated after time has lapsed and L12 is still HIGH.
SINGLE-PULSE JOGGING: The safety outputs are activated when both, the single-wire safety input L12 and B1 are HIGH. It remains active until the set time has lapsed. When one of the inputs changes to LOW, the safety outputs are deactivated immediately. B1 acts as an automatic/manual start to trigger the Jog function while L12 monitors the safety device through a base unit. If there is any malfunction, the JOG switch should be replaced.


[^6]Configuration, continued
Setting the Guardlocking Prox Logic Function - GLP

| Logic Setting | Lock Command | Application | Logic |
| :---: | :---: | :---: | :---: |
| 0 | Start-up Configuration Mode (X14 and X24 - safety outputs) |  |  |
| 1 | Power To Release | Category 1 Stop | Logic In Off |
| 2 |  |  | Logic In AND |
| 3 |  | Safe Limited Speed | Logic In Off |
| 4 |  |  | Logic In AND |
| 5 | Reserved for Future Use |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 | Alternate Start-up Configuration Mode (X14 and X24-test outputs) |  |  |

The GLP supports a power to release locking command:

- During normal operation, the lock command signal ( $51 / \mathrm{L} 61$ ) to the guardlocking device is unpowered to maintain the gate in a locked state. Press the Unlock request to start the timer. After the configured time delay expires, the lock command is powered to allow the safety gate to be opened.

The GLP is designed for two types of applications:

- Category 1 Stop: When the Unlock request is made, the Y32 output turns off to allow the stopping function to begin. When the GLP detects that the speed is below the stopped speed, the lock command changes state (depending on whether Power-To-Release or Power-To-Lock was configured).
- Safe Limited Speed: When the Unlock request is made, the Y32 output turns ON to allow slow speed operation. When the GLP detects that the speed is below the SL1 speed, the unlock command is turned ON.

Setting the configuration:

1. Start configuration/overwrite: With power off, turn rotary switch LOGIC to position 0 to configure X14 and X24 as saftey outputs, or position 9 to configure X14 and X24 as pulse test outputs for safety inputs. Power unit up. After power-up test, PWR LED will flash red.
2. Set configuration: Turn all three rotary switches to desired position, LOGIC, SLS, and MAX. IN1 indicates position of LOGIC, and Logic IN of SLS and Lock of MAX.
Note: Position is set when PWR LED is solid green.
3. Lock in configuration by cycling unit power.
4. Configuration must be confirmed before operation. A white rectangle on face of device is provided to record unit setting.
(1) Enable configuration mode

Logic

(2) Set operation mode (Logic, SLS and MAX)

Logic


Safe Limited Speed (SLS)


Safe Maximum Speed (MAX)

(3) Cycle power to store

(4) Record setting


## Bulletin 440R <br> Next Generation Guardmaster® Safety Relays <br> DI, DIS, SI, CI, GLP, EM, and EMD

Proximity Sensor Configuration
The GLP is designed to operate with two PNP sensors.

1. The proximity sensors can detect a geartooth arrangement where the ratio of the space to mark is $2: 4$.
2. The space must be at least twice the diameter of the sensor. The mark must be at least twice the width of the space.
3. The proximity sensors must be set back from the mark no further than $80 \%$ of their rated sensing distance, Sn .

Note: The distance of 0.5 Sn is required to achieve maximum speed.
4. The depth of the space must be at least 3 times the rated sensing distance.
5. The distance between the sensors must ensure that both sensors are not off at the same time.


## DIN Rail Combination Filter and Surge Protective Device 4983-DC

Bulletin 4983-DC is the combination of a filter and a surge protective device. The Bulletin 4983-DC product meets both UL 1449 and UL 1283. This product allows transient and noise protection in one small package.

## Features

- Small combination (filter and SPD) package size
- Features Isatrol technology
- All-mode transient protection with exceptional Line to Neutral value of 25 kA
- LED power indication
- Form C contact for remote status indication
- DIN Rail mountable



## Product Selection

| AC Network | Connection <br> Mode | Frequency [Hz] | Max. <br> Continuous <br> Operating Voltage (MCOV) (Uc) [V AC] | Maximum Discharge Current $8 / 20 \mu \mathrm{~s}$ ( $I_{\text {max }}$ ) [kA] |  |  | Nominal Discharge Current $8 / 20 \mu \mathrm{~s}\left(I_{n}\right)$ [kA] | UL1449 Voltage <br> Protection <br> Rating (VPR) [V AC] |  |  |  | Ampacity [A] | Cat. No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | L/G | L/N | N/G |  | L/G | L/N | N/G | L-L |  |  |
| 120 V AC | L/G,L/N, N/G | 47... 63 | 150 | 10 | 25 | 10 | 3 | 600 | 400 | 600 | - | 3.0 | 4983-DC120-03 |
|  |  |  |  |  |  |  |  |  |  |  |  | 5.0 | 4983-DC120-05 |
|  |  |  |  |  |  |  |  |  |  |  |  | 10 | 4983-DC120-10 |
|  |  |  |  |  |  |  |  |  |  |  |  | 20 | 4983-DC120-20 |
| 240 VAC |  |  | 320 |  |  |  |  | 1200 | - | - | 800 | 3.0 | 4983-DC240-03 |
|  |  |  |  |  |  |  |  |  |  |  |  | 5.0 | 4983-DC240-05 |
|  |  |  |  |  |  |  |  |  |  |  |  | 10 | 4983-DC240-10 |
|  |  |  |  |  |  |  |  |  |  |  |  | 20 | 4983-DC240-20 |

## Specifications

| Connection/Mounting Type | Series/DIN Rail mount |
| :---: | :---: |
| Enclosure | Metal, DIN Rail mount, product label |
| Approximate Weight | $\begin{aligned} & 3 \mathrm{~A}-1 \mathrm{lb} \\ & 5 \mathrm{~A}-1 \mathrm{lb} \\ & 10 \mathrm{~A}-1.5 \mathrm{bs} \\ & 20 \mathrm{~A}-1.5 \mathrm{lbs} \end{aligned}$ |
| Modes of Protection | $\begin{aligned} & \text { Line - Neutral } \\ & \text { Line -Line } \\ & \text { Line - PE } \\ & \text { Neutral - PE } \end{aligned}$ |
| Certifications | UR Recognized, CSA, CE Marked |
| Typical Cat. A Ringwave Rating | < 60 V peak |
| Typical Cat. B Ringwave Rating | < 100V peak |
| Status Indication | Single green LED indicating MOV integrity <br> Single form C contact ( 10 A @ 250V AC, 5 A @ 100V DC) |
| Response Time | Normal mode: $<0.5 \mathrm{~ns}$ Common Mode: $<5 \mathrm{~ns}$ |
| Operating Temperature | $-40 \ldots+60^{\circ} \mathrm{C}$ derate linearly to $60 \% @+70^{\circ} \mathrm{C}$ |
| Fusing | Appropriate external fusing is required |
| Frequency Response 100 kHz . . 50 MHz | Normal Mode ( $100 \mathrm{kHz} . .50 \mathrm{MHz}$ ) - 90 dB min. Common Mode ( $5 . . .50 \mathrm{MHz}$ ) - 60 dB min. 50 kHz cut-off frequency |

## Approximate Dimensions

Dimensions are shown in inches (millimeters). Dimensions are not intended for manufacturing purposes.
Cat. Nos. 4983-DCxxx-03, -DCxxx-05


## Cat. Nos. 4983-DCxxx-03,-DCxxx-05



## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

| Resource | Description |
| :--- | :--- |
| Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1 | Provides general guidelines for installing a Rockwell Automation industrial system. |
| Product Certifications website, rok.auto/certifications. | Provides declarations of conformity, certificates, and other certification details. |

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/ overview.page.


Note: Spring clamp sockets are also available. Cat. No. 700-HN223 for Cat. No. 700-HK36 and Cat. No. 700-HN224 for 700-HK32.
Bulletin 700-HK Slim Line Relay, Socket, and Retainer Clip Reference Chart

| Relay Type | Socket Cat. No. | Retainer Clip Cat. No. |
| :---: | :---: | :---: |
| 700-HK32 | 700-HN122, 700-HN222, 700- <br> HN224 | Provided |
| $700-$ HK36 | 700-HN121, 700-HN221, 700- <br> HN223 |  |

## 700-HA General-purpose Relay

- 10 A contact rating
- DPDT,3PDT
- Pin-style terminals
- Standard ON/OFF flag indicator
- Options: LED, push-to-test and manual override, socket-mounted surge suppressor module, or multi-function timer
- Contact choices: standard silver nickel, or bifurcated silver nickel with gold plating


Tube Base Relay with PIN Terminals (Single Contact) — Mechanical ON/OFF Indicator Included ${ }^{(1)}$

(1) LED Option: Add suffix (-4) to the selected 700-HA Relay Cat. No., except for the 240V AC Units, add (-4L). Push-to-test, Manual Override, and LED Option: Add suffix (-3-4) to the selected 700-HA Relay Cat. No., except for the 240V AC units, add ( $-3-4 \mathrm{~L}$ ). Push-to-test and Manual Override option: Add suffix $(-3)$ to the selected 700 -HA relay.
LED not available for 220V DC and 277V AC coils.

## Specifications - 700-HA Relays



[^7]
## Relay Performance Graphs



Contact life vs. AC1 load at 1,800 cycles $/ \mathrm{h}$


Breaking capacity for DC1 load at 1,800 cycles/h
A = load applied to one contact
$B=$ load applied to two contacts in series
C = load applied to three contacts in series


Load reduction factor vs. $\cos \varphi$

Specifications-700-HT3 Time Module

| Attribute | 700-HT3 |
| :---: | :---: |
| Electrical Ratings |  |
| Operating Voltage Range | 12... $240 \mathrm{VAC}(50 / 60 \mathrm{~Hz}$ ) $12 \ldots . .240 \mathrm{VDC}$ |
| Power Consumption | $\begin{aligned} & 0.1 \mathrm{~W}(12 \mathrm{~V}) \\ & 1.0 \mathrm{~W}(230 \mathrm{~V}) \end{aligned}$ |
| Mechanical |  |
| Degree of Protection of Input (B1) Terminal | IP 20 (Guarded Terminal) |
| Input Terminal Wire Range | $1.0 \times 0.2 \mathrm{~mm}^{2} \ldots 2.5 \mathrm{~mm}^{2}$ (24 AWG $\ldots 14$ AWG) $2.0 \times 0.2 \mathrm{~mm}^{2} \ldots 1.5 \mathrm{~mm}^{2}$ (24 AWG $\ldots 16$ AWG) |
| Input Terminal Torque Range | $0.45 \ldots 0.8 \mathrm{Nm}$ ( $4 \ldots . .7 \mathrm{lb}-\mathrm{in}$.) |
| Status Indicator | Red |
| Repeat Accuracy ${ }^{(1)}$ | $\pm 1 \%$ |
| Recovery Time | < 50 ms |
| Selectable Timing Ranges | Three DIP switches, seven ranges (set from $5 \ldots 100 \%$ of range): $1 \mathrm{~s}, 10 \mathrm{~s}, 100 \mathrm{~s}, 10 \mathrm{~min}, 100 \mathrm{~min}, 10 \mathrm{~h}, 100 \mathrm{~h}$ |
| Selectable Timing Modes | Three DIP switches, eight modes:  <br> 1. Power0n-Delay 5. Signal Off-Delay <br> 2. Power On One-Shot 6. Signal On-One-Shot <br> 3. Power On Repeat Cycle, On Start 7. Signal Off-One-Shot <br> 4. Signal On-Delay and Signal Off-Delay 8. Signal On and Signal Off Watchdog Monitor |
| Adjustable Trimmer Scale Accuracy | $\pm 5 \%$ of Time Range |
| Environmental |  |
| Temperature | $-20^{\circ} \mathrm{C} \ldots+50^{\circ} \mathrm{C}\left(-4{ }^{\circ} \mathrm{F} \ldots+122^{\circ} \mathrm{F}\right)$ |
|  | $-55^{\circ} \mathrm{C} \ldots+85^{\circ} \mathrm{C}\left(-67 \ldots+185^{\circ} \mathrm{F}\right)$ |
| Altitude | 2000 m (6560 ft) |
| Construction |  |
| Enclosure | Gray Plastic Housing |
| Mounting with Socket Only | 8- or 11-Pin Socket with Module Plug |
| Sockets | 700-HN204 (8-Pin with Plug), 700-HN205 (11-Pin with Plug) |
| Certifications | cURus Recognized (File No. E14843, Guide NRNT2/NRNT8), CE Marked |
| Standards | UL508, CSA C22.2 No. 14, EN 61810-1 |

(1) At constant voltage and temperature.

Interposing/Isolation Relays
Product Overview/Catalog Number Explanation

|  | Bulletin 700-HL 2-Pole "Terminal Block Relay" <br> - Relay and socket assembled interface modules for high density interposing or isolation applications <br> - Screw terminal and spring-clamp bases <br> -10 A relay, choice of silver or gold contacts <br> - DPDT (relay) <br> - Built-in retainer clip and snap-in marker lever <br> - Standard LED, reverse polarity protection, and surge protection <br> - Externally replaceable relay modules | Table of Contents <br> Product Selection ...... 9-51 <br> Accessories. $\qquad$ 9-51 <br> Specifications $\qquad$ 9-52 <br> Approximate <br> Dimensions. $\qquad$ 9-53 <br> Standards Compliance and Certifications <br> See Specification table in this section, page 9-52. |
| :---: | :---: | :---: |

Catalog Number Explanation

$\rightarrow$

| $a$ |  |
| :---: | :---: |
| Code | Series Type |
| HL | Description |


| Terminal Type |  |
| :---: | :---: |
| Code | Description |
| 1 | Screw Terminal |
| 2 | Spring Clamp Terminal |


| Supply Voltage |  |
| :---: | :---: |
| Code | Description |
| Z12 | 12V DC |
| Z24 | 24V DC |
| Z48 | 48V DC |
| U24 | 24V AC/DC |
| U1 | 110...125V AC/DC |
| U2 | 220...240V AC/DC |


$\rightarrow$| Gold-Plated Contact Option |  |
| :---: | :---: |
| Code | Description |
| Blank | None |
| $X$ | Gold Plate |



* For Gold-plated contacts: Add the letter "X" at the end of the catalog number. Example: Cat. No. 700-HLT12Z24 with gold plated contacts is catalog number 700-HLT12Z24X. The following relays are available with the gold-plated contact option: 700-HLT_2Z24, 700-HLT_2U24, 700-HLT_2U1, and 700-HLT_2U2.

| Standard built-in Features: <br> - LED <br> - Reverse Polarity Protection for <br> - Coil Surge Protection |  |  |  |
| :---: | :---: | :---: | :---: |
| Specifications |  |  |  |
| Output Type |  | DPDT (2 C/O); $I_{\text {th }}=10 \mathrm{~A}$ |  |
| Recommended Tightening Torque |  | 0.6 N•m max. ( 5.3 lb -in.) |  |
| Wire Range | Screw | ${ }^{2}$ (\#24...14 AWG), Spring Termin | m² (\#24...14 AWG) |
| Approvals |  | cULus, cURus, CE |  |
| Assembled Devices | Pkg. Quantity | $\begin{gathered} \text { Cat. No. } \\ \text { (Screw Terminals) } \end{gathered}$ | Cat. No. (Spring Clamp Terminals) |
| Input Voltage |  |  |  |
| 12 V DC | 10 | 700-HLT12Z12 | 700-HLT22Z12 |
| 24 V DC | 10 | 700-HLT12Z24* | 700-HLT22Z24* |
| 48 V DC | 10 | 700-HLT12Z48 | 700-HLT22Z48 |
| 24 V AC/DC | 10 | 700-HLT12U24* | 700-HLT22U24* |
| 110/125V AC/DC | 10 | 700-HLT12U1* | 700-HLT22U1* |
| 220...240V AC/DC | 10 | 700-HLT12U2* | 700-HLT22U2* |

* For Gold-plated contacts: Add the letter "X" at the end of the catalog number. Example: Cat. No. 700-HLT12Z24 with gold plated contacts is Cat. No. 700-HLT12Z24X. The following relays are available with the gold-plated contact option: 700-HLT_2Z24, 700-HLT_2U24, 700-HLT_2U1, and 700-HLT_2U2.

|  | Description | Pkg. Quantity | Socket Input Voltage | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
| Cat. No. 700-TBR224 | Replacement Relays Order must be for 20 relays or multiples of 20. | 20 | 12 V DC | 700-TBR212 |
|  |  |  | 24 V AC/DC | 700-TBR224* |
|  |  |  | 48 V DC | 700-TBR248 |
|  |  |  | 110/125V AC/DC 220...240V AC/DC | 700-TBR2110* |
| Cat. No. 700-TBJ08B | 8-Way Jumper <br> Can be cut to required length. $I_{t h}=10 \mathrm{~A}$ max per 8 -way jumper. | 1 | Color |  |
|  |  |  | Red | 700-TBJ08R |
|  |  |  | Grey | 700-TBJ08G |
|  |  |  | Blue | 700-TBJ08B |
| $1$ | End Barrier <br> Used for visual inspection of groups, safe separation of neighboring $700-\mathrm{HL}$ modules that end with jumpers. | 10 | Black | 700-HN177 |
|  |  |  |  |  |
|  | Snap-in Marker <br> These snap-in markers have a $6 \times 12 \mathrm{~mm}$ surface and snap into the ejection lever for the relay. | 100 | Blank | 1492-MS6X12 |
|  |  |  | Standard 1492MS6X12 | www.ab.com/ catalogs for information |
|  |  |  | Custom | , 桼 |

* For gold-plated contacts: Add the letter " $X$ " at the end of the catalog number. For example: if Cat. No. 700-TBR224 is required with gold plating, the new cat. no. is 700-TBR224X.
㯃 Go to http://www.ab.com/software/, click on "Terminal Marking System and WinABMS " to download software. Create custom text, save file, and e-mail to your local Rockwell Automation sales office or Allen-Bradley distributor
Note: Terminal Block Relay bases are not sold separately.


## Bulletin 700-HL

## Interposing/Isolation Relays

## Specifications

| Cat. No. 700-HLT...2-Pole (Relay Output) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Electrical Ratings |  |  |  |  |  |  |  |
| Rated Thermal Current ( $\mathrm{t}_{\text {th }}$ ) |  | 2-Pole - 10 A |  |  |  |  |  |
| Rated Insulation Voltage ( $\mathrm{U}_{\mathrm{i}}$ ) |  | 250 V IEC, 300V UL/CSA |  |  |  |  |  |
| Contacts | Inductive V AC UL | 120 V AC | $\begin{aligned} & \mathrm{AC}-15,3.0 \mathrm{~A} \\ & \text { B 300, 3.0 A } \end{aligned}$ |  | 1/4 HP (186 W), 1-phase |  |  |
|  |  | 240 V AC | $\begin{aligned} & \text { AC-15, 3.0 A } \\ & \text { B 300. } 1.5 \mathrm{~A} \end{aligned}$ |  | 1/2 HP (373 W), 1-phase |  |  |
|  | Inductive VDC | 24V DC | DC-13, 2.0 A |  |  |  |  |
|  |  | 125 V DC | DC-13, 0.3 A |  |  |  |  |
|  |  | 250V DC | DC-13, 0.2 A |  |  |  |  |
|  | Resistive Make, Break and Continuous | 250V AC | 10 A |  |  |  |  |
|  |  | 24V DC | 10 A |  |  |  |  |
|  |  | 250V DC | 0.28 A |  |  |  |  |
| Min. Permissible Contact Ratings |  | 12V, $10 \mathrm{~mA}(120 \mathrm{~mW}$ ) for Silver Contacts, $5 \mathrm{~V}, 1 \mathrm{~mA}(50 \mathrm{~mW})$ for Gold Contacts |  |  |  |  |  |
| Permissible Coil Voltage Variation |  | Pickup: | 85...110\% of Nominal Voltage at 50 Hz $85 . . .110 \%$ of Nominal Voltage at 60 Hz $80 . .110 \%$ of Nominal Voltage at DC |  |  | Must Dropout Voltage: | $10 \%$ of Nominal Voltage at AC $5 \%$ of Nominal Voltage at DC |
| Design Specification/Test Requirements |  |  |  |  |  |  |  |
| Dielectric Withstand Voltage |  | Pole to Pole (VRMS) | 1000V |  |  |  |  |
|  |  | Contact to Coil (VRMS) | 5000 V |  |  |  |  |
|  |  | Adjacent Contacts (VRMS) | 2500V |  |  |  |  |
| Input Voltage |  | 12V AC/DC | 24V AC/DC | 48 V DC | 120V AC/DC | 240V AC/DC |  |
| Impedance (Ohms) |  | 1 K | 2 K | 3 K | 34 K | 72 K |  |
| Power Consumption | AC | N/A | 0.5 V A | N/A | 0.4 V A | 0.8 V A |  |
| $\pm 10 \%$ | DC | 0.4 W | 0.5 W | 0.8 W | 0.5 W | 0.7 W |  |
| Mechanical |  |  |  |  |  |  |  |
| Degree of Protection |  | IP20 |  |  |  |  |  |
| Mechanical Life Operations |  | $3 \times 107$ |  |  |  |  |  |
| Electrical Life Operations |  |  | 250 V <br> 2 <br> 2 |  | esistive: 100 <br> stive: 6000 m <br> sistive: 6000 <br> stive: 30000 | min. |  |
| Switching Frequency Operations (no-load) |  | 1200 cycles/sec |  |  |  |  |  |
| Coil Voltages |  | See Overview/Product Selection |  |  |  |  |  |
| Operating Time at Nominal Voltage at $20^{\circ} \mathrm{C}$ (ms) |  | Pickup |  |  | typical 10 ms |  |  |
|  |  | Dropout |  |  | typical 10 ms |  |  |
| Maximum Operating Rate (full load =6 A) |  |  |  |  | /min. |  |  |
| Environmental |  |  |  |  |  |  |  |
| Temperature |  | Operating |  |  | $-40 \ldots+60^{\circ} \mathrm{C}$ |  |  |
|  |  | Storage |  |  | $-40 \ldots+100^{\circ} \mathrm{C}$ |  |  |
| Altitude |  |  |  | 2000 | 560 ft) |  |  |
| Construction |  |  |  |  |  |  |  |
| Insulating Material |  | Molded High-Dielectric Material |  |  |  |  |  |
| Enclosure |  | Relay RT II - flux-proof, pollution degree 2 installation environment |  |  |  |  |  |
| Contact Material |  |  |  | Ni 90/10 | Ni 90/10 + Au |  |  |
| Terminal Markings on Socket |  | In accordance with EN50 0005 |  |  |  |  |  |
| Certifications |  | cULus Listed (File No. E3125, Guide NRNT/NRNT7), CE Marked |  |  |  |  |  |
| Standards |  | UL 508, CSA C22.2 No. 14, EN/IEC 60947-1, -5-1 |  |  |  |  |  |

* Performance Data - See this catalog, Important 3

Approximate Dimensions
Approximate dimensions are shown in millimeters (inches). Approximate dimensions are not intended to be used for manufacturing purposes.


Bulletin 700-HL Screw Terminal Design Single Wire: $0.14 \mathrm{~mm}^{2} . . .2 .5 \mathrm{~mm}^{2}$ (\#26 AWG... 14 AWG)
Double Wire: $2 \times 0.14 \mathrm{~mm}^{2} \ldots 2 \times 1.5 \mathrm{~mm}^{2}(2 \times \# 26$ AWG... $2 \times 16$ AWG)
Wire Type: Solid or stranded, copper only
Strip Length: 9 mm (11/32 in). Torque: 0.5 N•m ( $4.4 \mathrm{lb} \cdot \mathrm{in}$ )


Bulletin 700-HL Spring Terminal Design
Single Wire: $0.2 \mathrm{~mm}^{2}$... $2.5 \mathrm{~mm}^{2}$ (\#24 AWG...\#14 AWG)
Wire Type: Solid or stranded, copper only
Strip Length: 9 mm (11/32 in)


Bulletin 700-TBJ08_ 8-Way Jumper


Cat. No. 199-DR1 DIN Mounting Rail Series B
Cat. No. 199-DR4 DIN Mounting Rail Series B Has No Mounting Holes

|  |  |  |  | Approx. <br> Cat. No. | A |
| :--- | :---: | :---: | :---: | :---: | :---: |


| Accessories |  |  |  |
| :---: | :---: | :---: | :---: |
| Accessories |  |  |  |
|  | Description | Pkg. Qty. | Cat. No. |
| Cat. No. 700-HN100 | Screw Terminal Tube Base Socket - Panel or DIN Rail Mounting; Guarded Terminal Construction. 8-Pin for use with DPDT Bulletin 700-HA Relays, -HX Timing Relays, -HT (On-Delay) and -HRM, -HRC and -HV (Repeat Cycle) Timing Relays. | 10 | 700-HN100 |
| Screw Terminal Tube Base Socket - Panel or DIN Rail Mounting; Open Style Construction. 8Pin for use with DPDT Bulletin 700-HA Relays, -HT (On-Delay) and -HRM, -HRC, and -HV (Repeat |  |  |  |
| Cat. No. 700-HN101 | Screw Terminal Tube Base Sockets - Panel or DIN Rail Mounting; Guarded Terminal Construction. 11-pin for use with 3PDT 700-HA relays. | 10 | 700-HN101 |
| Cat. No. 700-HN126 | Screw Terminal Tube Base Sockets - Panel or DIN Rail Mounting; Open Style Terminal Construction. 11-pin for use with 3PDT 700-HA relays. No retainer clip required. | 10 | 700-HN126 |
|  | 8-Pin Socket - Can Be Used With or Without Timing Attachment or Surge Suppressor Screw Terminal Tube Base Sockets - panel or DIN Rail mounting. Guarded terminal construction. Used with DPDT Bulletin 700-HA Relays. | 10 | 700-HN204 |
| Cat. No. 700-HN2O5 | 11-Pin Socket - Can Be Used With or Without Timing Module or Surge Suppressor. Screw Terminal Tube Base Sockets - panel or DIN Rail mounting. Guarded terminal construction. Used with 3PDT Bulletin 700-HA relays. | 10 | 700-HN205 |
|  | DIN (\#3) symmetrical hat rail $35 \times 7.5 \times 1 \mathrm{~m}$ | 10 | 199-DR1 |

Safety Control Relays Designed To Meet Worldwide Safety Standards

Bulletin 700S-CF<br>Bulletin 700S-P

Rockwell Automation introduces a new category of relays designed to meet the latest and emerging worldwide safety standards. These safety control relays offer special features to enable you to design safe control circuits with current ratings up to 20 Amps.

Bulletin 700S Safety Control Relays provide mechanically-linked contacts on all poles. Mechanically-linked contacts are required in feedback circuits for modern safety applications, such as e-stops, safety gates, light curtains, and master control relays.

## Mechanically-Linked Contacts

This feature allows detection of a welded contact condition. Mechanically-linked contacts are linked together, they are not independent. If a N.O. contact welds, all N.C. contacts remain open. If a N.C. contact welds, all N.O. contacts remain open.

## Double-Break Contacts

This design provides better protection against contact welding than a single break design. It offers greater DC load breaking capability and better isolation. This feature also provides separation of N.O. and N.C. circuits. Double-break contacts open the circuits in two places, creating two air gaps and reducing the probability of welded contacts by more that $50 \%$ compared to a single-break design.


Double-break contacts reduce the probability of a welded contact.


Bulletin 700S-CF

- Positively guided/mechanically linked contacts
- Mechanically-linked contacts symbol prominently displayed on front
- Red face plate
- 8 poles, all permanently attached
- Ideal for use in safety circuits
- AC and DC operating coils
- SUVA third-party certification

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## Description

Bulletin 700S-CF Safety Control Relays provide mechanically linked, positively guided contacts, which are required in feedback circuits for modern safety applications. The positively guided N.C. auxiliary contacts will not change state if a N.O. contact welds. Use with safety relays to expand output capability.

Conformity to Standards
IEC 947-5-1
EN 50011, EN 50005, EN 50022
UL 508
VDE 0660
CSA C22.2 Part 14

## Approvals

CE Certified
CSA Certified
UL Listed, File E14840, Guide NKCR
SUVA Third Party Certified

## Your order must include:

- Cat. No. of the relays required, complete with coil suffix.
- Cat. No. of adder decks, timers and accessories required.
- If required, the part number of replacement coils.


## Bulletin 700S-CF

## Safety Control Relays

## Product Selection

Type S-CF Safety Control Relays - 8-Pole AC and DC Coil Voltages

$\otimes$ AC Coil Voltage Suffix Code

| Voltage | 12 | 24 | 32 | 36 | 42 | 48 | 100 | $\begin{aligned} & 100- \\ & 110 \end{aligned}$ | 110 | 120 | 127 | 200 | $\begin{aligned} & 200- \\ & 220 \end{aligned}$ | 208 | $\begin{aligned} & 208- \\ & 240 \end{aligned}$ | $\begin{aligned} & 220- \\ & 230 \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 50 Hz | R | K | V | W | X | Y | KP | - | D | P | S | KG | - | - | - | F |
| 60 Hz | Q | J | - | V | - | X | - | KP | - | D | - | - | KG | H | L | - |
| $50 / 60 \mathrm{~Hz}$ | - | KJ | - | - | - | KY | KP | - | KD | - | - | KG | - | - | - | - |


| Voltage | 230 | $230-$ <br> 240 | 240 | 277 | 347 | 380 | $380-$ <br> 400 | 400 | $400-$ <br> 415 | 440 | 480 | 500 | 550 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 50 Hz | - | VA | T | - | - | - | N | - | G | B | - | M | C |
| 60 Hz | - | - | A | T | I | E | - | - | - | N | B | - | - |
| $50 / 60 \mathrm{~Hz}$ | KF | - | KA | - | - | - | - | KN | - | KB | - | - | - |

* DC Coil Voltage Suffix Code 1

| Voltage | 9 | 12 | 24 | 36 | 48 | 60 | 64 | 72 | 80 | 110 | 115 | 125 | 220 | 230 | 250 |
| :---: | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Standard | R | Q | J | W | Y | Z | B | G | E | D | P | S | A | F | T |
| With diode <br> suppressor | - | - | DJ | - | - | - | - | - | - | - | - | - | - | - | - |

(1)When ordering DJ coil with built-in surge suppression, remove $\mathbf{Z}$ from the Cat. No. Example: Cat. No. 700S-CF440Z $\otimes$ C becomes Cat. No. 700S-CF440DJC.


## 700S-CF620EJC

Safety Control Relay, 8 Pole, 3 N.O. / 1 N.C. Base, 3 N.O. / 1 N.C. Auxiliary, 24 V DC (w/Elec. Coil)
Contact Sales/Distributor for availability Add Notes

General

|  |  | Cat. No. 700S-CF main poles | front auxiliary contacts |
| :---: | :---: | :---: | :---: |
| Contact Ratings - NEMA |  | A600, P600 | A600, Q600 |
| UL General Purpose Current |  | 20A | !0A |
| Minimum Contact Rating | $\begin{array}{r} 17-19.9 V \\ 20-24 V \end{array}$ | $\begin{aligned} & 30 \mathrm{~mA} \\ & 20 \mathrm{~mA} \end{aligned}$ |  |
| Contact Ratings - IEC AC-15 (solenoids, contactors) at rated voltage IEC 947, EN 60947 | 24 V 48 V 120 V 240 V $400 / 415 \mathrm{~V}$ $480 \mathrm{~V} / 500 \mathrm{~V}$ 600 V 690 V | $\begin{gathered} 15 \mathrm{~A} \\ 15 \mathrm{~A} \\ 14 \mathrm{~A} \\ 10 \mathrm{~A} \\ 5 \mathrm{~A} \\ 2.5 \mathrm{~A} \\ 1.8 \mathrm{~A} \\ 1 \mathrm{~A} \end{gathered}$ | $\begin{gathered} 6 \mathrm{~A} \\ 6 \mathrm{~A} \\ 6 \mathrm{~A} \\ 5 \mathrm{~A} \\ 3 \mathrm{~A} \\ 1.6 \mathrm{~A} \\ 1.2 \mathrm{~A} \\ 1.0 \mathrm{~A} \end{gathered}$ |
|  $40^{\circ} \mathrm{C}$ <br> AC-12  <br> (Control of  <br> AC resistive  <br> loads)  <br> IEC 947, EN $60^{\circ} \mathrm{C}$ <br> 60947  | 230 V <br> 400V 690 V $I_{\text {th }}$ 230 V 400V 690 V | 20 A <br> 10 kW <br> 17 kW <br> 30 kW <br> 20 A <br> 8 kW <br> 14 kW <br> 24 kW | $10 \mathrm{~A}$ $6 \mathrm{~A}$ |
| DC-12 <br> (Control of DC resistive loads) IEC 947 EN 60947 | $\begin{array}{r} \hline 24 \mathrm{~V} \\ 48 \mathrm{~V} \\ 60 \mathrm{~V} \\ 110 \mathrm{~V} \\ 125 \mathrm{~V} \\ 220 \mathrm{~V} \\ 440 \mathrm{~V} \end{array}$ | $\begin{gathered} \hline 12 \mathrm{~A} \\ 9 \mathrm{~A} \\ 5.0 \mathrm{~A} \\ 3.5 \mathrm{~A} \\ 3.0 \mathrm{~A} \\ 0.55 \mathrm{~A} \\ 0.2 \mathrm{~A} \end{gathered}$ | $\begin{gathered} \hline 12 \mathrm{~A} \\ 9 \mathrm{~A} \\ 3.5 \mathrm{~A} \\ 3.5 \mathrm{~A} \\ 3.0 \mathrm{~A} \\ 0.55 \mathrm{~A} \\ 0.2 \mathrm{~A} \end{gathered}$ |
| DC-13 IEC 947, EN 60947, Solenoids and contactors | $\begin{array}{r} 24 \mathrm{~V} \\ 48 \mathrm{~V} \\ 60 \mathrm{~V} \\ 125 \mathrm{~V} \\ 220 \mathrm{~V} \\ 440 \mathrm{~V} \\ 600 \mathrm{~V} \end{array}$ | $\begin{gathered} 5 \mathrm{~A} \\ 2 \mathrm{~A} \\ 1.5 \mathrm{~A} \\ 0.7 \mathrm{~A} \\ 0.25 \mathrm{~A} \\ 0.12 \mathrm{~A} \\ 0.1 \mathrm{~A} \end{gathered}$ | $\begin{gathered} 5 \mathrm{~A} \\ 2 \mathrm{~A} \\ 1.5 \mathrm{~A} \\ 0.55 \mathrm{~A} \\ 0.25 \mathrm{~A} \\ 0.12 \mathrm{~A} \\ 0.1 \mathrm{~A} \end{gathered}$ |
| Avg-Mechanical Life (ops) | [Mil] | 15 | 15 |
| Average-  <br> Electrical AC-15 <br> Life $(240 \mathrm{~V}, 3 \mathrm{~A})$ <br> (ops)  | [Mil] | 1.1 | 0.75 |
| Terminal Cross-Sections <br> Terminal Type <br> Terminal Size per IEC 947-1 |  |  |  |
| $=-\square$ 1 or 2 <br> Solid/ Conductor <br> Stranded 1 Conductor | $\left[\mathrm{mm}^{2}\right]$ | $\begin{gathered} 1.5 \ldots 6 \\ 1 \ldots 4 \end{gathered}$ | $\begin{gathered} 0.5 \ldots 2.5 \\ 0.75 \ldots 2.5 \end{gathered}$ |
| Max. Wire Size per UL/CSA | [AWG] | 16... 10 | 18... 14 |
| Tightening Torque | [lb.-in.] | 8.9... 22 | 8.9...13.3 |
| Tightening Torque | [ $\mathrm{N} \bullet \mathrm{m}$ ] | 1...2.5 | 1...1.5 |

(1) For sixteen or more strands, end ferrule is required.

Bulletin 700S-CF
Safety Control Relays
Specifications, Continued

| Control Circuit |  |  |  |
| :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \hline \text { Cat. No. } \\ & \text { 700S-CF } \end{aligned}$ |
| Operating Voltage |  |  |  |
| AC $50 / 60 \mathrm{~Hz}$ | Pickup | [ $\mathrm{x} \mathrm{Us}_{\mathrm{s}}$ ] | 0.85...1.1 |
|  | Dropout | [ $\mathrm{x} \mathrm{U}_{\mathrm{s}}$ ] | 0.3...0.6 |
| DC © | Pickup | [ $\mathrm{x} \mathrm{U}_{\mathrm{s}}$ ] | 0.8...1.1 |
|  | Dropout | [ $\mathrm{UUs}^{\text {] }}$ | 0.1...0.6 |
| Coil Consumption at nominal voltage |  |  |  |
| AC $50 / 60 \mathrm{~Hz}$ | Inrush | [VA/W] | 70/50 |
|  | Seal | [VA/W] | 8/2.6 |
| DC | Inrush/Seal warm coil | [W] | 6.5 |
|  | Inrush/Seal cold coil | [W] | 8.5 |
| Operating Times |  |  |  |
| AC $50 / 60 \mathrm{~Hz}$ | Pickup Time | [ms] | 15... 30 |
|  | Dropout Time | [ms] | 10... 60 |
| DC | Pickup Time | [ms] | 40... 70 |
|  | Dropout Time | [ms] | 7... 15 |
| With integrated suppression |  | [ms] | 14... 20 |
| With diode suppression |  | [ms] | 70... 95 |

(1) For 9V DC, code ZR , use operating voltage $0.65 \ldots 1.3 \times \mathrm{U}_{\mathrm{s}}$. For 24V DC, code ZJ or DJ, use operating voltage $0.7 \ldots 1.25 \times \mathrm{U}_{\mathbf{s}}$.

General

|  | Cat. No. 700S-CF |
| :---: | :---: |
| Rated Insulation Voltage $\boldsymbol{U}_{\mathrm{i}}$ IEC <br> UL; CSA | $\begin{aligned} & 690 \mathrm{~V} \\ & 600 \mathrm{~V} \end{aligned}$ |
| Dielectric Withstand Voltage | 2500V |
| Rated Impulse Strength $U_{\text {imp }}$ | 8 kV (2 |
| Rated Voltage $U_{\text {e }}$ <br> AC <br> DC | $\begin{gathered} 115,230,400,500,690 \mathrm{~V} \\ 24,48,110,220,440 \mathrm{~V} \end{gathered}$ |
| Short-Circuit Protection IEC 947-5 Fuse-Type GG | 20 A |
| Rated Frequency | 50/60 Hz, DC |
| Ambient Temperature <br> Storage <br> Operation at nominal current | $\begin{gathered} -55 \ldots+80^{\circ} \mathrm{C}\left(-67 \ldots 176^{\circ} \mathrm{F}\right) \\ -25 \ldots+60^{\circ} \mathrm{C}\left(-13 \ldots 140^{\circ} \mathrm{F}\right) \mathbf{3 4} \end{gathered}$ |
| Corrosion Resistance | humid-alternating climate, cyclic, per IEC 68-2-30 and DIN 50 016, 56 cycles |
| Altitude | 2000 m above mean sea level, per IEC 947-4 |
| Type of Protection | IP2X in connected state |
| Finger Protection | safe from touch by fingers and back of hand per VDE 0106, Part 100 |

(2) 8 kV for main poles, 6 kV for front aux. contacts.
(3) 40 degree max. for 700S-CF350 with DC coil.
(4) Operation in $70^{\circ} \mathrm{C}$ ambient is permitted with current reduction of $15 \%$ below rated values


## AC Safety Control Relays

| a | b | c | c1 | c2 | $\varnothing \mathrm{d}$ | d1 | d2 | Cat. No. 1 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} 45 \\ (1-25 / 32) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 81 \\ (3-3 / 16) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 119.5 \\ (4-3 / 4) \end{gathered}$ | $\begin{gathered} \hline 114.5 \\ (4-43 / 64) \\ \hline \end{gathered}$ | $\begin{gathered} 6 \\ (1 / 4) \end{gathered}$ | $\begin{gathered} 2-4.5 \\ (2-3 / 16) \end{gathered}$ | $\begin{gathered} \hline 60 \\ (2-23 / 64) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 35 \\ (1-25 / 64) \\ \hline \end{gathered}$ | 700S-CF |

DC Safety Control Relays

| a | b | C | c1 | c2 | $\varnothing \mathrm{d}$ | d1 | d2 | Cat. No. ${ }^{1}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{gathered} 45 \\ (1-25 / 32) \end{gathered}$ | $\begin{gathered} 81 \\ (3-3 / 16) \end{gathered}$ | $\begin{gathered} 145.5 \\ (5-49 / 64) \end{gathered}$ | $\begin{gathered} 140.5 \\ (5-37 / 64) \end{gathered}$ | $\begin{gathered} 6 \\ (1 / 4) \end{gathered}$ | $\begin{gathered} 2-4.5 \\ (2-3 / 16) \end{gathered}$ | $\begin{gathered} 60 \\ (2-23 / 64) \end{gathered}$ | $\begin{gathered} 35 \\ (1-25 / 64) \end{gathered}$ | 700S-CF |

(1) All Cat. Nos. are factory stocked.

Accessories

| Safety Control Relays with | mm | (inches) |
| :---: | :---: | :---: |
| Auxiliary contact block for side mounting 1- or 2-pole | a + 9 | ( $\mathrm{a}+23 / 64$ ) |
| Electronic Timing Module on coil terminal side | b +24 | (b+15/16) |
| Mechanical Interlock on side of contactor | $a+9$ | ( $\mathrm{a}+23 / 64$ ) |
| Interface Module on coil terminal side | $b+9$ | (b+23/64) |
| Surge Suppressor on coil terminal side | $b+3$ | $(b+1 / 8)$ |
| Labeling with label sheet marking tag sheet with clear cover marking tag adapter for System Bul. 1492W | $\begin{gathered} +0 \\ +0 \\ +5.5 \end{gathered}$ | $\begin{gathered} (+0) \\ (+0) \\ (+7 / 32) \end{gathered}$ |

## Mounting Positions

Allen-Bradley

## Bulletin 800T／H

## 30.5 mm Push Buttons

## Selector Switches

## 2－Position Knob／Lever Type Selector Switch Devices，Illuminated

| Standard Knob Operator Cat．No．800T－16HR2KB6AX |  |  |  | Knob Lever Operator <br> Cat．No．800H－16HRR17KB6AX |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  | Type 4／13 | Type 4／4X／13 |
|  |  |  |  | Operato | Position |  | Standard Knob | Standard Knob |
| Type | Lamp Type | Volts | Knob Color | $5$ | $\theta$ | $\begin{gathered} \mathrm{M}=\text { Maintained } \\ \mathrm{S}=\text { Spring Return } \end{gathered}$ | Cat．No． | Cat．No． |
| Operator Only＊ |  |  |  | No Contacts |  | M M | 800T－00HX2KB6 | 800H－00HRX2KB6 |
| Full Voltage | Incandescent | 24V AC／DC | Red | $\begin{aligned} & \mathrm{X} \\ & 0 \end{aligned}$ | $\begin{aligned} & \mathrm{O} \\ & \mathrm{X} \end{aligned}$ | M M | 800T－24HR2KB6AX | 800H－24HRR2KB6AX |
|  |  |  |  |  |  | $\mathrm{S} \rightarrow \mathrm{M}$ 桼 | 800T－24HR4KL8AX | 800H－24HRR4KL8AX |
|  |  |  |  |  |  | $\mathrm{M} \leftarrow \mathrm{S}$ | 800T－24HR5KL8AX | 800H－24HRR5KL8AX |
|  | No Lamp | 0．．．250V AC／DC | No Knob |  |  | M M | 800T－25HXN2KB6AX | 800H－25HRXN2KB6AX |
| Universal | LED | 12．．．130V AC／DC | Red |  |  | M M | 800T－2HRH2KB6AX | 800H－2HRRH2KB6AX |
|  |  |  |  |  |  | $\mathrm{S} \rightarrow \mathrm{M}$ 粨 | 800T－2HRH4KL8AX | 800H－2HRRH4KL8AX |
|  |  |  |  |  |  | $\mathrm{M} \leftarrow \mathrm{S}$ | 800T－2HRH5KL8AX | 800H－2HRRH5KL8AX |
| Transformer | Incandescent | 120 V AC 50／60 Hz | Red | $\begin{aligned} & X \\ & 0 \end{aligned}$ | $\begin{aligned} & \mathrm{O} \\ & \mathrm{X} \end{aligned}$ | M M | 800T－16HR2KB6AX | 800H－16HRR2KB6AX |
|  |  |  |  |  |  | $\mathrm{S} \rightarrow \mathrm{M}$ 桼 | 800T－16HR4KL8AX | 800H－16HRR4KL8AX |
|  |  |  |  |  |  | $\mathrm{M} \leftarrow \mathrm{S}$ | 800T－16HR5KL8AX | 800H－16HRR5KL8AX |
|  | LED |  |  |  |  | M M | 800T－16HRH2KB6AX | 800H－16HRRH2KB6AX |
|  |  |  |  |  |  | $\mathrm{S} \rightarrow \mathrm{M}$ 絭 | 800T－16HRH4KL8AX | 800H－16HRRH4KL8AX |
|  |  |  |  |  |  | $\mathrm{M} \leftarrow \mathrm{S}$ | 800T－16HRH5KL8AX | 800H－16HRRH5KL8AX |
|  | No Lamp | 120 V AC $50 / 60 \mathrm{~Hz}$ | No Knob |  |  | M M | 800T－16HXN2KB6AX | 800H－16HRXN2KB6AX |


| Note：$x=$ Closed／O $=$ Open <br> ＊Operator <br> $H$ | 2 | $H R$ | W | H | 2 | KB6 | A | X |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |



| No．of Positions |  |  |
| :---: | :---: | :---: |
| $\begin{aligned} & \text { Bul. } \\ & \text { 800T } \end{aligned}$ | Description | $\begin{aligned} & \hline \text { Bul. } \\ & 800 \mathrm{H} \end{aligned}$ |
| Type |  | Type |
| 4／13 |  | 4／4X／13 |
| Code |  | Code |
| H | 2－position | HR |
| e |  |  |
| Knob Color |  |  |
| Code | Color |  |
| A | Amber |  |
| B | Blue |  |
| C | Clear |  |
| G | Green |  |
| R | Red |  |
| W | White |  |
| X | No knob |  |
| $f$ |  |  |
| Illumination Options |  |  |
| Code | Description |  |
| Blank | Incandescent |  |
| H | LED |  |

Table 1．Selector Switch Cam

| Cargets |  |  |  |
| :---: | :---: | :---: | :---: |
| Cam Description（2－Position） |  |  |  |
|  |  |  | Contact Block <br> Code |
|  |  |  |  |
| O | X |  |  |
| X | $\mathrm{D}, \mathrm{H}, \mathrm{V}, \mathrm{R}, 5$ |  |  |
| X | O |  |  |



Table 2．Contact Block Code Reduction Rules

| Contact Block Substitution |  |
| :---: | :---: |
| Combination | Code |
| Standard |  |
| D＋E | A |
| $D+D$ | M |
| $\mathrm{E}+\mathrm{E}$ | N |


| Contact Blocks\％ |  |
| :---: | :---: |
| Code | Description |
| Blank （both pos．） | No contacts |
| Standard |  |
| D | 1 N．O． |
| E | 1 N．C． |
| A | 1 N．O．－ 1 N．C． |
| X | ntacts in this po |
| PenTUFF（Low Voltage） |  |
| H | 1 N．O． |
| U | 1 N．C． |
| F | 1 N．O．－ 1 N．C． |
| Class 1，Div．2／Zone 2 |  |
| Logic Reed |  |
| V | 1 N．O． |
| W | 1 N．C． |
| T | 1 N．O．－ 1 N．C． |
| Sealed Switch |  |
| R | 1 N．O． |
| S | 1 N．C． |
| P | 1 N．O．－ 1 N．C． |
| Stackable Sealed Switch |  |
| 5 | 1 N．O． |
| 6 | 1 N．C． |
| 7 | 1 N．O．－ 1 N．C． |

$\%$ Contact blocks used on white side only．
H Target tables are reversed for spring return from left operators．

## Bulletin 800T/H

800HC-QRAH2GD1
30.5 mm Push

## Push Button Operators

| Momentary Contact Push Button Devices, Illuminated |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Extended Head Without Guard Cat. No. 800T-PB16R |  |  |  | Extended Head without Guard Cat. No. 800H-PRB16R |  |  |  |
|  |  |  |  |  |  | Type 4/4X/13 |  |
|  | Lamp Type | Volts | Color | Extended Head Without Guard* | Extended Head With Guard* | Extended Head without Guard* | Extended Head with Guard* |
| Type |  |  |  | Cat. No. | Cat. No. | Cat. No. | Cat. No. |
| Operator Only來 |  |  |  | 800T-SB00XX | 800T-SA00XX | 800H-SRB00XX | 800H-SRA00XX |
| Full Voltage | Incandescent | 24V AC/DC | Red | 800T-QB24R | 800T-QA24R | 800H-QRB24R | 800H-QRA24R |
|  |  |  | Green | 800T-QB24G | 800T-QA24G | 800H-QRB24G | 800H-QRA24G |
|  |  |  | Amber | 800T-QB24A | 800T-QA24A | 800H-QRB24A | 800H-QRA24A |
|  | No Lamp | 0...250V AC/DC | No Lens | 800T-QBN25 | 800T-QAN25 | 800H-QRBN25 | 800H-QRAN25 |
| Universal | LED | 12...130V AC/DC | Red | 800T-QBH2R | 800T-QAH2R | 800H-QRBH2R | 800H-QRAH2R |
|  |  |  | Green | 800T-QBH2G | 800T-QAH2G | 800H-QRBH2G | 800H-QRAH2G |
|  |  |  | Amber | 800T-QBH2A | 800T-QAH2A | 800H-QRBH2A | 800H-QRAH2A |
| Transformer | Incandescent | $\begin{aligned} & 120 \mathrm{~V} \mathrm{AC}, \\ & 50 / 60 \mathrm{~Hz} \end{aligned}$ | Red | 800T-PB16R | 800T-PA16R | 800H-PRB16R | 800H-PRA16R |
|  |  |  | Green | 800T-PB16G | 800T-PA16G | 800H-PRB16G | 800H-PRA16G |
|  |  |  | Amber | 800T-PB16A | 800T-PA16A | 800H-PRB16A | 800H-PRA16A |
|  | LED |  | Red | 800T-PBH16R | 800T-PAH16R | 800H-PRBH16R | 800H-PRAH16R |
|  |  |  | Green | 800T-PBH16G | 800T-PAH16G | 800H-PRBH16G | 800H-PRAH16G |
|  |  |  | Amber | 800T-PBH16A | 800T-PAH16A | 800H-PRBH16A | 800H-PRAH16A |
|  | No Lamp |  | No Lens | 800T-PBN16 | 800T-PAN16 | 800H-PRBN16 | 800H-PRAN16 |

* Includes as standard one Cat. No. 800T-XA (1 N.O. - 1 N.C.) contact block.

凝 Operator only supplied without power module, lamp, lens cap, or contact blocks.


## Specifications*

| Electrical Ratings |  |
| :---: | :---: |
| Contact ratings | Refer to the contact ratings tables on page 10-4. |
| Dielectric strength | 2200 V for one minute, 1300 V for one minute (Logic Reed) |
| Electrical design life cycles | 1000000 at max. rated load, 200000 at max. rated load (Logic Reed) |
| Mechanical Ratings |  |
| Vibration | $10 . .2000 \mathrm{~Hz}, 1.52 \mathrm{~mm}$ displacement (peak-to-peak) max./ 10 G max. (except Logic Reed) |
| Shock | $1 / 2$ cycle sine wave for $11 \mathrm{~ms} \geq 25 \mathrm{G}$ (contact fragility) and no damage at 100 G |
| Degree of protection | Type 1/4/12/13 (800T); Type 1/4/4X/12/13 (800H); EN/IEC 60529 IP66/65 |
| Mechanical design life cycles | 10000000 min . |
| Push buttons |  |
|  | 250000 min . |
|  | 250000 min . |
| Selector switches | 1000000 min . |
|  | 200000 min . |
| Potentiometers | 25000 min . |
| All other devices | 200000 min . |
| Contact operation | Shallow, mini, and low-voltage contact blocks: Slow, double make and break Logic Reed and sealed switch contact blocks: Single break magnetic |
| Wire gauge/Terminal screw torque | \#18... 14 AWG (\#18... 10 Max Duty) / 6... $8 \mathrm{lb} \bullet$ in |
| Typical operating forces | Flush, extended button, standard mushroom, jumbo plastic mushroom: 2 lbs max. Jumbo and extended aluminum mushroom head: 3.95 lbs max. Maintained selector switch: $3.6 \mathrm{in} \bullet \mathrm{lb}$ max. |
| Operators without contact blocks |  |
| Spring return selector switches | $3.6 \mathrm{in} \cdot \mathrm{lb}$ to stop, $0.2 \mathrm{in} \bullet \mathrm{lb}$ to return |
| Illuminated push buttons and push-to-test pilot lights | 5 lb max. |
| 2-position push-pull | 8.0 lb max. push or pull |
| 3-position push-pull | 8 lb max. push to in position or pull to center position ( 15 lb max. pull to out position) |
| Twist-to-release or push-pull | 9 lbs max. push or pull $30 \mathrm{in} \bullet$ oz max. twist, 6 in•oz minimum return |
| Potentiometer | Rotational torque $3 \ldots .12$ in•oz; stopping torque $12 \mathrm{in} \bullet \mathrm{lb}$ (minimum) |
| Contact blocks | 1 lb |
|  | 1 lb max. |
|  | 3 lb max. at 0.205 in . plunger travel |
|  | 1 lb max. |
|  | 1.4 lb max. |
|  | 1.4 lb max. |
|  | 1.6 lb |
| Environment |  |
| Temperature range | $-40 \ldots+131{ }^{\circ} \mathrm{F}\left(-40 \ldots+55^{\circ} \mathrm{C}\right)$ |
|  | $-40 \ldots+185{ }^{\circ} \mathrm{F}\left(-40 \ldots+85^{\circ} \mathrm{C}\right)$ |
| Note: Operating temperatures below freezing are based on the absence of moisture and liquids. Consult your local Rockwell Automation sales office or Allen-Bradley distributor for use in lower temperature applications. |  |
| Humidity | $50 \ldots 95 \% \mathrm{RH}$ from $77 \ldots 140^{\circ} \mathrm{F}\left(25 \ldots 60^{\circ} \mathrm{C}\right)$ per Procedure IV of MIL-STD-810C, Method 507.1 cycling test |

* Performance Data - See Important- 3.


## Bulletin 800T/H

## 30.5 mm Push Buttons

## Specifications

## Standard Contact Ratings

Minimum: 24V, 24 mA
Maximum thermal continuous current $I^{\text {th }} 10 \mathrm{~A} \mathrm{AC/2.5} \mathrm{~A} \mathrm{DC}$. 800T units with 800T-XA contacts have ratings as follows:

| Max. OpertnI. Volts $U_{e}$ | Utilization Category |  | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | IEC | NEMA | Volts $U_{\text {e }}$ | Make | Break |
| AC 600 | AC-15 | A600 | $\begin{gathered} \hline 120 \ldots 600 \\ 72 \ldots .120 \\ 24 \ldots 72 \end{gathered}$ | $\begin{gathered} \hline 7200 \mathrm{VA} \\ 60 \mathrm{~A} \\ 60 \mathrm{~A} \end{gathered}$ | $\begin{gathered} \hline 720 \mathrm{VA} \\ 720 \mathrm{VA} \\ 10 \mathrm{~A} \end{gathered}$ |
| DC 600 | DC-13 | Q600 | $\begin{aligned} & 28 \ldots 600 \\ & 24 . . .28 * \end{aligned}$ |  |  |

* For applications below $24 \mathrm{~V} / 24 \mathrm{~mA}$, PenTUFF or Logic Reed contacts are recommended.


## Sealed Switch Contact Ratings

Minimum: 5V, 1 mA
Maximum continuous current $I_{\text {th }} 5 \mathrm{~A}$. Bulletin 800T units have control circuit ratings with sealed switch contact blocks as follows:

| Max. Opertnl. <br> Volts $U_{e}$ | Utilization Category |  | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | AC-15 | NEMA | Volts $U_{\mathrm{e}}$ | Make | Break |
| DC 300 | DC-13 | $120 \ldots 600$ <br> $0 \ldots 120$ | 3600 VA <br> 30 A | 360 VA <br> 3 A |  |

Stackable Sealed Switch Contact Ratings Minimum: $5 \mathrm{~V}, 10 \mathrm{~mA}$ (digital); $24 \mathrm{~V}, 1 \mathrm{~mA}$ (analog)
Maximum continuous current $I_{\text {th }} 2.5 \mathrm{~A}$. Bulletin 800 T units have control circuit ratings with sealed switch contact blocks as follows:

| Max. Opertnl. <br> Volts $U_{\mathrm{e}}$ | Utilization Category |  | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | IEC | NEMA | Volts $U_{\mathrm{e}}$ | Make | Break |
| DC 15 | C300 | $120 \ldots 300$ <br> $0 \ldots 120$ | 1800 VA <br> 15 A | 180 VA <br> 1.5 A |  |
|  | DC-13 | Q150 | $24 \ldots 150$ <br> $0 . . .24$ | 6VA <br> 2.5 A |  |

## Logic Reed Contact Ratings

Minimum - DC: $5 \mathrm{~V}, 1 \mathrm{~mA}$
Maximum - DC: 30V, 0.06 A, AC: 150V, 0.15 A
Should only be used with resistive loads.

## Materials Used in 800H Type 4X Operators

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting Rings
- Sockets

Thermoplastic Polyester

- Non-illuminated button caps


## Transparent Amorphous Nylon

- Pilot light lens cap
- Illuminated button caps


## Glass Filled Crystalline Nylon

- Thrust washer


## Mineral Filled Nylon

- Trim washer


## Nitrile (Synthetic Rubber)

- Gaskets and internal seals


## PenTUFF ${ }^{\text {TM }}$ (Low Voltage) Contact Ratings

Minimum DC: 5V, 1 mA
Maximum thermal continuous current $I_{\text {th }} 2.5$ A AC/1.0 A DC. Bulletin 800 T units with 800T-XAV contacts have ratings as follows:

| Max. Opertnl. <br> Volts $U_{\mathrm{e}}$ | Utilization Category |  | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | IEC | NEMA | Volts $U_{\mathrm{e}}$ | Make | Break |
| DC 15 150 | C300 | $120 \ldots 300$ <br> $0 \ldots 120$ | 1800 VA <br> 15 A | 180 VA <br> 1.5 A |  |

Snap Action Contact Ratings

| Max. Opertni. <br> Volts $U_{\mathrm{e}}$ | Contact Rating <br> Designation | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Make | Break |  |
| AC 300 | A300 | $120 \ldots 300$ | 7200 VA | 720 VA |
|  |  | $24 \ldots 72$ | 60 A | 10 A |
| DC 250 | - | $230 \ldots 250$ | 0.2 A |  |
|  |  | $115 \ldots .125$ | 0.4 A |  |

MaxDuty Contact Rating
Maximum thermal continuous current $I_{\text {th }} 24 \mathrm{~A}$.
Pilot Duty - 120 V AC, 12 A; 24 V DC, 10 A
Motor Ratings - 120V AC, $1.5 \mathrm{Hp} ; 240 \mathrm{~V}$ AC, $3 \mathrm{Hp} ; 24 \mathrm{~V}$ DC, 10 A FLA/60 A LRA

## Time Delay Contacts

| Max. OpertnI. <br> Volts $U_{e}$ | Contact Rating <br> Designation | Rated Operational Currents |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | Make | Break |  |
| AC 120 | B150 | 120 | 3600 VA | 360 VA |

Note: This device is not rated for DC applications.
Adjustment range: $0.5 \ldots 15 \mathrm{~s} \pm 25 \% I_{\mathrm{th}}=5 \mathrm{~A}$

## 2－Position Red Trigger Action Twist－to－Release，Non－Illuminated

－Tamper resistant－front－of－panel mounting and non－removable operator head
－Compliant with global E－stop standards，including EN ISO 13850 and EN 60947－5－5


Cat．No．800T－TFXJET6


Cat．No．800t－TFXLET6


Cat．No．800t－TFXK6


Cat．No．800H－TFRXT6

| Contact Type | Operator Position |  | Type 4／13 |  |  | Type 4／4X／13 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\stackrel{\pi}{\pi}$ | $\stackrel{\leftrightarrows}{\leftrightarrows}$ | 45 mm Plastic | 63 mm Metal | Key Release | 45 mm Plastic |
|  | Out | In | Cat．No．＊＊敉 $\ddagger$ | Cat．No．＊§ | Cat．No．＊＊ | Cat．No．＊＊皐 $\ddagger$ |
| No contacts | － | － | 800T－TFXT6 | 800T－TFXLT6 | 800T－TFXK6 | 800H－TFRXT6 |
| 1 N．C． | X | 0 | 800T－TFXT6D2 | 800T－TFXLTD2 | 800T－TFXK6D2 | 800H－TFRXT6D2 |
| 1 N．O．－ 1 N．C． | $\begin{aligned} & \mathrm{O} \\ & \mathrm{x} \end{aligned}$ | $\begin{aligned} & \mathrm{X} \\ & 0 \end{aligned}$ | 800T－TFXT6A | 800T－TFXLT6A | 800T－TFXK6A | 800H－TFRXT6A |
| 1 S．M．C．B．－ | X | 0 | 800TC－TFXT6D4S | 800TC－TFXLT6D4S | 800TC－TFXK6D4S | 800HC－TFRXT6D4S |

＊For finger－safe contact block terminals，add a C to the cat．no．Example：Cat．No．800TC－TFXT6 or 800HC－TFRXT6．
承 To order a device with a jumbo（ 60 mm ）plastic head add the letter J after X．Example：Cat．No．800T－TFXJT6A or 800H－TFRXJT6A．
$\ddagger$ To order a jumbo head device with＂E－STOP＂printed on the cap add the letters JE after X．Example：Cat．No．800T－TFXJET6 or 800 H －TFRXJET6．
§ To order a device with＂E－STOP＂engraved on the cap add the letter E after L．Example：Cat．No．800TC－TFXLET6D4S．
＊Provided with two DO18 keys．
＞Self－monitoring contact block．

b

| Finger－Safe Guards |  |
| :---: | :---: |
| Code | Description |
| Blank | No guards |
| C | Guards on terminals |

C

| Head Type $\ddagger$ |  |  |
| :---: | :---: | :---: |
| 800T | Description | 800 H |
| Type |  | Type |
| $4 / 13$ |  | $4 / 4 \mathrm{X} / 13$ |
| Code | Standard $(45 \mathrm{~mm})$ mushroom head | FRX |
| FX | Jumbo $(60 \mathrm{~mm})$ mushroom head | FRXJ |
| FXJ | Fumbo $(60 \mathrm{~mm})$ mushroom head with＂E－STOP＂ | FRXJE |
| FXJE | 45 mm mushroom head key release | - |
| FXK | 63 mm anodized aluminum head | - |
| FXL | 63 mm anodized aluminum head with＂E－STOP＂ | - |
| FXLE |  |  |

d

| Release Function |  |
| :---: | :---: |
| Code | Color |
| Blank | Key release $\mathscr{A}$ |
| T | Twise release |

Note：X＝Closed／O＝Open
H Configurable only with FXK head type．

## AB Allen-Bradley

The new 800T MaxDuty ${ }^{m}$ contact blocks from Rockwell Automation are the solution to your higher-current switching needs. For use with 800 T and 800 H 30 mm push buttons, the new MaxDuty ${ }^{\text {m }}$ contacts can switch twice as much current as typical "pilot duty" contacts. In addition, they are also suitable for starting and stopping small horsepower-rated motors. The net result can be lower product/installation costs, reduced maintenance/downtime, and increased safety. So don't settle for "standard duty" or "heavy duty" contacts when your application demands 800 T MaxDuty" contacts.

## Features/Specifications

- Carry 24 A continuous current ( $\left.I_{\text {th }}=24 \mathrm{~A}\right)$
- Switch 12 A @ 120V AC, 10 A @ 24V DC (pilot duty - Inductive Loads)
- Start/Stop Motors: $1.5 \mathrm{Hp} @ 120 \mathrm{~V}$ AC 3 Hp @ 240V AC 10 A FLA/60 A LRA @ 24V DC
- Available in N.O., N.C. or N.C.L.B. configurations
- Finger safe version available
- Same physical package and mounting as 800 T shallow blocks
- Terminals accept up to 10 AWG wires
- Use with all existing 800 T and 800 H push button operators
- Available as accessory or as assembled onto push button operator
- ${ }_{C}$ UL ${ }_{\text {US }}$ listed



## 800T MaxDuty ${ }^{\text {nu }}$ Contact Blocks

## Switch up to 12 A - Start/Stop up to 3 Hp Motors



## Applications/Benefits

## - Longer Electrical Life.

Use MaxDuty ${ }^{\text {m" }}$ contacts in existing push button applications for longer contact life than "standard duty" or "heavy duty" contacts, thereby reducing maintenance/downtime and lowering product life-cycle costs.

## - Increased Safety.

Higher MaxDuty ${ }^{\text {min }}$ contact ratings reduce chance of contacts welding in existing E-Stop applications. Also, E-Stops may now possibly be wired in power circuit to directly break line/load, rather than relying on control relay contacts to open.

## - Lower Cost.

Displace small contactors, load/cam switches, or interposing relays in applications such as lighting, heating, 24 V DC, etc. MaxDuty ${ }^{\text {mic }}$ contacts can even displace manual motor starters in single-phase motor starting/stopping applications where overload protection is either not required or is built into the motor. Realize the lower product cost, reduced panel space, and ease of installation of push buttons as compared to these other products.

## Ratings Comparison

| Contacts | Continuous <br> Amps Ith | Pilot Duty/Inductive Loads |  |  |  | Motor Rated |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 120V AC |  | 24V DC |  | 120 V AC | 240 V AC | 24V DC |
|  |  | Make | Break | Make | Break | Hp | Hp | FLA/LRA |
| Typical Competitive | 10 A | 60 A | 6 A | 5 A | 5 A | - | - | - |
| New A-B MaxDuty" | 24 A | 120 A | 12 A | 10 A | 10 A | 1.5 Hp | 3 Hp | $10 \mathrm{~A} / 60 \mathrm{~A}$ |



## Easy Ordering

| Catalog Number | Description | $\leftarrow$ |
| :---: | :---: | :---: |
| Contact Blocks |  |  |
| 800T-XD1M | N.O. MaxDuty ${ }^{\text {m }}$ Contact Block |  |
| 800T-XD2M | N.C. MaxDuty ${ }^{\text {m }}$ Contact Block |  |
| 800T-XD4M | N.C.L.B. MaxDuty ${ }^{\text {ma }}$ Contact Block |  |
| 800TC-XD1M | Finger-Safe N.O. MaxDuty ${ }^{\text {m/ }}$ Contact Block |  |
| 800TC-XD2M | Finger-Safe N.C. MaxDuty ${ }^{\text {m }}$ Contact Block |  |
| 800TC-XD4M | Finger-Safe N.C.L.B. MaxDuty ${ }^{\text {m }}$ Contact Block |  |
| Assembled Push Buttons |  |  |
| 800T-A1D1M | Flush, Momentary, Green Push Button with N.O. MaxDuty ${ }^{\text {m }}$ Contacts |  |
| 800T-A2D1M | Flush, Momentary, Black Push Button with N.O. MaxDuty ${ }^{\text {m }}$ Contacts |  |
| 800T-B6D2M | Extended, Momentary, Red Push Button with N.C. MaxDuty ${ }^{\text {m/ }}$ Contacts |  |
| 800T-D6D2M | Mushroom, Momentary, Red Push Button with N.C. MaxDuty" Contacts |  |
| 800T-H2D1M | 2-Position Maintained Selector Switch with N.O. MaxDuty ${ }^{\text {m }}$ Contacts |  |
| 800T-J2AM | 3-Position Maintained Selector with N.O. and N.C. MaxDuty ${ }^{\text {m }}$ Contacts |  |
| 800T-FX6D4M | 2-Position, Red Push-Pull with N.C.L.B. MaxDuty ${ }^{\text {m }}$ Contacts |  |
| 800T-FXT6D4M | 2-Position, Red Push-Pull-Twist-Release with N.C.L.B. MaxDuty ${ }^{\text {m }}$ Contacts |  |

- Other assembled push button configurations available. Contact your local A-B distributor.
- Maintained push buttons are recommended for motor starting/stopping applications.
- MaxDuty"' contacts are not recommended for applications below $24 \mathrm{~V} / 100 \mathrm{~mA}$.



## www.rockwellautomation.com

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|  | Bulletin 855BS, 855BM, 855BL — Industrial Round Beacons <br> - Six colors available <br> - LED illumination functions: <br> - Single-color LED with user-selectable steady burning or flashing function <br> - Three-color LED (red, green, amber) <br> - LED Strobe with user-selectable single or double flash <br> - Halogen functions: steady, flashing, or rotating <br> - Xenon function: strobe <br> - Surface, NPT conduit, or tube mounting options <br> - UL Type 4/4X/13, IP65 | Table of Contents <br> 90 mm Beacons $\qquad$ this page <br> 120 mm Beacons $\qquad$ 11-25 <br> 160 mm Beacons $\qquad$ 11-26 <br> Accessories. $\qquad$ 11-27 <br> Specifications. $\qquad$ 11-30 <br> Approx. Dimensions. 11-31 <br> Standards Compliance <br> UL 508 <br> EN/IEC 60947-1 <br> EN/IEC 60947-5-1 <br> CSA 22.2 No. 14 <br> Certifications <br> cULus Listed (File No. E14840, Guides NKCR, NKCR7) CE Marked |
| :---: | :---: | :---: |

## Product Selection



$\rightarrow$

[^8]Bulletin 855BS/855BM/855BL
Round Beacons
Product Selection

## 90 mm Beacons

| Base Type | Voltage | Function | Color | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
| Surface Mount* | 24V AC/DC | Steady Halogen | Red | 855BS-S24DH4 |
|  |  |  | Amber | 855BS-S24DH5 |
|  |  | Rotating Halogen | Red | 855BS-S24RH4 |
|  |  |  | Amber | 855BS-S24RH5 |
|  |  | Xenon Strobe | Red | 855BS-S24BR4 |
|  |  |  | Amber | 855BS-S24BR5 |
|  | 120 V AC | Steady Halogen | Red | 855BS-S10DH4 |
|  |  |  | Amber | 855BS-S10DH5 |
|  |  | Rotating Halogen | Red | 855BS-S10RH4 |
|  |  |  | Amber | 855BS-S10RH5 |
|  |  | Xenon Strobe | Red | 855BS-S10BR4 |
|  |  |  | Amber | 855BS-S10BR5 |
| 1/2 in. NPT Conduit Mount | 24V AC/DC | Steady Halogen | Red | 855BS-N24DH4 |
|  |  |  | Amber | 855BS-N24DH5 |
|  |  | Rotating Halogen | Red | 855BS-N24RH4 |
|  |  |  | Amber | 855BS-N24RH5 |
|  |  | Xenon Strobe | Red | 855BS-N24BR4 |
|  |  |  | Amber | 855BS-N24BR5 |
|  | 120 V AC | Steady Halogen | Red | 855BS-N10DH4 |
|  |  |  | Amber | 855BS-N10DH5 |
|  |  | Rotating Halogen | Red | 855BS-N10RH4 |
|  |  |  | Amber | 855BS-N10RH5 |
|  |  | Xenon Strobe | Red | 855BS-N10BR4 |
|  |  |  | Amber | 855BS-N10BR5 |

90 mm LED Beacons

| Base Type | Voltage | Function | Color | Cat. No. |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Red | 855BS-S35SL4 |
|  | 24/48V AC/DC |  | Amber | 855BS-S35SL5 |
|  |  |  | Blue | 855BS-S35SL6 |
|  |  | Single-Color LED | Red | 855BS-S45SL4 |
|  | 120/240V AC/DC |  | Amber | 855BS-S45SL5 |
|  |  |  | Blue | 855BS-S45SL6 |
|  | 24V AC/DC | Three-Color LED | Green, Red, Amber | 855BS-S24ML345 |
|  | 120 V AC | Trı | Green, Red, Amber | 855BS-S10ML345 |
|  |  |  | Red | 855BS-S35BL4 |
|  | 24/48V AC/DC |  | Amber | 855BS-S35BL5 |
|  |  | Single/Double Strobe LED | Blue | 855BS-S35BL6 |
|  | 120 V AC |  | Red | 855BS-S10BL4 |
| 1/2 in. NPT Conduit Mount |  | Single-Color LED | Red | 855BS-N35SL4 |
|  | 24/48V AC/DC |  | Amber | 855BS-N35SL5 |
|  |  |  | Blue | 855BS-N35SL6 |
|  | 120/240V AC/DC |  | Red | 855BS-N45SL4 |
|  |  |  | Amber | 855BS-N45SL5 |
|  |  |  | Blue | 855BS-N45SL6 |
|  | 24V AC/DC | Three-Color LED | Green, Red, Amber | 855BS-N24ML345 |
|  | 120 V AC |  | Green, Red, Amber | 855BS-N10ML345 |
|  | 24/48V AC/DC | Single/Double Strobe LED | Red | 855BS-N35BL4 |
|  |  |  | Amber | 855BS-N35BL5 |
|  |  |  | Blue | 855BS-N35BL6 |
|  | 120 V AC |  | Red | 855BS-N10BL4 |

* When used outdoors, surface mount base must be installed with rough wall plate for NEMA Type $4 / 4 \mathrm{X} / 13$ rating, otherwise NEMA Type 1 only.


SAP\# 300837153

## LIMITRON" FNQ-R Class CC 600Vac, l/4-30A, time-delay fuses



## Catalog symbol:

- FNO-R-(amp)


## Description:

Advanced protection Class CC current-limiting, time-delay fuses.

## Specifications:

## Ratings

- Volts
- 600Vac
- 300Vdc (15 \& 20A)
- Amps 1/4-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc (15 \& 20A)


## Agency information

- UL® Listed, Std. 248-4, Class CC, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified, Class CC CSA, Class 1422-01, File 53787-HRC-MISC
- CE
- RoHS compliant*
* FNQ-R-1/4 not RoHS complaint.

| Catalog numbers (amps) |  |  |  |
| :--- | :--- | :--- | :--- |
| FNQ-R-1/4 | FNQ-R-1-3/10 | FNQ-R-3-2/10 | FNQ-R-8 |
| FNQ-R-3/10 | FNQ-R-1-4/10 | FNQ-R-3-1/2 | FNQ-R-9 |
| FNQ-R-4/10 | FNQ-R-1-1/2 | FNQ-R-4 | FNQ-R-10 |
| FNQ-R-1/2 | FNQ-R-1-6/10 | FNQ-R-4-1/2 | FNQ-R-12 |
| FNQ-R-6/10 | FNQ-R-1-8/10 | FNQ-R-5 | FNQ-R-15 |
| FNQ-R-3/4 | FNQ-R-2 | FNQ-R-5-6/10 | FNQ-R-17-1/2 |
| FNQ-R-8/10 | FNQ-R-2-1/4 | FNQ-R-6 | FNQ-R-20 |
| FNQ-R-1 | FNQ-R-2-1/2 | FNQ-R-6-1/4 | FNQ-R-25 |
| FNQ-R-1-1/8 | FNQ-R-2-8/10 | FNQ-R-7 | FNQ-R-30 |
| FNQ-R-1-1/4 | FNQ-R-3 | FNQ-R-7-1/2 |  |

Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in:



## Features:

- Provides 10X better current limitation to help prevent equipment damage caused by shortcircuit events.
- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast-acting fuse helps prevent equipment damage caused by short-circuit events.
- Rejection type fuse fits both standard and rejection-style holders.
- The Class CC FNQ-R Limitron fuse meets the needs of control circuit transformer protection.
- FNQ-R fuses can be sized according to NEC ${ }^{\circledR}$ and UL requirements and still allow the high inrush currents, with significantly more timedelay than the UL minimum value of 12 seconds at 200\% for Class CC fuses.
- Ideal for critical industrial or commercial applications that have specific current limitation requirements.


## E.t•N

Powering Business Worldwide

## Applications:

- Branch circuits
- Line protection
- Small control transformers
- Industrial control


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:
$1 / 2$ to $71 / 2 \mathrm{amps}$


## Time-current curves - average melt:

## 15 to 30 Amps



## Current-limitation curves:

1-1/2 to $7-1 / 2 \mathrm{amps}$


## Current-limitation curves:

10 to 30 amps


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[^9][^10]
## LIMITRON"' FNQ-R Class CC 600Vac, 1/4-30A, time-delay fuses



## Catalog symbol:

- FNO-R-(amp)


## Description:

Advanced protection Class CC current-limiting, time-delay fuses.

## Specifications:

## Ratings

- Volts
- 600Vac
- 300Vdc (15 \& 20A)
- Amps 1/4-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc (15 \& 20A)


## Agency information

- UL® Listed, Std. 248-4, Class CC, Guide JDDZ, File E4273
- CSA ${ }^{\circledR}$ Certified, Class CC CSA, Class 1422-01, File 53787-HRC-MISC
- CE
- RoHS compliant*
* FNQ-R-1/4 not RoHS complaint.

| Catalog numbers (amps) |  |  |  |
| :--- | :--- | :--- | :--- |
| FNQ-R-1/4 | FNQ-R-1-3/10 | FNQ-R-3-2/10 | FNQ-R-8 |
| FNQ-R-3/10 | FNQ-R-1-4/10 | FNQ-R-3-1/2 | FNQ-R-9 |
| FNQ-R-4/10 | FNQ-R-1-1/2 | FNQ-R-4 | FNQ-R-10 |
| FNQ-R-1/2 | FNQ-R-1-Q/10 | FNQ-R-4-1/2 | FNQ-R-12 |
| FNQ-R-6/10 | FNQ-R-1-8/10 | FNQ-R-5 | FNQ-R-15 |
| FNQ-R-3/4 | FNQ-R-2 | FNQ-R-5-6/10 | FNQ-R-17-1/2 |
| FNQ-R-8/10 | FNQ-R-2-1/4 | FNQ-R-6 | FNQ-R-20 |
| FNQ-R-1 | FNQ-R-2-1/2 | FNQ-R-6-1/4 | FNQ-R-25 |
| FNQ-R-1-1/8 | FNQ-R-2-8/10 | FNQ-R-7 | FNQ-R-30 |
| FNQ-R-1-1/4 | FNQ-R-3 | FNQ-R-7-1/2 |  |

Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in:



## Features:

- Provides 10X better current limitation to help prevent equipment damage caused by shortcircuit events.
- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast-acting fuse helps prevent equipment damage caused by short-circuit events.
- Rejection type fuse fits both standard and rejection-style holders.
- The Class CC FNQ-R Limitron fuse meets the needs of control circuit transformer protection.
- FNQ-R fuses can be sized according to NEC ${ }^{\circledR}$ and UL requirements and still allow the high inrush currents, with significantly more timedelay than the UL minimum value of 12 seconds at 200\% for Class CC fuses.
- Ideal for critical industrial or commercial applications that have specific current limitation requirements.


## Applications:

- Branch circuits
- Line protection
- Small control transformers
- Industrial control


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:
$1 / 2$ to $71 / 2 \mathrm{amps}$


## Time-current curves - average melt:

## 15 to 30 Amps



## Current-limitation curves:

1-1/2 to $7-1 / 2 \mathrm{amps}$


## Current-limitation curves:

10 to 30 amps


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[^11][^12]
## Low-Peak"' LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac,
- 300Vdc (1/2-2-8/10A, 20-30A)
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc


## Agency information

- UL ${ }^{\oplus}$ Listed Class CC, Std. 248-4,

Guide JDDZ, File E4273

- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)

| Catalog numbers (amps) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |  |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |  |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |  |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |  |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC-30 |  |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 1332 " x $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> Prospective <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |  |
| 1000 | 100 | 135 | 240 | 305 | 380 | 435 |  |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |  |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |  |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |  |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |  |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |  |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |  |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |  |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |  |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |  |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |  |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |  |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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[^13]
## Low-Peak" LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac,
- $300 \mathrm{Vdc}(1 / 2-2-8 / 10 \mathrm{~A}, 20-30 \mathrm{~A})$
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc


## Agency information

- UL® Listed Class CC, Std. 248-4,

Guide JDDZ, File E4273

- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)
Catalog numbers (amps)

| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |
| :--- | :--- | :--- | :--- | :--- |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC-30 |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 13/32" x $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> Prospective <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |  |
| 1000 | 100 | 135 | 240 | 305 | 380 | 435 |  |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |  |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |  |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |  |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |  |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |  |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |  |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |  |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |  |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |  |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |  |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |  |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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[^14]
## Low-Peak"' LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac,
- $300 \mathrm{Vdc}(1 / 2-2-8 / 10 \mathrm{~A}, 20-30 \mathrm{~A})$
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc


## Agency information

- UL ${ }^{\oplus}$ Listed Class CC, Std. 248-4, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)


## Catalog numbers (amps)

| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC-30 |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 1332 " $x$ $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Prospective <br> S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |
| $\mathbf{1 0 0 0}$ | 100 | 135 | 240 | 305 | 380 | 435 |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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## Low-Peak"' LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac
- 300Vdc (1/2-2-8/10A, 20-30A)
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.

20kA Vdc

## Agency information

- UL® Listed Class CC, Std. 248-4, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)

| Catalog numbers (amps) |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |  |  |  |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |  |  |  |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |  |  |  |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |  |  |  |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC-30 |  |  |  |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |  |  |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |  |  |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 1332 " x $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Prospective <br> S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |
| $\mathbf{1 0 0 0}$ | 100 | 135 | 240 | 305 | 380 | 435 |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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[^16]
## Low-Peak"' LP-CC Class CC 600Vac/300Vdc, 1/230A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac
- $300 \mathrm{Vdc}(1 / 2-2-8 / 10 \mathrm{~A}, 20-30 \mathrm{~A})$
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.

20kA Vdc

## Agency information

- UL® Listed Class CC, Std. 248-4, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)

| Catalog numbers (amps) |  |  |  |  |
| ---: | ---: | ---: | ---: | ---: |
| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | CP-CC-8 | LP-CC-30 |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\oplus}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only $13 / 32^{\prime \prime} \times$ $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
| 0-30 | CHCC1D_ | CHCC2D_ | CHCC3D_ |
|  | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |


| Panel mount holders |  |  | - |
| :--- | :---: | :---: | :---: |
| $0-30$ | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  | - |
| $0-30$ | - | HEY | - |
|  |  | HEZ | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

| Let-through current <br> Prospective <br> S.C.C. |  |  |  |  |  |  |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: |
|  | 1-1/4A | 2-8/10A | 15A | 20A | 25A | 30A |
| 1000 | 100 | 135 | 240 | 305 | 380 | 435 |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3 .

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Powering Business Worldwide

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f0in ${ }^{2}$

## Low-Peak" LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac,
- $300 \mathrm{Vdc}(1 / 2-2-8 / 10 \mathrm{~A}, 20-30 \mathrm{~A})$
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc


## Agency information

- UL ${ }^{\oplus}$ Listed Class CC, Std. 248-4, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)


## Et $\mathrm{T} \cdot \mathrm{N}$

Powering Business Worldwide

| Catalog numbers (amps) |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LPCC-25 |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC 30 |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\circledR}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 1332 " $x$ $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Prospective <br> S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |
| $\mathbf{1 0 0 0}$ | 100 | 135 | 240 | 305 | 380 | 435 |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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[^17]
## VpCl ${ }^{\circledR}$-111 Emitter, Patented



## PRODUCT DESCRIPTION

VpClo-111 emitters are unique devices designed to provide corrosion protection for metal components and parts enclosed in non-ventilated control boxes, cabinets or tool boxes up to 11 cubic feet (312 liters). The Vapor phase Corrosion Inhibitor ( $\mathrm{VpCl}^{\circledR}$ ) emits vapors, which form a molecular layer on internal metal surfaces to protect critical, complex, and expensive electronic equipment during operation, shipping, or storage. $\mathrm{VpCl}^{-}-111$ is patented with a breathable Tyvek ${ }^{\circledR}$ membrane cover through which corrosion inhibitors are slowly released. $\mathrm{VpCl}^{\circledR}-111$ provides long term protection against corrosion even in the presence of adverse conditions including salt, moisture, airborne contaminants, $\mathrm{H}_{2} \mathrm{~S}$ $\mathrm{SO}_{2}, \mathrm{NH}_{3}$, and others.
*Tyvek is a registered trademark of DuPont ${ }^{\text {TM }}$

## TYPICAL APPLICATIONS

- Operating, packaged, and stored electrical equipment
- Marine navigation and communication equipment
- Aerospace electrical controls
- Electric motors
- Switching equipment
- Fuse boxes and power boxes
- Medical equipment
- Electrical wireways and terminal boxes
- Scientific and measuring instruments
- Telecommunications equipment and remote electronics devices


## FEATURES

- Economical to use
- Provides continuous protection for up to 24 months during operation and/or shutdown
- Effective in polluted and humid environments
- Does not interfere with electrical, optical, or mechanical performance
- Multi-metal protection
- Quick and easy installation
- Very convenient to install
- Non-toxic and safe to handle
- Compact and space-saving
- Free of nitrites, halogens, and phosphates
- No spraying, wiping, or dipping required
- VOC values meet Southern California Clean Air Act and other National and local regulations
- Self-stick back
- Self-stick date label
- NSN\# 6850-01-408-9025
- Accepted by FDA for corrosion protection of electrical and electronic equipment within food processing plants
- Canadian Food Inspection Agency acceptance for indirect food contact
- Approved for U.S. military and NATO
- Product contains powder that is a commercial equivalent to MIL-1-22110C
- IBM approval \# 44V542

CORTEC
CORPORATION
Environmentally Safe $\mathrm{VpCl}{ }^{\circledR} \mathrm{MCl}$ Technologies

## METHOD OF APPLICATION

$\mathrm{VpCl}^{\circledR}-111$ is extremely simple and convenient to install. $\mathrm{VpCl}^{®_{-}}$ 111 emitters should be installed as early as possible, preferably during manufacturing or assembly. Simply select a space within enclosed device where corrosion protection would be useful. Verify that the surface on which the device will be installed is clean and free of debris. Peel off the protective peel strip from the bottom of the device and attach it to the clean surface. The peel strip can be separated to reveal a self-adhesive sticker on which the installation and replacement dates can be noted. $\mathrm{VpCl}^{\circledR}-111$ emitters can be installed in any position. For volumes greater than $11 \mathrm{ft}^{3}$ ( 312 L ), install more than one $\mathrm{VpCl}^{\circledR}-111$. If the enclosure is not totally air-tight or if the access doors are opened frequently, replace the $\mathrm{VpCl}^{\circledR}-111$ emitter more often than every two years. After periods of heavy maintenance, replace the emitter. For additional protection, spray the enclosure very lightly with ElectriCorr ${ }^{\circledR} \mathrm{VpCl}^{\circledR}-238$.

## PACKAGING AND STORAGE

Products should not be exposed to temperatures of over $185^{\circ} \mathrm{F}$ $\left(85^{\circ} \mathrm{C}\right) . \mathrm{VpCl}{ }^{\circledR}-111$ is available in 10 individually wrapped emitters per carton.

## STANDARD TEST METHODS

| NACE TM0208-2008 | Vapor Inhibiting Ability |
| :--- | :--- |
| NACE RP0487-2000 | Selection of Rust Preventives |
| MIL-I-22110C | Vapor Inhibiting Ability |

## PROPERTIES

| Appearance | Green cup with Tyvek ${ }^{\circledR}$ lid |
| :--- | :--- |
| Protection | $11 \mathrm{ft}^{3}$ (312 Liters) emitter |
| Standard size | Plastic device cup with breathable membrane 2.25 in. diameter $x$ |
|  | 1.27 in $\mathrm{H}(5.7 \mathrm{~cm} \times 3.2 \mathrm{~cm})$ |

# FOR INDUSTRIAL USE ONLY <br> KEEP OUT OF REACH OF CHILDREN <br> KEEP CONTAINER TIGHTLY CLOSED <br> NOT FOR INTERNAL CONSUMPTION <br> CONSULT SAFETY DATA SHEET FOR MORE INFORMATION 

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ENM Counting Instruments > Electrical Counters > E6B Electrical Counter - Two-Hole Panel Mount > T14 DC Powered Hour Meter II. > T14 DC Powered Hour Meter I. > T18 AC Powered Hour Meter III. > T18 AC Powered Hour Meter II. > T32 AC/DC DIN Rail Mount Hour Meter > Item \# T32F717D


# Vibratone ${ }^{\oplus}$ Horns 

## Models 350 and 450

## DESIGNED FOR ROUTINE SIGNALING

- Range of up to 200 feet
- Coded or sustained tones
- Model 350 - 12, 24, 120 and 240VAC; Model 450 - 12, 24, 125 and 250VDC
- Model 350 produces 100dBa at 10'
- Model 450 produces 99 dBa at $10^{\prime}$
- Type 4X when installed with Panel Mount Gasket Kit or Weatherproof Backbox (Model WB); Type 4X and Type 12 when installed with Surface Mount Trim Ring (Model TR)


## - UL and cUL Listed, CSA Certified and FM Approved

The Models 350 and 450 Vibratone Horns produce a very loud horn tone by the electro-mechanical vibration of a diaphragm. Capable of reproducing coded blasts or sustained tones through the use of a number of control devices from a push button to a PLC. Federal Signal's Vibratone horn is excellent for general alarm, start and dismissal, coded paging, and process control signaling in areas of high ambient noise levels.

The Vibratone Model 350 is available in AC voltages; 12VAC, 24VAC, 120VAC and 240VAC. The Model 350 produces 100dBa @ 10', except the 12VAC model, which produces 94dBa @ 10'.

The Model 450 is available in DC voltages; 12VDC, 24VDC, 125VDC and 250VDC. The Model 450 produces 99dBa @ 10'.

Vibratone mounting options provide for surface, flush or semi-flush mounting on walls, panels, in cabinets, on 4-inch square outlet boxes, or in concrete and deep wall constructions.
Installed on the front of a Vibratone Horn, the optional Model PR Projector or Model PR2 Double Projector direct sound output straight ahead or to the sides, optimizing sound output for long, narrow rooms or corridors.
Vibratone horns are UL and cUL Listed, CSA Certified and FM Approved. They are designed and approved for use in Type 4X applications when installed with the Panel Mount Gasket Kit or Weatherproof Backbox (Model WB). They are approved for Type 4X and Type 12 applications when installed with the Surface Mount Trim Ring (Model TR, illustrated on page 124).

Each Vibratone horn is enclosed in a zinc die-cast housing and sealed with grey powder-coat paint. The Model 350 features a stainless steel diaphragm. The Model 450 utilizes an aluminum diaphragm and heavy duty contacts. The rugged construction of the Vibratone horns resists vandalism and the effects of harsh industrial environments.

Compact size, loud output and heavy-duty construction make the VibraTone horns ideal for industrial and institutional signaling applications.

| Model | Voltage | Operating <br> Current | Decibels @ <br> 10' |  |
| :--- | :--- | :--- | :--- | :--- |
| $\mathbf{3 5 0 - 0 1 2 - 3 0}$ | 12VAC $50 / 60 \mathrm{~Hz}$ | 0.90 amps | 94 | 104 |
| $\mathbf{3 5 0 - 0 2 4 - 3 0}$ | 24VAC $50 / 60 \mathrm{~Hz}$ | 0.90 amps | 100 | 110 |
| $\mathbf{3 5 0 - 1 2 0 - 3 0}$ | 120VAC $50 / 60 \mathrm{~Hz}$ | 0.18 amps | 100 | 110 |
| $\mathbf{3 5 0 - 2 4 0 - 3 0}$ | 240VAC $50 / 60 \mathrm{~Hz}$ | 0.09 amps | 100 | 110 |
| $\mathbf{4 5 0 - 0 1 2 - 3 0}$ | 12VDC | 0.13 amps | 93 | 103 |
| $\mathbf{4 5 0 - 0 1 2 - 3 1}$ | 12VDC | 0.50 amps | 99 | 109 |
| $\mathbf{4 5 0 - 0 2 4 - 3 1}$ | 24VDC | 0.25 amps | 99 | 109 |
| $\mathbf{4 5 0 - 1 2 5 - 3 0}$ | $125 V D C$ | 0.05 amps | 99 | 109 |
| $\mathbf{4 5 0 - 2 5 0 - 3 0}$ | 250VDC | 0.03 amps | 99 | 109 |



## 450 HORN



## SPECIFICATIONS

## Operating Temperature:

Net Weight:
Shipping Weight:
Height:
Width:
Depth:
$-65^{\circ}$ F to $150^{\circ} \mathrm{F}$
1.4 lbs .
1.5 lbs .
4.0"
4.0"
2.5 "
$-54^{\circ} \mathrm{C}$ to $66^{\circ} \mathrm{C}$
0.6 kg
0.7 kg
102.0 mm
102.0 mm
64.0 mm

## ACCESSORIES

FB Wall box for flush mounting the Vibratone ${ }^{\circledR}$ horn in stud, $4^{\prime \prime}$ block, or other shallow wall construction; $4^{3} / 8^{\prime \prime}$ square box; $2^{7 / 8^{\prime \prime}}$ deep; shipping weight 2 lbs ( 0.91 kg )
FBL Same as FB, but $3^{13 / 16 " ~ d e e p ~ f o r ~} 6$ " x 8 " concrete block, cinder block or other deep wall construction; shipping wt. 3 lbs . ( 1.36 kg )
FG Flush grille which attaches to the basic unit and serves as the cover of the plasteredin FB flush box; $6^{\prime \prime} \mathrm{H} \times 6^{\prime \prime} \mathrm{W} \times 1 / 8^{\prime \prime} \mathrm{D}$; shipping wt. $1 \mathrm{lb} .(0.45 \mathrm{~kg})$
K8435666A Optional Panel Mounting Gasket Kit includes a gasket and hardware for surface or flush mounting the horn for NEMA Type 4X applications.
PR Projector which concentrates sound into a basic area when attached to the basic model 350/450 units; $4^{\prime \prime} \mathrm{H} \times 4^{\prime \prime} \mathrm{W} \times 6^{\prime \prime} \mathrm{D}$; shipping weight $1 \mathrm{lb} .(0.45 \mathrm{~kg})$
PR2 Double projector directs sounds to both sides when attached to the basic model 350/450 units; ideal for use in hallways; $4^{\prime \prime} \mathrm{H} \times 11^{1 / 2} 2^{\prime \prime} \mathrm{W} \times 4^{\text {" }}$ D; shipping weight 2 lbs. ( $0,91 \mathrm{~kg}$ )
SF Stamped surface plate used for installations on plastered-in 4" outlet switch boxes for semi-flush mountings; $6^{\prime \prime} \mathrm{H} \times 6^{\prime \prime} \mathrm{W} \times 1 / 2{ }^{\prime \prime} \mathrm{D}$; shipping weight $1 \mathrm{lb} .(0.45 \mathrm{~kg})$
TR Gasketed trim ring allowing surface mount installations of 350/450 units while maintaining Type12 and Type 4X rating of enclosure.
WB Cast aluminum neoprene-gasketed weatherproof housing for outside use, complete with mounting lugs; tapped for $1 / 2^{\prime \prime}, 3 / 4^{\prime \prime}$ conduit; $4^{3} / 8^{\prime \prime}$ square box; $2^{\prime \prime}$ deep mounting lugs on $4 \frac{1}{2} 2^{\prime \prime}$ centers; shipping weight $1 \mathrm{lb} .(0.45 \mathrm{~kg})$

## HOW TO ORDER

- Specify model and voltage
- Specify accessories from list
- Please refer to Model Number Index 350/450 beginning on page 374


## REPLACEMENT PARTS

## Description

Panel Mount Gasket Kit
Coil (120VAC only)
Volume Control Kit (350 Horn only)
Gasket for WB

Part Number K8435666A KFC1516C

K8435663B
K8435696A

## APPROVALS <br> 



| $>$ | CONNECTOR CODE | DESCRIPTION |
| :---: | :---: | :---: |
|  | R2 | CATEGORY 5 RJ45 F/F BULKHEAD |
|  | R26 | CATEGORY 5 RJ45 F/IDT BULKHEAD |
|  | R33 | CATEGORY 5 SHIELDED RJ45 F/F BULKHEAD |
|  | R62 | CATEGORY 6 RJ45 F/F BULKHEAD |

## . INSTALLATION

GracePorts® are intended to be mounted in or on an enclosure product. Installation should be performed by a qualified technician and adhere to applicable regulatory codes. These devices are for mounting on the flat surface of enclosures having the same type of environmental rating.

## SPECIFICATIONS: ELECTRICAL

Low voltage (data), limited to 30 VDC High voltage supply (for computer use only) 120 VAC, 15A (UL), 5A (CSA) 230-240 VAC, 16A (CE only)

## SPECIFICATIONS: MECHANICAL

Housing: Cast aluminum base
Latch: Type 304 Stainless Steel (1CR18NI19)
Cover: Polycarbonate, UV rated, V-O Flame rated Gasket: Thermoplastic elastomer Insert Material: Acrylic UL94HB


## SPECIFICATIONS: ELECTRICAL

Low voltage (data), limited to 30 VDC
High voltage supply (for computer use only) 120 VAC, 15A (UL), 5A (CSA)
230-240 VAC, 16A (CE only)

## SPECIFICATIONS: MECHANICAL

 Housing: Cast aluminum base Latch: Type 304 Stainless Steel (1CR18NI19) Cover: Polycarbonate, UV rated, V-O Flame rated Gasket: Thermoplastic elastomer Insert Material: Acrylic UL94HBUL RECOGNIZED: E207344 Type 4, IP-65 (Outdoor Use) CSA: LR110845 (not for interrupting circuit) CE: EN61010/EN60950 (Foreign Power Outlets)


- Remote door switch activates the light when the enclosure door is opened
- Mounts on enclosure frame and includes mounting hardware
- Mounting plate is 14 gauge steel with a plated finish
- Can be hard-wired to the PANELITE LED or Fluorescent light or connected via the PANELITE Door Switch Cable


## BULLETIN: A80LT, P20

TOUCH-SAFE UL LIGHT SWITCH


## APPLICATION

The Touch-Safe light switch is designed to be used with Hoffman ${ }^{\text {TM }}$ light kits (AC and DC). It provides a UL listed touch-safe switch that can be used on many enclosure types and includes hardware for most applications. The light switch maintains enclosure overall rating up to UL 508A Type 4X or 12.

## MOUNTING BRACKET KIT FOR LIGHT PACKAGE

Kit simplifies mounting light package in Hoffman PROLINE ${ }^{\text {TM }}$ disconnect enclosures. Includes brackets, all mounting hardware and complete instructions.

## BULLETIN: A80LT

| Catalog Number | Description |
| :--- | :--- |
| PDLFBRKT | Mounting Bracket Kit |

## LED PUCK LIGHT



The LED Puck Light is ideal for remote and darkened applications. This versatile light provides mounting flexibility; it can be magnetically attached to flat steel surfaces or can be hung with a swivel hook. This small form factor, light-weight LED light provides superior lighting performance with minimal power consumption. It can be used as a three-LED flashlight or as a $24-L E D$ work light with operating temperature of 40 F to 120 F (4C to 48 C$)$. An on/off switch is incorporated in the light and three AAA batteries are included.

BULLETIN: A80LT


## FEATURES

- UL listed for a touch-safe wire connection
- Easily mounted to various enclosure types; common bracket and hardware included for many enclosure types (NEMA, CONCEPT™ $/ F U S I O N^{\top M}$ G7, PROLINE ${ }^{\text {TM }}$, Freestanding Type 12)
- Cable PG compression hub
- Wide operating temperature range: $-49^{\circ} \mathrm{F}$ to $+158^{\circ} \mathrm{F}\left(-45^{\circ} \mathrm{C}\right.$ to $70^{\circ} \mathrm{C}$ )
- Rugged die-cast anodized zinc construction
- Connection 3 cage clamps for solid and stranded wire AWG 20-14 (0.5-2.5mm²]
- Protection class I (grounded)

BULLETIN: A80LT

| Catalog Number | Max. Cable Dia. | Max. Voltage |
| :--- | :--- | :--- |
| LDSWITCH | .375 in. | $250 \mathrm{AC} / 48 \mathrm{DC}$ |



Kax. Cade Dia. 250 AC / 48 DC

Clearance Range for DAH601


## ELECTRIC HEATERS



## INDUSTRY STANDARDS

UL 508A Component Recognized; File No. E61997
CSA Certified, CSA File No. LR42186
CE

## APPLICATION

Protect mechanical, electrical and electronic equipment from low temperatures, condensation and corrosion with this thermostatically controlled, fan-driven heater that maintains a stable enclosure temperature.
Fan draws cool air from the bottom of the enclosure and passes this air across the thermostat and heating element before being released into enclosure cavity. Heated air is discharged through the top of the heater unit.

## SPECIFICATIONS

- Aluminum housing
- Thermostat range adjustable from 0 F to 100 F (-18 C to 38 C)
- Four 10-32 x self-tapping screws are included with each heater
- Ball bearing fan
- Terminal strip with clamp connector that accepts both solid and stranded wire


## FINISH

- Brushed aluminum


## A CAUTION

These electric heaters are not designed for use in dusty, dirty, corrosive, or hazardous locations. Portions of the heater can get hot. Adequate protection must be taken to protect people from potential burns, and to protect other components from this heat. nVent recommends this heater only be installed in a totally-enclosed metal enclosure.

DO NOT INSTALL HEATERS ON WOOD PANELS. Heat sensitive components should not be placed near the heater discharge area since this air can be quite warm. The clearance range defines the space that must be kept free of these components for proper and safe operation of the heater.

ACCESSORIES ENCLOSURE HEATERS

Performance Data 100 and 200 Watt Heaters

| CATALOG NUMBERS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | DAH1001A | DAH1002A | DAH2001A | DAH2002A |
| ELECTRICAL DATA |  |  |  |  |
| Rated Voltage | 115 | 230 | 115 | 230 |
| Frequency (Hz) | 50/60 | 50/60 | 50/60 | 50/60 |
| Power Consumption (Watts) | 100 | 100 | 200 | 200 |
| Nominal Current (Amps) | 0.98 | 0.49 | 1.89 | 0.95 |
| HEATING PERFORMANCE |  |  |  |  |
| Watts | 100 | 100 | 200 | 200 |
| UNIT CONSTRUCTION |  |  |  |  |
| Weight (lb./kg) | 1.6/0.73 | 1.6/0.73 | 1.6/0.73 | 1.6/0.73 |
| X (in./mm) | 4.00/102 | 4.00/102 | 6.00/152 | 6.00/152 |

Performance Data 400 and 800 Watt Heaters

| CATALOG NUMBERS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | DAH4001B | DAH4002B | DAH8001B | DAH8002B |
| ELECTRICAL DATA |  |  |  |  |
| Rated Voltage | 115 | 230 | 115 | 230 |
| Frequency (Hz) | 50/60 | 50/60 | 50/60 | 50/60 |
| Power Consumption (Watts) | 400 | 400 | 800 | 800 |
| Nominal Current (Amps) | 3.72 | 1.86 | 7.37 | 3.69 |
| HEATING PERFORMANCE |  |  |  |  |
| Watts | 400 | 400 | 800 | 800 |
| UNIT CONSTRUCTION |  |  |  |  |
| Weight (lb./kg) | 2.2/1.00 | 2.2/1.00 | 2.2/1.00 | 2.2/1.00 |
| X (in./mm) | 6.00/152 | 6.00/152 | 8.00/203 | 8.00/203 |

Performance Data 1300 Watt Heaters

| CATALOGNUMBERS |  |  |
| :---: | :---: | :---: |
|  | DAH13001C | DAH13002C |
| ELECTRICAL DATA |  |  |
| Rated Voltage | 115 | 230 |
| Frequency (Hz) | 50/60 | 50/60 |
| Power Consumption (Watts) | 1300 | 1300 |
| Nominal Current (Amps) | 11.5 | 5.7 |
| HEATING PERFORMANCE |  |  |
| Watts | 1300 | 1300 |
| UNIT CONSTRUCTION |  |  |
| Weight (lb./kg) | $3.4 / 1.54$ | 3.4/1.54 |
| X (in./mm) | 8.00/203 | 8.00/203 |



Dimensions and Clearance Range Drawing for DAH4001B, -2B and DAH8001B, $-2 B$


## LED LIGHT KIT



LED light kits provide interior enclosure lighting. These light kits are ideal for remote and darkened enclosure applications. The light can be mechanically fastened with included hardware to maintain enclosure UL listing (up to Type 4X), or can be magnetically attached to flat steel surfaces. The lights have auto-sensing circuitry (AC voltage 90 VAC to 260 VAC and DC voltage 20 VDC to 60 VDC). LED lights are light-weight and in a small form factor while providing 900 LM of 6500 K light. Power consumption for all models is 5 watts.

## BULLETIN: A80LT



| Catalog Number | AxBxC in./mm | Weight (oz) | Weight (gm) | Mounting Style | Power Source | Activation | Voltage |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| LEDA1M35 | $\begin{aligned} & 1.34 \times 1.26 \times 13.82 \\ & 34 \times 32 \times 351 \end{aligned}$ | 4.8 | 135 | Magnetic | AC | On/off switch | 90 VAC-260 VAC |
| LEDA2M35 | $\begin{aligned} & 1.54 \times 1.26 \times 13.82 \\ & 39 \times 32 \times 351 \end{aligned}$ | 5.0 | 140 | Magnetic | AC | IR Motion Sensor | 90 VAC-260 VAC |
| LEDA1S35 | $\begin{aligned} & 1.42 \times 2.05 \times 13.82 \\ & 36 \times 52 \times 351 \end{aligned}$ | 4.8 | 135 | Screw | AC | On/off switch | 90 VAC-260 VAC |
| LEDA2S35 | $\begin{aligned} & 1.63 \times 2.05 \times 13.82 \\ & 41 \times 52 \times 351 \end{aligned}$ | 5.0 | 140 | Screw | AC | IR Motion Sensor | 90 VAC-260 VAC |
| LEDD1M35 | $\begin{aligned} & 1.34 \times 1.26 \times 13.82 \\ & 34 \times 32 \times 351 \end{aligned}$ | 4.8 | 135 | Magnetic | DC | On/off switch | 20 VDC-60 VDC |
| LEDD2M35 | $\begin{aligned} & 1.54 \times 1.26 \times 13.82 \\ & 39 \times 32 \times 351 \end{aligned}$ | 5.0 | 140 | Magnetic | DC | IR Motion Sensor | 20 VDC-60 VDC |
| LEDD1S35 | $\begin{aligned} & 1.42 \times 2.05 \times 13.82 \\ & 36 \times 52 \times 351 \end{aligned}$ | 4.8 | 135 | Screw | DC | On/off switch | $20 \mathrm{VDC}-60 \mathrm{VDC}$ |
| LEDD2S35 | $\begin{aligned} & 1.63 \times 2.05 \times 13.82 \\ & 41 \times 52 \times 351 \end{aligned}$ | 5.0 | 140 | Screw | DC | IR Motion Sensor | 20 VDC-60 VDC |

## LED LIGHT INPUT CONNECTOR/CABLE ASSEMBLY



The input connector/cable assembly is used to provide supply power to the LED light. Pre-assembled connector/cable assembly with
78.7 -in. (2000 mmJ long cable whip. Cables are constructed of 16 AWG copper wire.

BULLETIN: A80LT

| Catalog Number | A in./mm | Power Source | Use with |
| :--- | :--- | :--- | :--- |
| LEDA20C | 78.74 | AC | AC LED Lights |
|  | 2000 |  |  |
| LEDD20C | 78.74 | DC | DC LED Lights |
|  | 2000 |  |  |

LED LIGHT EXTENSION CONNECTOR/CABLE ASSEMBLY
The extension connector/cable assembly is used to connect adjacent LED lights (daisy chain). Up to 10 LED lights can be ganged or connected in series. Pre-assembled connector/cable assembly with 39.4 -in. ( 1000 mm ) long cable between input and output connectors. Cables are constructed of 16 AWG copper wire.
BULLETIN: A80LT

| Catalog Number | A in./mm | Power Source | Use with |
| :--- | :--- | :--- | :--- |
| LEDA10E | 39.37 | AC | AC LED Lights |
|  | 1000 |  |  |
| LEDD10E | 39.37 | DC | DC LED Lights |
|  | 1000 |  |  |

## LED LIGHT KIT



LED light kits provide interior enclosure lighting. These light kits are ideal for remote and darkened enclosure applications. The light can be mechanically fastened with included hardware to maintain enclosure UL listing (up to Type 4X), or can be magnetically attached to flat steel surfaces. The lights have auto-sensing circuitry (AC voltage 90 VAC to 260 VAC and DC voltage 20 VDC to 60 VDC). LED lights are light-weight and in a small form factor while providing 900 LM of 6500 K light. Power consumption for all models is 5 watts.

## BULLETIN: A80LT



| Catalog Number | AxBxC in./mm | Weight (oz) | Weight (gm) | Mounting Style | Power Source | Activation | Voltage |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| LEDA1M35 | $\begin{aligned} & 1.34 \times 1.26 \times 13.82 \\ & 34 \times 32 \times 351 \end{aligned}$ | 4.8 | 135 | Magnetic | AC | On/off switch | 90 VAC-260 VAC |
| LEDA2M35 | $\begin{aligned} & 1.54 \times 1.26 \times 13.82 \\ & 39 \times 32 \times 351 \end{aligned}$ | 5.0 | 140 | Magnetic | AC | IR Motion Sensor | 90 VAC-260 VAC |
| LEDA1S35 | $\begin{aligned} & 1.42 \times 2.05 \times 13.82 \\ & 36 \times 52 \times 351 \end{aligned}$ | 4.8 | 135 | Screw | AC | On/off switch | 90 VAC-260 VAC |
| LEDA2S35 | $\begin{aligned} & 1.63 \times 2.05 \times 13.82 \\ & 41 \times 52 \times 351 \end{aligned}$ | 5.0 | 140 | Screw | AC | IR Motion Sensor | 90 VAC-260 VAC |
| LEDD1M35 | $\begin{aligned} & 1.34 \times 1.26 \times 13.82 \\ & 34 \times 32 \times 351 \end{aligned}$ | 4.8 | 135 | Magnetic | DC | On/off switch | $20 \mathrm{VDC}-60 \mathrm{VDC}$ |
| LEDD2M35 | $\begin{aligned} & 1.54 \times 1.26 \times 13.82 \\ & 39 \times 32 \times 351 \end{aligned}$ | 5.0 | 140 | Magnetic | DC | IR Motion Sensor | 20 VDC-60 VDC |
| LEDD1S35 | $\begin{aligned} & 1.42 \times 2.05 \times 13.82 \\ & 36 \times 52 \times 351 \end{aligned}$ | 4.8 | 135 | Screw | DC | On/off switch | $20 \mathrm{VDC}-60 \mathrm{VDC}$ |
| LEDD2S35 | $\begin{aligned} & 1.63 \times 2.05 \times 13.82 \\ & 41 \times 52 \times 351 \end{aligned}$ | 5.0 | 140 | Screw | DC | IR Motion Sensor | 20 VDC-60 VDC |

## LED LIGHT INPUT CONNECTOR/CABLE ASSEMBLY



The input connector/cable assembly is used to provide supply power to the LED light. Pre-assembled connector/cable assembly with
78.7 -in. (2000 mm long cable whip. Cables are constructed of 16 AWG copper wire.
BULLETIN: A80LT

| Catalog Number | A in. $/ \mathrm{mm}$ | Power Source | Use with |
| :--- | :--- | :--- | :--- |
| LEDA2OC | 78.74 | AC | AC LED Lights |
|  | 2000 |  |  |
| LEDD20C | 78.74 | DC | DC LED Lights |
|  | 2000 |  |  |

The extension connector/cable assembly is used to connect adjacent LED lights (daisy chain). Up to 10 LED lights can be ganged or connected in series. Pre-assembled connector/cable assembly with 39.4 -in. ( 1000 mm ) long cable between input and output connectors. Cables are constructed of 16 AWG copper wire.
BULLETIN: A80LT

| Catalog Number | A in./mm | Power Source | Use with |
| :--- | :--- | :--- | :--- |
| LEDA10E | 39.37 | AC | AC LED Lights |
| LEDD10E | 1000 |  |  |
|  | 39.37 | DC | DC LED Lights |
|  | 1000 |  |  |

## S350-Kit



350 kcmil- 6 AWG wire range, and FLEX wire class G-K including mm2 class 5, 1 barrel, aluminum or copper wire, CU9AL, 90C temperature rating, one mounting hole of .343 inch dia $5 / 16$ " bolt, UL Listed, CSA Certified.

Supplied with 5/16-18 UNC x 3 3/4 long Steel zinc plated RoHS hex head cap screw and (1) 5/16 SAE flat washer steel zinc plated RoHS.


TO BE ADDED WITH OTHER AVALIABLE KIT OPTIONS.
See website for current pricing. https:///ugsdirect.com

Our RLW Reactors are the state-of-the art filtering solution for virtually any 4 or 6-pulse rectifier or power conversion unit. There are units available for amperage ratings from 0.5A to 750A. Our 3\% impedance option is $90 \%$ effective and our $5 \%$ option extends spike protection to $99 \%$.

Smaller size and weight makes these units ideal for OEMs, integrators and panel builders.

Wider range of impedance values for accurate and cost-effective selection.

DIN Rail mounting options for easy panel installation.
UL/cUL LISTED and CE marked for all your installation requirements.

Preliminary Performance Specifications:

| Impedance Levels | $1.5 \%, 3 \%$ and 5\% |
| :--- | :--- |
| Continuous Service Factor | $100 \%$ |
| Overload Rating - Line Side | $150 \%$ of RMS rating for 1 minute <br> $200 \%$ of RMS rating for 10 seconds |
| Voltage Range | $208 \mathrm{~V}-690 \mathrm{~V}$ |
| Current Range | $0.5 \mathrm{~A}-750 \mathrm{~A}$ |
| Temperature Rise | $140^{\circ} \mathrm{C}$ |
| Ambient Temperature | -40 to $50^{\circ} \mathrm{C}$ |
| Altitude Maximum |  |
| without de-rating | 1,000 meters |
| Fundamental Frequency | $50 / 60 \mathrm{~Hz}$ |
| Inductance Curve | $100 \%$ at $100 \%$ Current <br> $80 \%$ at $150 \%$ Current <br> $50 \%$ at $200 \%$ Current |




## ENCLOSURES

FIGURE 1


FIGURE 2


NOTE: HOODS
ONLY ON NEMA
3R ENCLOSURES

FIGURE 3


FIGURE 4


## mtecorp.com

## SELECTION TABLES

| Phase | Input Voltage \& Hz | $\begin{array}{\|c\|} \hline \% \\ \text { Impedance } \end{array}$ | $\begin{aligned} & 0.25 \mathrm{HP} \\ & 0.18 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 0.33 \mathrm{HP} \\ & 0.25 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 0.5 \mathrm{HP} \\ & 0.37 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 0.75 \mathrm{HP} \\ & 0.55 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 1.0 \mathrm{HP} \\ & 0.75 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 1.5 \mathrm{HP} \\ & 1.1 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 2.0 \mathrm{HP} \\ & 1.5 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 3.0 \mathrm{HP} \\ & 2.2 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 5.0 \mathrm{HP} \\ & 3.7 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 7.5 \mathrm{HP} \\ & 5.5 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 10.0 \mathrm{HP} \\ & 7.5 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 15.0 \mathrm{HP} \\ & 11.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 20.0 \mathrm{HP} \\ & 15.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 25.0 \mathrm{HP} \\ & 18.5 \mathrm{kw} \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Three Phase Input Applications Selected by Motor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 Phase | $\begin{aligned} & 208 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 3\% | $\begin{aligned} & \text { RLW- } \\ & 01 P 601 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 P 101 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 801 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P801 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 601 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 \mathrm{P} 601 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001101 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002101 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002801 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008301 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010401 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 208 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & 02 \mathrm{P} 103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 403 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 403 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 603 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 001103 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002801 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004601 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 240 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 3\% | $\begin{aligned} & \text { RLW- } \\ & 01 \text { P601 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P101 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P101 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ \text { 03P401 } \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 801 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 601 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001101 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002101 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002801 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008301 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 240 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & 01 P 603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 \mathrm{P} 103 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 403 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 603 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ \text { 07P603 } \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 003503 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 005503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 400 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 3\% | $\begin{aligned} & \text { RLW- } \\ & 0 P 7505 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ \text { 0P7503 } \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P103 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 03P403 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 400 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & 0 P 7506 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 0P7505 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 01 P 606 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P106 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 406 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P806 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 \mathrm{P} 606 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001106 \end{aligned}$ | RLW- <br> 001406 | $\begin{aligned} & \text { RLW- } \\ & 002106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002806 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 003505 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 480 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 3\% | $\begin{aligned} & \text { RLW- } \\ & \text { 01P105 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \mathrm{P} 606 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 01 \mathrm{P} 103 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 01 P 603 \end{aligned}$ |  | $\begin{aligned} & \text { RLW- } \\ & \text { 04P805 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 403 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 003503 \end{gathered}$ |
| 3 Phase | $\begin{aligned} & 480 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{gathered} \text { RLW- } \\ 0 P 7506 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \text { P106 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P10 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 P 105 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 405 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P805 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 600 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 3\% | $\begin{aligned} & \text { RLW- } \\ & \text { OP7506 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \mathrm{P} 106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \mathrm{P} 606 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 \mathrm{P} 106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P105 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 405 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P806 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P805 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 600 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & \text { 00P506 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { OP7506 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P106 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P606 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 P 106 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 406 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 406 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P806 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P606 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001106 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 001106 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 002106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002806 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002806 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 690 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 2\% | - | - | - | - | - | - | - | $\begin{aligned} & \text { RLW- } \\ & \text { 03P403 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P603 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002103 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 690 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 3\% | - | - | - | - | - | - | - | $\begin{aligned} & \text { RLW- } \\ & \text { 03P406 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P606 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 001106 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 001405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ |
| Single Phase Input Applicaitons |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 Phase | $\begin{aligned} & 400 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & \text { 01P105 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 P 606 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 P 105 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 405 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 04 P 805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 \mathrm{P} 606 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 002805 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 005505 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ |
| 1 Phase | $\begin{aligned} & 480 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & \text { 01P606 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 P 605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 P 105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \text { 04880 } \end{aligned}$ | $\begin{aligned} & \text { RLL- } \\ & 07 P 606 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 606 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 001106 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 001405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ |
| 1 Phase | $\begin{aligned} & 600 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 5\% | $\begin{aligned} & \text { RLW- } \\ & \text { 01P106 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \text { P105 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P605 } \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 03 P 406 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 406 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 806 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 805 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 07 \mathrm{P} 606 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 001106 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002106 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ |
| Three Phase Output Selected by Motor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 Phase | $\begin{aligned} & 480 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 1.5\% | $\begin{aligned} & \text { RLW- } \\ & \text { 01P103 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P1 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 01 \mathrm{P} 603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P101 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 04 \mathrm{P} 803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 04P803 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P603 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004601 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 600 \mathrm{~V} \\ & 60 \mathrm{~Hz} \end{aligned}$ | 1.5\% | $\begin{aligned} & \text { RLW- } \\ & \text { OP7503 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P103 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 01P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 02P103 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 02 \mathrm{P} 103 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 03 P 403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & \text { 07P605 } \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002802 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 002803 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ |
| 3 Phase | $\begin{aligned} & 690 \mathrm{~V} \\ & 50 \mathrm{~Hz} \end{aligned}$ | 1.5\% | - | - | - | - | - | - | - | $\begin{gathered} \text { RLW- } \\ 04 \mathrm{P} 805 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 07 P 605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 001105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002105 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 002805 \end{aligned}$ |

Impedance Rating:
$1.5 \%$ impedance reactors are the recommended maximum impedance for load side reactor applications.
$3 \%$ impedance reactors are typically sufficiant to absorb power line spikes and motor current surges. They will prevent nuisance tripping of drives or circuit breakers in most applications.

5\% impedance reactors are best for reducing harmonic currents and frequencies. Use them when you must reduce VFD drive generated harmonics, and to reduce motor operating temperature.

| $\begin{aligned} & 30.0 \mathrm{HP} \\ & 22.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 40.0 \mathrm{HP} \\ & 30.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 50.0 \mathrm{HP} \\ & 37.5 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 60.0 \mathrm{HP} \\ & 45.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 75.0 \mathrm{HP} \\ & 55.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 100.0 \mathrm{HP} \\ & 75.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 125.0 \mathrm{HP} \\ & 93.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 150.0 \mathrm{HP} \\ & 112.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 200.0 \mathrm{HP} \\ & 150.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 250.0 \mathrm{HP} \\ & 187.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 300.0 \mathrm{HP} \\ & 225.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 350.0 \mathrm{HP} \\ & 262.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 400.0 \mathrm{HP} \\ & 300.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 500.0 \mathrm{HP} \\ & 375.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 600.0 \mathrm{HP} \\ & 450.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 700.0 \mathrm{HP} \\ & 550.0 \mathrm{kw} \end{aligned}$ | $\begin{aligned} & 800.0 \mathrm{HP} \\ & 600.0 \mathrm{kw} \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Three Phase Input Applications Selected by Motor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { RLW- } \\ & 010401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 008301 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032201 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032201 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 010401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 013003 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 016003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 025003 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 004603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 004603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ | - | - |
| $\begin{gathered} \text { RLW- } \\ 004605 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 008303 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ | - |
| $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 013005 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - |
| $\begin{aligned} & \text { RLW- } \\ & 002803 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{aligned} & \text { RLW-W- } \\ & 013003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032203 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060003 \end{aligned}$ |
| $\begin{aligned} & \text { RLW- } \\ & 002806 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ | $\begin{aligned} & \text { RLW-W- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032207 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 051505 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ |
| Single Phase Input Applicaitons |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{gathered} \text { RLW- } \\ 008305 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075000 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - | - | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 006505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | - | - | - | - |
| Three Phase Output Selected by Motor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| $\begin{aligned} & \text { RLW- } \\ & 005501 \end{aligned}$ | $\begin{gathered} \text { RLW- } \\ 006501 \end{gathered}$ | $\begin{aligned} & \text { RLW- } \\ & 008301 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032201 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041401 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 004603 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005501 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008303 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016001 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032201 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041403 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060003 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075001 \end{aligned}$ | - | - |
| $\begin{aligned} & \text { RLW- } \\ & 003505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 004605 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 005505 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 006503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 008305 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 010405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 013005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 016005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 020005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 025005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032205 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 032200 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 041405 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 051503 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 060005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075005 \end{aligned}$ | $\begin{aligned} & \text { RLW- } \\ & 075003 \end{aligned}$ |

The RLW Reactors are available in 208-690 VAC / Three-Phase and Single-Phase Applications


Note: drawing dimensions are for reference only. See MTECORP.com for detailed information.

| NEMA 1/2 |  |  |  |  | NEMA 1/2 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Part Number | Weight (lbs.) | Cabinet | $\begin{aligned} & \text { Size (In.) } \\ & (H \times W \times D) \end{aligned}$ | Ref Figure | Part Number | Weight (lbs.) | Cabinet | $\begin{aligned} & \text { Size (In.) } \\ & (\mathrm{H} \times \mathrm{W} \times \mathrm{D}) \end{aligned}$ | Ref Figure |
| RLW-00P511 | 8.5 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-004615 | 42 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-00P513 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-004617 | 44.6 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-00P515 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-005511 | 36 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-00P516 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-005513 | 38 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-0P7511 | 8.5 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-005515 | 44 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-0P7513 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-005517 | 53 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-0P7515 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-006511 | 36 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-0P7516 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-006513 | 40 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P111 | 8.5 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-006515 | 44 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P113 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-006517 | 62 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P115 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-008311 | 37 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P116 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-008313 | 44 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P611 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-008315 | 53 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P613 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-008317 | 72 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P615 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-010411 | 40 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-01P616 | 8.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-010413 | 46 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-02P111 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-010415 | 59 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-02P113 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-010417 | 75 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-02P115 | 8.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-013011 | 44 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-02P116 | 8.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-013013 | 55 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-03P411 | 8.6 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-013015 | 70 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-03P413 | 8.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-013017 | 98 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-03P415 | 9.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-016011 | 52 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-03P416 | 9.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-016013 | 67 | CAB-13V | $13 \times 13 \times 13$ | 3 |
| RLW-04P811 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-016015 | 77 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-04P813 | 8.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-016017 | 99 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-04P815 | 9.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-020011 | 58 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-04P816 | 11 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-020013 | 73 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-07P611 | 8.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-020015 | 99 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-07P613 | 9.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-020017 | 115 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-07P615 | 11.1 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-025011 | 59 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-07P616 | 11.2 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-025013 | 79 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-001111 | 9.7 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-025015 | 99 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-001113 | 11.2 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-025017 | 145 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-001115 | 12.3 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-032211 | 81 | CAB-17V | $24 \times 17 \times 18.4$ | 4 |
| RLW-001116 | 13.5 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-032213 | 220 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-001411 | 9.8 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-032215 | 252 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-001413 | 11.3 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-032217 | 316 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-001415 | 13.5 | CAB-8 | $8 \times 8 \times 6$ | 1 | RLW-041411 | 222 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-001416 | 26.8 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-041413 | 242 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002111 | 22.2 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-041415 | 269 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002113 | 24.6 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-041417 | 354 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002115 | 27.2 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-051511 | 225 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002116 | 31.3 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-051513 | 262 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002811 | 23.1 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-051515 | 337 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002813 | 26.8 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-051517 | 392 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002815 | 31.7 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-060011 | 230 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-002816 | 32.3 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-060013 | 288 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-003511 | 28 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-060015 | 348 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-003513 | 31 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-060017 | 436 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-003515 | 36 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-075011 | 249 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-003517 | 36.3 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-075013 | 323 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-004611 | 31 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-075015 | 389 | CAB-26C | $47 \times 27 \times 25$ | 2 |
| RLW-004613 | 35 | CAB-13V | $13 \times 13 \times 13$ | 3 | RLW-075017 | 492 | CAB-26C | $47 \times 27 \times 25$ | 2 |

## The power quality experts.

MTE Corporation was formed in 1982 by bringing together Milwaukee Transformer Co., Transformer Design Inc., Hytran Inc., and Milwaukee Electronics Corporation - companies that specialized in different fields of magnetics and transformer design and were long established in their respective fields. This allowed us to build the best magnetics company in the country by capitalizing on the individual strengths of each, while bringing a new dimension in management, marketing and quality.

MTE vaulted into a leadership role in power quality with its unique AC reactor design and passive filter expertise. We continued to grow as a leader with innovative DC Link Chokes, Harmonic Filters, Motor Protection Filters and SineWave Filters. Our team of professional design engineers has over 100 years of collective experience in the magnetics industry and is complemented by as much experience in manufacturing. Our engineers utilize state-of-the-art platforms and best-in-class simulation/modeling tools so that new designs meet your application needs. At MTE, we know power quality because power quality is all we do.

## An SL Industries company. Better together.

MTE Corporation was acquired by SL Industries (NYSE:SLI) on November 1, 2006. SL Industries through its subsidiaries, designs, manufactures and markets power electronics, motion control, power protection, power quality electromagnetic and specialized communication equipment that is used in a variety of medical, commercial and military aerospace, computer, datacom, industrial, telecom, transportation, utility, rail and highway equipment applications.

## mtecorp.com

MTE Corporation
N83 W13330 Leon Road • Menomonee Falls, WI 53051
(800) 455-4MTE • (262) 253-8200


Circuit Diagram/
Schaltplan/
Diagrama de Circuito


Sealing / Dichtung / Lacre Isometric View Enclosure / Isometrische Ansicht Schaltschrank / Vista Isometrica del Gabinete


## Technical Data / Technische Daten / Datos Técnicos



DTS 3021/31(SS) -115V

*ID Plate Information / Daten auf Typschild / Información de la placa de identificación

## Spare parts / Ersatzteile / Piezas de repuesto

 solamente con el número de pieza de Pfannenberg.

|  | DTS 3021/31(SS) |
| :---: | :---: |
| Condenser fan / Kondensator Lüfter / Ventilador del condensador | 18881100001 |
| Evaporator fan / Verdampfer Lüfter / Ventilador del evaporador | 18881100001 |
| Thermostat / Thermostat / Termóstat | 18883000001 |
| Power Supply / Stromversorgung / de suministro de energía | 18883000012 |

## Fixed bridge - FBI 10-6-0203250

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## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| GTIN |  |
| GTIN | 4017918098070 |
| Weight per Piece (excluding packing) | 15.940 g |
| Custom tariff number | 85389099 |
| Country of origin | China |

## Technical data

Technical data

| Color | silver |
| :--- | :--- |
| Material | Copper |
| Number of positions | 10 |
| Pitch | 6 mm |

Environmental Product Compliance

| China RoHS | Environmentally friendly use period: unlimited = EFUP-e |
| :--- | :--- |
|  | No hazardous substances above threshold values |

## Fixed bridge - FBI 10-6-0203250

## Classifications

eCl@ss

| eCl@ss 4.0 | 27141199 |
| :--- | :--- |
| eCl@ss 4.1 | 27141199 |
| eCl@ss 5.0 | 27141140 |
| eCl@ss 5.1 | 27141140 |
| eCl@ss 6.0 | 27141140 |
| eCl@ss 7.0 | 27141140 |
| eCl@ss 8.0 | 27141140 |
| eCl@ss 9.0 | 27141140 |

ETIM

| ETIM 2.0 | EC000489 |
| :--- | :--- |
| ETIM 3.0 | EC000489 |
| ETIM 4.0 | EC000489 |
| ETIM 5.0 | EC000489 |
| ETIM 6.0 | EC000489 |

UNSPSC

| UNSPSC 6.01 | 30211829 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121426 |
| UNSPSC 11 | 39121426 |
| UNSPSC 12.01 | 39121426 |
| UNSPSC 13.2 | 39121426 |

## Approvals

Approvals

## Approvals

EAC

Ex Approvals

## Approval details

EAC
EAC-Zulassung

# Fixed bridge - FBI 10-6-0203250 

## Accessories

Accessories
Cutting tools
Cutting tool - CUTFOX FB-1205985


One-hand bridge cutter, for fixed bridges FBI 10-6, FBI 10-8, FBI 10-10, FBI 10-12

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## Fixed bridge - FBI 10-8-0203263

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Fixed bridge, Number of positions: 10, Color: silver

## Key Commercial Data

| Packing unit | 1 pc |
| :---: | :---: |
| GTIN |  |
| Weight per Piece (excluding packing) | 25.42 g |
| Custom tariff number | 85389099 |
| Country of origin | China |

## Technical data

Technical data

| Color | silver |
| :--- | :--- |
| Material | Copper |
| Number of positions | 10 |
| Pitch | 8.00 mm |

## Classifications

eCl@ss

| eCl@ss 4.0 | 27141199 |
| :--- | :--- |
| eCl@ss 4.1 | 27141199 |
| eCl@ss 5.0 | 27141140 |
| eCl@ss 5.1 | 27141140 |
| eCl@ss 6.0 | 27141140 |

## Fixed bridge - FBI 10-8-0203263

## Classifications

eCl@ss

| eCl@ss 7.0 | 27141140 |
| :--- | :--- |
| eCl@ss 8.0 | 27141140 |

ETIM

| ETIM 2.0 | EC000489 |
| :--- | :--- |
| ETIM 3.0 | EC000489 |
| ETIM 4.0 | EC000489 |
| ETIM 5.0 | EC000489 |

UNSPSC

| UNSPSC 6.01 | 30211829 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121426 |
| UNSPSC 11 | 39121426 |
| UNSPSC 12.01 | 39121426 |
| UNSPSC 13.2 | 39121426 |

Approvals
Approvals

Approvals
EAC

Ex Approvals

Approvals submitted

Approval details

EAC

## Accessories

Accessories
Cutting tools

## End clamp - E/NS 35 N - 0800886

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## Product Features

$\square$ Large-surface labeling

## Key Commercial Data

| Packing unit | 1 pc |
| :---: | :---: |
| Minimum order quantity | 50 pc |
| GTIN |  |
| Weight per Piece (excluding packing) | 14.8 g |
| Custom tariff number | 39269097 |
| Country of origin | Germany |

## Technical data

Dimensions

| Height | 32.8 mm |
| :--- | :--- |
| Length | 48.6 mm |
| Width | 9.5 mm |

General

| Material | PA |
| :--- | :--- |
| Color | gray |
| Tightening torque, min | 0.4 Nm |
| Tightening torque max | 0.5 Nm |

## Standards and Regulations

| Flammability rating according to UL 94 | V2 |
| :--- | :--- |

## Insert strip - ESL 44X7-0808244

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Insert strip, Sheet, white, unlabeled, can be labeled with: Office printing systems, Plotter, Perforated, Mounting type: Insert, Lettering field: $44 \times 7 \mathrm{~mm}$


Figure shows the ESL $29 \times 8$ version

## Product Features

- Insert labels for plastic cable markers
- The material file can be downloaded under the CLIP PROJECT software under Downloads - "Software update - Marking".


## Key Commercial Data

| Packing unit | 1 pc |
| :--- | :--- |
| Minimum order quantity | 10 pc |
| Weight per Piece (excluding packing) | 13.58 g |
| Custom tariff number | 39206219 |
| Country of origin | Germany |

## Technical data

Dimensions

| Length (b) | 44 mm |
| :--- | :--- |
| Width (a) | 7 mm |

## Ambient conditions

| Ambient temperature (operation) | $-40^{\circ} \mathrm{C} \ldots 100{ }^{\circ} \mathrm{C}$ |
| :--- | :--- |

## General

| Note | Print image may vary depending on laser printer |
| :--- | :--- |
| Color | white |
| Components | free from silicone and halogen |
| Material | Polyester foil |
| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |

## Insert strip - ESL 44X7-0808244

## Technical data

General

| Number of individual labels | 136 |
| :--- | :--- |
| Number of individual labels per row | 4 |
| Marking mounting type | Insert |

Standards and Regulations

| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |
| :--- | :--- |

## Classifications

eCl@ss

| eCl@ss 4.0 | 24190219 |
| :--- | :--- |
| eCl@ss 4.1 | 24190219 |
| eCl@ss 5.0 | 27141137 |
| eCl@ss 5.1 | 27141137 |
| eCl@ss 6.0 | 27141137 |
| eCl@ss 7.0 | 27141137 |
| eCl@ss 8.0 | 27141137 |
| eCl@ss 9.0 | 27141137 |

ETIM

| ETIM 2.0 | EC000761 |
| :--- | :--- |
| ETIM 3.0 | EC000761 |
| ETIM 4.0 | EC000761 |
| ETIM 5.0 | EC000761 |

UNSPSC

| UNSPSC 6.01 | 30211811 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121410 |
| UNSPSC 11 | 39121410 |
| UNSPSC 12.01 | 39121410 |
| UNSPSC 13.2 | 39121410 |

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## Zack Marker strip, flat - ZBF 12:UNBEDRUCKT- 0809735

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Zack Marker strip, flat, Strip, white, unlabeled, can be labeled with: PLOTMARK, CMS-P1-PLOTTER, mounting type: snap into flat marker groove, for terminal block width: 12 mm , lettering field size: $5.15 \times 12.15 \mathrm{~mm}$

## Your advantages

$\checkmark$ Can be labeled with CMS computer marking system or by hand using B-STIFT
$\square$ Sealing caps with external or inner thread
$\square$ Printed or unprinted marking labels
$\checkmark$ Consists of five individual labels with 17.5 mm pitch
$\square$ Labeling service: Phoenix Contact can custom-label all zack marker strip markers according to your requirements
$\square$ Flat zack marker strips

## Key Commercial Data

| Packing unit | 1 pc |
| :---: | :---: |
| Minimum order quantity | 10 pc |
| GTIN |  |
| GTIN | 4017918591694 |
| Weight per Piece (excluding packing) | 0.660 g |
| Custom tariff number | 39269097 |
| Country of origin | Germany |

## Technical data

Dimensions

| Width (a) | 12 mm |
| :--- | :--- |

## Ambient conditions

| Ambient temperature (operation) | $-40^{\circ} \mathrm{C} \ldots 100^{\circ} \mathrm{C}$ |  |
| :--- | :--- | :--- |

## Marker for terminal blocks - UC-TM 5 CUS - 0824581

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Marker for terminal blocks, Sheet, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 5.2 mm , Lettering field: $10.5 \times 4.6 \mathrm{~mm}$

Why buy this product
$\square$ The UC-TM ... UniCard labeling range includes markers for products with tall marker grooves
$\square$ The multi-section marking strips are easy to fit and can be easily separated if required
$\square$ Labeling service: Phoenix Contact can custom-label all UniCard markers according to your requirements
$\square$ The markers, which are supplied in uniform sheets, can be labeled quickly and easily using the BLUEMARK LED
$\square$ The markers support multi-line labeling
$\square$ The sheets provide space for including function texts
$\square$ The format automatically ensures printing with a high degree of positioning accuracy

Key commercial data

| Packing unit | 1 |
| :---: | :---: |
| Minimum order quantity | 10 |
| Catalog page | Page 51 (CL2-2011) |
| GTIN |  |
| Weight per Piece (excluding packing) | 8.7 GRM |
| Country of origin | GERMANY |

## Technical data

General

| Width (a) | 5 mm |
| :--- | :--- |
| Color | white |
| Inflammability class according to UL 94 | V2 |
| Wipe resistance | DIN EN $61010-1$ (VDE 0411-1) |
| Ambient temperature (operation) | $-40^{\circ} \mathrm{C} \ldots 120^{\circ} \mathrm{C}$ |
| Components | free from silicone and halogen |
| Material | PA |
| Number of individual labels | 96 |

## Marker for terminal blocks - UC-TM 5 CUS - 0824581

## Technical data

General

| Number of individual labels per row | 12 |
| :--- | :--- |

## Classifications

eclass

| eCl@ss 4.0 | 24190208 |
| :--- | :--- |
| eCl@ss 4.1 | 24190208 |
| eCl@ss 5.0 | 27149103 |
| eCl@ss 5.1 | 27149103 |
| eCl@ss 6.0 | 27149103 |

etim

| ETIM 2.0 | EC000761 |
| :--- | :--- |
| ETIM 3.0 | EC000761 |
| ETIM 4.0 | EC000761 |

unspsc

| UNSPSC 6.01 | 30211811 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121410 |
| UNSPSC 11 | 39121410 |
| UNSPSC 12.01 | 39121410 |
| UNSPSC 13.2 | 39121410 |

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## Marker for terminal blocks - UC-TM 6 CUS - 0824589

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Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, Mounting type: Snap into tall marker groove, for terminal block width: 6.2 mm , Lettering field: $5.6 \times 10.5 \mathrm{~mm}$

## Why buy this product

$\square$ The UC-TM ... UniCard labeling range includes markers for products with tall marker grooves

$\square$ The multi-section marking strips are easy to fit and can be easily separated if required
$\square$ The markers, which are supplied in uniform sheets, can be labeled quickly and easily using the BLUEMARK LED
$\square$ The markers support multi-line labeling
$\boxed{\square}$ The format automatically ensures printing with a high degree of positioning accuracy
$\checkmark$ The sheets provide space for including function texts

## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| GTIN |  |
| GTIN | 4046356359184 |
| Weight per Piece (excluding packing) | 15.000 g |
| Custom tariff number | 49119900 |
| Country of origin | Poland |

## Technical data

Dimensions

| Width (a) | 6 mm |
| :--- | :--- |

## Ambient conditions

Ambient temperature (operation)

## Marker for terminal blocks - UC-TM 6 CUS - 0824589

## Technical data

## Ambient conditions

| Recommended storage conditions | $23^{\circ} \mathrm{C} / 50 \%$ relative humidity. Storage in a dry and dark place in the original <br> packaging is recommended. |
| :--- | :--- |

General

| Color | white |
| :--- | :--- |
| Components | free from silicone and halogen |
| Flammability rating according to UL 94 | V2 |
| Material | PA |
| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |
| Number of individual labels | 80 |
| Number of individual labels per row | 10 |
| RoHS compliant | Yes |
| Printability | UV LED technology |
| Device | 5147999 BLUEMARK CLED |
| Test for substances that would hinder coating with paint or varnish | VW PV 3.10.7:2005-02 |
| Result | Test passed |
| Test specification weathering-resistance | Following ISO 4892-2:2013-03 |
| Test duration | 96 h |
| Wipe resistance test result | Test passed |
| Salt spray test specification | DIN EN 60068-2-11:2000-02 |
| Test duration | 96 h |
| Salt spray testing result | Test passed |
| Wipe resistance of test specification inscriptions | DIN EN 61010-1 (VDE 0411-1):2011-07 |
| Result | Test passed |
| Marking mounting type | Snap into tall marker groove |

Standards and Regulations

| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |
| :--- | :--- |
| Flammability rating according to UL 94 | V2 |

## Drawings

## Marker for terminal blocks - UC-TM 8 CUS - 0824597

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Why buy this product
$\boxed{\square}$ The UC-TM ... UniCard labeling range includes markers for products with tall marker grooves
$\square$ The multi-section marking strips are easy to fit and can be easily separated if required
$\square$ Labeling service: Phoenix Contact can custom-label all UniCard markers according to your requirements
The markers, which are supplied in uniform sheets, can be labeled quickly and easily using the BLUEMARK LED
$\checkmark$ The markers support multi-line labeling
$\square$ The sheets provide space for including function texts
$\checkmark$ The format automatically ensures printing with a high degree of positioning accuracy

## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| GTIN |  |
| GTIN | 4046356359290 |
| Weight per Piece (excluding packing) | 15.000 g |
| Custom tariff number | 49119900 |
| Country of origin | Poland |

## Technical data

Dimensions

| Width (a) | 8 mm |
| :--- | :--- |

## Ambient conditions

| Ambient temperature (operation) | $-40^{\circ} \mathrm{C} \ldots 120^{\circ} \mathrm{C}$ |
| :--- | :--- |

## Marker for terminal blocks - UC-TM 8 CUS - 0824597

## Technical data

## Ambient conditions

Recommended storage conditions
$23^{\circ} \mathrm{C} / 50 \%$ relative humidity. Storage in a dry and dark place in the original packaging is recommended.

## General

| Color | white |
| :---: | :---: |
| Type | high |
| Components | free from silicone and halogen |
| Flammability rating according to UL 94 | V2 |
| Material | PA |
| RoHS compliant | Yes |
| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |
| Number of individual labels | 56 |
| Number of individual labels per row | 7 |
| Printability | UV LED technology |
| Device | 5147999 BLUEMARK CLED |
| Test for substances that would hinder coating with paint or varnish | VW PV 3.10.7:2005-02 |
| Result | Test passed |
| Test specification weathering-resistance | Following ISO 4892-2:2013-03 |
| Test duration | 96 h |
| Wipe resistance test result | Test passed |
| Salt spray test specification | DIN EN 60068-2-11:2000-02 |
| Test duration | 96 h |
| Salt spray testing result | Test passed |
| Wipe resistance of test specification inscriptions | DIN EN 61010-1 (VDE 0411-1):2011-07 |
| Result | Test passed |
| Marking mounting type | snap into tall marker groove |
| Result | Test passed |
| Oxygen index (DIN EN ISO 4589-2) | 28,2\% |
| Class I | 3 |
| Class F | 2 |
| R22 | HL 1 - HL 2 |
| R23 | HL 1 - HL 2 |
| R24 | HL 1 - HL 2 |

Standards and Regulations

| Wipe resistance | DIN EN 61010-1 (VDE 0411-1) |
| :--- | :--- |
| Flammability rating according to UL 94 | V2 |
| Fire protection for rail vehicles (DIN EN 45545-2) R22 | HL 1-HL 2 HL 1-HL 2 HL 1 - HL 2 |
| Fire protection for rail vehicles (DIN EN 45545-2) R23 | HL 1-HL 2 HL 1-HL 2 HL $1-$ HL 2 |

## Terminal strip marker carrier - KLM-A - 1004348

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Terminal strip markers, for strip marking, adjustable height, for use with end clamps E/UK, E/NS 35 N or CLIPFIX 35 , lettering field size: $44 \times 7 \mathrm{~mm}$

The illustration shows a combination of versions KLM-A, and ESL $44 \times 7$

## Key Commercial Data

| Packing unit | 1 pc |
| :---: | :---: |
| Minimum order quantity | 100 pc |
| GTIN |  |
| Weight per Piece (excluding packing) | 1.8 g |
| Custom tariff number | 39269097 |
| Country of origin | Germany |

## Technical data

## Dimensions

| Length (b) | 46 mm |
| :--- | :--- |
| Width (a) | 9.5 mm |

## Ambient conditions

| Ambient temperature (operation) | $-40^{\circ} \mathrm{C} \ldots 80^{\circ} \mathrm{C}$ |
| :--- | :--- |

## General

| Color | transparent |
| :--- | :--- |
| Components | free from silicone and halogen |
| Flammability rating according to UL 94 | HB |
| Material | ABS |
| Marking mounting type | Plug in |

## End cover - D-UKKB 3/5-2771023

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## Key commercial data

| Packing unit | 1 pc |
| :---: | :---: |
| GTIN |  |
| Weight per Piece (excluding packing) | 5.068 GRM |
| Custom tariff number | 85389099 |
| Country of origin | Germany |

## Technical data

General

| Color | gray |
| :--- | :--- |

Dimensions

| Width | 2.5 mm |
| :--- | :--- |
| Length | 67 mm |
| Height | 62 mm |
| Height NS 35/7,5 | 62 mm |

## Classifications

eCl@ss

| eCl@ss 4.0 | 27141199 |
| :--- | :--- |
| eCl@ss 4.1 | 27141199 |
| eCl@ss 5.0 | 27141145 |

## End cover - D-UKKB 3/5-2771023

## Classifications

eCl@ss

| eCl@ss 5.1 | 27141145 |
| :--- | :--- |
| eCl@ss 6.0 | 27141133 |
| eCl@ss 7.0 | 27141133 |
| eCl@ss 8.0 | 27141133 |

ETIM

| ETIM 2.0 | EC000886 |
| :--- | :--- |
| ETIM 3.0 | EC000886 |
| ETIM 4.0 | EC000886 |
| ETIM 5.0 | EC000886 |

UNSPSC

| UNSPSC 6.01 | 30211827 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121424 |
| UNSPSC 11 | 39121424 |
| UNSPSC 12.01 | 39121424 |
| UNSPSC 13.2 | 39121424 |

## Approvals

Approvals

Approvals
GOST

Ex Approvals

Approvals submitted

Approval details

GOST PC

## Extract from the online catalog

## ATP-UKKB 3

Order No
2771065
http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2771065


Partition plate, Length: 75 mm, Width: 2.5 mm , Height: 67 mm ,
Color: gray

|  |  |
| :--- | :--- |
| Commercial data | 4017918068189 |
| EAN | 50 pcs. |
| Pack | 85472000 |
| Customs tariff | 0.006232 KG |
| Weight/Piece | Page 357 (CL-2009) |
| Catalog page information |  |

## Product notes

WEEE/RoHS-compliant since: 01/01/2003

## http://

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Phone +49 5235312000
Fax +495235341200
http://www.phoenixcontact.de
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UK universal modular terminal blocks



| Technical data |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height NS 35/7,5 |  |
| 6.2 | 56 | 62 |  |
| Width | Length | Height NS 32 |  |
| 6.2 | 56 | 67 |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max. }}$ [V] | max. $\varnothing$ [ $\mathrm{mm}^{2}$ ] | AWG |
| 32 | 500 | 0.2-4 | 24-12 |
| IEC 60947-7-1 |  |  |  |
| IEC | UL/CUL | CSA | IEC/ <br> EN 60079-7 |
| 500 | 600 | 300 | - |
| $32 / 4$ | $30 /$ - | 25/- | - |
| 4 | - | - | - |
| 24-12 | 26-10 | 28-10 | - |
| solid | stranded | Ferrule <br> Without / with plastic sleeve |  |
| 0.2-4 | 0.2-4 | 0.25-4$0.25-1.5$ | 0.25-2.5 |
| 0.2-1.5 | 0.2-1.5 |  | - |
|  |  |  | 0.5-1.5 |
| 4 | 2.5 |  |  |
| 8 |  |  |  |
| M3 |  |  |  |
| 0.6-0.8 |  |  |  |
| PA |  |  |  |
| V0 |  |  |  |


| Ordering data |  |  |  |
| :---: | :---: | :---: | :---: |
| Type | $I_{\text {max }}$ | Order No. | Pcs. / |
| UKK 5 |  | 2774017 | 50 |
| UKK 5 BU |  | 2774091 | 50 |
| UKK 5-PV |  | 2791388 | 50 |
| Accessories |  |  |  |
| D-UKK 3/5 |  | 2770024 | 50 |
| D-UKK 3/5 BU |  | 2770105 | 50 |
| DP-UKK 3/5 |  | 2770794 | 50 |
| FBI 10-6 | 32 A | 0203250 | 10 |
| EB 2-6 | 28 A | 0201155 | 100 |
| EB 3-6 | 28 A | 0201142 | 100 |
| EB 10-6 | 28 A | 0201139 | 10 |
| ISSBI 10-6 | 24 A | 0301505 | 10 |
| IS-K 4 |  | 1302338 | 100 |
| TS-KK 3 |  | 2770215 | 50 |
| ATP-UKK 3/5 |  | 2778521 | 50 |
| SF-SL 0,6X3,5-100 S-VDE |  | 1212587 | 10 |
| ZB6 (see Catalog 5) |  |  |  |



4 (4) mm², 32 A, double-level terminal block, both levels can be bridged


| Technical data |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height NS 35/7,5 |  |
| 6.2 | 67 | 62 |  |
| Width | Length | Height NS 32 |  |
| 6.2 | 67 | 67 |  |
| $\mathrm{I}_{\text {max. }}[\mathrm{A}]$ | $\mathrm{U}_{\text {max. }}$ [V] | $\max . \varnothing\left[\mathrm{mm}^{2}\right]$ | AWG |
| 32 | 500 | 0.2-4 | 24-12 |
| IEC 60947-7-1 |  |  |  |
| IEC | UL/CUL | CSA | $\begin{aligned} & \text { IEC/ } \\ & \text { EN 60079-7 } \end{aligned}$ |
| 500 | 600 | 600 | - |
| $32 / 4$ | 30/- | 25/- | - |
| 4 | - | - | - |
| 24-12 | 26-10 | 28-10 | - |
| solid | stranded | Ferrule <br> Without / with plastic sleeve |  |
| 0.2-4 | 0.2-4 | 0.25-4 | 0.25-2.5 |
| 0.2-1.5 | 0.2-1.5 | 0.25-1.5 | - |
|  |  |  | 0.5-1.5 |
| 4 | 2.5 |  |  |


| 8 |
| :--- |
| M3 |
| 0.6 |
| PA |
| V |



| Type | $I_{\text {max }}$ | Order No. | Pcs./ Pkt. |
| :---: | :---: | :---: | :---: |
| UKKB 5 |  | 2771146 | 50 |
| UKKв 5 BU |  | 3216053 | 50 |
| Accessories |  |  |  |
| D-UKKB 3/5 |  | 2771023 | 50 |
| D-UKKB 3/5 BU |  | 2771104 | 50 |
| DP-UKKB 3/5 |  | 2770804 | 50 |
| FBI 10-6 | 32 A | 0203250 | 10 |
| EB 2-6 | 28 A | 0201155 | 100 |
| EB 3-6 | 28 A | 0201142 | 100 |
| EB 10-6 | 28 A | 0201139 | 10 |
| ISSBI 10-6 | 24 A | 0301505 | 10 |
| IS-K 4 |  | 1302338 | 100 |
| TS-KK 3 |  | 2770215 | 50 |
| ATP-UKKB 3 |  | 2771065 | 50 |
| SF-SL 0,6X3,5-100 S-VDE |  | 1212587 | 10 |
| ZB 6 (see Catalog 5) |  |  |  |

M3
$0.6-0.8$
P


4 (4) $\mathrm{mm}^{2}, 32 \mathrm{~A}, 800 \mathrm{~V}$, double-level terminal block, both levels can be bridged

KEMA OOATEX2100 U


## Thermomagnetic device circuit breakers

The thermomagnetic device circuit breakers are used in information and communication technology as well as process engineering. Due to the various tripping characteristics, the circuit breakers can be used in a range of applications. The reactivation and immediate remote signaling of the operating state ensure availability.

## Your advantages:

- Compact design with precise nominal current levels
- Sophisticated remote signaling concept enables monitoring from any location
- Maximum overcurrent protection over long cable paths thanks to SFB tripping characteristic
- Supply/remote signaling can be bridged with CLIPLINE complete accessories
- Protect $230 / 240$ V AC control voltage with the aid of the M1 characteristic curve (based on characteristic C)
- Variable connection technology: either push-in or screw connection


Tripping characteristics

With thermomagnetic device circuit breakers, the tripping time depends on the type of overload. In the event of an overload, the load is disconnected from the power supply by means of time-delayed thermal
tripping. If there is a high overload current or even a short circuit, the magnetic tripping interrupts the circuit in a matter of milliseconds. Protective devices should be selected with the most suitable characteristic curve in
relation to the area of application, the load, and the protection requirements.


SFB



## Illustration of application

Thermomagnetic device circuit breakers are ideal for protecting programmable controllers, valves, motors and frequency inverters, for example.


Thermomagnetic device circuit breakers, 1 and 2-pos.


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SFB



## Illustration of application

Thermomagnetic device circuit breakers are ideal for protecting programmable controllers, valves, motors and frequency inverters, for example.


Thermomagnetic device circuit breakers, 1 and 2-pos.

| Product code <br> Fuse type <br> Function <br> Number of positions <br> Characteristic curve |  | CB device circuit breakers |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | TM thermomagnetic |  |  |
|  |  | 1 changeover contact |  |  |
|  |  | 1 |  |  |
|  |  | SFB | M1 | F1 |
|  | 0.5 A | CB TM1 0.5A SFB P Order No. 2800835 | CB TM1 0.5A M1 P Order No. 2800846 | CB TM1 0.5A F1 P Order No. 2800857 |
|  | 1 A | CB TM1 1A SFB P Order No. 2800836 | CB TM1 1A M1 P Order No. 2800847 | CB TM1 1A F1 P Order No. 2800858 |
|  | 2 A | CB TM1 2A SFB P Order No. 2800837 | CB TM1 2A M1 P Order No. 2800848 | CB TM1 2A F1 P Order No. 2800859 |
|  | 3 A | CB TM1 3A SFB P Order No. 2800838 | CB TM1 3A M1 P Order No. 2800849 | CB TM1 3A F1 P Order No. 2800860 |
|  | 4 A | CB TM1 4A SFB P Order No. 2800839 | CB TM1 4A M1 P <br> Order No. 2800850 | CB TM1 4A F1 P Order No. 2800861 |
|  | 5 A | CB TM1 5A SFB P Order No. 2800840 | CB TM1 5A M1 P Order No. 2800851 | CB TM1 5A F1 P Order No. 2800862 |
|  | 6 A | CB TM1 6A SFB P Order No. 2800841 | CB TM1 6A M1 P Order No. 2800852 | CB TM1 6A F1 P Order No. 2800863 |
|  | 8 A | CB TM1 8A SFB P Order No. 2800842 | CB TM1 8A M1 P <br> Order No. 2800853 | CB TM1 8A F1 P Order No. 2800864 |
|  | 10 A | CB TM1 10A SFB P <br> Order No. 2800843 | CB TM1 10A M1 P Order No. 2800854 | CB TM1 10A F1 P Order No. 2800865 |
|  | 12 A | CB TM1 12A SFB P Order No. 2800844 | CB TM1 12A M1 P Order No. 2800855 | CB TM1 12A F1 P <br> Order No. 2800866 |
|  | 16 A | CB TM1 16A SFB P Order No. 2800845 | CB TM1 16A M1 P Order No. 2800856 | CB TM1 16A F1 P <br> Order No. 2800867 |
| Function <br> Number of positions <br> Characteristic curve |  | 2 changeover contacts |  |  |
|  |  | 2 |  |  |
|  |  | SFB | M1 | F1 |
|  | 0.5 A | CB TM2 0.5A SFB P Order No. 2800868 | CB TM2 0.5A M1 P Order No. 2800879 | CB TM2 0.5A F1 P Order No. 2800890 |
|  | 1 A | CB TM2 1A SFB P Order No. 2800869 | CB TM2 1A M1 P Order No. 2800880 | CB TM2 1A F1 P Order No. 2800891 |
|  | 2 A | CB TM2 2A SFB P Order No. 2800870 | CB TM2 2A M1 P Order No. 2800881 | CB TM2 2A F1 P Order No. 2800892 |
|  | 3 A | CB TM2 3A SFB P Order No. 2800871 | CB TM2 3A M1 P Order No. 2800882 | CB TM2 3A F1 P Order No. 2800893 |
|  | 4 A | CB TM2 4A SFB P Order No. 2800872 | CB TM2 4A M1 P Order No. 2800883 | CB TM2 4A F1 P Order No. 2800894 |
|  | 5 A | CB TM2 5A SFB P Order No. 2800873 | CB TM2 5A M1 P Order No. 2800884 | CB TM2 5A F1 P Order No. 2800895 |
|  | 6 A | CB TM2 6A SFB P Order No. 2800874 | CB TM2 6A M1 P Order No. 2800885 | CB TM2 6A F1 P Order No. 2800896 |
|  | 8 A | CB TM2 8A SFB P <br> Order No. 2800875 | CB TM2 8A M1 P Order No. 2800886 | CB TM2 8A F1 P <br> Order No. 2800897 |
|  | 10 A | CB TM2 10A SFB P Order No. 2800876 | CB TM2 10A M1 P Order No. 2800887 | CB TM2 10A F1 P <br> Order No. 2800898 |
|  | 12 A | CB TM2 12A SFB P Order No. 2800877 | CB TM2 12A M1 P Order No. 2800888 | CB TM2 12A F1 P Order No. 2800899 |
|  | 16 A | CB TM2 16A SFB P Order No. 2800878 | CB TM2 16A M1 P Order No. 2800889 | CB TM2 16A F1 P <br> Order No. 2800900 |

## Thermomagnetic device circuit breakers

The thermomagnetic device circuit breakers are used in information and communication technology as well as process engineering. Due to the various tripping characteristics, the circuit breakers can be used in a range of applications. The reactivation and immediate remote signaling of the operating state ensure availability.

## Your advantages:

- Compact design with precise nominal current levels
- Sophisticated remote signaling concept enables monitoring from any location
- Maximum overcurrent protection over long cable paths thanks to SFB tripping characteristic
- Supply/remote signaling can be bridged with CLIPLINE complete accessories
- Protect $230 / 240$ V AC control voltage with the aid of the M1 characteristic curve (based on characteristic C)
- Variable connection technology: either push-in or screw connection


Tripping characteristics

With thermomagnetic device circuit breakers, the tripping time depends on the type of overload. In the event of an overload, the load is disconnected from the power supply by means of time-delayed thermal
tripping. If there is a high overload current or even a short circuit, the magnetic tripping interrupts the circuit in a matter of milliseconds. Protective devices should be selected with the most suitable characteristic curve in
relation to the area of application, the load, and the protection requirements.


SFB



## Illustration of application

Thermomagnetic device circuit breakers are ideal for protecting programmable controllers, valves, motors and frequency inverters, for example.


Thermomagnetic device circuit breakers, 1 and 2-pos.

Acessories

For more bridges and marking material, see main catalog or website.

End cover - D-UK 4/10-3003020
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## Key Commercial Data

| Packing unit | 50 pc |
| :---: | :---: |
| Minimum order quantity | 50 pc |
| GTIN |  |
| Weight per Piece (excluding packing) | 2.06 g |
| Custom tariff number | 85389099 |
| Country of origin | Germany |

## Technical data

General

| Color | gray |
| :--- | :--- |
| Material | PA 6.6 |
| Flammability rating according to UL 94 | V0 |

Dimensions

| Width | 1.8 mm |
| :--- | :--- |
| Length | 42.5 mm |
| Height | 35.9 mm |

General

| Relative insulation material temperature index (Elec., UL 746 B) | $130^{\circ} \mathrm{C}$ |
| :--- | :--- |
| Temperature index of insulation material (DIN EN 60216-1 (VDE <br> $0304-21)) ~$ | $130^{\circ} \mathrm{C}$ |
| Static insulating material application in cold | $-60^{\circ} \mathrm{C}$ |

## Standards and Regulations

| Flammability rating according to UL 94 | V0 |
| :--- | :--- |

## Terminal blocks


2.5 (4) mm², 24 A, feed-through terminal block

KEMA 06ATEX0119 U / IECEx KEM 06.0034U

| Technical data |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height NS 35/7,5 |  |
| 5.2 | 42.5 | 42 |  |
| Width | Length | Height NS 32 |  |
| 5.2 | 42.5 | 47 |  |
| $\mathrm{I}_{\text {max }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | Max. $\varnothing\left[\mathrm{mm}^{2}\right]$ | AWG (UL) |
| 24 | 800 | 0.2-4 | 30-12 |
| IEC 60947-7-1 |  |  | [Ex) |
| IEC | UL | CSA | $\begin{aligned} & \mathrm{IEC/} \\ & \text { EN 60079-7 } \end{aligned}$ |
| 800 | 300 | 300 | 550 |
| $24 / 2.5$ | 20/- | 20/- | 22 / 2.5 |
| 2.5 | - | - | 0.2-2.5 |
| 24-12 | 30-12 | 28-12 | 24-12 |
| Solid | Stranded | Ferrule without/with plastic sleeve |  |
| 0.2-4 | 0.2-2.5 | 0.25-2.5 | 0.25-1.5 |
| 0.2-1 | 0.2-1 | 0.25-1 | - |
| - | - | - | 0.5-1.5 |
| 2.5 | 2.5 | - | - |
| 7 |  |  |  |
| M3 |  |  |  |
| 0.6-0.8 |  |  |  |
| PA |  |  |  |
| V2 |  |  |  |


| Ordering data |  |  |  |
| :---: | :---: | :---: | :---: |
| Type | $I_{\text {max }}$ | Order No. | Pcs. $/$ Pkt. |
| UK $\mathbf{2 , 5} \mathrm{N}$ |  | 3003347 | 50 |
| UK $2,5 \mathrm{NBU}$ |  | 3003350 | 50 |


| Accessories ${ }^{1}$ ) |  |  |  |
| :---: | :---: | :---: | :---: |
| D-UK 2,5 <br> D-UK $2,5 \mathrm{BU}$ |  | $\begin{aligned} & 3001022 \\ & 3001103 \end{aligned}$ | $\begin{aligned} & 50 \\ & 50 \end{aligned}$ |
| FBRI 10-5 N | 24 A | 2770642 | 10 |
| EBL 10-5 | 24 A | 2303132 | 10 |
| USBR 2-7 | 18 A | 2303239 | 1 |
| TS-KK 3 |  | 2770215 | 50 |
| ATP-UK |  | 3003224 | 50 |
| PSB 3/10/4 |  | 0601292 | 10 |
| PSBJ 3/13/4 |  | 0201304 | 10 |
| SF-SL 0,6X3,5-100 S-VDE |  | 1212587 | 10 |

ZB 5 (see Catalog 5)

2.5 (4) mm², 32 A, feed-through terminal block
$0-\quad 0$

4 (6) mm², 41 A, feed-through terminal block

KEMA 98ATEX1651 U / IECEx KEM 06.0034U

| Technical data |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height NS 35/7 |  |
| 5.2 | 42.5 | 47 |  |
| Width | Length | Height NS 32 |  |
| 5.2 | 42.5 | 52 |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | Max. $\varnothing\left[\mathrm{mm}^{2}\right]$ | AWG (UL) |
| 32 | 800 | 0.2-4 | 28-12 |
| IEC 60947-7-1 |  |  | [ $\varepsilon_{\chi}$ ) |
| IEC | UL | CSA | $\begin{aligned} & \text { IEC/ } \\ & \text { EN 60079-7 } \end{aligned}$ |
| 800 | 600 | 600 | 690 |
| 24/2.5 | 20/- | 20/- | 23/2.5 |
| 2.5 | - | - | 0.2-2.5 |
| 24-12 | 28-12 | 28-12 | 24-12 |
| Solid | Stranded | Ferrule <br> without/with plastic sleeve |  |
| 0.2-4 | 0.2-2.5 | 0.25-2.5 | 0.25-1.5 |
| 0.2-1.5 | 0.2-1.5 | 0.25-1.5 | - |
| - | - | - | 0.5-1 |
| 4 | 2.5 | - | - |


| 8 |
| :--- |
| M3 |
| 0.6 |
| PA |
| V0 |

0.6-0.8
PA
vo


 Ex: 〔x〉
KEMA 98ATEX1651 U / IECEx KEM 06.0034U

| Technical data |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height NS 35/7,5 |  |
| 6.2 | 42.5 | 47 |  |
| Width | Length | Height NS 32 |  |
| 6.2 | 42.5 | 52 |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | Max. $\varnothing\left[\mathrm{mm}^{2}\right]$ | AWG (UL) |
| 41 | 800 | 0.2-6 | 30-10 |
| IEC 60947-7-1 |  |  | Ex ${ }^{\text {c }}$ |
| IEC | UL | CSA | $\begin{aligned} & \text { IEC/ } \\ & \text { EN 60079-7 } \end{aligned}$ |
| 800 | 600 | 600 | 690 |
| $32 / 4$ | 30/- | $30 /-$ | $30.5 / 4$ |
| 4 | - | - | 0.2-4 |
| 24-10 | 30-10 | 28-10 | 24-10 |
| Solid | Stranded | Ferrule without/with plastic sleeve |  |
| 0.2-6 | 0.2-4 | 0.25-4 | 0.25-2.5 |
| 0.2-1.5 | 0.2-1.5 | 0.25-1.5 | - |
| - | - | - | 0.5-2.5 |
| 4 | 4 | - | - |

8
M3
$0.6-0.8$
PA

| Ordering data |  |  |  |
| :---: | :---: | :---: | :---: |
| Type | $\mathrm{I}_{\text {max }}$ | Order No. | Pcs. / Pkt. |
| UK 5 N |  | 3004362 | 50 |
| UK 5 NBU |  | 3004388 | 50 |



## Feed-through terminal block - UK 6 N - 3004524

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Feed-through terminal block, nom. voltage: 800 V , nominal current: 41 A , connection method: Screw connection, number of connections: 2, cross section: $0.2 \mathrm{~mm}^{2}-10 \mathrm{~mm}^{2}$, AWG: $24-8$, width: 8.2 mm , color: gray, mounting type: NS 35/7,5, NS 35/15, NS 32

Why buy this product
$\boxtimes$ All universal terminal blocks in the UK... series can also be used in the Ex e area according to IEC/EN 60079 as standard
$\square$ The corresponding EC-type examination numbers for Ex approval can be found in the technical connection data

## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| Minimum order quantity | 50 STK |
| GTIN |  |
| GTIN | 4017918090821 |
| Weight per Piece (excluding packing) | 14.000 g |
| Custom tariff number | 85369010 |
| Country of origin | China |

## Technical data

General

| Number of levels | 1 |
| :--- | :--- |
| Number of connections | 2 |
| Potentials | 1 |
| Nominal cross section | $6 \mathrm{~mm}^{2}$ |
| Color | gray |
| Insulating material | PA |

## Feed-through terminal block - UK 6 N - 3004524

## Classifications

UNSPSC

| UNSPSC 7.0901 | 39121410 |
| :--- | :--- |
| UNSPSC 11 | 39121410 |
| UNSPSC 12.01 | 39121410 |
| UNSPSC 13.2 | 39121410 |

## Approvals

## Approvals

## Approvals

CSA / UL Recognized / KEMA-KEUR / cUL Recognized / LR / PRS / KR / NK / LR / EAC / EAC / IECEE CB Scheme / DNV GL / LR / cULus Recognized

Ex Approvals
IECEx / ATEX / UL Recognized / cUL Recognized / EAC Ex / GL / cULus Recognized

## Approval details

| CSA |  |
| :--- | :--- |
|  | $26-8$ |
| $\mathrm{~mm}^{2} / \mathrm{hWG} / \mathrm{kcmil}: / / w w w . c s a g r o u p . o r g / s e r v i c e s-i n d u s t r i e s / p r o d u c t-l i s t i n g / ~$ |  |
| Nominal current IN | 50 A |
| Nominal voltage UN | 600 V |



## Plug-in bridge - FBS 20-5-3030226

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Plug-in bridge, Pitch: 5.2 mm , Number of positions: 20, Color: red

## Product Features

■ The 2- to 50-pos. jumpers can bridge up to 50 terminal blocks in the two bridge shafts of the CLIPLINE complete system in one step

## Key Commercial Data

| Packing unit | 1 pc |
| :--- | :--- |
| Minimum order quantity | 10 pc |
| Weight per Piece (excluding packing) | 17.6 g |
| Custom tariff number | 85389099 |
| Country of origin | Germany |

## Technical data

Technical data

| Color | red |
| :--- | :--- |
| Material | Copper |
| Number of positions | 20 |
| Pitch | 5.20 mm |
| Maximum load current | 24 A (The current values for the jumpers can deviate when used in <br> different modular terminal block. The precise values can be found in the <br> accessories data for the respective modular terminal blocks.) |

## Classifications

eCl@ss

| eCl@ss 4.0 | 27141199 |
| :--- | :--- |
| eCl@ss 4.1 | 27141199 |

## Plug-in bridge - FBS 20-5-3030226

## Classifications

eCl@ss

| eCl@ss 5.0 | 27141140 |
| :--- | :--- |
| eCl@ss 5.1 | 27141140 |
| eCl@ss 6.0 | 27141140 |
| eCl@ss 7.0 | 27141140 |
| eCl@ss 8.0 | 27141140 |
| eCl@ss 9.0 | 27141140 |

ETIM

| ETIM 2.0 | EC000489 |
| :--- | :--- |
| ETIM 3.0 | EC000489 |
| ETIM 4.0 | EC000489 |
| ETIM 5.0 | EC000489 |

UNSPSC

| UNSPSC 6.01 | 30211829 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121426 |
| UNSPSC 11 | 39121426 |
| UNSPSC 12.01 | 39121426 |
| UNSPSC 13.2 | 39121426 |

## Approvals

Approvals

## Approvals

EAC

Ex Approvals
$\qquad$

Approvals submitted

## Approval details

[^18]
# Plug-in bridge - FBS 20-5-3030226 

## Accessories

Accessories
Cutting tools
Front cutter - CUTFOX-FBS - 1212124

Cutting tool, for separating individual jumper bars from FBS ... plug-in bridges and EB ... insertion bridges

Protective cap
Protective cap - FBSC - 3012325

Covering hood, provides reliable shock protection when using cut-to-length FBS ...-5 and FBS ...-6 bridges, color: red

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## Plug-in bridge - FBS 10-6-3030271

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Plug-in bridge, Pitch: 6.2 mm , Length: 23 mm , Width: 60.3 mm , Number of positions: 10, Color: red

## Why buy this product

$\boxed{\square}$ The 2- to 50-pos. jumpers can bridge up to 50 terminal blocks in the two bridge shafts of the CLIPLINE complete system in one step

## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| Minimum order quantity | 10 STK |
| GTIN |  |
| GTIN | 4017918188580 |
| Weight per Piece (excluding packing) | 10.140 g |
| Custom tariff number | 85389099 |
| Country of origin | Germany |

## Technical data

Technical data

| Color | red |
| :--- | :--- |
| Material | Copper |
| Number of positions | 10 |
| Pitch | 6.2 mm |
| Maximum load current | 32 A (The current values for the jumpers can deviate when used in <br> different modular terminal blocks. The precise values can be found in the <br> accessories data for the respective modular terminal blocks.) |
| Flammability rating according to UL 94 | V0 |

## Extract from the online catalog

## FBS 10-8

Order No.: 3030323

http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3030323

Plug-in bridge, Number of positions: 10, Color: red

|  |  |
| :--- | :--- |
| Commercial data | $\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|\\|$ |
| GTIN (EAN) | $4 \\|_{017918}$ |
| sales group | A690 |
| Pack | 10 pcs. |
| Customs tariff | 85389099 |
| Catalog page information | Page 330 (CL-2009) |

Product notes
WEEE/RoHS-compliant since: 01/01/2003
http://
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## Extract from the online catalog

## UTTB 4 YE

Order No.: 3035467
http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3035467

Double-level terminal block with screw connection, cross section: 0.14 $\mathrm{mm}^{2}-6 \mathrm{~mm}^{2}$, AWG: 26-10, width: 6.2 mm , color: Yellow

|  |  |
| :--- | :--- |
| Commercial data | 4046356305648 |
| GTIN (EAN) | Made-to-order |
| Note | A832 |
| sales group | 50 pcs. |
| Pack | 85369010 |
| Customs tariff | 0.020362 KG |
| Weight/Piece |  |

Product notes
WEEE/RoHS-compliant since: 07/27/2007

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## Certificates / Approvals

## ${ }^{2} \boldsymbol{N}_{\mathrm{us}}$ (6) (61)

Certification

Certification Ex:

CSA, CUL, GL, UL

IECEx, KEMA-EX

CSA

| Nominal voltage $U_{N}$ | 600 V |
| :--- | :--- |
| Nominal current $I_{N}$ | 30 A |
| AWG/kcmil | $26-10$ |
| CUL |  |
| Nominal voltage $U_{N}$ | 600 V |
| Nominal current $I_{N}$ | 30 A |
| AWG/kcmil | $26-10$ |

UL

| Nominal voltage $U_{N}$ | 600 V |
| :--- | :--- |
| Nominal current $I_{N}$ | 30 A |
| AWG/kcmil | $26-10$ |


| Accessories |  |
| :--- | :--- |
| Item $\quad$ Designation $\quad$ Description |  |

## Assembly

| 3047316 | ATP-UTTB 2,5/4 | Partition plate, Length: 74.3 mm, Width: 2.2 mm, Height: 70 mm, <br> Color: gray |
| :--- | :--- | :--- |
| 3047293 | D-UTTB $2,5 / 4$ | End cover, Length: 69.9 mm, Width: 2.2 mm, Height: 57.5 mm, <br> Color: gray |

Bridges

| 3030336 | FBS 2-6 | Plug-in bridge, Number of positions: 2, Color: red |
| :--- | :--- | :--- |
| 3030242 | FBS 3-6 | Plug-in bridge, Number of positions: 3, Color: red |
| 3030255 | FBS 4-6 | Plug-in bridge, Number of positions: 4, Color: red |
| 3030349 | FBS 5-6 | Plug-in bridge, Number of positions: 5, Color: red |
| 3030271 | FBS 10-6 | Plug-in bridge, Number of positions: 10, Color: red |
| 3030365 | FBS 20-6 | Plug-in bridge, Number of positions: 20, Color: red |
| 3032224 | FBS 50-6 | Plug-in bridge, Number of positions: 50, Color: red |

## General

| 3047303 | DP-UTTB 2,5/4 | Spacer plate, Length: 69.9 mm, Width: 2.6 mm, Height: 33 mm, <br> Color: gray |
| :--- | :--- | :--- |

## Extract from the online catalog

## D-UTTB 2,5/4

Order No.: 3047293
http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3047293


End cover, Length: 69.9 mm, Width: 2.2 mm, Height: 57.5 mm , Color: gray

|  |  |
| :--- | :--- |
| Commercial data | 4017918997267 |
| EAN | 50 pcs. |
| Pack | 85389099 |
| Customs tariff | 0.004635 KG |
| Weight/Piece | Page 40 (CL-2009) |
| Catalog page information |  |


| Product notes |
| :--- |
| WEEE/RoHS-compliant since: |
| 01/18/2005 |

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## Terminal blocks - CLIPLINE complete

## 2.5 mm $^{2}$ UT... screw connection terminal blocks

Feed-through, multi-conductor, and multi-level terminal blocks and ground terminals


| Dimensions |  |
| :--- | ---: |
| Max. electrical data | $[\mathrm{mm}]$ |
|  |  |
| Max. bridge current | $[\mathrm{A}]$ |
| Rated data | $[\mathrm{V}]$ |
| Rated voltage | $[\mathrm{C}] /\left[\mathrm{mm}^{2}\right]$ |
| Nominal current $/$ cross section |  |


|  |  |
| :--- | ---: |
| Description | Color |
| Terminal block | gray |
| upper level blue | gray |
| upper level blue | gray |
| With potential distribution | gray |
| Ground terminal | green/yellow |


| Cover, width 2.2 mm | gray |
| :--- | :--- |
| Spacer plate | gray |



28 A, double-level terminal block with PE foot
(1) ${ }^{\circ}$ T ${ }_{u s}$ EH[

| Technical data ${ }^{1}$ ) |  |  |  |
| :---: | :---: | :---: | :---: |
| Width | Length | Height |  |
| 5.2 | 69.9 | 65 (NS 35/7,5) |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | $\max$. $\varnothing\left[\mathrm{mm}^{2}\right]$ | AWG (UL) |
| 28 | 500 | 0.14-4 | 26-12 |
| 24 (FBS) / 17.5 (FBSR) |  |  |  |
| IEC | UL/ CUL | CSA | Ex |
| 500 | 600 | 600 | - |
| 24/2.5 | 20/- | 20/- | - |



24 A, three-level terminal block and ground terminal
(16. $\left.{ }^{[7}\right)_{u s}$ EH[

| Technical data ${ }^{1}$ ) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Width | Length | Height |  |  |
| 5.2 | 90 | 77.5 (NS 35/7,5) |  |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | $\max$. $\varnothing\left[\mathrm{mm}^{2}\right] \quad A$ |  | AWG (UL) |
| 24 | 500 | 0.14-4 |  | 26-12 |
| 19 (FBS) / 17.5 (FBSR) |  |  |  |  |
| IEC | UL / CUL |  | CSA |  | Ex |
| 500 | 600 | 600 |  | - |
| 19/2.5 | 20/- | 20/- |  | - |
| Ordering data |  |  |  |  |
| Type |  |  | der No. | Pcs./ Pkt. |
| UT 2,5-3L |  | (1) | 214259 | 50 |
| UT 2,5-3PV |  | (2) | 3214262 | 50 |
| UT 2,5-3PE |  | (3) | 3214275 | 50 |
| Accessories ${ }^{1}$ ) |  |  |  |  |
| D-UT 2,5-3L |  |  | 3214314 | 50 |

## Multi-level terminal blocks



| Dimensions |  |
| :--- | ---: |
| Max. electrical data | $[\mathrm{mm}]$ |
| Max. bridge current | $[\mathrm{A}]$ |
| Rated data | $[\mathrm{V}]$ |
| Rated voltage | $[\mathrm{A}] /\left[\mathrm{mm}{ }^{2}\right]$ |
| Nominal current / cross section |  |
|  | Color |
| Description | gray |
| Terminal block | gray |
| upper level blue | gray |
| Terminal block, with LED for 12-30 V DC, <br> $0.7-2.4$ mA |  |
|  | gray |



24 A, three-level terminal block with PE foot
(14. ${ }^{9} \mathrm{Al}_{\mathrm{us}} \mathrm{FH}$ [

| Technical data ${ }^{1}$ ) |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Width | Length | Height |  |  |
| 5.2 | 90 | 77.5 (NS 35/7,5) |  |  |
| $\mathrm{I}_{\text {max. }}$ [A] | $\mathrm{U}_{\text {max }}$ [V] | max. $\varnothing\left[\mathrm{mm}^{2}\right] \quad A$ |  | AWG (UL) |
| 24 | 500 | 0.14-4 2 |  | 26-12 |
| 19 (FBS) / 17.5 (FBSR) |  |  |  |  |
| IEC | UL/ CUL | CSA Ex |  | Ex |
| 500 | 600 | 600 |  | - |
| 19/2.5 | 20/- | 20/- |  |  |
| Ordering data |  |  |  |  |
| Type |  |  | Order No. | Pcs. / Pkt. |
| UT 2,5-PE/L/L |  | (1) | 3214301 | 50 |
| UT $\mathbf{2 , 5 - P E / L / N}$ |  | (1) | 3214291 | 50 |


| Accessories ${ }^{1}$ ) |  |  |
| :--- | ---: | ---: |
|  | 3214314 | 50 |
| D-UT 2,5-3L |  |  |

(1)


24 A, three-level terminal block with LED display



## Cover - D-UT 2,5-3L - 3214314

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## Key commercial data

| Packing unit | 0 |
| :---: | :---: |
| Minimum order quantity | 50 |
| Catalog page | Page 46 (CL1-2011) |
| GTIN |  |
| Custom tariff number | 85389099 |
| Country of origin | POLAND |

## Technical data

| Product type | End cover |
| :--- | :--- |
| Approval | GOST |

## Classifications

eclass

| eCl@ss 4.0 | 27141111 |
| :--- | :--- |
| eCl@ss 4.1 | 27141199 |
| eCl@ss 5.0 | 27141133 |
| eCl@ss 5.1 | 27141133 |
| eCl@ss 6.0 | 27141133 |

etim

| ETIM 3.0 | EC000886 |
| :--- | :--- |
| ETIM 4.0 | EC000886 |

unspsc

| UNSPSC 6.01 | 30211709 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121421 |
| UNSPSC 11 | 39121421 |
| UNSPSC 12.01 | 39121421 |

## Cover - D-UT 2,5-3L - 3214314

## Classifications

## unspsc

| UNSPSC 13.2 | 39121421 |
| :--- | :--- |

## Approvals

## Certificates

## Certification

GOST

Certification EX

Certification submitted

Approval details

GOST
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Product data sheet
Characteristics


Main

| Range of product | TeSys D |
| :--- | :--- |
|  | TeSys D control relay |
| Range | TeSys |
| Device short name | LAD4 |
| Product or component type | Suppressor module |
| Product compatibility | LC1D09...D38 (3P) |
|  | LC1DT20...DT40 (4P) |
|  | LC1D098...D258 (4P) |


| Complementary |  |
| :--- | :--- |
| Mounting location | Side |
| Mounting mode | By clips |
| Suppressor technology | Flywheel diode |
| $[$ Uc] control circuit voltage | $24 \ldots . .250 \mathrm{~V} \mathrm{DC}$ |
| Maximum peak voltage | 1 Uc |
| Product weight | $0.03 \mathrm{lb}(\mathrm{US})(0.012 \mathrm{~kg})$ |
| Compatibility code | LAD4 |

Environment

| Ambient air temperature for operation | $-13 \ldots . .131^{\circ} \mathrm{F}\left(-25 \ldots 5 \mathrm{o}^{\circ} \mathrm{C}\right)$ |
| :--- | :--- |
| Ambient air temperature for storage | $-40 \ldots 176{ }^{\circ} \mathrm{F}\left(-40 \ldots .0^{\circ} \mathrm{C}\right)$ |
|  |  |
| Ordering and shipping details | 22341 - CONTACTOR,D,K,\&F ACCESS |
| Category | 112 |
| Discount Schedule | 00785901825838 |
| GTIN | 1 |
| Nbr. of units in pkg. | 0.02 |
| Package weight(Lbs) | Y |
| Returnability | FR |
| Country of origin |  |

Offer Sustainability

| Sustainable offer status | Green Premium product |
| :--- | :--- |
| RoHS (date code: YYWW) | Compliant - since 0725-Schneider Electric declaration of conformity 尓 Schneider- <br> Electric declaration of conformity |
| REACh | Reference not containing SVHC above the threshold |
| Product environmental profile | Available |
| Product end of life instructions | Need no specific recycling operations |

Contractual warranty
Warranty period 18 months

## Product Life Status: Commercialised

 PremiumProduct availability: Stock - Normally stocked in distribution facility
Price*: 60.00 USD


| Main | TeSys |
| :--- | :--- |
| Range | TeSys LRD |
| Product name | Differential thermal overload relay |
| Product or component type | LRD |
| Device short name | Motor protection |
| Relay application | LC1D25 |
| Product compatibility | LC1D09 |
|  | LC1D12 |
|  | LC1D18 |
|  | LC1D38 |
| LC1D32 |  |
| Thermal protection adjustment range | DC |
| Ui] rated insulation voltage | AC |
|  | $0.1 \ldots . .0 .16$ A |

Complementary

| Network frequency | $0 \ldots . .400 \mathrm{~Hz}$ |
| :--- | :--- |
| Mounting support | Plate, with specific accessories <br> Rail, with specific accessories <br>  <br>  <br>  <br> Under contactor |
| Tripping threshold | $1.14+/-0.06$ Ir IEC $60947-4-1$ |
| [lth] conventional free air thermal current | 5 A signalling circuit |
| Permissible current | $3 \mathrm{~A} \mathrm{120} \mathrm{V} \mathrm{AC-15} \mathrm{signalling} \mathrm{circuit}$ |
|  | $0.22 \mathrm{~A} \mathrm{125} \mathrm{V} \mathrm{DC-13} \mathrm{signalling} \mathrm{circuit}$ |
| [Ue] rated operational voltage | $690 \mathrm{~V} \mathrm{AC} 0 \ldots . .400 \mathrm{~Hz}$ |
| [Uimp] rated impulse withstand voltage | 6 KV |
| Phase failure sensitivity | Tripping current $130 \%$ of Ir on two phase, the last one at 0 |
| Control type | Red push-button stop |
|  | Blue push-button reset |
| Temperature compensation | $-4 \ldots 140{ }^{\circ} \mathrm{F}\left(-20 \ldots 60^{\circ} \mathrm{C}\right)$ |


| Connections - terminals | Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ flexible without cable end <br> Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ flexible with cable end <br> Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ solid without cable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.02 \mathrm{in}^{2}\left(1.5 \ldots 10 \mathrm{~mm}^{2}\right)$ flexible withoutcable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.01 \mathrm{in}^{2}\left(1 \ldots 4 \mathrm{~mm}^{2}\right)$ flexible with cable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.01 \mathrm{in}^{2}\left(1 \ldots 6 \mathrm{~mm}^{2}\right)$ solid without cable end |
| :---: | :---: |
| Tightening torque | Control circuit 15.05 Ibf.in ( 1.7 N.m) screw clamp terminals Power circuit 15.05 lbf .in ( $1.7 \mathrm{~N} . \mathrm{m}$ ) screw clamp terminals |
| Width | $1.77 \mathrm{ln}(45 \mathrm{~mm})$ |
| Depth | $2.76 \mathrm{ln}(70 \mathrm{~mm})$ |
| Net weight | $0.27 \mathrm{Lb}(\mathrm{US})(0.124 \mathrm{~kg})$ |
| Environment |  |
| Protective treatment | TH IEC 60068 |
| IP degree of protection | IP20 IEC 60529 |
| Ambient air temperature for operation | $-4 \ldots 140^{\circ} \mathrm{F}\left(-20 \ldots 60^{\circ} \mathrm{C}\right)$ without derating IEC 60947-4-1 |
| Ambient air temperature for storage | $-76 \ldots 158{ }^{\circ} \mathrm{F}\left(-60 \ldots . .70^{\circ} \mathrm{C}\right)$ |
| Flame retardance | V1 UL 94 |
| Mechanical robustness | Vibrations6 Gn IEC 60068-2-6 Shocks15 Gn for 11 ms IEC 60068-2-7 |
| Dielectric strength | 6 KV 50 Hz IEC 60255-5 |
| Standards | EN 60947-4-1 <br> EN 60947-5-1 <br> IEC 60947-5-1 IEC 60947-4-1 UL 508 ATEX D 94/9/CE CSA C22.2 No 14 |
| Product certifications | ```RINA BV CCC GL UL GOST CSA DNV LROS (Lloyds register of shipping) ATEX INERIS``` |
| Ordering and shipping details |  |
| Category | 22347 - CONTACTOR,D-LINE,OVERLOADS-NEW |
| Discount Schedule | 112 |
| GTIN | 00785901206682 |
| Package weight(Lbs) | $0.14 \mathrm{Kg}(0.31 \mathrm{lb}(\mathrm{US})$ ) |
| Returnability | Yes |
| Country of origin | FR |

Offer Sustainability

| Sustainable offer status | Green Premium product |
| :---: | :---: |
| California proposition 65 | WARNING：This product can expose you to chemicals including：Antimony oxide \＆An－ timony trioxide which is known to the State of California to cause Carcinogen har－ m ．For more information go to www．p65warnings．ca．gov |
| REACh Regulation | 四REACh Declaration |
| EU RoHS Directive | Compliant ${ }_{\text {® }}$ EU RoHS Declaration |
| Mercury free | Yes |
| RoHS exemption information | ※Yes |
| China RoHS Regulation | 圂China RoHS Declaration |
| Environmental Disclosure | ®Product Environmental Profile |
| Circularity Profile | 区end Of Life Information |

Contractual warranty
Warranty 18 months

## Product Life Status：Commercialised

## Product data sheet <br> Characteristics

## LRD04

## TeSys LRD, thermal overload relay, 0.4 to 0.63 A , class 10A

## Green

 PremiumProduct availability: Stock - Normally stocked in distribution facility
Price*: 60.00 USD


| Main | TeSys |
| :--- | :--- |
| Range | TeSys LRD |
| Product name | Differential thermal overload relay |
| Product or component type | LRD |
| Device short name | Motor protection |
| Relay application | LC1D25 |
| Product compatibility | LC1D38 |
|  | LC1D32 |
|  | LC1D18 |
|  | LC1D12 |
|  | LC1D09 |
| Network type | AC |
|  | DC |
| Thermal protection adjustment range | $0.4 \ldots 0.63$ A |
| $[$ Ui] rated insulation voltage | Power circuit 600 V CSA |
|  | Power circuit 600 V UL |
|  | Power circuit 690 V IEC 60947-4-1 |

Complementary

| Network frequency | $0 \ldots . .400 \mathrm{~Hz}$ |
| :--- | :--- |
| Mounting support | Plate, with specific accessories <br> Rail, with specific accessories <br> Under contactor |
| Tripping threshold | $1.14+/-0.06$ Ir IEC $60947-4-1$ |
| [lth] conventional free air thermal current | 5 A signalling circuit |
| Permissible current | $3 \mathrm{~A} \mathrm{120} \mathrm{V} \mathrm{AC-15} \mathrm{signalling} \mathrm{circuit}$ |
|  | $0.22 \mathrm{~A} 125 \mathrm{~V} \mathrm{DC-13} \mathrm{signalling} \mathrm{circuit}$ |
| [Ue] rated operational voltage | $690 \mathrm{~V} \mathrm{AC} 0 \ldots .400 \mathrm{~Hz}$ |
| [Uimp] rated impulse withstand voltage | 6 KV |
| Phase failure sensitivity | Tripping current $130 \%$ of Ir on two phase, the last one at 0 |
| Control type | Red push-button stop |
|  | Blue push-button reset |
| Temperature compensation | $-4 \ldots 140^{\circ} \mathrm{F}\left(-20 \ldots 60^{\circ} \mathrm{C}\right)$ |


| Connections - terminals | Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ flexible without cable end <br> Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ flexible with cable end <br> Control circuit screw clamp terminals $20.00 \ldots 0.00 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ solid without cable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.02 \mathrm{in}^{2}\left(1.5 \ldots 10 \mathrm{~mm}^{2}\right)$ flexible withoutcable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.01 \mathrm{in}^{2}\left(1 \ldots 4 \mathrm{~mm}^{2}\right)$ flexible with cable end <br> Power circuit screw clamp terminals $10.00 \ldots 0.01 \mathrm{in}^{2}\left(1 \ldots 6 \mathrm{~mm}^{2}\right)$ solid without cable end |
| :---: | :---: |
| Tightening torque | Control circuit 15.05 Ibf.in ( $1.7 \mathrm{~N} . \mathrm{m}$ ) screw clamp terminals Power circuit 15.05 Ibf.in (1.7 N.m) screw clamp terminals |
| Width | $1.77 \mathrm{ln}(45 \mathrm{~mm})$ |
| Depth | $2.76 \mathrm{ln}(70 \mathrm{~mm})$ |
| Net weight | 0.27 Lb (US) ( 0.124 kg ) |
| Environment |  |
| Protective treatment | TH IEC 60068 |
| IP degree of protection | IP20 IEC 60529 |
| Ambient air temperature for operation | $-4 \ldots 140{ }^{\circ} \mathrm{F}\left(-20 . . .60^{\circ} \mathrm{C}\right)$ without derating IEC 60947-4-1 |
| Ambient air temperature for storage | $-76 \ldots 158{ }^{\circ} \mathrm{F}\left(-60 \ldots 70^{\circ} \mathrm{C}\right)$ |
| Flame retardance | V1 UL 94 |
| Mechanical robustness | Vibrations6 Gn IEC 60068-2-6 Shocks15 Gn for 11 ms IEC 60068-2-7 |
| Dielectric strength | 6 KV 50 Hz IEC 60255-5 |
| Standards | ATEX D 94/9/CE EN 60947-5-1 EN 60947-4-1 IEC 60947-4-1 IEC 60947-5-1 UL 508 CSA C22.2 No 14 |
| Product certifications | ```RINA GL UL ATEX INERIS CSA GOST LROS (Lloyds register of shipping) DNV CCC BV``` |

Ordering and shipping details

| Category | 22347 - CONTACTOR,D-LINE,OVERLOADS-NEW |
| :--- | :--- |
| Discount Schedule | 112 |
| GTIN | 00785901206712 |
| Package weight(Lbs) | $0.15 \mathrm{Kg} \mathrm{(0.32} \mathrm{lb(US))}$ |
| Returnability | Yes |
| Country of origin | FR |

Offer Sustainability

| Sustainable offer status | Green Premium product |
| :---: | :---: |
| California proposition 65 | WARNING：This product can expose you to chemicals including：Antimony oxide \＆An－ timony trioxide which is known to the State of California to cause Carcinogen har－ m ．For more information go to www．p65warnings．ca．gov |
| REACh Regulation | 四REACh Declaration |
| EU RoHS Directive | Compliant ${ }_{\text {® }}$ EU RoHS Declaration |
| Mercury free | Yes |
| RoHS exemption information | ※Yes |
| China RoHS Regulation | 圂China RoHS Declaration |
| Environmental Disclosure | ®Product Environmental Profile |
| Circularity Profile | 区end Of Life Information |

Contractual warranty
Warranty 18 months

## Product Life Status：Commercialised

Product availability : Stock - Normally stocked in distribution facility

Price* : 60.00 USD


| [Uimp] rated impulse withstand voltage | 6 kV |
| :---: | :---: |
| Phase failure sensitivity | Tripping current $130 \%$ of Ir on two phase, the last one at 0 |
| Control type | Red push-button stop Blue push-button for reset mode |
| Temperature compensation | $-4 . . .140^{\circ} \mathrm{F}\left(-20 . . .60^{\circ} \mathrm{C}\right)$ |
| Connections - terminals | Control circuit: screw clamp terminals 2 cable(s) $0 \ldots 0 \mathrm{in}^{2}$ ( $1 \ldots 2.5 \mathrm{~mm}^{2}$ ) - cable stiffness: flexible without cable end <br> Control circuit: screw clamp terminals 2 cable(s) $0 \ldots 0 \mathrm{in}^{2}$ ( $1 \ldots 2.5 \mathrm{~mm}^{2}$ ) - cable stiffness: flexible - with cable end <br> Control circuit: screw clamp terminals 2 cable(s) $0 \ldots 0 \mathrm{in}^{2}\left(1 \ldots 2.5 \mathrm{~mm}^{2}\right)$ - cable stiffness: solid - without cable end <br> Power circuit: screw clamp terminals 1 cable(s) $0 \ldots . .0 .02 \mathrm{in}^{2}\left(1.5 \ldots 10 \mathrm{~mm}^{2}\right)$ - cable stiffness: flexible without cable end <br> Power circuit: screw clamp terminals 1 cable(s) $0 \ldots 0.01 \mathrm{in}^{2}\left(1 \ldots .4 \mathrm{~mm}^{2}\right)$ - cable stiffness: flexible - with cable end <br> Power circuit: screw clamp terminals 1 cable(s) $0 \ldots . .0 .01 \mathrm{in}^{2}\left(1 \ldots 6 \mathrm{~mm}^{2}\right)$ - cable stiffness: solid without cable end |
| Tightening torque | Control circuit: 15.04 Ibf.in (1.7 N.m) - on screw clamp terminals Power circuit: 15.04 lbf.in ( $1.7 \mathrm{~N} . \mathrm{m}$ ) - on screw clamp terminals |
| Width | 1.77 in ( 45 mm ) |
| Depth | 2.76 in (70 mm) |
| Product weight | $0.27 \mathrm{lb}(\mathrm{US})(0.124 \mathrm{~kg}$ ) |

## Environment

| Protective treatment | TH conforming to IEC 60068 |
| :--- | :--- |
| IP degree of protection | IP20 conforming to IEC 60529 |
| Ambient air temperature for operation | Without derating conforming to IEC 60947-4-1 |
| Ambient air temperature for storage | $-76 . .1^{\circ}{ }^{\circ} \mathrm{F}\left(-60 \ldots .0^{\circ} \mathrm{C}\right)$ |
| Flame retardance | V1 conforming to UL 94 |
| Mechanical robustness | Vibrations 6 Gn IEC 60068-2-6 |
|  | Shocks 15 Gn for 11 ms IEC 60068-2-7 |
| Dielectric strength | 6 kVat 50 Hz conforming to IEC 60255-5 |
| Standards | EN 60947-4-1 |
|  | CSA C22.2 No 14 |
|  | UL 508 |
|  | ATEX D 94/9/CE |
|  | IEC 60947-5-1 |
|  | IEC 60947-4-1 |
|  | EN 60947-5-1 |
| Product certifications | BV |
|  | GL |
|  | DNV |
|  | CCC |
|  | CSA |
|  | ATEX INERIS |
|  | GOST |
|  | UL |
|  | RINA |
|  | LROS (Lloyds register of shipping) |

Ordering and shipping details

| Category | 22347 - CONTACTOR,D-LINE,OVERLOADS-NEW |
| :--- | :--- |
| Discount Schedule | 112 |
| GTIN | 00785901206743 |
| Nbr. of units in pkg. | 1 |
| Package weight(Lbs) | 0.32000000000000001 |
| Returnability | Y |
| Country of origin | FR |

Offer Sustainability
Sustainable offer status
Green Premium product

| RoHS (date code: YYWW) | Compliant - since 0631 - Schneider Electric declaration of conformity <br>  <br> REACh <br>  <br> Reference not containing SVHC above the threshold <br> Reference not containing SVHC above the threshold |
| :--- | :--- |
| Product environmental profile | Available |
| Product end of life instructions | Available |
|  |  |
| Contractual warranty |  |
| Warranty period | 18 months |

Product data sheet
Characteristics


Complementary

| Network frequency | $0 \ldots 400 \mathrm{~Hz}$ |
| :--- | :--- |
| Mounting support | Plate with specific accessories <br> Rail with specific accessories <br> Under contactor |
| Tripping threshold | $1.14+/-0.06$ Ir conforming to IEC 60947-4-1 |
| llth] conventional free air thermal current | 5 A for signalling circuit |
| Permissible current | 3 A at $120 \mathrm{~V} \mathrm{AC-15} \mathrm{for} \mathrm{signalling} \mathrm{circuit}$ |
|  | 0.22 A at 125 V DC-13 for signalling circuit |
| System Voltage | 690 V AC $0 \ldots . .400 \mathrm{~Hz}$ |
| [Uimp] rated impulse withstand voltage | 6 kV |
| Phase failure sensitivity | Tripping current $130 \%$ of Ir on two phase, the last one at 0 |
| Control type | Red push-button stop |
|  | Blue push-button for reset mode |
| Temperature compensation | $-4 \ldots 140^{\circ} \mathrm{F}\left(-20 \ldots 60{ }^{\circ} \mathrm{C}\right)$ |

Jan 25, $2019 \quad$| Schneider |
| :---: |
| SNElectric |

| Connections - terminals | Control circuit : screw clamp terminals 2 cable(s) $1 \ldots .2 .5 \mathrm{~mm}^{2}$ flexible without cable end |
| :--- | :--- |
|  | Control circuit : screw clamp terminals 2 cable(s) $1 \ldots .2 .5 \mathrm{~mm}^{2}$ flexible with cable end |
|  | Control circuit : screw clamp terminals 2 cable(s) $1 \ldots .2 .5 \mathrm{~mm}^{2}$ solid without cable end |
|  | Power circuit : screw clamp terminals 1 cable(s) $1.5 \ldots 10 \mathrm{~mm}^{2}$ flexible without ca- |
|  | ble end |
|  | Power circuit : screw clamp terminals 1 cable(s) $1 \ldots . \mathrm{mm}^{2}$ flexible with cable end |
|  | Power circuit : screw clamp terminals 1 cable(s) $1 \ldots . .6 \mathrm{~mm}^{2}$ solid without cable end |
| Tightening torque | Control circuit : $1.7 \mathrm{~N} . \mathrm{m}$ on screw clamp terminals |
|  | Power circuit : $1.7 \mathrm{~N} . \mathrm{m}$ on screw clamp terminals |
| Width | 1.77 in $(45 \mathrm{~mm})$ |
| Depth | 2.76 in $(70 \mathrm{~mm})$ |
| Product weight | $0.27 \mathrm{lb}(\mathrm{US})(0.124 \mathrm{~kg})$ |
| Compatibility code | LRD |

## Environment

| Protective treatment | TH conforming to IEC 60068 |
| :---: | :---: |
| IP degree of protection | IP20 conforming to IEC 60529 |
| Ambient air temperature for operation | $-4 \ldots 140{ }^{\circ} \mathrm{F}\left(-20 \ldots 6{ }^{\circ} \mathrm{C}\right)$ without derating conforming to IEC 60947-4-1 |
| Ambient air temperature for storage | $-76 \ldots 158{ }^{\circ} \mathrm{F}\left(-60 \ldots 70^{\circ} \mathrm{C}\right)$ |
| Flame retardance | V1 conforming to UL 94 |
| Mechanical robustness | Vibrations 6 Gn IEC 60068-2-6 Shocks 15 Gn for 11 ms IEC 60068-2-7 |
| Dielectric strength | 6 kVat 50 Hz conforming to IEC 60255-5 |
| Standards | ATEX D 94/9/CE <br> EN 60947-4-1 <br> EN 60947-5-1 <br> IEC 60947-4-1 <br> IEC 60947-5-1 <br> UL 508 <br> CSA C22.2 No 14 |
| Product certifications | ATEX INERIS <br> BV <br> CCC <br> CSA <br> DNV <br> GL <br> GOST <br> LROS (Lloyds register of shipping) <br> RINA <br> UL |

Ordering and shipping details

| Category | 22347 - CONTACTOR,D-LINE,OVERLOADS-NEW |
| :--- | :--- |
| Discount Schedule | I12 |
| GTIN | 00785901206750 |
| Nbr. of units in pkg. | 1 |
| Package weight(Lbs) | 0.31 |
| Returnability | Y |
| Country of origin | FR |

Offer Sustainability

| Sustainable offer status | Green Premium product |
| :--- | :--- |
| RoHS (date code: YYWW) | Compliant - since 0631-Schneider Electric declaration of conformity |
|  | Electric declaration of conformity |
| REACh | Reference not containing SVHC above the threshold |
| Product environmental profile | Available |
| Product end of life instructions | Available |
| California proposition 65 | WARNING: This product can expose you to chemicals including: |


| ------ Substance 1 | Antimony oxide \& Antimony trioxide, which is known to the State of California to cause- <br> cancer. |
| :--- | :--- |
| ----- More information | For more information go to www.p65warnings.ca.gov |
| Contractual warranty |  |
| Warranty period | 18 months |
|  |  |
| Product Life Status: Commercialised |  |

## Product data sheet

Characteristics

T02BN13BD
Contactor TeSys NEMA Sz0 3P 24VDC
Product availability: Stock - Normally stocked in distribution facility
Price*: 280.00 USD

## Main

| Product or component type | Contactor |
| :--- | :--- |
| Range of product | TeSys N |
| Contactor application | Non-reversing |
| NEMA size | 0 |
| Motor power hp | 3 hp 230 V AC |
|  | 5 hp 460 V AC |
|  | 5 hp 575 V AC |
| NEMA degree of protection | 3 hp 200 V AC |
| Control circuit | Not rated (open device) |
| UC] control circuit voltage | Common control circuit |
| Auxiliary contact composition | 24 V DC |
| Poles description | 1 NO + 1 NC |
| Phase | 3 P |
| Line Rated Current | 3 phases |
| Product certifications | 18 A |
|  | CE |
| System Voltage | CSA |
| Electrical connection | 600 V AC |

Ordering and shipping details

| Category | $21196-$ TESYS N CONTACTORS SIZES $00-2$ |
| :--- | :--- |
| Discount Schedule | CP1 |
| GTIN | 00785901514176 |
| Nbr. of units in pkg. | 1 |
| Package weight(Lbs) | 1.28 |
| Returnability | Y |
| Country of origin | FR |

Offer Sustainability

| California proposition 65 | WARNING: This product can expose you to chemicals including: |
| :--- | :--- |
| ------ Substance 1 | Antimony oxide \& Antimony trioxide, which is known to the State of California to cause- <br> cancer. |
| ----- - More information | For more information go to www.p65warnings.ca.gov |

## Product Life Status : Commercialised

## Product data sheet

Characteristics

T02BN23BD
Rev. Contactor TeSys NEMA Sz0 3P 24VDC

Product availability : Stock - Normally stocked in distribution facility

Price* : 692.00 USD




Product data sheet
Characteristics

## PK23GTA <br> LOAD CENTER EQUIPMENT GROUND BAR ASSY

## SQUARE

by Schneider Electric

Price* : 21.30 USD


## Up to 400 A Class J ferrule and knifeblade power distribution fuse blocks



30 and 60 amp modular ferrule blocks.


100, 200 and 400 amp modular knifeblade blocks.

## Catalog symbols:

- JM60030-_MW_
- JM60060-_MW_
- JM60100-_MW_
- JM60200-_MW_
- JM60400-_MW_


## Description:

Bussmann ${ }^{\circledR}$ series Class J fuse block features power distribution capability.
This patented design simplifies panel layouts and uses up to 65 percent less panel space. Additionally, it lowers inventory costs while reducing installation time and labor by an average of 33 percent.
Furthermore, this design uses fewer wire connections, reducing watts loss and overall operating temperature of the panel.

## Features and benefits:

- Combination power distribution block and fuse block reduces wire connections and total panel components, using up to 65 percent less panel space and reducing installation time and labor by an average of 33 percent when compared with traditional fuse block/power distribution block solutions.
- A 200,000 amp withstand rating helps achieve a higher assembly short-circuit current rating (SCCR) for compliance with NEC ${ }^{\circledR}$ sections 110.10, 409.110(4), 409.22, 440.4(B), 670.3(A)(4) and 670.5 .
- Optional see-through cover enhances safety with IP20 finger-safe protection, lockout/tagout capability and open circuit indication.
- Available in 1-, 2- and 3-pole configurations to meet stocking requirements.
- To reduce inventory, assembly time and labor, modular single-pole blocks snap-together for tool-less assembly of multiple poles at point of use.
- Blocks rated up to 60 amps feature DIN-Rail and panel mount versatility, which allows one product to be used for multiple applications without incurring additional inventory cost.

Technical Data 10192
Effective June 2016

## Specifications:

## Fuse class

- Class J


## Ratings

- Volts: 600 V
- Amps: up to 400 A
- Withstand rating (SCCR): 200 kA Sym RMS


## Agency information

- Blocks:
- UL® Listed E14853 - IZLT
- CSA ${ }^{\oplus}$ Certified 47235 - 6225-01
- Covers: UL Listed UL E58836 - JDVS
- RoHS compliant


## Poles

- 1-, 2-, 3-pole


## Mounting

- 30 and 60 amp blocks DIN-Rail and panel mount
- 100, 200 and 400 amp blocks panel mount only


## Flammability ratings

- Blocks: UL 94V0, self-extinguishing
- Covers: UL 94HB, self-extinguishing


## Operating and storage temperature range

- Blocks: $-40^{\circ} \mathrm{C}$ to $+120^{\circ} \mathrm{C}$
- Covers:
- Non-indicating $-40^{\circ} \mathrm{C}$ to $+120^{\circ} \mathrm{C}$
- Indicating $-20^{\circ} \mathrm{C}$ to $+90^{\circ} \mathrm{C}$


## Materials

- Base:Thermoplastic
- Terminals: Tin-plated aluminum


## Conductors

- $75^{\circ} \mathrm{C} / 90^{\circ} \mathrm{C} \mathrm{Cu} / \mathrm{Al}$ (unless otherwise noted)


## Accessories:

- Optional IP20 finger-safe covers in indicating and non-indicating versions. Order one for each pole.
- Universal marker labels for 30 and 60 amp blocks, Bussmann series catalog number TM26CB.
- DIN-Rail end stops for blocks rated up to 60 A, Bussmann series catalog numbers BRKT-ND or BRKT-NDSCRW2.

Recommended fuses (order separately)

| Description | Amps | Data sheet no. |
| :---: | :---: | :---: |
| Ultimate protection Low-Peak™ LPJ time-delay fuses | up to 60 | 1006 |
|  | 70 to 600 | 1007 |
| Advanced protection Limitron ${ }^{\text {TM }}$ JKS fast-acting fuses | up to 60 | 1026 |
|  | 70 to 600 | 1027 |
| High speed Class J DFJ drive fuses | up to 600 | 1048 |



## Catalog numbers:



[^19]
## 30 A dimensions - mm (in)

Catalog nos. JM60030-(poles)MW14 - One port in, four ports out (covers not available)


## 60 A dmensions - mm (in)

Catalog nos. JM60060-(poles)MW12 - Two ports in, one port out


With optional cover, see catalog number table on page three for available versions


## 60 A dimensions - mm (in)

Catalog nos. JM60060-(poles)MW14 - One port in, four ports out


With optional cover, see catalog number table on page three for available versions


## 60 A dimensions - mm (in)

Catalog nos. JM60060-(poles)MW24 - Two ports in, four ports out


With optional cover, see catalog number table on page three for available versions


100, 200 and 400 A dimensions - mm (in)
Catalog nos. JM60100-(poles)MW14 (100 A), JM60200-(poles)MW16 (200 A) and JM60400-(poles)MW16/26 (400 A)


| Block size |  | A | B | C | D | E | F | G | H | I | J | K | L | M | ØN | $\varnothing 0$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 100 A | in | 2.0 | 4.0 | 6.0 | 5.5 | 5.5 | 2.8 | 2.2 | 6.0 | 2.8 | 0.9 | 2.0 | 0.4 | 1.1 | 0.4 | 0.5 |
|  | mm | 51 | 102 | 153 | 139 | 139 | 72 | 55 | 152 | 72 | 22 | 51 | 10 | 29 | 9 | 13 |
| 200 A | in | 2.6 | 5.3 | 8.0 | 6.8 | 6.8 | 3.8 | 3.0 | 7.3 | 3.8 | 1.4 | 2.6 | 0.3 | 1.3 | 0.4 | 0.7 |
|  | mm | 67 | 134 | 203 | 172 | 172 | 97 | 75 | 186 | 97 | 35 | 67 | 8 | 32 | 9 | 19 |
| 400 A | in | 3.5 | 7.0 | 10.6 | 8.0 | 8.0 | 4.8 | 4.1 | 8.7 | 4.8 | 2.0 | 3.5 | 0.3 | 1.6 | 0.4 | 0.7 |
|  | mm | 88 | 177 | 268 | 202 | 202 | 121 | 105 | 220 | 121 | 50 | 88 | 8 | 41 | 9 | 19 |

## Installing/removing covers on $\mathbf{3 0}$ to $\mathbf{4 0 0} \mathrm{amp}$ blocks



Installing 30 and 60 amp blocks on a 35mm DIN-Rail

1. Place one edge of DIN-Rail into rail clips on one side of the block.

2. Rotate and push block down to deflect rail clips.


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## Mouser Electronics

Authorized Distributor

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## Eaton:

JM60030-1MW14 JM60030-2MW14 JM60060-3MW12 JM60030-3MW14 JM60060-1MW14 JM60060-2MW12
JM60060-1MW12 JM60060-3MW14 JM60060-2MW14 JM60060-1MW24 JM60060-2MW24 JM60060-3MW24

Product data sheet
Characteristics

## SDSA4040D

Surge Protect - 40kA - 480VAC delta - 3P3W T4X

SQUARE $]^{1}$
by Schneider Electric

Price** : 257.92 USD


Main

| Product | Surge protection device |
| :---: | :---: |
| Complementary |  |
| Surge Current | 40 kA |
| Voltage Rating | 480 V delta AC |
| Number of Phases | 3 phase |
| Wiring Configuration | 3-wire |
| Connection | Wire AWG 12 copper |
| MCOV | 180 V |
| Nominal Discharge Current | 10 kA |
| SCCR | 200 kA |
| Local Signalling | Status LED normal operation |
| Mounting Support | Panel mounting |
| Height | 3.07 in (78 mm) |
| Width | 3.62 in (92 mm) |
| Depth | 2.64 in (67 mm) |
| Environment |  |
| Enclosure Rating | NEMA 4X |
| Enclosure Material | black plastic |
| Standards | UL 1449:ed. 4 CSA C22.2 No 8:1986 |
| Ambient Operating | $149{ }^{\circ} \mathrm{F}\left(65{ }^{\circ} \mathrm{C}\right)$ |

Ordering and shipping details

| Category | $08462-$ SURGE PROTECTION SDSA |
| :--- | :--- |
| Discount Schedule | DE1B |
| GTIN | 00785901599920 |
| Package weight(Lbs) | $0.43 \mathrm{~kg}(0.94 \mathrm{lb}($ US $))$ |
| Returnability | Yes |
| Country of origin | MX |

Offer Sustainability

| California proposition 65 | WARNING: This product can expose you to chemicals including: DINP and DIDP which is known <br> to the State of California to cause Carcinogen and Reproductive harm. For more information go to <br> www.p65warnings.ca.gov |
| :--- | :--- |
| REACh Regulation | REACh Declaration |
| REACh free of SVHC | Yes |
| EU RoHS Directive | Compliant <br> EU RoHS Declaration |
| Mercury free | Yes |
| RoHS exemption information | Yes |
| China RoHS Regulation | China RoHS declaration |


in.
mm

## PowerFlex 525 AC Drive

PowerFlex 525 AC drives feature an innovative, modular design offering fast and easy installation and configuration. These cost-effective compact drives come with embedded EtherNet/IP ${ }^{T M}$ communications, safety, USB configuration and a high ambient operating temperature capability. PowerFlex 525 AC drives also provide a variety of motor control algorithms including volts per hertz, sensorless vector control and closed loop velocity vector control, making these drives ideal for a vast array of applications.


| PowerFlex 525 AC Drive at a glance |  |
| :---: | :---: |
| Ratings |  |
| $\begin{aligned} & 100 \ldots 120 \mathrm{~V}: \\ & 200 \ldots 20 \mathrm{~V}: \\ & 380 \ldots 40 \mathrm{~V}: \\ & 525 \ldots 60 \mathrm{~V}: \\ & \text { 32.: } \end{aligned}$ | $0.4 \ldots 1.1 \mathrm{~kW} / 0.5 \ldots 1.5 \mathrm{Hp} / 2.5 \ldots 6 \mathrm{~A}$ <br> $0.4 \ldots 15 \mathrm{~kW} / 0.5 \ldots 20 \mathrm{Hp} / 2.5 \ldots 62.1 \mathrm{~A}$ <br> $0.4 \ldots 22 \mathrm{~kW} / 0.5 \ldots 30 \mathrm{Hp} / 1.4 \ldots 43 \mathrm{~A}$ <br> $0.4 \ldots 22 \mathrm{~kW} / 0.5 \ldots 30 \mathrm{Hp} / 0.9 \ldots 32 \mathrm{~A}$ |
| Motor Control | - V/Hz Control <br> - Sensorless Vector Control <br> - Closed Loop Velocity Vector Control <br> - Permanent Magnet Motor Control ** |
| Enclosures | - IP20, NEMA/UL Type Open <br> - IP30, NEMA/UL Type 1 (with optional kit) |
| Safety | Safe Torque-Off PLd/SIL2 Cat 3 (meets ISO 13849-1) |
| Additional Features | - Modular design eases installation <br> - Operating temperatures from $-20^{\circ} \mathrm{C}\left(-4^{\circ} \mathrm{F}\right)$ up to $50^{\circ} \mathrm{C}\left(122^{\circ} \mathrm{F}\right)$. Up to $70^{\circ} \mathrm{C}\left(158^{\circ} \mathrm{F}\right)$ with current derating and optional control module fan kit. <br> - Embedded EtherNet/IP port <br> - Option for dual port EtherNet//P adapter which supports DLR functionality. DeviceNet and PROFFBUS DP adapters also available. <br> - Embedded Safe Torque-OffPLd/SIL2 Cat 3 <br> - LCD HIM with multi-language support <br> - MainsFree ${ }^{\text {™ }}$ Programming via USB <br> - Configure using Connected Components Workbench Software <br> - Add-on Profiles for Studio $5000^{\text {Tm }}$ Logix Designer Software <br> - Automatic Device Configuration <br> - Economizer motor control for energy savings <br> - Application specific parameter groups <br> - Simple positioning control with optional encoder card <br> - Conformal coating to IEC 607213 C2 standards |
| Certifications | - ACS 156 <br> - ATEX <br> - C-Tick <br> - c-UL,UL <br> - CE <br> - EPRI/SEMI F47 <br> - GOST-R <br> - KCC <br> - Lloyd's Register <br> - RoHS <br> - TÜV FS ISO/EN13849-1 (EN954-1) |
| Options | See pages 52... 56 |

## Additional Information

PowerFlex 520-Series Technical Data, publication 520-TD001
PowerFlex 520-Series User Manual, publication 520-UM001

## Catalog Number Explanation

25B
$-\underset{\substack{\text { Voltage } \\ \text { Raing }}}{\mathrm{D}} \underset{\substack{\text { Pating }}}{6 \mathrm{PO}} \frac{\mathrm{N}}{\substack{\text { Encosure }}}$ $1 \quad \underbrace{1}_{\substack{\text { Inemaleenc } \\ \text { filer } \\ 0=\text { No } \\ 1=\text { ves }}}$

## 4

## Product Selection

100...120V AC, Single-Phase Input, Three-Phase Output Drives, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size | Cat. No. |  |
| kW | Hp | kW | Hp | A |  |  | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 2.5 | A | 25B-V2P5N104 | - |
| 0.75 | 1 | 0.75 | 1 | 4.8 | B | 25B-V4P8N104 | - |
| 1.1 | 1.5 | 1.1 | 1.5 | 6 | B | 25B-V6PON104 | - |

200...240V AC, Single-Phase Input, Three-Phase Output Drives, 50/60 Hz

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter $\ddagger$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current |  |  | Cat. |
| kW | Hp | kW | Hp | A | Frame Size | Cat. No. |  |
| 0.4 | 0.5 | 0.4 | 0.5 | 2.5 | A | 25B-A2P5N104 | 25B-A2P5N114 |
| 0.75 | 1 | 0.75 | 1 | 4.8 | A | 25B-A4P8N104 | 25B-A4P8N114 |
| 1.5 | 2 | 1.5 | 2 | 8 | B | 25B-A8PON104 | 25B-A8PON114 |
| 2.2 | 3 | 2.2 | 3 | 11 | B | 25B-A011N104 | 25B-A011N114 |

$\ddagger \quad$ This filter is suitable for use with cable lengths up to 10 meters ( 32.8 feet) for $C 2$ spec and 20 meters ( 65.6 feet) for C3 spec.
200...240V AC, Three-Phase, 50/60 Hz

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size | Cat. No. |  |
| kW | Hp | kW | Hp | A |  |  | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 2.5 | A | 25B-B2P5N104 | - |
| 0.75 | 1 | 0.75 | 1 | 5 | A | 25B-B5PON104 | - |
| 1.5 | 2 | 1.5 | 2 | 8 | A | 25B-B8PON104 | - |
| 2.2 | 3 | 2.2 | 3 | 11 | A | 25B-B011N104 | - |
| 4 | 5 | 4 | 5 | 17.5 | B | 25B-B017N104 | - |
| 5.5 | 7.5 | 5.5 | 7.5 | 24 | C | 25B-B024N104 | - |
| 7.5 | 10 | 7.5 | 10 | 32.2 | D | 25B-B032N104 | - |
| 11 | 15 | 11 | 15 | 48.3 | E | 25B-B048N104 | - |
| 15 | 20 | 11 | 15 | 62.1 | E | 25B-B062N104 | - |

380...480V AC, Three-Phase, $50 / 60 \mathrm{~Hz}$

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter $\ddagger$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size | Cat. No. | Cat. No. |
| kW | Hp | kW | Hp | A |  |  |  |
| 0.4 | 0.5 | 0.4 | 0.5 | 1.4 | A | 25B-D1P4N104 | 25B-D1P4N114 |
| 0.75 | 1 | 0.75 | , | 2.3 | A | 25B-D2P3N104 | 25B-D2P3N114 |
| 1.5 | 2 | 1.5 | 2 | 4 | A | 25B-D4PON104 | 25B-D4PON114 |
| 2.2 | 3 | 2.2 | 3 | 6 | A | 25B-D6PON104 | 25B-D6PON114 |
| 4 | 5 | 4 | 5 | 10.5 | B | 25B-D010N104 | 25B-D010N114 |
| 5.5 | 7.5 | 5.5 | 7.5 | 13 | C | 25B-D013N104 | 25B-D013N114 |
| 7.5 | 10 | 7.5 | 10 | 17 | C | 25B-D017N104 | 25B-D017N114 |
| 11 | 15 | 11 | 15 | 24 | D | 25B-D024N104 | 25B-D024N114 |
| 15 | 20 | 11 | 15 | 30 | D | 25B-D030N104 | 25B-D030N114 |
| 18.5 | 25 | 15 | 20 | 37 | E | 25B-D037N114§ | 25B-D037N114 |
| 22 | 30 | 18.5 | 25 | 43 | E | 25B-D043N114§ | 25B-D043N114 |

[^20]525...600V AC, Three-Phase, 50/60 Hz

| Drive Ratings |  |  |  |  |  | No Filter | with Integral EMC Filter |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Normal Duty |  | Heavy Duty |  | Output Current | Frame Size | Cat. No. |  |
| kW | Hp | kW | Hp | A |  |  | Cat. No. |
| 0.4 | 0.5 | 0.4 | 0.5 | 0.9 | A | 25B-EOP9N104 | - |
| 0.75 | 1 | 0.75 | 1 | 1.7 | A | 25B-E1P7N104 | - |
| 1.5 | 2 | 1.5 | 2 | 3 | A | 25B-E3PON104 | - |
| 2.2 | 3 | 2.2 | 3 | 4.2 | A | 25B-E4P2N104 | - |
| 4 | 5 | 4 | 5 | 6.6 | B | 25B-E6P6N104 | - |
| 5.5 | 7.5 | 5.5 | 7.5 | 9.9 | C | 25B-E9P9N104 | - |
| 7.5 | 10 | 7.5 | 10 | 12 | C | 25B-E012N104 | - |
| 11 | 15 | 11 | 15 | 19 | D | 25B-E019N104 | - |
| 15 | 20 | 11 | 15 | 22 | D | 25B-E022N104 | - |
| 18.5 | 25 | 15 | 20 | 27 | E | 25B-E027N104 | - |
| 22 | 30 | 18.5 | 25 | 32 | E | 25B-E032N104 | - |

## Approximate Dimensions and Weights

Dimensions are in mm (in.) - weights are in kg (lb)
IP20, NEMA/UL Type Open

| Frame | $\mathbf{H}$ | W | $\boldsymbol{D}$ | Weight |
| :---: | :---: | :---: | :---: | :---: |
| A | $152.0(5.98)$ | $72.0(2.83)$ | $172.0(6.77)$ | $1.10(2.4)$ |
| B | $180.0(7.08)$ | $87.0(3.42)$ | $172.0(6.77)$ | $1.60(3.5)$ |
| C | $220.0(8.66)$ | $109.0(4.29)$ | $184.0(7.24)$ | $2.30(5.1)$ |
| D | $260.0(10.23)$ | $130.0(5.11)$ | $212.0(8.34)$ | $3.20(7.1)$ |
| E | $300.0(11.81)$ | $185.0(7.28)$ | $279.0(10.98)$ | $12.90(28.4)$ |



## Low-Peak" LP-CC Class CC 600Vac/300Vdc, 1/2-30A time-delay fuses



## Catalog symbol:

- LP-CC-(amp)


## Description:

Ultimate protection Class CC current-limiting, timedelay fuses. Time-delay - 12 seconds (minimum) at $200 \%$ of rated current.

## Specifications:

## Ratings

- Volts
- 600Vac,
- $300 \mathrm{Vdc}(1 / 2-2-8 / 10 \mathrm{~A}, 20-30 \mathrm{~A})$
- $150 \mathrm{Vdc}(3-15 \mathrm{~A})$
- Amps 1/2-30A
- IR
- 200kA Vac RMS Sym.
- 20kA Vdc


## Agency information

- UL ${ }^{\oplus}$ Listed Class CC, Std. 248-4, Guide JDDZ, File E4273
- CSA ${ }^{\oplus}$ Certified; Class 1422-02, File 53787
- CE
- RoHS compliant (20-30A)


## Et $\mathrm{T} \cdot \mathrm{N}$

Powering Business Worldwide

| Catalog numbers (amps) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| LP-CC-1/2 | LP-CC-1-1/2 | LP-CC-3 | LP-CC-6 | LP-CC-12 |  |
| LP-CC-6/10 | LP-CC-1-6/10 | LP-CC-3-2/10 | LP-CC-6-1/4 | LP-CC-15 |  |
| LP-CC-8/10 | LP-CC-1-8/10 | LP-CC-3-1/2 | LP-CC-7 | LP-CC-20 |  |
| LP-CC-1 | LP-CC-2 | LP-CC-4 | LP-CC-7-1/2 | LP-CC-25 |  |
| LP-CC-1-1/8 | LP-CC-2-1/4 | LP-CC-4-1/2 | LP-CC-8 | LP-CC-30 |  |
| LP-CC-1-1/4 | LP-CC-2-1/2 | LP-CC-5 | LP-CC-9 |  |  |
| LP-CC-1-4/10 | LP-CC-2-8/10 | LP-CC-5-6/10 | LP-CC-10 |  |  |

## Carton quantity:

| Amp rating | Carton qty. |
| :--- | :--- |
| $1 / 4-30$ | 10 |

## Dimensions - in (mm)



## Features:

- 200kA interrupting rating complies with NEC ${ }^{\oplus}$ Section 110.9 for today's large capacity systems.
- Fast short-circuit protection and dual-element, time-delay performance provide ultimate protection.
- Reduces existing fuse inventory by up to $33 \%$ when upgrading to Low-Peak fuses.
- Consistent 2:1 ampacity ratios for all Low-Peak fuses make selective coordination easy.
- Time-delay characteristic avoids unwanted fuse openings from surge currents while fast response speed under short-circuit conditions provides a high degree of current limitation.
- Current-limitation protects downstream components against damaging thermal and magnetic effects of short-circuit currents.
- A superior, all-purpose, space-saving branch circuit fuse that meets most protection requirements up to 30A.
- Very compact, with a physical size only 1332 " $x$ $11 / 2^{\prime \prime}(10.3 \times 38.1 \mathrm{~mm})$ with rejction tip.
- Proper sizing can provide "no damage" Type 2 coordinated protection for NEMA and IEC motor controllers.
- Can be used where either a time-delay or a fast-acting fuse is needed, making selection easier and reducing spare fuse inventories for substantial cost reduction.
- Superior protection for small horsepower motor circuits.


## Recommended fuse blocks and holders:

| Fuse amps | 1-Pole | 2-Pole | 3-Pole |
| :---: | :---: | :---: | :---: |
| Modular open blocks |  |  |  |
| 0-30 | BCM603-1_ | BCM603-2_ | BCM603-3_ |
| DIN-Rail holders |  |  |  |
|  | CHCC1D_ | CHCC2D_ | CHCC3D_ |
| 0-30 | - | - | OPM-NG-_ |
|  | - | - | OPM-1038_ |
|  | - | - | OPM-1038_SW |
| Panel mount holders |  |  |  |
| 0-30 | HPS | - | - |
|  | HPF | - | - |
| In-line holders |  |  |  |
| 0-30 | - | HEY | - |
|  | HEZ | - | - |

For additional information on Class CC fuse blocks and holders, see data sheets:

- Modular open blocks \# 10241 (BCM)
- DIN-Rail holders No. 3185 (CHCC), No. 1109 (OPM), No. 1102 (OPM-1038), No. 1103 (OPM-1038_SW)
- Panel mount holders No. 2113 (HPS), No. 2114 (HPF)
- In-line holders No. 2126 (HEY), No. 2130 (HEZ)

Time-current curves - average melt:


## Current-limitation curves:



Current-limiting effects:

|  | Let-through current <br> (apparent RMS symmetrical vs. fuse rating) |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Prospective <br> S.C.C. | $\mathbf{1 1 / 4 A}$ | $\mathbf{2 ~ 8 / 1 0 A}$ | $\mathbf{1 5 A}$ | $\mathbf{2 0 A}$ | $\mathbf{2 5 A}$ | $\mathbf{3 0 A}$ |
| $\mathbf{1 0 0 0}$ | 100 | 135 | 240 | 305 | 380 | 435 |
| 3000 | 140 | 210 | 350 | 440 | 575 | 580 |
| 5000 | 165 | 255 | 420 | 570 | 690 | 710 |
| 10,000 | 210 | 340 | 540 | 700 | 870 | 1000 |
| 20,000 | 260 | 435 | 680 | 870 | 1090 | 1305 |
| 30,000 | 290 | 525 | 800 | 1030 | 1300 | 1520 |
| 40,000 | 315 | 610 | 870 | 1150 | 1390 | 1700 |
| 50,000 | 340 | 650 | 915 | 1215 | 1520 | 1820 |
| 60,000 | 350 | 735 | 1050 | 1300 | 1650 | 1980 |
| 80,000 | 390 | 785 | 1130 | 1500 | 1780 | 2180 |
| 100,000 | 420 | 830 | 1210 | 1600 | 2000 | 2400 |
| 200,000 | 525 | 1100 | 1600 | 2000 | 2520 | 3050 |

NOTE: To calculate $I_{p}\left(I_{\text {peak }}\right)$ multiply $I_{\text {RMS }}$ value by 2.3.

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## Eaton

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[^21]
### 9.0 Field Component Cutsheets

## Separation

## SCREW PRESS FIELD COMPONENTS CUTSHEETS

$N C \approx \omega_{\mathrm{T}}^{\mathrm{I}} \mathrm{m}$
NO $\triangle \leftrightarrow M$
Brass or Stainless Steel Bodies 3/8" to $21 / 2^{\prime \prime}$ NPT

## Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage.
- High Flow Valves for liquid, corrosive, and air/inert gas service.
- Industrial applications include:
- Car wash
- Laundry equipment
- Air compressors
- Industrial water control
- Pumps

Construction

| Valve Parts in Contact with Fluids |  |  |
| :--- | :---: | :---: |
| Body | Brass | 304 Stainless Steel |
| Seals and Discs | NBR or PTFE |  |
| Disc-Holder | PA |  |
| Core Tube | 305 Stainless Steel |  |
| Core and Plugnut | 430F Stainless Steel |  |
| Springs | 302 Stainless Steel |  |
| Shading Coil | Copper |  |

## Electrical

|  | Watt Rating and <br> Power Consumption |  |  |  |  | Spare Coil Part Number |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Standard <br> Coil and <br> Class of <br> Insulation | DC <br> Watts | Watts | VA <br> Holding | VA <br> Inrush | AC | DC | AC | DC |  |
| F |  | 6.1 | 16 | 40 | 238210 | - | 238214 | - |  |
| F |  | 10.1 | 25 | 70 | 238610 | 238710 | 238614 | 238714 |  |
| F | 16.8 | 16.1 | 35 | 180 | 272610 | 97617 | 272614 | 97617 |  |
| F | - | 17.1 | 40 | 93 | 238610 | - | 238614 | - |  |
| F | - | 20 | 43 | 240 | 99257 | - | 99257 | - |  |
| F | - | 20.1 | 48 | 240 | 272610 | - | 272614 | - |  |
| H | 30.6 | - | - | - | - | 74073 | - | 74073 |  |
| F | 40.6 | - | - | - | - | 238910 |  | 238914 |  |

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz ). $6,12,24,120,240$ volts DC. Must be specified when ordering. Other voltages available when required.

## Solenoid Enclosures

Standard: Red-Hat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; Red-Hat - Type I.
Optional: Red-Hat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, $4 X, 7$, and 9 .
(To order, add prefix "EF" to catalog number, except Catalog
Numbers 8210B57, 8210B58, and 8210B59. Valves not available with
Explosionproof enclosures.)


## Nominal Ambient Temperature Ranges:

Red-Hat II/
Red-Hat AC: $32^{\circ} \mathrm{F}$ to $125^{\circ} \mathrm{F}\left(0^{\circ} \mathrm{C}\right.$ to $\left.52^{\circ} \mathrm{C}\right)$
Red-Hat II DC: $32^{\circ} \mathrm{F}$ to $104^{\circ} \mathrm{F}\left(0^{\circ} \mathrm{C}\right.$ to $\left.40^{\circ} \mathrm{C}\right)$
Red-Hat DC: $32^{\circ} \mathrm{F}$ to $77^{\circ} \mathrm{F}\left(0^{\circ} \mathrm{C}\right.$ to $\left.25^{\circ} \mathrm{C}\right)$
( $104^{\circ} \mathrm{F} / 40^{\circ} \mathrm{C}$ occasionally)

## Approvals:

CSA certified. Red-Hat II meets applicable CE directives.

## SERIES

8210

Specifications (English units)

| Pipe Size | Orifice Size (ins.) | Cv Flow Factor | Operating Pressure Differential (psi) |  |  |  |  |  |  | Max. Fluid Temp. ${ }^{\circ} \mathrm{F}$ |  | Brass Body |  |  | Stainless Steel Body |  |  | Watt Rating/ Class of Coil Insulation (7) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Max. AC |  |  | Max. DC |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | Min. | AirInert Gas | Water | $\begin{aligned} & \text { Light Oil } \\ & \text { @ 300 } \end{aligned}$ | AirInert Gas | Water | $\begin{aligned} & \text { Light Oil } \\ & \text { @ 300 } \end{aligned}$ | AC | DC | Catalog Number | Constr. Ref. No. (4) | UL (5) Listing | Catalog Number | Constr. Ref. No. (4) | UL (5) Listing | AC | DC |

NORMALLY CLOSED (Closed when de-energized), NBR or PTFE (2) Seating

| 3/8 | 3/8 | 1.5 | (1) | 150 | 125 | - | 40 | 40 | - | 180 | 150 | 8210G73 (3) | 1 P | $\bullet$ | 8210G36 (3) | 1P | $\bullet$ | 6.1/F | 11.6/F |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3/8 | 5/8 | 3 | 0 | 150 | 150 | - | 40 | 40 | - | 180 | 150 | 8210G93 | 5D | $\bigcirc$ | - | - | - | 10.1/F | 11.6/F |
| 3/8 | 5/8 | 3 | 5 | 200 | 150 | 135 | 125 | 100 | 100 | 180 | 150 | 8210G1 | 6D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 3/8 | 5/8 | 3 | 5 | 300 | 300 | 300 | - | - | - | 175 | - | 8210G6 | 5D | $\bigcirc$ | - | - | - | 17.1/F | - |
| 1/2 | 7/16 | 2.2 | (1) | 150 | 125 | - | 40 | 40 | - | 180 | 150 | 8210G15 (3) | 2 P | $\bullet$ | 8210G37 (3) | 2P | $\bullet$ | 6.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 0 | 150 | 150 | - | 40 | 40 | - | 180 | 150 | 8210G94 | 5D | $\bigcirc$ | - | - | - | 10.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 0 | 150 | 150 | 125 | 40 | 40 | - | 175 | 150 | - | - | - | 8210G87 | 7D | $\bullet$ | 17.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 5 | 200 | 150 | 135 | 125 | 100 | 100 | 180 | 150 | 8210G2 | 6D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 5 | 300 | 300 | 300 | - | - | - | 175 | - | 8210G7 | 5D | $\bigcirc$ | - | - | - | 17.1/F | - |
| 1/2 | 5/8 | 4 | 5 | 300 | 300 | - | 300 | 300 | - | 180 | 125 | 8210G227 | 5D | $\bigcirc$ | - | - | - | 17.1/F | 40.6/H |
| 3/4 | 5/8 | 4.5 | 0 | 150 | 150 | 125 | 40 | 40 | - | 175 | 150 | - | - | - | 8210G88 | 7D | $\bullet$ | 17.1/F | 11.6/F |
| 3/4 | 3/4 | 5 | 5 | 125 | 125 | 125 | 100 | 90 | 75 | 180 | 150 | 8210G9 | 9D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 3/4 | 3/4 | 5 | 0 | 150 | 150 | - | 40 | 40 | - | 180 | 150 | 8210G95 | 8D | $\bigcirc$ | - | - | - | 10.1/F | 11.6/F |
| 3/4 | 3/4 | 6.5 | 5 | 250 | 150 | 100 | 125 | 125 | 125 | 180 | 150 | 8210G3 | 11D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 3/4 | 3/4 | 6 | 0 | - | - | - | 200 | 180 | 180 | - | 77 | 8210B26 (2) $\ddagger$ | 10P | - | - | - | - | - | 30.6/H |
| 3/4 | 3/4 | 6 | 0 | 350 | 300 | 200 | - | - | - | 200 | - | 8210G26 (2) $\ddagger$ | 40P | $\bullet$ | - | - | - | 16.1F | - |
| 1 | 1 | 13 | 0 | - | - | - | 100 | 100 | 80 | - | 77 | 8210B54 $\ddagger$ | 31D | - | 8210D89 | 15D | - | - | 30.6/H |
| 1 | 1 | 13 | 0 | 150 | 125 | 125 | - | - | - | 180 | - | 8210G54 | 41D | $\bullet$ | 8210G89 | 45D | $\bullet$ | 16.1/F | - |
| 1 | 1 | 13 | 5 | 150 | 150 | 100 | 125 | 125 | 125 | 180 | 150 | 8210G4 | 12D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 1 | 1 | 13.5 | 0 | 300 | 225 | 115 | - | - | - | 200 | - | 8210G27 $\ddagger$ | 42P | $\bullet$ | - | - | - | 20.1/F | - |
| 1 | 1 | 13.5 | 10 | 300 | 300 | 300 | - | - | - | 175 | - | 8210G78 | 3 P | - | - | - | - | 17.1/F | - |
| 11/4 | 11/8 | 15 | 0 | - | - | - | 100 | 100 | 80 | - | 77 | 8210B55 $\ddagger$ | 32D | - | - | - | - | - | 30.6/H |
| 11/4 | 11/8 | 15 | 0 | 150 | 125 | 125 | - | - | - | 180 | - | 8210G55 | 43D | $\bullet$ | - | - | - | 16.1/F | - |
| 11/4 | 11/8 | 15 | 5 | 150 | 150 | 100 | 125 | 125 | 125 | 180 | 150 | 8210G8 | 16D | $\bigcirc$ | - | - | - | 6.1/F | 11.6/F |
| 11/2 | 11/4 | 22.5 | 0 | - | - | - | 100 | 100 | 80 | - | 77 | 8210B56 $\ddagger$ | 33D | - | - | - | - | - | 30.6/H |
| 11/2 | 11/4 | 22.5 | 0 | 150 | 125 | 125 | - | - | - | 180 | - | 8210G56 $\ddagger$ | 44D | $\bullet$ | - | - | - | 16.1/F | - |
| 11/2 | 11/4 | 22.5 | 5 | 150 | 150 | 100 | 125 | 125 | 125 | 180 | 150 | 8210G22 | 18D | $\bullet$ | - | - | - | 6.1/F | 11.6/F |
| 2 | 13/4 | 43 | 5 | 150 | 125 | 90 | 50 | 50 | 50 | 180 | 150 | 8210G100 | 20P | $\bullet$ | - | - | - | 6.1/F | 11.6/F |
| $21 / 2$ | 13/4 | 45 | 5 | 150 | 125 | 90 | 50 | 50 | 50 | 180 | 150 | 8210G101 | 21P | $\bullet$ | - | - | - | 6.1/F | 11.6/F |

NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)

| 3/8 | 5/8 | 3 | 0 | 150 | 150 | 125 | 125 | 125 | 80 | 180 | 150 | 8210G33 | 23D | $\bullet$ | - | - | - | 10.1/F | 11.6/F |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3/8 | 5/8 | 3 | 5 | 250 | 200 | 200 | 250 | 200 | 200 | 180 | 180 | 8210G11 (8) (9) | 39D | $\bullet$ | - | - | - | 10.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 0 | 150 | 150 | 125 | 125 | 125 | 80 | 180 | 150 | 8210G34 | 23D | $\bullet$ | - | - | - | 10.1/F | 11.6/F |
| 1/2 | 5/8 | 3 | 0 | 150 | 150 | 100 | 125 | 125 | 80 | 180 | 150 | - | - | - | 8210G30 | 37D | $\bullet$ | 10.1/F | 11.6/F |
| 1/2 | 5/8 | 4 | 5 | 250 | 200 | 200 | 250 | 200 | 200 | 180 | 180 | 8210G12 (8) (9) | 39D | $\bullet$ | - | - | - | 10.1/F | 11.6/F |
| 3/4 | 3/4 | 5.5 | 0 | 150 | 150 | 125 | 125 | 125 | 80 | 180 | 150 | 8210G35 | 25D | $\bullet$ | - | - | - | 10.1/F | 11.6/F |
| 3/4 | 5/8 | 3 | 0 | 150 | 150 | 100 | 125 | 125 | 80 | 180 | 150 | - | - | - | 8210G38 | 38D | $\bullet$ | 10.1/F | 11.6/F |
| 3/4 | 3/4 | 6.5 | 5 | - | - | - | 250 | 200 | 200 | - | 180 | 8210C13 | 24D | $\bullet$ | - | - | - | - | 16.8/F |
| 3/4 | 3/4 | 6.5 | 5 | 250 | 200 | 200 | - | - | - | 180 | - | 8210G13 | 46D | $\bullet$ | - | - | - | 16.1/F | - |
| 1 | 1 | 13 | 0 | 125 | 125 | 125 | - | - | - | 180 | - | 8210B57 (6) (10) | 34D | $\bullet$ | - | - | - | 20/F | - |
| 1 | 1 | 13 | 5 | - | - | - | 125 | 125 | 125 | - | 180 | 8210D14 | 26D | $\bullet$ | - | - | - | - | 16.8/F |
| 1 | 1 | 13 | 5 | 150 | 150 | 125 | - | - | - | 180 | - | 8210G14 | 47D | $\bullet$ | - | - | - | 16.1/F | - |
| 11/4 | 11/8 | 15 | 0 | 125 | 125 | 125 | - | - | - | 180 | - | 8210B58 (6) (10) | 35D | $\bullet$ | - | - | - | 20/F | - |
| 11/4 | $11 / 8$ | 15 | 5 | - | - | - | 125 | 125 | 125 | - | 180 | 8210D18 | 28D | $\bullet$ | - | - | - | - | 16.8/F |
| 11/4 | $11 / 8$ | 15 | 5 | 150 | 150 | 125 | - | - | - | 180 | - | 8210G18 | 48D | $\bullet$ | - | - | - | 16.1/F | - |
| 11/2 | 11/4 | 22.5 | 0 | 125 | 125 | 125 | - | - | - | 180 | - | 8210B59 (6) (10) | 36D | $\bullet$ | - | - | - | 20/F | - |
| 11/2 | 11/4 | 22.5 | 5 | - | - | - | 125 | 125 | 125 | - | 180 | 8210D32 | 29D | $\bullet$ | - | - | - | - | 16.8/F |
| 11/2 | 11/4 | 22.5 | 5 | 150 | 150 | 125 | - | - | - | 180 | - | 8210G32 | 49D | $\bullet$ | - | - | - | 16.1/F | - |
| 2 | 13/4 | 43 | 5 | - | - | - | 125 | 125 | 125 | - | 150 | 8210103 | 30P | $\bullet$ | - | - | - | - | 16.8/F |
| 2 | $13 / 4$ | 43 | 5 | 125 | 125 | 125 | - | - | - | 180 | - | 8210G103 | 50P | $\bullet$ | - | - | - | 16.1/F | - |
| $21 / 2$ | 13/4 | 45 | 5 | - | - | - | 125 | 125 | 125 | - | 150 | 8210104 | 27P | $\bullet$ | - | - | - | - | 16.8/F |
| $21 / 2$ | 13/4 | 45 | 5 | 125 | 125 | 125 | - | - | - | 180 | - | 8210G104 | 51P | $\bullet$ | - |  |  | 16.1/F | - |

Notes: (1) 5 psi on Air; 1 psi on Water.

[^22] Refer to Engineering Section (Approvals) for details.

[^23]

TECHNICAL INFORMATION

| MODEL | DESCRIPTION |
| :---: | :---: |
| RS-1 | One SP/DT micro switch (1)LSTED (10. |
| RS-2 | Two SP/DT micro switches (L)USTED (1/8 |
| RS-2L | Two SP/DT micro switches with external signal light includes 110 V lamp |
| RS-1X | Explosion proof with one SP/DT micro switch for NEMA 7 and 9 |
| RS-2X | Explosion proof with two SP/DT micro switches for NEMA 7 and 9 |
| $\begin{aligned} & \text { RSB-1 } \\ & \text { RSB-2 } \end{aligned}$ | One SP/DT switch w/cable break detection (U) LSTED Two SP/DT switches w/cable break detection |
| $\begin{aligned} & \hline \text { RSB-1X } \\ & \text { RSB-2X } \end{aligned}$ | Explosion proof, 1 SP/DT \& cable break detection Explosion proof, 2 SP/DT \& cable break detection |

Standard Construction - rubber gaskets seal unit for outside applications listed by Underwriter Laboratories for for NEMA 4 dust-tight and raintight construction. Applies to units RS-1, RS-2, and RS-2L.
Housing - aluminum or cast iron. Epoxy coating available.
Conduit Opening - $3 / 4^{\prime \prime}$ NPT standard. $1^{\prime \prime}$ NPT optional.
Standard units have three conduit openings, explosion proof have one at the bottom.
Actuating Arm - Red epoxy coated steel handle with stainless steel shaft.
Internal Cam and Wear Plate - hardened steel.
External Hardware - stainless steel
Switches - SP/DT micro switches. Rated $2 Q$ amp at 125, 250 or 480V AC. Switches may be wired for single throw operation, either normally open or normally closed as required. DP/DT micro switches also available.

## INSTALLATION INSTRUCTIONS

1. The controls should be mounted on a flat surface using the three mounting holes on the bottom half of the housing. The holes are designed for $3 / 8^{\prime \prime}$ bolts.
2. Each switch can cover a maximum of 200 of conveyor 100 ' in each direction. Safety considerations dictate that not more than 100' of cable be attached on each side. More cable might result in too much slack, delaying actuation.
3. The eyebolts supporting the cable should be placed at intervals from $8-10^{\prime}$. Care must be taken that the cable does not become too slack. However, if the cable is too tight, false actuation of the switch might occur.
4. The Model RS control is designed for pilot duty. The control circuit should be wired through the motor starter circuit of the conveyor or other equipment to be controlled. Do not wire the unit directly into a heavy duty motor circuit.
5. The unit should be tested after installation by actuation of the cable. The protected equipment should stop and alarms should sound as required with a minimum of effort on the cable. Cable tension can be adjusted if necessary by changing the location of the cable on the handle.


## OPTIONAL CABLE AND FITTINGS


conduit plug
$3 / 4^{n}$ metal, socket head conduit plug.

Instrument Data Sheet

| General | 1 | Product | Safety Stop Switch / Pull Cord Switch |
| :---: | :---: | :---: | :---: |
|  | 2 | Model Number | RS-5 |
|  | 3 | Manufacturer | Conveyor Components Company |
|  | 4 |  |  |
| Environment | 5 | Certified Ambient Temperature Rating | $40^{\circ} \mathrm{C}$ [104 $\left.{ }^{\circ} \mathrm{F}\right]$ |
|  | 6 | Functional Ambient Temperature | -50 to $40^{\circ} \mathrm{C}$ [-58 to $104^{\circ} \mathrm{F}$ ] (increased actuation force may be required below $\left.-30^{\circ} \mathrm{C}\left[-22^{\circ} \mathrm{F}\right]\right)$ |
|  | 7 | Enclosure Material | 319 cast aluminum |
|  | 8 | Enclosure Rating (UL) | NEMA Type 1, 3, 3R, 4, 4X |
|  | 9 | Enclosure Rating (CSA) | NEMA Type 3, 4, 4X |
|  | 10 | Mounting | 3 holes at $\emptyset^{13} / 32^{\prime \prime}$ [10 mm] (Vertical surface mounting standard, bracket available for horizontal surfaces) |
|  | 11 |  |  |
| Switch | 12 | Switch Type | DPDT $\times 2$ |
|  | 13 | Contact Type | Dry contact |
|  | 14 | Contact Rating | 15A @ 125V or 250 V AC; $3 / 4 \mathrm{hp}$ @ 125V AC; $11 / 2 \mathrm{hp}$ @ 250V AC |
|  | 15 | Electrical Action | Latching (via actuator) |
|  | 16 | Electrical Connection | $3 / 4$ NPT x 3 |
|  | 17 | Indicating Lamp | None |
|  | 18 |  |  |
|  | 19 |  |  |
| Actuator | 20 | Type | Pull cord switch |
|  | 21 | Cable Length | Maximum 100' [ 30.5 m ] on each side of the unit (maximum 200' [61 m] total) |
|  | 22 | Cable Material | $\emptyset^{3} / 32^{\prime \prime}$ [2 mm] 7x7 galvanized aircraft cable: orange vinyl or nylon coated to $\emptyset^{3} / 16^{\prime \prime}$ [5 mm] OD |
|  | 23 | Mechanism | Lever with rotating cam |
|  | 24 | Non-activated Position | Rotated fully clockwise |
|  | 25 | Activated Position | Rotated fully counter-clockwise |
|  | 26 | Range of Travel | $60^{\circ}$ counter-clockwise from non-activated position |
|  | 27 | Action | Latching (To reset, push lever inward and rotate clockwise) |
|  | 28 | Actuation Force | Field adjustable |
|  | 29 |  |  |
| Options | 30 | Finish | Uncoated (standard) or epoxy coating (option E) |
| Accessories | 31 | Safety Cable | Orange vinyl (RS-25) or nylon (RS-26) coated cable available |
|  | 32 | Cable Support Eye Bolt | RS-27: $1^{\prime \prime}$ eye $\times 6^{\prime \prime}$ [150 mm] long, two nuts and lockwasher included |
|  | 33 | Cable End Fitting | RS-28 |
|  | 34 | Conduit Plug | RS 29: 3/4" metal conduit plug; square head |
|  | 35 | Mounting Bracket | RS-30 available for horizontal surface mount |
|  | 36 |  |  |
| Certifications | 37 | UL Certification File | NMFT.E83971 |
|  | 38 | CSA Certification File | 71174 |
|  | 39 |  |  |
| Manufacturer | 40 |  | Conveyor Components Company Division of Material Control, Inc. 130 Seltzer Road, PO Box 167 Croswell, MI 48422 USA (810) 679-4211 info@conveyorcomponents.com www.conveyorcomponents.com |
| Notes: 1. Cable must be supported with eyebolts. Maximum spacing: $10^{\prime}[3 \mathrm{~m}]$. <br> 2. Maximum of $100^{\prime}$ [ 30.5 m ] of cable may be attached to each side of the unit; $200^{\prime}$ [ 61 m ] total. |  |  |  |



G-450
Red-U-Bolte, Clip Crosby Clips, all sizes $1 / 4^{\prime \prime}$ and larger, meet the performance requirements of Federal Specification FF-C-450 TYPE 1 CLASS 1 , except for those provisions required of the contractor. For additional information, see page 452

- Each base has a Product Identification Code (PIC) for material traceability, the name CROSBY or CG, and a size forged into it.
- Based on the catalog breaking strength of wire rope, Crosby wire rope clips have an efficiency rating of $80 \%$ for $1 / 8^{\prime \prime}-7 / 8^{\prime \prime}$ sizes, and $90 \%$ for sizes $1^{\prime \prime}$ through $3-1 / 2^{\prime \prime}$.
- Entire Clip is Galvanized to resist corrosive and rusting action.
- Sizes $1 / 8^{\prime \prime}$ through $2-1 / 2^{\prime \prime}$ and $3^{\prime \prime}$ have forged bases.
- All Clips are individually bagged or tagged with proper application instructions and warning information.
- Clip sizes up through 1-1/2" have rolled threads.
- Meets or exceeds all requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. Importantly, these wire rope clips meet other critical performance requirements including fatigue life, impact properties and material traceability, not addressed by ASME B30.26.
- Look for the Red-U-Bolt ${ }^{\circledR}$, your assurance of Genuine Crosby Clips.


G-450 Crosby Clips


| Rope Size |  | G-450 <br> Stock No. | Std. Package Qty. | Weight <br> Per 100 <br> (lbs.) | Dimensions (in.) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (in.) | (mm) |  |  |  | A | B | C | D | E | F | G | H |
| 1/8 | 3-4* | 1010015 | 100 | 6 | . 22 | . 72 | . 44 | . 47 | . 37 | . 38 | . 81 | . 99 |
| 3/16* | 5* | 1010033 | 100 | 10 | . 25 | . 97 | . 56 | . 59 | . 50 | . 44 | . 94 | 1.18 |
| 1/4 | 6-7 | 1010051 | 100 | 19 | . 31 | 1.03 | . 50 | . 75 | . 66 | . 56 | 1.19 | 1.43 |
| 5/16 | 8 | 1010079 | 100 | 28 | . 38 | 1.38 | . 75 | . 88 | . 73 | . 69 | 1.31 | 1.66 |
| 3/8 | 9-10 | 1010097 | 100 | 48 | . 44 | 1.50 | . 75 | 1.00 | . 91 | . 75 | 1.63 | 1.94 |
| 7/16 | 11 | 1010113 | 50 | 78 | . 50 | 1.88 | 1.00 | 1.19 | 1.13 | . 88 | 1.91 | 2.28 |
| 1/2 | 12-13 | 1010131 | 50 | 80 | . 50 | 1.88 | 1.00 | 1.19 | 1.13 | . 88 | 1.91 | 2.28 |
| 9/16 | 14-15 | 1010159 | 50 | 109 | . 56 | 2.25 | 1.25 | 1.31 | 1.34 | . 94 | 2.06 | 2.50 |
| 5/8 | 16 | 1010177 | 50 | 110 | . 56 | 2.25 | 1.25 | 1.31 | 1.34 | . 94 | 2.06 | 2.50 |
| 3/4 | 18-20 | 1010195 | 25 | 142 | . 62 | 2.75 | 1.44 | 1.50 | 1.39 | 1.06 | 2.25 | 2.84 |
| 7/8 | 22 | 1010211 | 25 | 212 | . 75 | 3.12 | 1.62 | 1.75 | 1.58 | 1.25 | 2.44 | 3.16 |
| 1 | 24-26 | 1010239 | 10 | 252 | . 75 | 3.50 | 1.81 | 1.88 | 1.77 | 1.25 | 2.63 | 3.47 |
| 1-1/8 | 28-30 | 1010257 | 10 | 283 | . 75 | 3.88 | 2.00 | 2.00 | 1.91 | 1.25 | 2.81 | 3.59 |
| 1-1/4 | 32-34 | 1010275 | 10 | 438 | . 88 | 4.44 | 2.22 | 2.34 | 2.17 | 1.44 | 3.13 | 4.13 |
| 1-3/8 | 36 | 1010293 | 10 | 442 | . 88 | 4.44 | 2.22 | 2.34 | 2.31 | 1.44 | 3.13 | 4.19 |
| 1-1/2 | 38 | 1010319 | 10 | 544 | . 88 | 4.94 | 2.38 | 2.59 | 2.44 | 1.44 | 3.41 | 4.44 |
| 1-5/8 | 41-42 | 1010337 | Bulk | 704 | 1.00 | 5.31 | 2.62 | 2.75 | 2.66 | 1.63 | 3.63 | 4.75 |
| 1-3/4 | 44-46 | 1010355 | Bulk | 934 | 1.13 | 5.75 | 2.75 | 3.06 | 2.92 | 1.81 | 3.81 | 5.24 |
| 2 | 48-52 | 1010373 | Bulk | 1300 | 1.25 | 6.44 | 3.00 | 3.38 | 3.03 | 2.00 | 4.44 | 5.88 |
| 2-1/4 | 56-58 | 1010391 | Bulk | 1600 | 1.25 | 7.13 | 3.19 | 3.88 | 3.19 | 2.00 | 4.56 | 6.38 |
| 2-1/2 | 62-65 | 1010417 | Bulk | 1900 | 1.25 | 7.69 | 3.44 | 4.13 | 3.69 | 2.00 | 4.69 | 6.63 |
| ** 2-3/4 | ** 68-72 | 1010435 | Bulk | 2300 | 1.25 | 8.31 | 3.56 | 4.38 | 4.88 | 2.00 | 5.00 | 6.88 |
| 3 | 75-78 | 1010453 | Bulk | 3100 | 1.50 | 9.19 | 3.88 | 4.75 | 4.44 | 2.38 | 5.31 | 7.61 |
| ** 3-1/2 | ** 85-90 | 1010426 | Bulk | 4000 | 1.50 | 10.75 | 4.50 | 5.50 | 6.00 | 2.38 | 6.19 | 8.38 |

*Electro-plated U-Bolt and Nuts. ** 2-3/4" and 3-1/2" base is made of cast steel.

SS-450
Stainless Steel Wire Rope Clips

- Each base has a Product Identification Code (PIC) for material traceability, the name CROSBY or "CG", and a size forged into it.
- Entire clip is made from 316 Stainless Steel to resist corrosive and rusting action.
- All components are Electro-Polished.
- All Clips are individually bagged or tagged with proper application instructions and warning information.


## SS-450 Stainless Steel Wire Rope Clips

| Rope Size |  | $\begin{aligned} & \text { SS-450 } \\ & \text { Stock No. } \end{aligned}$ | Std. <br> Package Qty. | Weight Per 100 (lbs.) | Dimensions (in.) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| (in.) | (mm) |  |  |  | A | B | C | D | E | F | G | H |
| 1/8 | 3-4 | 1011250 | Bulk | 6 | . 22 | . 72 | . 44 | . 47 | . 41 | . 38 | . 81 | . 94 |
| 3/16 | 5 | 1011261 | Bulk | 10 | . 25 | . 97 | . 56 | . 59 | . 50 | . 44 | . 94 | 1.16 |
| 1/4 | 6-7 | 1011272 | Bulk | 20 | . 31 | 1.03 | . 50 | . 75 | . 66 | . 56 | 1.19 | 1.44 |
| 3/8 | 9-10 | 1011283 | Bulk | 47 | . 44 | 1.50 | . 75 | 1.00 | . 91 | . 75 | 1.63 | 1.94 |
| 1/2 | 12-13 | 1011305 | Bulk | 77 | . 50 | 1.88 | 1.00 | 1.19 | 1.13 | . 88 | 1.91 | 2.28 |
| 5/8 | 16 | 1011327 | Bulk | 106 | . 56 | 2.38 | 1.25 | 1.31 | 1.34 | . 94 | 2.06 | 2.50 |

IIA2010-FRKG/10M/PH


## ©C. $C \in E H$



Inductive sensor
IIA2010-FRKG/10M/PH


## Electrical connection

Cable: 10 m, PUR / PVC; $2 \times 0.5 \mathrm{~mm}^{2}$

## Connection



Core colours :
$B K=$
black
$\mathrm{WH}=$ white


PL-001BREA01-E-ZVG/US/ /P


1: tightening torque 20 Nm

| 気 C |  |  |  |
| :---: | :---: | :---: | :---: |
| Product characteristics |  |  |  |
| Electronic pressure sensor |  |  |  |
| Quick disconnect |  |  |  |
| no dead space |  |  |  |
| Zero and span adjustable |  |  |  |
| Programmable via EPS interface |  |  |  |
| Sealing cone G 1 male |  |  |  |
| Process connection: Sealing cone G 1 male |  |  |  |
| Analog output |  |  |  |
| Measuring range: -50... $1000 \mathrm{mbar} /-0.7 \ldots 14.5 \mathrm{psi} /-5.0 \ldots 100 \mathrm{kPa}$ |  |  |  |
| Application |  |  |  |
| Application | Type of pressure: relative pressure Hygienic systems, viscous media and liquids with suspended particles Liquids and gases |  |  |
| Pressure rating | 10000 mbar | 145 psi | 1000 kPa |
| Bursting pressure min. | 30000 mbar | 450 psi | 3000 kPa |
| Medium temperature [ $\left.{ }^{\circ} \mathrm{C}\right]$ |  | -25... 80 |  |
| Electrical data |  |  |  |
| Electrical design | 3-wire DC; 2-wire DC |  |  |
| Operating voltage [V] | 14... 30 DC |  |  |
| Insulation resistance [M | > 100 (500 V DC) |  |  |
| Protection class | III |  |  |
| Reverse polarity protection | yes |  |  |
| Outputs |  |  |  |
| Output | Analog output |  |  |
| Output function | 4... 20 mA analog |  |  |
| Overload protection | yes |  |  |
| Analog output | 4... 20 mA |  |  |
| Max. load [ ${ }^{\text {] }}$ | max. (Ub-13V)/20 mA; 550 at $\mathrm{Ub}=24 \mathrm{~V}$ |  |  |
| Measuring / setting range |  |  |  |
| Measuring range | -50... 1000 mbar | -0.7...14.5 psi | -5.0... 100 kPa |

## PL2657

PL－001BREA01－E－ZVG／US／／P
Setting range

| Analog start point，ASP | $-50 \ldots 749 \mathrm{mbar}$ | $-0.7 \ldots 10.9 \mathrm{psi}$ | $-5.0 \ldots .74 .9 \mathrm{kPa}$ |
| :--- | :---: | :---: | :---: |
| Analog end point，AEP | $200 \ldots 999 \mathrm{mbar}$ | $2.9 \ldots 14.5 \mathrm{psi}$ | $20 \ldots 99.9 \mathrm{kPa}$ |
| in steps of | 1 mbar | 0.1 psi | 0.1 kPa |

Factory setting
ASP $=0$ mbar； $\mathrm{AEP}=999 \mathrm{mbar}$
Accuracy／deviations
Accuracy／deviations
（in \％of the span）Turn down 1：1

| Characteristics deviation＊） |  | $< \pm 0.6$ |
| :--- | :--- | :--- |
| Linearity |  | $< \pm 0.5$ |
| Hysteresis |  | $< \pm 0.1$ |
| Repeatability ${ }^{* *}$ ） | $< \pm 0.1$ |  |
| Long－term stability $* * *)$ |  | $< \pm 0.1$ |

Temperature coefficients（TEMPCO）in the temperature range $0 \ldots 80^{\circ} \mathrm{C}$（in $\%$ of the span per 10 K ）

| Greatest TEMPCO of the zero point | $< \pm 0.1$ |
| :---: | :---: |
| Greatest TEMPCO of the span | $< \pm 0.2$ |
| Reaction times |  |
| Response time analog output［ms］ | 3 |
| Environment |  |
| Ambient temperature［ $\left.{ }^{\circ} \mathrm{C}\right]$ | －25．．． 80 |
| Storage temperature $\quad\left[{ }^{\circ} \mathrm{C}\right]$ | －40．．． 100 |

Tests／approvals


## 

## PL2657

PL-001BREA01-E-ZVG/US/ /P

## Pressure sensors

| Remarks |  |
| :---: | :---: |
| Remarks | *) linearity, incl. hysteresis and repeatability; <br> (limit value setting to DIN 16086) <br> ${ }^{* *}$ ) with temperature fluctuations $<10 \mathrm{~K}$ <br> ***) in \% of the span per year <br> The 3-A qualification is only valid if adapters with 3-A qualification are used for installation. |
| Pack quantity [piece] | 1 |

ifm efector, inc. •1100 Atwater Drive • Malvern•PA 19355 - We reserve the right to make technical alterations without prior notice. - US - PL2657 - 26.03 .2009

## SCREW PRESS JUNCTION BOX 1 CUTSHEETS

## End clamp - E/NS 35 N - 0800886

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## Product Features

- Large-surface labeling


## Key Commercial Data

| Packing unit | 1 pc |
| :---: | :---: |
| Minimum order quantity | 50 pc |
| GTIN |  |
| Weight per Piece (excluding packing) | 14.8 g |
| Custom tariff number | 39269097 |
| Country of origin | Germany |

## Technical data

Dimensions

| Height | 32.8 mm |
| :--- | :--- |
| Length | 48.6 mm |
| Width | 9.5 mm |

General

| Material | PA |
| :--- | :--- |
| Color | gray |
| Tightening torque, min | 0.4 Nm |
| Tightening torque $\max$ | 0.5 Nm |

## Standards and Regulations

| Flammability rating according to UL 94 | V2 |
| :--- | :--- |

## Feed-through terminal block - UT 2,5-3044076

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Feed-through terminal block, nom. voltage: 1000 V , nominal current: 24 A , connection method: Screw connection, number of connections: 2, cross section: $0.14 \mathrm{~mm}^{2}-4 \mathrm{~mm}^{2}$, AWG: $26-12$, width: 5.2 mm , height: 46.9 mm , color: gray, mounting type: NS 35/7,5, NS 35/15

## Why buy this product

$\boxed{\text { The large wiring space enables the connection of solid and stranded conductors without ferrules, even above the nominal cross section }}$
$\checkmark$ As well as saving space, the compact design enables user-friendly wiring in a small amount of space
$\square$ Optimum screwdriver guidance through closed screw shafts
$\square$ Tested for railway applications
$\square$ The cable entry funnel enables the use of conductors with ferrules and plastic collars within the nominal cross section


## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| Minimum order quantity | 50 STK |
| GTIN |  |
| GTIN | 4017918960377 |
| Weight per Piece (excluding packing) | 8.000 g |
| Custom tariff number | 85369010 |
| Country of origin | Germany |

## Technical data

## General

| Number of levels | 1 |
| :--- | :--- |
| Number of connections | 2 |
| Potentials | 1 |

## Feed-through terminal block - UT 2,5-3044076

## Technical data

General

| Nominal cross section | $2.5 \mathrm{~mm}^{2}$ |
| :---: | :---: |
| Color | gray |
| Insulating material | PA |
| Flammability rating according to UL 94 | V0 |
| Area of application | Railway industry |
|  | Machine building |
|  | Plant engineering |
|  | Process industry |
| Rated surge voltage | 8 kV |
| Degree of pollution | 3 |
| Overvoltage category | III |
| Insulating material group | I |
| Maximum power dissipation for nominal condition | 0.77 W |
| Maximum load current | 32 A (with $4 \mathrm{~mm}^{2}$ conductor cross section) |
| Nominal current $\mathrm{I}_{\mathrm{N}}$ | 24 A |
| Nominal voltage $\mathrm{U}_{\mathrm{N}}$ | 1000 V |
| Open side panel | Yes |
| Shock protection test specification | DIN EN 50274 (VDE 0660-514):2002-11 |
| Back of the hand protection | guaranteed |
| Finger protection | guaranteed |
| Result of surge voltage test | Test passed |
| Surge voltage test setpoint | 9.8 kV |
| Result of power-frequency withstand voltage test | Test passed |
| Power frequency withstand voltage setpoint | 2.2 kV |
| Result of the test for mechanical stability of terminal points ( $5 \times$ conductor connection) | Test passed |
| Result of bending test | Test passed |
| Bending test rotation speed | 10 rpm |
| Bending test turns | 135 |
| Bending test conductor cross section/weight | $0.14 \mathrm{~mm}^{2} / 0.2 \mathrm{~kg}$ |
|  | $2.5 \mathrm{~mm}^{2} / 0.7 \mathrm{~kg}$ |
|  | $4 \mathrm{~mm}^{2} / 0.9 \mathrm{~kg}$ |
| Tensile test result | Test passed |
| Conductor cross section tensile test | $0.14 \mathrm{~mm}^{2}$ |
| Tractive force setpoint | 10 N |
| Conductor cross section tensile test | $2.5 \mathrm{~mm}^{2}$ |
| Tractive force setpoint | 50 N |

## Feed-through terminal block - UT 2,5-3044076

## Technical data

General

| Conductor cross section tensile test | $4 \mathrm{~mm}^{2}$ |
| :---: | :---: |
| Tractive force setpoint | 60 N |
| Result of tight fit on support | Test passed |
| Tight fit on carrier | NS 35 |
| Setpoint | 1 N |
| Result of voltage-drop test | Test passed |
| Requirements, voltage drop | $\leq 3.2 \mathrm{mV}$ |
| Result of temperature-rise test | Test passed |
| Short circuit stability result | Test passed |
| Conductor cross section short circuit testing | $2.5 \mathrm{~mm}^{2}$ |
| Short-time current | 0.3 kA |
| Conductor cross section short circuit testing | $4 \mathrm{~mm}^{2}$ |
| Short-time current | 0.48 kA |
| Result of thermal test | Test passed |
| Proof of thermal characteristics (needle flame) effective duration | 30 s |
| Oscillation, broadband noise test result | Test passed |
| Test specification, oscillation, broadband noise | DIN EN 50155 (VDE 0115-200):2008-03 |
| Test spectrum | Service life test category 1, class B, body mounted |
| Test frequency | $\mathrm{f}_{1}=5 \mathrm{~Hz}$ to $\mathrm{f}_{2}=150 \mathrm{~Hz}$ |
| ASD level | $1.857\left(\mathrm{~m} / \mathrm{s}^{2}\right)^{2} / \mathrm{Hz}$ |
| Acceleration | 0,8 g |
| Test duration per axis | 5 h |
| Test directions | X-, Y- and Z-axis |
| Shock test result | Test passed |
| Test specification, shock test | DIN EN 50155 (VDE 0115-200):2008-03 |
| Shock form | Half-sine |
| Acceleration | 5 g |
| Shock duration | 30 ms |
| Number of shocks per direction | 3 |
| Test directions | X-, Y- and Z-axis (pos. and neg.) |
| Relative insulation material temperature index (Elec., UL 746 B) | $130{ }^{\circ} \mathrm{C}$ |
| Temperature index of insulation material (DIN EN 60216-1 (VDE 0304-21)) | $125{ }^{\circ} \mathrm{C}$ |
| Static insulating material application in cold | $-60{ }^{\circ} \mathrm{C}$ |
| Behavior in fire for rail vehicles (DIN 5510-2) | Test passed |
| Flame test method (DIN EN 60695-11-10) | V0 |
| Oxygen index (DIN EN ISO 4589-2) | >32 \% |
| NF F16-101, NF F10-102 Class I | 2 |

## Feed-through terminal block - UT 2,5-3044076

## Technical data

General

| NF F16-101, NF F10-102 Class F | 2 |
| :--- | :--- |
| Surface flammability NFPA 130 (ASTM E 162) | passed |
| Specific optical density of smoke NFPA 130 (ASTM E 662) | passed |
| Smoke gas toxicity NFPA 130 (SMP 800C) | passed |
| Calorimetric heat release NFPA 130 (ASTM E 1354) | $27,5 \mathrm{MJ} / \mathrm{kg}$ |
| Fire protection for rail vehicles (DIN EN 45545-2) R22 | $\mathrm{HL} 1-\mathrm{HL} \mathrm{3}$ |
| Fire protection for rail vehicles (DIN EN 45545-2) R23 | $\mathrm{HL} 1-\mathrm{HL} \mathrm{3}$ |
| Fire protection for rail vehicles (DIN EN 45545-2) R24 | $\mathrm{HL} 1-\mathrm{HL} \mathrm{3}$ |
| Fire protection for rail vehicles (DIN EN 45545-2) R26 | $\mathrm{HL} \mathrm{1-HL} \mathrm{3}$ |

## Dimensions

| Width | 5.2 mm |
| :--- | :--- |
| End cover width | 2.2 mm |
| Length | 47.7 mm |
| Height | 46.9 mm |
| Height NS 35/7,5 | 47.5 mm |
| Height NS 35/15 | 55 mm |

## Connection data

| Connection method | Screw connection |
| :--- | :--- |
| Connection in acc. with standard | IEC 60947-7-1 |
| Note | Note: Product releases, connection cross sections and notes on <br> connecting aluminum cables can be found in the download area. |
| Conductor cross section solid min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section solid max. | $4 \mathrm{~mm}^{2}$ |
| Conductor cross section AWG min. | 26 |
| Conductor cross section AWG max. | 12 |
| Conductor cross section flexible min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section flexible max. | $4 \mathrm{~mm}^{2}$ |
| Min. AWG conductor cross section, flexible | 26 |
| Max. AWG conductor cross section, flexible | 12 |
| Conductor cross section flexible, with ferrule without plastic sleeve min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section flexible, with ferrule without plastic sleeve max. | $2.5 \mathrm{~mm}^{2}$ |
| Conductor cross section flexible, with ferrule with plastic sleeve min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section flexible, with ferrule with plastic sleeve max. | $2.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, solid min. | $0.14 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, solid max. | $1.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded min. | $0.14 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded max. | $1.5 \mathrm{~mm}^{2}$ |

## Feed-through terminal block - UT 2,5-3044076

## Technical data

Connection data

| 2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min. | $0.5 \mathrm{~mm}^{2}$ |
| :---: | :---: |
| 2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max. | $1.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, ferrules without plastic sleeve, min. | $0.14 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, ferrules without plastic sleeve, max. | $1.5 \mathrm{~mm}^{2}$ |
| Connection in acc. with standard | IEC/EN 60079-7 |
| Conductor cross section solid min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section solid max. | $4 \mathrm{~mm}^{2}$ |
| Conductor cross section AWG min. | 26 |
| Conductor cross section AWG max. | 12 |
| Conductor cross section flexible min. | $0.14 \mathrm{~mm}^{2}$ |
| Conductor cross section flexible max. | $2.5 \mathrm{~mm}^{2}$ |
| Stripping length | 9 mm |
| Internal cylindrical gage | A3 |
| Screw thread | M3 |
| Tightening torque, min | 0.5 Nm |
| Tightening torque max | 0.6 Nm |

Standards and Regulations

| Connection in acc. with standard | CSA |
| :---: | :---: |
|  | IEC 60947-7-1 |
| Flammability rating according to UL 94 | V0 |
| Fire protection for rail vehicles (DIN EN 45545-2) R22 | HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 |
| Fire protection for rail vehicles (DIN EN 45545-2) R23 | HL 1 - HL 3 HL 1 - HL 3 HL $1-\mathrm{HL} 3$ HL 1 - HL 3 |
| Fire protection for rail vehicles (DIN EN 45545-2) R24 | HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 HL 1 - HL 3 |
| Fire protection for rail vehicles (DIN EN 45545-2) R26 | HL 1 - HL 3 HL 1 - HL 3 HL $1-\mathrm{HL} 3 \mathrm{HL} 1-\mathrm{HL} 3$ |

## Environmental Product Compliance

| China RoHS | Environmentally Friendly Use Period = 50 |
| :--- | :--- |
|  | For details about hazardous substances go to tab "Downloads", Category <br> "Manufacturer's declaration" |

## Drawings

## Feed-through terminal block - UT 2,5-3044076

## Classifications

eCl@ss

| eCl@ss 4.0 | 27141120 |
| :--- | :--- |
| eCl@ss 4.1 | 27141120 |
| eCl@ss 5.0 | 27141120 |
| eCl@ss 5.1 | 27141120 |
| eCl@ss 6.0 | 27141120 |
| eCl@ss 7.0 | 27141120 |
| eCl@ss 8.0 | 27141120 |
| eCl@ss 9.0 | 27141120 |

ETIM

| ETIM 2.0 | EC000897 |
| :--- | :--- |
| ETIM 3.0 | EC000897 |
| ETIM 4.0 | EC000897 |
| ETIM 5.0 | EC000897 |
| ETIM 6.0 | EC000897 |

UNSPSC

| UNSPSC 6.01 | 30211811 |
| :--- | :--- |
| UNSPSC 7.0901 | 39121410 |
| UNSPSC 11 | 39121410 |
| UNSPSC 12.01 | 39121410 |
| UNSPSC 13.2 | 39121410 |

## Approvals

Approvals

[^24]Ex Approvals
IECEx / ATEX / UL Recognized / cUL Recognized / EAC Ex

## Approval details

## Feed-through terminal block - UT 2,5-3044076

## Approvals

| CSA | http://www.csagroup.org/services-industries/product-listing/ |  | 13631 |
| :---: | :---: | :---: | :---: |
|  | B | C |  |
| mm²/AWG/kcmil | 26-12 | 26-12 |  |
| Nominal current IN | 20 A | 20 A |  |
| Nominal voltage UN | 600 V | 600 V |  |


| UL Recognized |  |  |  |
| :--- | :--- | :--- | :--- |
|  | B | C |  |
|  | http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm E 60425 |  |  |
| mm²/AWG/kcmil | $26-12$ | $26-12$ |  |
| Nominal current IN | 20 A | 20 A |  |
| Nominal voltage UN | 600 V | 600 V |  |


| VDE Gutachten mit <br> Fertigungsüberwachung | http://www2.vde.com/de/Institut/Online-Service/ <br> VDE-gepruefteProdukte/Seiten/Online-Suche.aspx |  |  | 40013658 |
| :--- | :--- | :--- | :---: | :---: |
|  |  |  |  |  |
| mm²/AWG/kcmil | $0.2-2.5$ |  |  |  |
| Nominal current IN | 24 A |  |  |  |
| Nominal voltage UN | 800 V |  |  |  |



Feed-through terminal block - UT 2,5-3044076
Approvals

| IECEE CB Scheme | http://www.iecee.org/ | DE1-60117 |
| :---: | :---: | :---: |
| mm²/AWG/kcmil | 0.2-2.5 |  |
| Nominal voltage UN | 800 V |  |


| EAC |  |  | EAC-Zulassung |
| :---: | :---: | :---: | :---: |
| DNV GL |  |  |  |
|  |  | http://exchange.dnv.com/tari/ | TAE00001S9 |
| PRS |  |  |  |
|  | http://www.prs.p// |  | TE/2156/880590/17 |

cULus Recognized
http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm

## Accessories

## Accessories

Component plug terminal block
Component connector - P-CO 2-5 R47K - 3032447

Component connector, with 47 kOhm resistor for open circuit monitoring, pitch: 5.2 mm , length: 8.9 mm , width: 4.1 mm , height: 34.8 mm , number of positions: 2 , color: black

DIN rail

## Feed-through terminal block - UT 2,5-3044076

## Accessories

DIN rail perforated - NS 35/ 7,5 PERF 2000MM - 0801733

DIN rail perforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 UNPERF 2000MM - 0801681


DIN rail, unperforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Steel, galvanized, passivated with a thick layer, length: 2000 mm , color: silver

DIN rail perforated - NS 35/ 7,5 WH PERF 2000MM - 1204119

DIN rail perforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Steel, Galvanized, white passivated, length: 2000 mm , color: white

DIN rail, unperforated - NS 35/ 7,5 WH UNPERF 2000MM - 1204122


DIN rail, unperforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Steel, Galvanized, white passivated, length: 2000 mm, color: white

DIN rail, unperforated - NS 35/ 7,5 AL UNPERF 2000MM - 0801704
DIN rail, unperforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Aluminum, uncoated, length: 2000 mm, color: silver

## Feed-through terminal block - UT 2,5-3044076

## Accessories

DIN rail perforated - NS 35/ 7,5 ZN PERF 2000MM - 1206421

DIN rail perforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/ 7,5 ZN UNPERF 2000MM - 1206434


DIN rail, unperforated - NS 35/ 7,5 CU UNPERF 2000MM - 0801762


DIN rail, unperforated, Standard profile, width: 35 mm , height: 7.5 mm , acc. to EN 60715 , material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/ 7,5 CAP - 1206560

DIN rail end piece, for DIN rail NS 35/7.5


DIN rail perforated - NS 35/15 PERF 2000MM - 1201730


DIN rail perforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

## Feed-through terminal block - UT 2,5-3044076

## Accessories

DIN rail, unperforated - NS 35/15 UNPERF 2000MM - 1201714

DIN rail, unperforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm , color: silver

DIN rail perforated - NS 35/15 WH PERF 2000MM - 0806602


DIN rail perforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: white

DIN rail, unperforated - NS 35/15 WH UNPERF 2000MM - 1204135


DIN rail, unperforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, Galvanized, white passivated, length: 2000 mm, color: white

DIN rail, unperforated - NS 35/15 AL UNPERF 2000MM - 1201756


DIN rail, unperforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715 , material: Aluminum, uncoated, length: 2000 mm, color: silver

DIN rail perforated - NS 35/15 ZN PERF 2000MM - 1206599


DIN rail perforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

## Feed-through terminal block - UT 2,5-3044076

## Accessories

DIN rail, unperforated - NS 35/15 ZN UNPERF 2000MM - 1206586


DIN rail, unperforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Steel, galvanized, length: 2000 mm, color: silver

DIN rail, unperforated - NS 35/15 CU UNPERF 2000MM - 1201895


DIN rail, unperforated, Standard profile, width: 35 mm , height: 15 mm , similar to EN 60715, material: Copper, uncoated, length: 2000 mm, color: copper-colored

End cap - NS 35/15 CAP - 1206573


DIN rail end piece, for DIN rail NS 35/15

DIN rail, unperforated - NS 35/15-2,3 UNPERF 2000MM - 1201798

DIN rail, unperforated, Standard profile 2.3 mm , width: 35 mm , height: 15 mm , acc. to EN 60715, material: Steel, galvanized, passivated with a thick layer, length: 2000 mm, color: silver

## End block

End clamp - CLIPFIX 35-3022218


Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray

# Feed-through terminal block - UT 2,5-3044076 

## Accessories

End clamp - CLIPFIX 35-5-3022276


Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, with parking option for FBS...5, FBS...6, KSS 5, KSS 6, width: 5.15 mm , color: gray

## End clamp - E/NS 35 N-0800886



End clamp, width: 9.5 mm , color: gray

## End cover

End cover - D-UT 2,5/10-3047028


End cover, length: 47 mm , width: 2.2 mm , height: 39.8 mm , color: gray

## Front adapter

Front adapters - VIP-PA-PWR/20XOE/ 1,0M/S7-2904724

VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20
individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 1
m

Front adapters - VIP-PA-PWR/20XOE/ 2,0M/S7-2904725

VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20 individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 2 m

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Front adapters - VIP-PA-PWR/20XOE/ 3,0M/S7-2904726
VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20 individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 3 m

Front adapters - VIP-PA-PWR/20XOE/10,0M/S7-2904730
VIP power cabling, universal front adapter for connection to all popular 20-pos. SIMATIC S7-300 I/O modules, via 20 individual wires in rope structure, not assembled (field connection, e.g., via 20 modular terminal blocks), cable length: 10 m

Front adapters - VIP-PA-PWR/40XOE/ 1,0M/S7-2904731
VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 1 m

Front adapters - VIP-PA-PWR/40XOE/ 2,0M/S7-2904732

VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 2 m

Front adapters - VIP-PA-PWR/40XOE/ 3,0M/S7-2904733
VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 3 m

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Front adapters - VIP-PA-PWR/40XOE/10,0M/S7-2904737


VIP power cabling, universal front adapter for connection to all popular 40-pos. SIMATIC S7-300 I/O modules, via 40 individual wires in rope structure, not assembled (field connection, e.g., via 40 modular terminal blocks), cable length: 10 m

Insulating sleeve

Insulating sleeve - MPS-IH WH - 0201663

Insulating sleeve, color: white

Insulating sleeve - MPS-IH RD - 0201676

Insulating sleeve, color: red

Insulating sleeve - MPS-IH BU - 0201689

Insulating sleeve, color: blue

Insulating sleeve - MPS-IH YE - 0201692

Insulating sleeve, color: yellow


# Feed-through terminal block - UT 2,5-3044076 

## Accessories

Insulating sleeve - MPS-IH GN - 0201702

Insulating sleeve, color: green
$\qquad$
Insulating sleeve - MPS-IH GY-0201728

Insulating sleeve, color: gray

Insulating sleeve - MPS-IH BK - 0201731

Insulating sleeve, color: black
$\qquad$
Jumper
Plug-in bridge - FBS 2-5-3030161

Plug-in bridge, pitch: 5.2 mm , length: 22.7 mm , width: 9 mm , number of positions: 2 , color: red

Plug-in bridge - FBS 3-5-3030174

Plug-in bridge, pitch: 5.2 mm , length: 22.7 mm , width: 14.2 mm , number of positions: 3 , color: red

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Plug-in bridge - FBS 4-5-3030187

Plug-in bridge, pitch: 5.2 mm , length: 22.7 mm , width: 19.4 mm , number of positions: 4 , color: red

Plug-in bridge - FBS 5-5-3030190


Plug-in bridge, pitch: 5.2 mm , length: 22.7 mm , width: 24.6 mm , number of positions: 5, color: red

Plug-in bridge - FBS 10-5-3030213


Plug-in bridge, pitch: 5.2 mm , length: 22.7 mm , width: 50.6 mm , number of positions: 10 , color: red

Plug-in bridge - FBS 20-5-3030226


Plug-in bridge, pitch: 5.2 mm , number of positions: 20, color: red

Plug-in bridge - FBS 50-5-3038930


Plug-in bridge, pitch: 5.2 mm , number of positions: 50, color: red

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Plug-in bridge - FBSR 2-5-3033702

Plug-in bridge, pitch: 5.2 mm , number of positions: 2 , color: red

Plug-in bridge - FBSR 3-5-3001591


Plug-in bridge, pitch: 5.2 mm , number of positions: 3 , color: red

Plug-in bridge - FBSR 4-5-3001592


Plug-in bridge, pitch: 5.2 mm , number of positions: 4, color: red

Plug-in bridge - FBSR 5-5-3001593


Plug-in bridge, pitch: 5.2 mm , number of positions: 5, color: red

Plug-in bridge - FBSR 10-5-3033710


[^25]
## Feed-through terminal block - UT 2,5-3044076

## Accessories

Plug-in bridge - FBS 2-5 BU - 3036877

Plug-in bridge, pitch: 5.2 mm , number of positions: 2, color: blue

Plug-in bridge - FBS 3-5 BU - 3036880


Plug-in bridge, pitch: 5.2 mm , number of positions: 3 , color: blue

Plug-in bridge - FBS 4-5 BU - 3036893

Plug-in bridge, pitch: 5.2 mm , number of positions: 4 , color: blue

Plug-in bridge - FBS 5-5 BU - 3036903

Plug-in bridge, pitch: 5.2 mm , number of positions: 5 , color: blue

Plug-in bridge - FBS 10-5 BU - 3036916


Plug-in bridge, pitch: 5.2 mm , number of positions: 10 , color: blue

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Plug-in bridge - FBS 20-5 BU - 3036929

Plug-in bridge, pitch: 5.2 mm , number of positions: 20, color: blue

Plug-in bridge - FBS 50-5 BU - 3032114


## Labeled terminal marker

Zack marker strip - ZB 5 CUS - 0824962

Zack marker strip, can be ordered: Strip, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $5.15 \times 10.5 \mathrm{~mm}$

Zack marker strip - ZB 5,LGS:FORTL.ZAHLEN - 1050017


Zack marker strip, Strip, white, labeled, printed horizontally: consecutive numbers 1-10, 11-20, etc. up to 491-500, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $5.15 \times 10.5 \mathrm{~mm}$

Zack marker strip - ZB 5,QR:FORTL.ZAHLEN - 1050020


## Feed-through terminal block - UT 2,5-3044076

## Accessories

Zack marker strip - ZB 5,LGS:GLEICHE ZAHLEN - 1050033


Zack marker strip, Strip, white, labeled, can be labeled with: CMS-P1-PLOTTER, printed horizontally: Identical numbers 1 or 2, etc. up to 100, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: 5.15 $\times 10.5 \mathrm{~mm}$

Marker for terminal blocks - ZB 5,LGS:L1-N,PE - 1050415


Marker for terminal blocks, Strip, white, labeled, Horizontal: L1, L2, L3, N, PE, L1, L2, L3, N, PE, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $5.15 \times 10.5 \mathrm{~mm}$

Marker for terminal blocks - UC-TM 5 CUS - 0824581

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $10.5 \times 4.6 \mathrm{~mm}$

Marker for terminal blocks - UCT-TM 5 CUS - 0829595

Marker for terminal blocks, can be ordered: by sheet, white, labeled according to customer specifications, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $4.6 \times 10.5 \mathrm{~mm}$

## Marker pen

Marker pen - X-PEN 0,35-0811228


Marker pen without ink cartridge, for manual labeling of markers, labeling extremely wipe-proof, line thickness 0.35 mm

# Feed-through terminal block - UT 2,5-3044076 

## Accessories

Partition plate

Partition plate - ATP-UT - 3047167


Partition plate, length: 50 mm , width: 2.2 mm , height: 48 mm , color: gray

Spacer plate - DP PS-5-3036725


Spacer plate, length: 22.4 mm , width: 5.2 mm , height: 29 mm , number of positions: 1 , color: red

## Planning and marking software

## Software - CLIP-PROJECT ADVANCED - 5146040



Multilingual software for convenient configuration of Phoenix Contact products on standard DIN rails.

## Software - CLIP-PROJECT PROFESSIONAL - 5146053



Multilingual software for terminal strip configuration. A marking module enables the professional marking of markers and labels for identifying terminal blocks, conductors and cables, and devices.

Screwdriver tools

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Screwdriver - SZS 0,6X3,5-1205053

Actuation tool, for ST terminal blocks, insulated, also suitable for use as a bladed screwdriver, size: $0.6 \times 3.5 \times 100 \mathrm{~mm}$, 2-component grip, with non-slip grip

## Terminal marking

Zack marker strip - ZB 5 :UNBEDRUCKT - 1050004
$\qquad$

Marker for terminal blocks - UC-TM 5-0818108

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: BLUEMARK ID, BLUEMARK ID COLOR, BLUEMARK CLED, BLUEMARK LED, CMS-P1-PLOTTER, PLOTMARK, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $10.5 \times 4.6 \mathrm{~mm}$

Marker for terminal blocks - UCT-TM 5-0828734

Marker for terminal blocks, Sheet, white, unlabeled, can be labeled with: THERMOMARK PRIME, THERMOMARK CARD, BLUEMARK ID, BLUEMARK ID COLOR, BLUEMARK CLED, BLUEMARK LED, TOPMARK NEO, mounting type: snap into tall marker groove, for terminal block width: 5.2 mm , lettering field size: $4.6 \times 10.5 \mathrm{~mm}$

## Test plug terminal block

Test plugs - MPS-MT - 0201744


[^26]
## Feed-through terminal block - UT 2,5-3044076

## Accessories

Test plugs - PS-5-3030983
Test plugs - PS-5/2,3MM RD - 3038723

Test adapter - PAI-4-FIX-5/6 OG - 3035974

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 YE - 3035977

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Test adapter - PAI-4-FIX-5/6 RD - 3035976

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GN - 3035978

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 BK - 3035980

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 GY - 3035982

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 VT - 3035979

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

## Feed-through terminal block - UT 2,5-3044076

## Accessories

Test adapter - PAI-4-FIX-5/6 BN - 3035981

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-FIX-5/6 WH - 3035983

4 mm test adapter, for terminal blocks with 5.2 mm and 6.2 mm pitch

Test adapter - PAI-4-N GY - 3032871

4 mm test adapter, for terminal blocks with $5.2 \mathrm{~mm}, 6.2 \mathrm{~mm}$ and 8.2 mm pitch

Warning label printed

Warning label - WS UT 2,5-3047923

Warning sign for UT terminal blocks


Warning label - WS UT 2,5-3047923

Warning sign for UT terminal blocks

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## Feed-through terminal block - UT 2,5 GN - 3045091

Please be informed that the data shown in this PDF Document is generated from our Online Catalog. Please find the complete data in the user's documentation. Our General Terms of Use for Downloads are valid (http://phoenixcontact.com/download)


Feed-through terminal block, nom. voltage: 1000 V , nominal current: 24 A , connection method: Screw connection, number of connections: 2, cross section:0.14 mm²-4 mm², AWG: $26-12$, width: 5.2 mm , color: green, mounting type: NS 35/7,5, NS 35/15

## Key Commercial Data

| Packing unit | 1 STK |
| :---: | :---: |
| Minimum order quantity | 50 STK |
| GTIN |  |
| GTIN | 4017918975432 |
| Weight per Piece (excluding packing) | 8.180 g |
| Custom tariff number | 85369010 |
| Country of origin | Germany |

## Technical data

General

| Number of levels | 1 |
| :--- | :--- |
| Number of connections | 2 |
| Potentials | 1 |
| Nominal cross section | $2.5 \mathrm{~mm}^{2}$ |
| Color | green |
| Insulating material | PA |
| Flammability rating according to UL 94 | V0 |
| Area of application | Railway industry |
|  | Machine building |

## Feed-through terminal block - UT 2,5 GN - 3045091

## Technical data

General

|  | Plant engineering |
| :---: | :---: |
|  | Process industry |
| Rated surge voltage | 8 kV |
| Degree of pollution | 3 |
| Overvoltage category | III |
| Insulating material group | I |
| Maximum power dissipation for nominal condition | 0.77 W |
| Maximum load current | 32 A (with $4 \mathrm{~mm}^{2}$ conductor cross section) |
| Nominal current $\mathrm{I}_{\mathrm{N}}$ | 24 A |
| Nominal voltage $\mathrm{U}_{\mathrm{N}}$ | 1000 V |
| Open side panel | Yes |
| Shock protection test specification | DIN EN 50274 (VDE 0660-514):2002-11 |
| Back of the hand protection | guaranteed |
| Finger protection | guaranteed |
| Result of surge voltage test | Test passed |
| Surge voltage test setpoint | 9.8 kV |
| Result of power-frequency withstand voltage test | Test passed |
| Power frequency withstand voltage setpoint | 2.2 kV |
| Result of the test for mechanical stability of terminal points ( $5 \times$ conductor connection) | Test passed |
| Result of bending test | Test passed |
| Bending test rotation speed | 10 rpm |
| Bending test turns | 135 |
| Bending test conductor cross section/weight | $0.14 \mathrm{~mm}^{2} / 0.2 \mathrm{~kg}$ |
|  | $2.5 \mathrm{~mm}^{2} / 0.7 \mathrm{~kg}$ |
|  | $4 \mathrm{~mm}^{2} / 0.9 \mathrm{~kg}$ |
| Tensile test result | Test passed |
| Conductor cross section tensile test | $0.14 \mathrm{~mm}^{2}$ |
| Tractive force setpoint | 10 N |
| Conductor cross section tensile test | $2.5 \mathrm{~mm}^{2}$ |
| Tractive force setpoint | 50 N |
| Conductor cross section tensile test | $4 \mathrm{~mm}^{2}$ |
| Tractive force setpoint | 60 N |
| Result of tight fit on support | Test passed |
| Tight fit on carrier | NS 35 |
| Setpoint | 1 N |
| Result of voltage-drop test | Test passed |

A8064CHNFSS6

CONTINUOUS-HINGE WITH CLAMPS, TYPE 4X


INDUSTRY STANDARDS
UL 50, 50E Listed; Type 3R, 4, 4X, 12; File No. E27567 cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No. E27567
UL 508A Listed; Type 3R, 4, 4X, 12; File No. E61997
cUL Listed per CSA C22.2 No 94; Type 3R, 4, 4X, 12; File No.
E61997
NEMA/EEMAC Type 3R, 4, 4X, 12, 13
CSA File No. 42184: Type 4, 4X, 12
IEC 60529, IP66
Meets NEMA Type 3 XX requirements

## APPLICATION

Used in either indoor or outdoor applications, these enclosures combine a rugged continuous hinge, seamless foam-in-place gasket and stainless steel screw-down clamps for a reliable seal that protects components from corrosive environments.

## SPECIFICATIONS

- 16 and 14 gauge Type 304 or 316L stainless steel
- Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- Stainless steel screws and clamps
- Pull stainless steel continuous hinge pin to remove door
- Weldnuts provided for mounting optional panels and terminal block kits
- Bonding provision on door and body


## FINISH

Cover and sides of body have smooth \#4 brushed finish.

## ACCESSORIES

Fast-Operating Clamp-Cover Junction Box Clamp
Lock Kit for Clamp Cover Junction Boxes
Panels for Junction Boxes
Terminal Block Kit Assembly for Junction Boxes

## MODIFICATION AND CUSTOMIZATION

Hoffman excels at modifying and customizing products to your specifications. Contact your local Hoffman sales office or distributor for complete information.

## BULLETIN: A51S

Standard Product

| Catalog Number | AxBxC in./mm | Stainless Steel Type | UL Listed | Body Gauge | $\begin{aligned} & \text { Cover } \\ & \text { Gauge } \end{aligned}$ | Steel Panel | Conductive Panel | Panel Size DxE in./mm | $\begin{aligned} & \text { Mounting } \\ & \text { 6xH } \\ & \text { in. } / \mathrm{mm} \end{aligned}$ | $\begin{aligned} & \text { Overall } \\ & \text { LxW } \\ & \text { in./mm } \end{aligned}$ | $\begin{aligned} & \mathrm{F} \\ & \mathrm{in} . / \mathrm{mm} \end{aligned}$ | $\underset{\mathrm{in} . / \mathrm{mm}}{\mathrm{~J}}$ | $\begin{aligned} & \mathrm{N} \\ & \mathrm{in} . / \mathrm{mm} \end{aligned}$ | $\begin{aligned} & \mathrm{T} \\ & \mathrm{in} . / \mathrm{mm} \end{aligned}$ | $\begin{aligned} & \mathrm{V} \\ & \mathrm{in} . / \mathrm{mm} \end{aligned}$ | $\begin{aligned} & \mathrm{Y} \\ & \mathrm{in} . / \mathrm{mm} \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A6044CHNFSS | $\begin{aligned} & 6.00 \times 4.00 \times 4.00 \\ & 152 \times 102 \times 102 \end{aligned}$ | 304 | 508A | 16 | 16 | A6P4 | A6P4G | $\begin{aligned} & 4.88 \times 2.88 \\ & 124 \times 73 \end{aligned}$ | $\begin{aligned} & 6.75 \times 2.00 \\ & 171 \times 51 \end{aligned}$ | $\begin{aligned} & 7.50 \times 4.94 \\ & 191 \times 125 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 3.00 \\ & 76 \end{aligned}$ | $\begin{aligned} & 0.31 \\ & 8 \end{aligned}$ | $\begin{aligned} & 0.56 \\ & 14 \end{aligned}$ |
| A606CHNFSS | $\begin{aligned} & 6.00 \times 6.00 \times 4.00 \\ & 152 \times 152 \times 102 \end{aligned}$ | 304 | 50, 50E | 16 | 16 | A6P6 | A6P6G | $\begin{aligned} & 4.88 \times 4.88 \\ & 124 \times 124 \end{aligned}$ | $\begin{aligned} & 6.75 \times 4.00 \\ & 171 \times 102 \end{aligned}$ | $\begin{aligned} & 7.50 \times 6.94 \\ & 191 \times 176 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 5.00 \\ & 127 \end{aligned}$ | $\begin{aligned} & 0.31 \\ & 8 \end{aligned}$ | $\begin{aligned} & 0.56 \\ & 14 \end{aligned}$ |
| A8064CHNFSS | $\begin{aligned} & 8.00 \times 6.00 \times 4.00 \\ & 203 \times 152 \times 102 \end{aligned}$ | 304 | 50, 50E | 14 | 16 | A8P6 | A8P6G | $\begin{aligned} & 6.75 \times 4.88 \\ & 171 \times 124 \end{aligned}$ | $\begin{aligned} & 8.75 \times 4.00 \\ & 222 \times 102 \end{aligned}$ | $\begin{aligned} & 9.50 \times 6.94 \\ & 241 \times 176 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 1.38 \\ & 35 \end{aligned}$ | $\begin{aligned} & 5.00 \\ & 127 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1008CHNFSS | $\begin{aligned} & 10.00 \times 8.00 \times 4.00 \\ & 254 \times 203 \times 102 \end{aligned}$ | 304 | 50, 50E | 14 | 16 | A10P8 | A10P8G | $\begin{aligned} & 8.75 \times 6.88 \\ & 222 \times 175 \end{aligned}$ | $\begin{aligned} & 10.75 \times 6.00 \\ & 273 \times 152 \end{aligned}$ | $\begin{aligned} & 11.50 \times 8.94 \\ & 292 \times 227 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 1.38 \\ & 35 \end{aligned}$ | $\begin{aligned} & 7.00 \\ & 178 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A12106CHNFSS | $\begin{aligned} & 12.00 \times 10.00 \times 6.00 \\ & 305 \times 254 \times 152 \end{aligned}$ | 304 | 50, 50E | 14 | 16 | A12P10 | A12P10G | $\begin{aligned} & 10.75 \times 8.88 \\ & 273 \times 225 \end{aligned}$ | $\begin{aligned} & 12.75 \times 8.00 \\ & 324 \times 203 \end{aligned}$ | $\begin{aligned} & 13.50 \times 10.94 \\ & 343 \times 278 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 9.00 \\ & 229 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1212CHNFSS | $\begin{aligned} & 12.00 \times 12.00 \times 6.00 \\ & 305 \times 305 \times 152 \end{aligned}$ | 304 | 50, 50E | 14 | 16 | A12P12 | A12P12G | $\begin{aligned} & 10.75 \times 10.88 \\ & 273 \times 276 \end{aligned}$ | $\begin{aligned} & 12.75 \times 10.00 \\ & 324 \times 254 \end{aligned}$ | $\begin{aligned} & 13.50 \times 12.94 \\ & 343 \times 329 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 11.00 \\ & 279 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1412CHNFSS | $14.00 \times 12.00 \times 6.00$ $356 \times 305 \times 152$ | 304 | 50, 50E | 14 | 16 | A14P12 | A14P12G | $\begin{aligned} & 12.75 \times 10.88 \\ & 324 \times 276 \end{aligned}$ | $\begin{aligned} & 14.75 \times 10.00 \\ & 375 \times 254 \end{aligned}$ | $\begin{aligned} & 15.50 \times 12.94 \\ & 394 \times 329 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 11.00 \\ & 279 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1614CHNFSS | $\begin{aligned} & 16.00 \times 14.00 \times 6.00 \\ & 406 \times 356 \times 152 \end{aligned}$ | 304 | 508A | 14 | 16 | A16P14 | A16P14G | $\begin{aligned} & 14.75 \times 12.88 \\ & 375 \times 327 \end{aligned}$ | $\begin{aligned} & 16.75 \times 12.00 \\ & 425 \times 305 \end{aligned}$ | $\begin{aligned} & 17.50 \times 14.94 \\ & 445 \times 379 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 13.00 \\ & 330 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A6044CHNFSS6 | $\begin{aligned} & 6.00 \times 4.00 \times 4.00 \\ & 152 \times 102 \times 102 \end{aligned}$ | 316 L | 50, 50E | 16 | 16 | A6P4 | A6P4G | $\begin{aligned} & 4.88 \times 2.88 \\ & 124 \times 73 \end{aligned}$ | $\begin{aligned} & 6.75 \times 2.00 \\ & 171 \times 51 \end{aligned}$ | $\begin{aligned} & 7.50 \times 4.94 \\ & 191 \times 125 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 3.00 \\ & 76 \end{aligned}$ | $\begin{aligned} & 0.31 \\ & 8 \end{aligned}$ | $\begin{aligned} & 0.56 \\ & 14 \end{aligned}$ |
| A606CHNFSS6 | $\begin{aligned} & 6.00 \times 6.00 \times 4.00 \\ & 152 \times 152 \times 102 \\ & \hline \end{aligned}$ | 316 L | 50, 50E | 16 | 16 | A6P6 | A6P6G | $\begin{aligned} & 4.88 \times 4.88 \\ & 124 \times 124 \\ & \hline \end{aligned}$ | $\begin{aligned} & 6.75 \times 4.00 \\ & 171 \times 102 \\ & \hline \end{aligned}$ | $\begin{aligned} & 7.50 \times 6.94 \\ & 191 \times 176 \\ & \hline \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \\ & \hline \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \\ & \hline \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \\ & \hline \end{aligned}$ | $\begin{aligned} & 5.00 \\ & 127 \\ & \hline \end{aligned}$ | $\begin{aligned} & 0.31 \\ & 8 \\ & \hline \end{aligned}$ | $\begin{aligned} & 0.56 \\ & 14 \\ & \hline \end{aligned}$ |
| A8064CHNFSS6 | $\begin{aligned} & 8.00 \times 6.00 \times 4.00 \\ & 203 \times 152 \times 102 \end{aligned}$ | 316 L | 50, 50E | 14 | 16 | A8P6 | A8P6G | $\begin{aligned} & 6.75 \times 4.88 \\ & 171 \times 124 \end{aligned}$ | $\begin{aligned} & 8.75 \times 4.00 \\ & 222 \times 102 \end{aligned}$ | $\begin{aligned} & 9.50 \times 6.94 \\ & 241 \times 176 \\ & \hline \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \\ & \hline \end{aligned}$ | $\begin{aligned} & 3.62 \\ & 92 \\ & \hline \end{aligned}$ | $\begin{aligned} & 1.38 \\ & 35 \\ & \hline \end{aligned}$ | $\begin{aligned} & 5.00 \\ & 127 \\ & \hline \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \\ & \hline \end{aligned}$ |
| A1008CHNFSS6 | $\begin{aligned} & 10.00 \times 8.00 \times 4.00 \\ & 254 \times 203 \times 102 \end{aligned}$ | 316L | 50, 50E | 14 | 16 | A10P8 | A10P8G | $\begin{aligned} & 8.75 \times 6.88 \\ & 222 \times 175 \end{aligned}$ | $\begin{aligned} & 10.75 \times 6.00 \\ & 273 \times 152 \end{aligned}$ | $\begin{aligned} & 11.50 \times 8.94 \\ & 292 \times 227 \end{aligned}$ | $\begin{aligned} & 3.50 \\ & 89 \end{aligned}$ | $\begin{aligned} & \hline 3.62 \\ & 92 \end{aligned}$ | $\begin{aligned} & 1.38 \\ & 35 \end{aligned}$ | $\begin{aligned} & 7.00 \\ & 178 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A12106CHNFSS6 | $\begin{aligned} & 12.00 \times 10.00 \times 6.00 \\ & 305 \times 254 \times 152 \end{aligned}$ | 316L | 50, 50E | 14 | 16 | A12P10 | A12P10G | $\begin{aligned} & 10.75 \times 8.88 \\ & 273 \times 225 \end{aligned}$ | $\begin{aligned} & 12.75 \times 8.00 \\ & 324 \times 203 \end{aligned}$ | $\begin{aligned} & 13.50 \times 10.94 \\ & 343 \times 278 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 9.00 \\ & 229 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1212CHNFSS6 | $\begin{aligned} & 12.00 \times 12.00 \times 6.00 \\ & 305 \times 305 \times 152 \end{aligned}$ | 316L | 50, 50E | 14 | 16 | A12P12 | A12P12G | $\begin{aligned} & 10.75 \times 10.88 \\ & 273 \times 276 \end{aligned}$ | $\begin{aligned} & 12.75 \times 10.00 \\ & 324 \times 254 \end{aligned}$ | $\begin{aligned} & 13.50 \times 12.94 \\ & 343 \times 329 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 11.00 \\ & 279 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1412CHNFSS6 | $14.00 \times 12.00 \times 6.00$ $356 \times 305 \times 152$ | 316 L | 50, 50E | 14 | 16 | A14P12 | A14P12G | $\begin{aligned} & 12.75 \times 10.88 \\ & 324 \times 276 \end{aligned}$ | $\begin{aligned} & 14.75 \times 10.00 \\ & 375 \times 254 \end{aligned}$ | $\begin{aligned} & 15.50 \times 12.94 \\ & 394 \times 329 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 11.00 \\ & 279 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |
| A1614CHNFSS6 | $\begin{aligned} & 16.00 \times 14.00 \times 6.00 \\ & 406 \times 356 \times 152 \end{aligned}$ | 316L | 50, 50E | 14 | 16 | A16P14 | A16P14G | $\begin{aligned} & 14.75 \times 12.88 \\ & 375 \times 327 \end{aligned}$ | $\begin{aligned} & 16.75 \times 12.00 \\ & 425 \times 305 \end{aligned}$ | $\begin{aligned} & 17.50 \times 14.94 \\ & 445 \times 379 \end{aligned}$ | $\begin{aligned} & 5.50 \\ & 140 \end{aligned}$ | $\begin{aligned} & 5.62 \\ & 143 \end{aligned}$ | $\begin{aligned} & 2.38 \\ & 60 \end{aligned}$ | $\begin{aligned} & 13.00 \\ & 330 \end{aligned}$ | $\begin{aligned} & 0.25 \\ & 6 \end{aligned}$ | $\begin{aligned} & 0.62 \\ & 16 \end{aligned}$ |

A6044CHNFSS and A6044CHNFSS6 UL 508A Listed. The remaining catalog numbers are UL 50 Listed.
Purchase panels separately. Optional stainless steel, composite and aluminum panels are available for most sizes.


PANELS FOR JUNCTION BOXES
BULLETIN: PNLJ, PNLWM


Steel panels are 14 gauge, finished with white polyester powder paint or with a conductive, corrosion-resistant coating. Stainless steel panels are 14 gauge Type 304 and have a commercial \#3 finish which is protected on one side with a plastic film. Aluminum panels are $5052-\mathrm{H} 32$ aluminum alloy $0.080-\mathrm{in}$. ( $2-\mathrm{mm}$ ) thick and protected on one side with a plastic film. Panel mounting hardware is furnished with all enclosures which accept these panels.

| Catalog Number | Material | Panel Size D x E (in.) | Panel Size D x E (mm) | V (in.) | V (mm) | X (in.) | X (mm) | Y (in.) | Y (mm) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A4P4G | Conductive | $2.88 \times 2.88$ | $73 \times 73$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P4 | Painted steel | $4.88 \times 2.88$ | $124 \times 73$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P4G | Conductive steel | $4.88 \times 2.88$ | $124 \times 73$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P4SS | Stainless Steel | $4.88 \times 2.88$ | $124 \times 73$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P4AL | Aluminum | $4.88 \times 2.88$ | $124 \times 73$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P6 | Painted steel | $4.88 \times 4.88$ | $124 \times 124$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P6G | Conductive steel | $4.88 \times 4.88$ | $124 \times 124$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P6SS | Stainless Steel | $4.88 \times 4.88$ | $124 \times 124$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A6P6AL | Aluminum | $4.88 \times 4.88$ | $124 \times 124$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A7P7G | Conductive | $5.88 \times 5.88$ | $149 \times 149$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A8P6 | Painted steel | $6.75 \times 4.88$ | $171 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P6G | Conductive steel | $6.75 \times 4.88$ | $171 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P6SS | Stainless Steel | $6.75 \times 4.88$ | $171 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P6AL | Aluminum | $6.75 \times 4.88$ | $171 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P8 | Painted steel | $6.75 \times 6.88$ | $171 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P8G | Conductive Steel | $6.75 \times 6.88$ | $171 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A8P8AL | Aluminum | $6.75 \times 6.88$ | $171 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A9P6G | Conductive | $7.38 \times 4.63$ | $187 \times 118$ | . 31 | 8 | . 31 | 8 | 1.25 | 32 |
| A10P8 | Painted steel | $8.75 \times 6.88$ | $222 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P8G | Conductive steel | $8.75 \times 6.88$ | $222 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P8SS | Stainless Steel | $8.75 \times 6.88$ | $222 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P8AL | Aluminum | $8.75 \times 6.88$ | $222 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P10 | Painted steel | $8.75 \times 8.88$ | $222 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P10G | Conductive steel | $8.75 \times 8.88$ | $222 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A10P10AL | Aluminum | $8.75 \times 8.88$ | $222 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P6 | Painted steel | $10.75 \times 4.88$ | $273 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P6G | Conductive steel | $10.75 \times 4.88$ | $273 \times 124$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P10 | Painted steel | $10.75 \times 8.88$ | $273 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P10G | Conductive steel | $10.75 \times 8.88$ | $273 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P10SS | Stainless Steel | $10.75 \times 8.88$ | $273 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P10AL | Aluminum | $10.75 \times 8.88$ | $273 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P12 | Painted steel | $10.75 \times 10.88$ | $273 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P12G | Conductive steel | $10.75 \times 10.88$ | $273 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A12P12SS | Stainless Steel | $10.75 \times 10.88$ | $273 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P8 | Painted steel | $12.75 \times 6.88$ | $324 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P8G | Conductive steel | $12.75 \times 6.88$ | $324 \times 175$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P12 | Painted steel | $12.75 \times 10.88$ | $324 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P12G | Conductive steel | $12.75 \times 10.88$ | $324 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P12SS | Stainless Steel | $12.75 \times 10.88$ | $324 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A14P12AL | Aluminum | $12.75 \times 10.88$ | $324 \times 276$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P10 | Painted steel | $14.75 \times 8.88$ | $375 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P10G | Conductive steel | $14.75 \times 8.88$ | $375 \times 226$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P14 | Painted steel | $14.75 \times 12.88$ | $375 \times 327$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P14G | Conductive steel | $14.75 \times 12.88$ | $375 \times 327$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P14SS | Stainless Steel | $14.75 \times 12.88$ | $375 \times 327$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A16P14AL | Aluminum | $14.75 \times 12.88$ | $375 \times 327$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A18P16 | Painted steel | $16.75 \times 14.88$ | $425 \times 378$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A18P16G | Conductive steel | $16.75 \times 14.88$ | $425 \times 378$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A18P16SS | Stainless Steel | $16.75 \times 14.88$ | $425 \times 378$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A18P16AL | Aluminum | $16.75 \times 14.88$ | $425 \times 378$ | . 25 | 6 | . 31 | 8 | 1.25 | 32 |
| A20P16J | Painted | $18.75 \times 14.88$ | $476 \times 378$ | . 47 | 12 | . 54 | 14 | . 81 | 21 |
| A20P16JAL | Aluminum | $18.75 \times 14.88$ | $476 \times 378$ | . 47 | 12 | . 54 | 14 | . 81 | 21 |

### 10.0 Motor Information



DATA SHEET
Three Phase Induction Motor - Squirrel Cage
Customer : ROSSI DO BRASIL COMERCIO E SERVICOS LTDA

| Product line | : W22-IE3 / Nema Premium Efficiency Tru Metric |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Frame | : 90L |  | Locked rotor time | : 14 s (hot) 25 s (cold) |
| Output | : 2 HP (1.5 kW) |  | Temperature rise | : 80 K |
| Poles | : 4 |  | Duty cycle | : S1 |
| Frequency | : 60 Hz |  | Ambient temperature | : $-20^{\circ} \mathrm{C}$ to $+40^{\circ} \mathrm{C}$ |
| Rated voltage | : 480 V |  | Altitude | : 3280 ft |
| Rated current | : 2.71 A |  | Protection degree | : IP66 |
| L. R. Amperes | : 22.5 A |  | Cooling method | : IC411-TEFC |
| LRC | : 8.3 Code L |  | Mounting | : B5R(D) |
| No load current | : 1.61 A |  | Rotation ${ }^{1}$ | : Both |
| Rated speed | : 1755 rpm |  | Noise level ${ }^{2}$ | : $49.0 \mathrm{~dB}(\mathrm{~A})$ |
| Slip | : 2.50 \% |  | Vibration class | : A |
| Rated torque | : 8.00 Nm |  | Starting method | : Direct On Line |
| Locked rotor torque | : 310 \% |  | Coupling | : Direct |
| Pull up torque | : 260 \% |  | Approx. weight ${ }^{3}$ | : 50.7 lb |
| Breakdown torque | : 390 \% |  | Painting plan | : 203A |
| Insulation class | : F |  | Color | : RAL 5015 |
| Service factor | : 1.25 |  | Design | : N |
| Moment of inertia (J) | : 0.1566 sq.ft.lb |  |  |  |
| Output | 50\% 75\% | 100\% | Load type | - |
| Efficiency (\%) | $82.5 \quad 85.5$ | 86.5 | Load torque | :- |
| Power Factor | 0.55 0.68 | 0.77 | Load inertia ( $\mathrm{J}=\mathrm{GD}^{2} / 4$ ) | :- |
|  | Drive end | Non drive end | Foundation loads |  |
| Bearing type | 6205-ZZ | 6204-ZZ | Max. traction | : 779.1 N |
| Lubrication interval | - | - | Max. compression | : 1004.8 N |
| Lubricant amount | - | - |  |  |
| Lubricant type | MOBIL POL | YREX EM |  |  |

Notes
See notes on page 2.

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1 m and with tolerance of $+3 \mathrm{~dB}(\mathrm{~A})$.
(3) Approximate weight, subject to be changed after manufacturing process.
(4) At $100 \%$ of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in IEC 60034-1.

| Rev. | Changes Summary |  | Rev. | Checked | Date |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| Performed by | natashas |  | 1066706406 |  |  |
| Checked by | natashas |  | Page | Rev. |  |
| Date | $27 / 01 / 2020$ |  |  | $1 / 2$ | 1 |

Customer : ROSSI DO BRASIL COMERCIO E SERVICOS LTDA.

Product line
: W22 - IE3 / Nema Premium Efficiency Tru Metric

Space heater information
Voltage: 200-240 V
Output: 9.1-13 W
Notes

|  | Specification | : MG1 - Part 10 | Vibration | : MG1-Part 7 |
| :---: | :---: | :---: | :---: | :---: |
|  | Test | : MG1 - Part 12 | Tolerance | : MG1-Part 12 |
|  | Noise | : MG1 - Part 9 |  |  |

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1 m and with tolerance of $+3 \mathrm{~dB}(\mathrm{~A})$.
(3) Approximate weight, subject to be changed after manufacturing process.
(4) At $100 \%$ of full load.

| Rev. | Changes Summary |  | Rev. | Checked | Date |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |
| Performed by | natashas |  | 1066706406 |  |  |
| Checked by | natashas |  | Page | Rev. |  |
| Date | $27 / 01 / 2020$ |  |  | $2 / 2$ | 1 |

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2 HP 04 Poles 60 Hz


### 11.0 Compressor Information

## 2 HP Reciprocating

5 cfm @ 125 psl

## Compressor Features

- Cast iron industrial grade pump
- Industrial Grade Electric Motor
- Auto start/stop
- Fully enclosed beltguard
- All UL control components
- ASME/CRN certified tank


| M1 | Phere visligy Tmit |  |  | Etrict | Widh | Heytht | AmpDrameralt | Anperichevier |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| B23H1060 | 3 | 230/460 | 10 Gallon Horizontal | 31" | 16.5" | 28" | 6.8 amps | 3.4 amps |
|  |  |  |  |  |  |  |  |  |

## Compressed Air Systems

Simplicity. It's What We Da
compressed-alr-systams.com | 1-900-531-9656 | Fax972-352-6364
eccoppend wrigomituc zamr


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## /IIJORC

## COMBO

## Electronic timer drain with integrated strainer

## PRODUCT FEATURES

The COMBO timer controlled condensate drain combines an easy to program timer controlled drain, a ball valve and a mesh strainer into one compact easy to install package.

The COMBO is perfect for a wide range of compressed air applications, especially those with solid particulate contaminants.

With a test button, LED ON/OFF indication and a fully serviceable direct acting valve, the COMBO offers ease to use, affordable and reliable condensate management without the need to install additional valves and strainers. Use it on compressors, receivers, filters or refrigerated air dryers.

The 115 VAC version of this drain is supplied with a 6 ft . power cord with plug and the 230 VAC version is supplied with a 7 ft . power cord.

## COMMERCIAL BENEFITS



- Installation time saver thanks to the integrated shut off valve and mesh strainer
- Dual thread inlet ( $1 / 2^{\prime \prime} \& 1 / 4^{\prime \prime}$ ), offering installation flexibility
- Any type of compressed air system and up to 230 psi (16 bar)
- Serviceable valve construction, offering you routine maintenance revenues
- Consult JORC for private labelling options


## TECHNICAL ADVANTAGES

- Integrated mesh strainer, offering valve and orifice protection from larger particles found in condensate
- Integrated shut off valve, offering easy shut off of the valve for routine maintenance
- Does not air-lock during operation
- TEST (micro-switch) feature


## COMBO

Electronic timer drain with integrated strainer DIMENSIONS



Compact design!

## TECHNICAL SPECIFICATIONS

Max. compressor capacity Any size

Pressure range
Supply voltage options
Medium temperature
Ambient temperature
Timer cycle range (ON/OFF) Timer PCB

Timer cycle indication TEST feature

Valve type
Valve orifice
Valve seals
Inlet/outlet connections Inlet connection height
Serviceable valve
Valve housing material

Power connection
Environmental protection
o-230 psi (o-16 bar), for higher pressures see OPTIMUM-HP-S 12-380 VAC/DC 50/60Hz. (please indicate)

34-122 ${ }^{\circ} \mathrm{F}\left(1-50^{\circ} \mathrm{C}\right)$
34-122 ${ }^{\circ} \mathrm{F}\left(1-50^{\circ} \mathrm{C}\right)$
0.5-10 seconds/0.5-45 minutes SMD technology, ensuring consistency in production
Bright LED illumination
Yes
2/2 way, direct acting
4 mm
FPM
1/4" \& 1/2" / 1/2" NPT or BSP
$0.4^{\prime \prime}$ (10 mm)
Yes
Brass (Stainless steel available, see OPTIMUM)

DIN 43650-A
NEMA4 (IP65)


Dual inlet feature $1 / 2^{\prime \prime} \& 1 / 4^{\prime \prime}$

## JORC is NEN - EN - ISO 9001:2015 certified

Information provided herewith is believed to be accurate and reliable. However, no responsibility is assumed for its use or for any infringement of patents or rights of others, which may result from its use. In addition, JORC reserves the right to revise information without notice and without incurring any obligation.



## E. KENAI WWTF RECORD DRAWINGS

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## KENAI WWTF RECORD DRAWINGS

Electronic copies of record drawings for the Kenai WWTF are available upon request to those on current plan holder's list. Contact the Public Works Department at publicworks@kenai.city. Location of existing features, equipment, pipes, etc. in the record drawings are approximate. Contractor shall be responsible for obtaining field verification of all dimensions and layout.

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F. ASBESTOS SAMPLING SUMMARY REPORT

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# SUMMARY REPORT - SLUDGE PRESS REPLACEMENT PROJECT ROOFING ASBESTOS SAMPLING 



# CITY OF KENAI WASTEWATER TREATMENT PLANT 

KENAI, ALASKA

## Surveyed <br> May 5, 20221

Report Date
May 31, 2022

EHS:ALASKA, INC.
ENGINEERING, HEALTH \& SAFETY CONSULTANTS
11901 BUSINESS BLVD., SUITE 208
EAGLE RIVER, ALASKA 99577-7701

# ASBESTOS SAMPLING SUMMARY REPORT SLUDGE PRESS REPLACEMENT PROJECT 

KENAI, ALASKA

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# ASBESTOS SAMPLING SUMMARY REPORT SLUDGE PRESS REPLACEMENT PROJECT 

KENAI, ALASKA

## OVERVIEW

Roofing Materials likely to be disturbed during the installation of a new Sludge Press at the Waste Water Treatment Plant (WWTP), located in Kenai, Alaska, was surveyed for the presence of asbestos-containing materials (ACM) as a part of the Sludge Press Replacement Project for the City of Kenai. No other hazardous materials were included in this focused survey. Mr. Martin K. Schwan, Project Manager, of EHSAlaska, Inc. (EHS-Alaska) conducted the inspections in May 2022. It will be the contractor's responsibility to take this baseline data, and to conduct hazardous materials removal in compliance with all regulatory requirements.

## A. GENERALIZED REQUIREMENTS FOR HAZARDOUS MATERIALS

Potentially hazardous materials have been identified at the WWTP that will be affected by the proposed renovations. Those materials include asbestos, lead, polychlorinated bi-phenyls (PCBs), mercury, and radioactive materials. Not all materials were tested for potentially hazardous components, other potentially hazardous materials, including those exterior to the building, such as contamination from underground fuel tanks may be present, but are not part of this report.

Buildings or portions of buildings that were constructed prior to 1978 which are residences, or contain day care facilities, kindergarten classes or other activities frequently visited by children under 6 years of age are classified as child occupied facilities. All work which is NOT classified as "minor repair and maintenance activities" (as defined by the regulations), that takes place in the "child occupied" portions of facilities must comply with the requirements of 40 CFR 745 . This building is not classified as a child occupied facility and therefore the requirements of 40 CFR 745 are not applicable.

Only the materials that will be directly affected by this project are required to be removed. It is the Contractor's responsibility to take this baseline data to coordinate and fully develop a hazardous materials removal design that will identify the presence, locations, and quantities of asbestos and/or other hazardous materials that will be affected by this project. The removal and disposal of potentially hazardous materials are highly regulated, and it is anticipated that removal and disposal of asbestos, lead and chemical hazards will be conducted by a subcontractor to the general contractor who is qualified for such removal. It is anticipated that the general contractor and other trades will be able to conduct their work using engineering controls and work practices to control worker exposure and to keep airborne contaminants out of occupied areas of the building.

Settled and concealed dusts in areas not subject to routine cleaning are present throughout the building, including the roof, and inside and on top of architectural, mechanical, electrical, and structural elements, and those dusts are assumed to contain regulated air contaminants. This should not be read to imply that there is an existing hazard to building occupants (normal occupants of the building as opposed to construction workers working in the affected areas). However, depending on the specific work items involved and on the means and methods employed when working in the affected areas, construction workers could be exposed to regulated air contaminants from those dusts in excess of the OSHA Permissible Exposure Limits (PELs).

The settled and concealed dusts were examined by an EPA Certified Building Inspector but were not sampled. The inspector determined that the dusts are not "asbestos debris" from an asbestos-containing building material (ACBM). Based on similar sampling from similar buildings, the inspector also determined that the dusts are unlikely to contain more than one percent (1\%) asbestos by weight, and therefore are not an asbestos-containing material (ACM). Reference 40 CFR 763.83.
"Awareness training" (typically 2 hours) and possibly respiratory protection will be required for all Contractor Personnel who will be disturbing the dusts. The extent of the training and protective measures will depend upon the airborne concentrations measured during air monitoring of the contractors work force, which depends on the means and methods employed to control the dusts. The air monitoring may be discontinued following a "negative exposure assessment" showing that worker exposures are below the OSHA permissible exposure limits for the type of work and means and methods employed. Previous air monitoring from similar jobs with similar conditions may be used as historical data to establish a "negative exposure assessment."

## B. BUILDING DESCRIPTION

The Kenai Waste Water Treatment Plant was reportedly constructed in 1971 of steel post and beams and metal siding. The roof is a built-up asphaltic roof over $2^{\prime \prime}$ rigid insulation on $11 / 2^{\prime \prime}$ steel deck. Giving the age of the building there is a potential that a previous re-roof occurred but the two roof cores taken during this survey were consistent with the 1971 drawings provided by the City of Kenai. The exposed underside was the $1 / 1 / 2^{\prime \prime}$ metal deck.

The west portion of the building has some areas with a spray-applied cellulose insulation on the underside of the roof deck and walls and two samples were collected which the lab reported as "none detected" for asbestos.

## C. SAMPLING AND ANALYSIS

## 1. Asbestos-Containing Materials

The survey was limited to the areas of the roof where penetrations in support of the new sludge press were shown on the drawing provided by the City of Kenai and not all areas were included in this limited survey.

The samples were analyzed for the presence of asbestos using polarized light microscopy (PLM), analysis, as recommended by EPA, to determine the composition of suspected ACMs (EPA method 600/M4-82020). Only materials containing more than $1 \%$ total asbestos were classified as "asbestos-containing" based on EPA and OSHA criteria. Samples analyzed to have less than 10\% asbestos were "point-counted" by the laboratory for more accuracy. Samples listed as having a "Trace by Point Count" had asbestos fibers found in the material, but the fibers were not present at the counting grids. Table 1 in Part D below contains a summary list of the asbestos bulk samples and the applicable results.

The Bulk Asbestos samples were analyzed for asbestos content by International Asbestos Testing Laboratories (IATL), Mt. Laurel, New Jersey a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

EPA regulations under 40 CFR 763 require the use of PLM to determine whether or not a material contains asbestos. While PLM analysis does a good job for most materials, it does have some limitations. Fibers may be undetectable if their small size prevents visibility under a standard optical microscope, or if they are bound in an organic matrix to the point that the fibers are obscured. At the discretion of the building inspector and the client, some types of samples may be analyzed or re-analyzed by what is called Transmission Electron Microscopy for Non-Friable Organically Bound (TEM NOB) materials. TEM NOB analysis was not done for this project.

Field survey data sheets and laboratory reports of the bulk samples are included in Appendix A. Drawings showing sample locations are included as Appendix E.

## 2. Lead-Containing Materials

Nearly all surfaces in the building were coated with paint and most surfaces had been repainted but no testing of paints or sealants for lead was authorized for this project, and no sampling occurred.
no lead survey was included in the survey.

## 3. Testing of Paints and Sealants for PCB's

No testing of paints or sealants for PCB's was authorized for this project, and no sampling occurred.

## D. SURVEY RESULTS

## 1. Asbestos-Containing Materials

The following Table 1A lists the samples taken in May 2022 in the WWTP, and the results of the laboratory analysis. Asbestos field survey data sheets and laboratory reports are included as Appendix A. Refer to Appendix B for sample locations sketch.

TABLE 1A

| SAMPLE <br> NUMBER | MATERIAL | LOCATION | ASBESTOS <br> CONTENT |
| :--- | :--- | :--- | :--- |
| WTP0522-A01 | Built-up roofing: L1 - Asphaltic <br> rolled roofing, L2 underlayment, <br> L3 underlayment. Not included <br> L4 4" rigid foam, L5 fibrous thin <br> layer of underlayment. | Roof Core: one 21/2" core from the <br> center of the roof - Top layer L1 and <br> L2 and L3. Photo 249 | All 3 layers - None <br> Detected |
| WTP0522-A02 | L5 fibrous thin layer of <br> underlayment, tar. | Roof Core: one 21/2" core from the <br> center of the roof - Bottom layer <br> L5.Photo 250 | None Detected |
| WTP0522-A03 | Pliable black tar | Roof: South side AHU, SW corner <br> on built-up curb facing roof edge on <br> base of AHU. Photo 259 | None Detected |
| WTP0522-A04 | Black tar, fiber board. Lab also <br> reported black shingle. | Roof: South side AHU, just west of <br> the SE corner on built-up curb <br> facing roof edge on base of AHU. <br> Photo 262 | All 3 layers - None <br> Detected |
| WTP0522-A05 | Black tar | Roof: South side AHU, SE corner on <br> east face of AHU above the built-up <br> curb. Photo 263 | None Detected |
| WTP0522-A06 | Pliable black sealant | Roof: smaller (RA) housing east of <br> the AHU, SW corner of metal <br> housing above the built-up curb. <br> Photo 264 | None Detected |
| WTP0522-A07 | Black glass tar. Lab also <br> reported black shingle. | Roof: smaller (RA) housing east of <br> the AHU, SW corner of metal <br> housing on the built-up curb. Photo <br> 264 | Both layers - None <br> Detected |
| WTP0522-A08 | Soft Black Sealant | Roof: on duct between the AHU and <br> the RA housing, top on seam. <br> Photo 269 | None Detected |
| WTP0522-A10 | Built-up roofing: L1 - Asphaltic <br> rolled roofing, L2 black tar, L3 <br> underlayment. Not included L4 <br> 4" rigid foam, L5 fibrous thin <br> layer of underlayment. | Roof Core: one 21/2" core from the <br> area adjacent to AHU on the west <br> side, north end - Top layer L1 and <br> L2 and L3. Photo 277 | All 4 layers - None <br> Detected |
| 274 | Roof: smaller (RA) housing east of <br> the AHU, NW corner of metal <br> housing on the built-up curb. Photo | All 3 layers - None <br> Detected |  |
| Black tar, asphaltic roofing. Lab |  |  |  |
| also reported silver/black tar. |  |  |  |


| SAMPLE <br> NUMBER | MATERIAL | LOCATION | ASBESTOS <br> CONTENT |
| :--- | :--- | :--- | :--- |
| WTP0522-A11 | L5 fibrous thin layer of <br> underlayment, tar. | Roof Core: one 21/2" core from the <br> center of the roof - Bottom layer <br> L5.Photo 277 | Both layers - None <br> Detected |
| WTP0522-A12 | White seal sealant, putty-like | Roof: on seam of the outside air <br> intake housing on the west side <br> of the AHU. Photo 292 | 1.9\% Chrysotile |
| WTP0522-A13 | White spray-on fire proofing, <br> fluffy - "cotton-like" | WWTP Office: East wall, left of the <br> door above the electrical panel, <br> above the GWB, at former wall <br> penetrations. Photo 310 | None Detected |
| WTP0522-A14 | White spray-on fire proofing, <br> fluffy - "cotton-like" | WWTP Office: East wall, left of the <br> door above the electrical panel, <br> above the GWB on steel post. <br> Photo 311 | None Detected |
| The testing method used (polarized light microscopy [PLM]) is not consistently reliable in detecting asbestos in floor coverings and <br> similar non-friable organically bound materials. Before this material can be considered or treated as non-asbestos containing, <br> confirmation should be made by quantitative transmission electron microscopy (TEM). |  |  |  |

The following materials have been found to contain asbestos in this survey or were assumed to contain asbestos.

1. Roofing outside of the scope of this sampling (assumed asbestos).
2. Penetration Sealants (assumed asbestos).
3. White Putty-like seam sealant on AHU (confirmed asbestos).
4. Metal siding seam sealant (assumed asbestos).

The effects of the above asbestos-containing materials on the proposed renovation are discussed below.

## Roofing

Roofing over this portion of the building is an asphaltic built-up roofing and all samples in the areas where penetrations will be made for the Sludge Press replacement were none detected for asbestos. However, there may be asbestos-containing roofing materials in areas which were not included in this limited survey. The roofing materials will be partially removed by this project.

## Penetration Sealants

Doors, windows, and other penetrations of the exterior walls are assumed to contain an asbestos-containing sealant compound. An asbestos-containing sealant is assumed to be present around exterior door frames. The sealants are unlikely to be disturbed by this project.

## AHU Seam Sealant

A white putty-like sealant on the AHU that will be affected by this project is asbestos-containing. These materials were in good condition but may become friable during removal or disassembly. The sealant will be partially removed by this project.

## Metal Siding Sealants

There is a factory installed sealant located on the metal siding joints according to the building details provided by the City of Kenai. Previous testing of similar metal buildings in the same era have shown the sealant contains asbestos. The sealants are unlikely to be disturbed by this project.

## 2. Asbestos in Dusts

The settled and concealed dusts were examined by an EPA Certified Building Inspector but no samples for asbestos in dusts were authorized for this project. Based on their visual inspection and experience from
similar buildings, the inspector determined that the typical settled and concealed dusts are not "asbestos debris" from an asbestos-containing building material (ACBM). Based on similar sampling from similar buildings, the inspector also determined that the dusts are unlikely to contain more than one percent (1\%) asbestos by weight, and therefore are not an asbestos-containing material (ACM).

## 3. Lead-Containing Materials

## Lead-Testing

No lead paint testing was performed.

## 4. PCB-Containing Materials

## Bulk Products

Some older paints, sealants and other building materials may contain measurable amounts of PCB's. PCB use in paints and sealants was supposed to have been discontinued in 1979. The EPA does not require the sampling of bulk products, and no sampling of "Bulk Products" were authorized for this project.

## 5. Mercury-Containing Materials

## Fluorescent Lamps

Fluorescent lamps use mercury to excite the phosphor crystals that coat the inside of the lamp. These lamps contain from 15 to 48 milligrams of mercury depending on their age and manufacturer. No fluorescent light fixtures are scheduled to be replaced by this project.

All mercury-containing items being removed by this project are required to be disposed of as hazardous waste or recycled.

## 6. Other Hazardous Materials

This survey was limited in scope and therefore other hazardous materials may be present that were not part of this survey.

## Soil Contamination

The scope of work for EHS-Alaska, Inc. did not include investigation of soils for petroleum or other contaminations.

## E. REGULATORY CONSTRAINTS

## 1. Asbestos-Containing Materials

The Federal Occupational Safety and Health Administration (29 CFR 1926.1101) and the State of Alaska Department of Labor (8 AAC 61) have promulgated regulations requiring testing for airborne asbestos fibers; setting allowable exposure limits for workers potentially exposed to airborne asbestos fibers; establishing contamination controls, work practices, and medical surveillance; and setting worker certification and protection requirements. These regulations apply to all workplace activities involving asbestos-containing materials.

The EPA regulations, issued as Title 40 of the Code of Federal Regulations, Part 61 (40 CFR 61), Subpart M under the National Emission Standards for Hazardous Air Pollutants (NESHAP), established procedures for handling ACM during asbestos removal and waste disposal.

The EPA regulations require an owner (or the owner's contractor) to notify the EPA of asbestos removal operations and to establish responsibility for the removal, transportation, and disposal of asbestoscontaining materials.

The disposal of asbestos waste is regulated by the EPA, the Alaska Department of Environmental Conservation, and the disposal site operator. Wastes being transported to the disposal site must be sealed in leak tight containers prior to disposal and must be accompanied by disposal permits and waste manifests.

## 2. Dusts with Asbestos

Settled and concealed dusts above ceilings, and at other areas that are not routinely cleaned (such as inside ducts and at roofs, etc.) are assumed to have measurable concentrations of asbestos. Based on sampling of similar settled and concealed dusts at similar buildings, those dusts are assumed to contain less than 1 percent asbestos. Normal settled and concealed dusts are distinct and treated differently from debris resulting from damaged asbestos-containing materials.

Background levels of asbestos in dusts for a particular location will depend on many factors, including whether or not asbestos occurs naturally in soils in the area.

## Likely sources of asbestos in dusts include natural occurrences of asbestos

The types of asbestos found in settled and concealed dusts often contain actinolite, anthophyllite and tremolite forms of asbestos which are not commonly found in bulk samples taken of materials from buildings. Those forms of asbestos may come from natural occurrences of asbestos in an outside source, such as rock or ore deposits, which appear to be common in Alaska.

Because the type of disturbance, concentration of asbestos in the dusts, cohesiveness of the dusts and room sizes will change, the airborne asbestos levels expected during the project will depend on the contractor's means and methods of conducting the work. The mere presence of asbestos in the dusts does not necessarily imply that a "hazard" exists which would require the use of specially trained workers to "abate" the "hazard." All dusts will likely be required to be removed from the areas where asbestoscontaining materials are being removed (abatement areas) in order to achieve clearances. The dusts in the other areas are to be controlled so as to limit worker exposures and prevent contamination of occupied areas of the building.

There is no established correlation between settled or adhered dusts with measurable concentrations of asbestos and airborne concentrations. The definition in the OSHA regulations of asbestos-containing materials as those materials that contain 1 percent or more asbestos by weight, apply to cohesive materials and not to dusts. The OSHA regulations are essentially "performance based," if workers are exposed above the permissible exposure limits, then all of the requirements in the regulations become effective.

## 3. Lead-Containing Materials

The EPA Standard 40 CFR 745, Lead-Based Paint Poisoning Prevention in Certain Residential Structures, defines lead-based paint hazards and regulates lead based paint activities in target housing and childoccupied facilities. The requirements of this regulation include training certification, pre-work notifications, work practice standards and record keeping. Areas typically classified as child occupied facilities may include but are not limited to day care facilities, preschools, kindergarten classrooms, restrooms, multipurpose rooms, cafeterias, gyms, libraries, and other areas routinely used by children under 6 years of age. Training requirements for Firms (Contractors) and Renovators (Workers) became effective on April 22, 2010. The building is not classified as a child occupied facility therefore the requirements of 40 CFR 745 do not apply.

The requirements apply to renovation, repair or painting activities that are NOT classified as "minor repair and maintenance activities" (as defined by the regulations), which take place in the "child occupied" portions of facilities. It is anticipated that only small amounts of lead based paint (if present) will be required to be disturbed for the Sludge Press replacement work, and the work would be classified as minor repair and maintenance activities, therefore most requirements of 40 CFR 745 do not apply.

## 4. PCB-Containing Materials

The EPA has promulgated regulations (40 CFR Part 761) that cover the proper handling and disposal of PCB-containing materials. If any PCB-containing equipment is discovered and if they will be removed, those materials are required to be disposed of at fully permitted hazardous waste facilities. The EPA regulates liquid PCBs differently from non-liquid materials. Workers who remove or handle PCB-containing or PCB-contaminated materials or who transport or dispose of PCB wastes must be trained and certified in hazardous waste operations and emergency response (HAZWOPER) as required by 29 CFR 1910.120 and the State of Alaska Department of Labor (8 AAC 61). The Department of Transportation under 49 CFR Parts 100-199 regulates the marking, packaging, handling, and transportation of hazardous materials. All federal, state, and local standards regulating PCBs and PCB waste must be followed during this project.

## 5. Mercury-Containing Materials

Thermostats and mercury-containing lamps are classified by the EPA as Universal Wastes. The EPA encourages that all Universal Wastes be recycled in accordance with 40 CFR 273. Mercury and mercurycontaining products are considered hazardous waste if TCLP testing of the waste for mercury confirms the mercury content to be greater than the EPA criteria of $0.2 \mathrm{mg} / \mathrm{l}$.

## 6. Other Hazardous Materials

Other hazardous materials to include refrigerants, chemicals, waste heat transfer fluids, radioactive materials were not part of this survey. If other hazardous materials are disturbed or removed during the Sludge Press installation, they shall be removed and disposed according to all regulations.

## F. RECOMMENDATIONS

## 1. Asbestos-Containing Materials

The asbestos-containing materials identified in the building are typically in intact condition and are classified as non-friable ACM. All asbestos-containing materials that will be disturbed by the planned renovation work are required to be removed by trained asbestos workers. If any asbestos-containing materials are found that will be disturbed by the Sludge Press installation, they are required to be removed by trained asbestos workers.

## 2. Dusts with Asbestos

Dusts with measurable concentrations of asbestos are assumed to be present, but are not classified as asbestos-containing materials, or as debris from asbestos-containing materials. Workers disturbing dusts are required to have hazard communication training in accordance with OSHA regulations but are not required to receive 40 hours of training, which is required for asbestos workers. The contractor will need to choose means and methods to control worker exposures to airborne contaminants. At least an initial exposure assessment or data from previous air monitoring is needed to show that worker exposures are maintained below the OSHA permissible exposure limits (PELs).

## 3. Lead-Containing Materials

Federal OSHA (29 CFR 1926.62) and the State of Alaska (8 AAC Chapter 61) have promulgated regulations that apply to all construction work where employees may be exposed to lead, including disturbance of paints with low concentrations of lead.

## 4. PCB-Containing Materials

If any PCB-containing ballasts are discovered, and they are removed or replaced, they will need to be removed, handled, packaged, and disposed of in accordance with all regulations.

## 5. Mercury-Containing Materials

If any mercury-containing materials are removed or replaced, they will need to be removed, handled, packaged, and disposed of in accordance with all regulations. If mercury-containing lamps and thermostats are handled and disposed of in accordance with the Universal Waste Regulations, no TCLP test is required. If the Contractor chooses to perform a TCLP test of fluorescent lamps, the test shall be conducted in accordance with the requirements of ANSI/NEMA Standard Procedure for Fluorescent Lamp Sample Preparation and Toxicity Characteristic Leaching Procedure, C78.LL 1256-2003 or latest version.

## 6. Other Hazardous Materials

Although other hazardous materials were not included as part of this limited survey, if other hazardous materials are identified that will be disturbed as part of the Sludge Press replacement project, they will need to be removed, handled, packaged, and disposed of in accordance with all regulations.

## G. LIMITATIONS

The conclusions and recommendations contained in this report are based upon professional opinions with regard to the subject matter. These opinions have been arrived at in accordance with currently accepted environmental consulting and engineering standards and practices and are subject to the following inherent limitations:

## 1. Accuracy of Information

The laboratory reports utilized in this assessment were provided by the accredited laboratories cited in this report. Although the conclusions, opinions, and recommendations are based in part, on such information, our services did not include the verification of accuracy or authenticity of such reports. Should such information provided be found to be inaccurate or unreliable, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

## 2. Site Conditions

This limited survey did not include investigation of the entire site and may not be valid outside the area identified as the area where penetrations were proposed in support of the Sludge Press replacement project and was limited to testing for asbestos only. This survey is not intended to be utilized as the sole design document for abatement. The scope of work for this survey did not include identification of all potentially hazardous materials that may be present at this site such as lead, PCB's, mercury, and was limited to the scope of work agreed upon with our client. Although a concerted effort was made to identify those common hazardous materials likely to be affected by this project, some hazardous materials may not have been identified. Other asbestos-containing or potentially hazardous materials may be present in the facilities that were concealed by structural members, walls, ceilings, or floor coverings, or in materials where testing was not conducted.

## 3. Changing Regulatory Constraints

The regulations concerning hazardous materials are constantly changing, including the interpretations of the regulations by the local and national regulating agencies. Should the regulations or their interpretation be changed from our current understanding, EHS-Alaska, Inc. reserves the right to amend or revise its conclusions, opinions, and/or recommendations.

## APPENDIX A

Asbestos Bulk Sample Field Survey Data Sheets
and
Laboratory Reports

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$\mathbb{E} H \mathrm{H}_{\boldsymbol{A}} \mathrm{Al}_{\text {aska, }} \mathbb{I n}_{\text {nc. }}$
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| $\begin{aligned} & \text { PROJECT NO: } \\ & 7933-01 \\ & \hline \hline \end{aligned}$ | PROJECT NAME: <br> COK WWTP - Kenai Roof Sampling | Facility: <br> Kenai WWTP Roof | $\begin{aligned} & \hline \hline \text { COLLECTION } \\ & \text { DATE: } \\ & \hline \mathbf{0 5 / 0 5 / 2 0 2 2} \\ & \hline \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| FIELD SURVEY DATA |  |  |  |
| $\frac{\text { EHS SAMPLE No. }}{\text { LAB ID No }}$ | SAMPLE DESCRIPTION (COLOR, MATERIAL TYPE, LAYERS, FRIABILITY) | LoCATION/COMMENTS (INCLUDING PHOTO/XREF) | $\begin{gathered} \text { RESULTS } \\ \hline \text { FOR EHS-ALASKA } \\ \text { USE ONLY } \end{gathered}$ |
| $\begin{gathered} \text { WTP0522-A10 } \\ 64.405 \end{gathered}$ | Built-up roofing: L1 - Asphaltic rolled <br>  Not included L4 4" rigid foam, L5 fibrous thin layer of underlayment. | Roof Core: one $21 / 2^{\prime \prime}$ core from the area adjacent to AHU on the west side, north end Top layer L1 and L2 and L3. Photo 277 | All 4 leiges - Rone Actected |
| $\begin{aligned} & \text { WTP052-A11 } \\ & : 42.706 \end{aligned}$ | L5 fibrous thin layer of underlayment, tar. | Roof Core: one $21 / 2^{\prime \prime}$ core from the center of the roof - Bottom layer L5.Photo 277 | Both lacy hore Detected |
| $\mathrm{wTR}_{2} 522-\mathrm{A} 12 \mathrm{y}$ | White seal sealant, putty-like | Roof: on seam of the outside air intake housing on the west side of the AHU. Photo 292 | $\begin{aligned} & 109 \% \\ & \text { chrerpibite } \end{aligned}$ |
| $\begin{aligned} & \text { WTP0522-A13 } \\ & -424.08 \\ & 8 \end{aligned}$ | White spray-on fire proofing, fluffy -"cotton-like" | WWTP Office: East wall, left of the door above the electrical panel, above the GWB, at former wall penetrations. Photo 310 | None selected |
|  | White spray-on fire proofing, fluffy -"cotton-like" | WWTP Office: East wall, left of the door above the electrical panel, above the GWB on steel post. Photo 311 | Nire petected |
| END | END | END |  |
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Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

| Client: | EHS Alaska Incorporated | Report Date: $5 / 17 / 2022$ |  |
| :--- | :--- | :--- | :--- |
|  | 11901 Business Blvd., Ste 208 | Report No.: $660676-$ PLM |  |
|  | Eagle River AK 99577 | Project: | COK WWTP - Kenai Rood Sampling |
| Client: | EHS511 | Project No.: | $7933-01$ |

## PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7424696
Client No.: WTP0522-A01

Percent Asbestos:
None Detected
Lab No.: 7424696(L2)
Client No.: WTP0522-A01

Percent Asbestos:
None Detected

Lab No.: 7424696(L3)
Client No.: WTP0522-A01

Percent Asbestos:
None Detected

Lab No.: 7424696(L4)
Client No.: WTP0522-A01

Percent Asbestos:
None Detected

Analyst Observation: Black Shingle
Client Description: Built-Up Roofing: L1-Asphaltic Rolled Roofing, L2 Underlayment, L3 Underlayment. Not Included L4 4"
Percent Non-Asbestos Fibrous Material:
20 Fibrous Glass

Analyst Observation: Black Tar
Client Description: Built-Up Roofing: L1-Asphaltic Rolled Roofing, L2 Underlayment, L3 Underlayment. Not Included L4 4"
Percent Non-Asbestos Fibrous Material:
None Detected

Analyst Observation: Black Underlayment
Client Description: Built-Up Roofing: L1-Asphaltic Rolled Roofing, L2 Underlayment, L3 Underlayment. Not Included L4 4"
Percent Non-Asbestos Fibrous Material:
35 Fibrous Glass 20 Cellulose

Analyst Observation: Black Underlayment
Client Description: Built-Up Roofing: L1-Asphaltic Rolled Roofing, L2 Underlayment, L3 Underlayment. Not Included L4 4"
Percent Non-Asbestos Fibrous Material:
35 Cellulose
15 Fibrous Glass

Location: Roof Core: One 21/2" Core From The Center Of The Roof-Top Layer L1, L2, L3. Photo 249

## Facility:

Percent Non-Fibrous Material:
80

Location: Roof Core: One 21/2" Core From The Center Of The Roof-Top Layer L1, L2, L3. Photo 249

## Facility:

Percent Non-Fibrous Material:
100

Location: Roof Core: One 21/2" Core From The Center Of The Roof-Top Layer L1, L2, L3. Photo 249

## Facility:

Percent Non-Fibrous Material: 45

Location: Roof Core: One 21/2" Core From The Center Of The Roof-Top Layer L1, L2, L3. Photo 249

## Facility:

Percent Non-Fibrous Material:
50

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received:
Date Analyzed:
Signature:
Analyst:

| $\frac{5 / 10 / 2022}{05 / 17 / 2022}$ |
| :--- |
| Dacẽd Hecejer |
| David Hayes |

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| Client: EHS Alaska Incorporated |  | 5/17/2022 |
| :---: | :---: | :---: |
| 11901 Business Bl | d., Ste 208 Report No.: | 660676 - PLM |
| Eagle River AK | 99577 Project: | COK WWTP - Kenai Rood Sampling |
| Client: EHS511 Project No.. 7933-01 |  |  |
| PLM BULK SAMPLE ANALYSIS SUMMARY |  |  |
| Lab No.: 7424697 <br> Client No.: WTP0522-A02 | Analyst Observation: Black Underlayment Client Description: L5 Fibrous Thin Layer Of Underlayment, Tar | Location: Roof Core: One 21/2" Core From |
|  |  | The Center Of The Roof-Bottom Layer L5. Photo 250 |
|  |  | Facility: |
| Percent Asbestos: <br> None Detected | Percent Non-Asbestos Fibrous Material: | Percent Non-Fibrous Material: |
|  | 40 Cellulose | 45 |
|  | 15 Fibrous Glass |  |
| Lab No.: 7424698 <br> Client No.: WTP0522-A03 | Analyst Observation: Black Tar Client Description: Pliable Black Tar | Location: Roof South Side AHU, SW |
|  |  | Corner On Built-Up Curb Facing Roof Edge |
|  |  | On Base Of AHU. Photo 259 |
|  |  | Facility: |
| Percent Asbestos: | Percent Non-Asbestos Fibrous Material: | Percent Non-Fibrous Material: |
| None Detected | None Detected | 100 |
| Lab No.: 7424699 Client No.: WTP0522-A04 | Analyst Observation: Black Tar Client Description: Black Tar, Fiberboard | Location: Roof: South Side AHU, Just West |
|  |  | Of The SE Corner On Built-Up Curb Facing |
|  |  | Roof Edge On Base Of AHU. P |
|  |  | Facility: |
| Percent Asbestos: | Percent Non-Asbestos Fibrous Material: | Percent Non-Fibrous Material: |
| None Detected | None Detected | 100 |
| Lab No.: 7424699(L2) Client No.: WTP0522-A04 | Analyst Observation: Black Shingle Client Description: Black Tar, Fiberboard | Location: Roof: South Side AHU, Just West |
|  |  | Of The SE Corner On Built-Up Curb Facing Roof Edge On Base Of AHU. P |
|  |  | Facility: |
| Percent Asbestos: | Percent Non-Asbestos Fibrous Material: | Percent Non-Fibrous Material: |
| None Detected | 20 Fibrous Glass | 80 |
| Lab No.: 7424699(L3) | Analyst Observation: Tan Fibrous | Location: Roof: South Side AHU, Just West |
| Client No.: WTP0522-A04 | Client Description: Black Tar, Fiberboard | Of The SE Corner On Built-Up Curb Facing Roof Edge On Base Of AHU. P |
|  |  | Facility: |
| Percent Asbestos: | Percent Non-Asbestos Fibrous Material: | Percent Non-Fibrous Material: |
| None Detected | 90 Cellulose | 10 |


| Please refer to the Appendix of this report for further information regarding your analysis. |  |
| :--- | :--- |
| Date Received: | $5 / 10 / 2022$ |
| Date Analyzed: | $\frac{05 / 17 / 2022}{\text { Daceicl Heeczen }}$ |
| Signature: | David Hayes |
| Analyst: |  |

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| Please refer to the Appendix of this report for further information regarding your analysis. |  |
| :--- | :--- |
| Date Received: | $5 / 10 / 2022$ |
| Date Analyzed: | $05 / 17 / 2022$ |
| Signature: | Daceicl Leeyen |
| Analyst: | David Hayes |

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| Client: | EHS Alaska Incorporated | Report Date: | 5/17/2022 |
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|  | 11901 Business Blvd., Ste 208 | Report No.: | $660676-$ PLY |
|  | Eagle River AK 99577 | Project: | COK WWTP - Kenai Rood Sampling |
| Client: | EHS511 | Project No.: | 7933-01 |

## PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7424704
Client No.: WTP0522-A09

Percent Asbestos
None Detected
Lab No.: 7424704(L2)
Client No.: WTP0522-A09

Percent Asbestos
None Detected

Lab No.: 7424704(L3)
Client No.: WTP0522-A09

| Percent Asbestos: <br> None Detected | Percent Non-Asbestos Fibrous Material: |
| :--- | :--- |
| 3 Cellulose |  |

Location: Roof: Smaller (RA) Housing East
Of The AHU, NW Corner Of Metal Housing On The Built-Up Curb. Photo 2

## Facility:

Percent Non-Fibrous Material: 95

Location: Roof: Smaller (RA) Housing East Of The AHU, NW Corner Of Metal Housing On The Built-Up Curb. Photo 2
Facility:
Percent Non-Fibrous Material: 75

Location: Roof: Smaller (RA) Housing East Of The AHU, NW Corner Of Metal Housing On The Built-Up Curb. Photo 2
Facility:
Percent Non-Fibrous Material: 97

Location: Roof Core: One 21/2" Core From The Area Adj To AHU On The West Side, North End-Top Layer L1, L2, L3.
Facility:
Percent Non-Fibrous Material: 80

Location: Roof Core: One 21/2" Core From The Area Adj To AHU On The West Side, North End-Top Layer L1, L2, L3.
Facility:
Percent Non-Fibrous Material: 100

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received:
Date Analyzed:
Signature:
Analyst:

Approved By:


Frank E. Ehrenfeld, III
Laboratory Director

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Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com


| Please refer to the Appendix of this report for further information regarding your analysis. |  |
| :--- | :--- |
| Date Received: | $5 / 10 / 2022$ |
| Date Analyzed: | $05 / 17 / 2022$ |
| Signature: | Daceicl Leeyen |
| Analyst: | David Hayes |

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Telephone: 856-231-9449
Email: customerservice@iatl.com


| Please refer to the Appendix of this report for further information regarding your analysis. |  |  |  |
| :---: | :---: | :---: | :---: |
| Date Received: | 5/10/2022 | Approved By: | $\square 5$ |
| Date Analyzed: | 05/17/2022 |  |  |
| Signature: | Danend Hexyen |  | Frank E. Ehrenfeld, III <br> Laboratory Director |
| Analyst: | David Hayes |  |  |

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| Client: | EHS Alaska Incorporated | Report Date: | $5 / 17 / 2022$ |
| :--- | :--- | :--- | :--- |
|  | 11901 Business Blvd., Ste 208 | Report No.: | $660676-$ PLM |
|  | Eagle River AK 99577 | Project: | COK WWTP - Kenai Rood Sampling |
| Client: | EHS511 | Project No.: | $7933-01$ |

# Appendix to Analytical Report 

Customer Contact: Cali Swatlowski
Method: 40 CFR Appendix E to Subpart E of Part 763, interim method for the Determination of Asbestos in Bulk Insulation Samples, USEPA 600, R93-116 and NYSDOH ELAP 198.1 as needed.

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.
iATL Customer Service: customerservice@iatl.com
iATL Office Manager: wchampion@iatl.com
iATL Account Representative: Semih Kocahasan
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

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## Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).
Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOH-ELAP No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at $<0.25 \%$ by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. PC Trace represents a $<0.25 \%$ amount. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB) See additional information at the end of this appendix.

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## CERTIFICATE OF ANALYSIS

| Client: | EHS Alaska Incorporated | Report Date: | 5/17/2022 |
| :--- | :--- | :--- | :--- |
|  | 11901 Business Blvd., Ste 208 | Report No.: | 660676 - PLM |
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| Client: | EHS511 | Project No.: | 7933-01 |

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)
Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique - by TEM): ASTM D 5755, D5756, or D6480
Various other asbestos matrices (air, water, etc.) and analytical methods are available.

## Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at customerservice@iatl.com.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination
10) Note: Not building material. $1 \%$ threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at $0.080 \%$.
15) Note: Analyzed by EPA $600 /$ R- $93 / 116$. Point Counting detection limit at $0.125 \%$.
16) Note: This sample contains $>10 \%$ vermiculite mineral. See Appendix for Recommendations for Vermiculite Analysis.

## Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.
iATL recommends initial testing using the EPA $600 / \mathrm{R}-93 / 116$ method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

For New York State customers, NYSDOH requires disclaimers and qualifiers for various vermiculite containing samples that direct analysis via ELAP198.6 and ELAP198.8 for samples that contain $>10 \%$ vermiculite mineral where ELAP 198.6 may be used to evaluate the asbestos content of the material. However, any test result using ELAP198.6 will be reported with the following disclaimer: "ELAP198.6 method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing $>10 \%$ vermiculite."

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional. NYS customers please follow current NYSDOH ELAP requirements per policy on subject of surfacing and vermiculite, May 6, 2016, Testing Requirements for Surfacing Material Containing Vermiculite (https://www.wadsworth.org/sites/default/files/WebDoc/I198_8_02_2.pdf)

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:
1)Analytical Step/Method: Initial Screening by PLM, EPA 600R-93/116

Requirements/Comments: Minimum of 0.1 g of sample. $\sim 0.25 \%$ for most samples.

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## CERTIFICATE OF ANALYSIS

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| :--- | :--- | :--- | :--- |
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|  | Eagle River AK 99577 | Project: | COK WWTP - Kenai Rood Sampling |
| Client: | EHS511 | Project No.: | $7933-01$ |

2)Analytical Step/Method:Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.
3)Analytical Step/Method:Wet Separation by PLM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.
4)Analytical Step/Method:Wet Separation by TEM Gravimetric Technique, EPA R-04/004 Requirements/Comments: Minimum $50 \mathrm{~g}^{* *}$ of dry sample. Analysis of "Sinks" only.
5)Analytical Step/Method:Wet Separation by TEM Gravimetric Technique, EPA R-04/004

Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container ( $\sim 9 \times 6$ inch bag of sample).
New York State Department of Health requires that samples originating from NYS that they categorize as Non-friable Organically Bound materials can only be confirmed as None Detected for asbestos by method 198.4. See the table below for a list of those materials. (ENVIRONMENTAL LABORATORY APPROVAL PROGRAM CERTIFICATION MANUAL - ITEM No. 198.1, Revision Date 5/6/16)
*Asphalt Shingles, Caulking, Ceiling Tiles with Cellulose, Duct Wrap, Glazing, Mastic, Paint Chips, Resilient Floor Tiles, Rubberized Asbestos Gaskets, Siding Shingles Vinyl Asbestos Tile, NOB materials (other that SM-V) with $<10 \%$ vermiculite, Any material (Friable or NOB other than SM-V) with $>10 \%$ vermiculite.

Statistically derived uncertainty with any measure should be taken into consideration when reviewing and interpreting all reported data and results. A more comprehensive listing of accuracy, precision, and uncertainty as it impacts this method is available upon request.

## APPENDIX B

## Sketch of Sample Locations




[^0]:    ${ }^{1}$ Unless otherwise stated, all references to an ARTICLE refer to the articles of these general conditions.

[^1]:    $\star$ Mounting bracket
    $\ddagger$ Overall dimensions of optional wiring ducts
    § Required 25 mm insulating phase barriers provided

    * Optional front cover for DIN Rail

[^2]:    * All major fuse brands and current ranges have been evaluated for this fuse holder. Due to the heat they generate, the following fuses must be derated:

    Ferraz Shamut ATQR $1.25 I=0.42$ A max.
    Ferraz Shamut ATQR $1.40 I=0.47$ A max.

[^3]:    * $1+\mathrm{N}$ configurations are not UL or CSA certified.

[^4]:    ${ }^{(1)}$ Use this conductor category information for planning conductor routing as described in the system level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

[^5]:    Note: Output terminals described by image.

[^6]:    0 : Configuration Mode

[^7]:    (1) See NEMA Ratings and Test Values on page 5

[^8]:    * Surface mount base must be installed with rough wall plate for UL Type 4/4X/13 rating, otherwise UL Type 1 only.
    $\ddagger$ Not available in 12 V AC/DC.
    § 25 mm tube mount is UL Recognized, other mounting types are UL Listed.
    - SL function uses 35 ( $16 \ldots . .60 \mathrm{~V}$ AC/16...80V DC) and 45 ( $90 \ldots . .250 \mathrm{~V}$ AC/DC) voltage codes only.
    \& ML function uses 24,10 , and 20 voltage codes only.
    + BL function uses 35 (19...52V AC/16...60V DC), 10, and 20 voltage codes only.
    * Green, Red, Amber color combination is only valid for the three color LED selection (ML).

[^9]:    Eaton
    1000 Eaton Boulevard
    Cleveland, OH 44122
    Eaton.com

    ## Bussmann Division

    114 Old State Road
    Ellisville, MO 63021
    United States
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[^11]:    Eaton
    1000 Eaton Boulevard
    Cleveland, OH 44122
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    CSA $^{\oplus}$ is a registered trademark of the
    Canadian Standards Group.
    NEC ${ }^{\oplus}$ is a registered trademark of the Nationa
    Fire Protection Association, Inc.

[^18]:    EAC

[^19]:    * Order one cover per pole.
    ** With open fuse indication. 90 V minimum and closed circuit required for illumination.
    *** Dual wire rated lugs with same wire size and stranding.
    $\dagger \quad$ Rated for $75^{\circ} \mathrm{C} \mathrm{Cu} / \mathrm{Al}$ conductors. Conductors with higher ratigns may be used with appropriate derating

[^20]:    $\ddagger \quad$ This filter is suitable for use with cable lengths up to 10 meters ( 32.8 feet) for C2 spec and 20 meters ( 65.6 feet) for C3 spec.
    § With EMC filter.

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    NEC ${ }^{\oplus}$ is a registered trademark of the Nationa
    Fire Protection Association, Inc.

[^22]:    (2) Valve provided with PTFE main disc.
    (3) Valve includes Ultem (G.E. trademark) piston.
    (4) Letter "D" denotes diaphragm construction; "P" denotes piston construction.
    (5) O Safety Shutoff Valve; General Purpose Valve.

[^23]:    (6) Valves not available with Explosionproof enclosures.
    (7) On 50 hertz service, the watt rating for the $6.1 / \mathrm{F}$ solenoid is 8.1 watts.
    (8) AC construction also has PA seating.
    (9) No disc-holder.
    (10) Stainless Steel disc-holder.
    $\ddagger$ Must have solenoid mounted vertical and upright.

[^24]:    Approvals
    CSA / UL Recognized / VDE Gutachten mit Fertigungsüberwachung / cUL Recognized / LR / IECEE CB Scheme / EAC / DNV GL / PRS / cULus Recognized

[^25]:    Plug-in bridge, pitch: 5.2 mm , number of positions: 10 , color: red

[^26]:    Test plugs, with solder connection up to $1 \mathrm{~mm}^{2}$ conductor cross section, color: silver

