

## CONTROL PANEL INFORMATION



**LETTER OF TRANSMITTAL**

**June 21, 2021**

**ATTN: Paul Beck – City & Borough of Juneau**

**Job #: AKP21-0018**

*Project:* Gruening Park Lift Station

*PH:* 907-209-8833

*FAX:*

*Email:* paul.beck@juneau.org

**RE:** Gruening Park Lift Station Control Submittal

**Please see the attached:**

- Shop Drawings   
  Plans   
  Specifications   
  Submittals   
  Other:  
 Prints   
  Samples   
  Reports   
  Manuals

COPIES	DESCRIPTION
1	REVISED GRUENING PARK LIFT STATION CONTROLS SUBMITTAL

Which are transmitted (as checked below):

- For Approval   
  For Review & Comment   
  As Final Submission   
  Other:  
 As Requested   
  With Corrections   
  For Bid Due:

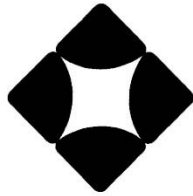
REMARKS:

Please sign and return to certify that you have received the transmitted items listed above:

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



# STACON

## ENGINEERING SUBMITTALS

FILE	
JOB NAME-	GRUENING PARK
QUOTE NO -	112241AC
DATE-	6/21/2021
CUSTOMER	ALASKA PUMP
	Rev: A

ELECTRICAL SERVICE	
<input checked="" type="checkbox"/>	480Y/277V THREE PHASE (3 HOT + GRD)
<input type="checkbox"/>	120/240V HI LEG DELTA THREE PHASE (3 HOT + N + GRD)
<input type="checkbox"/>	208Y/120V THREE PHASE (3 HOT + N + GRD)
<input type="checkbox"/>	120/240V SINGLE PHASE (2 HOT + N + GRD)
(1) SURGE PROTECTION DEVICES AND POWER TRAIN REQUIREMENTS ARE BASED ON SERVICE SELECTION AS STATED ABOVE. UNLESS CONFIRMED OTHERWISE BY THE CUSTOMER ANY MISSING, INCORRECT OR DAMAGED COMPONENTS DUE TO A DIFFERENT SERVICE CONFIGURATION ARE NOT THE PANEL MANUFACTURER'S RESPONSIBILITY.	

CONTROL SYSTEM	
TYPE OF CONTROL PANEL -	DUPLEX CONTROLS
SENSING DEVICE -	PROBE
NUMBER OF MOTORS -	2
MOTOR H.P.-	17 HP (FLA 18A) [FUTURE 30HP (40 FLA)]
ENCLOSURE:	
MATERIAL -	304 STAINLESS STEEL
NEMA RATING -	4X
SIZE -	60" x 36" X 16"
MODIFICATIONS -	DEADFRONT
MOUNTING STYLE -	WALL MOUNT

PRODUCTION REQUIREMENT	
<input type="checkbox"/>	APPROVAL WAIVED
<input type="checkbox"/>	APPROVED AS SUBMITTED
<input type="checkbox"/>	DRAWINGS APPROVED AS NOTED, "PROVIDE CLEAR AND PRECISE COMMENTS"

APPROVAL SIGNATURE: \_\_\_\_\_

# SUBMITTAL REVIEW COMMENTS / RESPONSES

Quote # :	112241AC	Date :	6/21/2021	Rev :	A
Job Name :	GRUENING PARK				
Customer :	ALASKA PUMP				

1. POWER FACTOR CAPACITOR ENCLOSURE REMOVED. PFC PROVIDED LOOSE FOR REMOTE MOUNTING BY OTHERS.
2. POWER TRANSFORMER CHANGED TO 5KVA AS REQUESTED. SECONDARY WIRING OF TRANSFORMER NOW SHOWING 240/120 OUTPUT. SECONDARY TRANSFORMER BREAKER CHANGED TO TWO POLE 30A BREAKER, SELECTED AS NECESSARY TO MEET UL 508A (50AMP WOULD BE TOO LARGE ON 240VAC OUTPUT).
3. PANEL HEATER CHANGED TO 800W AS REQUESTED.
4. RECEPTACLE PROVIDED ON THE BOTTOM OF THE ENCLOSURE AS REQUESTED.
5. BREAKERS ADDED FOR THE PANEL HEATER AND RECEPTACLE AS REQUESTED.

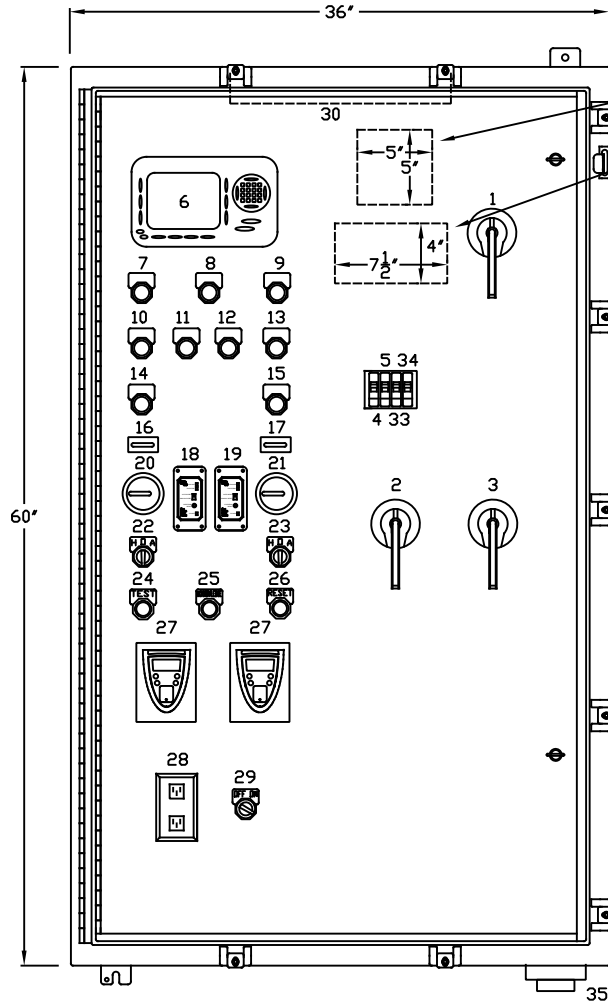


**CONFORMS TO DESIGN CONCEPT** INC.

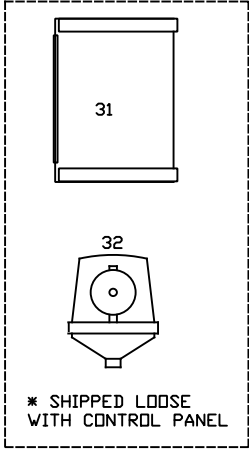
This shop drawing or cut sheet has been reviewed for general conformance with design concept only and does not relieve the contractor or vendor of responsibility for conformance with design drawings and specifications, all of which have priority over this shop drawing or cut sheet.

Mark Morris 6/21/21

\*SPECIAL LABELS FOR PUMP NO. 1 RUNNING, PUMP NO. 2 RUNNING, PUMP NO. 1 FAULT, PUMP NO. 2 FAULT  
PUMP NO.1 OFF, PUMP NO. 2 OFF.



(FUTURE)  
SPACE FOR  
AUTO-DIALER KEYPAD  
MOUNTED ON FRONT OF  
INNER DEADFRONT DOOR  
  
AUTO-DIALER MOUNTED  
ON BACKSIDE OF  
INNER DEADFRONT DOOR



OUTER DOOR HAS BEEN REMOVED FOR CLARITY

- 1 - MFD MAIN FUSIBLE DISCONNECT
- 2 - FD1 FUSIBLE DISCONNECT 1
- 3 - FD2 FUSIBLE DISCONNECT 2
- 4 - DRB DUPLEX RECEPTACLE BREAKER
- 5 - SRB SIMPLEX RECEPTACLE BREAKER
- 6 - MSPC MULTISMART DISPLAY
- 7 - PL3 POWER ON
- 8 - PL1 LOW LEVEL
- 9 - PL2 HIGH LEVEL
- 10 - PL6 PUMP NO. 1 OFF
- 11 - PL4 PUMP NO. 1 FAULT
- 12 - PL5 PUMP NO. 2 FAULT
- 13 - RL7 PUMP NO. 2 OFF
- 14 - RL1 PUMP NO. 1 RUNNING
- 15 - RL2 PUMP NO. 2 RUNNING
- 16 - COUNTER 1
- 17 - COUNTER 2
- 18 - PMR2-1 PUMP MONITOR RELAY
- 19 - PMR2-2 PUMP MONITOR RELAY
- 20 - ETM1 ELAPSED TIME METER 1
- 21 - ETM2 ELAPSED TIME METER 2
- 22 - HDA HAND-OFF-AUTO SWITCH 1
- 23 - HDA HAND-OFF-AUTO SWITCH 2
- 24 - ALARM TEST
- 25 - ALARM ACKNOWLEDGE
- 26 - ALARM RESET
- 27 - VFD1-2 KEYPADS
- 28 - DR DUPLEX RECEPTACLE GFI
- 29 - WLS WORK LIGHT SWITCH OFF-ON
- 30 - WL WORK LIGHT (LED)
- 31 - CPT CONTROL POWER TRANSFORMER
- 32 - AL ALARM LIGHT
- 33 - HCB HERATER CIRCUIT BREAKER
- 34 - CCB CONTROL CIRCUIT BREAKER
- 35 - SR WATERTIGHT TWISTLOCK RECEPTACLE

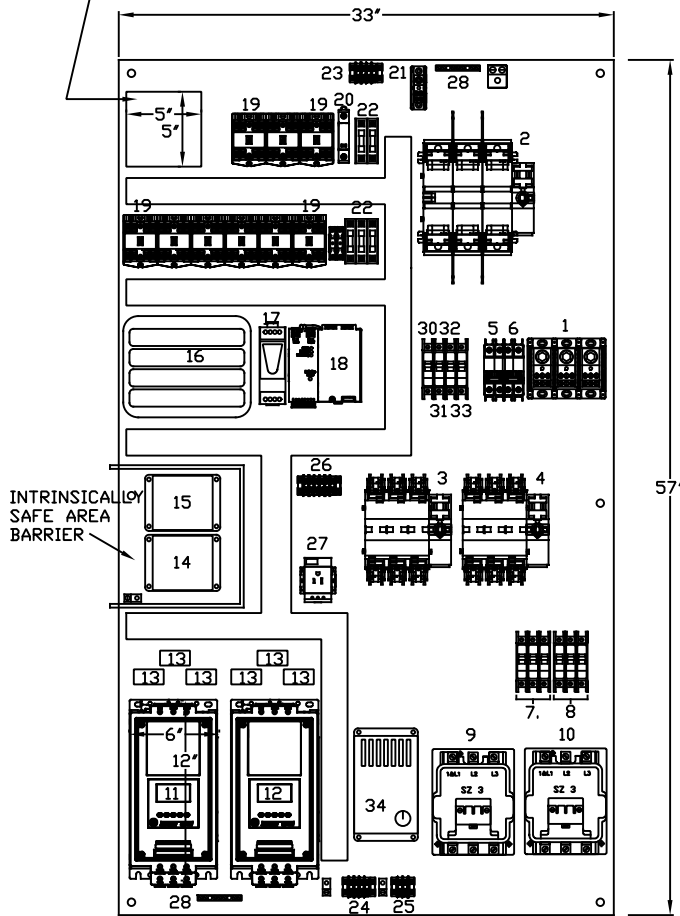
<b>GRUENIUNG PARK</b>	
QUOTE NO.	DRAWN BY
DATE	REVISION
112241AC	6/21/21 DMC/MED
A	

2525 SOUTH DBT  
APOPKA, FLORIDA  
32703



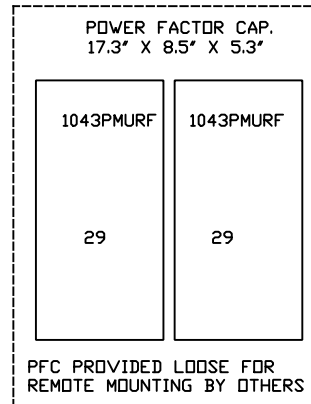
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(FUTURE)  
SPACE FOR  
AUTO-DIALER BATTERY  
MOUNTED ON SUBPANEL



LAYOUT MAY VARY

- 1 - PDB POWER DISTRIBUTION BLOCK
- 2 - MFD MAIN FUSIBLE DISCONNECT
- 3 - FDI FUSIBLE DISCONNECT 1
- 4 - FD2 FUSIBLE DISCONNECT 2
- 5 - TCB1 PRIMARY TRANSFORMER BREAKER
- 6 - TCB2 SECONDARY TRANSFORMER BREAKER
- 7 - CB1 POWER FACTOR CAP 1 BREAKER
- 8 - CB2 POWER FACTOR CAP 2 BREAKER
- 9 - C1 CONTACTOR 1
- 10 - C2 CONTACTOR 2
- 11 - SSS1 SOLID STATE STARTER 1
- 12 - SSS2 SOLID STATE STARTER 2
- 13 - CT CURRENT TRANSFORMERS
- 14 - MTISB-10 MULTITRODE INTRINSIC SAFE BARRIER
- 15 - MTISB-5 MULTITRODE INTRINSIC SAFE BARRIER
- 16 - MSPC MULTISMART CONTROLLER
- 17 - PS 24VDC POWER SUPPLY
- 18 - DC UPS BACKUP W/ BATTERY
- 19 - R1-9 RELAYS 1-9
- 20 - SPD SURGE PROTECTION DEVICE (120V)
- 21 - N NEUTRAL BLOCK
- 22 - FUSE BLOCKS
- 23 - TSA TERMINAL STRIP A
- 24 - TSC TERMINAL STRIP C
- 25 - TSD TERMINAL STRIP D
- 26 - TSE TERMINAL STRIP E
- 27 - FUTURE DIALER RECEPTACLE
- 28 - GROUND BUSBAR
- 29 - PF1-2 POWER CAPS 1-2
- 30 - DRB DUPLEX RECEPTACLE CIRCUIT BREAKER
- 31 - SRB SIMPLEX RECEPTACLE CIRCUIT BREAKER
- 32 - HCB HEATER CIRCUIT BREAKER
- 33 - CCB CONTROL CIRCUIT BREAKER
- 34 - HEATER 800W

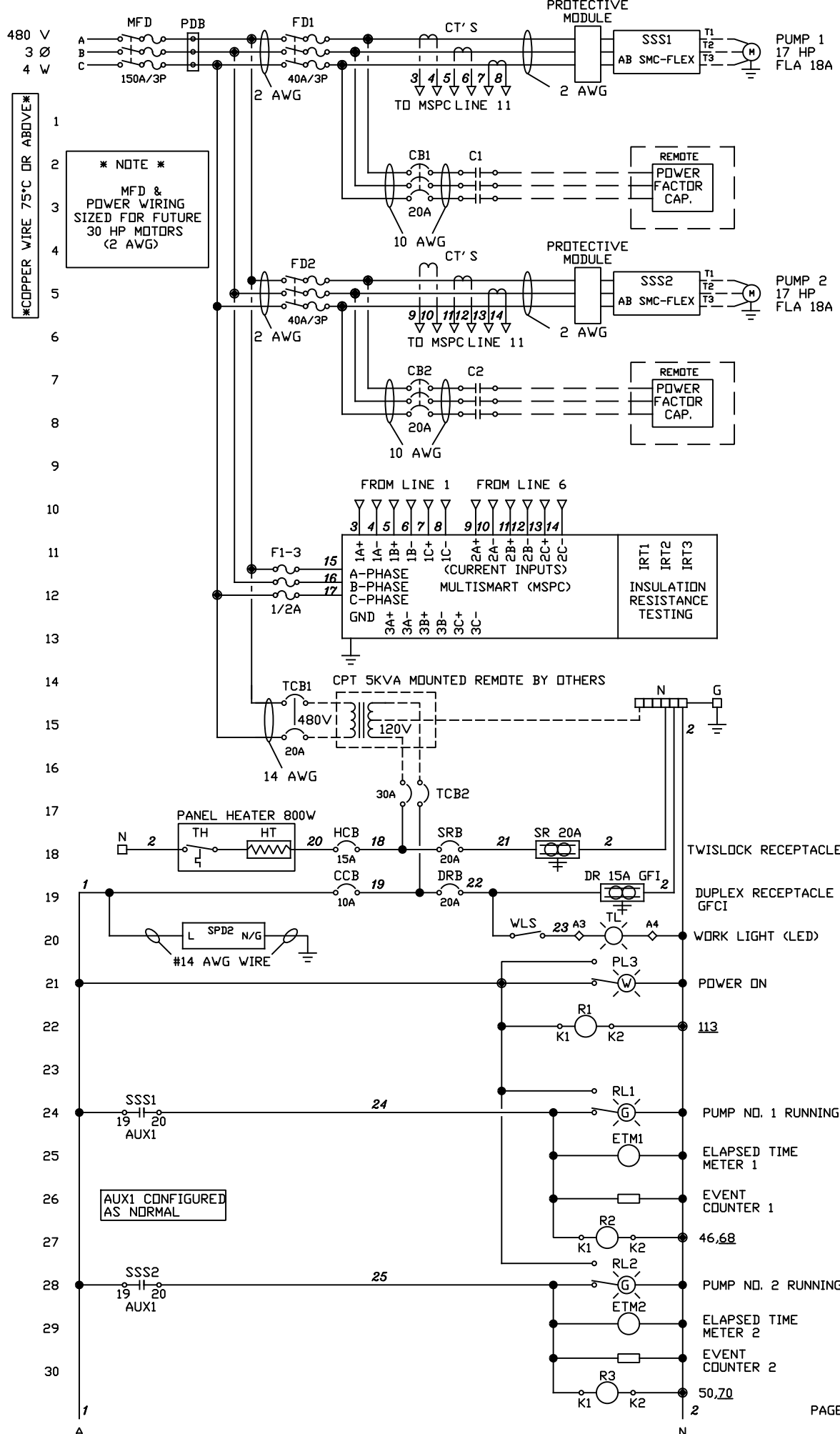


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\*COPPER WIRE 75°C OR ABOVE\*

\* NOTE \*  
MFD & POWER WIRING SIZED FOR FUTURE 30 HP MOTORS (2 AWG)

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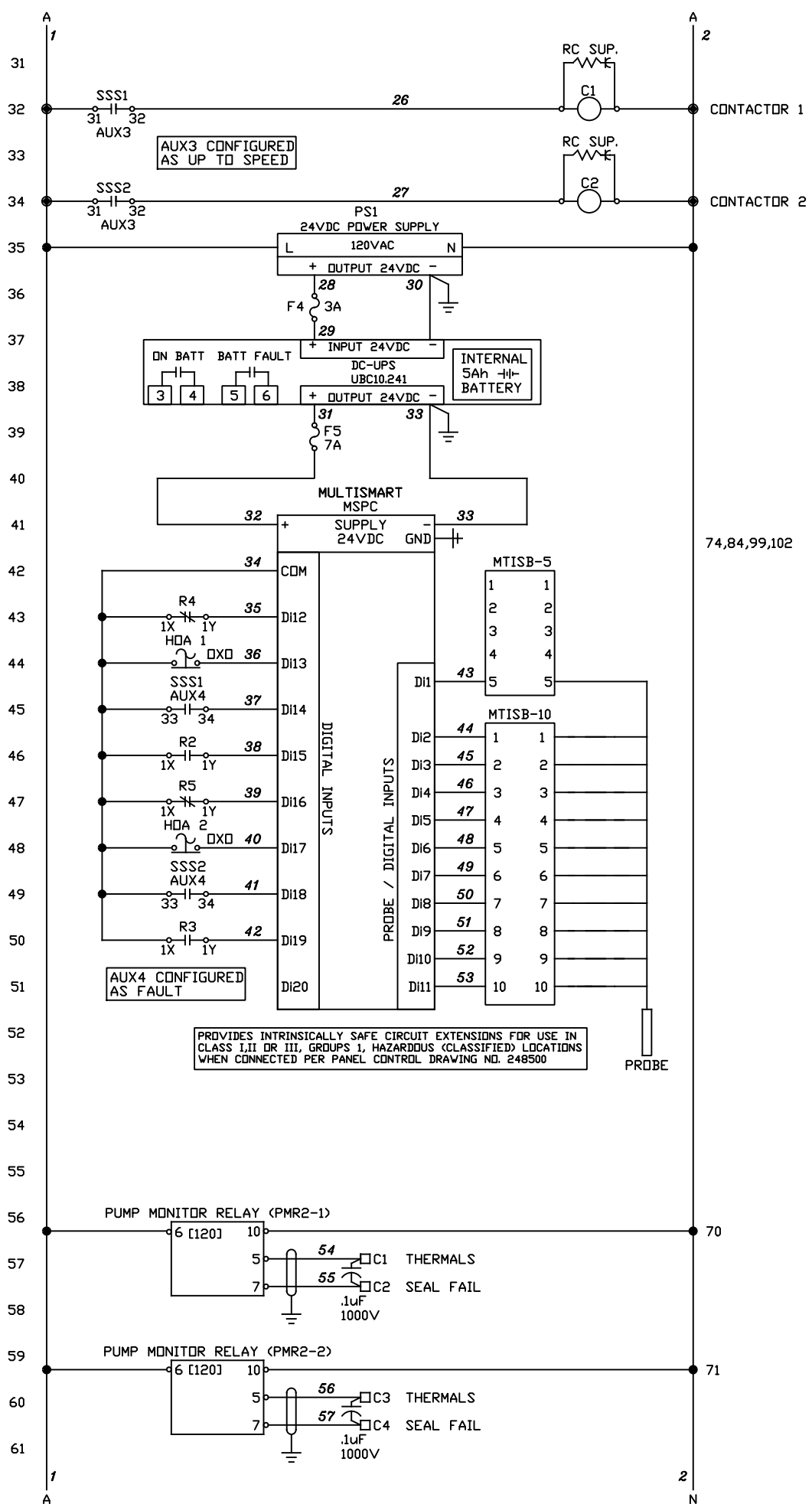
<b>GRUENING PARK</b>	
QUOTE NO.	DATE
112241AC	6/21/21
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AUX1 CONFIGURED AS NORMAL



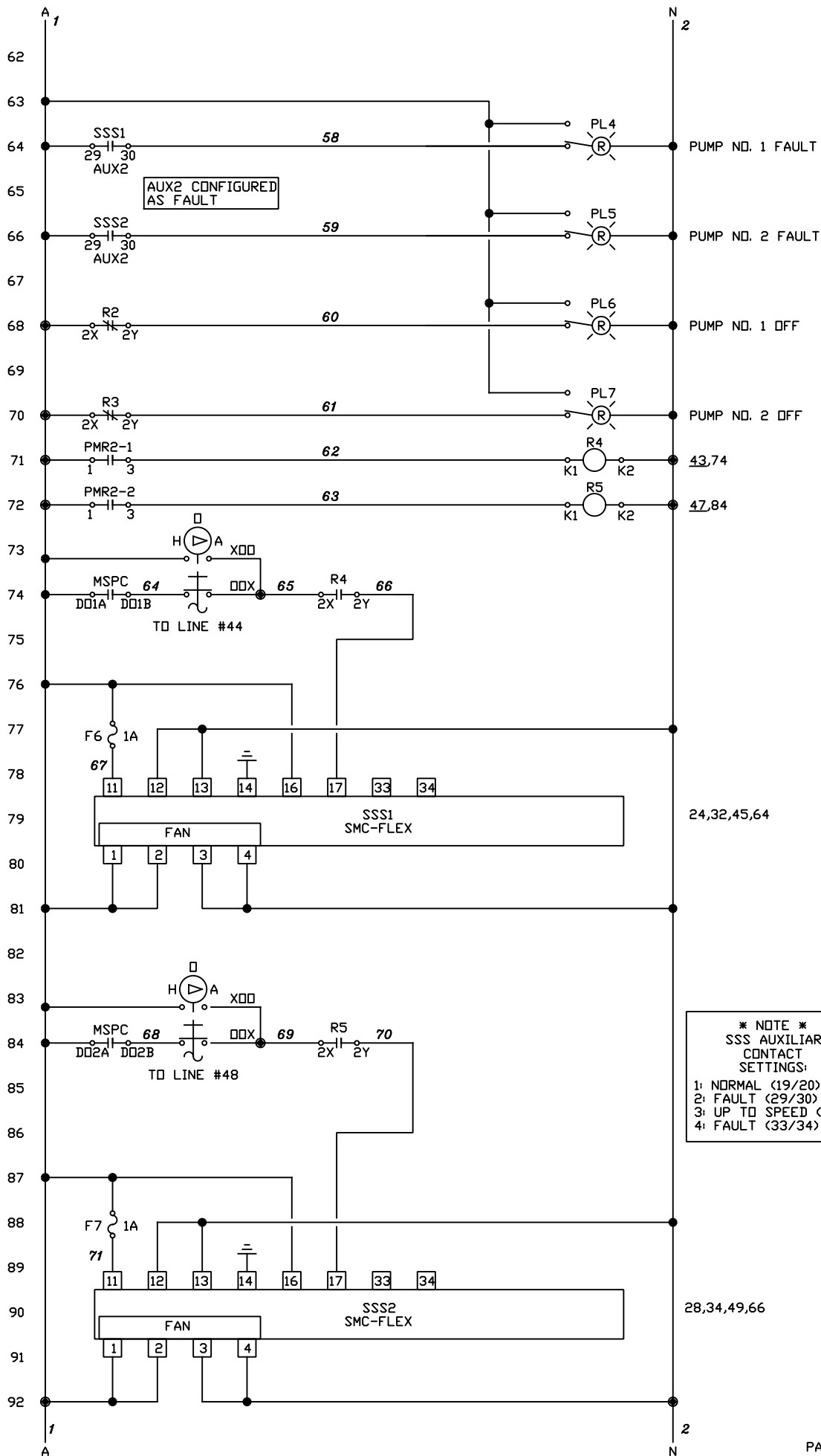
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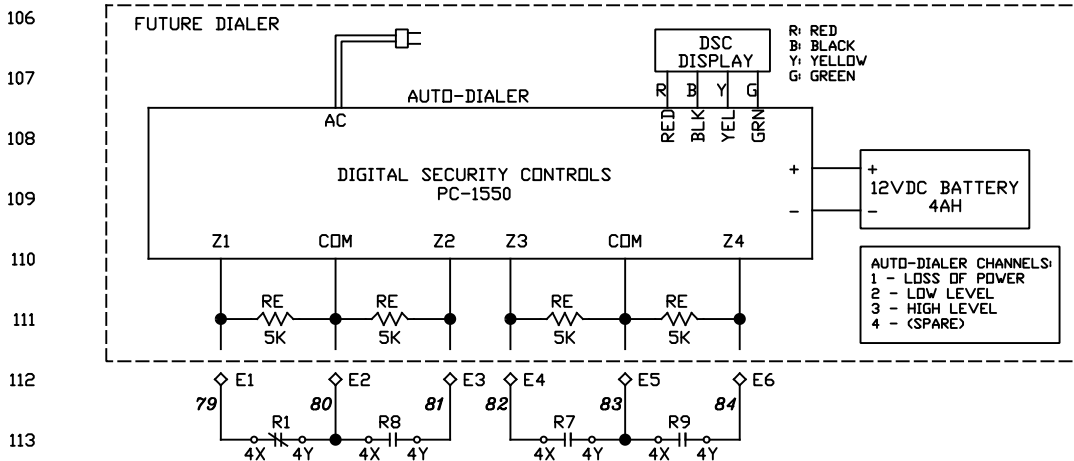
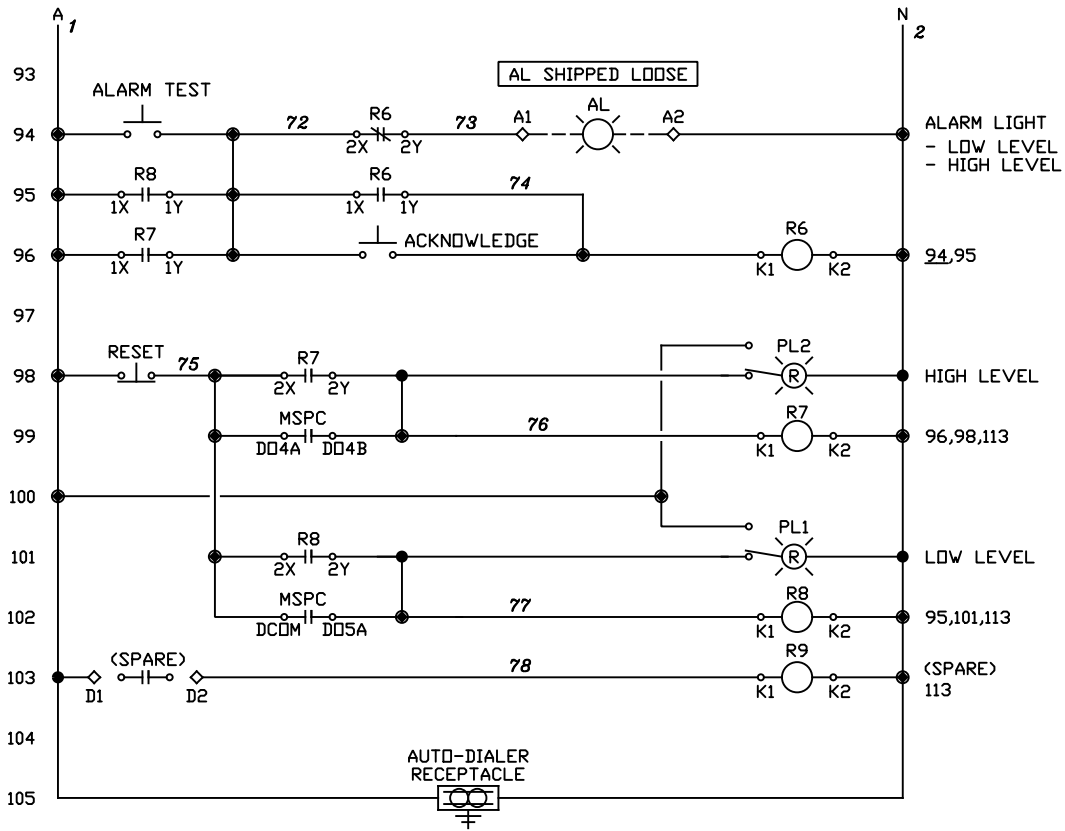
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 32703



**\* NOTE \***  
 SSS AUXILIARY CONTACT SETTINGS:  
 1: NORMAL (19/20)  
 2: FAULT (29/30)  
 3: UP TO SPEED (31/32)  
 4: FAULT (33/34)

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LAST WIRE #84

GRUENING PARK	
QUOTE NO.	DATE
112241AC	6/21/21
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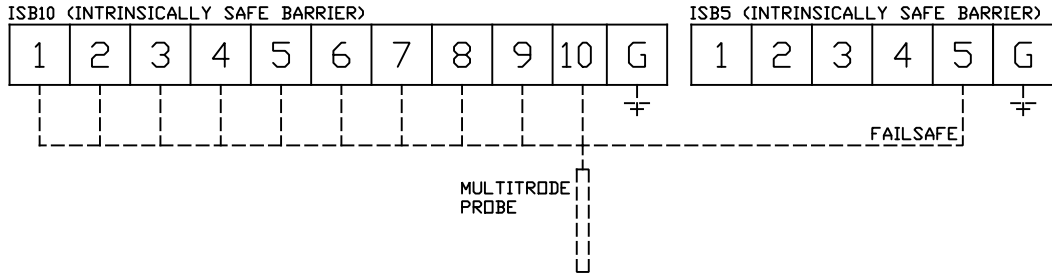
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32703



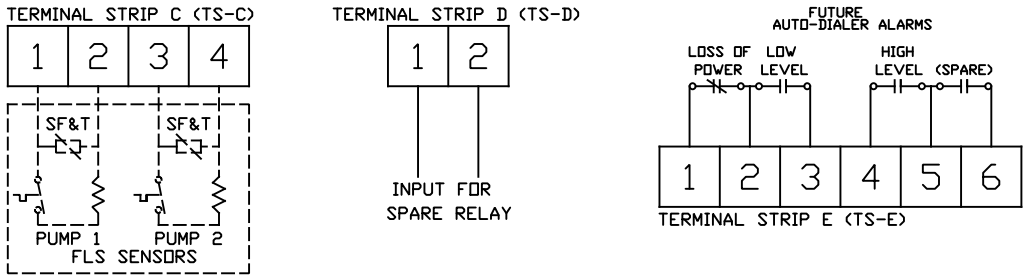
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THE CIRCUIT WIRING IN THE HAZARDOUS AREA MUST NOT EXCEED 100 FEET BASED ON CABLE WITH 60pF/FT CAPACITANCE AND 0.2uH/FT INDUCTANCE

Intrinsically safe wiring terminals  
 "Install in accordance with Article 504 of the National Electrical Code."



Nonintrinsically safe wiring terminals



FUSE REPLACEMENT CHART	
FUSE	REPLACEMENT
F1-3	KTK-R-1/2/600V
F5	ABC-7-R
F4	ABC-3-R
F6-7	FNQ-R-1/600V

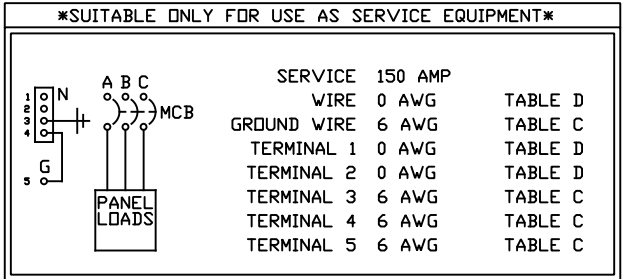
\*COPPER WIRE 75°C OR ABOVE\*

INDICATES DEVICES AND CONNECTIONS BY INSTALLER

CUSTOMER	ALASKA PUMP		
JOB NAME	GRUENING PARK		
ENCLOSURE UL TYPE RATING:	UL TYPE 1	UL TYPE 1	
VOLTAGE	480V	PHASE 3	HZ 60
H.P.	#1 17	#2 17	#3 - #4 -
F.L.A.	18A	18A	- -
TOTAL F.L.A.	46A		
SERIAL #	21-	DATE:	
SCCR:	5KA SYMMETRICAL RMS 480V MAX.		
MANUFACTURED BY:	STA CDN INC 2525 S. DBT APOPKA FL 32703		

T&B BLACKBURN LUG TORQUE TIGHTENING	
Wire Range/Screw Type & Wrench Size AWG CU	Torque lb-in.
(SLOTTED) 10-14	20
(SLOTTED) 8	25
(SLOTTED) 4-6	35
(SLOTTED) 2-2/0	50
(3/16 HEX) 2/0	100
(5/16 HEX) 3/0[250]-350	275
(3/8 HEX) 500-600	450*
(3/8 HEX) 750-1000	550

\*=UNLESS OTHERWISE NOTED ON CONNECTOR



SQD Ground Busbar PK7GTA, PK12GTA, PK15GTA	
Wire Range AWG CU-AL	Torque lb-in.
14-10 CU, 12-10 AL	20
8	25
6-4	35
Two 14 or 12 CU, Two 12 or 10 AL	25

SQD Terminal Block GK6 + GR6	
Wire Range AWG CU	Torque lb-in.
(Type GK6) 22-10	11-12
(Type GR6) 22-8	18-20

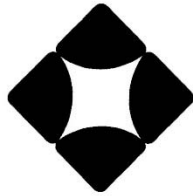
GRUENING PARK

QUOTE NO.	DATE	DRAWN BY	REVISION
112241AC	6/21/21	DMC/MED	A

2525 SOUTH DBT APOPKA, FLORIDA 32703



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# STACON

<b>BILL OF MATERIAL</b>			<b>BY: DMC/MED</b>	
<b>QUOTE NO.</b>	<b>112241AC</b>	<b>Date: 6/21/2021</b>		<b>Rev: A</b>
<b>JOB NAME</b>	<b>GRUENING PARK</b>	<b>SN: 21-</b>		
<b>CUSTOMER</b>	<b>ALASKA PUMP</b>	<b>PO:</b>		

QTY	LEGEND	DESCRIPTION	MFG.	PART #	Check Off
1		ENCLOSURE (4X SS) 60x36x16	HOFFMAN	A60H3616SSSLP	[ ]
1		SUB PANEL [ENCLOSURE 60 x 36]	HOFFMAN *	A60P36	[ ]
1	MFD	MAIN FUSIBLE DISCONNECT (SEL) (200A RATED)	SQD	GS2MU3N	[ ]
1	MFD	FUSIBLE DISCONNECT SHAFT 15.7"	SQD	GS2AE21	[ ]
1	MFD	FUSIBLE DISCONNECT HANDLE	SQD	GS2AH130	[ ]
1	MFD	LUG KIT (6-300KCMIL) 6/PK	SQD	GS1AW403	[ ]
3	F	FUSIBLE DISCONNECT CLASS J FUZE	BUSSMANN	JKS-150	[ ]
1	PDB	POWER DIST. BLOCK 175 A. (1-6) Line [2/0 to 14] – Load [4 to 14]	BUSSMAN	16335-3	[ ]
2	FD1-2	FUSIBLE DISCONNECT (100A RATED)	SQD	GS2JU3N	[ ]
2	FD1-2	FUSIBLE DISCONNECT SHAFT 15.7"	SQD	GS2AE21	[ ]
2	FD1-2	FUSIBLE DISCONNECT HANDLE	SQD	GS2AH130	[ ]
6	F	FUSIBLE DISCONNECT CLASS J FUZE	BUSSMANN	JKS-40	[ ]
1	N	ISOLATED NEUTRAL BLOCK 175 A. (1-4) Line [2/0 to 14] – Load [4 to 14]	BUSSMAN	16220-1	[ ]
2	GB	GROUND BUSS (#8-1)	SQD	PK7GTA	[ ]
1	TCB1	PRIMARY TRANSFORMER CIRCUIT BREAKER (20A / 2P)	SQD	M9F43220	[ ]
1	TCB2	SECONDARY TRANSFORMER CIRCUIT BREAKER (30A)	SQD	QOU230	[ ]
1	CCB	CONTROL BREAKER (10A)	SQD	QOU110	[ ]
1	DRB	DUP RECEPTACLE BREAKER (20A)	SQD	QOU120	[ ]
1	HCB	CONTROL BREAKER (15A)	SQD	QOU115	[ ]
1	SRB	SIMPLEX RECEP BREAKER (20A)	SQD	QOU120	[ ]
2	SSS1-2	SOLID STATE STARTER	AB	150-F60NBDB S# S#	[ ]
2	PMD	SSS 480V PROTECTIVE MODULE	AB	150-F84	[ ]
2	HIM	HUMAN INTERFACE CABLE	ALLEN BRADLEY	20-HIM-H10	[ ]
2	HMI	HUMAN INTERFACE MODULE – DOOR MOUNT (NEMA 4X)	ALLEN BRADLEY	20-HIM-C3S	[ ]
2	CB1-2	CIRCUIT BREAKER (20A / 3P)	SQD	M9F43320	[ ]
2	C1,2	ISOLATION CONTACTOR - NEMA (SZ 3, 120VAC COIL) (POWER FACTOR CAP)	SQD	8502-SEO2V02S	[ ]
2		R-C SUPPRESSOR	ALLEN BRADLEY	199-MSMA1	[ ]
16	TS	TERMINAL STRIP	SQD	9080-GK6	[ ]

1	* DR	DUPLEX RECEPTACLE (GFCI)	HUBBELL	GF20I	[ ]
1		WALL PLATES (GFCI)	HUBBELL	NP26I	[ ]
1	* SR	SINGLE RECEPTACLE (15A) (DIN RAIL MOUNT)	PHOENIX CONTACT	0804155	[ ]
3	F1-3	FUSE (PHASE MONITOR)	BUSSMANN	KTK-R-1/2 /600V	[ ]
2	F6-7	FUSE (SSS)	BUSSMANN	FNQ-R-1/600V	[ ]
1	F4	FUSE	BUSSMANN	ABC-3-R (3 amp)	[ ]
2	F5	FUSE	BUSSMANN	ABC-7-R (7 amp)	[ ]
2		FUSE BLOCK (FOR ABC FUSES)	BUSSMANN	S-8301	[ ]
5		FUSE HOLDER (1 POLE) [CLASS CC]	BUSSMANN	BCM603-1PQ	[ ]
2	HOA	HAND-OFF-AUTO SELECTOR (LEVER KNOB)	ALLEN BRADLEY	800T-J17-KD7-B	[ ]
2	RL1-2	RUN LIGHT (GREEN LED)	ALLEN BRADLEY	800H-QRTH2G	[ ]
6	PL1-2, PL4-7	PILOT LIGHT (RED LED)	ALLEN BRADLEY	800H-QRTH2R	[ ]
1	PL3	PILOT LIGHT (WHITE)	ALLEN BRADLEY	800H-QRTH2W	[ ]
2	P/B	PUSH BUTTON (NO)	ALLEN BRADLEY	800H-AR6D1	[ ]
1	P/B	PUSH BUTTON (NC)	ALLEN BRADLEY	800H-AR6D2	[ ]
9	R1-R9	RELAY (4 CONTACTS, 120V) INDUSTRIAL TYPE	ALLEN BRADLEY	700-P400A1	[ ]
2	ETM	ELAPSED TIME METER	INTERMATIC	FWZ72K120ST	[ ]
2	CO	EVENT COUNTER (115 VAC) [RESETTABLE]	REDINGTON	P2-4906	[ ]
2	PMR2	PUMP MONITOR RELAY (ADD .1Uf 1000V CAPACITOR TO PMR2 PINS 5-7)	MPE ILLINOIS CAP	PMR2 104MSR102K	[ ]
2		11 PIN SOCKET (REVERSE)	OMRON	P3GA-11	[ ]
1	WLS	WORK LIGHT SWITCH (NO/NC)	ALLEN BRADLEY	800T-H2A	[ ]
1	* WL	WORK LIGHT (120VAC LED)	HOFFMAN	LEDA1S35	[ ]
1	SPD	SURGE PROTECTION DEVICE (120V / 1 PHASE) [1 POLE DIN RAIL]	BUSSMANN	BSPMA1120S2GR	[ ]
1	UPS	24 VDC UPS 10A w/ INTEGRATED 5Ah BATTERY	PULS	UBC10.241	[ ]
1	PS	24 VDC POWER SUPPLY, 3 AMP	SQD	ABL8RPS24030	[ ]
1	TH/HT	HEATER UNIT (800W)	HOFFMAN	D-AH8001B	[ ]
1	SR	SIMPLEX RECEPTACLE	HUBBELL	HBL67W08	[ ]

NOTES: \* OR EQUAL

**PARTS PROVIDED BY OTHERS FOR INSTALLATION BY STACON**

Quote # :	112241AC	Date :	6/21/2021	Rev :	A
Job Name :	GRUENING PARK			SN :	21-
Customer :	ALASKA PUMP			PO :	

**\*\* ALL CUSTOMER PROVIDED PARTS SHIPPED TO STA-CON FOR INSTALLATION MUST BE TAGGED WITH THE CUSTOMER NAME, PROJECT NAME AND EITHER OUR QUOTE NUMBER OR PANEL PO NUMBER. PARTS NOT PROPERLY TAGGED WILL BE RETURNED TO SENDER AND THIS WILL DELAY PANEL ESTIMATED DELIVERY DATES.**

1	MTB	MULTITRODE BARRIER	MULTITRODE	MTISB-5 S# -	[ ]
1	MTB	MULTITRODE BARRIER	MULTITRODE	MTISB-10 S# -	[ ]
1	MT	MULTISMART CONTROLLER W/ MOTOR PROTECTION	MULTITRODE	MSPC-3 S# -	[ ]
6	MTB	CURRENT TRANSFORMERS 50A	MULTITRODE	CT050	[ ]

## PACKING LIST

Quote#: 112241AC	Date: 6/21/2021	Rev: A
------------------	-----------------	--------

### SPARE PARTS

QTY	LEGEND	DESCRIPTION	MFG	PART #	
3	F1-3	FUSE (PHASE MONITOR)	BUSSMANN	KTK-R-1/2 /600V	[ ]
2	F6-7	FUSE (SSS)	BUSSMANN	FNQ-R-1/600V	[ ]
1	F4	FUSE	BUSSMANN	ABC-3-R (3 amp)	[ ]
2	F5	FUSE	BUSSMANN	ABC-7-R (7 amp)	[ ]
2	HOA	HAND-OFF-AUTO SELECTOR (LEVER KNOB)	ALLEN BRADLEY	800T-J17-KD7-B	[ ]
1	PL	PILOT LIGHT ( LED)	ALLEN BRADLEY	800H-QRTH2G	[ ]
1	P/B	PUSH BUTTON (NO)	ALLEN BRADLEY	800H-AR6D1	[ ]
1	P/B	PUSH BUTTON (NC)	ALLEN BRADLEY	800H-AR6D2	[ ]
1	WLS	WORK LIGHT SWITCH (NO/NC)	ALLEN BRADLEY	800T-H2A	[ ]
1	R	RELAY (4 CONTACTS, 120V) INDUSTRIAL TYPE	ALLEN BRADLEY	700-P400A1	[ ]
1	ETM	ELAPSED TIME METER	INTERMATIC	FWZ72K120ST	[ ]
1	CO	EVENT COUNTER (115 VAC) [RESETTABLE]	REDINGTON	P2-4906	[ ]

### SHIP WITH PANEL (MOUNTED REMOTE BY OTHERS)

QTY	LEGEND	DESCRIPTION	MFG	PART #	
1	CPT	CONTROL POWER TRANSFORMER NEMA 4X SS (5KVA) 480x240V – 120/240V (1 PH)	HAMMOND POWER SOLUTIONS	Q005LEKF7	[ ]
1	AL	ALARM LIGHT (3R, 120VAC)	EDWARDS	94R-N5	[ ]
2		POWER FACTOR CAPACITOR	EATON	1043PMURF	[ ]

### SUPPLIED BY ALASKA PUMP IN THE FIELD

QTY	LEGEND	DESCRIPTION	MFG	PART #	
1 @	MTP	MULTITRODE FAILSAFE PROBE 2.5/10-30	MULTITRODE	(SUPPLIED BY ALASKA PUMP)	[ ]

# SHOP CHECK SHEET

Quote#: 112241AC	Date: 6/21/2021	Rev: A
------------------	-----------------	--------

P.O.#				Ship Date			
H.P.'s	17	# PUMPS	2	VOLTAGE	480	PHASE	3
FUS. #		DRIPSHIELD	NO	SERIAL #	21-		
DEADFRONT	ALUM.	ENCLOSURE TYPE	4X	MATLIERIAL	304 STAINLESS		

- SPACE FOR DIALER, DIALER KEYPAD + BATTERY

INTRINSICALLY SAFE DEVICES HAVE ALUMINUM BARRIER	[ ]
ALARM LIGHT SHIPPED W/ CONTROLS	[ ]
Wire size from MFD to PDB [wire size - _____]	[ ]
Wire size from PDB to FD [wire size - _____]	[ ]
Wire size from CB1-2 to CONTACTOR [wire size - 10 AWG ]	[ ]
RED WARNING LABEL <b>*WARNING – BEFORE APPLYING POWER: ELECTRICAL CONNECTIONS CAN BECOME LOOSE DURING SHIPPING. TIGHTEN ALL SCREWS, AND INSPECT FOR DAMAGE TO WIRES AND COMPONENTS.</b>	[ X ]

<b>WARNING:</b> This product can expose you to chemicals, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a> .	[ X ]
--	-------

Wire Numbers – Type _____	[ ]
Legends and Legend Sheet	[ ]
Ground Lugs	[ ]
Pump Data Sheet	[ ]
Drawings on Door	[ ]
Picture of Panel	[ ]

UL 698A US/C	[ ]
SEL	[ ]

## Spare Parts

[ X ] In Panel                      See Packing List                      [ ]

[ ] In Separate Box              See Packing List                      [ ]

Wired by: subpanel \_\_\_\_\_ door/deadfront \_\_\_\_\_

Tester \_\_\_\_\_

Inspector \_\_\_\_\_

Comments \_\_\_\_\_



**CONTINUOUS HINGE WITH CLAMPS, 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 3, 3R, 4, 4X, 12, 13  
 CSA File No. 42186: Type 4, 4X, 12  
 IEC 60529, IP66  
 Meets NEMA Type 3RX requirements

**APPLICATION**

For use in indoor and outdoor corrosive environments that require a water-tight seal, this enclosure's seamless foam-in-place gasket and screw-down clamps provide a secure seal against contaminants.

**SPECIFICATIONS**

- 14 gauge Type 304 or Type 316L stainless steel bodies and doors
- Seams continuously welded and ground smooth
- Seamless foam-in-place gasket
- Rolled lip around three sides of door
- Stainless steel door clamp assembly
- Hasp and staple for padlocking
- Door removed 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.

**ACCESSORIES**

 See also *Accessories*.

Fast-Operating Clamp Assembly

Panels for Type 3R, 4, 4X, 12 and 13 Enclosures

Junction Box and Wall-Mount Enclosure Swing Out Panel Kit

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.

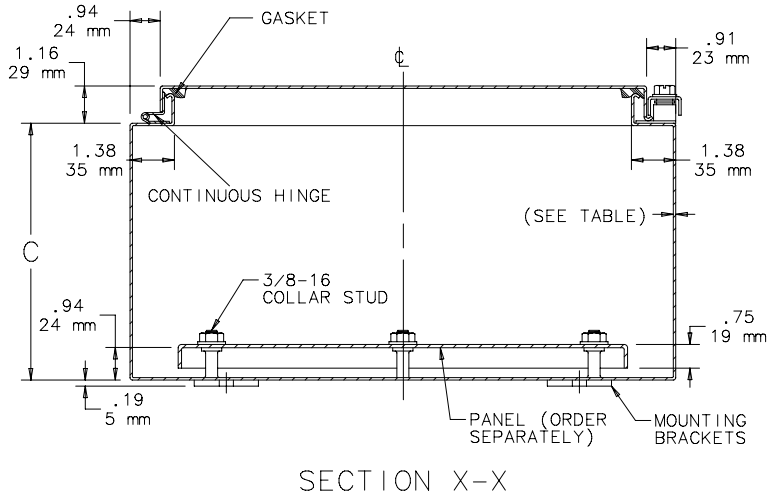
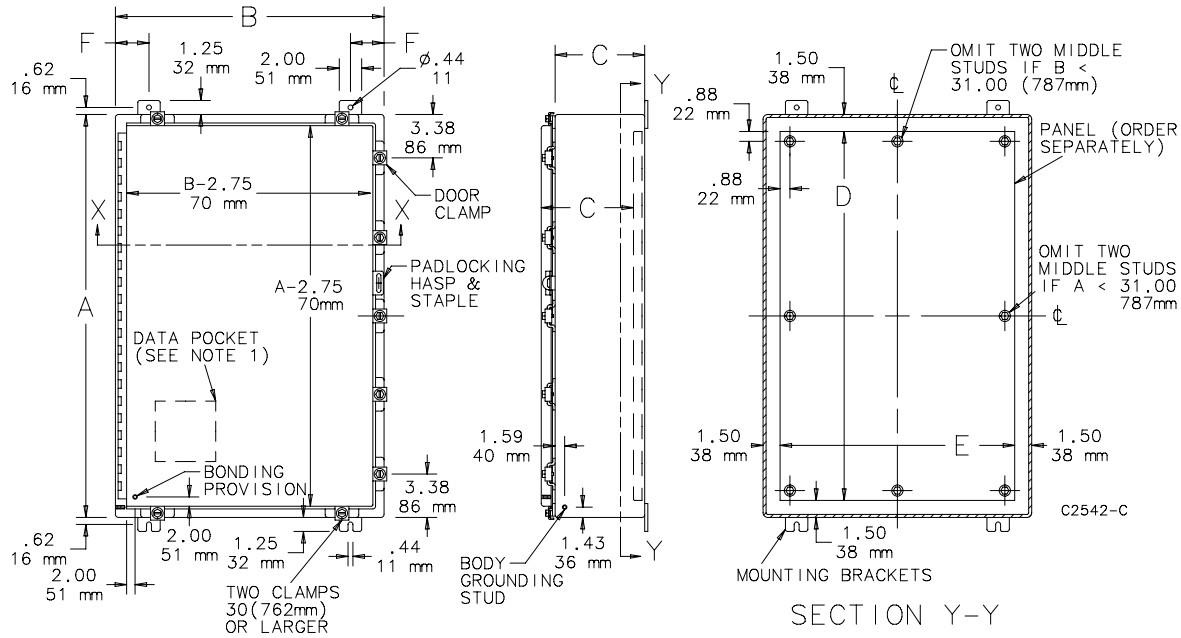
**BULLETIN: A4S**

## Standard Product

Catalog Number	AxBxC in./mm	Stainless Steel Type	Steel Panel	Conductive Steel Panel	Stainless Steel Panel	Panel Size D x E in./mm	F in./mm	Clamps Qty.	Data Pocket
A16H1206SSLP	16.00 x 12.00 x 6.00 406 x 305 x 152	304	A16P12	A16P12G	A16P12SS6	13.00 x 9.00 330 x 229	1.25 32	4	Small
A16H1206SS6LP	16.00 x 12.00 x 6.00 406 x 305 x 152	316L	A16P12	A16P12G	A16P12SS6	13.00 x 9.00 330 x 229	1.25 32	4	Small
A16H1606SSLP	16.00 x 16.00 x 6.00 406 x 406 x 152	304	A16P16	A16P16G	A16P16SS6	13.00 x 13.00 330 x 330	3.00 76	4	Small
A16H1606SS6LP	16.00 x 16.00 x 6.00 406 x 406 x 152	316L	A16P16	A16P16G	A16P16SS6	13.00 x 13.00 330 x 330	3.00 76	4	Small
A16H2006SSLP	16.00 x 20.00 x 6.00 406 x 508 x 152	304	A20P16	A20P16G	A20P16SS6	17.00 x 13.00 432 x 330	3.00 76	4	Small
A16H2006SS6LP	16.00 x 20.00 x 6.00 406 x 508 x 152	316L	A20P16	A20P16G	A20P16SS6	17.00 x 13.00 432 x 330	3.00 76	4	Small
A20H1606SSLP	20.00 x 16.00 x 6.00 508 x 406 x 152	304	A20P16	A20P16G	A20P16SS6	17.00 x 13.00 432 x 330	3.00 76	4	Small
A20H1606SS6LP	20.00 x 16.00 x 6.00 508 x 406 x 152	316L	A20P16	A20P16G	A20P16SS6	17.00 x 13.00 432 x 330	3.00 76	4	Small
A20H2006SSLP	20.00 x 20.00 x 6.00 508 x 508 x 152	304	A20P20	A20P20G	A20P20SS6	17.00 x 17.00 432 x 432	3.00 76	4	Small
A20H2006SS6LP	20.00 x 20.00 x 6.00 508 x 508 x 152	316L	A20P20	A20P20G	A20P20SS6	17.00 x 17.00 432 x 432	3.00 76	4	Small
A24H2006SSLP	24.00 x 20.00 x 6.00 610 x 508 x 152	304	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	3.00 76	5	Small
A24H2006SS6LP	24.00 x 20.00 x 6.00 610 x 508 x 152	316L	A24P20	A24P20G	A24P20SS6	21.00 x 17.00 533 x 432	3.00 76	5	Small
A24H2406SSLP	24.00 x 24.00 x 6.00 610 x 610 x 203	304	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	3.00 76	5	Small
A24H2406SS6LP	24.00 x 24.00 x 6.00 610 x 610 x 152	316L	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	3.00 76	5	Small

Catalog Number	AxBxC in./mm	Stainless Steel Type	Steel Panel	Conductive Steel Panel	Stainless Steel Panel	Panel Size D x E in./mm	F in./mm	Clamps Qty.	Data Pocket
A36H3010SS6LP	36.00 x 30.00 x 10.00 914 x 762 x 254	316L	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	3.00 76	7	Large
A42H3010SSLP	42.00 x 30.00 x 10.00 1067 x 762 x 254	304	A42P30	A42P30G	A42P30SS6	39.00 x 27.00 991 x 686	3.00 76	8	Large
A42H3010SS6LP	42.00 x 30.00 x 10.00 1067 x 762 x 254	316L	A42P30	A42P30G	A42P30SS6	39.00 x 27.00 991 x 686	3.00 76	8	Large
A48H3610SSLP	48.00 x 36.00 x 10.00 1219 x 914 x 254	304	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A48H3610SS6LP	48.00 x 36.00 x 10.00 1219 x 914 x 254	316L	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A24H2412SSLP	24.00 x 24.00 x 12.00 610 x 610 x 305	304	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	3.00 76	5	Small
A24H2412SS6LP	24.00 x 24.00 x 12.00 610 x 610 x 305	316L	A24P24	A24P24G	A24P24SS6	21.00 x 21.00 533 x 533	3.00 76	5	Small
A30H2412SSLP	30.00 x 24.00 x 12.00 762 x 610 x 305	304	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	3.00 76	5	Large
A30H2412SS6LP	30.00 x 24.00 x 12.00 762 x 610 x 305	316L	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	3.00 76	5	Large
A36H3012SSLP	36.00 x 30.00 x 12.00 914 x 762 x 305	304	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	3.00 76	7	Large
A36H3012SS6LP	36.00 x 30.00 x 12.00 914 x 762 x 305	316L	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	3.00 76	7	Large
A36H3612SSLP	36.00 x 36.00 x 12.00 914 x 914 x 305	304	A36P36	A36P36G	A36P36SS6	33.00 x 33.00 838 x 838	3.00 76	7	Large
A36H3612SS6LP	36.00 x 36.00 x 12.00 914 x 914 x 305	316L	A36P36	A36P36G	A36P36SS6	33.00 x 33.00 838 x 838	3.00 76	7	Large
A48H3612SSLP	48.00 x 36.00 x 12.00 1219 x 914 x 305	304	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A48H3612SS6LP	48.00 x 36.00 x 12.00 1219 x 914 x 305	316L	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A60H3612SSLP	60.00 x 36.00 x 12.00 1524 x 914 x 305	304	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	3.00 76	9	Large
A60H3612SS6LP	60.00 x 36.00 x 12.00 1524 x 914 x 305	316L	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	3.00 76	9	Large
A30H2416SSLP	30.00 x 24.00 x 16.00 762 x 610 x 406	304	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	3.00 76	5	Large
A30H2416SS6LP	30.00 x 24.00 x 16.00 762 x 610 x 406	316L	A30P24	A30P24G	A30P24SS6	27.00 x 21.00 686 x 533	3.00 76	5	Large
A36H3016SSLP	36.00 x 30.00 x 16.00 914 x 762 x 406	304	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	3.00 76	7	Large
A36H3016SS6LP	36.00 x 30.00 x 16.00 914 x 762 x 406	316L	A36P30	A36P30G	A36P30SS6	33.00 x 27.00 838 x 686	3.00 76	7	Large
A48H3616SSLP	48.00 x 36.00 x 16.00 1219 x 914 x 406	304	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A48H3616SS6LP	48.00 x 36.00 x 16.00 1219 x 914 x 406	316L	A48P36	A48P36G	A48P36SS6	45.00 x 33.00 1143 x 838	3.00 76	8	Large
A60H3616SSLP	60.00 x 36.00 x 16.00 1524 x 914 x 406	304	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	3.00 76	9	Large
A60H3616SS6LP	60.00 x 36.00 x 16.00 1524 x 914 x 406	316L	A60P36	A60P36G	A60P36SS6	57.00 x 33.00 1448 x 838	3.00 76	9	Large

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



- NOTE:
1. Removable data pocket included (see table for size). Large data pocket 12.00 x 12.00 (305mm x 305mm); small data pocket 6.00 x 6.00 (152mm x 152mm).
  2. Maximum spacing between door clamps is 15.00 (382mm)



GS2GU3N



Auxiliary Contacts  
GS1AD10 + GS2AM110



Shorting Links

**GS2 Fusible Disconnect Switches**

Table 8.65: GS Fusible IEC Style Disconnect Switches

Pole	Rating (A)	Catalog No.	Maximum Horsepower Rating				Short Circuit Current Rating, 600 Vac		Shaft Style
			240 V	480 V	600 V	250 Vdc	Fuse	SCCR kA	
3	30	GS1DDU3	7.5	15	20	5	CC	100	AG
3	30	GS1DU3	7.5	15	20	5	J	100	AG
3	30	GS2EEU3	7.5	15	20	5	CC	100	B
3	30	GS2EU3N	7.5	15	20	5	J	100	B
3	60	GS2GU3N	15	30	50	10	J	100	B
3	100	GS2JU3N	30	60	75	20	J	200	B
3	200	GS2MU3N	60	125	150	40	J	200	B
3	400	GS2QU3N	125	250	300	50	J	200	B
3	600	GS2SU3	200	500	500	—	J	200	C
3	800	GS2TU3	200	500	500	—	J	200	C

Table 8.66: Handles and Shafts for GS Switches [6]

Rating (A)	Handle			Shaft: 12.6 in. (320 mm)	Shaft: 15.7 in. (400 mm)	Shaft: 19.7 in. (500 mm)	Shaft Guide Catalog No.	Shaft Style	Support Bracket [7]
	Catalog No.	Type	Color	Catalog No.	Catalog No.	Catalog No.			
30-60	GS2AH110	1, 3R, 12	Black	GS2AE8	GS2AE81	—	GS2AEH12	AG	—
30-60	GS2AH120	1, 3R, 12	Red/Yellow						
30-60	GS2AH410	4, 4X	Black						
30-60	GS2AH420	4, 4X	Red/Yellow	GS2AE2	GS2AE21	GS2AE23	GS2AEH12	B	GS2AESB
30-400	GS2AH130	1, 3R, 12	Black						
30-400	GS2AH140	1, 3R, 12	Red/Yellow						
30-400	GS2AH430	4, 4X	Black	GS2AE5	GS2AE51	GS2AE53	GS2AEH12	C	—
30-400	GS2AH440	4, 4X	Red/Yellow						
600-800	GS2AH150	1, 3R, 4, 4X, 12	Black						
600-800	GS2AH160	1, 3R, 4, 4X, 12	Red/Yellow						

NOTE: Hole adapter kit for GS1 to GS2 Handles: GS2AH100TO200.

Table 8.67: Auxiliary Contacts for GS Switches [8]

Switch Amperes	Catalog No.	Description
30-800	GS1AM110	Auxiliary Contact, 1 N.O.
30-800	GS1AM101	Auxiliary Contact, 1 N.C.
30	GS1AD10	Auxiliary Contact Holder

Table 8.68: Shorting Links

For use on:	Shorting Links per Kit	Catalog No.
GS2, 60 A	3	GS1AU203
GS2, 100 A	3	GS1AU303
GS2, 200 A	3	GS1AU403
GS2, 400 A	3	GS1AU503
GS2, 600-800 A	3	GS1AU803

Table 8.69: NFPA79 Kit

For Use With:	Description	Kit Part Number
GS2Q3N	NFPA 79 Internal Handle Kit 400 A Switch Shaft	GS2AD040N
GS2GU3N, GS2GLU3N, GS2JU3N, GS2JLU3N	NFPA 79 Internal Handle Kit 60-200 A Switch Shaft	GS2AD030N
GS1DDU3, GS1DU3	NFPA 79 Internal Handle Kit for 5 mm Shafts	GS1AD010

Table 8.70: Terminal Shrouds for GS Switches, Line or Load [9]

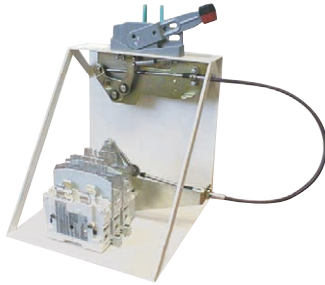
Switch Amperes	Catalog No.	Description
30-100	—	Standard on product
200	GS2AP43	GS2, 3-Pole, 200 A
400	GS2AP53	GS2, 3-Pole, 400 A
600-800	GS2AP73	GS2, 3-Pole, 600-800 A

[6] GS2AH100TO200-GS1 to GS2 Handle Adapter if using GS1 holes.

[7] Not for use with flange disconnects.

[8] GS1DU3 and GS1DDU3 switches allow up to 4 auxiliary contacts without adding contact holder GS1AD10. For more than 4 contacts, GS1AD10 is required.

[9] Order one terminal shroud per side. For example, order one terminal shroud for either the line side or load side; order two terminal shrouds for both the line side and load side.



Flange Handle  
Cable Operator Kit

**Cable Operator Kits for GS2 Switches**

**Table 8.71: Cable Operator Kits for GS2 Switches** [10] [11]

Catalog No.	Description
<b>200 A and Below</b>	
GS2AH36F	36 in. Cable Operator Kits for GS2 Switches, 200 A and Below
GS2AH60F	60 in. Cable Operator Kits for GS2 Switches, 200 A and Below
GS2AH120F	120 in. Cable Operator Kits for GS2 Switches, 200 A and Below
GS2AH144F	144 in. Cable Operator Kits for GS2 Switches, 200 A and Below
GS2AH180F	180 in. Cable Operator Kits for GS2 Switches, 200 A and Below
<b>400 A</b>	
GS2AH460F	60 in. Cable Operator Kits for GS2 Switches, 400 A
GS2AH4120F	120 in. Cable Operator Kits for GS2 Switches, 400 A
GS2AH4144F	144 in. Cable Operator Kits for GS2 Switches, 400 A
GS2AH4180F	180 in. Cable Operator Kits for GS2 Switches, 400 A

**Table 8.72: Handles for use with Cable Operator Kits**

Catalog No.	NEMA Type Enclosure	Type of Handle
9422A1	1, 3, 3R, 4, (Sheet Steel)	6 in.
9422A2	4, 4X (Stainless)	6 in.
9422A3	1, 3, 3R, 4, (Sheet Steel)	4 in.
9422A4	4, 4X (Stainless)	4 in.

**Accessories**

**Table 8.73: Terminal Lugs**



Terminal Lugs

For Use On:	Rating	No. of Wires per Lug	No. of Lugs per Terminal	Lug Size (AWG)	Wire Type	Lugs per Kit	Lug Kit Catalog Number
LK4DU3CN	30	1	1	#12-2/0	Cu	—	Standard
LK4GU3CN	60	1	1	#12-2/0	Cu	—	Standard
LK4JU3N	100	1	1	6-300 kcmil	Cu/Al	6	GS1AW403
LK4MU3N	200	1	1	6-300 kcmil	Cu/Al	6	GS1AW403
LK4QU3N	400	2	1	350 MCM-6	Cu/Al	6	GS1AW603
		1	—	600 MCM-4	—	—	—
		2	1	250 MCM-1/0	Cu/Al	6	GS1AW606
LK4SU3N	600	2	1	2 x 2-600 kcmil	Cu/Al	6	GS1AW503
LK4TU3N	800	2	2	2 x 2-600 kcmil	Cu/Al	12	GS1AW903
LK4UU3N	1000	2	2	2 x 2-600 kcmil	Cu/Al	12	GS1AW903
LK4WU3N	1200	2	2	2 x 2-600 kcmil	Cu/Al	12	GS1AW903
GS1DDU3	30	1	1	#14-#10	Cu	—	Standard
GS1DU3	30	1	1	#14-#10	Cu	—	Standard
GS2EEU3	30	1	1	#14-#10	Cu	—	Standard
GS2EU3N	30	1	1	#14-#6	Cu	—	Standard
GS2GU3N	60	1	1	#10-#6	Cu	—	Standard
GS2IU3N	100	1	1	#12-#1	Cu	—	Standard
GS2MU3N	200	1	1	6-300 kcmil	Cu/Al	6	GS1AW403
GS2QU3N	400	2	1	350 MCM-6	Cu/Al	6	GS1AW603
		1	—	600 MCM-4	—	—	—
		2	1	250 MCM-1/0	Cu/Al	6	GS1AW606
GS2SU3	600	2	1	2 x 2-600 kcmil	Cu/Al	6	GS1AW503
GS2TU3	800	2	1	2 x 2-600 kcmil	Cu/Al	6	GS1AW503

**Table 8.74: Power Distribution Lugs GS1 or GS2 Only**

For Use On:	Rating	No. of Wires per Lug	Lug Size (AWG)	Wire Type	Lugs per Kit	Lug Kit Catalog No.
GS1JU3	100	6	#14-#6	Cu	3	GS1AW306 [12]
GS2MU3N	200	12	#14-#4	Cu	3	GS1AW406
GS2QU3N	400	12	#14-#4	Cu	3	GS1AW406
GS2MU3N	200	6	#12-2/0	Cu	3	GS1AW506
GS2QU3N	400	6	#12-2/0	Cu	3	GS1AW506

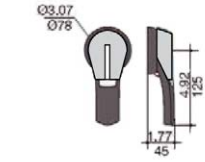
[10] Does not include handle. For handle, see Table 8.72.

[11] Not compatible with GS2EEU3.

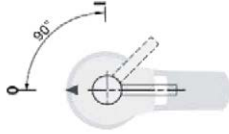
[12] Cannot be used on GS2JU3N.

**GS2JU3N, 100 A Fusible Disconnect Switches, Class J Fuses**

Handle for 100 A, 200 A, and 400 A Fusible Disconnect Switches

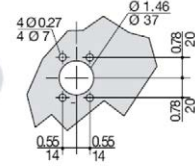


Handle Part No.  
GS2AH130  
GS2AH140  
GS2AH430  
GS2AH440

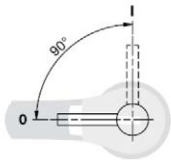


Front operation

Direction of operation

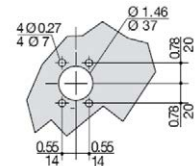


Door drilling template

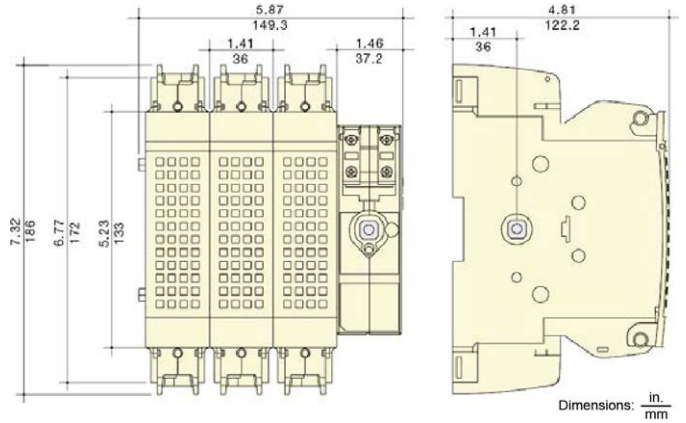


Side operation

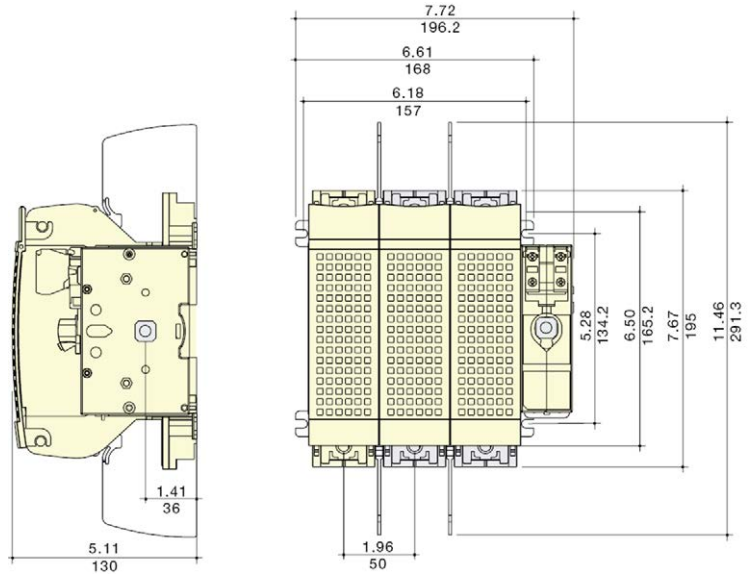
Direction of operation



Door drilling template



**GS2MU3N, 200 A Fusible Disconnect Switches, Class J Fuses**



## Limitron® Fast-acting Fuses

### JKS Class J



#### Specifications

Description: Fast-acting, current-limiting fuse.

Dimensions: See page 15 for Class J dimensions.

Ratings:

Volts — 600Vac (or less)

Amps — 1-600A

IR — 200kA RMS Sym.

Agency Information: CE, Std. 248-8, Class J, UL Listed, Guide JDDZ, File E4273, CSA Certified, Class 1422-02, File 53787.

#### Features and Benefits

- Current limitation for non-inductive circuits provides Class J current-limiting response to maximum ground fault and short-circuit conditions.
- 200kA interrupting rating provides high ratings at all circuit locations.
- Economical solutions for high-fault circuits.

#### Typical Applications

- Power Panelboards
- Machinery Disconnects

#### Catalog Numbers (Amps)

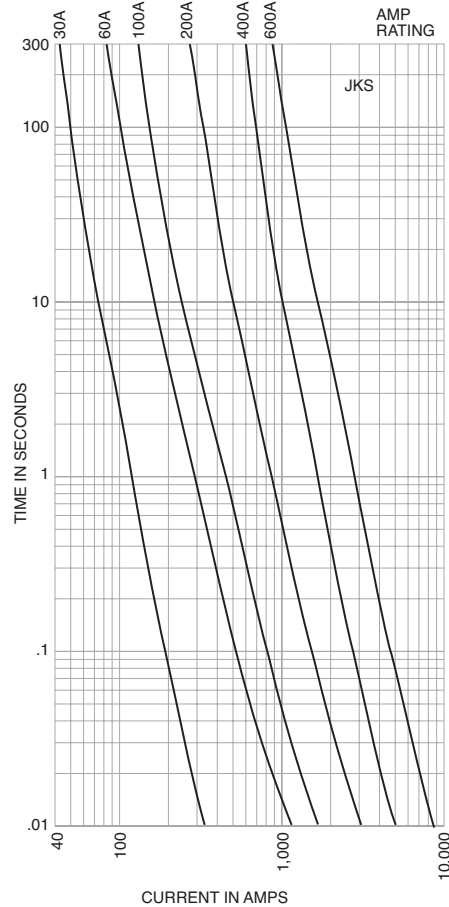
JKS-1	JKS-15	JKS-70	JKS-225
JKS-2	JKS-20	JKS-80	JKS-250
JKS-3	JKS-25	JKS-90	JKS-300
JKS-4	JKS-30	JKS-100	JKS-350
JKS-5	JKS-35	JKS-110	JKS-400
JKS-6	JKS-40	JKS-125	JKS-450
JKS-8	JKS-45	JKS-150	JKS-500
JKS-10	JKS-50	JKS-175	JKS-600
JKS-12	JKS-60	JKS-200	

For superior electrical protection, Cooper Bussmann recommends upgrading JKS fuse applications to Low-Peak LPJ fuses See page 23.

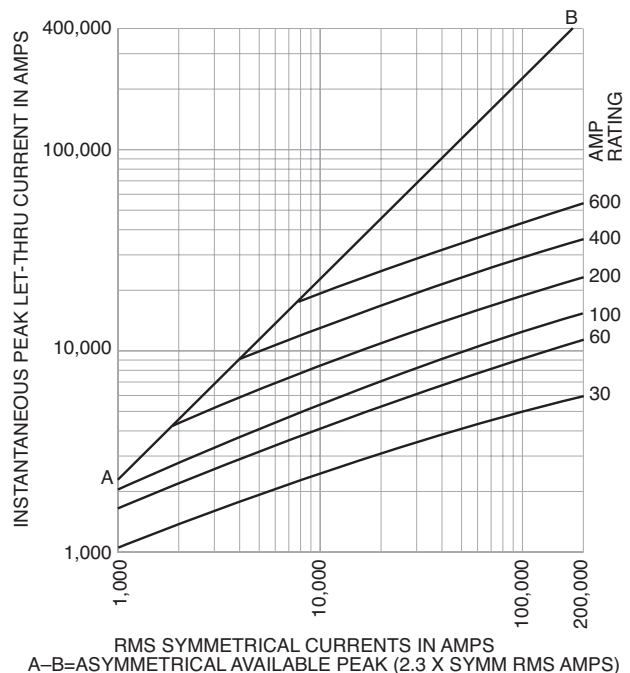
#### Recommended Fuse Holders & Blocks For Class J Fuses

- See page 14

Time-Current Characteristic Curves—Average Melt



Current Limitation Curves

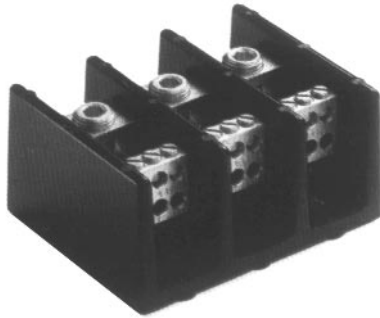


# Power Distribution & Terminal Blocks

# PDB

## Power Distribution Blocks

### 600 Volt AC or DC



Catalog Symbol: Power Distribution Blocks  
 Voltage Rating: 600 Volts AC or DC maximum  
 Agency Information:  
 UL Recognized, Guide XCFR2, File E221592  
 CSA Certified, Class 6228-01, File 15364

Example: A 3-pole, 16023 series is 16023-3. The line side of the device has (1) conductor opening per pole that accepts 350kcmil - #6 CU/AL. The load side of the device has (6) conductor openings per pole that each accepts #4 - #14 CU or #4 - #12 AL.

#### Power Distribution Blocks (600V) Catalog Data

Catalog Number					Connection		Connector Material and Ampacity	UL	CSA
	1-Pole	2-Pole	3-Pole	4-Pole	Line	Load			
16021	NA	-2	-3	-4	2/0 - #14CU, 2/0 - #8AL	(6) #4 - #14CU, #4 - #8AL	AL-175A	•	•
16023	NA	-2	-3	-4	350kcmil - #6CU-AL	(6) #4 - #14CU, #4 - #12AL	AL-310A	•	•
16220	-1	-2	-3	NA	2/0 - #14CU, 2/0 - #8AL	(4) #4 - #14CU, #4 - #8AL	AL-175A	•	•
16321	-1	-2	-3	NA	2/0 - #14CU, 2/0 - #8AL	(6) #4 - #14CU, #4 - #8AL	AL-175A	•	•
16323	-1	-2	-3	NA	350kcmil - #6CU-AL	(6) #4 - #14CU, #4 - #12AL	AL-310A	•	•
16325	-1	-2	-3	NA	(2) 2/0 - #14CU, 2/0 - #8AL	(6) #4 - #14CU, #4 - #8AL	AL-350A	•	•
16330	-1	-2	-3	NA	500kcmil - #6CU-AL	(6) #2 - #14CU, #2 - #12AL	AL-380A	•	•
16332	-1	-2	-3	NA	350kcmil - #6CU-AL	(3) #2 - #14CU, #2 - #8AL (2) 1/0 - #14CU, 1/0 - #8AL	AL-310A	•	•
16335	-1	-2	-3	NA	500kcmil - #6CU-AL	(3) #2 - #14 CU, #2 - #8AL (2) 1/0 - #14CU, 1/0 - #8AL	AL-380A	•	•
16370	-1	-2	-3	NA	350kcmil - #6CU-AL	(12) #4 - #14CU, #4 - #12AL	AL-310A	•	•
16371	-1	-2	-3	NA	350kcmil - #6CU-AL	(6) #2 - #14CU, #2 - #8AL (3) 1/0 - #14CU, 1/0 - #8AL	AL-310A	•	•
16372	-1	-2	-3	NA	350kcmil - #6CU-AL	(21) #10 - #14CU, #10AL	AL-310A	•	•
16373	-1	-2	-3	NA	350kcmil - #6CU-AL	(3) 1/0 - #14CU-AL (14) #10 - #14CU, #10AL	AL-310A	•	•
16375	-1	-2	-3	NA	600kcmil - #2CU-AL	(12) #4 - #14CU, #4 - #12AL	AL-420A	•	•
16376	-1	-2	-3	NA	600kcmil - #2CU-AL	(6) #2 - #14CU, #2 - #8AL (3) 1/0 - #14CU, 1/0 - #8AL	AL-420A	•	•
16377	-1	-2	-3	NA	(2)300kcmil - #4CU-AL	(12) #4 - #14CU, #4 - #12AL	AL-570A	•	•
16528	-1	-2	-3	NA	(2) 600kcmil - #2CU-AL	(4) 3/0 - #6CU-AL (4) #4 - #14CU-AL	AL-840A	•	•
16530	-1	-2	-3	NA	(2) 500kcmil - #6CU-AL	(12) #4 - #14CU-AL	AL-760A	•	•
16541	-1	-2	-3	NA	500kcmil - #6CU-AL	(21) #6 - #14CU-AL	AL-380A	•	•

**How To Order:** Catalog Number + # of Poles  
**Example:** 16021-3 (complete part number)

Dimensional information on page 3

Optional covers:      160 Series: CPB160 - (pole)  
                                  162 Series: CPB162 - (pole)  
                                  163 Series: CPDB - (pole)  
                                  165 Series: CPDB165 (1 for each pole)

CE CE logo denotes compliance with European Union Low Voltage Directive (50-1000Vac, 75-1500Vdc). Refer to Data Sheet: 8002 or contact Bussmann Application Engineering at 636-527-1270 for more information.



# PK7GTA

## LOAD CENTER EQUIPMENT GROUND BAR ASSY



by Schneider Electric

List Price \$11.70 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

### Technical Characteristics

Application	Load Centers
Circuit Breaker Type	PK
Marketing Trade Name	QO and Homeline

### Shipping and Ordering

Category	00102 - Load Centers, Accessories, Type QO
Discount Schedule	DE3A
GTIN	00785901026372
Package Quantity	1
Weight	0.08 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	US

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.

# Miniature circuit breakers

## UL/CSA + IEC/EN 60947-2 + GB

### C60BP - UL 489 - Z, C, D curves – Tunnel terminals



#### UL 489 / CSA C22.2 No 5 / IEC/EN 60947-2 / GB 14048-2

C60BP are multi-standard miniature circuit breakers and branch circuit protection as defined by UL 489. It combines following functions:

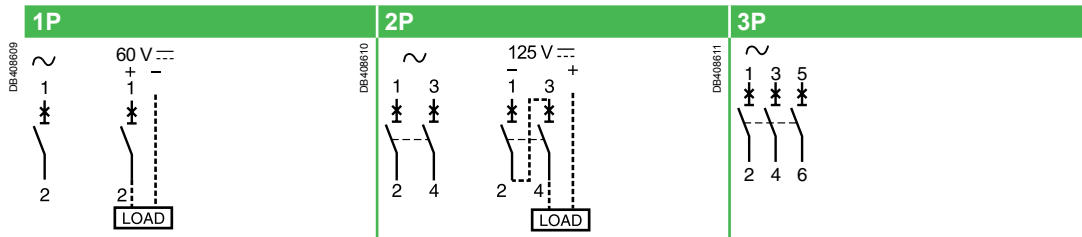
- circuit protection against short-circuit currents
- circuit protection against overload currents
- tripping and fault indication by the addition of auxiliaries.



Number of 18 mm (0.71 in.) poles	Rating (A) 25°C/77°F	Breaking capacity (kA rms) AIR				Icu			
		UL 489 / CSA C22.2 No 5				IEC 60947-2			
1P	0.5 to 35	10	14	14	10	-	3	10	20
	40 to 63	-	10	10	10	-	3	10	20
2P	1 to 25	480Y/277 V ~		240 V ~	125 V ---	440 V ~	415 V ~	240 V ~	125 V ---
	30 to 35	10	14	14	10	6	10	20	-
3P	1 to 35	10	14	-	-	6	10	20	-
2P/3P	40 to 63	-	10	-	-	6	10	20	-

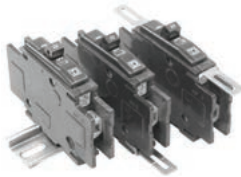


#### Electrical diagrams



#### Catalogue numbers

Tunnel terminal connection											
Type	UL489 and CSA voltages	1P			2P			3P			
Auxiliaries											
Remote indication and tripping, see page 43											
Rating (In)		Curve			Width in 9 mm modules	Curve		Width in 9 mm modules	Curve		Width in 9 mm modules
		Z	C	D (=K)		C	D (=K)		C	D (=K)	
<b>C60BP</b>											
0.5	480Y/277 V and 240 V	M9F44170	M9F42170	M9F43170	2	-	-	4	-	-	6
1		M9F44101	M9F42101	M9F43101		M9F42201	M9F43201		M9F42301	M9F43301	
2		M9F44102	M9F42102	M9F43102		M9F42202	M9F43202		M9F42302	M9F43302	
3		M9F44103	M9F42103	M9F43103		M9F42203	M9F43203		M9F42303	M9F43303	
4		M9F44104	M9F42104	M9F43104		M9F42204	M9F43204		M9F42304	M9F43304	
5		M9F44105	M9F42105	M9F43105		M9F42205	M9F43205		M9F42305	M9F43305	
6		M9F44106	M9F42106	M9F43106		M9F42206	M9F43206		M9F42306	M9F43306	
8		M9F44108	M9F42108	M9F43108		M9F42208	M9F43208		M9F42308	M9F43308	
10		M9F44110	M9F42110	M9F43110		M9F42210	M9F43210		M9F42310	M9F43310	
15		M9F44115	M9F42115	M9F43115		M9F42215	M9F43215		M9F42315	M9F43315	
20	M9F44120	M9F42120	M9F43120		M9F42220	M9F43220		M9F42320	M9F43320		
25	M9F44125	M9F42125	M9F43125		M9F42225	M9F43225		M9F42325	M9F43325		
30	M9F44130	M9F42130	M9F43130		M9F42230	M9F43230		M9F42330	M9F43330		
35	M9F44135	M9F42135	M9F43135		M9F42235	M9F43235		M9F42335	M9F43335		
40	M9F44140	M9F42140	M9F43140	2	M9F42240	M9F43240	4	M9F42340	M9F43340	6	
45	M9F44145	M9F42145	M9F43145		M9F42245	M9F43245		M9F42345	M9F43345		
50	M9F44150	M9F42150	M9F43150		M9F42250	M9F43250		M9F42350	M9F43350		
63	M9F44163	M9F42163	M9F43163		M9F42263	M9F43263		M9F42363	M9F43363		
<b>Accessories</b>		See page 48									



Low Ampere QOU

**Low Ampere QOU Miniature Circuit Breakers**

QOU unit mount miniature circuit breakers (cable-in/cable-out) are ideal for OEM applications. They have the Square D™ circuit breaker’s unique Visi-Trip™ feature and can be DIN rail-mounted or surface- or flush-mounted using mounting feet. Mounting feet not provided [30].

**General Specifications Common to All Low Ampere QOU Circuit Breakers**

- For convenient flush mount, surface mount or DIN mount (symmetrical rail 35 x 7.5 DIN/EN 50 022)
- Single handle with internal common trip
- Terminal lug wire size (1) 14–2 AWG Cu or Al
- Reversible line and load lugs
- Field-installable quick connectors
- UL Listed 48 Vdc (5 k AIR)
- UL Listed as HACR Type: 10–70 A
- High magnetic trip circuit breakers (QOU-HM) are recommended for applications where high initial inrush may occur and for individual dimmer applications.
- For DIN mounting rails, see IEC Starters and Relays, Section 18.

**Table 7.22: QOU Low Ampere Miniature Circuit Breakers**

Ampere Rating	Cat. No.			
	1P 120/240 Vac	2P 120/240 Vac	2P 240 Vac [31]	3P 240 Vac
<b>10 k AIR</b>				
10 A	QOU110	QOU210	—	QOU310
15 A	QOU115	QOU215	QOU215H	QOU315
20 A	QOU120	QOU220	QOU220H	QOU320
25 A	QOU125	QOU225	QOU225H	QOU325
30 A	QOU130	QOU230	QOU230H	QOU330
35 A	QOU135	QOU235	—	QOU335
40 A	QOU140	QOU240	—	QOU340
45 A	QOU145	QOU245	—	QOU345
50 A	QOU150	QOU250	—	QOU350
60 A	QOU160	QOU260	—	QOU360
70 A	QOU170	QOU270	—	QOU370
<b>22 k AIR</b>				
15 A	QOU115VH	QOU215VH	—	QOU315VH
20 A	QOU120VH	QOU220VH	—	QOU320VH
25 A	QOU125VH	QOU225VH	—	QOU325VH
30 A	QOU130VH	QOU230VH	—	QOU330VH
35 A	QOU135VH	QOU235VH	—	—
40 A	QOU140VH	QOU240VH	—	—
45 A	QOU145VH	QOU245VH	—	—
50 A	QOU150VH	QOU250VH	—	—
60 A	QOU160VH	QOU260VH	—	—

**Table 7.23: QOU-HM Miniature Circuit Breakers (10 k AIR)**

Ampere Rating	Cat. No.			
	1P 120/240 Vac	2P 120/240 Vac	2P 240 Vac	3P 240 Vac
15 A	QOU115HM	—	—	—
20 A	QOU120HM	—	—	—

**Table 7.24: QYU UL1077 Recognized Supplementary Protectors (5 k AIR)**

Ampere Rating	Cat. No.			
	1P 277 Vac	2P 120/240 Vac	2P 240 Vac	3P 240 Vac
10 A	QYU110	—	—	—
15 A	QYU115	—	—	—
20 A	QYU120	—	—	—
25 A	QYU125	—	—	—
30 A	QYU130	—	—	—

[30] See QOU Accessories, page 7-20.  
[31] QOU-H interrupting rating is 10 kA at 240 Vac.



## Bulletin 150 — SMC™ Flex Smart Motor Controller

The SMC Flex controller provides microprocessor controlled starting for standard 3-phase squirrel-cage induction or Wye-Delta (6-lead) motors. Seven standard modes of operation are available within a single controller.

- 1...1250 A Range
- Seven Standard Start Modes
- Options Include Pump Control and Braking Control

### Features

- Built in SCR Bypass/Run Contactor
- Built in Electronic Motor Overload Protection
- CT on each Phase
- Metering
- DPI Communication
- LCD Display
- Keypad Programming
- Four Programmable Auxiliary Contacts

The SMC Flex controller is available for motors rated 1...1250 A; 200...480V AC, 200...600V AC, or 230...690V AC, 50/60 Hz. In addition to motors, the SMC Flex controller can be used to control resistive loads.

## Table of Contents

Features.....	this page
Cat. No. Explanation.....	8
Product Selection.....	9
Options.....	19
Accessories.....	20
Specifications.....	22
Approx. Dims. ....	27

This catalog is based on the **minimum** information needed to select an SMC soft starter for applications with low starting torque requirements. For product selection involving loads with high starting torque requirements (large fan, rock crusher, chipper, etc.), use of the free tools available from the Rockwell Automation Website is recommended:

[http://www.ab.com/industrialcontrols/products/solid-state\\_motor\\_control/software/](http://www.ab.com/industrialcontrols/products/solid-state_motor_control/software/)

## Standards Compliance

- UL 508
- CSA C22.2 No.14
- EN/IEC 60947-1
- EN/IEC 60947-4-2

## Certifications

- cULus Listed (Open Type) (File No. E96956, Guides NMFT, NMFT7)
- CSA Certified (File No. LR 1234)
- CE Marked
- CCC Certified

## Modes of Operation

The SMC Flex controller provides the following modes of operation as standard:

- Soft Start
- Selectable Kickstart
- Current Limit Start
- Dual Ramp Start
- Full Voltage Start
- Linear Speed Acceleration
- Preset Slow Speed
- Soft Stop

**Note:** For detailed information about the different modes of operation, see page 4.

## Description of Features

### Electronic Motor Overload Protection

The SMC Flex controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an  $I^2t$  algorithm.

When coordinated with the proper short-circuit protection, overload protection is intended to protect the motor, motor controller, and power wiring against overheating caused by excessive overcurrent. The SMC Flex controller meets applicable requirements as a motor overload protective device.

The controller's overload protection is programmable, providing the user with flexibility. The overload trip class consists of either OFF, 10, 15, 20, or 30 protection. The trip current is programmed by entering the motor full-load current rating, service factor, and selecting the trip class.

Thermal memory is included to accurately model motor operating temperature. Ambient temperature insensitivity is inherent in the electronic design of the overload.

## Optional Modes of Operation

### Pump Control

- Start and Stop

### Braking Control

- SMB — Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking

### Undervoltage Protection

The SMC Flex controller's undervoltage protection will halt motor operation if a drop in the incoming line voltage is detected. The undervoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...99%. To eliminate nuisance trips, a programmable undervoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain below the undervoltage trip level during the programmed delay time.

### Overvoltage Protection

If a rise in the incoming line voltage is detected, the SMC Flex controller's overvoltage protection will halt motor operation. The overvoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...199%. To eliminate nuisance trips, a programmable overvoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain above the overvoltage trip level during the programmed delay time.

**Stall Protection and Jam Detection**

Motors can experience locked-rotor currents and develop high torque levels in the event of a stall or a jam. These conditions can result in winding insulation breakdown or mechanical damage to the connected load. The SMC Flex controller provides both stall protection and jam detection for enhanced motor and system protection. Stall protection allows the user to program a maximum stall protection delay time from 0...10 seconds. The stall protection delay time is in addition to the programmed start time and begins only after the start time has timed out. If the controller senses that the motor is stalled, it will shut down after the delay period has expired. Jam detection allows the user to determine the motor jam detection level as a percentage of the motor's full-load current rating. To prevent nuisance tripping, a jam detection delay time, from 0.0...99.0 seconds, can be programmed. This allows the user to select the time delay required before the SMC Flex controller will trip on a motor jam condition. The motor current must remain above the jam detection level during the delay time. Jam detection is active only after the motor has reached full speed.

**Underload Protection**

Utilizing the underload protection of the SMC Flex controller, motor operation can be halted if a drop in current is sensed. The SMC Flex controller provides an adjustable underload trip setting from 0...99% of the programmed motor full-load current rating with an adjustable trip delay time of 0...99 seconds.

**Voltage Unbalance Protection**

Voltage unbalance is detected by monitoring the 3-phase supply voltage magnitudes in conjunction with the rotational relationship of the three phases. The controller will halt motor operation when the calculated voltage unbalance reaches the user-programmed trip level.

The voltage unbalance trip level is programmable from 0...25% unbalance.

**Excessive Starts Per Hour**

The SMC Flex controller allows the user to program the allowed number of starts per hour (up to 99). This helps eliminate motor stress caused by repeated starting during a short time period.

**Metering**

Power monitoring parameters include:

- 3-phase current
- 3-phase voltage
- Power in kW or MW
- Power usage in kWh or MWh
- Power Factor
- Motor thermal capacity usage
- Elapsed time

**Note:** The motor thermal capacity usage allows the user to monitor the amount of overload thermal capacity usage before the SMC Flex controller's built-in electronic overload trips.

**Built-in DPI Communication Capabilities**

A serial interface port is provided as standard, which allows connection to a Bulletin 20 Human Interface Module and a variety of Bulletin 20-COMM Communication Modules. This includes Allen-Bradley Remote I/O, DeviceNet, ControlNet, Ethernet, ProfiBUS, Interbus, and RS485-DF1.

**LCD Display**

The SMC Flex controller's three-line 16-character backlit LCD display provides parameter identification using clear, informative text. Controller set up can be performed quickly and easily without the use of a reference manual. Parameters are arranged in an organized four-level menu structure for ease of programming and fast access to parameters.

**Keypad Programming**

Programming of parameters is accomplished through a five-button keypad on the front of the SMC Flex controller. The five buttons include up and down arrows, an Enter button, a Select button, and an Escape button. The user needs only to enter the correct sequence of keystrokes for programming the SMC Flex controller.

**Auxiliary Contacts**

Four fully programmable hard contacts are furnished as standard with the SMC Flex controller:

Aux #1, Aux #2, Aux #3, Aux #4

- N.O./N.C.
- Normal/Up-to-Speed/External Bypass/Fault/Alarm/Network

**Network I/O**

The SMC Flex can have up to two inputs and four outputs controlled via a communication network. The output contacts use the auxiliary contacts.

**Ground Fault Input**

The SMC Flex can monitor for ground fault conditions. An external core balance current transformer is required for this function. See SMC Flex User Manual for additional information.

**Tach Input**

A motor tachometer is required for the Linear Speed Start mode. Please see the Specifications section on page 22 for tachometer characteristics.

**PTC Input**

A motor PTC input can be monitored by the SMC Flex. In the event of a fault, the SMC Flex will shut down and indicate a motor PTC fault.



Open and Non-Combination

**150 – F135    F    B    D    B – 8L**  
*a            b            c            d            e            f            g*

**a**

Bulletin Number	
Code	Description
150	Solid-State Controller
150B	Enclosed Solid-State Controller with Isolation Contactor

**c**

Enclosure Type	
Code	Description
F	NEMA Type 4/12 (IP65) (Non-Combination Only)
J	NEMA Type 12 (IP54)
N	Open

**e**

Control Voltage	
Code	Description
D	100...240V AC (5...480 A units)
R	24V AC/DC (5...480 A units) (Open Only)
E	110/120V AC (625...1250 A units)
A	230/240V AC (625...1250 A units)

**b**

Controller Ratings	
Code	Description
F5	5 A, 3 Hp @ 460V AC
F25	25 A, 15 Hp @ 460V AC
F43	43 A, 30 Hp @ 460V AC
F60	60 A, 40 Hp @ 460V AC
F85	85 A, 60 Hp @ 460V AC
F108	108 A, 75 Hp @ 460V AC
F135	135 A, 100 Hp @ 460V AC
F201	201 A, 150 Hp @ 460V AC
F251	251 A, 200 Hp @ 460V AC
F317	317 A, 250 Hp @ 460V AC
F361	361 A, 300 Hp @ 460V AC
F480	480 A, 400 Hp @ 460V AC
F625	625 A, 500 Hp @ 460V AC
F780	780 A, 600 Hp @ 460V AC
F970	970 A, 800 Hp @ 460V AC
F1250	1250 A, 1000 Hp @ 460V AC

**d**

Input Line Voltage	
Open Type	
Code	Description
B	200...460V AC, 3-phase, 50 and 60 Hz
C	200...575V AC, 3-phase, 50 and 60 Hz
Z	230...690V AC, 3-phase, 50 and 60 Hz (Open Only, 108 A and above)
Non-Combination Enclosed Only	
H	200...208V AC, 3-phase, 50 and 60 Hz
A	230V AC, 3-phase, 50 and 60 Hz
B	400...460V AC, 3-phase, 50 and 60 Hz
C	500...575V AC, 3-phase, 50 and 60 Hz

**f**

Options (Select Only One)	
Code	Description
Blank	Standard
B	Pump Control
D	Braking Control

**g**

Options (Non-Combination only) (see page 19 for a full listing)	
Code	Description
8L	Line-Mounted Protective Module (enclosed only)
8M	Load-Mounted Protective Module (enclosed only)
8B	Line- and Load-Mounted Protective Modules (enclosed only)

Load-side MOVs are not available with Pump and Braking options, or on delta-connected motors. MOVs can be field installed for open type units.

Combination

**152H – F480    F    BD    B – 59 – 8B**  
*a            b            c            d            e            f            g*

**a**

Bulletin Number	
Code	Description
152H	Solid-State Controller with Fusible Disconnect
152B	Solid-State Controller with Fusible Disconnect and Isolation Contactor
153H	Solid-State Controller with Circuit Breaker
153B	Solid-State Controller with Circuit Breaker and Isolation Contactor

**c**

Enclosure Type	
Code	Description
F	NEMA Type 4/12 (IP65)
J	NEMA Type 12 (IP54)

**e**

Control Options	
Code	Description
Blank	Standard
B	Pump Control
D	Braking Control

**b**

Controller Ratings	
Code	Description
F5	5 A, 3 Hp @ 460V AC
F25	25 A, 15 Hp @ 460V AC
F43	43 A, 30 Hp @ 460V AC
F60	60 A, 40 Hp @ 460V AC
F85	85 A, 60 Hp @ 460V AC
F108	108 A, 75 Hp @ 460V AC
F135	135 A, 100 Hp @ 460V AC
F201	201 A, 150 Hp @ 460V AC
F251	251 A, 200 Hp @ 460V AC
F317	317 A, 250 Hp @ 460V AC
F361	361 A, 300 Hp @ 460V AC
F480	480 A, 400 Hp @ 460V AC
F625	625 A, 500 Hp @ 460V AC
F780	780 A, 600 Hp @ 460V AC

**d**

Line Voltage, 120V AC Control Voltage	
Code	Description
HD	200...208V AC, 3-phase, 50 and 60 Hz
AD	230V AC, 3-phase, 50 and 60 Hz
BD	400...460V AC, 3-phase, 50 and 60 Hz
CD	500...575V AC, 3-phase, 50 and 60 Hz

**g**

Options (see page 19 for a full listing)	
Code	Description
8L	Line-Mounted Protective Module
8M	Load-Mounted Protective Module
8B	Line- and Load-Mounted Protective Modules

Load-side MOVs are not available with Pump and Braking options, or when used with inside-the-delta connections.

**f**

Horsepower									
Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating	Cat. No.	Hp Rating
33	0.5	39	5	46	40	52	150	60	450
34	0.75	40	7.5	47	50	54	200	61	500
35	1	41	10	48	60	56	250	62	600
36	1.5	42	15	49	75	57	300	63	700
37	2	43	20	50	100	58	350	65	800
38	3	44	25	51	125	59	400	67	1000
—	—	45	30	—	—	—	—	—	—



**Bulletin 150 — SMC™ Flex Smart Motor Controller**

The SMC Flex controller provides microprocessor controlled starting for standard 3-phase squirrel-cage induction or Wye-Delta (6-lead) motors. Seven standard modes of operation are available within a single controller.

- 1...1250 A Range
- Seven Standard Start Modes
- Options Include Pump Control and Braking Control

**Features**

- Built in SCR Bypass/Run Contactor
- Built in Electronic Motor Overload Protection
- CT on each Phase
- Metering
- DPI Communication
- LCD Display
- Keypad Programming
- Four Programmable Auxiliary Contacts

The SMC Flex controller is available for motors rated 1...1250 A; 200...480V AC, 200...600V AC, or 230...690V AC, 50/60 Hz. In addition to motors, the SMC Flex controller can be used to control resistive loads.

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4

This catalog product information is based on the **minimum** information needed to select an SMC soft starter for applications with low starting torque requirements. For product selection involving loads with high starting torque requirements (large fan, rock crusher, chipper, etc.), use of the free tools available from the Rockwell Automation Website is recommended:

[http://www.ab.com/industrialcontrols/products/solid-state\\_motor\\_control/software/](http://www.ab.com/industrialcontrols/products/solid-state_motor_control/software/)

**Standards Compliance**

- UL 508
- CSA C22.2 No.14
- EN/IEC 60947-1
- EN/IEC 60947-4-2

**Modes of Operation**

The SMC Flex controller provides the following modes of operation as standard:

- Soft Start
- Selectable Kickstart
- Current Limit Start
- Dual Ramp Start
- Full Voltage Start
- Linear Speed Acceleration
- Preset Slow Speed
- Soft Stop

**Note:** For detailed information about the different modes of operation, see page 4-109.

**Certifications**

- cULus Listed (Open Type) (File No. E96956, Guides NMFT, NMFT7)
- CSA Certified (File No. LR 1234)
- CE Marked
- CCC Certified

**Optional Modes of Operation**

**Pump Control**

- Start and Stop

**Braking Control**

- SMB — Smart Motor Braking
- Accu-Stop
- Slow Speed with Braking

**Description of Features**

**Electronic Motor Overload Protection**

The SMC Flex controller incorporates, as standard, electronic motor overload protection. This overload protection is accomplished electronically with an  $I^2t$  algorithm.

When coordinated with the proper short-circuit protection, overload protection is intended to protect the motor, motor controller, and power wiring against overheating caused by excessive overcurrent. The SMC Flex controller meets applicable requirements as a motor overload protective device.

The controller's overload protection is programmable, providing the user with flexibility. The overload trip class consists of either OFF, 10, 15, 20, or 30 protection. The trip current is programmed by entering the motor full-load current rating, service factor, and selecting the trip class.

Thermal memory is included to accurately model motor operating temperature. Ambient temperature insensitivity is inherent in the electronic design of the overload.

**Undervoltage Protection**

The SMC Flex controller's undervoltage protection will halt motor operation if a drop in the incoming line voltage is detected.

The undervoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...99%. To eliminate nuisance trips, a programmable undervoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain below the undervoltage trip level during the programmed delay time.

**Overvoltage Protection**

If a rise in the incoming line voltage is detected, the SMC Flex controller's overvoltage protection will halt motor operation.

The overvoltage trip level is adjustable as a percentage of the programmed line voltage, from 0...199%. To eliminate nuisance trips, a programmable overvoltage trip delay time of 0...99 seconds can also be programmed. The line voltage must remain above the overvoltage trip level during the programmed delay time.

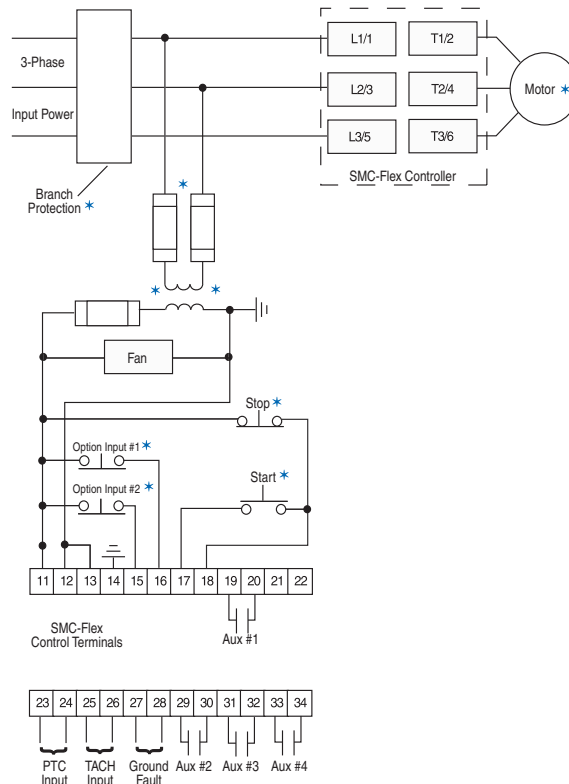


Functional Design Specifications

Standard Features	Installation	Power Wiring	Standard squirrel-cage induction motor or a Wye-Delta, six-lead motor.
		Control Wiring	2- and 3-wire control for a wide variety of applications.
	Setup	Keypad	Front keypad and backlit LCD display.
		Software	Parameter values can be downloaded to the SMC-Flex Controller with DriveTools programming software and the Cat. No. 20-COMM... DPI communication module.
	Communications		One DPI provided for connection to optional human interface and communication modules.
	Starting and Stopping Modes		Soft Start Current Limit Start Dual Ramp Full Voltage Linear Speed Acceleration Preset Slow Speed Soft Stop
	Protection and Diagnostics		Power loss, line fault, voltage unbalance, excessive starts/hour, phase reversal, undervoltage, overvoltage, controller temp, stall, jam, open gate, overload, underload, communication fault.
	Metering		Amps, volts, kW, kWh, MW, MWh, elapsed time, power factor, motor thermal capacity usage.
	Alarm Contact		Overload, underload, undervoltage, overvoltage, unbalance, jam, stall, and ground fault
	Status Indication		Stopped, starting, stopping, at speed, alarm, and fault.
Auxiliary Contacts		Four fully programmable contacts as normal/up-to-speed/fault/alarm/network (N.O./N.C.), or external bypass (N.O. only).	
Optional Features	Pump Control		Helps reduce fluid surges in centrifugal pumping systems during starting and stopping period. Starting time is adjustable from 0...30 s. Stopping time is adjustable from 0...120 s.
	Braking Control	SMB Smart Motor Braking	Provides motor braking without additional equipment for applications that require the motor to stop quickly. Braking current is adjustable from 0...400% of the motor's full-load current rating.
		Accu-Stop	Provides controlled position stopping. During stopping, braking torque is applied to the motor until it reaches preset slow speed (7% or 15% of rated speed) and holds the motor at this speed until a stop command is given. Braking torque is then applied until the motor reaches zero speed. Braking current is programmable from 0...450% of full-load current.
		Slow Speed with Braking	Used on applications that require slow speed (in the forward direction) for positioning or alignment and also require braking control to stop.

4

Wiring Diagram — Line Controller



\* Customer supplied.



Electrical Ratings				
	Device Rating	UL/CSA/NEMA	IEC	
<b>Power Circuit</b>	Rated Operation Voltage	480V	200...480V AC (-15%, +10%)	200...415V
		600V	200...600V AC (-15%, +10%)	200...500V
		690V	230...600V AC (-15%, +10%)	230...690V/Y (-15%, +10%)
	Rated Insulation Voltage	480V	N/A	500V
		600V		500V
		690V		690V
	Rated Impulse Voltage	480V	N/A	6000V
		600V		
		690V		
	Dielectric Withstand	480V	2200V AC	2500V
		600V		
		690V		
	Repetitive Peak Inverse Voltage Rating	480V	1400V	1400V
		600V	1600V	1600V
		690V	1800V	1800V
	Operating Frequency	All	50/60 Hz	
Utilization Category	5...480 A	MG 1	AC-53B:3.0-50:1750	
	625...1250 A	MG 1	AC-53B:3.0-50:3550	
Protection Against Electrical Shock	5...85 A	N/A	IP20	
	108...480 A		IP2X (with terminal covers)	
	625...1250 A		IP00 (open device)	
DV/DT Protection	480V & 600V	RC Snubber Network		
	690V	None		
Transient Protection	480V & 600V	Metal Oxide Varistors: 220 Joules		
	690V	None		
<b>Control Circuit</b>	Rated Operational Voltage§	5...480 A	100...240V AC or 24V AC/DC	
		625...1250 A	110/120V AC and 230/240V AC	
	Rated Insulation Voltage	All	N/A	240V
	Rated Impulse Voltage	All	N/A	3000V
	Dielectric Withstand	All	1600V AC	2000V
	Operating Frequency	All	50/60 Hz	
	Input onstate voltage minimum	85V AC, 19.2V DC / 20.4V AC		
	Input onstate current	20 mA @120V AC / 40 mA @ 240V AC, 7.6 mA @ 24V AC/DC		
	Input offstate voltage maximum	50V AC, 10V DC / 12V AC		
	Input offstate current @ input offstate voltage	<10 mA AC, <3 mA DC		



§ 690V power is only available with 100...240V control.

Electrical Ratings

SCPD Performance 200...600V		Type 1§*					
SCCR List*		Max. Standard Available Fault	Max. Standard Fuse [A]*	Max. Standard Available Fault	Max. Circuit Breaker [A]	Max. High Fault	Max. Fuse [A] ‡
Line Device Operational Current Rating [A]	5	5 kA	20	5 kA	20	70 kA	10
	25	5 kA	100	5 kA	100	70 kA	50
	43	10 kA	150	10 kA	150	70 kA	90
	60	10 kA	225	10 kA	225	70 kA	125
	85	10 kA	300	10 kA	300	70 kA	175
	108	10 kA	400	10 kA	300	70 kA	200
	135	10 kA	500	10 kA	400	70 kA	225
	201	18 kA	600	18 kA	600	70 kA	350
	251	18 kA	700	18 kA	700	70 kA	400
	317	30 kA	800	30 kA	800	69 kA	500
	361	30 kA	1000	30 kA	1000	69 kA	600
	480	42 kA	1200	42 kA	1200	69 kA	800
	625	42 kA	1600	42 kA	1600	74 kA	1600
	780	42 kA	1600	42 kA	2000	74 kA	1600
	970	85 kA	2500	85 kA	2500	85 kA	2500
1250	85 kA	3000	85 kA	3200	85 kA	3000	
Delta Device Operational Current Rating [A]	8.7	5 kA	35	5 kA	35	70 kA	17.5
	43	5 kA	150	5 kA	150	70 kA	90
	74	10 kA	300	10 kA	300	70 kA	150
	104	10 kA	400	10 kA	400	70 kA	200
	147	10 kA	400	10 kA	400	70 kA	200
	187	10 kA	600	10 kA	500	70 kA	300
	234	10 kA	700	10 kA	700	70 kA	400
	348	18 kA	1000	18 kA	1000	70 kA	600
	435	18 kA	1200	18 kA	1200	70 kA	800
	549	30 kA	1600	30 kA	1600	69 kA	1000
	625	30 kA	1600	30 kA	1600	69 kA	1200
	831	42 kA	1600	30 kA	1600	69 kA	1600
	850	42 kA	1600	42 kA	2000	74 kA	1600
	900	42 kA	1600	42 kA	2000	74 kA	1600
	1200	85 kA	3000	85 kA	3200	85 kA	3000
1600	85 kA	3000	85 kA	3200	85 kA	3000	
SCPD Performance 690V		Type 1§					
SCCR List*	Device Rating	Max. Standard Available Fault	Max. Ampere Tested — North American Style		Max. Ampere Tested — European Style		
Maximum FLC	108	70 kA	A070URD33xxx500		6,9 gRB 73xxx400 6,6URD33xxx500		
	135	70 kA	A070URD33xxx500		6,9 gRB 73xxx400 6,6URD33xxx500		
	201	70 kA	A070URD33xxx700		6,9 gRB 73xxx630 6,6URD33xxx700		
	251	70 kA	A070URD33xxx700		6,9 gRB 73xxx630 6,6URD33xxx700		
	317	70 kA	A070URD33xxx900		6,9 gRB 73xxx800 6,6URD33xxx900		
	361	70 kA	A070URD33xxx900		6,9 gRB 73xxx800 6,6URD33xxx900		
	480	70 kA	A070D33xxx1250 A100URD73xxx1250		9 URD 73xxx1250 6,6URD33xxx1250		
	625	70 kA	A070URD33xxx1400		6,6URD33xxx1400		
	780	70 kA	A070URD33xxx1400		6,6URD33xxx1400		
	970	85 kA	Two fuses in parallel A070URD33xxx1250		Two fuses in parallel 6,6URD33xxx1250		
1250	85 kA	Two fuses in parallel A070URD33xxx1250		Two fuses in parallel 6,6URD33xxx1250			

\* Consult local codes for proper sizing of short circuit protection.

\* Non-time delay fuses (K5 — 5...480V (8.7...831 A) devices; Class L — 625...1250V (850...1600 A) devices).

‡ High capacity fault rating when used with time delay class CC, J, or L fuses.

§ Type 1 performance/protection indicates that, under a short-circuit condition, the fused or circuit breaker-protected starter shall cause no danger to persons or installation but may not be suitable for further service without repair or replacement.

\* For short-circuit current rating (SCCR) for enclosed panel with external bypass or isolation contactor, see the Industrial Controls catalog website: [www.ab.com/catalogs](http://www.ab.com/catalogs).

Short-Circuit Protection



Electrical Ratings							
Power Requirements	Control Module	1...480 A	120...240V AC	Transformer	75 VA		
			24V AC	Transformer	130 VA		
			24V DC	Inrush Current	5 A		
				Inrush Time	250 ms		
				Transient Watts	60 W		
				Transient Time	500 ms		
				Steady State Watts	24 W		
				Minimum Allen-Bradley Power Supply	1606-XLP50E		
			625...1250 A	751 VA (recommended 800 VA)			
			Heatsink Fan(s)*	5...135 A, 20 VA			
201...251 A, 40 VA							
317...480 A, 60 VA							
625...1250 A, 150 VA							
Steady State Heat Dissipation with Control and Fan Power (Watts)	Controller Rating [A]	5	70				
		25	70				
		43	81				
		60	97				
		85	129				
		108	91				
		135	104				
		201	180				
		251	198				
		317	225				
		361	245				
		480	290				
		625	446				
		780	590				
970	812						
1250	1222						
Auxiliary Contacts 19/20 (Aux #1) 29/30 (Aux #2) 31/32 (Aux #3) 33/34 (Aux #4)	Type of Control Circuit		Electromagnetic relay				
	Number of Contacts		1				
	Type of Contacts		programmable N.O./N.C.				
	Type of Current		AC				
	Rated Operational Current		3 A @ 120V AC, 1.5 A @ 240V AC				
	Conventional Thermal Current $I_{th}$ , AC/DC		5 A				
	Make/Break VA		3600/360				
	Utilization Category		AC-15/DC				
PTC Input Ratings	Response Resistance		3400 $\Omega$ $\pm$ 150 $\Omega$				
	Reset Resistance		1600 $\Omega$ $\pm$ 100 $\Omega$				
	Short-Circuit Trip Resistance		25 $\Omega$ $\pm$ 10 $\Omega$				
	Max. Voltage at PTC Terminals ( $R_{PTC} = 4$ k $\Omega$ )		< 7.5V				
	Max. Voltage at PTC Terminals ( $R_{PTC} =$ open)		30V				
	Max. No. of Sensors.		6				
	Max. Cold Resistance of PTC Sensor Chain		1500 $\Omega$				
Response Time		800 ms					
Tach Input			0...5V DC, 4.5V DC = 100% Speed				

\* Heatsink fans can be powered by either 110/120V AC or 220/240V AC.

Bulletin 150  
**SMC™ Flex Smart Motor Controllers**  
 Specifications

**Environmental**

Operating Temperature Range	-5...+50 °C (23...+122 °F) (open) -5...+40 °C (23...+104 °F) (enclosed)
Storage and Transportation Temperature Range	-20...+75 °C (-4...+167 °F)
Altitude	2000 m (6560 ft)
Humidity	5...95% (non-condensing)
Pollution Degree	2

**Mechanical**

Resistance to Vibration	Operational	All	1.0 G Peak, 0.15 mm (0.006 in.) displacement
	Non-Operational	5...480 A	2.5 G Peak, 0.38 mm (0.015 in.) displacement
		625...1250 A	1.0 G Peak, 0.15 mm (0.006 in.) displacement
Resistance to Shock	Operational	5...85 A	15 G
		108...480 A	5.5 G
		625...1250 A	4 G
	Non-Operational	5...85 A	30 G
		108...480 A	25 G
		625...1250 A	12 G
Construction	Power Poles	5...85 A	Heatsink thyristor modular design
	Power Poles	108...1250 A	Heatsink hockey puck thyristor modular design
	Control Modules		Thermoset and Thermoplastic Moldings
	Metal Parts		Plated Brass, Copper, or Painted Steel
Terminals	Power Terminals	5...85 A	Cable size — Line Upper — 2.5...95 mm <sup>2</sup> (14...3/0 AWG) Line Lower — 0.8...2.5 mm <sup>2</sup> (18...14 AWG) Load Upper — 2.5...50 mm <sup>2</sup> (14...1 AWG) Load Lower — 0.8...2.5 mm <sup>2</sup> (18...14 AWG) Tightening torque — 14.7 N•m (130 lb.-in.) Wire strip length — 18...20 mm (0.22...0.34 in.)
		108...135 A	One M10 x 1.5 diameter hole per power pole
		201...251 A	Two M10 x 1.5 diameter holes per power pole
		317...480 A	Two M12 x 1.75 diameter holes per power pole
		625...1250 A	Two 13.5 mm (0.53 in.) diameter holes per power pole
	Power Terminal Markings		NEMA, CENELEC EN50 012
Control Terminals	M3 screw clamp	Clamping yoke connection	

**Other**

EMC Emission Levels	Conducted Radio Frequency Emissions Radiated Emissions	Class A Class A		
EMC Immunity Levels	Electrostatic Discharge Radio Frequency Electromagnetic Field Fast Transient Surge Transient	8 kV Air Discharge Per EN/IEC 60947-4-2 Per EN/IEC 60947-4-2 Per EN/IEC 60947-4-2		
Overload Characteristics	Current Range [A]	Line	Delta	
		5	1...5	1.7...9
		25	5...25	8.6...43
		43	8.6...43	14.8...75
		60	12...60	20.8...104
		85	17...85	29.4...147
		108	27...108	47...187
		135	34...135	59...234
		201	67...201	116...348
		251	84...251	145...435
		317	106...317	183...549
		361	120...361	208...625
		480	160...480	277...831
		625	208...625	283...850
		780	260...780	300...900
970	323...970	400...1200		
1250	416...1250	533...1600		
	Trip Classes Trip Current Rating Number of Poles	10, 15, 20, and 30 117% of Motor FLC 3		
Certifications	Open-Type Controllers	CE Marked Per Low Voltage Directive 73/23/EEC, 93/68/EEC UL Listed (File No. E96956)		

4

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

### Approximate Dimensions and Shipping Weights

#### Open Type Controllers

Rating [A]	Height	Width	Depth	Weight
5...85	321 (12.6)	150 (5.9)	203 (8.0)	5.7 kg (12.6 lbs)
108...135	443.7 (17.47)	196.4 (7.74)	205.2 (8.08)	15.0 kg (33 lbs)
201...251	560 (22.05)	225 (8.86)	253.8 (9.99)	30.4 kg (67 lbs)
317...480	600 (23.62)	290 (11.42)	276.5 (10.89)	45.8 kg (101 lbs)
625...780	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	179 kg (395 lbs)
970...1250	1041.1 (41.0)	596.9 (23.5)	346.2 (13.63)	224 kg (495 lbs)

#### Enclosed-Type Line-Connected Controllers

Factory-installed options may affect enclosure size requirements.

Exact dimensions can be obtained after order entry. Please consult your local Rockwell Automation sales office or Allen-Bradley distributor.

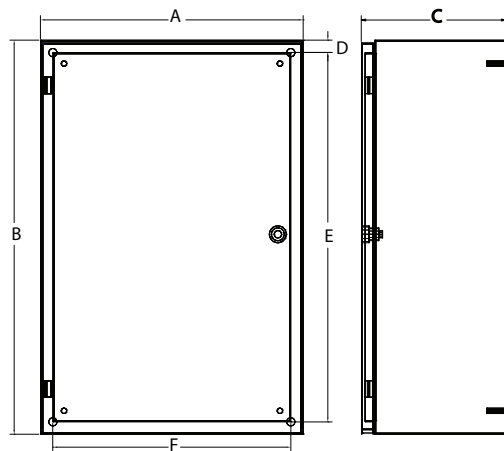


Figure 1 — Wall-Mount

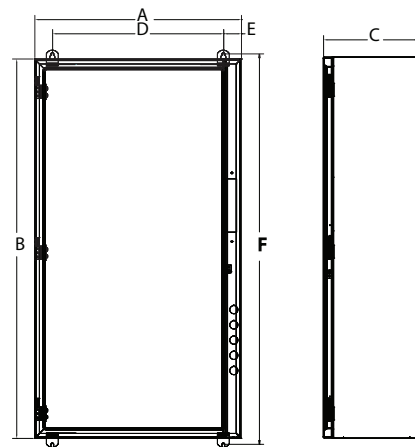


Figure 2 — Wall-Mount

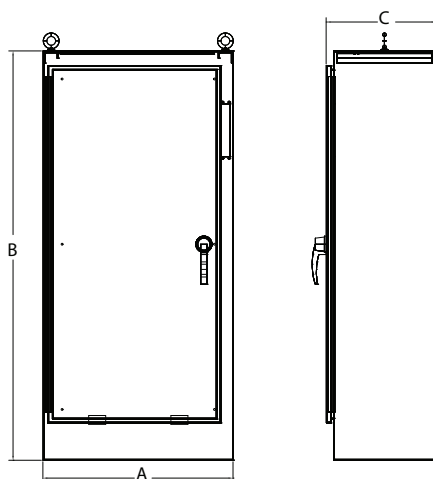


Figure 3 — Floor-Mount

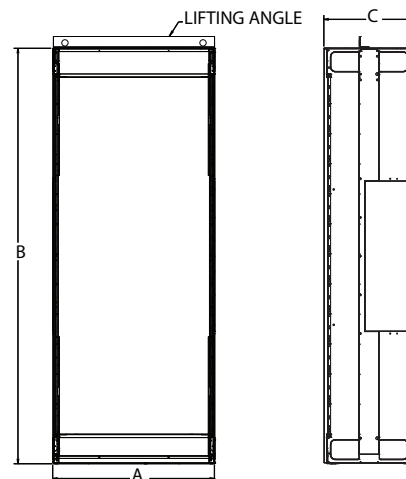


Figure 4 — Floor-Mount

Controller Rating [A]	Bulletin	With Option	Dimension Figure No.	Dimensions in inches (mm)					
				A (Width)	B (Height)	C (Depth)	D (Mtg. Dim.)	E (Mtg. Dim.)	F (Mtg. Dim.)
<b>SMC-Flex Combination Controller</b>									
5...25	152H,153H,152B,153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		BP,NB,NI,6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
43	152H,153H,152B,153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		BP, 6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		NI, NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
60	153H, 153B	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	152H, 153H,153B	6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H,152B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H,152B, 153B,153H	NI, NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
85	153B, 153H	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	152B,152H	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152H, 153H,153B	6_		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	153H	BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	152B, 152H,153B	BP, 6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
108	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	153H,153B,152H,152B	6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
135	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	152H,152B,153H,153B	BP, NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
201	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	152B,153B,153H,152H	6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
251	152H,153H	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	152B,153B,153H,152H	6_		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
317	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	153H	6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
	153H	BP,NB		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	153B	—	2	36 (914)	60 (1524)	14 (356)	33.88 (861)	58.5 (1486)	34.5 (876)
	152H,152B	6_		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
152B,153B,152H	NB,NI	3	40 (1016)	84 (2134)	18 (457)	—	—	—	
361	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	153H	6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
	153H	BP		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
	153B	—	2	36 (914)	60 (1524)	14 (356)	33.88 (861)	58.5 (1486)	34.5 (876)
	152H, 152B	—		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	152H	6_		38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
153H,152B,153B,152H	NB,NI	3	40 (1016)	84 (2134)	18 (457)	—	—	—	
480	153H	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	153H	6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
	153H,153B	BP,NI	1*	36 (914)	60 (1524)	14 (356)	33.88 (861)	58.5 (1486)	34.5 (876)
	152H	—	2*‡	38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	152H	BP	3*‡	38 (965)	60 (1524)	17 (431)		1.75 (45)	61.69 (1567)
	152H	NB	3*‡	40 (1016)	84 (2134)	18 (457)		—	—
	153H,153B	—	4*§	20 (508)	91.5 (2324)	20 (508)	—	—	—
	153H,153B	BP,NB,NI	3*§	40 (1016)	84 (2134)	18 (457)	—	—	—
152B	BP,NB,NI,6_	3*	40 (1016)	84 (2134)	18 (457)	—		—	
152H,152B	BP,NB,NI	4	35 (889)	91.5 (2324)	20 (508)	—		—	
625	152B	—	4	55 (1397)	91.5 (2324)	20 (508)	—	—	—
	152B,152H,153B,153H	NB		105 (2664)	91.5 (2324)	20 (508)		—	—
	152H	—		55 (1397)	91.5 (2324)	20 (508)		—	—
	152H	BP		70 (1778)	91.5 (2324)	20 (508)		—	—
153B,153H	—	4	65 (1651)	91.5 (2324)	20 (508)	—	—	—	
152B	—		55 (1397)	91.5 (2324)	20 (508)		—	—	
152B,152H	BP,NI		70 (1778)	91.5 (2324)	20 (508)		—	—	
152B,152H,153B,153H	NB		105 (2664)	91.5 (2324)	20 (508)		—	—	
153B,153H	—	4	65 (1651)	91.5 (2324)	20 (508)	—	—	—	

\* Assumed line voltage to be 480V AC. Different voltage may necessitate a bigger enclosure size. Consult your local Rockwell Automation sales office or Allen-Bradley distributor.

‡ 350 Hp max.

‡ 150 Hp @ 208V AC, 350 Hp @480V, 400...4500 Hp @ 600V

§ 200 Hp @ 240V AC, 400 Hp @480V, 5000 Hp @ 600V



# SMC™ Flex Smart Motor Controllers

## Approximate Dimensions

Controller Rating [A]	Bulletin	With Option	Dimension Figure No.	Dimensions in inches (mm)					
				A (Width)	B (Height)	C (Depth)	D (Mtg. Dim.)	E (Mtg. Dim.)	F (Mtg. Dim.)
<b>Non-Combination Controller</b>									
5...43	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
		6_	1*	16 (406)	24 (610)	10 (254)		22.5 (572)	14.5 (368)
		BP	1	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150, 150B	NB,NI	1	24 (610)	30 (762)	305(12)		28.5 (724)	22.5 (572)
	150	NB,6P_	1*	30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
60	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	150B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150	6_	1*	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150, 150B	NB	1	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		NI		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
85	150	—	1	16 (406)	24 (610)	10 (254)	0.75 (19)	22.5 (572)	14.5 (368)
	150B	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		BP		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
	150	NB	24 (610)	30 (762)	12 (305)	28.5 (724)		22.5 (572)	
	150, 150B	6_	1*	24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
		NB,NI,6P_	1*	30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
108	150	—	1	24 (610)	30 (762)	12 (305)	0.75 (19)	28.5 (724)	22.5 (572)
		BP		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
		NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150B	—		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
		NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
	150	—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
135	150	BP	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	150B	—		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150	NB		30 (762)	38 (965)	14 (356)		36.5 (927)	28.5 (724)
	150B	NB,NI		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
		—		24 (610)	30 (762)	12 (305)		28.5 (724)	22.5 (572)
201	150	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	150, 150B	NB,NI,BP,6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
251	150	—	1	30 (762)	38 (965)	14 (356)	0.75 (19)	36.5 (927)	28.5 (724)
	150, 150B	NB,NI,BP,6_		36 (914)	51 (1295)	14 (356)		49.5 (1257)	34.5 (876)
317	150	NB,NI,BP,6_	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150B	NB,NI,BP,6_		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
361	150	NB,NI,BP,6_	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150B	NB,NI,BP,6_		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
480	150	—	1	36 (914)	51 (1295)	14 (356)	0.75 (19)	49.5 (1257)	34.5 (876)
	150, 150B	BP,NB,NI		36 (914)	60 (1524)	14 (356)		58.5 (1486)	34.5 (876)
625	150	—	4	35 (889)	91.5 (2324)	20 (508)	—	—	—
		BP,NB		60 (1524)	91.5 (2324)	20 (508)			
	150B	—		60 (1524)	91.5 (2324)	20 (508)			
		NB		90 (2286)	91.5 (2324)	20 (508)			
780	150	—	4	35 (889)	91.5 (2324)	20 (508)	—	—	—
		BP,NB		60 (1524)	91.5 (2324)	20 (508)			
	150B	—		60 (1524)	91.5 (2324)	20 (508)			
		NB		90 (2286)	91.5 (2324)	20 (508)			

\* Extra capacity transformer may require a larger enclosure; consult your local Rockwell Automation sales office or Allen-Bradley distributor.

\* 1 kVA control transformers or larger extra capacity transformers may require a larger enclosure; consult your local Rockwell Automation sales office or Allen-Bradley distributor.

## Enclosed Options, Continued

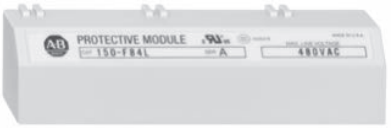
Option	Description	Cat. No. Modification
NEMA Bypass Contactor and Overload Relay	5...43 A	-NB
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	
NEMA Isolation Contactor	5...43 A	-NI
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	
MCS Bypass Contactor and Overload Relay	5...43 A	-BP
	60...85 A	
	108...135 A	
	201...251 A	
	317...361 A	
	480 A	

4

## Accessories

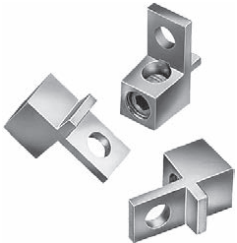
## Protective Modules\*

Protective modules must not be placed on the load side of a device when using an inside-the-delta connection or with Pump, Braking, or Linear Speed control.

	Current Rating [A]	Description	Field Modification Cat. No.
	5...85	480V Protective Module	150-F84
108...1250	150-F84L		
5...85	600V Protective Module	150-F86	
108...1250			150-F86L

\* The same protective module mounts on the line or load side of the SMC Flex. For applications requiring both line and load side protection, two protective modules must be ordered.

## Terminal Lug Kits (108...1250 A)

	Current Rating [A] *	Wire Size	Total No. of Line Controller Terminal Lugs Possible Each Side		Pkg. Qty.	Cat. No.
			Line Side	Load Side		
	108...135♣	#6...250 MCM AWG 16 mm <sup>2</sup> ...120 mm <sup>2</sup>	3	3	3	199-LF1
	201...251♣		6	6		
	317...480♣	#4...500 MCM AWG 25 mm <sup>2</sup> ...240 mm <sup>2</sup>	6	6		199-LG1
	625...780		6	6		
	970	4/0...500 MCM AWG	3	3		100-DL860
	1250§	2/0...500 MCM AWG	3	3		100-DL630
		4/0...500 MCM AWG	3	3		100-DL860

Line and Load terminals are provided as standard on enclosed SMCs.

\* 5...85 A units have box lugs standard. No additional lugs are required.

§ The 1250 A device requires (1) 100-DL630 and (1) 100-DL860 per connection.

♣ When a multi-conductor lug is required, refer to the User Manual for appropriate lug catalog number.



# PowerFlex 7-Class Options

## Human Interface Modules



Blank Plate



20-HIM-A3



20-HIM-A5



20-HIM-A6



20-HIM-C3S



20-HIM-C5S



20-HIM-C6S

Description	Cat. No.	Used with PowerFlex Drive					
		70	700	700H	700S	700L	753/755
No HIM (Blank Plate), Handheld/Local (Drive Mount)	20-HIM-A0	✓	✓	✓	✓	✓	✓
LCD Display, Full Numeric Keypad, Handheld/Local (Drive Mount)	20-HIM-A3	✓	✓	✓	✓	✓	
LCD Display, Programmer Only, Handheld/Local (Drive Mount)	20-HIM-A5	✓	✓	✓	✓	✓	
Enhanced, LCD, Full Numeric Keypad, Handheld/Local (Drive Mount)	20-HIM-A6	✓	✓	✓	✓	✓	✓
Remote (Panel Mount) LCD Display, Full Numeric Keypad★‡	20-HIM-C3S	✓	✓	✓	✓	✓	
Remote (Panel Mount) LCD Display, Programmer Only★‡	20-HIM-C5S	✓	✓	✓	✓	✓	
Enhanced, LCD, Full Numeric Keypad★‡	20-HIM-C6S	✓	✓	✓	✓	✓	✓

★ IP66, NEMA Type 4X/12—for indoor use only.

‡ Includes a 1202-C30 interface cable (3 m/9.8 ft) for connection to drive.

## Human Interface Module (HIM) Accessories

Description	Cat. No.	Used with PowerFlex Drive					
		70	700	700H	700S	700L	753/755
Bezel Kit for LCD HIMs, NEMA Type 1‡	20-HIM-B1	✓	✓	✓	✓	✓	✓
PowerFlex HIM Interface Cable, 1 m (3.3 ft) ♣	20-HIM-H10	✓	✓	✓	✓	✓	✓
Comm Option Cable Kit (Male-Male)							
0.33 m (1.1 ft)	1202-C03	✓	✓	✓	✓	✓	✓
1 m (3.3 ft)	1202-C10	✓	✓	✓	✓	✓	✓
3 m (9.8 ft)	1202-C30	✓	✓	✓	✓	✓	✓
9 m (29.5 ft)	1202-C90	✓	✓	✓	✓	✓	✓
Cable Kit (Male-Female) △							
0.33 m (1.1 ft)	1202-H03	✓	✓	✓	✓	✓	✓
1 m (3.3 ft)	1202-H10	✓	✓	✓	✓	✓	✓
3 m (9.8 ft)	1202-H30	✓	✓	✓	✓	✓	✓
9 m (29.5 ft)	1202-H90	✓	✓	✓	✓	✓	✓
DPI™ Cable Kit with Connectors, Tools and 100 m (328 ft) Cable	1202-CBL-KIT-100M	✓	✓	✓	✓	✓	✓
DPI Cable Connector Kit	1202-TB-KIT-SET	✓	✓	✓	✓	✓	✓
DPI/SCANport™ One to Two Port Splitter Cable	1203-S03	✓	✓	✓	✓	✓	✓

‡ Includes a 1202-C30 interface cable (3 m/9.8 ft) for connection to drive.

♣ Required only when HIM is used as handheld or remote.

△ Required in addition to 20-HIM-H10 for distances up to a total maximum of 10 m (32.8 ft).

# Miniature circuit breakers

## UL/CSA + IEC/EN 60947-2 + GB

### C60BP - UL 489 - Z, C, D curves – Tunnel terminals



#### UL 489 / CSA C22.2 No 5 / IEC/EN 60947-2 / GB 14048-2

C60BP are multi-standard miniature circuit breakers and branch circuit protection as defined by UL 489. It combines following functions:

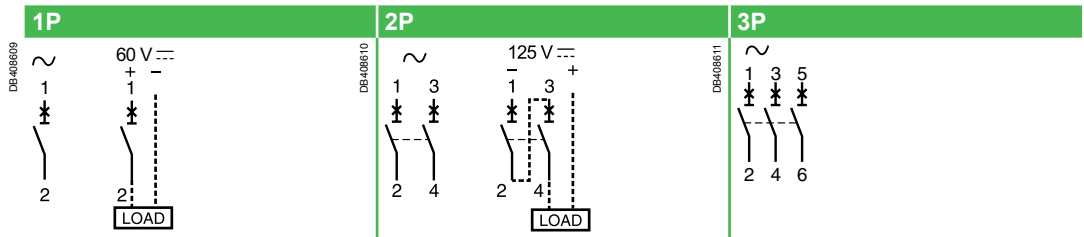
- circuit protection against short-circuit currents
- circuit protection against overload currents
- tripping and fault indication by the addition of auxiliaries.



Number of 18 mm (0.71 in.) poles	Rating (A) 25°C/77°F	Breaking capacity (kA rms) AIR				Icu			
		UL 489 / CSA C22.2 No 5				IEC 60947-2			
1P	0.5 to 35	10	14	14	10	-	3	10	20
	40 to 63	-	10	10	10	-	3	10	20
2P	1 to 25	480Y/277 V ~		240 V ~	125 V ---	440 V ~	415 V ~	240 V ~	125 V ---
	30 to 35	10	14	14	10	6	10	20	-
3P	1 to 35	10	14	-	-	6	10	20	-
2P/3P	40 to 63	-	10	-	-	6	10	20	-



#### Electrical diagrams



#### Catalogue numbers

Tunnel terminal connection											
Type	UL489 and CSA voltages	1P			2P			3P			
Auxiliaries											
Remote indication and tripping, see page 43											
Rating (In)		Curve			Width in 9 mm modules	Curve		Width in 9 mm modules	Curve		Width in 9 mm modules
		Z	C	D (=K)		C	D (=K)		C	D (=K)	
<b>C60BP</b>											
0.5	480Y/277 V and 240 V	M9F44170	M9F42170	M9F43170	2	-	-	4	-	-	6
1		M9F44101	M9F42101	M9F43101		M9F42201	M9F43201		M9F42301	M9F43301	
2		M9F44102	M9F42102	M9F43102		M9F42202	M9F43202		M9F42302	M9F43302	
3		M9F44103	M9F42103	M9F43103		M9F42203	M9F43203		M9F42303	M9F43303	
4		M9F44104	M9F42104	M9F43104		M9F42204	M9F43204		M9F42304	M9F43304	
5		M9F44105	M9F42105	M9F43105		M9F42205	M9F43205		M9F42305	M9F43305	
6		M9F44106	M9F42106	M9F43106		M9F42206	M9F43206		M9F42306	M9F43306	
8		M9F44108	M9F42108	M9F43108		M9F42208	M9F43208		M9F42308	M9F43308	
10		M9F44110	M9F42110	M9F43110		M9F42210	M9F43210		M9F42310	M9F43310	
15		M9F44115	M9F42115	M9F43115		M9F42215	M9F43215		M9F42315	M9F43315	
20		M9F44120	M9F42120	M9F43120		M9F42220	M9F43220		M9F42320	M9F43320	
25		M9F44125	M9F42125	M9F43125		M9F42225	M9F43225		M9F42325	M9F43325	
30		M9F44130	M9F42130	M9F43130		M9F42230	M9F43230		M9F42330	M9F43330	
35		M9F44135	M9F42135	M9F43135		M9F42235	M9F43235		M9F42335	M9F43335	
40		M9F44140	M9F42140	M9F43140	2	M9F42240	M9F43240	4	M9F42340	M9F43340	6
45	M9F44145	M9F42145	M9F43145		M9F42245	M9F43245		M9F42345	M9F43345		
50	M9F44150	M9F42150	M9F43150		M9F42250	M9F43250		M9F42350	M9F43350		
63	M9F44163	M9F42163	M9F43163		M9F42263	M9F43263		M9F42363	M9F43363		
<b>Accessories</b>		See page 48									



Type SCO2  
Size 1, 3-Pole Contactor

**General Information**

Class 8502 Type S magnetic contactors are used to switch heating loads, capacitors, transformers, and electric motors where overload protection is provided separately. Class 8502 contactors are available in NEMA Sizes 00–7. Type S contactors are designed for operation up to 600 Vac, 50–60 Hz.

**Table 16.99: 3-Pole Polyphase—600 Vac Maximum—50–60 Hz**  
(replace ●●● with the voltage code)

NEMA Size	Continuous Current Ratings	Motor Voltage	Max. Hp	Open Type	NEMA 1 General Purpose Enclosure	NEMA 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure (Size 0-5) <sup>[1]</sup>
				Type <sup>[2]</sup>	Type <sup>[2]</sup>	Type <sup>[2]</sup>
00	9	200 230 460 575	1.5 1.5 2 2	SAO12●●●	SAG12●●●	Use Size 0
0	18	200 230 460 575	3 3 5 5	SBO2●●●	SBG2●●●	SBW12●●●
1	27	200 230 460 575	7.5 7.5 10 10	SCO2●●●	SCG2●●●	SCW12●●●
2	45	200 230 460 575	10 15 25 25	SDO2●●●	SDG2●●●	SDW12●●●
3	90	200 230 460 575	25 30 50 50	SEO2●●●	SEG2●●●	SEW12●●●
4	135	200 230 460 575	40 50 100 100	SFO2●●●	SFG2●●●	FW12●●●
5	270	200 230 460 575	75 100 200 200	SGO2●●●	SGG2●●●	SGW12●●●
6	540	200 230 460 575	150 200 400 400	SHO2●●●	SHG2●●●	SHW2●●●
7	810	200 230 460 575	300 600 600	SJO2●●●	SJG2●●●	SJW2●●●

**Table 16.100: Coil Voltage Codes**

Voltage		Code
60 Hz	50 Hz	
24 <sup>[3]</sup>	—	V01
120 <sup>[4]</sup>	110	V02
208	—	V03
240	220	V04
277	—	V06
480	440	V07
600	550	V09
Specify	Specify	V99

**NOTE:** For voltage codes used with control transformers, see Table 16.338.

Form S (separate control) is used when a separate source of power is available for the control (coil) voltage. Available at no charge.

Dimensions: page 16-41

Factory Modifications (Forms) page 16-117

Separate Enclosures (Class 9991): page 16-110

Replacement Parts (Class 9998): page 16-122

Type S Accessories (Class 9999): page 16-125

For How to Order Information, see page 16-30.

[1] Size 6 and 7 are NEMA 4 only, painted sheet steel enclosures.

[2] Replace the three bullets (●●●) in the catalog number with the coil voltage code. Refer to the standard voltage codes shown in Table 16.100.

[3] 24 V coils are not available on Sizes 4–7. On Sizes 00–3, where 24 V coils are available, Form S (separate control) must be specified (for example, order as 8502SBO2V01S).








[4] 120 V Polyphase contactors are wired for separate control Form S must be specified (i.e., order as 8502SCO2V02S).

## General Information

### Surge Suppression Information

	Cat. No (s).	For use with	Suppression Technique	Max. Relay Contact Dropout Time	Max. Transient Voltage Relative to System Voltage
	700-ADR	700-HA, -HB, -HP (6...220V DC)	Diode	3X	—
	700-ADL1	700-HC (6...24V DC)	Diode + LED	3X	—
	700-ADL1R	700-HB, -HA, -HP (6...24V DC)	Diode + LED	3X	—
	700-ADL2	700-HC (28...60V DC)	Diode + LED	3X	—
	700-ADL2R	700-HB, -HA, -HP (28...60V DC)	Diode + LED	3X	—
	700-ADL3	700-HC (110...220V DC)	Diode + LED	3X	—
	700-ADL3R	700-HB, -HA, -HP (110...220V DC)	Diode + LED	3X	—
	700-AR1	700-HB, -HA, -HC, -HP (6...24V AC/DC)	RC	No Effect	3
	700-AR2	700-HB, -HA, -HC, -HP (110...240V AC/DC)	RC	No Effect	—
	700-AV1R	700-HB, -HA, -HC, -HP (6...24V AC)	Varistor + LED	No Effect	—
	700-AV3R	700-HB, -HA, -HC, -HP (110...240V AC)	Varistor + LED	No Effect	—
	See 700-CF Relay	700-CF built-in	—	Diode	—
	100-FSC	100C, 700-CF	R-C Ckt	No Effect	3X
	100-FSV	100C, 700-CF	MOV	No Effect	—
	100-FSD	100C, 700-CF	Diode	70...95 ms	6...10X
	100-JE	100C, 700-CF	Diode	5X	6...10X
See 700-M Relay	700-M built-in	—	Diode	—	6...10X
	199-MSMA	100-M, 700-M	R-C Ckt	No Effect	3X
	199-MSMV1 (12...55V AC)	100-M, 700-M	MOV	No Effect	—
	199-MSMV2 (56...136V AC)				
	199-MSMV3 (137...277V AC)				
	199-MSMD	100-M, 700-M	Diode	5X	6...10X
	700-N5	700-P, 700-N	RC	No effect	3X
	700-N24	700-P, 700-N	RC	No effect	3X
See 700-R Relay	700-R built-in	—	Diode	—	6...10X
	199-FSMA1, FSMA2	700-P, 700-H, 700-CF, 700-M, 700-DCR	RC	No effect	3X
	199-FSMA9, 10, 11	700-P, 700-H, 700-CF, 700-M, 700-DCR	MOV	No effect	—
	199-FSMZ	700-P, 700-H, 700-CF, 700-M, 700-DCR	Diode	5X	—

**Table 24.16: Selection Guide**

Description	Maximum Voltage	Maximum Current ■	Blocks				End Barriers ♦			Blocks per ft	Max. Wire Combinations	
			Color	Type	\$ Price ea.	Std. Pack ▲	Type	\$ Price ea.	Std. Pack ▲		Copper Wire (stranded or solid)	
 <p>Solderless Box Lug for #22 to #8 AWG wire. Mounts on standard 9080GH track or 35 mm DIN 3 track. Fingersafe per DIN 57470.</p>	600 V	60 A	Natural	GR6	2.40	50	GM6B	0.78	10	34	1 #8 1 #10 1-3 #12 1-4 #14	1-4 #16 1-5 #18 1-8 #20 1-10 #22
			Black	GRB6			GMB6B					
			Blue	GRL6			GML6B					
			Green	GRG6			GMG6B					
			Gray	GRE6			GME6B					
			Orange	GRS6			GMS6B					
			Red	GRR6			GMR6B					
			Yellow	GRY6			GMY6B					
Brown	GRN6	GMN6B										
 <p>Similar to a 9080GR6 except with a 9080GH91 banana test plug adapter installed. Fingersafe per DIN 57470.</p>	600 V	60 A	Natural	GR6T	2.90	50	GM6B	0.78	10			
 <p>Solderless Box Lug for #22 to #10 AWG wire. Can be mounted directly to a panel or can be mounted on 9080GH track.</p>	600 V	40 A	Natural	GK6	2.40	50	GK6B	0.93	50	34	1-4 #16 1 #10 1-2 #12 1-2 #14	1-4 #16 1-5 #18 1-8 #20 1-10 #22
			Black	GKB6								
			Blue	GKL6								
			Green	GKG6								
			Gray	GKE6								
			Orange	GKS6								
			Red	GKR6								
Yellow	GKY6											
 <p>High Density Solderless Box Lug for #22 to #10 AWG wire. Mounts on standard 9080GH track or 35 mm DIN 3 track. Fingersafe per DIN 57470.</p>	600 V	30 A	Natural	GM6	1.80	50	GM6B	0.78	10	51	1 #10 1 #12 1 #14 1-2 #16	1-2 #18 1-5 #20 1-8 #22 1-2 #16
			Black	GMB6			GMB6B					
			Blue	GML6			GML6B					
			Green	GMG6			GMG6B					
			Gray	GME6			GME6B					
			Orange	GMS6			GMS6B					
			Red	GMR6			GMR6B					
			Yellow	GMY6			GMY6B					
Brown	GMN6	GMN6B										
 <p>Solderless Box Lug for #18 to #4 AWG wire. Mounts on standard 9080GH track or 35 mm DIN 3 track.</p>	600 V	85 A	Natural	GC6	5.00	50	GC6B	1.30	10	28	1 #4 1 #6 1-2 #8 1-4 #10	1-5 #12 1-6 #14 1-6 #16 1-8 #18
 <p>Solderless Box Lug for #12 to #1/0 AWG wire. Mounts on standard 9080GH track or 35 mm DIN 3 track.</p>	600 V	170 A	Natural	GD6	10.10	10	GD6B	1.70	10	17	1 1/0 1 #1 1 #2 1-2 #4	1-3 #6 1-5 #8 1-6 #10 1-7 #12
 <p>Solderless Box Lug for #6 AWG to 250 kcmil wire. ★ Mounts on standard 9080GH track or 35 mm DIN 3 track.</p>	600 V	255 A	Natural	GE6	27.00	10	None Required			10	1 250 kcmil★ 1 4/0 1 #1 1 3/0 1 #2 1 2/0 1 #4 1 1/0 1 #6	

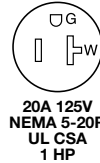
- ▲ Orders must specify standard package quantity or multiples of that quantity.
- These maximum current values assume the use of insulated copper conductors with 75°C temperature rating, and are calculated based on NEC Article 310, Table 310-16. In most cases this value is the maximum ampacity of that wire or combination of wires (as listed in the above table) which has the greatest current carrying capacity. The actual allowable current for a particular application depends on the number, size, insulation class, and other characteristics of the wires used. The lower of the UL and CSA ratings are shown.
- ♦ One end-barrier is required for each assembly of like blocks.
- ★ Terminals are tin plated, making them suitable for use with either copper or aluminum wire.

# HUBBELLPRO Ground Fault Receptacle AUTOGUARD® Self Test GFCI 20A, Standard

# HUBBELL

## Features

- Autoguard self-test technology with auto-monitor, power denial
- Flush, smooth profile and satin finish complement any décor



## Ordering Information

Description	Color	UPC Number	Catalog Number
20A, 125V, Style Line®, AUTOGUARD® self test GFCI receptacle, flush face, back and side wired	Ivory	883778450587	<b>GF20I</b>

## Listings

UL Listed - Canadian and U.S. Meets ADA Standard Meets are NEC requirements	CSA Certified NEMA WD-6 Complaint
---	--------------------------------------

## Specifications

Face	Nylon
Base	Nylon
Power Contacts	Brass
Ground Contacts	Brass
Mounting Strap	Galvanized Steel
Mounting Screw	Zinc Plated Steel

## Performance

### Electrical

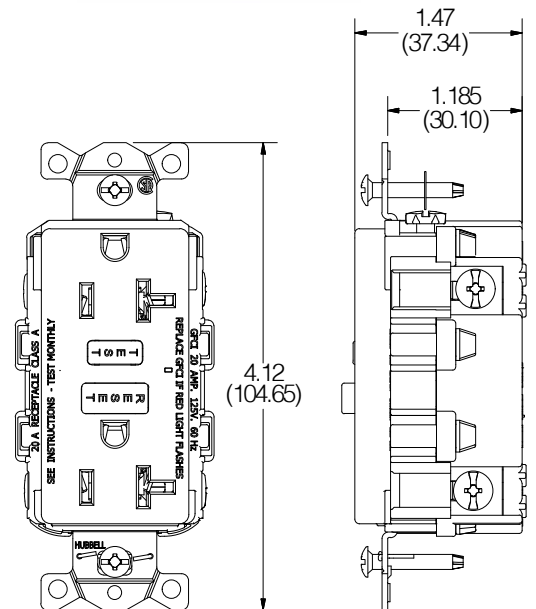
Amperage	20A, 20A Feed Thru
Current Interrupting	Certified for current interrupting at full rated current
Dielectric Voltage	Withstands 1,500V minimum
Frequency	60 Hz
Maximum Interrupting Capacity	10,000A
Trip Level	4 to 6 mA
Trip Time	0.25 second nominal
Voltage	120 AC +10% - 15% (102V to 132V)

### Mechanical

Product Identification	Ratings are a permanent part of the device
Terminal Accommodation	#14 - 10 AWG copper stranded or solid conductor only
Terminal Identification	Terminals identified in accordance with UL 948 and CSA

### Environmental

Flammability	V2 per UL 94
Operating Temperature	-35 C to 66 C or -30 F to 150 F



## Accessories

Wall plate not included

## Links

Customer Drawings  
Instruction Installations  
Media

Wallplates  
Decorator Wallplates

# HUBBELL

## Wallplates

### Features

- Reinforcement ribs for extra strength
- Curved corners for improved aesthetics
- High-impact, self-extinguishing nylon material

### Ordering Information

Description	Color	Catalog No.	UPC
1-Gang, Decorator	Ivory	NP26I	883778102400

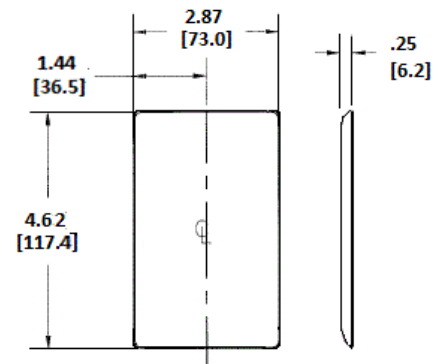


### Listings

UL Listed  
CSA Certified

### Specifications

Material	Nylon
Plate Type	1-Gang
Plate Openings	Decorator
Mounting Screws	Steel painted, slotted head
Appearance	Smooth



### Online Resources

Customer Use Drawing  
eCatalog

# Socket - EO-AB/UT/LED/15 - 0804155

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>)



Socket, Pin connector pattern type AB 15A, Screw connection, for USA and other countries, with LED display, gray, for mounting on a DIN rail in the service interface or direct mounting, 125 V AC, 15 A, -20 °C, 60 °C, UL 508



## Key Commercial Data

Packing unit	1 pc
Minimum order quantity	5 pc
GTIN	 4 055626 226781
GTIN	4055626226781
Weight per Piece (excluding packing)	84.000 g
Custom tariff number	85366990
Country of origin	Poland

## Technical data

### Dimensions

Width	45 mm
Height	75 mm
Depth	57.5 mm

### Ambient conditions

Ambient temperature (operation)	-20 °C ... 60 °C
---------------------------------	------------------

### General

Nominal voltage $U_N$	125 V AC (60 Hz)
Nominal current $I_N$	15 A
Status display	Yes



## Limitron® Rejection-type Fuses

### KTK-R Class CC

#### Specifications

Description: Fast-acting, branch circuit, rejection-type fuse.

Dimensions: 1½" x 1 ½" (10.3 x 38.1mm).

#### Ratings:

Volts — 600Vac (or less)

Amps — 1/10-30A

IR — 200kA RMS Sym.

Agency Information: CE, Std. 248-4, Class CC, UL Listed, Guide JDDZ, File E4273 CSA Certified, File 53787, Class 1422-02.

#### Features and Benefits

- Current limitation at Class CC levels provides maximum component short-circuit current protection.
- 200kA interrupting rating provides high ratings for control circuit locations.
- Class CC rejection feature, with appropriate fuse block, prevents inserting lesser-rated supplementary fuses.

#### Typical Applications

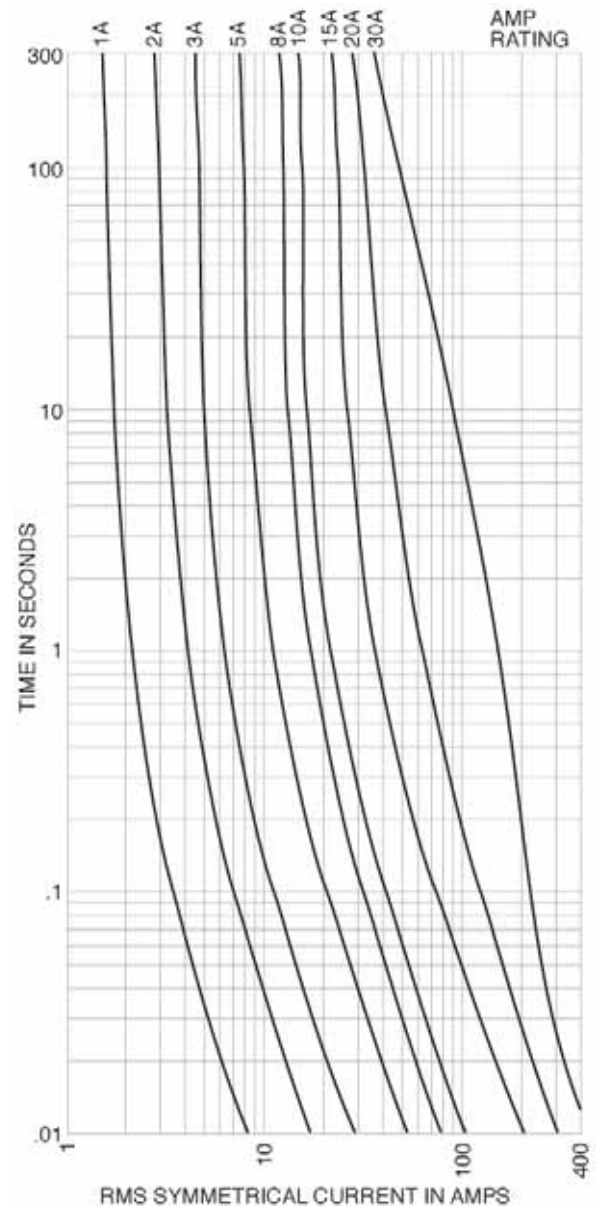
- Specialized Circuits
- Industrial Control
- Isolated, In-Line Fuse Holders (street lighting)

#### Catalog Numbers (Amps)

KTK-R-1/10	KTK-R-1	KTK-R-7
KTK-R-1/8	KTK-R-1-1/2	KTK-R-8
KTK-R-1/4	KTK-R-2	KTK-R-9
KTK-R-3/8	KTK-R-2-1/2	KTK-R-10
KTK-R-1/2	KTK-R-3	KTK-R-12
KTK-R-3/4	KTK-R-3-1/2	KTK-R-15
<b>KTK-R-1</b>	KTK-R-4	KTK-R-20
KTK-R-1 1/4	KTK-R-5	KTK-R-25
KTK-R-1 1/2	KTK-R-6	KTK-R-30



Time-Current Characteristic Curves—Average Melt



For superior electrical protection, Cooper Bussmann recommends upgrading KTK-R fuse applications to Low-Peak LP-CC fuses See page 17.

Recommended Fuse Holders & Blocks For Class CC Fuses

- See page 12

## CC-Tron® Rejection-type Fuses

### FNQ-R Class CC

#### Specifications

Description: Time-delay, branch circuit, rejection-type fuse.

Dimensions:  $1\frac{3}{32}$ " x  $1\frac{1}{2}$ " (10.3 x 38.1mm).

#### Ratings:

Volts — 600Vac (or less); 300Vdc (15-20A)

Amps —  $\frac{1}{4}$ -30A

IR — 200kA RMS Sym.; 20kA DC

Agency Information: CE, Std. 248-4, Class CC, UL Listed, Guide JDDZ, File E4273 CSA Certified, Class 1422-01, File 53787.



#### Features and Benefits

- Time delay compatible with inrush characteristic of small control transformers.
- Current limitation at Class CC levels provides maximum component short-circuit current rating protection.
- 200kA interrupting rating provides high ratings for control circuit locations.
- Class CC rejection feature, with appropriate fuse block, prevents inserting lesser-rated supplementary fuses.

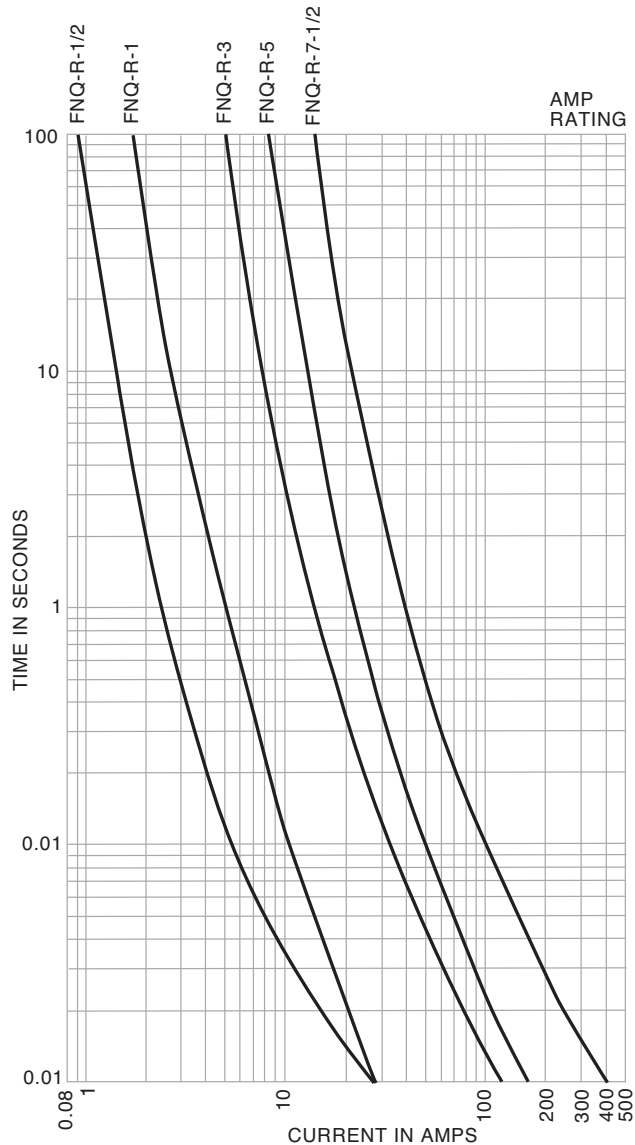
#### Typical Applications

- Line Protection, Small Control Transformers
- Industrial Control
- Isolated, In-Line Fuse Holders

#### Catalog Numbers (Amps)

FNQ-R- $\frac{1}{4}$	FNQ-R-1- $\frac{5}{16}$	FNQ-R-6
FNQ-R- $\frac{3}{16}$	FNQ-R-1- $\frac{3}{8}$	FNQ-R-6- $\frac{1}{4}$
FNQ-R- $\frac{1}{2}$	FNQ-R-2	FNQ-R-7
FNQ-R- $\frac{5}{16}$	FNQ-R-2- $\frac{1}{4}$	FNQ-R-7- $\frac{1}{2}$
FNQ-R- $\frac{3}{4}$	FNQ-R-2- $\frac{1}{2}$	FNQ-R-8
FNQ-R- $\frac{5}{8}$	FNQ-R-2- $\frac{3}{8}$	FNQ-R-9
FNQ-R-1	FNQ-R-3	FNQ-R-10
FNQ-R-1- $\frac{1}{8}$	FNQ-R-3- $\frac{5}{16}$	FNQ-R-12
FNQ-R-1- $\frac{1}{4}$	FNQ-R-3- $\frac{1}{2}$	FNQ-R-15
FNQ-R-1- $\frac{3}{16}$	FNQ-R-4	FNQ-R-17- $\frac{1}{2}$
FNQ-R-1- $\frac{1}{2}$	FNQ-R-4- $\frac{1}{2}$	FNQ-R-20
FNQ-R-1- $\frac{3}{4}$	FNQ-R-5	FNQ-R-25
FNQ-R-1- $\frac{1}{2}$	FNQ-R-5- $\frac{5}{16}$	FNQ-R-30

Time-Current Characteristic Curves—Average Melt



For superior electrical protection, Cooper Bussmann recommends upgrading FNQ-R fuse applications to Low-Peak LP-CC fuses See page 17.

Recommended Fuse Holders & Blocks For Class CC

600V Fuses

- See page 12

# 1/4" Dia. x 1 1/4" Length Fast-acting Ferrule Fuses

## AGC (AGC-V axial leads)

Specifications  
Description:  
Fast-acting fuse.  
Dimensions: 1/4" x 1 1/4"  
(6.4 x 31.7mm).

Construction: Glass tube with nickel-plated brass endcaps.

Ratings:

Volts — 250Vac (1/20-10A)  
— 32Vac (12-30A)

Amps — 1/20-30A

IR — 35A (1/20-1A @ 250Vac)  
— 100A (1 1/4-3A @ 250Vac)  
— 200A (4-10A @ 250Vac)  
— 10kA (1/20-10A @ 125Vac)  
— 1000A (12-30A @ 32Vac)

Agency Information: CE, UL Listed, Guide JDYX, File E19180, 0-10A UL Recognized, Guide JDYX2, File E19180, 12-30A CSA Certification, Class 1422-01, File 053787, 1/20-30A.

### Features and Benefits

- Original electronic glass tube fuse.
- Fast-acting for maximum protection.
- Wide amp/volt ratings allow versatility of protecting electronic circuits.

### Typical Applications

- Electronic Circuits

### Catalog Numbers (Amps)

#### With Axial Leads

AGC-V-1/20-R	AGC-V-1-R	AGC-V-7-1/2-R
AGC-V-1/10-R	AGC-V-1-1/4-R	AGC-V-8-R
AGC-V-1/10-R	AGC-V-1-1/2-R	AGC-V-9-R
AGC-V-1/8-R	AGC-V-2-R	AGC-V-10-R
AGC-V-1/10-R	AGC-V-2-1/4-R	AGC-V-12-R
AGC-V-1/10-R	AGC-V-2-1/2-R	AGC-V-14-R
AGC-V-1/4-R	AGC-V-3-R	AGC-V-15-R
AGC-V-1/10-R	AGC-V-4-R	AGC-V-20-R
AGC-V-1/8-R	AGC-V-5-R	AGC-V-25-R
AGC-V-1/8-R	AGC-V-6-R	AGC-V-30-R
AGC-V-1/4-R	AGC-V-7-R	

#### Without Axial Leads

AGC-1/20-R	AGC-1-R	AGC-7-1/2-R
AGC-1/10-R	AGC-1-1/4-R	AGC-8-R
AGC-1/10-R	AGC-1-1/2-R	AGC-9-R
AGC-1/8-R	AGC-2-R	AGC-10-R
AGC-1/10-R	AGC-2-1/4-R	AGC-12-R
AGC-1/10-R	AGC-2-1/2-R	AGC-14-R
AGC-1/4-R	AGC-3-R	AGC-15-R
AGC-1/10-R	AGC-4-R	AGC-20-R
AGC-1/8-R	AGC-5-R	AGC-25-R
AGC-1/8-R	AGC-6-R	AGC-30-R
AGC-1/4-R	AGC-7-R	

## ABC (ABC-V axial leads)

Specifications  
Description: Fast-acting fuse.

Dimensions:  
1/4" x 1 1/4" (6.4 x 31.7mm).

Construction: Ceramic tube with nickel-plated brass endcaps.

Ratings:

Volts — 250Vac/125Vdc (1/4-15A, 20-30A)\*

— 250Vac (18A)

Amps — 1/4-30A

IR\*\* — 35A (1/4-1A @ 250Vac)

— 100A (1 1/4-3A @ 250Vac)

— 200A (4-10A @ 250Vac)

— 750A (12-15A @ 250Vac)

— 400A (18-20A @ 250Vac)

— 10kA (1/4-15A @ 125Vac)

— 1kA (18-30A @ 125Vac)

— 10kA (1/4-15, 20A @ 125Vdc)

— 400A (25-30A @ 125Vdc)

— 200A (25-30A @ 250Vac)

\*CSA approvals for 25A and 30A are at 125Vac – IR 1000A and Vdc – IR 400A (IR 1000A at 75Vdc)

\*\*Interrupting ratings measured at 70% – 80% power factor on AC. The interrupting ratings for 18A and 20A were measured at 85%-95% power factor on AC. The interrupting ratings for 25A and 30A were measured at 89% power factor on AC.

Agency Information: CE, Std. 248-14 UL Listed, Guide JDYX File E19180, 1/4-15A; UL Recognized, Guide JDYX2, File E19180, 18-30A; CSA Certification, Class 1422-01 & 1422-30, File 53787, 1/4-30A.

### Features and Benefits

- Ceramic body allows for higher amp/volt rating combinations.

### Typical Applications

- Electronic Circuits

### Catalog Numbers (Amps)

#### With Axial Leads

ABC-V-1/4-R	ABC-V-3-R	ABC-V-12-R
ABC-V-1/2-R	ABC-V-4-R	ABC-V-15-R
ABC-V-1/2-R	ABC-V-5-R	ABC-V-18-R
ABC-V-1-R	ABC-V-6-R	ABC-V-20-R
ABC-V-1-1/2-R	ABC-V-7-R	ABC-V-25-R
ABC-V-2-R	ABC-V-8-R	ABC-V-30-R
ABC-V-2-1/2-R	ABC-V-10-R	

Without Axial Leads

ABC-1/4-R	ABC-3-R	ABC-12-R
ABC-1/2-R	ABC-4-R	ABC-15-R
ABC-1/2-R	ABC-5-R	ABC-18-R
ABC-1-R	ABC-6-R	ABC-20-R
ABC-1-1/2-R	ABC-7-R	ABC-25-R
ABC-2-R	ABC-8-R	ABC-30-R
ABC-2-1/2-R	ABC-10-R	

## GBB (GBB-V axial leads)

Specifications  
Description: Very fast-acting fuse.

Dimensions:  
1/4" x 1 1/4"  
(6.4 x 31.7mm).

Construction: Ceramic cartridge with nickel-plated brass endcaps.

Ratings:

Volts — 250Vac/125Vdc

Amps — 1-30A

IR — 200A @ 250Vac

— 200A (20-30A @ 125Vac/dc)  
— 10,000A (1A -15A @ 125Vac/dc)

### Agency Information:

CE, Std. 248-14, UL Recognized, 1-30,125Vdc/250Vac, File E56412, Guide JFHR2, CSA Accepted, 1-30, 125Vdc/250Vac, File 53787, Class 1422-30.

### Features and Benefits

- Very fast-acting performance allows protection of highly sensitive electronic circuitry.

### Typical Applications

- Electronic Circuits

### Catalog Numbers (Amps)

#### With Axial Leads

GBB-V-1-R	GBB-V-6-R	GBB-V-15-R
GBB-V-1-1/4-R	GBB-V-7-R	GBB-V-20-R
GBB-V-2-R	GBB-V-8-R	GBB-V-25-R
GBB-V-3-R	GBB-V-9-R	GBB-V-30-R
GBB-V-4-R	GBB-V-10-R	
GBB-V-5-R	GBB-V-12-R	

#### Without Axial Leads

GBB-1-R	GBB-6-R	GBB-15-R
GBB-1-1/4-R	GBB-7-R	GBB-20-R
GBB-2-R	GBB-8-R	GBB-25-R
GBB-3-R	GBB-9-R	GBB-30-R
GBB-4-R	GBB-10-R	
GBB-5-R	GBB-12-R	

## Fuse Blocks for 1/4" x 1 1/4" Fuses

### Series 8000



#### Specifications

Description: Bolt-in and snap-in mounting for 1/4" x 1 1/4" fuses.

Construction: Blocks are molded flame retarded thermoplastic. Clips are spring-bronze.

#### Ratings:

Volts: — 300V

Amps: — 25A (See Catalog Numbers table)

Agency Information: CE, UL Recognized ; File E14853, Guide IZLT2, CSA Certified Class 6225-01, File 47235.

Anti-Rotation Pin: Single-pole blocks may be ordered without the anti-rotational pin simply by adding an "X" to the number of poles (Example: BK/S-8000-1X).

Carton Quantity: 10; shelf package: 100.

Bulk Carton: Single-pole and 2-pole fuse blocks – 1,000; Multiple-pole fuse blocks – 3- to 8-pole: 200; 9- to 12-pole: 50. When ordering bulk quantities, prefix "BK/" to catalog number: (Example: BK/S-8001-1-SNP).

#### Catalog Numbers

##### Bolt-in Mounting

Basic Catalog Numbers	Series	Terminal	Angle	Agency Maximums	Poles (Suffix)
S-8001-	8000	Solder	0°	UL 25A	1 - 12
S-8002-			40°	CSA 21A	
S-8101-	8100	3/16" Quick Connect	0°	UL 20A	
S-8102-			40°	CSA 13A	
S-8201-	8200	1/4" Quick Connect	0°	UL 20A	
S-8202-			40°	CSA 16A	
S-8203-			Side		
S-8301-	8300	Screw	—	UL 30A CSA 25A	

##### Snap-in Mounting

Catalog Numbers	Series	Terminal	Angle	Agency Maximums	Poles (Suffix)
S-8001-1-SNP	8000	Solder	0°	UL 25A	Available only in single pole
S-8002-1-SNP			40°	CSA 21A	
S-8101-1-SNP	8100	3/16" Quick Connect	0°	UL 20A	
S-8102-1-SNP			40°	CSA 13A	
S-8201-1-SNP	8200	1/4" Quick Connect	0°	UL 20A	
S-8203-1-SNP			Side	CSA 16A	

#### Catalog Number Build-A-Code

Prefix for Bulk Packing	Series 8000 Product Line	Type Terminal	Terminal Angle	Number of Poles (1-12)
BK/	S-8	0	00	-00
"0" - Solder "1" - 3/16" Quick Connect "2" - 1/4" Quick Connect "3" - Screw "01" - straight (0°) "02" - 40° "03" - side*				



Data Sheet: 2101

\*Available only in single pole

### Single-Pole Fuse Blocks

#### Specifications

Description: Single-pole fuse block for 1/4" x 1 1/4" (6.4 x 31.8mm) size fuses.

Dimensions: See Dimensions illustrations.

Construction: Bakelite base width 1/2" (12.7mm); spring-bronze, bright tin-lead plate clips.

#### Ratings:

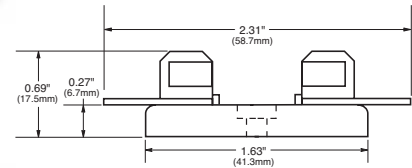
Volts: — 250V

Amps: — 30A



4405 - 0° Solder terminals with integral terminal and clip

Dimensions - in (mm)

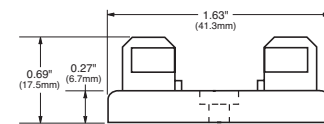


4406 - Side solder terminal



4574 - Spare fuse block

Dimensions - in (mm)

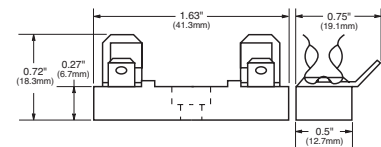


2499 - Side quick-connect

Agency Information: UL Recognized, Guide IZLT2, File E14853

Terminals: 1/4" (6.4mm); 15A, 250V

Dimensions - in (mm)



Note: Mounting screw hole diameter is 0.147" (3.7mm). Counterbore diameter, 0.636" (8.0mm). Max Mounting Screw No. 6.

## Class CC and supplemental modular ferrule fuse blocks

RoHS



### Product description:

BCM (Class CC) and BMM (supplemental 13/32 x 1-1/2" /10x38) modular style fuse blocks with optional covers.

These new Bussmann fuse blocks contain multiple features to add versatility, reduce labor and enhance safety of any panel design.

### Features and benefits:

- Available in 1-, 2- and 3-pole configurations to meet stocking requirements.
- Blocks are fully modular with a snap-together design that provides tool-less assembly of multiple pole blocks at point-of-use to reduce inventory and save assembly time and labor.
- DIN-Rail and panel mount versatility allows one product to be used for multiple applications, lowering inventory cost.
- Compact footprint consumes minimal panel space.
- Optional see-through cover enhances safety with IP20 finger-safe protection, lockout/tagout capability and open circuit indication.
- Easy circuit identification with available universal marker labels for fuse block covers.
- Tin-plated bimetallic copper fuse clips deliver superior fatigue resistance compared to traditional spring brass.
- Terminal options to meet application needs including 1/4" spade quick connect terminals for faster panel assembly.

## Specifications



### Ratings:

- Volts 600V
- Amps up to 30A
- Withstand 200kA RMS Sym

### Agency information:

#### Class CC BCM Series

- UL Listed E14853 - IZLT
- CSA Certified 47235-6225-01
- CE
- RoHS Compliant
- Conflict mineral free
- REACH declaration available upon request

#### 13/32" x 1-1/2" (Midget) BMM Series

- UL Recognized E14853 - IZLT2
- CSA Certified 47235-6225-01
- CE
- RoHS Compliant
- Conflict mineral free
- REACH declaration available upon request

### Covers:

- Covers are included in the overall UL Listing/Recognition and CSA Certification
- IP20 finger-safe
- RoHS Compliant
- REACH declaration available upon request

### Poles:

- 1-, 2-, 3-pole units factory assembled
- Single-pole units snap together to create desired number of poles

### Flammability ratings:

- Blocks — UL 94V0, self-extinguishing
- Covers — UL 94HB, self-extinguishing

### Operating and storage temperature range:

- Blocks -40°C to +120°C
- Non indicating covers -40°C to +120°C
- Indicating covers -20°C to +90°C\*

\* Indication requires minimum 90Vac/dc and closed circuit to illuminate.

### Materials:

- Base — Thermoplastic
- Terminals — Tin-plated bimetallic copper
- Covers — Thermoplastic
- Screws and pressure plates — Zinc-plated steel

### Cover Part Numbers:

- For blocks with quick connect terminals — CVR(I)-CCM-QC
- All other terminal options — CVR(I)-CCM

### Marker labels:

- Use Bussmann part number TM26CB

### Recommended Bussmann fuses:

#### Class CC

- Ultimate protection time-delay Low-Peak LP-CC, data sheet No. 1023
- Advanced protection time-delay Limitron FNQ-R, data sheet No. 1014
- Advanced protection fast-acting Limitron KTK-R, data sheet No. 1015

#### 13/32" x 1-1/2" (midget)

- Fast-acting 250Vac BAF, data sheet No. 2011
- Fast-acting 600Vac KTK, data sheet No. 1011
- Fast-acting 600Vac/dc KLM, data sheet No. 2020
- Time-delay 250Vac FNM, data sheet No. 2028
- Time-delay 500Vac FNQ, data sheet No. 1012

#### 10x38mm (IEC)

- Class aM and gG/gL IEC industrial fuses, data sheet No. 720115

### Recommended Bussmann DIN-Rail end stops:

- Part No. BRKT-ND
- Part No. BRKT-NDSCREW2

Table 1. Catalog numbers

#10-32 Phil-slot screw	Terminal type				Poles	Fuse class
	Screw with quick connect*	Pressure plate	Pressure plate with quick connect*	Box lug		
BCM603-1S	BCM603-1SQ	BCM603-1P	BCM603-1PQ	BCM603-1C	1	CC
BCM603-2S	BCM603-2SQ	BCM603-2P	BCM603-2PQ	BCM603-2C	2	CC
BCM603-3S	BCM603-3SQ	BCM603-3P	BCM603-3PQ	BCM603-3C	3	CC
—	BMM603-1SQ	—	BMM603-1PQ	BMM603-1C	1	10x38 (13/32"x1-1/2")
—	BMM603-2SQ	—	BMM603-2PQ	BMM603-2C	2	10x38 (13/32"x1-1/2")
—	BMM603-3SQ	—	BMM603-3PQ	BMM603-3C	3	10x38 (13/32"x1-1/2")
—	BCCMM603-3SQ	—	BCCMM603-3PQ	—	3	3-Pole control circuit transformer block 2-pole CC with 1-pole 10x38 (13/32"x1-1/2")

\* 1/4" Quick Connect terminal maximum ampacity dependent on female spade connector and wire ratings.

# 3-position – Non-illuminated



Standard Knob Operator  
Cat. No. 800T-J2A

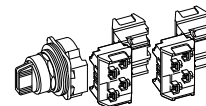


Knob Lever Operator  
Cat. No. 800T-J17A



Standard Knob Operator  
Cat. No. 800H-JR2A

800 T - J 2 C  
a b c d e f



a	
Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b	
Fingersafe Guards	
Code	Description
Blank	No guards
C	Guard on terminals

c		
Knob Insert Colors		
800T Code	Description	800H Code
J	White	JR
JX	Packet of colored inserts <sup>(1)</sup>	JRX
Metal Wing Lever Colors		
JA	Red	–
JG	Gray	–

(1) One insert of each color (blue, green, orange, red, and yellow).

d	
Operator Type and Function	
Code	Operator Function
Standard Knob	
2	Maintained
4	Spring return from left
5	Spring return from right
91	Spring return from both
Knob Lever <sup>(2) (3)</sup>	
17	Maintained
18	Spring return from left
19	Spring return from right
20	Spring return from both
Metal Wing Lever <sup>(2) (3)</sup>	
11	Maintained
15	Spring return from left
16	Spring return from right
141	Spring return from both
Coin Slot <sup>(2) (3)</sup>	
6	Maintained
7	Spring return from left
8	Spring return from right
10	Spring return from both

e	
Cam Options <sup>(1) (2)</sup>	
Code	Description
Blank	KB7 cam (std.)
KA1	KA1 cam
KA7	KA7 cam
KC1	KC1 cam
KC7	KC7 cam
KD7	KD7 cam
KE7	KE7 cam <sup>(4)</sup>
KQ1	KQ1 cam
KQ7	KQ7 cam
KR1	KR1 cam <sup>(4)</sup>
KR7	KR7 cam <sup>(4)</sup>
KT1	KT1 cam <sup>(4)</sup>
KT7	KT7 cam <sup>(4)</sup>
KU7	KU7 cam <sup>(4)</sup>

f	
Contact Blocks <sup>(1)</sup>	
Code	Description
Blank	No contacts on operator
Standard	
A	1 N.O. - 1 N.C. One <b>800T-XA</b> on white side
B	2 N.O. - 2 N.C. Two <b>800T-XAs</b> – 1 on white side/1 on black side
PenTUFF (Low Voltage)	
AV	1 N.O. - 1 N.C. One <b>800T-XAV</b> on white side
BV	2 N.O. - 2 N.C. Two <b>800T-XAVs</b> – 1 on white side/1 on black side
Class I, Div. 2 - Logic Reed	
AR	1 N.O. - 1 N.C. One <b>800T-XAR</b> on white side
BR	2 N.O. - 2 N.C. Two <b>800T-XARs</b> – 1 on white side/1 on black side

f (cont'd)	
Contact Blocks <sup>(1)</sup>	
Code	Description
Class I, Div. 2 - Explosion-protected	
AF	1 N.O. - 1 N.C. One <b>800TC-XAF</b> on white side
BF	2 N.O. - 2 N.C. Two <b>800TC-XAFs</b> – 1 on white side/1 on black side
Class I, Div. 2 - Stackable Sealed Switch	
AY	1 N.O. - 1 N.C. One <b>800T-XAY</b> on white side
BY	2 N.O. - 2 N.C. Two <b>800T-XAYs</b> – 1 on white side/1 on black side

(1) See [Table 5 on page 19](#) for cam selections and associated targets.  
 (2) If an overlapping cam is required, consult your local distributor.  
 (3) Only available on Bulletin 800T, Type 4/13 operators.  
 (4) Not available with wing levers.

# Pilot Light Devices



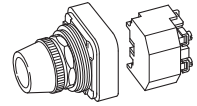
Transformer Type Pilot Light  
Cat. No. 800T-P16R



Push-to-test Pilot Light  
Cat. No. 800T-PT16R

800    T    -    P    T    16    G    AR  
          a    b    c    d    e    f    g    h

(Push-to-test)



a	
Protection Rating <sup>(1)</sup>	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b	
Fingersafe Guards	
Code	Description
Blank	No guards
C	Guards on terminals

c		
Power Module Type		
800T Code	Description	800H Code
P	Transformer (or dual input)	PR
Q	Full voltage	QR
S	Operator only <sup>(6)</sup>	SR

d	
Lamp Test Options	
Code	Description
Blank	No test option <sup>(2)</sup>
T	Push-to-test <sup>(3)</sup>
D	Dual input – diode <sup>(4)(5)</sup>
DT	Dual input – transformer relay <sup>(5)</sup>

- (1) All pilot lights except push-to-test without sealed contacts and dual-input transformer relay, are rated for Class I, Division 2 applications.
- (2) Non-push-to-test pilot lights using the universal LED option cannot be ordered as Bulletin 800HC or 800TC. The terminals are fingersafe as standard.
- (3) Push-to-test supplied with factory jumpered contact block. For typical pilot light wiring diagrams, see [page 23](#).
- (4) Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs.
- (5) Dual-input devices (diode or transformer type) cannot be ordered as Bulletin 800HC or 800TC. Fingersafe terminal guards are not available.
- (6) Operator-only supplied without power module, lamp, or lens. For push-to-test operator-only, order [Momentary Contact Devices – Illuminated on page 10](#).

e	
Illumination Options	
Code	Description
Blank	Incandescent
H	LED <sup>(2)</sup>

f	
Voltage	
Code	Description
Transformer	
16	120V AC, 50/60 Hz
26	240V AC, 50/60 Hz
46	480V AC, 50/60 Hz
56	600V AC, 50/60 Hz
Full Voltage – Incandescent	
12	12V AC/DC
24	24V AC/DC
48	48V AC/DC
10	120V AC/DC
20	240V AC/DC
Full Voltage – LED	
2	12...130V AC/DC
Dual Input	
16	120V AC
24	24V AC/DC (dual-input diode only)
Operator Only	
00	No power module

g		
Lens Color		
Code	Description	Glass Code <sup>(1)</sup>
Blank	No lens	Blank
A	Amber	D
B	Blue	E
C	Clear	F
G	Green	H
R	Red	J
W	White	K
Y	Yellow	–

h	
Contact Blocks (Push-to-test Units Only)	
Code	Description
Standard	
Blank	1 N.O. - 1 N.C.
PenTUFF™ (Low Voltage)	
AV	1 N.O. - 1 N.C.
Class I, Div. 2 - Explosion-protected	
AF	1 N.O. - 1 N.C.
Class I, Div. 2 - Logic Reed	
AR	1 N.O. - 1 N.C.
Class I, Div. 2 - Stackable Sealed Switch	
AY	1 N.O. - 1 N.C.

- (1) Glass lens available on 800T pilot lights only. Not available on push-to-test units.
- (2) LED illumination option is not available with diode type dual input.



## Momentary Contact Devices – Non-illuminated



Flush Head Unit  
Cat. No. 800T-A1A



Extended Head Unit  
Cat. No. 800T-B6A

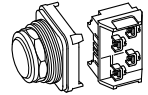


Booted Unit  
Cat. No. 800H-R2A



Bootless Flush Head Unit  
Cat. No. 800H-AR1A

800 T          - A 1          A  
a b c d e f



a	
Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b	
Fingersafe Guards	
Code	Description
Blank	No guards
C	Guard on terminals

c		
Operator Type		
800T Code	Description	800H Code
A	Flush head	AR
B	Extended head	BR
D	Mushroom head	DR
DX	Mushroom head (no color cap)	DRX
–	Bootless guarded head	GR
–	Booted head	R <sup>(2)</sup>

d	
Color Cap	
Code	Description
Blank	Used only when Operator Type DX/DRX is ordered
1	Green
2	Black
3	Orange <sup>(1)</sup>
4	Gray <sup>(1)</sup>
5	White <sup>(1)</sup>
6	Red
7	Blue
9	Yellow

(1) Not available for booted operators.

(2) Underlying operators are extended head. Boot material is chlorosulfonated polyethylene.

e	
Special Mushroom Head	
Code	Description
J	Jumbo mushroom head (plastic)
L <sup>(1)</sup>	Jumbo mushroom head (metal)

**Note:** Special mushroom head options only apply to mushroom head operator type code D/DR (Table c).

f	
Contact Blocks	
Code	Description
Blank	No contacts
Standard	
D1	1 N.O.
D2	1 N.C.
D3	1 N.O.E.M.
D4	1 N.C.L.B.
D5	1 N.O. (Mini)
D6	1 N.C. (Mini)
A1	1 N.C.L.B. - 1 N.O.
A2	2 N.O. <sup>(2)</sup>
A4	2 N.C.
A7	1 N.C.L.B. - 1 N.C.
A	1 N.O. - 1 N.C.
B	2 N.O. - 2 N.C.

f (cont'd)	
Contact Blocks	
Code	Description
PentUFF™ (Low Voltage)	
D1V	1 N.O.
D2V	1 N.C.
D3V	1 N.O.E.M.
D4V	1 N.C.L.B.
AV	1 N.O. - 1 N.C.
BV	2 N.O. - 2 N.C.
Time Delay	
T	1 N.O. Depress close, delayed opening
S	1 N.C. Depress open, delayed closure
Snap Action <sup>(3)</sup>	
M	1 N.O. - 1 N.C.
N	2 N.O. - 2 N.C.

f (cont'd)	
Contact Blocks	
Code	Description
Class I, Div. 2 – Explosion-protected	
AF	1 N.O. - 1 N.C.
BF	2 N.O. - 2 N.C.
Class I, Div. 2 – Logic Reed	
D1R	1 N.O.
D2R	1 N.C.
A2R	2 N.O. <sup>(2)</sup>
A4R	2 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
Class I, Div. 2 – Stackable Sealed Switch	
D1Y	1 N.O.
D2Y	1 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C.

**Time Delay Contacts**

Series C field installable kits can only be used with Series T or later operators. Adjustable range of 0.5...15 s + 25%. Maximum continuous current  $I_{th}$  5 A.

**Snap Action Contacts**


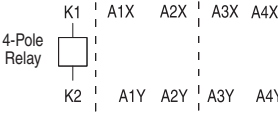
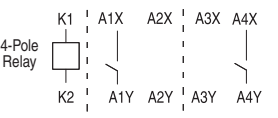
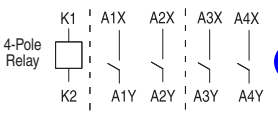
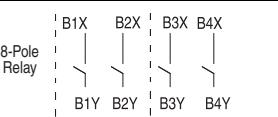
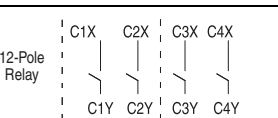
Snap-action contacts feature a quick make, quick break snap-action mechanism that is only available on factory-assembled units. Maximum continuous current  $I_{th}$  10 A.

(1) Jumbo mushroom head (metal) is only available in colors green, black, red, and yellow.

(2) A2 and A2R contact blocks cannot be stacked upon, but can stack on other contact blocks.


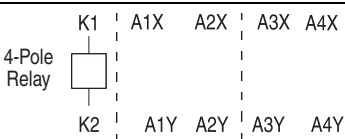
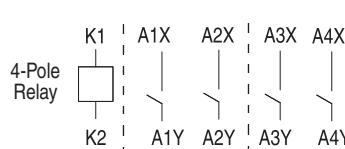
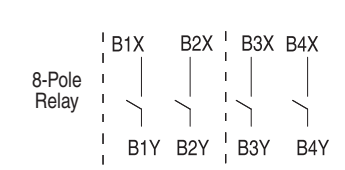
(3) Snap action contact blocks only available with flush and extended head operators in the colors green, black, or red.

### AC-Operated Relays - In-stock Contact Configurations

Photo	Contacts	Contact Arrangement and Markings	Open Type, DIN Rail, or Relay Rail Mount (700-MP)		
	N.O. (1)		120V AC	240V AC	480V AC
	0		700-P000A1	—	—
	2		700-P200A1	—	—
	4		700-P400A1	700-P400A2	700-P400A4
	8		700-P800A1	—	—
	12		700-P1200A1	—	—

(1) Factory assembled N.O. contacts can be easily to N.C. in the field.

### DC-Operated Relays - In-stock Contact Configurations

Photo	Contacts	Contact Arrangement and Markings	Open Type Relay Rail Mount (2)	
	N.O. (1)		24V DC	120V DC
			Cat. No.	Cat. No.
	0		700DC-P000Z24	—
	4		700DC-P400Z24	700DC-P400Z1
	8		700DC-P800Z24	—

(1) Factory assembled N.O. contacts can be easily to N.C. in the field.

(2) For DIN Rail mounting, order Cat. No. 700-DRA.

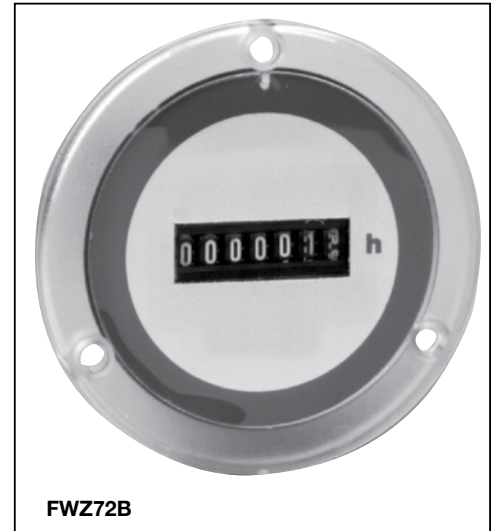
# FWZ Series



## FWZ72 Series

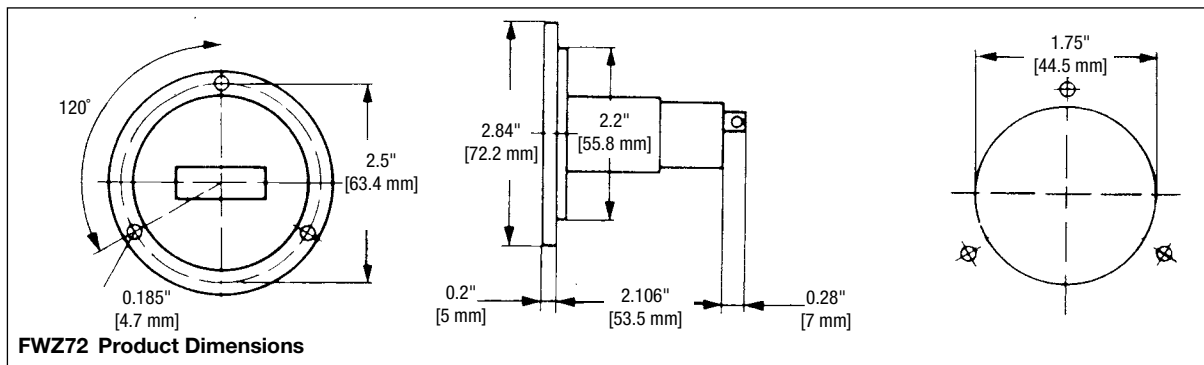
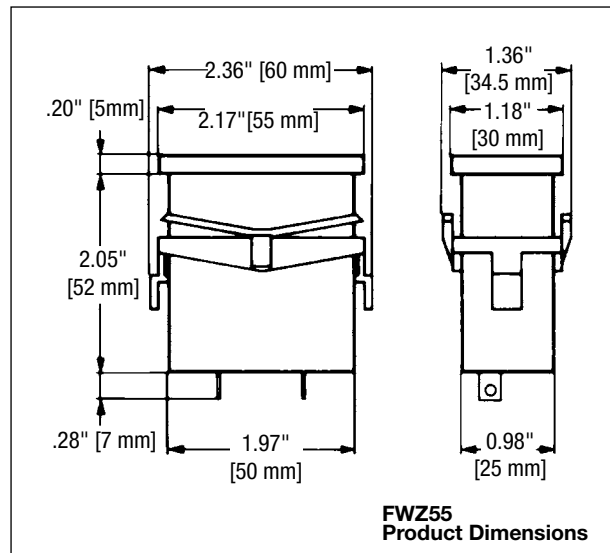
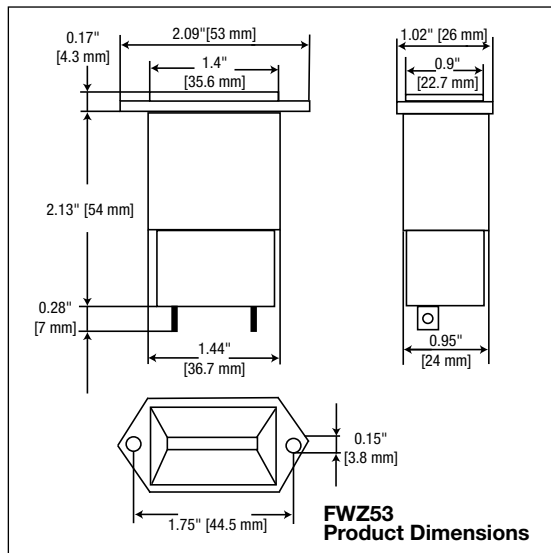
## FWZ72K120ST

Bezel:	2.83" round (72 mm), 3 hole
Capacity:	99,999.99 Hours
Digits:	0.16" high numerals
Voltage:	24, 120, 240 VAC, 50 or 60 Hz
Power Consumption:	1VA
Operating Temperature:	-40°F to 160°F (-40°C to 72°C)
Termination:	Combination ¼" spade and screw clamp Rear access screw terminals available (model "K")
Weight:	1.8 oz
Mounting:	Flush panel mounted with three 0.185" holes for #8 screws
Panel Opening:	1.75" round (44.5 mm) or 1.50"x 1" rectangular (38 mm x 24 mm)
Ordering Information:	1.) FWZ72-voltage/frequency 2.) FWZ72B-voltage/frequency 3.) FWZ72K*-voltage/frequency *Rear access screw terminals



FWZ72B

## Diagrams





**Description**

Economically priced 4 and 6 figure push-button reset, electromechanical counter designed for use where limited space is a factor and when reliability is critical. Rugged operating mechanisms require no lubrication or maintenance. Compact size and minimum space requirements make the Model 49 ideally suited for use in control panels, business machines, and test equipment.

**Features**

- Compact
- No maintenance
- Quick reset

**Options**

- Voltages
- Extended temperatures
- 4 or 6 figure

**Specifications**

**Figures:** 4 or 6 figures, white on black, 0.16" [4mm] high  
**Reset:** Push-button  
**Speed:** 600 counts/minute  
 (min. 50ms - on, 50ms - off)  
**Voltages:** 115VAC, 24VDC  
 (+10% to - 15%)  
**Power:** AC: 115VAC ~ 3 watts  
 DC: 24VDC ~ 2 watts

**Mounting:** Panel, base, or bail  
**Termination:** (2) #22 AWG 105°C wire leads, 10" [254mm] long  
**Operating Life:** Beyond 100 million counts  
**Temp. Range:** -15°F to +140°F [-26°C to +60°C]  
**Approvals:** UL Recognized, CE Compliant, ROHS  
**Weight:** 4 oz. [113g] (4 fig.), 5 oz. [142g] (6 fig.)

Models	Description
B2-4904	115VAC, 4 figure, bail mount
B8-4904	24VDC, 4 figure, bail mount
<b>D2-4904</b>	115VAC, 4 figure, base mount
<b>P2-4904</b>	115VAC, 4 figure, panel mount
<b>P8-4904</b>	24VDC, 4 figure, panel mount
P9-4904	12VDC, 4 figure, panel mount

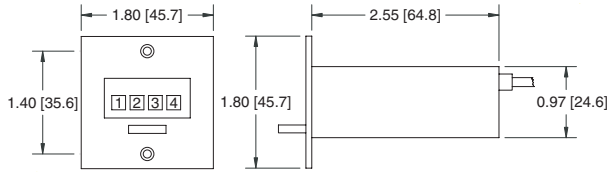
Models	Description
B2-4906	115VAC, 6 figure, bail mount
B8-4906	24VDC, 6 figure, bail mount
D2-4906	115VAC, 6 figure, base mount
<b>P2-4906</b>	115VAC, 6 figure, panel mount
<b>P8-4906</b>	24VDC, 6 figure, panel mount
P9-4906	12VDC, 6 figure, panel mount

\* Items in bold are normally in factory stock.



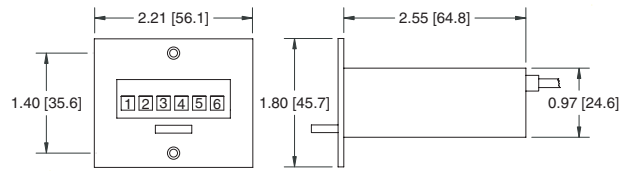
Dimensions

Panel Mount - 4 Figure



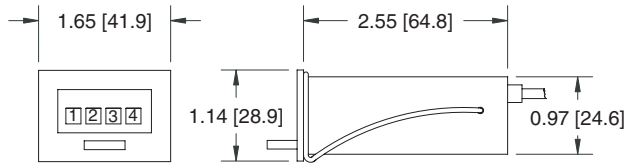
Panel cutout: 1.46" x 1.01" [37.1 x 25.7mm]  
Mounting holes: For #4 flat head screw

Panel Mount - 6 Figure



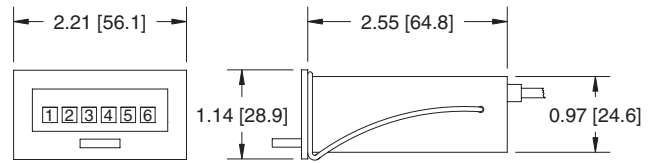
Panel cutout: 2.00" x 1.01" [50.8 x 25.7mm]  
Mounting holes: For #4 flat head screw

Bail Mount - 4 Figure



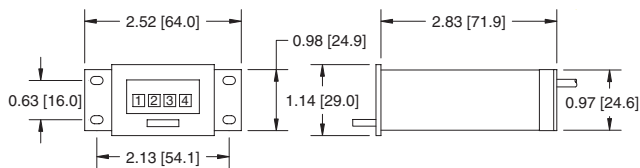
Panel cutout: 1.46" x 1.01" [37.1 x 25.7mm]

Bail Mount - 6 Figure



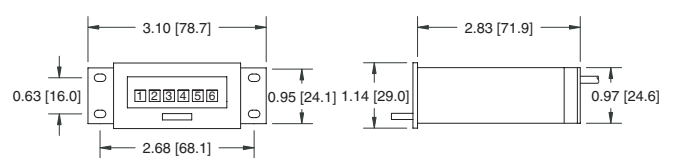
Panel cutout: 2.00" x 1.01" [50.8 x 25.7mm]

Base Mount - 4 Figure



Mounting holes: 0.12" x 0.20" [3.1 x 5.1mm] slots

Base Mount - 6 Figure



Mounting holes: 0.12" x 0.20" [3.1 x 5.1mm] slots

Applications

Test Equipment



Control Panels



Business Machines



Medical devices





# Pump Monitor Relay PMR2

MADE IN  
THE U.S.A.



UL FILE #E101681



## OPERATION

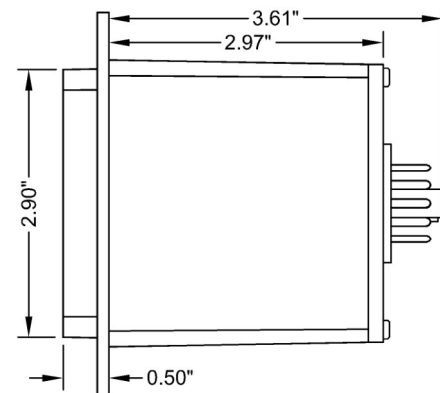
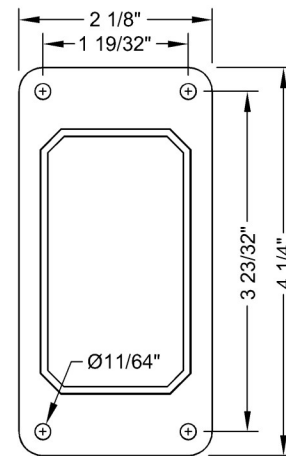
The PMR2 Pump Monitor Relay provides Motor Over Temperature and Seal Leakage alarms for submersible pumps equipped with FLS or CLS sensors.

The PMR2 applies 12 VDC to the sensor and measures the current flow through the sensor. The sensor controls the current in the circuit. If the sensor current is in the normal range the Temperature Alarm Relay is energized to allow normal pump operation. If the sensor circuit becomes shorted, the 12 VDC is turned off and all LEDs flash.

Upon a High Motor Temperature condition, the sensor opens so that the sensor circuit current drops to zero. With the sensor current below the Trip Point ( $\leq 3.0 \text{ mA} \pm 5\%$ ), the Overtemp Indication is turned on and the Temperature Alarm Relay is de-energized, preventing pump operation.

When the High Motor Temperature condition has cleared, the unit will reset based on the position of Alarm Reset Mode Select Switch (Auto or Manual). When in the Auto position, the Overtemp Alarm resets automatically. If the switch is in the Manual position, the Overtemp Reset Push-button must be pushed to clear the alarm.

Upon a Seal Leakage condition, the sensor increases the sensor circuit current above the Trip Point ( $\geq 22 \text{ mA} \pm 5\%$ ), the Leakage Indication is turned on and the Leakage Alarm Relay is energized.



## SPECIFICATIONS

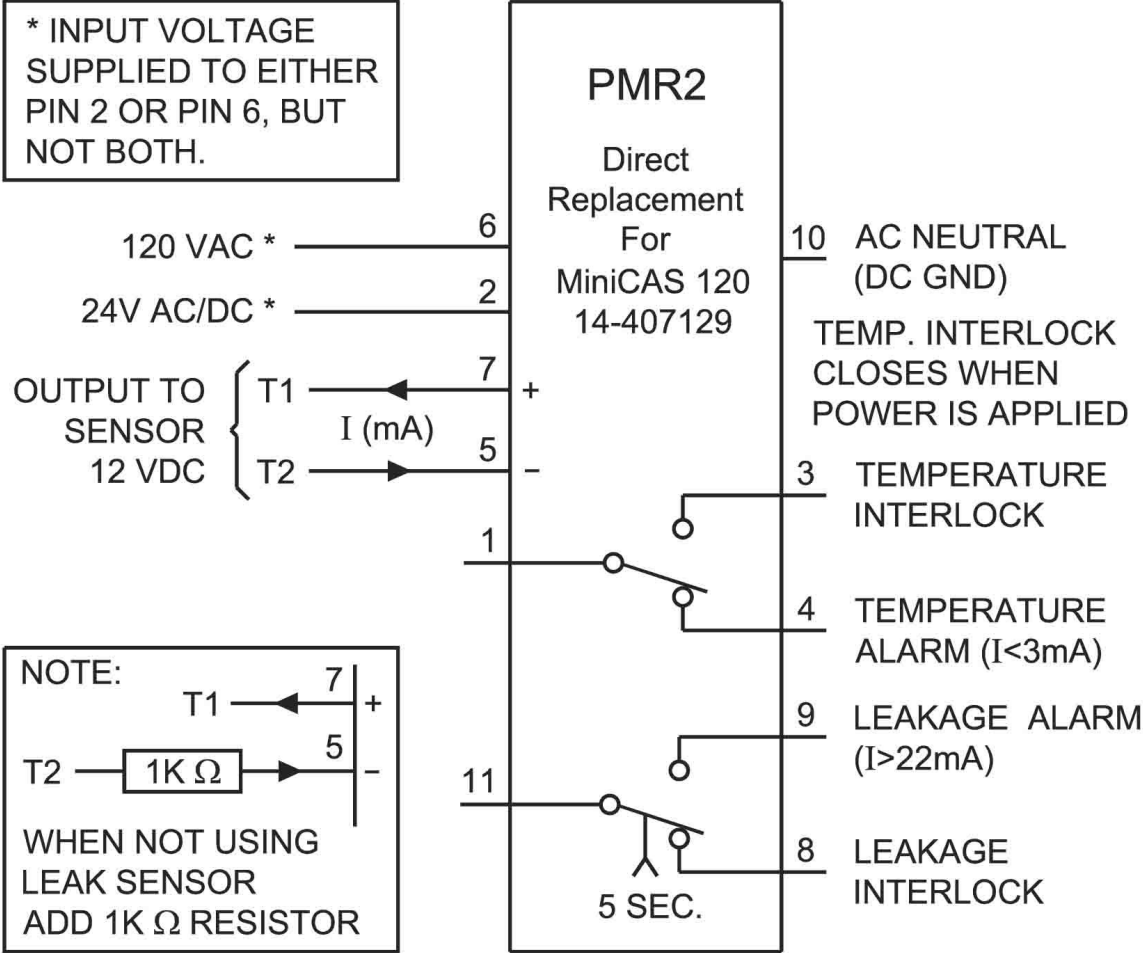
Input Power:	120 VAC $\pm 10\%$ , 7.0 VA max 24 VAC $\pm 10\%$ , 3.5 VA max 24 VDC $\pm 10\%$ , 125 mA max
Output Rating:	8A Resistive @ 120VAC
Operating Temp:	-20 °C to +65 °C
Storage Temp:	-45 °C to +85 °C
Sensor Circuit Voltage:	12 VDC $\pm 10\%$
Temp Alarm Trip Point:	$\leq 3.0 \text{ mA} \pm 5\%$
Leak Alarm Trip Point:	$\geq 22 \text{ mA} \pm 5\%$
Enclosure:	Blue Lexan
Base:	Phenolic

## ORDERING INFORMATION

Part Number: **PMR2**

# Pump Monitor Relay PMR2

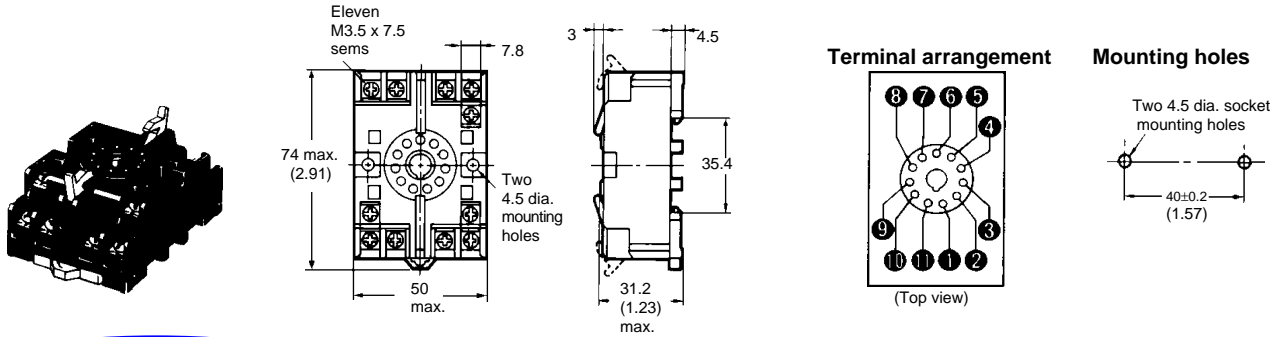
## CONNECTION DIAGRAM



■ SOCKETS

11-Pin Sockets for H3CR-A, H3CR-AS

P2CF-11 Bottom surface or track mounting socket

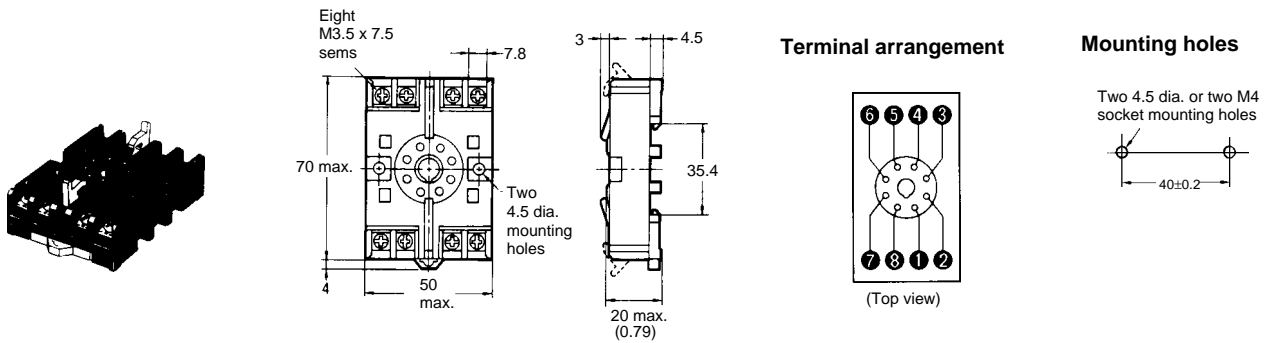


P3GA-11 Back Mounting Socket

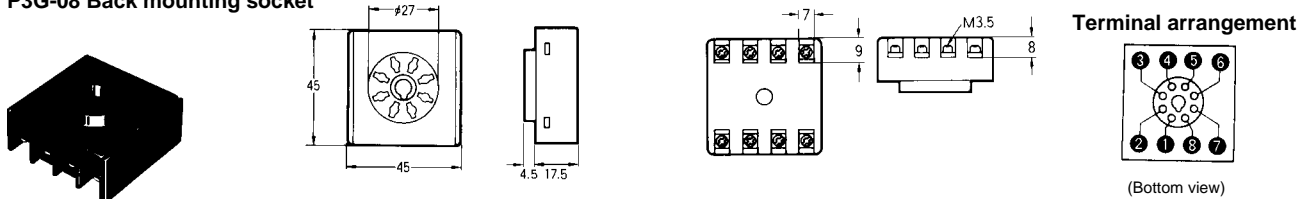


8-Pin Sockets for H3CR-A8, H3CR-A8S, H3CR-A8E, H3CR-A8EL

P2CF-08 Bottom surface or track mounting



P3G-08 Back mounting socket





## 2-position – Non-illuminated



Standard Knob Operator  
Cat. No. 800T-H2A

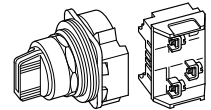


Knob Lever Operator  
Cat. No. 800T-H17A



Standard Knob Operator  
Cat. No. 800H-HR2A

800    T                    -    HA    2            A  
          a                    b                    c                    d                    e



a	
Protection Rating	
Code	Description
T	Metal, Type 4/13
H	Plastic, Type 4/4X/13

b	
Fingersafe Guards	
Code	Description
Blank	No guards
C	Guard on terminals

c		
Knob Insert Colors		
800T Code	Description	800H Code
H	White	HR
HX	Packet of colored inserts <sup>(1)</sup>	HRX
Metal Wing Lever Colors		
HA	Red	–
HG	Gray	–

(1) One insert of each color (blue, green, orange, red, and yellow).

d	
Operator Type and Function	
Code	Operator Function
Standard Knob	
2	Maintained
4	Spring return from left <sup>(1)</sup>
5	Spring return from right
Knob Lever <sup>(2)</sup>	
17	Maintained
18	Spring return from left <sup>(1)</sup>
19	Spring return from right
Metal Wing Lever <sup>(2)</sup>	
11	Maintained
15	Spring return from left <sup>(1)</sup>
16	Spring return from right
Coin Slot <sup>(2)</sup>	
6	Maintained
7	Spring return from left
8	Spring return from right

e			
Contact Blocks			
Code	Contact Configuration	2-position	
Blank	No contacts	–	–
Standard			
D1	1 N.O.	0	X
D2	1 N.C.	X	0
A	1 N.O. - 1 N.C.	0	X
		X	0
B	2 N.O. - 2 N.C.	0	X
		X	0
		0	X
		X	0
Code	Description		
MaxDuty (Horsepower Rated) <sup>(3)</sup>			
D1M	1 N.O.		
D2M	1 N.C.		
PentUFF™ (Low Voltage) <sup>(3)</sup>			
D1V	1 N.O.		
D2V	1 N.C.		
AV	1 N.O. - 1 N.C.		
BV	2 N.O. - 2 N.C.		

e (cont'd)	
Contact Blocks	
Code	Description
Class I, Div. 2 - Explosion-protected <sup>(3)</sup>	
AF	1 N.O. - 1 N.C.
BF	2 N.O. - 2 N.C.
Class I, Div. 2 - Logic Reed <sup>(3)</sup>	
D1R	1 N.O.
D2R	1 N.C.
AR	1 N.O. - 1 N.C.
BR	2 N.O. - 2 N.C.
Class I, Div. 2 - Stackable Sealed Switch <sup>(3)</sup>	
D1Y	1 N.O.
D2Y	1 N.C.
AY	1 N.O. - 1 N.C.
BY	2 N.O. - 2 N.C.

(1) Target tables are reversed from what is shown in Table e.

(2) Only available on Bulletin 800T, Type 4/13 operators.

(3) Contact target tables are the same as standard contact blocks.

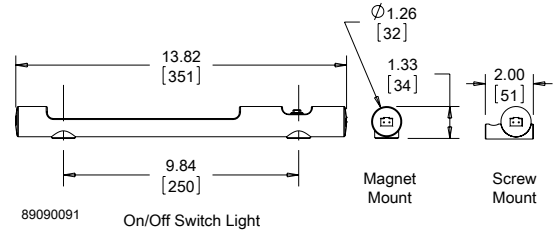
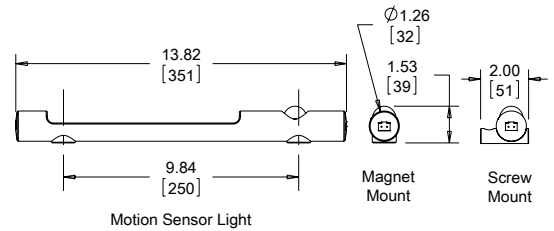
## LED LIGHT KIT



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 6500K 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	1.34 x 1.26 x 13.82 34 x 32 x 351	4.8	135	Magnetic	AC	On/off switch	90 VAC-260 VAC
LEDA2M35	1.54 x 1.26 x 13.82 39 x 32 x 351	5.0	140	Magnetic	AC	IR Motion Sensor	90 VAC-260 VAC
<b>LEDA1S35</b>	1.42 x 2.05 x 13.82 36 x 52 x 351	4.8	135	Screw	AC	On/off switch	90 VAC-260 VAC
LEDA2S35	1.63 x 2.05 x 13.82 41 x 52 x 351	5.0	140	Screw	AC	IR Motion Sensor	90 VAC-260 VAC
LEDD1M35	1.34 x 1.26 x 13.82 34 x 32 x 351	4.8	135	Magnetic	DC	On/off switch	20 VDC-60 VDC
LEDD2M35	1.54 x 1.26 x 13.82 39 x 32 x 351	5.0	140	Magnetic	DC	IR Motion Sensor	20 VDC-60 VDC
LEDD1S35	1.42 x 2.05 x 13.82 36 x 52 x 351	4.8	135	Screw	DC	On/off switch	20 VDC-60 VDC
LEDD2S35	1.63 x 2.05 x 13.82 41 x 52 x 351	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./mm	Power Source	Use with
LEDA20C	78.74 2000	AC	AC LED Lights
LEDD20C	78.74 2000	DC	DC LED Lights

## 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.

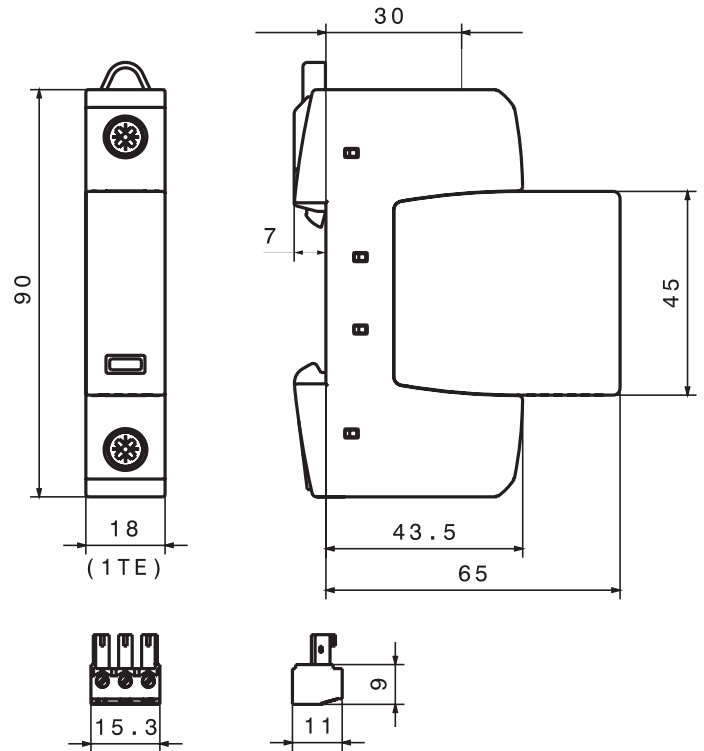
### BULLETIN: A80LT

Catalog Number	A in./mm	Power Source	Use with
LEDA10E	39.37 1000	AC	AC LED Lights
LEDD10E	39.37 1000	DC	DC LED Lights

**1-Pole, UL Type 1 DIN-Rail high SCCR surge protective devices**



**Dimensions — mm**



Surge protective devices

**Catalog symbol:**

- BSPMA1\_S2GR

**Description:**

The Bussmann™ series one-pole DIN-Rail UL Listed Type 1 surge protective devices feature a high 200 kA SCCR. Replaceable arrester modules are mechanically coded with the base to ensure against installing an incorrect replacement. The unique module locking system fixes the module to the base, and allows it to be easily replaced without tools by simply depressing the release buttons.

**Standard local visual status indication:**

The module's visual indicator shows the protective status at a glance: green = good, red = replace.

**Remote contact signaling:**

The standard three-pole terminal remote Form C contact signaling relay has a floating changeover contact for use as a break or make contact, according to circuit concept.

**Ratings:**

- System volts/types
  - 120 Vac single-phase
  - 240 Vac single-phase
- Short-circuit Current Rating (SCCR) 200 kA

**Agency information:**

- UL Listed open Type 1, ANSI/ UL 1449 4<sup>th</sup> Edition, Guide VZCA, VZCA7
- CSA Type 4-1 Component Assembly, C22.2 No. 269.1-14, Class 2157-27
- RoHS compliant

**Mounting**

- 35mm Din-Rail

**Warranty**

- Five years

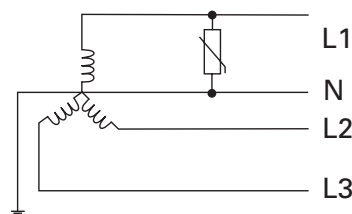
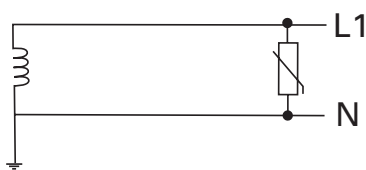
## Specifications/ordering information

System voltage/type	120 Vac single-phase	240 Vac single-phase
Catalog number	<b>BSPMA1120S2GR</b>	BSPMA1240S2GR
Replacement module catalog number (qty.)	BPMA230UL (1)	BPMA385UL (1)
SPD class per ANSI/UL 1449 4 <sup>th</sup> Ed.	Open-Type 1 SPD	
SPD class per CSA - C22.2 No. 269.1-14	Type 4-1 Component Assembly	
Nominal system voltage ( $U_N$ ) [L-N/L-G]	127 Vac	277 Vac
Nominal power frequency	50 / 60 Hz	
Max. continuous operating voltage AC (MCOV) [L-L]	230 Vac	385 Vac
Nominal discharge current ( $I_n$ ) (8x20 $\mu$ s)	20 kA	
Max. discharge current ( $I_{max}$ ) (8/20)	50 kA	
Voltage Protection Rating (VPR) [L-L]	700 V <sub>pk</sub>	1200 V <sub>pk</sub>
Short Circuit Current Rating (SCCR)	200 kA	
Operating temperature range ( $T_U$ ) °F (°C)	-31 to 185 (-35 to 85)	
Operating state / fault indication	Green = good ; Red = replace	
Wire range (60/75°C Cu, solid/stranded)	2-14 AWG (2.5-35 mm <sup>2</sup> )	
Terminal torque — lb-in (N•m)	35-45 (4-5.1)	
Mounting	35 mm DIN-Rail per EN 60715	
Enclosure material	Thermoplastic, UL 94 V0	
Protection	IP20 (finger-safe)	
Capacity	1 module(s), DIN 43880	
Agency information	UL Listed, Guide VZCA, VZCA7/CSA Component Acceptance Class 2157-27, RoHS	
Weight - oz (g)	4.13 (117)	4.44 (126)

## Contact signaling

Signaling type	Floating (dry), Form C (SPDT)
NEC Circuits	NEC Class 2 circuits only
Switching capacity AC (DC)	250 V/5 A (250 V/0.1 A, 125 V/0.2 A, 75 V/0.5 A)
Wire range (60/75°C Cu, solid/stranded)	16-22 AWG (1.5-0.34mm <sup>2</sup> )
Terminal torque - lb-in (N•m)	1.8 (0.2)

### Typical installation/system application:





### DC-UPS WITH INTEGRATED BATTERY

- Compact and Easy to Install
- Longest Buffer Time in Class
- Easy Battery Access
- Stable Output Voltage in Buffer Mode
- Superior Battery Management for Longest Battery Life
- Temperature Compensated Battery Charging
- Comprehensive Diagnostics and Monitoring Functions
- Replace Battery Signal Included
- Electronically Overload and Short Circuit Protected
- 50% Power Reserves
- Selectable Buffer Time Limiter

## 1. GENERAL DESCRIPTION

This uninterruptible power supply (UPS) controller UBC10.241 with integrated battery is a compact addition to standard 24V power supplies to bridge power failures or voltage fluctuations. Expensive downtimes, long restart cycles and loss of data can be avoided.

The DC-UPS includes a professional battery management system which charges and monitors the battery to achieve the longest battery service life as well as many diagnostic functions that ensure a reliable operation of the entire system.

A unique feature of the UBC10.241 is that only one 12V battery is required to buffer the 24V output. This makes matching batteries unnecessary and allows a precise battery charging and testing.

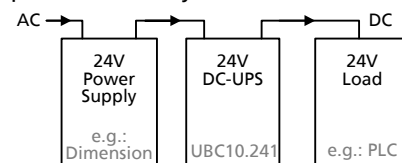
The UBC10.241 has one integrated 12V 5Ah high current VRLA battery, which is easy to change.

In addition to the UBC10.241, a separate UPS controller (UB10.241) which requires an external 12V battery is available when a longer buffer time is required.

## 2. SHORT-FORM DATA

Input voltage	nom. 24Vdc	
range	22.5-30Vdc	
Output current	min. 15A	Normal mode
	min. 10A	Buffer mode
Output voltage	typ. 0.23V lower as input voltage	Normal mode
	22.25V	Buffer mode, 10A
Integrated battery	12V 5Ah	VRLA lead acid
Temperature range	0 to 40°C	Operational
Dimensions	123x124x119mm	WxHxD
Buffer time	typ. 16'15"	At 5A load
	typ. 6'15"	At 10A load

Typical setup of a DC-UPS system with the UBC10.241:



## 3. ORDER NUMBERS

DC-UPS	<b>UBC10.241</b>	Standard unit
	<b>UBC10.241-N1</b>	Battery not assembled
Accessories	<b>UZH12.051</b>	Battery 12V 5Ah

## 4. MARKINGS



Ul. 2014 / Rev. 1.2 DS-UBC10.241-EN

All parameters are specified at an input voltage of 24V, 10A output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. It is assumed that the input power source can deliver a sufficient output current.

# Product data sheet

## Characteristics

# ABL8RPS24030

universal power supply, Phaseo, 1 or 2 phase,  
100 to 500 V, 24 V, 3 A

Product availability : Stock - Normally stocked in distribution facility



Price\*\* : 270.00 USD



### Main

Range of product	Phaseo
Product or component type	Power supply
Power supply type	Regulated switch mode
Nominal input voltage	100...120 V AC single phase N-L1 200...500 V AC phase to phase L1-L2
Rated power in W	72 W
Output voltage	24 V DC
Power supply output current	3 A
Permissible temporary current boost	1.5 x In for 4 s)

### Complementary

Power Factor	0.51 240 V 0.59 120 V
Efficiency	87 %
Output voltage adjustment	24...28.8 V adjustable
Power dissipation in W	7.8 W
Hold-up time	>= 120 ms 400 V >= 20 ms 100 V >= 40 ms 240 V
Provided equipment	Power factor correction filter IEC 61000-3-2
Connections - terminals	Input connection screw type terminals 3 x 0.5...3 x 4 mm <sup>2</sup> AWG 22...AWG 12 Input ground connection screw type terminals 1 x 0.5...1 x 4 mm <sup>2</sup> AWG 22...AWG 12 Output connection screw type terminals 4 x 0.5...4 x 4 mm <sup>2</sup> AWG 22...AWG 12 Output ground connection screw type terminals 1 x 0.5...1 x 4 mm <sup>2</sup> AWG 22...AWG 12
Status LED	Output voltage 1 LED green and red) Output current 1 LED green, red and orange)
Depth	4.92 in (125 mm)
Height	4.92 in (125 mm)

Width	1.77 in (45 mm)
Net weight	0.66 lb(US) (0.3 kg)
Output coupling	Parallel Series
Marking	CE
Operating position	Vertical

## Environment

Standards	CSA C22.2 No 60950-1 UL 508
Product certifications	CCSAus EAC UL RCM KC
Environmental characteristic	EMC EN 61000-6-1 EMC EN 61000-6-3 EMC EN/IEC 61000-6-2 EMC EN/IEC 61000-6-4 EMC EN/IEC 61204-3 Safety EN/IEC 60950-1 Safety EN/IEC 61204-3 Safety SELV
Operating altitude	6561.68 ft (2000 m)
Ambient air temperature for operation	122...140 °F (50...60 °C) with derating factor -13...122 °F (-25...50 °C) without
Ambient air temperature for storage	-40...158 °F (-40...70 °C)
Relative humidity	0...90 % during operation 0...95 % in storage
Overvoltage category	Class I VDE 0106-1
Dielectric strength	3500 V between input and ground 4000 V between input and output 500 V between output and ground

## Ordering and shipping details

Category	22525 - ABL8 AND ABL7 POWER SUPPLIE
Discount Schedule	CP12
GTIN	00785901685852
Returnability	Yes
Country of origin	PH

## Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: Lead and lead compounds which is known to the State of California to cause Carcinogen & Reproductive harm. For more information go to <a href="http://www.p65warnings.ca.gov">www.p65warnings.ca.gov</a>
REACH Regulation	<a href="#">REACH Declaration</a>
REACH free of SVHC	Yes
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope) <a href="#">EU RoHS Declaration</a>
Mercury free	Yes
RoHS exemption information	<a href="#">Yes</a>
China RoHS Regulation	<a href="#">China RoHS declaration</a>
Environmental Disclosure	<a href="#">Product Environmental Profile</a>
Circularity Profile	<a href="#">End of Life Information</a>

**ELECTRIC HEATERS**



115/230 Volt  
100/200 Watt



115/230 Volt  
400/800 Watt



115/230 Volt  
1300 Watt

**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

**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. Pentair Technical Products 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.



Performance Data **100 and 200 Watt Heaters**

CATALOG NUMBERS				
	DAH1001A	DAH1002A	DAH2001A	DAH2002A
<b>ELECTRICAL DATA</b>				
<b>Rated Voltage</b>	<b>115</b>	<b>230</b>	<b>115</b>	<b>230</b>
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
<b>HEATING PERFORMANCE</b>				
<b>Watts</b>	<b>100</b>	<b>100</b>	<b>200</b>	<b>200</b>
<b>UNIT CONSTRUCTION</b>				
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	4.00/102	4.00/102

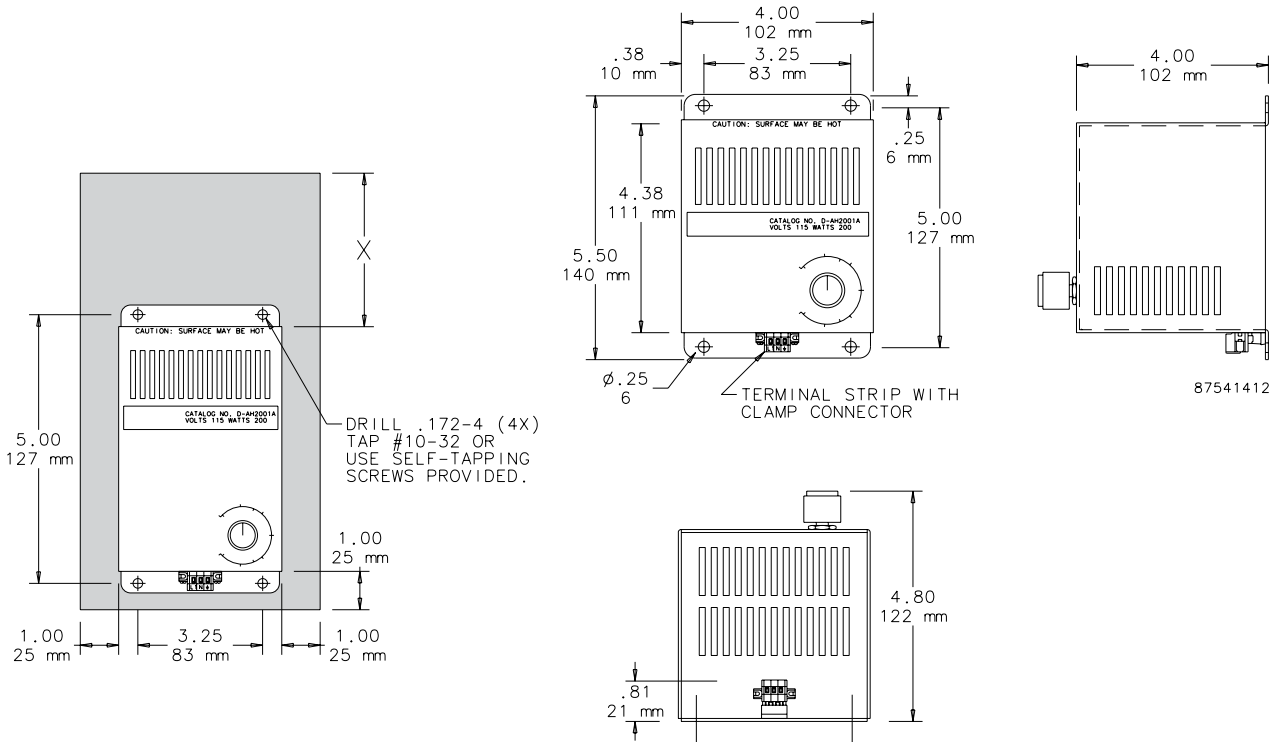
Performance Data **400 and 800 Watt Heaters**

CATALOG NUMBERS				
	DAH4001B	DAH4002B	DAH8001B	DAH8002B
<b>ELECTRICAL DATA</b>				
<b>Rated Voltage</b>	<b>115</b>	<b>230</b>	<b>115</b>	<b>230</b>
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
<b>HEATING PERFORMANCE</b>				
<b>Watts</b>	<b>400</b>	<b>400</b>	<b>800</b>	<b>800</b>
<b>UNIT CONSTRUCTION</b>				
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

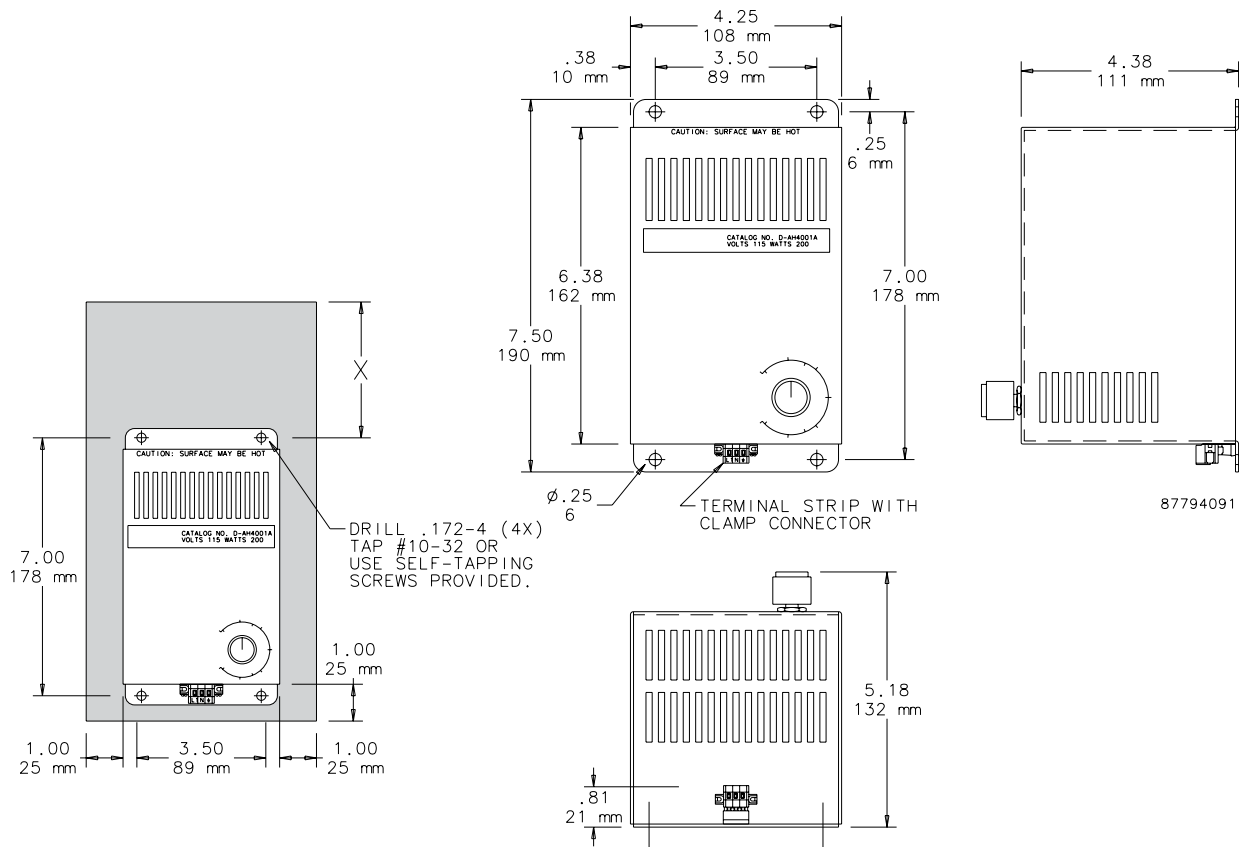
Performance Data **1300 Watt Heaters**

CATALOG NUMBERS		
	DAH13001C	DAH13002C
<b>ELECTRICAL DATA</b>		
<b>Rated Voltage</b>	<b>115</b>	<b>230</b>
Frequency (Hz)	50/60	50/60
Power Consumption (Watts)	1300	1300
Nominal Current (Amps)	11.5	5.7
<b>HEATING PERFORMANCE</b>		
<b>Watts</b>	<b>1300</b>	<b>1300</b>
<b>UNIT CONSTRUCTION</b>		
Weight (lb./kg)	3.4/1.54	3.4/1.54
X (in./mm)	8.00/203	8.00/203

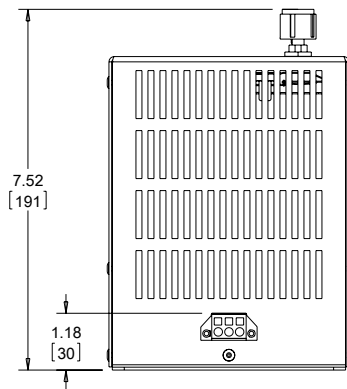
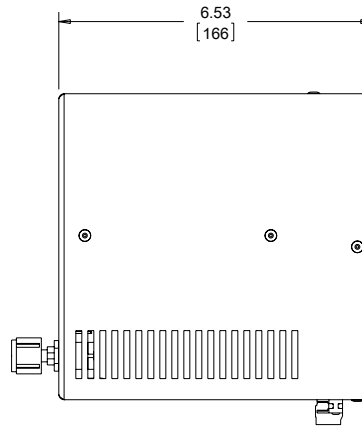
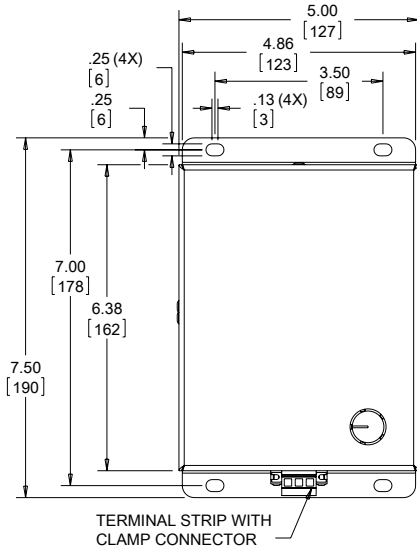
Dimensions and Clearance Range Drawing for DAH1001A, -2A and DAH2001A, -2A



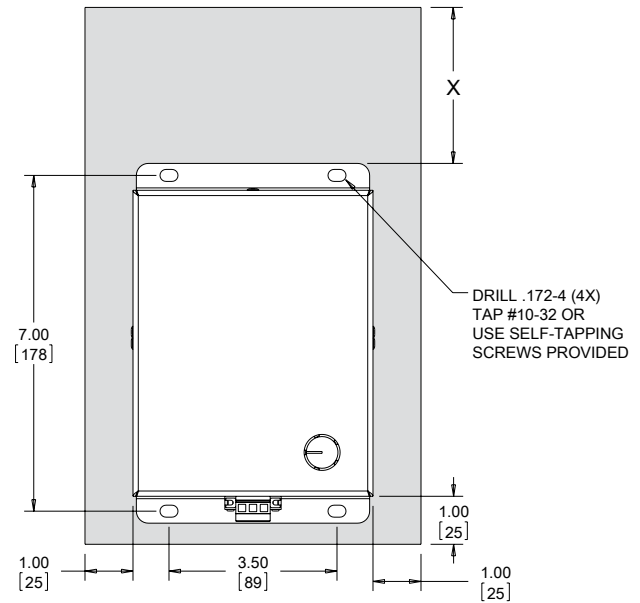
Dimensions and Clearance Range Drawing for DAH4001B, -2B and DAH8001B, -2B



Dimensions and Clearance Range Drawing for DAH13001C and DAH13002C



89091692



## Watertight Devices

20A, 125/250V AC 3P 3W

# Twist-Lock® Receptacle

# HUBBELL

## Features

- Impact resistant PBT lid, cover plate, and receptacle body
- Thermoplastic elastomer seal
- Stainless steel hardware and corrosion-resistant connection points

## Ordering Information

Description	Device Color	UPC Number	Catalog Number
Thermoplastic elastomer yellow receptacle	Yellow	783585456638	HBL67W08

## Listings

IP69K rating  
Listed to UL498  
Certified to CSA C22.2 No. 42  
Meets NEMA WD-1, WD-6 and ANSI standards  
UL Listed, CSA Certified to Type 4, 4X, 12, 6, 6P

## Specifications

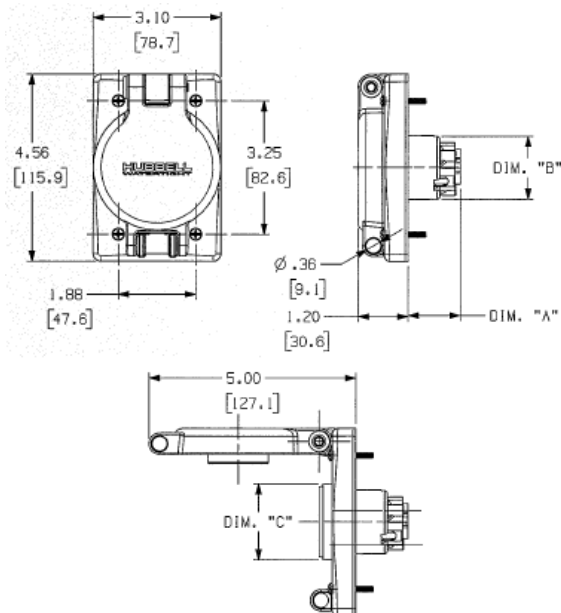
Body	PBT
Contact Carrier	White Nylon
Terminal Retainer	Clear polycarbonate
Contacts	Nickel plated brass
Core	White Nylon
Terminal Screws	Nickel plated brass
Hardware	Stainless Steel

## Performance

Electrical	
Current Interrupting	Rated for current interruption per UL498
Dielectric Voltage	2500V AC
Max Working Voltage	As marked
Temperature Rise	30°C max per UL498 at rated current

## Environmental

Moisture Resistance	UL Listed 4, 4X, 12, 6, 6P
Operating temperatures	-40°C (without impact) to +60°C continuous
UV resistance	All exposed materials are UV stabilized



## Complementary Products

Watertight Plug

HBL26W08

## Online Resources

Customer Use Drawing  
eCatalog  
Installation Instructions

Dimensions in Inches (mm)

Hubbell Wiring Device-Kellems • Hubbell Incorporated (Delaware) • 40 Waterview Drive • Shelton, CT 06484

Phone (800) 288-6000 • Fax (800) 255-1031 • Specifications subject to change without notice.





Hammond  
Power Solutions

GUELPH, ONT. BARABOO, WI. COMPTON, CA MONTERREY, MX



31GW E258346

SINGLE PHASE DRY TYPE TRANSFORMER  
TRANSFORMATEUR SEC MONOPHASE

HV/HT 240 X 480V

BIL -

TERM. BORNES H1 H3 H2 H4

VOLTS	CURRENT COURANT	% RATED VOLTAGE % TENSION NOMINALE	CONNECTION EACH PHASE CONNEXION PAR PHASE

LV/BT 120/240V

BIL -

TERM. BORNES X4 X2 X3 X1

Cust. Ref. / Réf. du client

Serial No. / No. de série

Part No. / No. de pièce Q005LEKF7

kVA 5

TYPE HZQ

Cooling / Refroidissement ANC

Temp. Rise / Echauffement 115 °C

Temp. Class / Classe de Temp. 180 °C

Frequency / Fréquence 60 Hz

Impédance % @ 135 °C 3.6

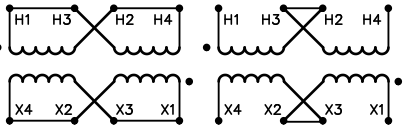
Encl. Type / Type de boîtier 4X

Wt LBS / Poids en lbs. 135

Winding / Enroulement CU

GENERAL PURPOSE TRANSFORMER  
FOR USE IN HAZARDOUS LOCATIONS  
ABS CERT. NO.14-HS1174640-PDA  
SPACINGS BETWEEN ANY VENTILATED ENCLOSURE PANEL AND  
ANY ADJACENT WALL SHALL BE A MINIMUM OF 1 INCHES  
ELECTROSTATIC SHIELD

TEMPERATURE CLASSIFICATION: T3A



00010035b



TITLE: 1PH DISTRIBUTION TRANSFORMER  
NAMEPLATE INFORMATION

1	12/10/11	PB	CORRECTED ENCL DIM	DES: RBHATIA
NO.	DATE	BY	REVISION	SCALE: NTS

SHEET 1 OF 3

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# HPS TITAN

## General Purpose Transformer for use in Hazardous Locations

Class I, Division 2, Groups A, B, C, & D  
 Class I, Zone 2, Group IIC, T3  
 Hazardous Locations

**WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.**  
**WARNING - EXPLOSION HAZARD - SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.**

LAB62181



**Hammond Power Solutions Inc.**

TITLE: 1PH DISTRIBUTION TRANSFORMER

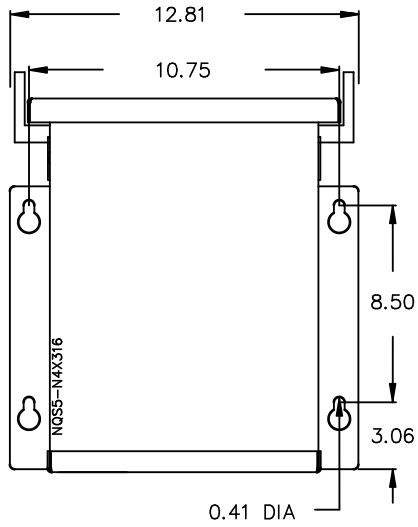
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NO.	DATE	BY	REVISION	SCALE: NTS

SHEET 2 OF 3

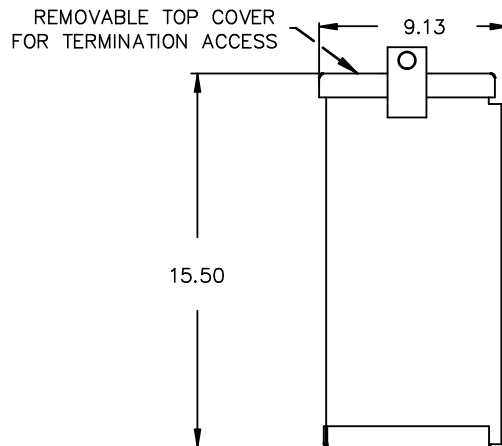
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FRONT VIEW



SIDE VIEW



All Dimensions in inches

ENCLOSURE COLOR :316 STAINLESS STEEL

CUSTOMER NOTES:

- HV1 TERMINATED AT LEADS
- LV1 TERMINATED AT LEADS
- C/W STAINLESS STEEL NAMEPLATE



**Hammond Power Solutions Inc.**

TITLE: 1PH DISTRIBUTION TRANSFORMER

1	12/10/11	PB	CORRECTED ENCL DIM	DES: RBHATIA
				DATE: 10/09/30
NO.	DATE	BY	REVISION	SCALE: NTS

SHEET 3 OF 3

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# Beacons

## Flashing Xenon

### 94 Series

Edwards 94 Series Xenon strobe beacons are heavy-duty visual signals suitable for use where more frequent and longer lasting signaling cycles may be required. Optically designed fresnel lenses improve viewer perception for indoor and outdoor applications. The base is cast metal and can be utilized as a junction box.

The 94DF Series offers a double flash model that doubles the apparent strobe on-time (50 double flashes per minute). Trigger and timing circuits are included as integral parts of the power supply.

Replacement costs are reduced, as it is necessary to replace only the strobe tube.

The 94DV2 Series Division 2 Xenon strobe beacons are high profile visual signals suitable for outdoor and wet locations requiring a UL Listed, NEMA Type 4X enclosure. The 94DDV2 Series is Diode Polarized for use in electrically supervised circuits. Both versions can be conduit mounted.

### Features and Specifications

- Xenon strobe light source
- Cast base can function as a junction box
- Optically designed fresnel lenses
- Suitable for indoor and outdoor applications
- For outdoor use, lens should face up
- Conduit mounting
- NEMA Type 4X enclosure
- Class I, Div 2, Groups A, B, C and D; Class II, Div 2, Groups F and G; Class III, (94DV2 and 94DDV2)



8 1/16"



### Ordering Information

Description	Cat. No.	Operating Voltage <sup>1</sup>	Current	Lens Colors	Flash Rate	Peak Candela	Replacement		
							Lens	Dome	Strobe Tube
Xenon Strobe Single Flash	94A-N5	120V AC	0.1 A	Amber	65 fpm	800,000	93-LA	94-DC	92-ST 3,000 hour <sup>2</sup>
	94B-N5	120V AC	0.1 A	Blue	65 fpm	800,000	93-LB		
	94C-N5	120V AC	0.1 A	Clear	65 fpm	800,000	93-LC		
	94G-N5	120V AC	0.1 A	Green	65 fpm	800,000	93-LG		
	94M-N5	120V AC	0.1 A	Magenta	65 fpm	800,000	93-LM		
	94R-N5	120V AC	0.1 A	Red	65 fpm	800,000	93-LR		
	94A-R5	240V AC	0.05 A	Amber	65 fpm	800,000	93-LA		
	94B-R5	240V AC	0.05 A	Blue	65 fpm	800,000	93-LB		
	94C-R5	240V AC	0.05 A	Clear	65 fpm	800,000	93-LC		
	94G-R5	240V AC	0.05 A	Green	65 fpm	800,000	93-LG		
Xenon Strobe Double Flash	94DFA-N5	120V AC	0.1 A	Amber	50 dfpm	1,100,000	93-LA	94-DC	92-ST 3,000 hour <sup>2</sup>
	94DFB-N5	120V AC	0.1 A	Blue	50 dfpm	1,100,000	93-LB		
	94DFC-N5	120V AC	0.1 A	Clear	50 dfpm	1,100,000	93-LC		
	94DFG-N5	120V AC	0.1 A	Green	50 dfpm	1,100,000	93-LG		
	94DFM-N5	120V AC	0.1 A	Magenta	50 dfpm	1,100,000	93-LM		
	94DFR-N5	120V AC	0.1 A	Red	50 dfpm	1,100,000	93-LR		
	94DFA-R5	240V AC	0.05 A	Amber	50 dfpm	1,100,000	93-LA		
	94DFB-R5	240V AC	0.05 A	Blue	50 dfpm	1,100,000	93-LB		
	94DFC-R5	240V AC	0.05 A	Clear	50 dfpm	1,100,000	93-LC		
	94DFG-R5	240V AC	0.05 A	Green	50 dfpm	1,100,000	93-LG		
	94DFM-R5	240V AC	0.05 A	Magenta	50 dfpm	1,100,000	93-LM		
	94DFR-R5	240V AC	0.05 A	Red	50 dfpm	1,100,000	93-LR		

<sup>1</sup>AC voltage frequency is 50/60 Hz

<sup>2</sup>Calculated at operating power to 75% efficiency.





# Beacons

## Flashing Xenon

### 94 Series

Ordering Information		Continued							
Description	Cat. No.	Operating Voltage <sup>1</sup>	Current	Lens Colors	Flash Rate	Peak Candela	Replacement		
							Lens	Dome	Strobe Tube
Xenon Strobe Haz Loc AC	94DV2A-N5	120V AC	0.1 A	Amber	65 fpm	800,000	93-LA		
	94DV2B-N5	120V AC	0.1 A	Blue	65 fpm	800,000	93-LB		
	94DV2C-N5	120V AC	0.1 A	Clear	65 fpm	800,000	93-LC	94DV2-DC	92-ST 3,000 hour <sup>2</sup>
	94DV2G-N5	120V AC	0.1 A	Green	65 fpm	800,000	93-LG		
	94DV2M-N5	120V AC	0.1 A	Magenta	65 fpm	800,000	93-LM		
	94DV2R-N5	120V AC	0.1 A	Red	65 fpm	800,000	93-LR		
Xenon Strobe Haz Loc DC Diode Polarized	94DDV2A-G1	24V DC	1.2 A	Amber	65 fpm	800,000	93-LA		
	94DDV2B-G1	24V DC	1.2 A	Blue	65 fpm	800,000	93-LB		
	94DDV2C-G1	24V DC	1.2 A	Clear	65 fpm	800,000	93-LC	94DV2-DC	92-ST 3,000 hour <sup>2</sup>
	94DDV2G-G1	24V DC	1.2 A	Green	65 fpm	800,000	93-LG		
	94DDV2M-G1	24V DC	1.2 A	Magenta	65 fpm	800,000	93-LM		
	94DDV2R-G1	24V DC	1.2 A	Red	65 fpm	800,000	93-LR		

<sup>1</sup>AC voltage frequency is 50/60 Hz

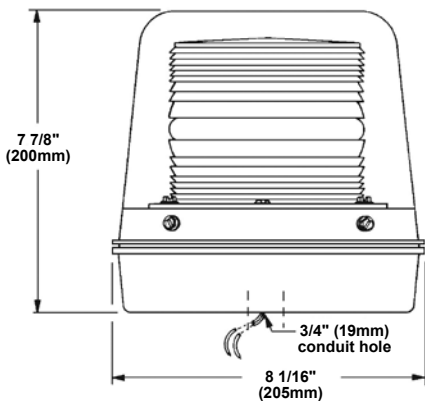
<sup>2</sup>Calculated at operating power to 75% efficiency.

Hazardous Location Listings				
Cat. No.	Class	Division	Group	Operating Temperature Code
94DV2*-N5	I	2	A, B, C, D	T3 (200°C, 392°F)
	II	2	F, G	T6 (85°C, 185°F)
	III			T6 (85°C, 185°F)
94DDV2*-G1	I	2	A, B, C, D	T3 (200°C, 392°F)
	II	2	F, G	T6 (85°C, 185°F)
	III			T6 (85°C, 185°F)

\*Letter in this position designates lens color: A - amber, B - blue, C - clear, G - green, M - magenta, or R - red

Weights and Dimensions		
Cat. No.	Approx. Net Weight (lb.)	Approx. Shipping Weight (lb.)
94*-N5	5.53	6.10
94*-R5	5.53	6.10
94DF*-N5	5.53	6.10
94DF*-R5	5.53	6.10
94DV2*-N5	5.53	6.10
94DDV2*-G1	5.60	6.18

\*Letter in this position designates lens color: A - amber, B - blue, C - clear, G - green, M - magenta or R - red



## Product Selection

## UNIPAK Low Voltage Fixed Capacitor Banks

2

UNIPAK



## 240 Vac UNIPAK Selection Chart

kvar	Rated Current (Amperes)	Enclosure	Shipping Weight in Lb (kg)	Catalog Number
1	2.4	A1	18 (8)	123PMURF
1.5	3.6	A1	18 (8)	1X23PMURF
2	4.8	A1	19 (9)	223PMURF
2.5	6	A1	19 (9)	2X23PMURF
3	7.2	A1	19 (9)	323PMURF
4	9.6	A1	20 (9)	423PMURF
5	12	A2	29 (13)	523PMURF
6	14.4	A2	29 (13)	623PMURF
7.5	18	A2	30 (14)	7X23PMURF
8	19.2	A2	31 (14)	823PMURF
10	24	A2	31 (14)	1023PMURF
12.5	30	A2	32 (14)	12X23PMURF
15	36	A2	33 (15)	1523PMURF
17.5	42	B1	44 (20)	17X23PMURF
20	48	B1	45 (20)	2023PMURF
22.5	54	B1	46 (21)	22X23PMURF
25	60	B1	46 (21)	2523PMURF
30	72	B1	47 (21)	3023PMURF
32.5	78	C1	47 (22)	32X23PMURF
35	84	C1	48 (22)	3523PMURF
37.5	90	C1	60 (27)	37X23PMURF
40	96	C1	64 (29)	4023PMURF
42.5	102	C1	65 (30)	42X23PMURF
45	108	C1	66 (30)	4523PMURF
50	120	C1	68 (31)	5023PMURF
60	144	C1	69 (31)	6023PMURF
70	168	C2	99 (45)	7023PMURF
75	180	C2	100 (46)	7523PMURF
80	192	C2	101 (46)	8023PMURF
90	216	C2	103 (47)	9023PMURF
100	240	D1	104 (47)	10023PMURF
120	288	D1	133 (60)	12023PMURF
140	336	E1	137 (62)	14023PMURF
150	360	E1	140 (64)	15023PMURF
160	384	E1	175 (80)	16023PMURF
180	432	E1	182 (83)	18023PMURF
200	480	E1	189 (86)	20023PMURF

**Notes**

Multiply the 240 Vac kvar rating by 0.75 to calculate the kvar value at 208 Vac.

Fused with blown-fuse indication available standard. Non-fused and no lights also available—please consult the factory.

Other ratings available, consult factory.

For dimensional information, refer to **Page V3-T2-61**.

**Part Numbers:**

PMURF—three fuses + three lights

PMURN—non-fused

**480 Vac UNIPAK Selection Chart**

kvar	Rated Current (Amperes)	Enclosure	Shipping Weight in Lb (kg)	Catalog Number
1.5	1.8	A1	17 (8)	1X43PMURF
2	2.4	A1	18 (8)	243PMURF
2.5	3	A1	18 (8)	2X43PMURF
3	3.6	A1	19 (9)	343PMURF
4	4.8	A1	19 (9)	443PMURF
5	6	A1	19 (9)	543PMURF
6	7.2	A1	19 (9)	643PMURF
7.5	9	A1	20 (9)	7X43PMURF
8	9.6	A1	20 (9)	843PMURF
9	10.8	A1	20 (9)	943PMURF
10	12	A1	20 (9)	1043PMURF
12.5	15	A2	29 (13)	12X43PMURF
15	18	A2	29 (13)	1543PMURF
17.5	21	A2	30 (14)	17X43PMURF
20	24	A2	31 (14)	2043PMURF
22.5	27	B1	44 (20)	22X43PMURF
25	30	A2	32 (15)	2543PMURF
27.5	33	B1	44 (20)	27X43PMURF
30	36	B1	44 (20)	3043PMURF
32.5	39	B1	45 (20)	32X43PMURF
35	42	B1	45 (20)	3543PMURF
37.5	45	B1	46 (21)	37X43PMURF
40	48	B1	46 (21)	4043PMURF
42.5	51	B1	47 (21)	42X43PMURF
45	54	B1	47 (22)	4543PMURF
50	60	B1	48 (22)	5043PMURF
55	66	C1	48 (22)	5543PMURF
60	72	C1	48 (22)	6043PMURF
65	78	C1	64 (29)	6543PMURF
70	84	C1	65 (30)	7043PMURF
75	90	C1	65 (30)	7543PMURF
80	96	C1	66 (30)	8043PMURF
85	102	C1	68 (31)	8543PMURF
90	108	C1	68 (31)	9043PMURF
100	120	C1	69 (31)	10043PMURF
120	144	C2	69 (31)	12043PMURF
125	150	C2	99 (45)	12543PMURF
140	168	C2	100 (46)	14043PMURF
150	180	C2	101 (46)	15043PMURF
160	192	D1	103 (47)	16043PMURF
180	216	D1	104 (47)	18043PMURF
200	240	D1	137 (62)	20043PMURF
225	270	D1	140 (64)	22543PMURF
250	300	E1	170 (77)	25043PMURF
300	360	E1	175 (80)	30043PMURF
350	420	E1	182 (83)	35043PMURF
400	480	E1	189 (86)	40043PMURF

**600 Vac UNIPAK Selection Chart**

kvar	Rated Current (Amperes)	Enclosure	Shipping Weight in Lb (kg)	Catalog Number
5	4.9	A1	19 (9)	563PMURF
7.5	7.4	A1	19 (9)	7X63PMURF
10	9.8	A1	20 (9)	1063PMURF
12.5	12.3	A1	20 (9)	12X63PMURF
15	14.7	A2	29 (13)	1563PMURF
17.5	17.2	A2	29 (13)	17X63PMURF
20	19.6	A2	30 (14)	2063PMURF
22.5	22.1	B1	44 (20)	22X63PMURF
25	24.5	B1	31 (14)	2563PMURF
27.5	27.0	B1	44 (20)	27X63PMURF
30	29.4	B1	45 (20)	3063PMURF
32.5	31.9	B1	45 (20)	32X63PMURF
35	34.3	B1	46 (21)	3563PMURF
37.5	36.8	B1	46 (21)	37X63PMURF
40	39.2	B1	47 (21)	4063PMURF
42.5	41.7	B1	47 (22)	42X63PMURF
45	44.1	B1	48 (22)	4563PMURF
50	49.0	B1	48 (22)	5063PMURF
55	53.9	C1	64 (29)	5563PMURF
60	58.8	C1	64 (29)	6063PMURF
65	63.7	C1	65 (30)	6563PMURF
70	68.6	C1	65 (30)	7063PMURF
75	73.5	C1	66 (30)	7563PMURF
80	78.4	C1	68 (31)	8063PMURF
85	83.3	C1	68 (31)	8563PMURF
90	88.2	C1	69 (31)	9063PMURF
100	98.0	C1	69 (31)	10063PMURF
120	117.6	C2	99 (45)	12063PMURF
125	122.5	C2	100 (46)	12563PMURF
140	137.2	C2	101 (46)	14063PMURF
150	147.0	C2	103 (47)	15063PMURF
160	156.8	D1	135 (61)	16063PMURF
180	176.4	D1	137 (62)	18063PMURF
200	196.0	D1	140 (64)	20063PMURF
225	220.5	D1	143 (65)	22563PMURF
250	245.0	E1	170 (77)	25063PMURF
300	294.0	E1	175 (80)	30063PMURF
350	343.0	E1	182 (83)	35063PMURF
400	392.0	E1	189 (86)	40063PMURF

**Notes**

Fused with blown-fuse indication available standard.  
 Non-fused and no lights also available—please consult the factory.  
 Other ratings available, consult factory.  
 For dimensional information, refer to **Page V3-T2-61**.

Part Number  
 PMURF—three fuses + three lights  
 PMURN—non-fused

## UNIPAK—with Harmonic Cells

## 2

## Harmonic Cells



## Low Voltage Fixed Capacitor Systems with Heavy-Duty Cells

kvar	Rated Current (Amperes)	Case Size	Shipping Weight in Lb (kg)	Catalog Number
<b>240 V</b>				
15	36	B1	38.4 (17)	1523HURF
25	60	B1	38.4 (17)	2523HURF
30	72	C1	55.2 (25)	3023HURF
50	120	C1	57.6 (26)	5023HURF
60	144	C2	100.8 (46)	6023HURF
75	180	C2	104.4 (47)	7523HURF
100	240	D1	136.8 (62)	10023HURF
125	300	E1	189.6 (86)	12523HURF
<b>480 V</b>				
15	18	B1	25.2 (11)	1543HURF
25	30	B1	37.2 (17)	2543HURF
30	36	B1	38.4 (17)	3043HURF
50	60	C1	39.6 (18)	5043HURF
60	72	C1	52.8 (24)	6043HURF
75	90	C2	55.2 (25)	7543HURF
100	120	C2	57.6 (26)	10043HURF
125	150	D1	100.8 (46)	12543HURF
150	180	D1	104.4 (47)	15043HURF
200	240	E1	136.8 (62)	20043HURF
250	300	E1	186.0 (84)	25043HURF
<b>600 V</b>				
15	14.7	B1	37.2 (17)	1563HURF
25	24.5	B1	38.4 (17)	2563HURF
30	29.4	B1	39.6 (18)	3063HURF
50	49	C1	55.2 (25)	5063HURF
60	58.8	C1	57.6 (26)	6063HURF
75	73.5	C2	100.8 (46)	7563HURF
100	98	C2	104.4 (47)	10063HURF
125	122.5	D1	136.8 (62)	12563HURF
150	147	D1	136.8 (62)	15063HURF
200	196	E1	186.0 (84)	20063HURF
250	245	E1	189.6 (86)	25063HURF

**Notes**

Fused with blown-fuse indication standard.

Other ratings available, consult factory.

# Specification

## MultiSmart Pump Station Manager Specification

**MULTISMART CONTROLLER - 3 PUMPS**  
**\* WITH MOTOR PROTECTION 3MP**



<b>Document</b>	MultiSmart Pump Station Manager
<b>Date</b>	October 16, 2012
<b>Revision</b>	5.03
<b>MultiSmart version</b>	3.0.3

# Specification

## MultiSmart Pump Station Manager Specification

### 1 Functionality

The Pump Station Manager shall provide “Out of the box” control of a typical pump station, with an intuitive user-interface. The product shall come with pre-built configuration parameters which are selectable via the user interface, including:

- Functionality for advanced pump control of up to 6 pumps
- Pump mode, for each pump, between Auto/ Manual / Off
  - In manual control (semi-automatic manual) pump switches off at deactivation setpoint and reverts to Auto mode to prevent accidental pump run on
  - To pump beyond off set point in manual button must be held down (full manual)
- Setpoint adjustment for pump activation/deactivation and level alarms
- Level device from 4-20mA, conductive probe or remote level
  - Redundant level device handling
- Selectable between fill / empty
- Functionality for advanced pump control of up to 6 pumps including grouping and alternation
- Station optimization including
  - Max off time (odour reduction)
  - Maximum pumps to run (overload protection)
  - Maximum starts per hour (pump protection)
  - Inter-pump start and stop delays
  - Maximum run time (turn off inefficient or partially blocked pumps)
  - Blocked pump detection
  - Well washer controls
  - Well clean out (periodic pump down to snore point)
  - Pump groups with different configurations (e.g. alternation schemes) for each group
- “Locked level” alarm to indicate level device problem
  - User-defined % change within a time period
  - Different values for low use, high use times (user defined)
- Alternation schemes including:
  - Fixed lead/duty
  - Alternation
  - Alternation N:1 (e.g., 3:1)
  - Run most efficient pump, N:1 ratio, e.g. more efficient pump runs 20 times for each operation of the less efficient pump(s)
  - Alternation by hours run or starts
- Pump decommission/commission
  - Decommissioned pump automatically removed from control algorithm, alarms, displays, etc
  - SCADA tag flags decommissioned status

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## MultiSmart Pump Station Manager Specification

- Six profiles of setpoints for spill management, off peak pumping, tariffing, etc
  - Automatic profile change on date/time
  - Selectable from SCADA, digital input, logic tag or faceplate
  - Profile includes some pump control parameters – max no of pumps, max run time, max off time
- Datalogger for user-defined faults and events (process values)
  - 50,000 events to internal flash memory
  - 10,000,000 events by writing direct to Compact Flash card
  - Download event and fault log as csv to Compact Flash for Excel analysis
  - ftp transfer of event and fault log as csv for Excel analysis
- 3-phase supply monitoring and supply protection
  - Under-voltage
  - Over-voltage
  - Phase fail
  - Phase rotation
- Monitoring of dc supply, battery voltage, and internal temperature
- Energy, power and pump efficiency monitoring:
  - kW, kVA, power factor, kWhr, KVAH calculation for each pump
  - pump efficiency calculation (litres or gals per kWhr) for each pump
- Motor protection including:
  - 3-phase current monitoring for each pump
  - Over- and under-current trip
  - Ground/earth fault
  - Current phase imbalance fault
  - I<sup>2</sup>T fault
  - Insulation resistance testing for motor windings
    - Values and user-definable fault threshold
- Flow measurement/calculation
  - Calculated flow via draw down test
- VFD control algorithm
- Fault module with flexibility for any fault to
  - hold out pump(s) or be display only
  - auto-restart after user-defined time subsequent to fault condition clearing
  - auto-restart user-defined number of times (subsequent to fault condition clearing) before locking out
  - manual/ SCADA reset required
- Remote control via SCADA for
  - changing mode of pumps (auto/off/manual)
  - reset of pump and station faults
  - changing pump and alarm setpoints
  - changing setpoint profiles

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## MultiSmart Pump Station Manager Specification

- Security
  - Admin user sets PINs for access to configuration of the unit
  - Automatic datalogging of who has entered the configuration menu
  - Automatic logging of all unsuccessful login attempts with date/time
  - Digital input option, e.g. key switch, for access to configuration menu
- Compact Flash port allows
  - Firmware upgrades
  - Save/load configuration (allows backup to be restored, or configuration copied from another station)
  - Download datalogger in CSV
  - Export/import Modbus and DNP3 points list in csv format

## 2 Programmability

The product shall have the option of IEC61131-3 and IEC61499 compliant PLC programming language to enhance/interact with all the modules in the pump station manager.

The product shall have the option of a simple logic engine to enhance/interact with all the modules in the pump station manager.

## 3 I/O

The I/O shall be expandable to many hundreds of I/O points per unit.

Available I/O types shall include:

- Digital inputs (voltage free input), also configurable as counters
- Digital outputs (240V, 5A resistive)
- Analog inputs (10bit)
- Analog outputs (10bit)

### 3.1 Digital Inputs configurable for seal, thermistor, and other pump station requirements

Additionally, the Digital Inputs shall be selectable as pump station specific I/O to reduce components in the panel and therefore save cost, e.g. remove pump relays such as mini-CAS relays, MAS relays.

- Seal sensor (conductive)
- PTC Thermistor
- Flygt FLS & CLS
- Conductive probe (for liquid level sensing)

### 3.2 Specific I/O for motor protection and current/voltage monitoring

The product shall have I/O cards to minimise additional components which include:

- Insulation resistance test (IRT) to 1000v
- 3-phase current monitoring, derived from CT's, 0.5% resolution
- 3-phase supply monitoring, 0.5% resolution. Up to 630V phase to phase.



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## MultiSmart Pump Station Manager Specification

### 3.3 Support for Duo Probe

The product shall have an internal atmospheric pressure sensor to allow for atmospheric pressure sensing and correction.

## 4 User interface

The field hardware shall include a user interface for operations and configuration. The display shall provide status of most aspects of the pump station, control of pumps, resetting of faults, and configuration of parameters.

### 4.1 Status

The following parameters shall be displayed on the main screen:

- Level in user definable units eg %, metres or custom units
- Setpoints for alarms and pump start/stop
- Pump running/stopped
- Pump available/unavailable
- 3-phase current for each motor
- Faults
- 3-phase supply
- Date/time
- User-configurable option to display pump efficiency, flow rates, total starts, total hours run and other parameters

The screen will also have buttons to allow the user to access Faults, History, Information and Settings.

### 4.2 Information screens

The following parameters shall be available via a user key press from the main screen:

- Hours Run accumulators for each pump & the station with the following comparisons
  - last minutes run
  - this hour, last hour
  - today, yesterday
  - this week, last week
  - total hours run
- Starts accumulators for each pump & the station with the following comparisons
  - this hour, last hour
  - today, yesterday
  - this week, last week
  - total starts
- Flow values, either derived from calculations or via a flowmeter
  - Inflow
  - pump flow rate
  - total volume
  - overflow data, including start time, duration, estimated volume

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## MultiSmart Pump Station Manager Specification

- Power & efficiency
  - pump efficiency in litres or gals per kWhr - or KVAH
  - power in kW, KVA
  - power factor
  - energy accumulators per pump in kWhr and KVAH
- Insulation resistance value for each motor from 1000v test
- Status of all I/O
  - Digital I/O open/closed and accumulator
  - Analog I/O mA and scaled
  - 3-phase voltage, current, frequency, phase angle, power factor
- Database viewer to view all datapoints/tags in real time
- Communications stats

### 4.3 Control

The following aspects of the system, as a minimum, shall be controlled intuitively through the user-interface:

- Pump mode, for each pump, between Auto/ Manual (Hand)/ Off
- Pump fault reset
- Level alarm reset

### 4.4 Fault screen

The main screen shall include a Fault button which takes the user to a Fault screen and allows them to check all current and unacknowledged alarms.

The fault screen will detail the fault (e.g. contactor fail, seal fault, motor overtemp, over-current, etc) along with date/time each fault occurred and cleared.

A reset option for a fault will be presented to the user when faults can be acknowledged/reset.

### 4.5 History screen

The main screen shall include a History button which takes the user to a History screen

- View all date/time stamped faults and events
- Filter by pump or other station parameters, by time period
- Export via CSV for analysis in Excel

### 4.6 Configuration

The user interface should allow intuitive configuration of the system, including as a minimum:

- Setup Wizard to allow a complete configuration (display, IO and configuration of functional blocks) by the user answering simple questions
- Set-points, including alarm and pump setpoints
- Enable/disable level alarms (so that for example, the low level alarm can be easily activated or deactivated)
- Start, stop and alarm delays
- Alternation/ fixed sequence and grouping of pumps where necessary
- Configure I/O

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## MultiSmart Pump Station Manager Specification

- Assign primary/backup level to any input, e.g. 4-20mA or conductive probe
- Assign pre-defined (or user-defined) faults, e.g. thermal overload, contactor fail, to any digital input
- Zero and span analog inputs
- Set Digital outputs to change state with any digital tag in the system
- Set Analog outputs to follow any analog value, including primary level
- Fault configuration for each fault to either
  - display only
  - manual/SCADA reset before pump becomes available
  - auto-restart (after fault condition clears) with configurable restart time
  - auto-restart user-selectable number of times within time window before locking out
  - customized text for fault and event name
- Pump station optimization parameters such as:
  - Max off time (odour reduction)
  - Maximum pumps to run (overload protection)
  - Maximum starts per hour (pump protection)
  - Inter-pump start and stop delays
  - Maximum run time (turn off inefficient or partially blocked pumps)
  - Well washer controls
  - Well clean out (periodic pump down to snore point)
  - Random duty start (random time after activation point reached before pump starts) to reduce fat build up
  - Optimization parameters applied differently to different groups of pumps if required
- Supply protection
  - Under- and over-voltage alarm points
  - Volts phase imbalance and volts phase rotation
  - DC-supply alarm point
- Motor protection
  - Under-current
  - Over-current
  - Ground/earth fault
  - Phase fail
  - I<sup>2</sup>T protection
- Communications ports, speeds and addresses

The configuration of the unit will also allow the user to save a known good configuration on the unit itself that they can revert back to at any time.

# Specification

## MultiSmart Pump Station Manager Specification

### 4.7 Configuration backup and restore & Firmware upgrades

The Configuration interface will allow the user to save and restore configurations onto a SD card or USB storage device, to allow easy configuration from saved versions (or copying settings from one site to another).

The unit will allow the user to backup system log files, alarm and event log files, and custom scripts via the SD or USB ports.

The unit shall allow for the import of DNP3 and Modbus point lists and custom logic scripts via the SD or USB ports.

Firmware upgrades will be possible by copying the upgrade image onto a SD card, or USB storage device, then inserting into a field unit and cycling power.

### 4.8 Maintainability

The supplier shall also demonstrate that their system is maintainable in the future, especially that future applications do not incur any user-interface development cost on the customer, i.e., the user-interface shall be an integral part of the system.

## 5 Communications

Integral RTU/outstation

### 5.1 Physical

The product shall include:

- Two Ethernet ports to 10Mbit/s
- Two RS232 ports to 115kBit/s
- Two RS485 ports to 115kBit/s

### 5.2 Media

The system shall support a variety of media and communications networks including:

- TCP/IP
- UDP
- RS232
- RS485
- Private radio over RS232
- PSTN
- Wireless LAN
- Cellular data (via integral ppm module)
- Cellular voice

### 5.3 Protocols

DNP3 master & slave, level 2 compliant, including:

- Change of state reporting
- Native date/time and quality stamps for each data point
- Event buffering for different classes of data
- Support for multiple masters and slaves to be configured on the unit



# MTISB

## Intrinsically Safe Barrier

### Description:

The MTISB Intrinsically Safe Barrier is certified intrinsically safe for operation in hazardous applications.

Use with all Flygt equipment installations up to and including Class 1 Zone 0.

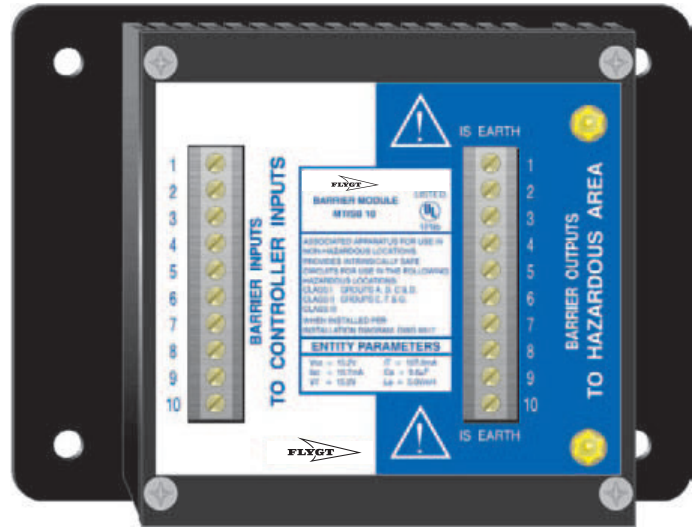
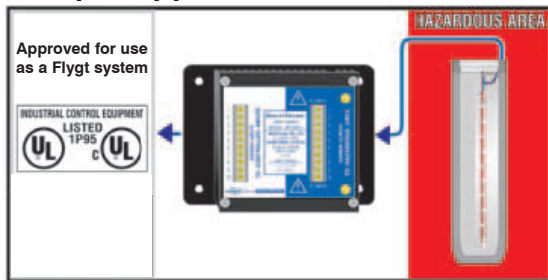
- Makes specified Flygt products intrinsically safe
- Compatible with all Flygt products
- Easily installed as an aftermarket upgrade

The MTISB is a 5 or 10 channel Barrier unit for use with the Flygt probes and control equipment. It will eliminate any risk of dangerous energy entering the explosive environment where the level probe is located. It is approved for use in sewerage pump stations, digesters, mining and most other hazardous installations.

Connection is made from the controller through the barrier to the Flygt probe located in the hazardous area. It is used to prevent any flash or spark-inducing energy from entering a hazardous area, that could lead to an explosion.

The MTISB is a certified Intrinsically Safe Barrier for use with Flygt equipment in installations up to and including Class 1, Zone 0.

### Sample Application



### Specifications

#### Protection Certifications:

- |                         |  |
|-------------------------|--|
| USA & Canadian<br>UL913 | UL Listing 1P95<br>Class I Groups A, B, C & D.<br>Class II Groups E, F & G.<br>Class III |
|-------------------------|--|

#### Installation & Apparatus Entity Values:

USA/Canada	MTISB-5	MTISB-10
Allowed System Voltage [VT]	15.2v	15.2v
Max Short circuit current [IT]	10.7mA	10.7mA
Allowed capacitance	0.6uF	0.6uF
Allowed inductance	20mH	5mH
Internal resistance	1500 Ohms . nom per/ch	
Barrier clamp voltage	22.8V.	

#### Other Connections:

- |                          |                             |
|--------------------------|-----------------------------|
| Intrinsically Safe Earth | 2x Brass studs Thread M4    |
| Terminal size            | 4mm <sup>2</sup> , #12 Wire |

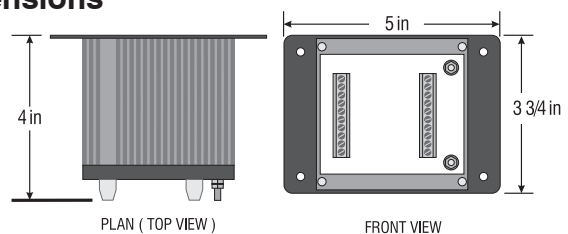
#### Physical Product:

- |               |                    |
|---------------|--------------------|
| Dimensions mm | 95H x 130W x 102D  |
| Mounting      | 4 x M4 Screws #6   |
| Enclosure     | Extruded aluminium |

#### Environmental Range:

- |                |                |
|----------------|----------------|
| - 10° to +60°C | +14° to +140°F |
|----------------|----------------|

### Dimensions



### ORDERING INFORMATION

P/N	Description
84-800061	5 Channel (5 sensor MTISB)
84-800060	10 Channel (10 sensor MTISB)

# CURRENT TRANSFORMERS

**Model 2**  
Window Diameters  
1.00", 1.05", 1.13"

**APPLICATION:**  
Generally for ammeter use only.

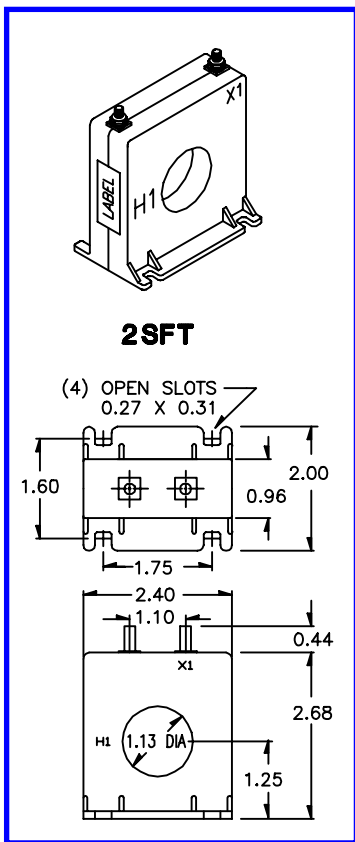
**FREQUENCY:**  
50-400 Hz.

**INSULATION LEVEL:**  
600 Volts, 10 kV BIL full wave.

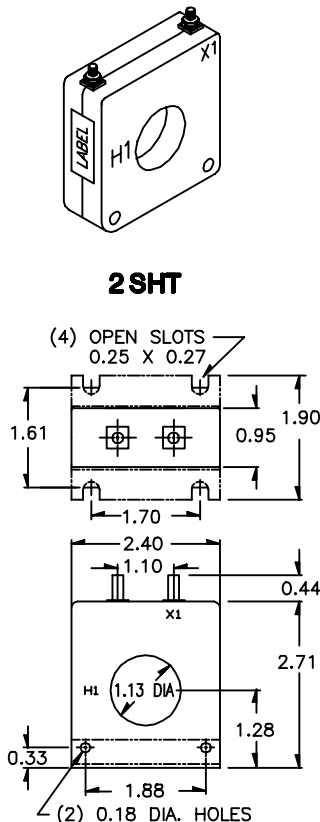
**RATING FACTOR:**  
2.0 @ 30°C amb.



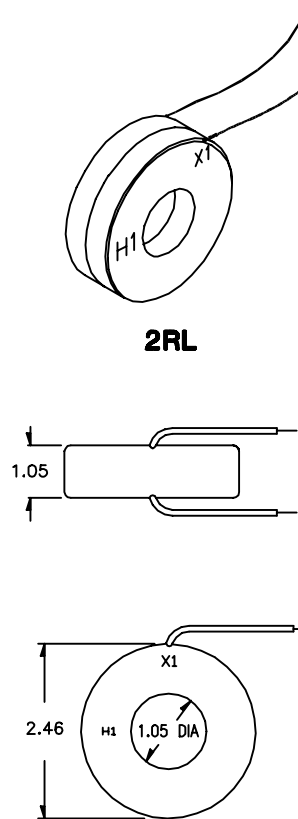
- Flexible leads are UL 1015 105 °C, CSA approved, #16 AWG, 24" long.
- Non-standard length to be specified.
- Terminals are brass studs No. 8-32 UNC with one flat washer, lockwasher and regular nut.
- SHT and SFT case styles also available as SHL and SFL with leads.
- Mounting bracket kit 0221B00839 when required for MODEL 2SHT.
- Approximate weight 0.5 lb.



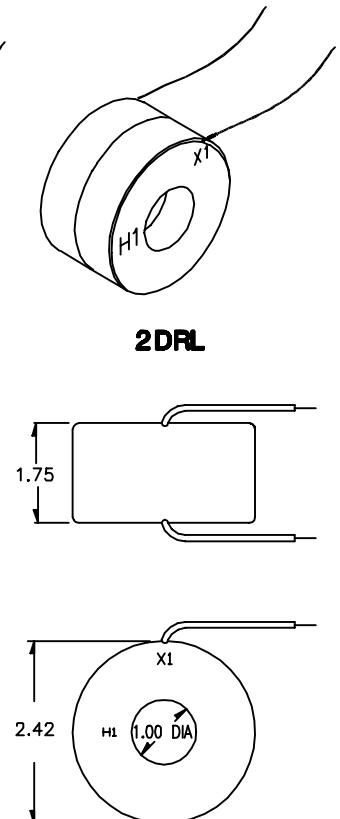
**2SFT**



**2SHT**



**2RL**



**2DRL**

CATALOG NUMBER	CURRENT RATIO	MODELS 2SFT, 2SHT, 2RL		MODEL 2DRL	
		ACCURACY AT 60 Hz	BURDEN VA AT 60 Hz	ACCURACY AT 60 Hz	BURDEN VA at 60 Hz
2**-500	50:5	± 3 %	2.0	± 2 %	1.5
2**-600	60:5	± 2 %	2.0	± 1 %	2.5
2**-750	75:5	± 2 %	2.0	± 1 %	3.5
2**-800	80:5	± 2 %	2.0	± 1 %	4.0
2**-101	100:5	± 1 %	2.0	± 1 %	5.0
2**-121	120:5	± 1 %	2.5	± 1 %	5.0
2**-1250	125:5	± 1 %	2.5	± 1 %	5.0
2**-151	150:5	± 1 %	4.0	± 1 %	8.0
2**-201	200:5	± 1 %	4.0	± 1 %	10.0
2**-251	250:5	± 1 %	6.0	± 1 %	12.5
2**-301	300:5	± 1 %	8.0	± 1 %	15.0

\*\* NOTE: When ordering, prefix Cat. No. with model designation required, i.e. 2SFT-301, 2RL-301, OR 2DRL-301, etc.