

Three-Phase Programmable Resettable Sectionalizer (3Ø PRS)

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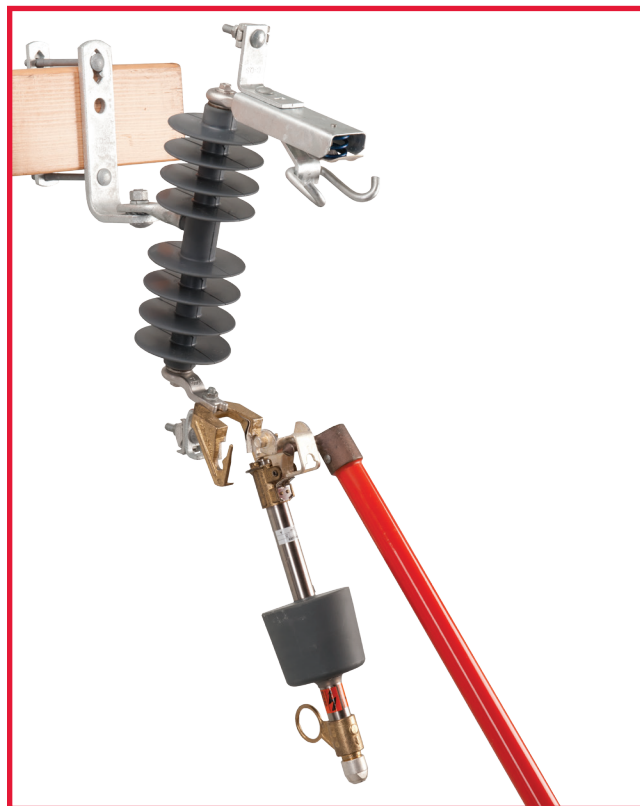
Three-Phase Programmable Resettable Sectionalizer

The Three-Phase Programmable Resettable Sectionalizer (3Ø PRS) is a device which has built-in intelligence to discriminate between temporary (transient) and permanent faults on three-phase distribution systems. It operates in conjunction with a 3-phase gang-operated automatic recloser. It is specifically designed for the protection of three-phase lateral lines. When installed at the beginning of the laterals, it virtually eliminates nuisance outages. Its functional concept and design greatly improve system coordination.

Traditionally, three-phase systems are protected by expulsion-type fused cutouts. These cutouts are intended to operate only during a permanent fault on the lateral by careful selection of fuse links to coordinate with an upstream three-phase automatic recloser or a three-phase circuit breaker. Unfortunately, proper coordination between fuse links and upstream three-phase recloser is unachievable above a few thousand amperes. Coordination, if achieved on paper can easily change as fault current increases due to larger capacity facilities, addition of larger substations or reconductoring. Errors in re-fusing is another way that three-phase system coordination can be lost.

The 3Ø PRS is a protective device designed to automatically sectionalize faults synchronously on all the three phases of a three-phase distribution system. Since the 3Ø PRS doesn't require time-current characteristics for its operation, the coordination range is extended to the maximum interrupting rating of the three-phase upstream protective device (Figure 1).

This difference in functionality makes the 3Ø PRS an ideal device for application on three-phase distribution laterals where available fault currents make recloser-fuse coordination unachievable. The synchronous operation of the 3Ø PRS also prevents three-phase imbalance. As the 3Ø PRS is programmable and resettable, it provides the utility with an economical and easy to retrofit method of enhancing protection of the distribution system.



The 3Ø PRS comprises three cutout mountings and three electronic modules with no mechanical link between the three units. The three electronic modules are integrated with 2.4GHz RF transceivers that require 10Amps load current to operate. The communication range is up to 20 feet (open air). A synchronous drop-out is achieved by all of the three 3Ø PRS units when a permanent fault is seen by any of the three units. The 3Ø PRS modules fit into the standard mounting of the Chance Type C, S&C (MPS) Type XS and ABB Type ICX cutout. This interchangeability reduces the cost of retrofit installation.

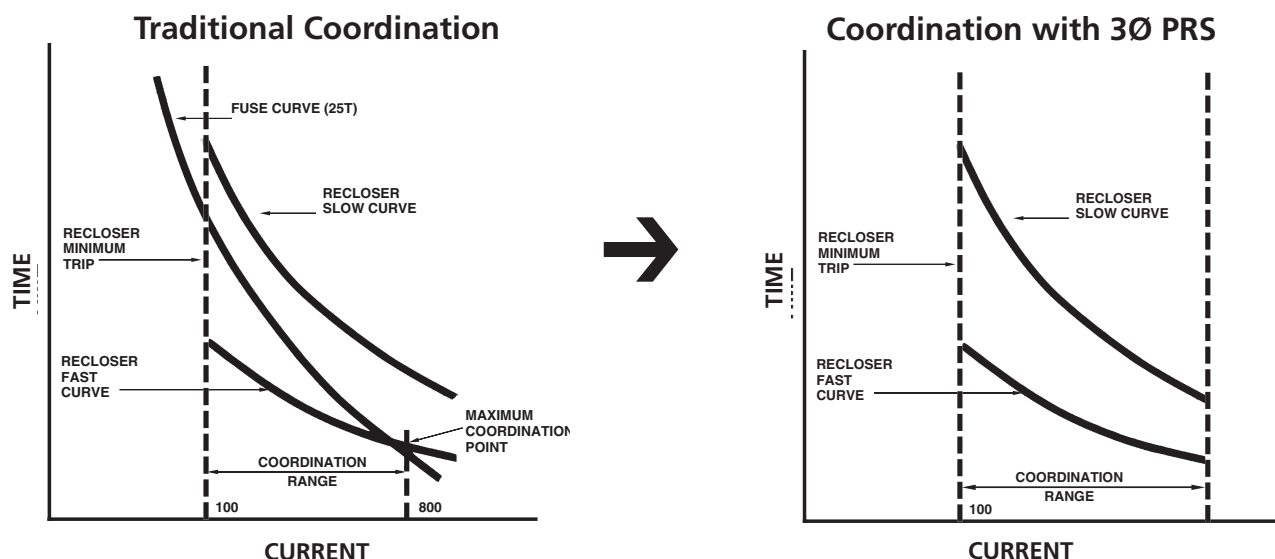


Figure 1. Addition of the 3Ø PRS eliminates the fuse curve and extends the coordination range.

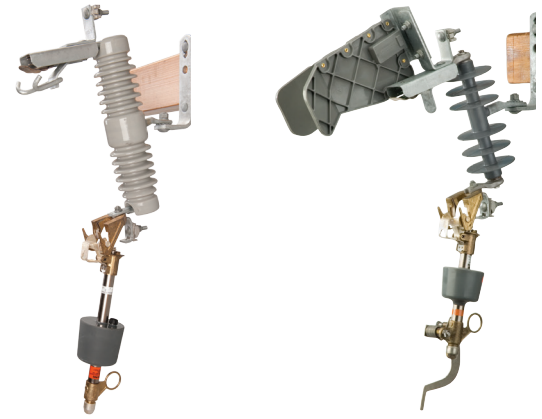
Application

The 3Ø PRS is best suited for use in the following applications:

- Locations where fuse coordination is difficult to achieve
- Areas with insufficient load to justify investments in apparatus such as reclosers
- Remote locations prone to frequent faults caused by fauna and/or flora

Benefits

- SAIDI improvements
- Distinguishes between permanent and transient faults to reduce outages
- Three programmable units meet all needs per specific voltage class reducing inventory
- Historical data storage, report generation for system overview and analysis
- Ability to record and track total number of the blinks on the line from the date of installation.
- Resettable in the cutout mounting base, no consumable parts



Drop-open operation is the same for both types of the 3Ø PRS: Standard (left) and Loadbreak (right, with Arc Chute interrupter). See following pages for specifications and ordering information.

Operation

The three modules of the 3Ø PRS are programmed to maintain a constant radio link when all the units are powered by at least 10A line current through the built in current transformer on each unit.

Each unit can detect fault current when the line current exceeds the programmed actuating current. The unit will sense the subsequent open circuit ("dead-line") condition of 500mA caused by the upstream recloser acting on the fault current. This event is registered as a "count".

If the fault is temporary and cleared before the "count" reaches the programmed "count", the unit does not operate and after the reset time expires, the "counts" is reset. If the fault is permanent, the unit will see multiple instances of fault current followed by recloser opening and in each instance, the "count" will be incremented.

After detecting the programmed number of "counts", the unit (detecting the fault) will use the radio link to command the other two units in the set to drop open. The radio signal communication and acknowledgement process is completed within 30 msec and upon receiving a positive acknowledgement from all units in the set, all 3 units will drop open within 20 msec of each other. Thus, all 3 phases of the faulted section will be isolated synchronously while the upstream recloser is in the open position, maintaining 3-phase system balance.

Trunnion Design

The Three-Phase PRS is equipped with a patent pending trunnion design which enables the sectionalizers to be reset while still in the cutout mounting base. If removal from the cutout mounting base is necessary, the sectionalizers can be manually reset using a wrench.



Push towards cutout to reset

**For Specifications,
see following pages.**

Three-Phase Programmable Resettable Sectionalizer

System Voltage:

The sectionalizer must have a voltage rating equal to or greater than the system voltage.

Continuous Current:

The sectionalizer must have a continuous current rating equal to or greater than the anticipated system load current plus overload.

Where hydraulic reclosers are used, the continuous current rating of the sectionalizer is typically equal to the continuous current rating of the upstream automatic circuit recloser.

For all 3 phases to operate as specified, the continuous current load on the line must also equal at least 10A. This allows for the radios to be 'ON' and capable of communicating during a dropout event.

Minimum Actuating Current:

The minimum actuating current of sectionalizers should be 80% of the phase minimum trip of the source side single-phase automatic circuit recloser (ACR). Where three-phase reclosers or circuit breakers are used, a user may want to coordinate the sectionalizer's actuating current with the ground trip rating.

Where hydraulic reclosers are used, this is easily accomplished by matching the sectionalizer and the recloser's continuous current ratings. The sectionalizer's minimum actuating current is 160% of its continuous current rating and the hydraulic reclosers' phase pick-up is 200% of its continuous current rating ($160/200=.80$). (Table A).

Deadline Current Threshold:

The deadline current threshold is the current the 3Ø PRS unit should see on the line in order to (1) increment its count, and (2) send an 'Open' signal to the other two 3Ø PRS units after the unit has reached its programmed number of counts.

The device verifies that the current on the line is below the 500mA programmed deadline current threshold for 80ms (5 cycles) before the synchronous trip signal is sent.

Number of Counts:

The sectionalizer should be set to operate in at least one less count than the backup recloser. Example: a 4-shot recloser would require a maximum of a 3-count sectionalizer downstream (Figure 2, line A).

In case of a 2-fast/2-slow reclose setting, a 2-count sectionalizer may be used to reduce the number of recloser operations (Figure 2, line B).

Where sectionalizers are used in series, the downstream sectionalizer should have one less count than the upstream sectionalizer (Figure 3).

Recloser	Typical Sectionalizer Ratings	
Minimum Trip, Amps	Minimum Actuating Current, Amps $\pm 10\%$	Continuous Current, Amps
30	24	15
50	40	25
70	56	35
100	80	50
140	112	70
200	160	100
280	224	140
400	320	200

Table A. Recloser/sectionalizer coordination.

NOTE: In order for the devices to meet the deadline threshold of 500mA it is important to ensure that no backfeed, e.g., capacitor banks, generators, etc. downstream from the sectionalizers is reverse loading the line.

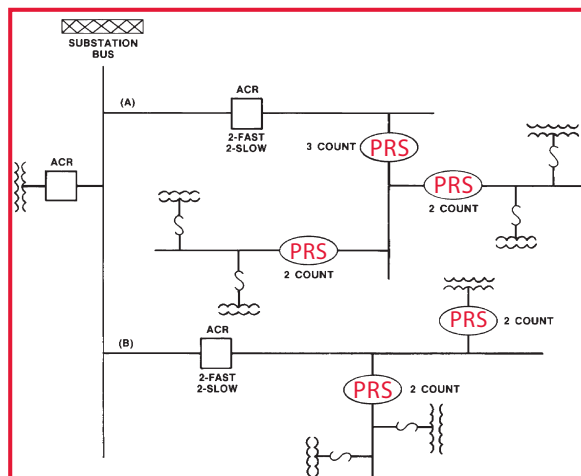


Figure 2. Typical distribution system with Type PRS two- and three-count electronic resettable sectionalizers.

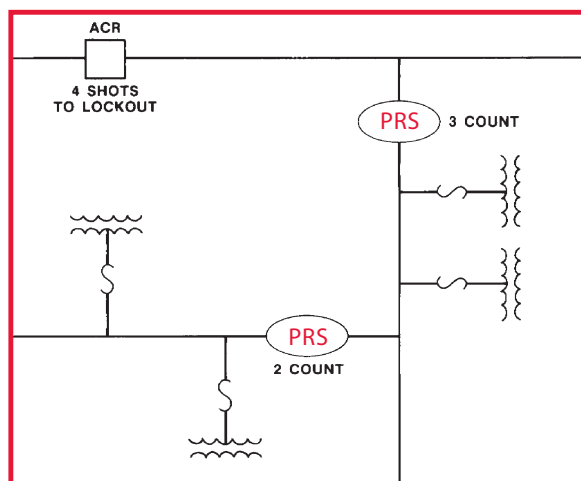


Figure 3. Coordination of sectionalizers in series.

Three-Phase Programmable Resettable Sectionalizer

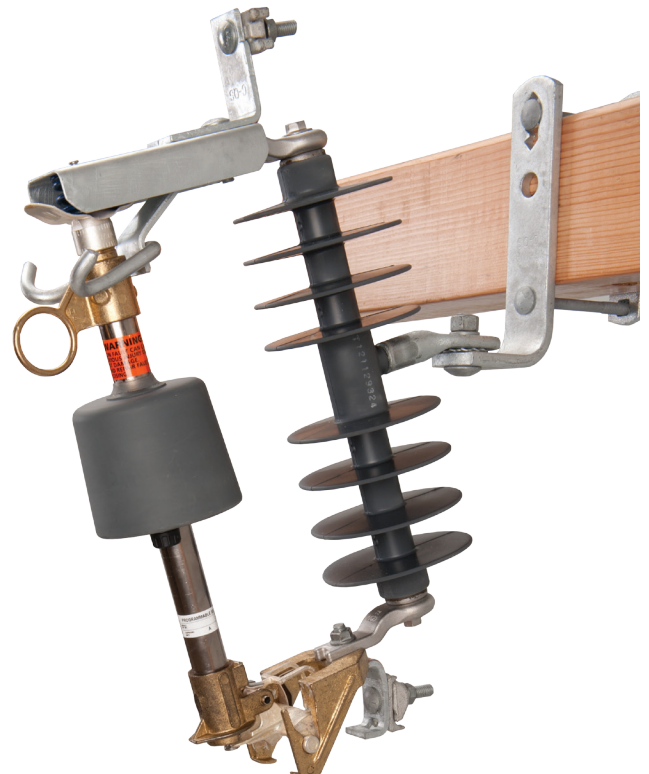
Technical Specifications

Rated Power Frequency	60 Hz/50 Hz
Rated Voltage (BIL)	15kV (110kV BIL) 27kV (125kV BIL) 38kV (150/170kV BIL)
Rated Continuous Current	300 Amps
Minimum Line Current	10 Amps
Minimum Actuating Current	Programmable between 16 A and 480 A
Number of Counts:	Programmable for 1, 2, 3 or 4 counts
Reset time:	Programmable, 30 seconds to 300 seconds with resolution of 1 second
Inrush detection time	Less than 1 cycle
Types of inrush currents detected:	Symmetrical and Asymmetrical
Method of inrush currents detection:	Fourier Analysis (FFT)
Deadline detection:	≤ 500mA
Total execution time:	130 msec (± 20 msec)
Short time current withstand, 15 cycle (at 60 Hz): 1 second: 3 seconds:	8600 Amps Sym. 4000 Amps Sym. 3200 Amps Sym.
Momentary current rating:	12,000 Amps. Asym.
*Current measurement accuracy:	±5%
Temperature range:	-40°C to +60°C
Maximum Thermal Rating:	300 A continuous current
Surge current withstand	65kA, per ANSI C37.63
Electromagnetic interference	per ANSI C37.90.2
USB port	Rated IP68

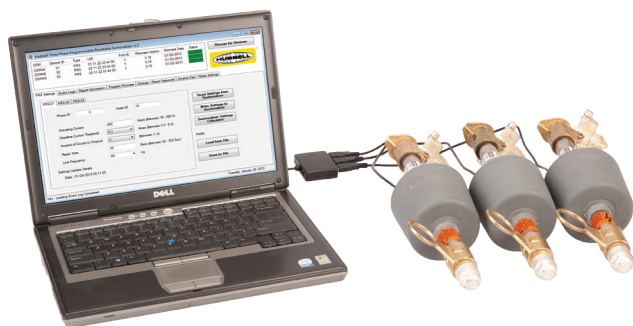
Note: Ratings are based on testing conducted at 60Hz

* With 5% accuracy, if the unit is programmed for 50 A actuating current, then the unit will pick-up the count at 52.5 A and above but ignore a count at 47.5 A and below.

**For Catalog Number System,
see following pages.**

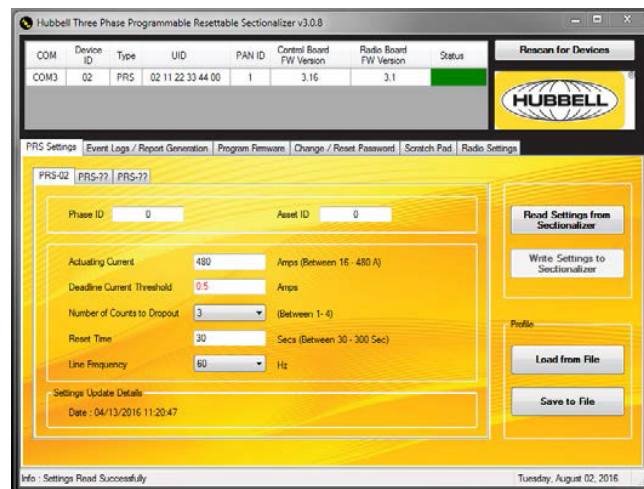


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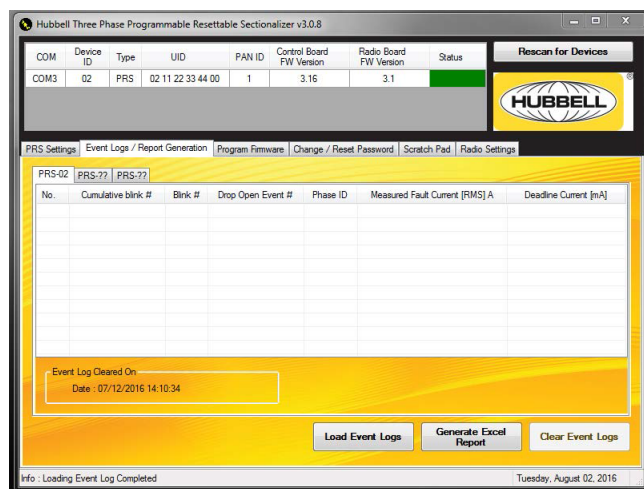
Programming

Programming of the 3Ø PRS units has been simplified with the use of Three Phase Programmable Resettable Sectionalizer programming software. Simply connect the USB hub to the USB port of the computer and then connect the three USB ports on the bottom of the 3Ø PRS units to the connected USB hub. Identify the devices by running the software. Enter the programmable parameters on the settings page. Each unit can be assigned its own Phase and Asset ID's. User can finish programming the three units connected by clicking Write Settings to Sectionalizer.

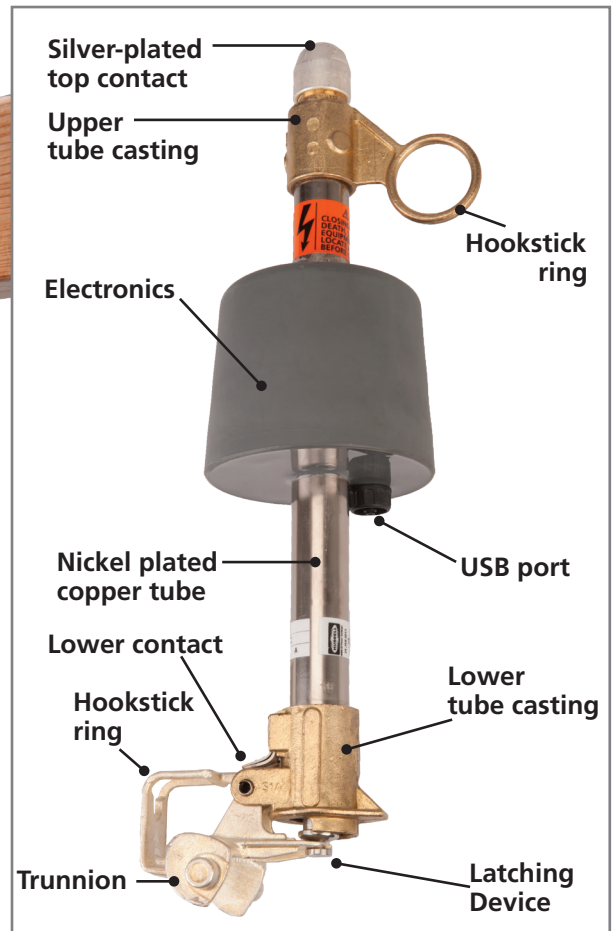


Event Log

The 3Ø PRS contains onboard memory storage that records blinks as well as open operations on the line. The event log supports 40 events. Users will be able to download the event log when connected to unit via the USB cable and have access to the measured fault current, number of counts, blink number, cumulative blinks, drop open events and deadline current.



Three-Phase Programmable Resettable Sectionalizer



POLYMER Cutout Catalog Number System

Position 3: Cutout Type

4 = Non-Loadbreak
5 = Loadbreak

Position 9: Cutout Terminal Connectors

P = Parallel-groove
E = Small eyebolt
L = Large eyebolt
*T = Electronic Module Only

3 USB Cables and 1 USB hub
Cat. No. PSC7410021
(must order separately)



CP7

4

10

1

PP

L

B

Position 6: Cutout Insulation Level

1 = 15kV, 110kV BIL
2 = 27kV, 125kV BIL
(Non-loadbreak only)
15/27kV, 125kV BIL
(Loadbreak only)

Position 10: Cutout Bracket

Z = No bracket
B = NEMA B bracket
D = D bracket
X = Extended bracket
Blank = Electronic Module Only
V = Easy-On Bracket

Universal Cutout Tool

Ideal for use with Standard Electronic Sectionalizer to easily lift out, place, *open and close. Inverted, secure method also fits 100 amp fuse holders of ABB, Chance, S&C cutouts.



Cat. No. PSC4033484 (Wt. 4 oz.)
See Tools Catalog Section 2100.

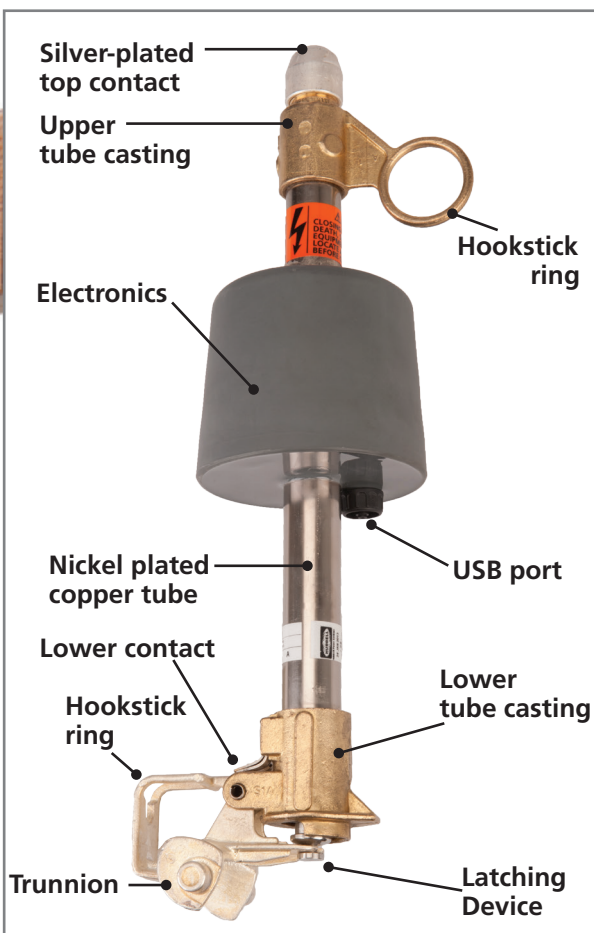
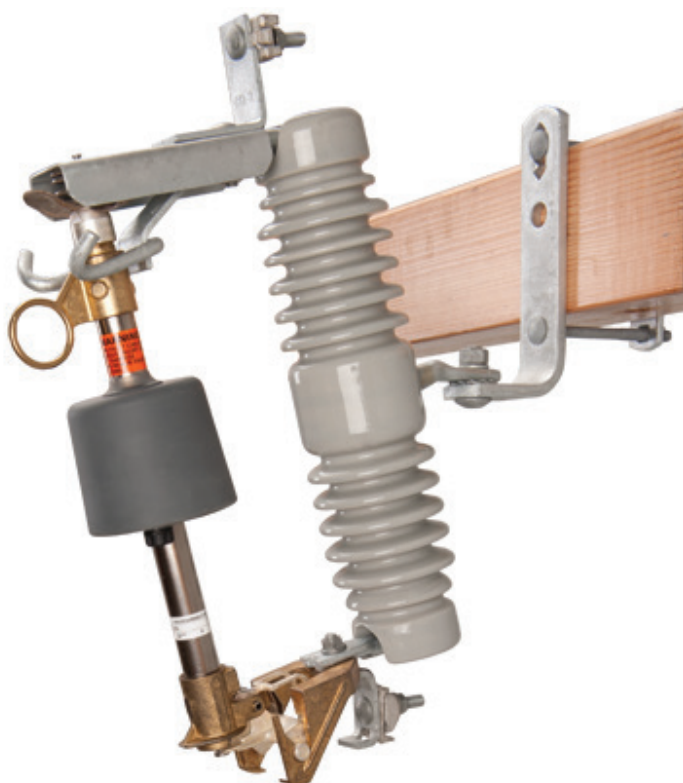
*When opening a cutout, follow all work rules and OSHA regulations.
Not for use with Loadbreak cutouts.

Examples:

- To order 27kV Polymer cutout programmable sectionalizer with extended bracket and large eyebolt connectors = CP74102PPLX.
- To order 27kV programmable sectionalizer module only = C74102PPT.

*To order programmable sectionalizer module only, replace "CP7" with "C7" followed by selections for Positions 3 through 9.

Three-Phase Programmable Resettable Sectionalizer



PORCELAIN Cutout Catalog Number System

Position 3: Cutout Type

4 = Non-Loadbreak
5 = Loadbreak

Position 9: Cutout Terminal Connectors

P = Parallel-groove
E = Small eyebolt
L = Large eyebolt
T = Electronic Module Only

3 USB Cables and 1 USB hub
Cat. No. PSC7410021
(must order separately)



C7 4 10 1 PP L B

Position 6: Cutout Insulation Level

1 = 15kV, 110kV BIL
2 = 27kV, 125kV BIL (Non-loadbreak only)
15/27kV, 125kV BIL (Loadbreak only)
3 = 38kV, 150kV BIL (Non-loadbreak only)
6 = 38kV, 170kV BIL (Non-loadbreak only)

Position 10: Cutout Bracket

Z = No bracket
B = NEMA B bracket
D = D bracket
X = Extended bracket
Blank = Electronic Module Only
V = Easy-On Bracket

Universal Cutout Tool

Ideal for use with Standard Electronic Sectionalizer to easily lift out, place, *open and close. Inverted, secure method also fits 100 amp fuse holders of ABB, Chance, S&C cutouts.



Cat. No. PSC4033484 (Wt. 4 oz.)
See Tools Catalog Section 2100.

**When opening a cutout, follow all work rules and OSHA regulations.
Not for use with Loadbreak cutouts.*

Examples:

To order 38kV, 170kV BIL Porcelain cutout programmable sectionalizer with extended bracket and large eyebolt connectors = C74106PPLX.

To order 38kV, 170kV BIL programmable sectionalizer module only = C74106PPT.



Phone: 573-682-5521 Email: hpsliterature@hubbell.com Web: hubbellpowersystems.com

Accessories

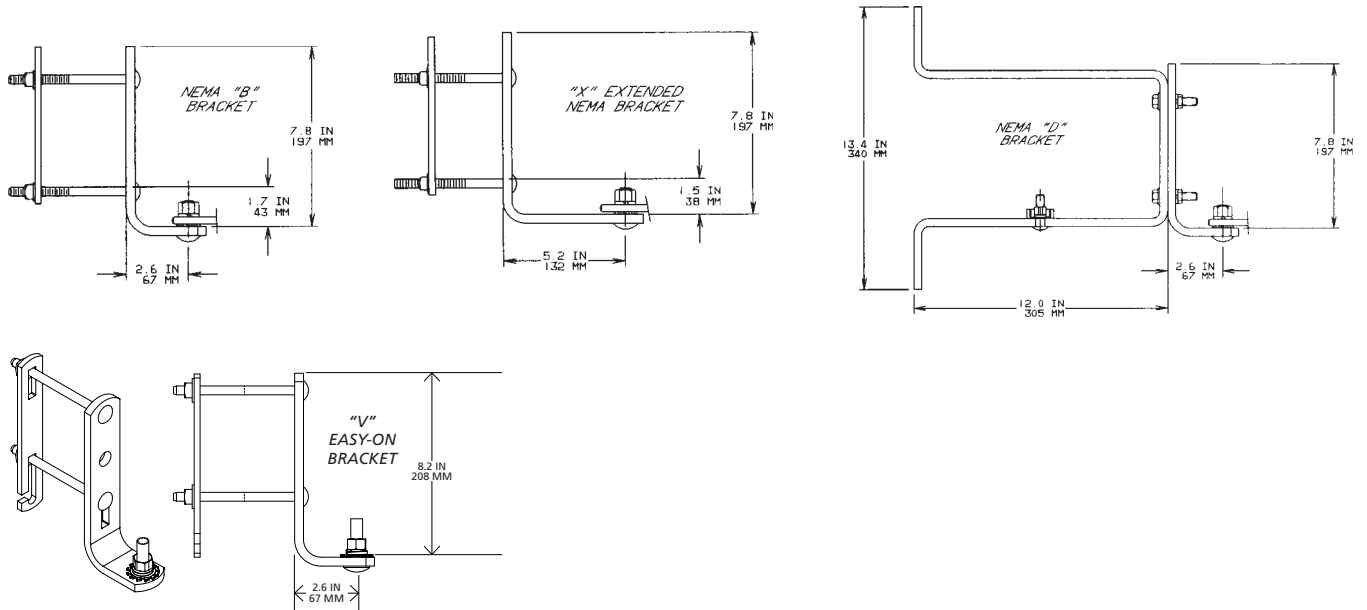
Terminal Connectors

Catalog No.	Description	Wt. (lb./kg.)	Min. Order Qty.
T7001325	Parallel-Groove Clamp, tin-plated bronze for No. 6 solid thru 4/0 ACSR or 250 kcmil stranded	0.33 / 0.15	10
T7001326	Small Eyebolt for No. 8 solid thru 2/0 stranded	0.16 / 0.07	10
T7001327	Large Eyebolt for No. 6 solid thru 4/0 ACSR or 250 kcmil stranded	0.40 / 0.14	10

Mounting Brackets

C2060283	NEMA Heavy Duty "B" Bracket with 1½" captive bolt for crossarm mounting	2.84 / 1.29	—
C2060280	Extended Crossarm Bracket (Horizontal section is 2½" longer than NEMA "B" bracket)	3.75 / 1.70	—
C2060299	"D" Pole Mounting Bracket	7.67 / 3.48	—
C2060632	Cutout/Arrester Bracket complete with carriage bolts and backstrap	4.00 / 1.81	—
PSC2060887	"V" Easy-On Bracket for Crossarm Height range: 4⅞" to 5⅝", Crossarm Width range: 2¾" to 4"	2.9 / 1.32	—

Mounting Bracket Dimensions



NOTES



NOTES

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HUBBELL[®]

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