



Powering Business Worldwide

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Powering Business Worldwide

Loadcenters

Resources

Electrical Sales and Distribution Training

What's the Difference?

BR Loadcenter



Characteristics

- Tin-plated aluminum bus standard
- Galvanized enclosure, ANSI 61 painted cover
- Cover ships with loadcenter
- Combination surface / flush cover

Main Circuit Breaker Types

- BR main breaker (100A and 125A)
- CSR main breaker (150A, 200A and 225A)
- DK main breaker (300A and 400A)
- HLD main breaker (600A)

Branch Circuit Breaker Features

- Trips to center
- 1-inch width per pole
- Black handle

Warranty

- 10 year

CH Loadcenter



Characteristics

- Silver-plated copper bus standard
- Sandalwood painted enclosure and cover
- Cover ships separately
- True surface cover or combination surface / flush cover

Main Circuit Breaker Types

- CH main breaker (100A and 125A)
- CSR main breaker (150A, 200A and 225A)
- DK main breaker (300A and 400A)

Branch Circuit Breaker Features

- Mechanical flag for trip indication
- Trips to OFF
- ¾ inch width per pole
- Sandalwood handle

Warranty

- Limited Lifetime



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More Info

Choose the Right Loadcenter

Information

For more information on loadcenters, see the catalog, Volume 1 - Residential and Light Commercial, Tab 1 (CA08100002E) or visit www.eaton.com/residential1.

This is a check list for selecting the correct loadcenter for the application

- Number of branch circuits?
- Main device (main breaker or main lug)?
- Bus material (AL or CU)?
- Amp rating?
- Voltage?
- Phase (single-phase or 3-phase)?
- AIC rating?
- Enclosure type (NEMA 1 or NEMA 3R)?
- Branch breakers (thermal-magnetic, GFCI and/or AFCI)?
- Cover / trim (combination = used in surface/flush applications, surface)?
- Any options or accessories?



← CH Loadcenter



← BR Loadcenter



← BR 3-Phase Loadcenter



← CH Surge Loadcenter



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JARE092018

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Resources

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What's the Difference?



BR Thermal-Magnetic Circuit Breakers

Characteristics

- Trips to center
- Two Step Reset: Push to OFF, Push to ON
- 1 inch width per pole
- Black body with black handle

Interrupting Ratings

- 1-pole 10 and 22 kAIC
- 2-pole 10, 22, 42 and 65 kAIC
- 3-pole 10 and 22 kAIC

Certifications

- UL® 489

Product Offerings

- 1-pole (10-70 amps)
- 2-pole (10-125 amps)
- 3-pole (10-100 amps)

Warranty

- 10 year



CH Thermal-Magnetic Circuit Breakers

Characteristics

- Trips to OFF
- Trip identification using Trip Flag
- Auto Reset: Push to ON
- ¾ inch width per pole
- Black body with sandalwood handle

Interrupting Ratings

- 10 kAIC

Certifications

- UL® 489

Product Offerings

- 1-pole (10-70 amps)
- 2-pole (10-125 amps)
- 3-pole (10-100 amps)

Warranty

- Limited Lifetime



What's the Difference?



Ground Fault Circuit Interrupter

Protection Provided

A Ground Fault Circuit Interrupter (GFCI) was designed to protect people and equipment from electrical shock.

How Do These Breakers Work?

When a ground fault occurs, there is a current transformer inside the breaker that senses a current imbalance between the line & neutral and generates a small current output that is electronically amplified to trip the circuit breaker.

Types Available

- 5 milli-amp GFCI provides people protection
- 30 milli-amp GFCI provides equipment protection

Where are These Breakers Required?

All 125-volt through 250-volt circuits in NEC 210.8, areas A1-11 need GFCI protection for personnel. Areas A1-11 are defined as the following: bathrooms, garages, outdoors, crawl spaces, unfinished basements, sinks, boathouses, bathtubs/showers, indoor damp and wet locations

Offerings

- 1-pole (15-30 amps)
- 2-pole (15-60 amps)



Arc Fault Circuit Interrupter

Protection Provided

An Arc Fault Circuit Interrupter (AFCI) was designed to detect arcing faults in wiring, appliances and equipment, preventing electrical fires.

How Do These Breakers Work?

The AFCI circuit breaker contains an integrated processor that recognizes the unique current and/or voltage signatures associated with arcing faults

Types Available

- Combination AFCI protects against both parallel and series arcs
- Dual function arc fault/ground fault circuit breaker protects against parallel arcs, series arcs and 5 milli-amp ground faults

Where are These Breakers Required?

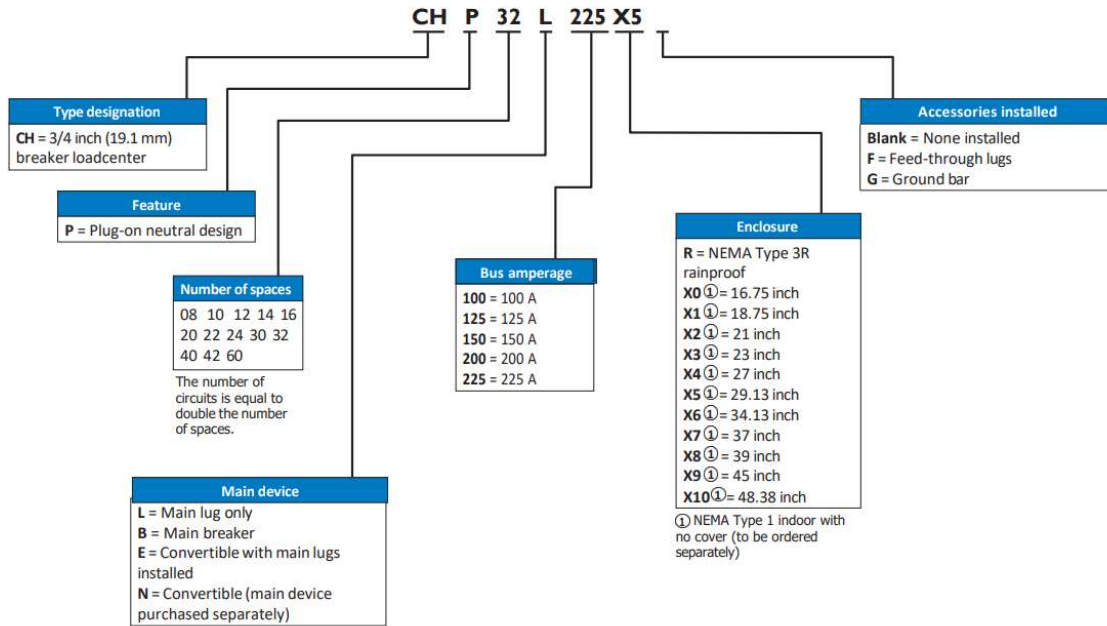
- Combination type AFCI circuit breakers are required for (120V, single-phase, 15 and 20A circuits) living spaces such as bedrooms, family rooms, living rooms, parlors, libraries, dens, sun rooms, recreation rooms or similar rooms.
- Dual function arc fault/ground fault circuit breaker is required for (120V, single-phase, 15 and 20A circuits) kitchens, laundry areas and finished basements

Offerings

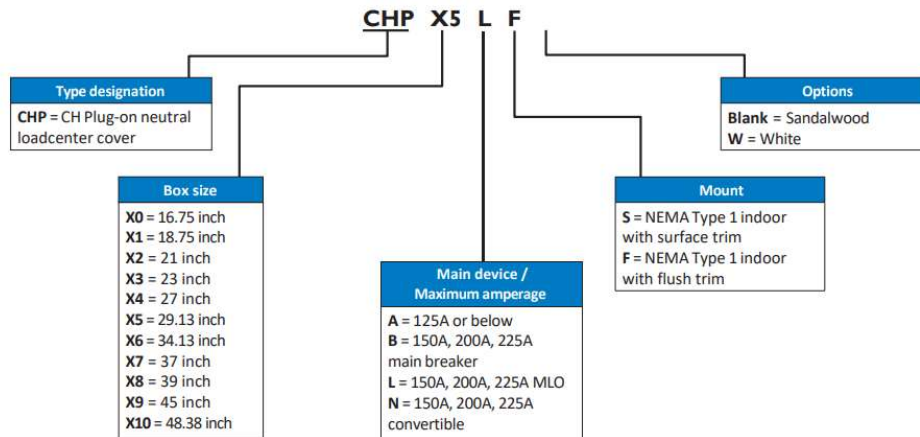
- 1-pole (15-20 amps)
- 2-pole (15-20 amps), combination AFCI only



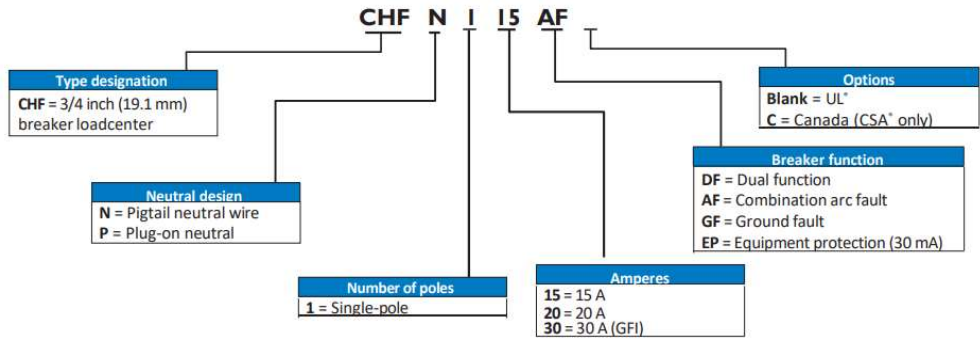
CH Plug-on neutral loadcenters



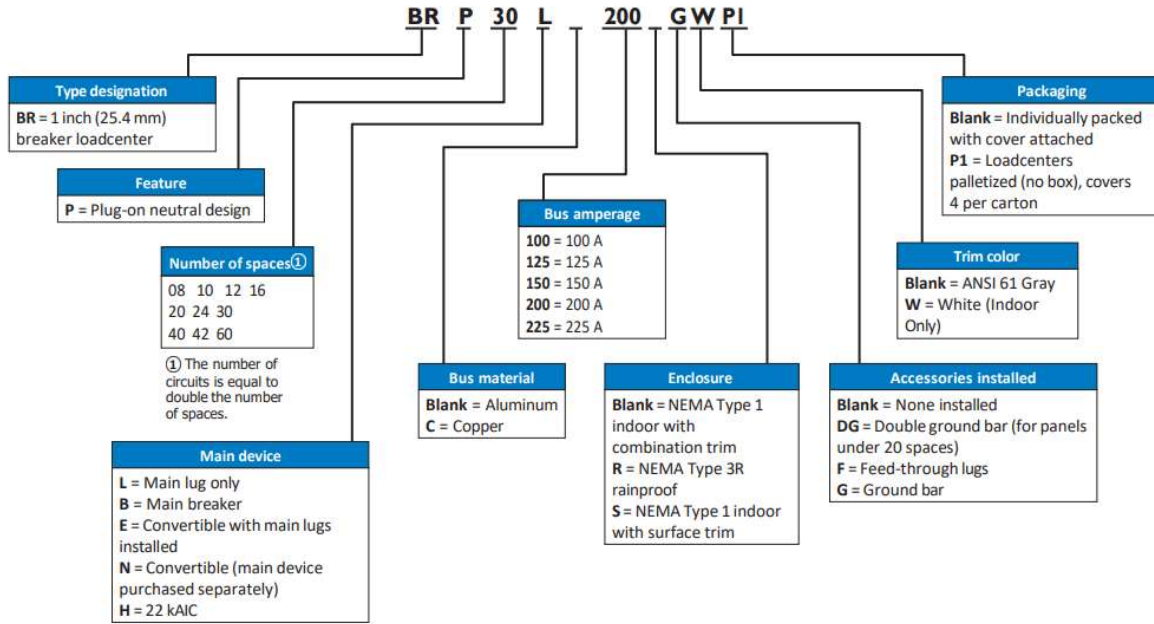
CH Plug-on neutral loadcenter covers



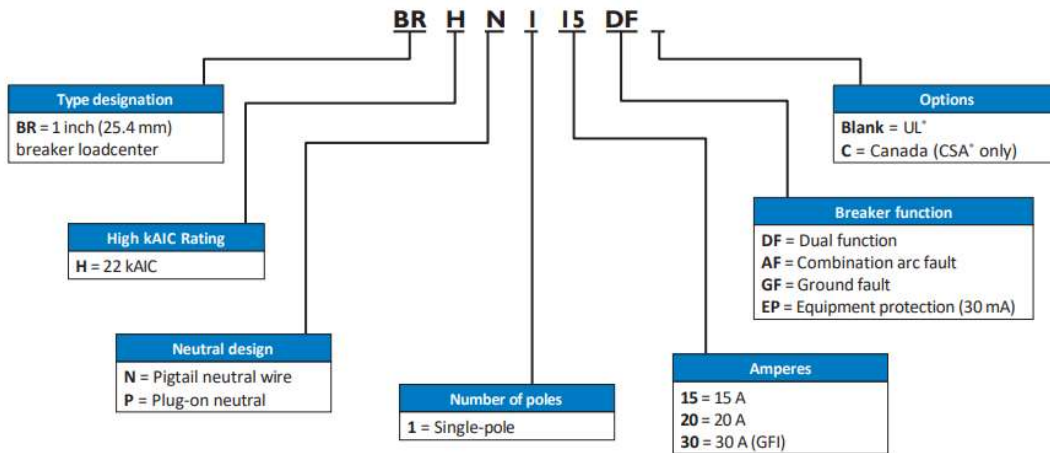
CHF Electronic circuit breakers*



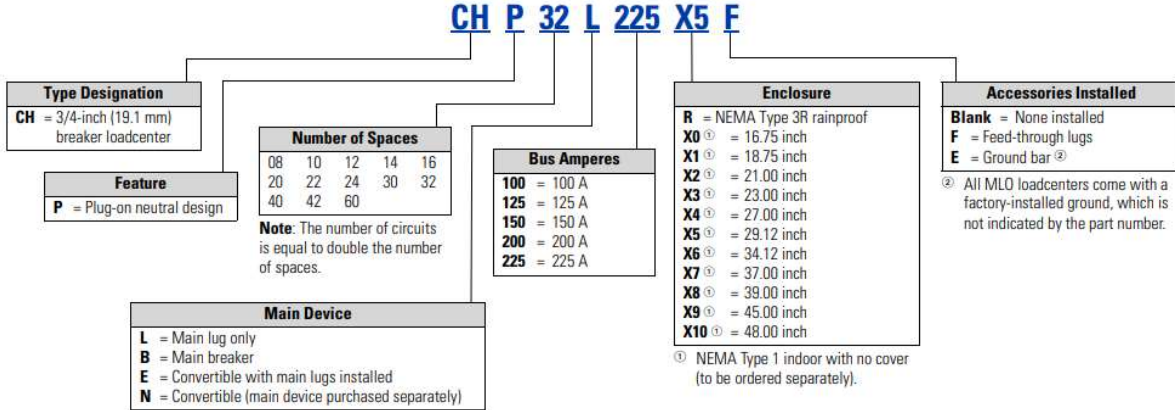
BR plug-on neutral loadcenters



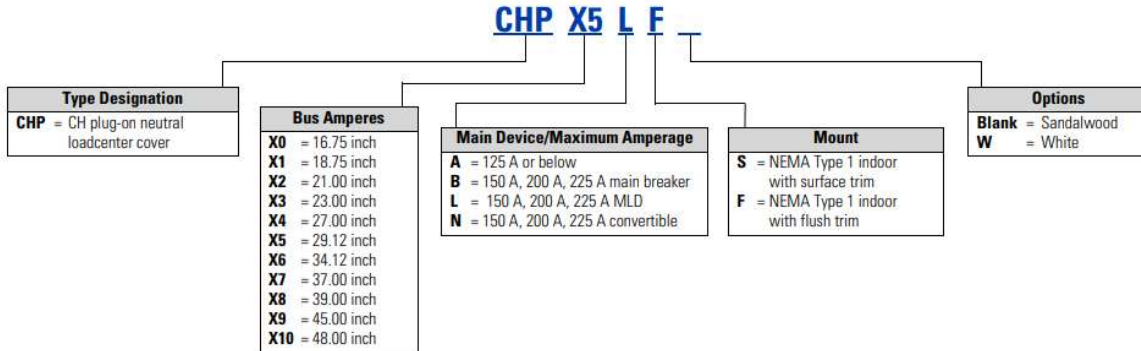
BR Electronic circuit breakers



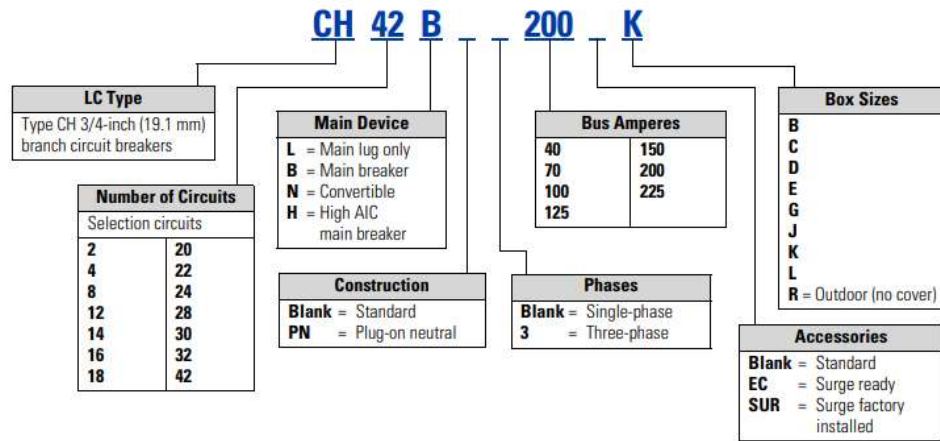
CH Plug-on Neutral Loadcenters



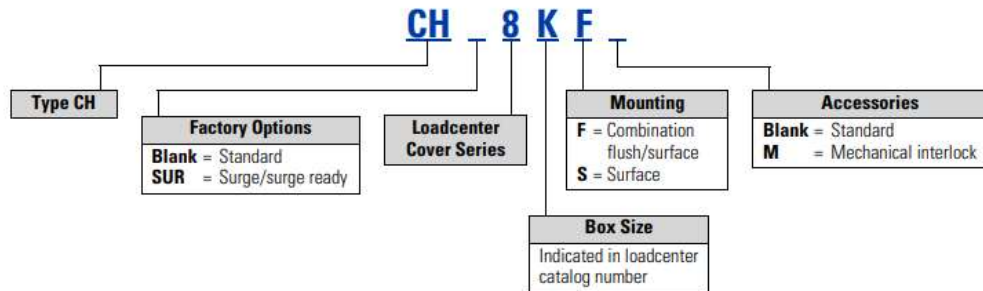
CH Plug-on Neutral Covers (Ordered Separately)



CH Legacy Loadcenters

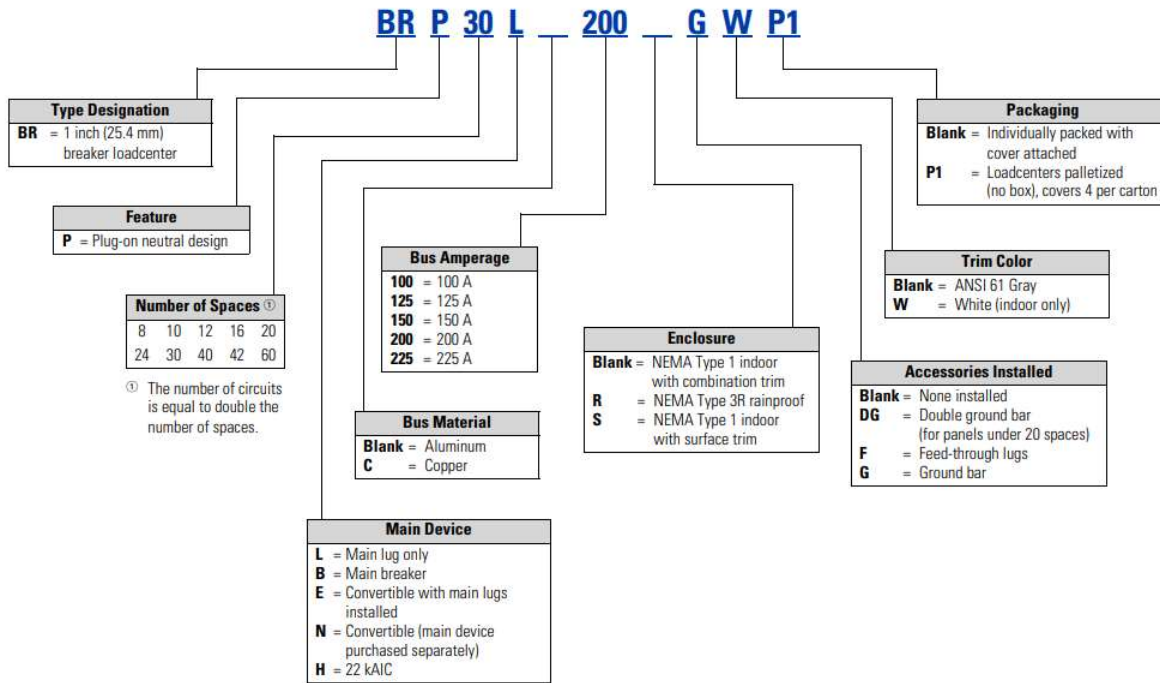


CH Legacy Indoor Covers (Ordered Separately)

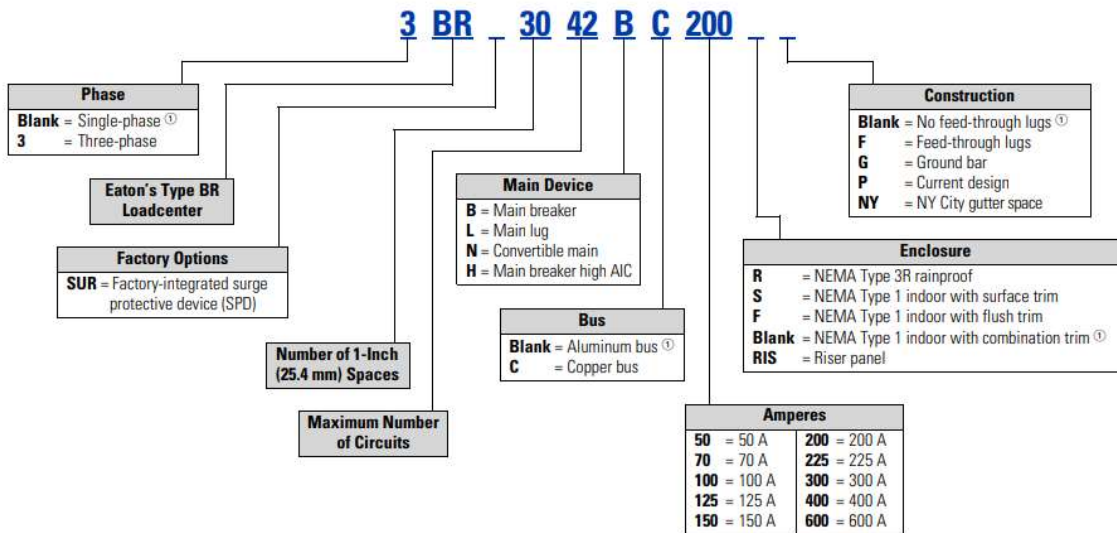


Note: All combinations are not valid, refer to the catalog section.

Single-Phase Plug-on Neutral Loadcenters



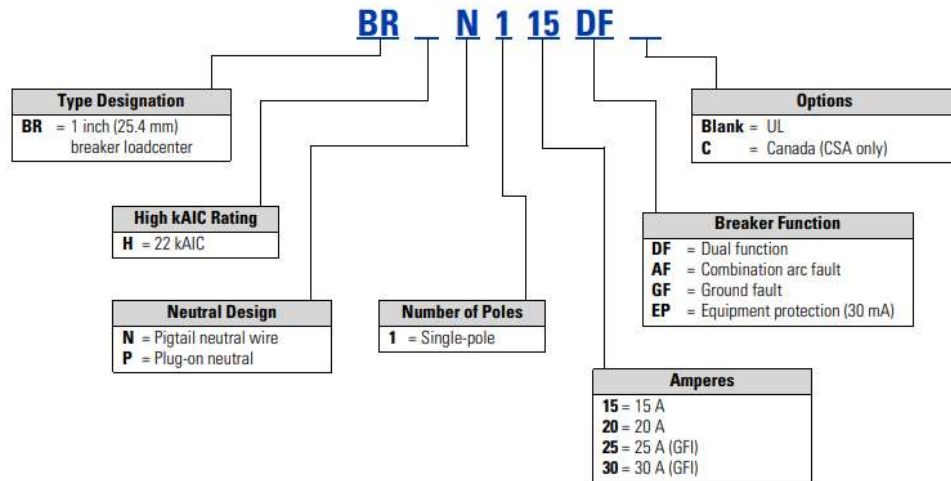
Single- and Three-Phase Legacy Loadcenters



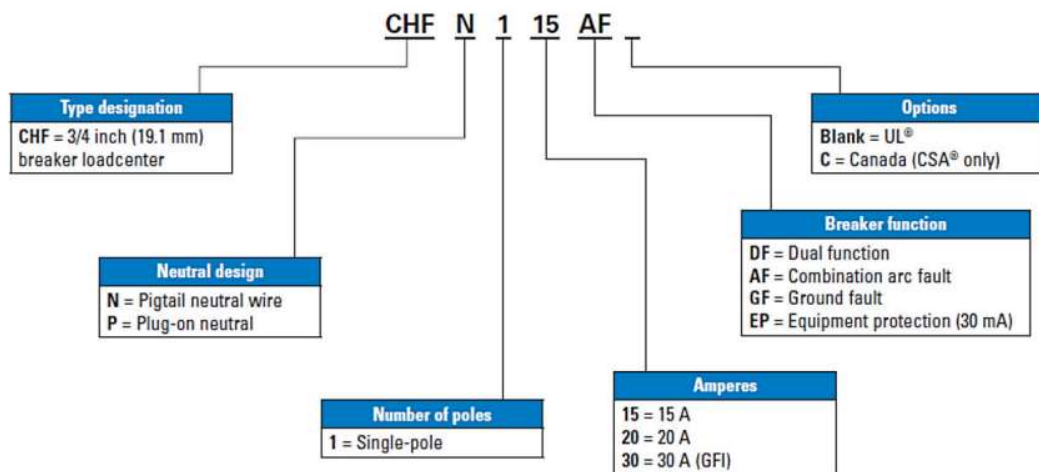
Note

① No character space used.

BR Electronic Circuit Breakers



CHF Electronic circuit breakers





Powering Business Worldwide

Panelboards

What's the Difference?

PRL1X

Max Voltage

- 240Vac



Max Main Breaker/Bus Amp/Sub-Feed Breaker

- 600A MCB or MLO
- 100A Max Branch Amps
- 600A single or twin 225A sub feed breakers

Standard Provisions Included

Yes – specified by # of circuits

Features

- Pow-R-Xpress options
- EZ box and trim standards
- Surge options are available up to 200kA – bus connected standard, breaker connected optional
- Chassis accepts miniature circuit breakers: BAB – 10 kaic or QB – 22kaic @240v AC (fully rated)
- PXM350 and PXBCM customer metering options are available @400A and below
- GFI available on PXR20 equipped MCB's
- ARMS available on PXR20 equipped MCB's and SFB's
- RMS The PRL1X is designed for 240Vac and below lighting and appliance applications

PRL2X

Max Voltage

- 480Y/277Vac
- 125/250Vdc 3w



Max Main Breaker/Bus Amp/Sub-Feed Breaker

- 600A MCB or MLO
- 100A Max Branch Amps
- 600A single or twin 225A sub feed breakers

Standard Provisions Included

Yes – specified by # of circuits

Features

- Pow-R-Xpress options
- EZ box and trim standards
- Surge options are available up to 200kA – bus connected standard, breaker connected optional
- Chassis accepts miniature circuit breakers: GHQ & GHB – 14kaic @480/277v AC or 65kaic @240v AC; HGHB 1p20A up to 25kaic @277v AC (fully rated)
- PXM350 and PXBCM customer metering options are available @400A and below
- GFI available on PXR20 equipped MCB's
- ARMS available on PXR20 equipped MCB's and SFB's
- The PRL2X is designed for low aic 480Y/277Vac, lighting and appliance applications or high aic 120/208Vac applications

PRL3X

Max Voltage

- 600Vac
- 250Vdc 2w



Max Main Breaker/Bus Amp/Sub-Feed Breaker

- 600A MCB, 800A MLO
- 225A Max Branch Amps
- 400A single sub feed or twin 250A breakers

Standard Provisions Included

No – must be manually added

Features

- Standard chassis accepts PD2 frame molded case circuit breakers
- Can include 1X or 2X sub-chassis for miniature breakers
- ASCO contractor options
- EZ box and trim standards
- Surge options are available up to 200kA – bus connected standard, breaker connected optional
- PXM350 customer metering options are available @400A and below
- ARMS available on PXR20 equipped MCB's and SFB's
- 800A bus uses 28"W box; MLO only and CU bus required
- The PRL3X is a hybrid lighting and power panel for lighting / appliance and light power distribution and small motor loads

PRL4X

Max Voltage

- 600Vac
- 600Vdc 2w



Max Main Breaker/Bus Amp/Sub-Feed Breaker

- 1200A MCB or MLO
- 1200A Max Branch Amps

Standard Provisions Included

No – must be manually added

Features

- Standard chassis accepts PD2-PD5 molded case breakers
- Can include 1X or 2X sub-chassis for miniature breakers
- Can accommodate both breakers and fusible switches
- BX type box, DFC only standard, Door-in-Door option available
- Surge options are available up to 400kA; integral breaker included
- Full line of PXR, and PXM metering, monitoring and communications options
- GFCI and ARMS available on the MCB
- Branch GFCI and ARMS available for PXR20 equipped breakers
- The PRL4X is designed for 1200A and below, power distribution and motor loads



Panelboard Selection Criteria



Panelboard Types

Following are the types and names of the panelboards that Eaton manufactures:

- Fusible Lighting Panelboards; Pow-R-Line 1XF & Pow-R-Line 2XF, and Pow-R-Line 3FQS
- **Lighting:** Pow-R-Line 1X, Pow-R-Line 2X, Pow-R-Line 3X, Pow-R-Line 3E
- **Distribution:** Pow-R-Line 3X, Pow-R-Line 4X
- **Draw out MCCB:** Pow-R-Line 4D
- **Branch Circuit Monitoring:** Pow-R-Line 1X BCM, Pow-R-Line 2X BCM, Pow-R-Line 4X with PXR20 or PXMP
- **Renovation:** Pow-R-Line 1RX, Pow-R-Line 2RX
- **Lighting Control:** Pow-R-Command
- **Column Width:** Pow-R-Line 1X-LX, Pow-R-Line 2X-LX
- **Special Application:** Elevator Control Panelboards, FDPB Fused Switch Panels

Selection Criteria

Refer to the specifications, one-line, and panel schedules for the following information:

- System voltage – voltage, phases, and number of wires
- Amperage
- Interrupting rating – kaic
- Series or fully rated
- Service entrance requirement
- Incoming device – MLO, MCB, or MFS
- Branch devices – quantity, amps, poles, and accessories
- Spaces, provisions, or spares
- Bus material
- Ground bar material
- Ground bar type – bolted or isolated
- Full capacity or 200% neutral
- Trim mounting – surface or flush
- Cable entry – top or bottom
- Lug sizes – main and branch feeders; wire size and number of parallel runs per phase
- Enclosure type
- Nameplate – adhesive-backed or screw-on; special color or additional info
- Feeder device nameplates in distribution panels
- Directory frame – plastic sleeve or metal framed with plastic cover
- Circuit numbers – tape strip or permanent micarta strip
- Surge protection or customer metering/comms



Manufacturing Locations

- **Main plant:** Sumter, SC (SUP) and El Paso, TX
- **Regional Satellite manufacturing specializing in quick ship, emergency response, and custom designs:** Atlanta, Baltimore, Chicago, Cleveland, Dallas, Denver, Hartford, Houston, Los Angeles, Nashville, New Jersey, Phoenix, Raleigh, St Louis, San Francisco, Seattle
- Pow-R-Xpress – field assembled Pow-R-Line 1X and Pow-R-Line 2X panels only, available from select distributors. Limited options.

Resource Website

www.eaton.com/panelboards
www.eaton.com/designguides

- **Technical Support:** local satellite
- **Catalog:** Volume 2 Commercial Distribution, Tab 10: Panelboards and Lighting Control
- **Selection Tool:** Bid Manager





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Loadcenter vs. Panelboard

Resources

Electrical Sales and Distribution Training

What's the Difference?

CH Loadcenters

Certifications

- UL® E8741

Overcurrent Devices

- Main circuit breaker – 400A max
- Branch circuit breaker – 150A max
- Branch breakers – plug on
- Branch breakers are ordered and installed separately
- Provisions are not required
- Thermal magnetic circuit breakers, ground fault circuit breakers, or arc fault circuit breakers are available

Features

- Typical applications: Residential
- Sandalwood painted enclosure and cover
- Standard depth – 3.88"
- Silver flash plated copper bus standard
- Cover is ordered and shipped separately
- Standard boxes include knockouts
- 240Vac max
- 400A bus max
- Short circuit interrupting rating – 100kAIC max (available on some styles)
- Surge protection available
- Max subfeed lugs – 125A
- Stocked product in warehouse
- Available in NEMA Type Enclosures – 1, 3R
- Stocked product in warehouse
- Available in NEMA Type Enclosures – 1, 3R

Warranty

- Lifetime



Pow-R-Line Panelboards

Certifications

- UL 50 and UL 67
- NEMA® PB1

Overcurrent Devices

- Main circuit breaker – 1200A max
- Branch circuit breaker – 1200A max
- Branch breakers – miniature or molded case breaker type – bolt on standard; draw out and plug on designs available
- Branch breakers are factory installed (field installed for Pow-R-Xpress)
- Provisions required for Molded Case Circuit Breakers (PRL3X/PRL4X)
- Thermal magnetic circuit breakers, electronic circuit breakers, and fusible overcurrent protective devices available

Features

- Typical applications: Commercial / Industrial
- Unpainted box and light gray ANSI 61 painted trims
- Standard depth for NEMA1 enclosure – PRL1X/2X/3X: 5.75"; PRL4X: 10.4"~11.3" with DFC
- Aluminum bus standard, copper available
- Ships in 3 parts – box, interior and trim for NEMA1 enclosures; box and trim ship together for non N1
- Standard boxes do not include knockouts – all top, bottom, and side surfaces available for conduit entry
- 600Vac max
- 1200A bus max
- Short circuit interrupting rating – 200kAIC max
- Lighting contactors, electronic metering, and advanced surge protection available
- Max through feed lugs – 1200A
- Custom built at the plant or Satellites (PRL1X/2X can be stocked by Pow-R-Xpress distributors)
- UL listings available for panels 84 circuits and greater
- Available in NEMA ratings – 1,3R, 4, 4X, 4X NM and 12

Warranty

- 18 months after shipment or 1 year after installation

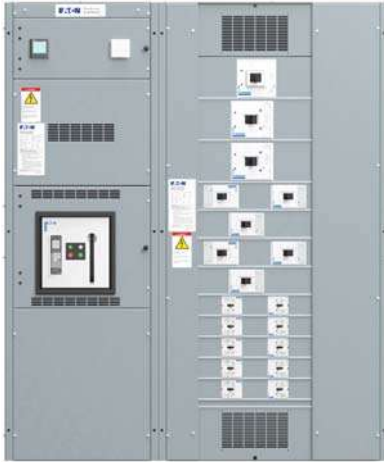




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Switchboards

Pow-R-Line Xpert Group-Mounted Distribution Switchboard



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Pow-R-Line Xpert Distribution Switchboards	
Product Description	V2-T4-2
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Features, Benefits and Functions	V2-T4-2
Standards and Certifications	V2-T4-2
Product Selection	V2-T4-2

Pow-R-Line Xpert Distribution Switchboards

Product Description

Eaton's Pow-R-Line Xpert™ distribution switchboards combine a space-saving design with modular construction and increased system ratings to provide economical and dependable electrical system distribution and protection.

Application Description

Refer to Eaton's *Pow-R-Line Xpert Switchboard Design Guide*.

Features, Benefits and Functions

- 6000 A maximum main bus rating
- 600 Vac and below
- 600 Vdc and below
- Front or rear accessible
- Type 1 or Type 3R enclosures
- ANSI-61 gray powder coat paint finish
- Power Defense molded case circuit breakers
- Microprocessor-based metering and monitoring devices
- Utility metering provisions
- Surge protective devices (SPD)
- Ground fault protection on mains and distribution devices
- Busway and transformer connections
- Complete protective device accessory capability
- 65 kAIC bus bracing standard; optional 100 or 200 kAIC
- Standard tin-plated aluminum bus; optional copper- or silver-plated copper bus
 - Standard bus ampacities based on UL® heat test ratings. Optional density rated bus systems are also available

Main and Individually Mounted Devices

- Power Defense™ SB insulated case circuit breakers, 800–5000 A, fixed or drawout
- Magnum PXR power circuit breakers, 800–5000 A, fixed or drawout
- Series NRX™ insulated case circuit breaker, 400–3000 A, fixed or drawout
- High-pressure contact switch (HPX), 800–3000 A, fixed mounted
- Power Defense molded case circuit breakers, 400–2500 A, fixed mounted
- Bolted pressure switches, 800–5000 A
- FDPW fusible switches, 400–1200 A

Group-Mounted Distribution Devices

- Power Defense molded case circuit breakers, 15–1200 A
- FDPW fusible switches, 30–1200 A

Standards and Certifications

- Meets NEMA® Standard PB-2 and UL 891
- Seismically qualified



Product Selection

For complete application and pricing information, contact your local Eaton sales office.



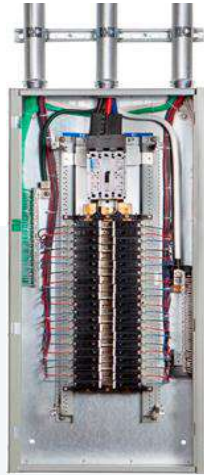
Powering Business Worldwide

Switchboard vs. Panelboard

Resources

Electrical Sales and Distribution Training

What's the Difference?



Panelboard

Certifications

- UL® 67 – Panelboards
- UL 50 – Cabinets and boxes
- NEMA® PB1

Features

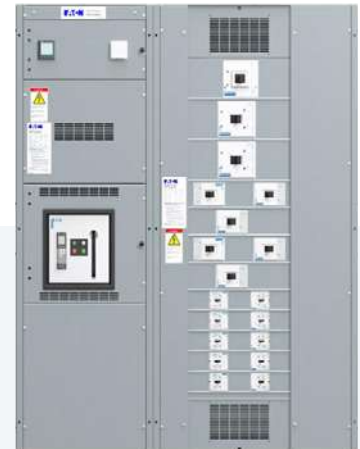
- Flush or surface wall-mounted
- Front access only
- Box, interior, and trim separate
- 1-Phase or 3-Phase
- Fixed mounted breakers
- Through-feed or sub-feed lugs feed multiple panels
- Pow-R-Line 1x, 2x, and 3e chassis measured in circuits
- Pow-R-Line 3x and 4x measured in X-space
- Fully or series-rated
- Limited surge, metering, and communications options
- NEMA 1, 2, 3R, 4, 4x, 4xNM, and 12 enclosure offerings as standard

Overcurrent Devices

- Miniature and molded case circuit breakers, UL 489
- Fusible switches, UL 98
- 1200A maximum main
- 1200A maximum group mounted feeders
- Typically bolt-on

The Bottom Line

- Wall-mounted, lower main amperage, lower capacity feeder breakers, more NEMA enclosures as standard and fewer accessory options



Switchboard

Certifications

- UL 891
- NEMA PB2

Features

- Free standing
- Front or rear access
- Frame, buses, overcurrent devices, instrumentation, covers
- 3-Phase or 1-Phase (rare)
- Fixed or draw out mounted power breakers
- Horizontal bus feeds multiple sections
- Layout measured in X-Space
- Typically fully-rated
- Full selection of surge, metering, and advanced communications options
- NEMA 1 and 3R standard
- More internal wiring/working space

Overcurrent Devices

- Molded case circuit breakers, UL 489
- Power circuit breakers, UL 1066
- Fusible switches, UL 98
- 5000A maximum main
- Group mounted feeders up to 2000A
- Individually mounted feeders up to 4000A

The Bottom Line

- Free-standing, higher main amperage, higher capacity feeder breakers, fewer standard NEMA enclosures, more accessory options





Powering Business Worldwide

Switchboard vs. Switchgear

What's the Difference

Switchboard

What you need to know and look for in specifications

- UL 891
- NEMA PB2

Features

- Can be as shallow as 18 inches deep
- Typically front access only, rear access optional
- Internal barriers not required
- Bolted front covers
- Internal barriers, draw-out MCCB & Power breaker options available



Overcurrent Device Types

- UL 489 Molded case circuit breaker 100A–2500A frames
- Group mounted up to 2000A, individually mounted above 2000A
- UL 489 (NRX) and UL1066 (Magnum) Power circuit breakers; fixed or drawout mounted; manual or electrically operated up to 4000A
- Fused switches available as group mounted feeders up to 1200A and individually mounted Bolted Pressure Switches (Pringle) up to 4000A

Circuit Breaker Features

- Fixed mounted standard
- Group mounted breakers are factory sealed, but interchangeable trip units (ITU) and field accessory options are available
- Basic trip units as standard, a range of sophisticated trip units available
- Communications, remote monitoring, metering and predictive diagnostics available using PXR trip units
- Set points and AF protection features available using Dash Board (DB) & Dash Board Light (DBL) interface

Product Testing

- Density rated bus testing
- Dielectric tested at 2200 V
- Wired and tested per latest UL and NEMA standards

Switchgear

- UL 1558 or UL 891
- NEMA SG5
- ANSI C37.20.1; ANSI C37.20.7 ARC resistant available

- Minimum depth is 54 inches or 40 inches in front access
- Rear access standard, front access available
- Compartment barriers standard
- Custom controls and metering
- ARC resistant type 2B



- UL 1066 power circuit breakers, drawout, normally electrically operated
- 800A–6000A frame breakers
- 42 KAIC to 200 KAIC ratings
- Integrated switchboard chassis available

- Drawout breakers with option to integrate switchboard structure
- Built for field maintenance, modification and inspection
- Accessory field mounting is okay
- Maximum selective coordination
- Trip unit for integral metering and communications

- Thermal tested bus for 65 degrees C rise over 40 C
- Dielectric tested at 2200 V
- 30 cycle withstand rated breakers and bus

The Bottom Line

Made to work together in series with one another to provide maximum system coordination. Switchgear is measured by withstand ratings, to endure moderate faults while switchboards are intended to interrupt the faults downstream to provide greater reliability.



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Powering Business Worldwide

Digital Metering

Product Selection Guide

Metering Selection Chart

PXM350



Power Xpert Energy Meter



Power Xpert Meter 4000/6000/8000 Series



Section Page Number	V3-T9-7	V3-T9-14	V3-T9-22
Electrical Parameters			
Volts	±0.5% of RV	±0.1% RV	0.1% of RV + 0.02% FS
Amperes	±0.5% of RV	±0.1% RV	0.05% of RV + 0.01% FS
Current range (% of nominal)	0.1–200%	0.1–200%	0.005–20 A (400%)
Watts	±0.5% of RV	±0.1% of RV	0.1% of RV + 0.0025% FS
Vars	±0.5% of RV	±0.1% of RV	0.1% of RV + 0.0025% FS
VA	±0.5% of RV	±0.1% of RV	0.1% of RV + 0.0025% FS
PF-apparent	±0.5% of RV	±0.1% of RV	0.1%
PF-displacement	±0.5% of RV	—	0.1%
Frequency	0.12 Hz	±0.001 Hz	±0.01 Hz
THD-voltage	—	63rd ^{①②}	127th
THD-current	—	63rd ^{①②}	127th
Watt-hours	±0.5% per ANSI C12.20 0.5 Class	±0.1% per ANSI C12.20 0.1 Class	±0.2% per ANSI C12.20 0.2 Class ^④
Var-hours	±0.5%	±0.1%	±0.2% per ANSI C12.20 0.2 Class ^④
VA-hours	±0.5%	±0.1%	±0.2% per ANSI C12.20 0.2 Class ^④
Ampere-demand	±0.5%	±0.1%	0.05% of RV + 0.01% FS
Watt-demand	±0.5% per ANSI C12.20 0.5 Class	±0.1% per ANSI C12.20 0.1 Class	±0.2% per ANSI C12.20 0.2 Class ^④
Var-demand	±0.5%	±0.1%	±0.2% per ANSI C12.20 0.2 Class ^④
VA-demand	±0.5%	±0.1%	±0.2% per ANSI C12.20 0.2 Class ^④
Revenue accuracy	—	—	±0.2% per ANSI C12.20 0.2 Class ^④
Individual ampere harmonics	—	63rd (50 Hz or 60 Hz), 15th ^{①②}	85th ^⑤
Individual voltage harmonics	—	63rd (50 Hz or 60 Hz), 15th ^{①②}	85th ^⑤
Interharmonics	—	—	Yes
Minimum and/or Maximum Values			
Volts	—	L-L, L-N	L-L, L-N, N-G, VAUX L-L
Current	—	A, B, C, N	A, B, C, N, G
Power	—	Watt, var, VA	Watt, var, VA
Power factor	—	Apparent	Apparent/displacement
Frequency	—	Hertz	Hertz
THD	—	Amperes/volts	Amperes/volts (L-L, L-N, AUX L-L)
Demand values	kW, kvar, kVA, amperes	kW, kvar, kVA, amperes, TOU	kW, kvar, kVA, amperes
Trend analysis	—	16 MB ^② / 8 GB ^③	2 / 4 ^⑥ / 8 ^⑦ GB
Event logging	20 alarms/15 events with timestamp	16 alarms/50,000 events with timestamp	2 / 4 ^⑥ / 8 ^⑦ GB
Disturbance recording	—	16 MB ^② , 20 cycles per waveform	2 / 4 ^⑥ / 8 ^⑦ GB 60 cycles per event

Notes

- ① PXE1 only.
- ② PXE2 only.
- ③ Optional communication module PXM1K-ETHMULTI.
- ④ Under typical operating conditions.
- ⑤ Individual values reported to 85th harmonic; anti-alias filtering prevents higher frequencies from distorting readings (see IEC 61000-4-7).
- ⑥ PMX 6000 only.
- ⑦ PXM 8000 only.

- Legend:** PG = Programmable
 FS = Full scale
 RV = Read value

- Auxiliary voltage (optional) = Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.
 Interharmonics = Power Xpert Meter 6000/8000 supported.

Metering Selection Chart, continued

PXM350



Power Xpert Energy Meter



Power Xpert Meter 4000/6000/8000 Series



Section Page Number

V3-T9-7

V3-T9-14

V3-T9-22

Other Features

Storage	8 KB	16 MB ^① / Additional 8 GB to the meter ^②	2 / 4 ^⑥ / 8 ^⑦ GB
PG output relays	Form A, 5 A	5 A ^③	5 maximum
PG analog outputs	—	Optional 0–20 mA or 4–20 mA or 0–5 V or 1–5 V ^③	—
Discrete contact inputs	—	Optional 4 or 6, 2 mA ^③	8
Analog inputs	—	Optional 0–20 mA or 4–20 mA or 0–5 V or 1–5 V ^③	—
Synch-input kW utility	—	Via end of interval pulse with optional digital inputs	Via status input
Auxiliary voltage ^④	—	—	Yes
kWh pulse initiator	Yes, 10 mA, 250 Vac	Yes	Yes
Waveform display	—	Web pages ^{①②}	Local/computer
Waveform capture, samples/cycle	—	Yes, up to 512 ^①	Yes, 512 (4096 oversampling)
Frequency distribution display	—	—	—
Display type	Backlit LCD	Backlit LCD ^④	LCD ^⑥
Display lines/character	1 line, 7 characters	5 line, 4 characters	Color graphic
Display character height	7.85 mm	10 mm	—
Communications	Serial: Modbus RTU, BACnet MS/TP	Serial: Modbus RTU, DNP3.0, BACnet MS/TP Network ^{②⑤} : Modbus TCP/IP, BACnet/IP, EtherNet/IP, HTTPS, HTTPS Post, FTP, sFTP, IPV6, SNMP, NTP, COMTRADE, IEC 61850, PROFINET, DNP3.0 over IP, and MQTT 8 GB datalogging, trendlog display	Serial: Modbus RTU, Modbus ASCII ^⑤ Network: Modbus TCP, Ethernet TCP/IP, HTTP, SNMP, SMTP, FTP, DNP 3.0
Setup configuration	Via configuration software/display	Via configuration software/display Via web browser	Via web browser
Dimensions	3.54 (90.0) H x 4.25 (108.0) W x 2.46 (62.5) D	Meter: 3.77 (96.0) H x 3.77 (96.0) W x 2.50 (63.5) D Display: 3.77 (96.0) H x 3.77 (96.0) W x 2.31 (58.7) D	Refer to TD02601007E
Operating temperature range	–25 °C to +70 °C	–25 °C to +70 °C	–20 °C to +60 °C display unit –20 °C to +70 °C meter base unit
Reference literature	TD150024EN	TD150048EN	TD02601007E

Notes

- ① PXE2 only.
- ② Optional communication module PXM1K-ETHMULTI.
- ③ 2 I/O modules plus the comm module can be installed, or 3 I/O modules with no comm module (ETHMULTI)
Relay outputs—up to 6 total
Analog outputs—up to 6 total
Discrete contact inputs—up to 16 total
Analog inputs—up to 6 total
- ④ Available transducer version with remote display.
- ⑤ Optional.
- ⑥ PXM 6000 only.
- ⑦ PXM 8000 only.

Legend: T PG = Programmable
FS = Full scale
RV = Read value

Auxiliary voltage (optional) = Provides three additional voltage inputs to the meter: Va2, Vb2, Vc2.
Interharmonics = Power Xpert Meter 6000/8000 supported.



Powering Business Worldwide

Group Metering

What's the Difference

Group Metering



Meter Pack



Meter Pack

Features

- A meter pack is a self contained, single enclosure
- Up to a maximum of 6 meters
- Up to 600A maximum horizontal bus rating
- 240/120V, single-phase, 3-wire

Available Mains

- Main terminal box (main lug only)

Phase Balancing

- Not required

Accessories

- Lug kits, crimp lug landing pad kit

Applications

- Used where six or less meters are required

Group Metering

- Group metering consists of a main device and multiple meter stacks in several connected enclosures
- As many meters as required by the customer or specifications
- Up to 1200A maximum horizontal bus rating
- 240/120V, single-phase, 3-wire
- 208Y/120V, 3-phase, 4-wire

- Main terminal box (main lug only) or main terminal box with utility pull box
- Main circuit breaker or main circuit breaker with utility pull box
- Main fusible switch or main fusible switch with utility pull box
- Main bolted pressure switch
- Underground pull box

Field phase balancing is required when connected to a 208Y/120V, 3-phase, 4-wire system.

- One of every 3-**stacks** should be phased AB
- One of every 3-**stacks** should be phased BC
- One of every 3-**stacks** should be phased AC

- Box lug kit, compression lug kit, wall bracket, bussed spacer, elbow

- Used where six or more meters are required



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Resources

Electrical Sales and Distribution Training

What's the Difference?



Commercial Meter Stack

Features

- 1 to 4 meter sockets per stack
- Rated for indoor or outdoor use
- 1200A horizontal bus
- Aluminum or copper bus

Tenant Circuit Breakers

- Bolt-on circuit breakers for 35MM and 35SS meter stacks: CCV (10 kAIC), CCVH (25 kAIC), CVS (42 kAIC), CV (65 kAIC) and CVH (100 kAIC)
- Bolt-on circuit breakers for 37MM and 37SS meter stacks: EHD (10 kAIC), CC (10 kAIC), CVS (42 kAIC), CV (65 kAIC) and CVH (100 kAIC)

Bypass Options

- Lever bypass
- Test bypass

Phase Balancing

Field phase balancing is required for 3-phase in, 1-phase out applications

- One of every 3-**sockets** should be phased AB
- One of every 3-**sockets** should be phased BC
- One of every 3-**sockets** should be phased AC

Part Numbering

- 35MM and 35SS (three phase-in, single phase-out)
- 37MM and 37SS (three phase-in, three phase-out)



Residential Meter Stack

Features

- 2 to 6 meter sockets per stack
- Rated for indoor or outdoor use
- 800 or 1200A horizontal bus
- Aluminum or copper bus

Tenant Circuit Breakers

- Plug-on circuit breakers for 125A meter stacks: BR (10 kAIC), BRH (22 kAIC), BRHX (22 kAIC), BRHH (42 kAIC) and BRX (65 kAIC)
- Bolt-on circuit breakers for 200A meter stacks: CCV (10 kAIC), CCVH (25 kAIC), CVS (42 kAIC), CV (65 kAIC) and CVH (100 kAIC)

Bypass Options

- Horn bypass
- Lever bypass

Phase Balancing

Field phase balancing is required for 3-phase in, 1-phase out applications

- One of every 3-**stacks** should be phased AB
- One of every 3-**stacks** should be phased BC
- One of every 3-**stacks** should be phased AC

Part Numbering

- 1MM (single phase-in, single phase-out)
- 3MM (three phase-in, single phase-out)



Digital Copy



More Info

Questions to ask to meet utility requirements

Group Metering

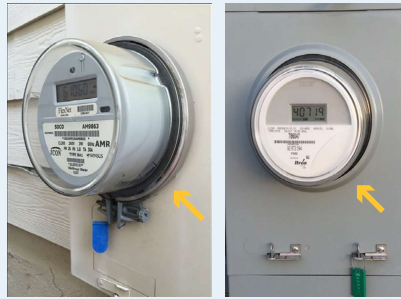
EUSERC or NON-EUSERC ?



EUSERC

NON-EUSERC

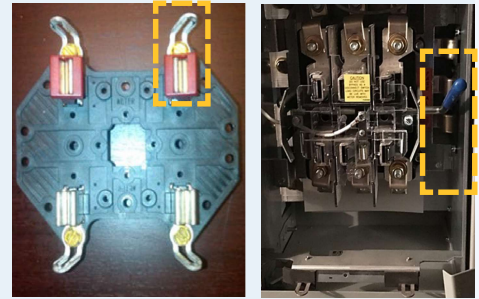
What style covers are required ?



Ring cover

Ringless cover

Is a bypass option required ?



Horn bypass

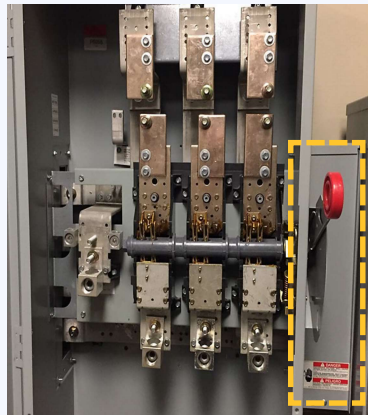
Lever bypass

What are the maximum number of meters allowed in a meter stack ?



Maximum number of meters

Is a bussed spacer required ?



Bussed spacer

Any other options or gotchas ?

- Meter jumper and cover
- Extra ground bar
- Barrel lock
- Barrier

Residential Features	
<input type="checkbox"/> Lug Block	Meter Bypass Jumper <input type="text" value="0"/>
<input type="checkbox"/> Meter Jumper and Cover	<input type="checkbox"/> Fifth Jaw Kit
<input type="checkbox"/> Extra Ground Bar	<input type="checkbox"/> Manual Bypass Kit
<input type="checkbox"/> Barrier for Individual Sockets	<input type="checkbox"/> Isolated Fifth Jaw Kit
<input type="checkbox"/> Barrel Lock	
Commercial Features	
Phase Balancing <input type="text" value="v"/>	<input type="checkbox"/> 3-phase to 1-phase conversion kit
<input type="checkbox"/> Barrel Lock	<input type="checkbox"/> Handle Insulator
<input type="checkbox"/> Blank Cover Kit	<input type="checkbox"/> Barrier (3-phase)
<input type="checkbox"/> Factory Installed KD-frame Breaker	<input type="checkbox"/> Totalizing Jumper
Number of Jaws: 5	

Other options



Features and Benefits

Single Meter Sockets

Features	Benefits
Block assembly base exceeds 400 in-lb of torque	Provides durability under the most extreme installation circumstances
One-piece, die-run enclosure	Eliminates tampering and extends product life
High visibility Eaton name embossed on cover	Company identity and brand preference
Knockouts are installer friendly	Labor savings, less time needed for removing knockouts
Oversized 7/8-inch diameter, heavy-duty, steel lug screws	Stronger connection component facilitates a reliable wire termination
Slide-nuts are captive	Allow for ease in installation of conductors and eliminates lost components
Horn bypass kit is field installable by changing out slide nut	Less inventory required and field modifications are simple
Integral triplex or quadplex ground extruded in neutral lug	One piece for terminating incoming/outgoing neutral conductors, which increases integrity of connections
100% plated bridge with 4-point mounting	Zinc chromate plated to provide superior corrosion resistance
kAIC rating	Tested and UL listed up to 200 kAIC rating with specified overcurrent protection devices
Provides a complete Eaton residential solution	Adding meter sockets to the already existing (loadcenter, surge, breakers, generators and AC disconnect) product lines that we already provide, makes Eaton a one-stop shop for our customers residential and light commercial needs
Copper-plated alloy jaws with reinforcing spring	Steel reinforcing springs used in all socket jaws to maintain electrical connections

Catalog Number Selection

Single Meter Sockets RS Group

UT RS 2 0 2 B CH

Note: The "U" prefix is always used first followed by other prefixes required in alphabetical order.

Standard Prefixes	
A	= Aluminum enclosure
B	= Barrel lock provision, for an exposed INNER-TITE® or Brooks barrel lock; unit includes an internal lock receiver bracket
F	= Barrel Lock with guard provision, for a lock guard INNER-TITE or Brooks barrel lock; unit includes an internal lock receiver bracket
G	= Grounded fifth terminal (9 o'clock position)
H	= Horn bypass
I	= Inhibitor installed in wire connectors
M	= Temporary meter cover (waxed cardboard)
N	= No sealing ring (applies only to ring style sockets)
R	= Ring style socket
S	= Aluminum screw type sealing ring (applies only to ring style sockets)
T	= Grounding connector (#14-#2 Cu) for triplex ground
TT	= Two grounding connectors (#14-#2 Cu) for quadplex ground
U	= UL Underwriters Laboratories Label
Z	= 5/16-inch hex head connector screw in place of slotted (100 A only)

Product Group	
RS	= Residential service, single position
2R-6R	= Residential service, multiple position
2H-6H	= Commercial or residential service, multiple position
H	= Commercial or residential service, single position

Standard Suffixes	
A	= Solid top
B	= Small hub opening
C	= Small hub closing plate mounted
L	= 1.25-inch (31.8 mm) hub mounted
M	= 1.50-inch (38.1 mm) hub mounted
N	= 2.00-inch (50.8 mm) hub mounted
P	= 2.50-inch (63.5 mm) hub mounted
T	= Large hub opening hub
U	= Large hub cover plate hub mounted
V	= 2.50-inch (63.5 mm) large hub mounted
Q	= 3.00-inch (76.2 mm) large hub mounted
R	= 3.50-inch (88.9 mm) large hub mounted
S	= 4.00-inch (101.6 mm) large hub mounted
Z	= Large to small hub adapter mounted

Maximum Conductor (Line and Load)	
0	= 0.38-inch stud connectors
1	= #2/0 connectors
2	= #250 kcmil connectors
3	= #350 kcmil connectors

Service Design	
0	= Overhead
1	= Combination overhead/underground
2	= Underground, side wired
3	= Combination overhead/underground, side wired

Ampere Rating	
1	= 100 A
2	= 200 A
5	= 150 A

Commercial Lever Bypass Sockets



Contents

Description

	<i>Page</i>
Single Meter Sockets	V1-T4-2
Commercial Lever Bypass Sockets	
Product Selection	V1-T4-11
Dimensions	V1-T4-15
Multiple Position Horizontal Ganged Sockets	V1-T4-17
Instrument Rated Sockets	V1-T4-23
Residential Pedestals	V1-T4-28
Meter Socket Accessories	V1-T4-30

Commercial Lever Bypass Sockets

Product Description

- Heavy-duty, lever bypass, jaw clamping ringless meter socket design
- 200 A and 320 A styles available
- Single-phase or three-phase
- 4, 5 or 7 terminal available
- 600 Vac maximum rating
- Multiple service design offerings

Standards and Certifications

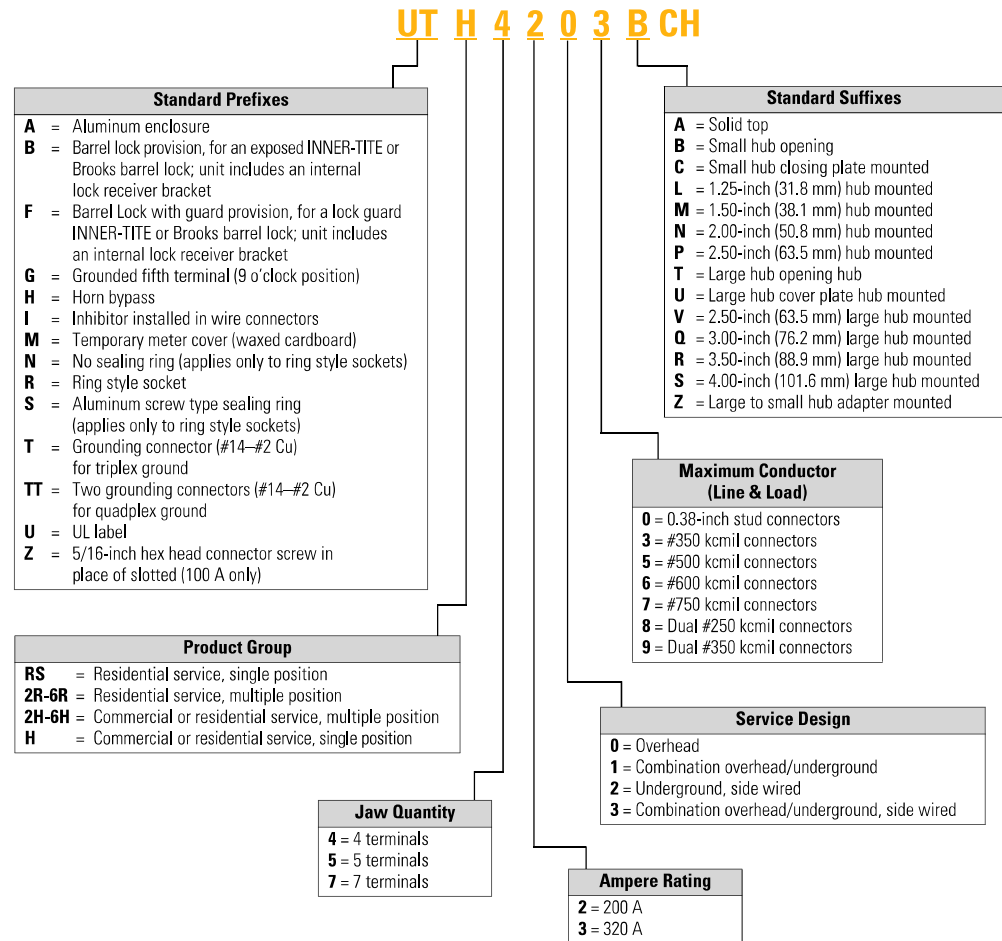
- UL 414 listed and recognized



Catalog Number Selection

Single Meter Sockets H Group

Note: The "U" prefix is always used first followed by other prefixes required in alphabetical order.



Multiple Position Horizontal Ganged Sockets



Contents

Description	Page
Single Meter Sockets	V1-T4-2
Commercial Lever Bypass Sockets	V1-T4-10
Multiple Position Horizontal Ganged Sockets	
Product Selection	V1-T4-18
Dimensions	V1-T4-21
Instrument Rated Sockets	V1-T4-23
Residential Pedestals	V1-T4-28
Meter Socket Accessories	V1-T4-30

Multiple Position Horizontal Ganged Sockets

Product Description

- Available in 100 A and 200 A designs
- Available in 2-position through 6-position designs
- Multiple service design offerings
- Multiple line/load lug configurations
- Residential or lever bypass socket designs

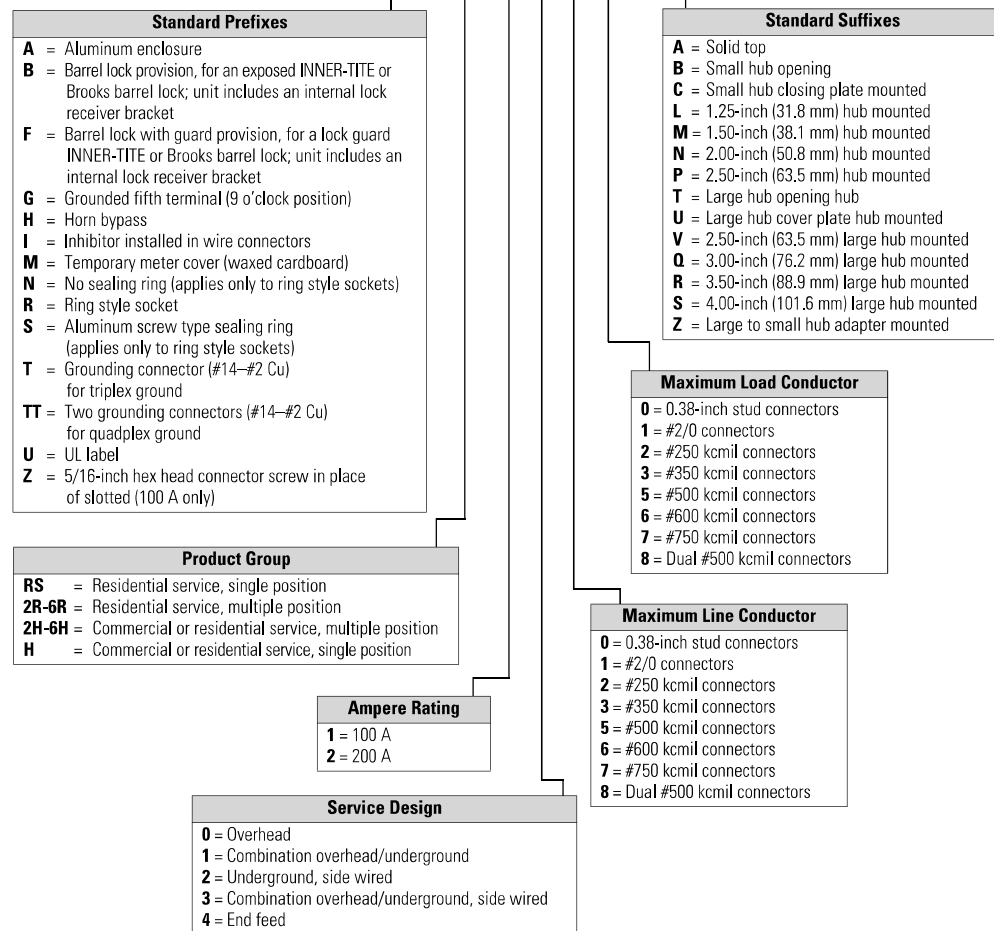
Multiple hub opening and closure plate sizes available

Catalog Number Selection

Single Meter Sockets 2R-6R and 2H-6H Group

Note: The "U" prefix is always used first followed by other prefixes required in alphabetical order.

UT 2R 1 1 2 1 B CH



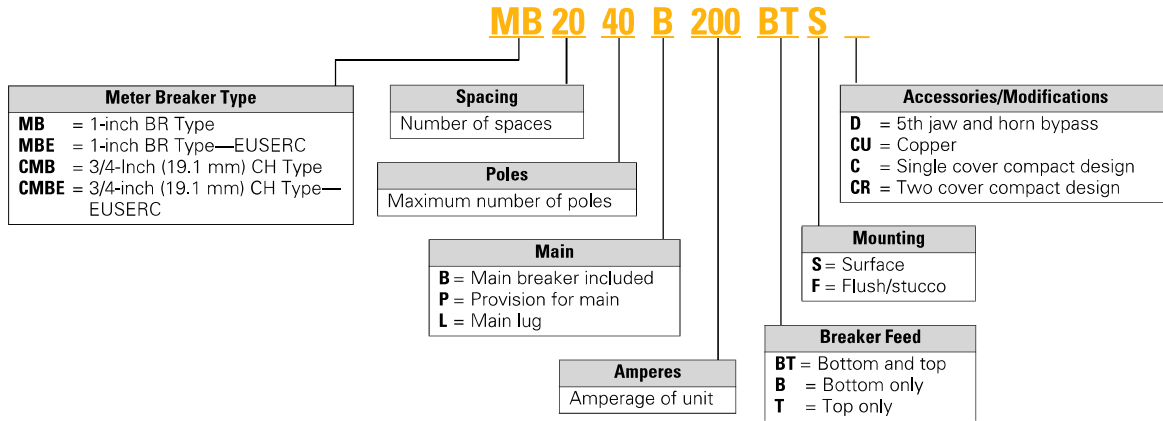
4.2

Metering Products

Meter Breakers

4

Catalog Number Selection

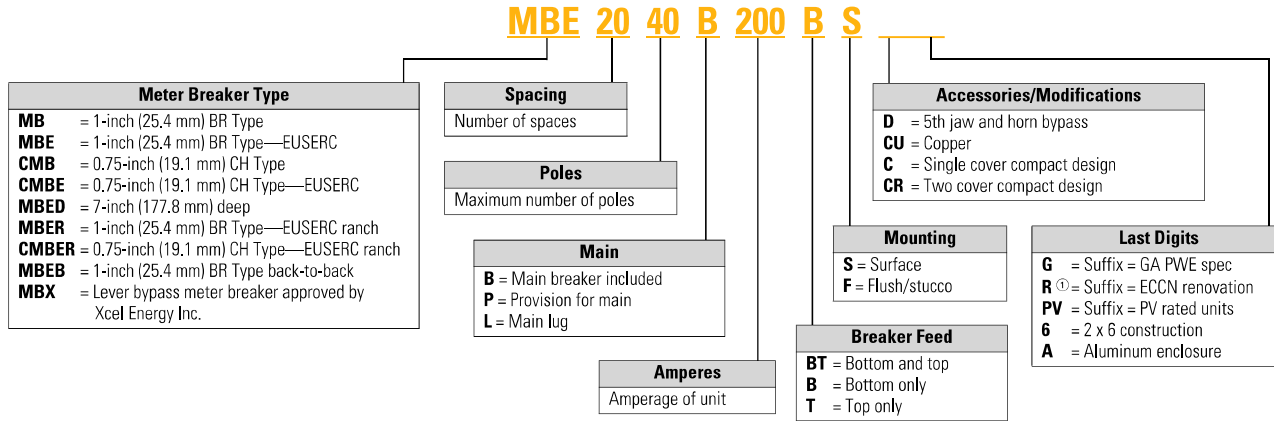


Product Selection

Main Breaker Selection Chart

Maximum Ampere Rating	Two-Pole Breaker Catalog Numbers			
	10 kAIC	25 kAIC	25 kAIC	35 kAIC
100	BW2100	CSR2100	CSR2100N	CSH2100N
125	BW2125	CSR2125	CSR2125N	CSH2125N
150	BW2150	CSR2150	CSR2150N	CSH2150N
200	BW2200	CSR2200	CSR2200N	CSH2200N
Load Side Lug Kit for BW and CSR Breakers			MCBK225	

Catalog Number Selection



Product Selection

Note: See knockout drawings on **Pages V1-T4-61 through V1-T4-67** for hub information.

Combination Service Entrance Devices—EUSERC

Ampere Rating	By-pass	Service	kAIC	Jaws	Distribution	Main	Branch Breaker Type	Dimensions and Enclosure Shape ^②	Page Numbers	Knockout ^②	Catalog Number—Surface	Catalog Number—Flush
Ring Style Meter Mains (no distribution section included)												
125	None	OH/UG	③	4	2/4	MLO	BR	2	V1-T4-62	V1-T4-62	MBE24L125BTS ^④	MBE24L125BTF
125	None	OH/UG	③	4	2/4	MLO	CH	2	V1-T4-62	V1-T4-62	CMBE24L125BTS ^{④⑤}	—
150	None	OH/UG	22	4	None	CSR2150N	None	3	V1-T4-62	V1-T4-62	CMBER150BTS ^{④⑤}	—
200	None	OH/UG	10	4	None	CSR2200	None	3	V1-T4-62	V1-T4-62	MBEB200BTS ^④	MBEB200BTF
200	None	OH/UG	22	4	None	CSR2200N	None	3	V1-T4-62	V1-T4-62	CMBEB200BTS ^{④⑤}	—
200	None	OH/UG	④	4	2/4	MLO	BR	3	V1-T4-62	V1-T4-62	MBE24L200BTS ^④	MBE24L200BTF
200	None	OH/UG	③	4	2/4	MLO	CH	3	V1-T4-62	V1-T4-62	CMBE24L200BTS ^{④⑤}	—
Ring Style All-in-Ones (includes distribution section)												
100	None	OH/UG	10	4	12/24	BR2100	BR	2	V1-T4-62	V1-T4-62	MBE1224B100BTS	MBE1224B100BTF
100	None	UG	10	4	14/28	BR2100	BR	4	V1-T4-61	V1-T4-61	MBE1428B100BS ^⑥	MBE1428B100BF ^⑥
100	None	OH	10	4	12/24	BR2100	BR	9	V1-T4-63	V1-T4-63	MBE1224B100TS	—
125	None	OH/UG	10	4	12/24	BR2125	BR	2	V1-T4-62	V1-T4-62	MBE1224B125BTS	MBE1224B125BTF
125	None	OH	10	4	12/24	BR2125	BR	9	V1-T4-63	V1-T4-63	MBE1224B125TS	—
125	None	UG	10	4	18/36	BR2125	BR	5	V1-T4-61	V1-T4-61	—	MBE1836B125BF ^⑥
150	None	OH/UG	10	4	4/8	CSR2150	BR	19	—	—	MBER48B150BTS ^{⑦⑧}	—
150	None	OH/UG	22	4	8/8	CSR2150N	CH	19	—	—	CMBER88B150BTS ^{⑤⑦⑧}	—
150	None	OH/UG	22	4	8	CSR2150N	CH	3	V1-T4-62	V1-T4-62	CMBE88B150BTS ^{⑤⑦}	CMBE88B150BTF ^{⑥⑦}
150	None	UG	22	4	32/42	CSR2150N	CH	7	V1-T4-61	V1-T4-61	CMBE3242B150BS ^{⑥⑧}	—
150	None	UG	10	4	20/40	CSR2150	BR	6	V1-T4-61	V1-T4-61	—	MBE2040B150BF ^{⑥⑨}

Notes

- ① Not available in CR.
- ② See **Page V1-T4-61** for box details.
- ③ Interrupting rating is dependent on the main breaker that is installed.
- ④ Reference drawing EUSERC DWG-301, G1.
- ⑤ Unit has copper bus.
- ⑥ Reference drawing EUSERC DWG-301/301A.
- ⑦ Units come with feed-through lugs.
- ⑧ Units include a two-pole provision for secondary main 70 A max. Type BR, BRH, BRHH.
- ⑨ Please use RH-Type hubs on top end wall for overhead feed.

Note: See knockout drawings on **Pages V1-T4-61 through V1-T4-67** for hub information.

Combination Service Entrance Devices—EUSERC, continued

Ampere Rating	By-pass	Service	kAIC	Jaws	Distribution	Main	Branch Breaker Type	Dimensions and Enclosure Shape ①	Page Numbers Knockout ①	Catalog Number—Surface	Catalog Number—Flush
Ring Style All-in-Ones (includes distribution section), continued											
150	None	OH/UG	10	4	4/8	CSR2150	BR	3	V1-T4-62	MBE48B150BTS	—
200	None	OH/UG	10	4	4/8	CSR2200	BR	3	V1-T4-62	MBE48B200BTS ③	MBE48B200BTF ③
200	None	OH/UG	22	4	8	CSR2200N	CH	3	V1-T4-62	CMBE88B200BTS ③④	CMBE88B200BTF ③④
200	None	OH/UG	10	4	8	CSR2200	BR	3	V1-T4-62	MBE88B200BTS	—
200	None	OH/UG	10	4	4/8	CSR2200	BR	19	V1-T4-65	MBER48B200BTS ③⑤	—
200	None	OH/UG	10	4	4/8	CSR2200	BR	19	V1-T4-65	MBER48B200BTS ④⑥	—
200	None	OH/UG	②	4	8/16	Provision	BR	10	V1-T4-63	MBE816P200TSCU ⑥④	—
200	None	OH	②	4	8/16	Provision	BR	10	V1-T4-63	MBE816P200TS ⑥③	—
200	None	UG	②	4	6–2 Pole	Main Lug	CH	5	V1-T4-61	CMBE1212L200BS ④⑦	MBE1212L200BTF ⑦
200	None	OH/UG	②	4	6–2 Pole	Main Lug	BR	9	V1-T4-61	MBE1212L200BTS	—
200	None	OH	10	4	20/40	CSR2200	BR	10	V1-T4-63	MBE2040B200TS ⑥	MBE2040B200TF ⑥
200	None	UG	10	4	20/40	CSR2200	BR	6	V1-T4-61	MBE2040B200BS ⑥	MBE2040B200BF ⑥
200	None	OH/UG	22	4	20/40	CSR2200	BR	—	—	MBE2040BH200BTS ⑥	—
200	None	OH/UG	22	4	20/40	CSR2200	BR	—	—	MBE2040BH200BTF ⑥	—
200	None	UG	22	4	30/42	CSR2200	BR	7	—	—	MBE3042B200BF
200	None	UG	22	4	32/42	CSR2200N	CH	7	V1-T4-61	CMBE3242B200BS ④⑦	CMBE3242B200BF ④⑦
200	None	UG	22	4	40	CSR2200	BR	12	—	MBE4040B200BSH ⑥⑦	—
200	None	OH/UG	22	4	40	CSR2200	BR	12	—	MBE4040B200BTS	MBE4040B200BTF ⑥
200	None	OH/UG	22	4	42	CSR2200N	CH	12	—	CMBE4242B200BTS ④	—
200	None	OH/UG	10	4	20/40	CSR2200	BR	18	V1-T4-65	MBE2040B200BTS ⑥	MBE2040B200BTF ⑥
225	None	OH/UG	10	4	20/40	CSR2225	BR	18	V1-T4-65	MBE2040B225BTS ⑥	MBE2040B225BTF ⑥
225	None	UG	22	4	30/42	CSR2225	BR	7	—	—	MBE3042B225BF ⑦
225	None	UG	22	4	32/42	CSR2225N	CH	7	V1-T4-61	CMBE3242B225BS ④⑦	CMBE3242B225BF ④⑦

Notes

- ① See **Page V1-T4-61** for box details.
- ② Interrupting rating is dependent on the main breaker that is installed.
- ③ Units come with feed-through lugs.
- ④ Unit has copper bus.
- ⑤ Semi-flush flange, not full stucco flange.
- ⑥ Please use RH-Type hubs on top end wall for overhead feed.
- ⑦ Reference drawing EUSERC DWG-301/301A.
- ⑧ When a provision for main is provided, order one of the main breakers listed on **Page V1-T4-61**. All panels are dual labeled to accept Types BW or CSR Main Breakers.
- ⑨ Includes factory-mounted 2.50-inch hub on bottom endwall. UG feed only.



Powering Business Worldwide

Surge Protection Devices

Understanding Surge Terminology



Voltage Protection Rating (VPR)

Features

Measures the maximum amount of voltage that will be let through the SPD.

Performance

- Also, referred to as the “let through” voltage
- The lower the rating, the better

Example

For example, when Eaton’s CHSPT2ULTRA was tested to the UL 1449 3rd edition standard, 3-6000V / 3000A surges were applied to the device and it allowed 600V out on the line. Under these conditions, our device was able to shunt 90% of the surge to ground.



Nominal Discharge Current Rating (In)

Features

Measures the amperage that the SPD can withstand.

Performance

- This is an indicator of the performance or durability of the SPD
- The higher the rating, the better

Example

For example, when Eaton’s CHSPT2ULTRA was tested to the UL 1449 3rd edition standard, 15 surges of 20,000 amps were applied to the device without destroying it.



Surge Current Capacity, Per Phase Rating

Features

Expresses the maximum amount of surge current a SPD can shunt to ground during a surge event on one phase.

Performance

- Predictor of how long the SPD will last
- The higher the rating, the better

Example

For example, when Eaton’s CHSPT2ULTRA was tested to the UL 1449 3rd edition standard, it was able to withstand a surge up to 108kA without being destroyed.





Powering Business Worldwide

Transformers

Low Voltage Dry Type Distribution Transformers



Eaton Transformer Types

Following are the types and names of the transformers that Eaton manufactures.

- **DOE2016 Energy Efficient (DS-3, DT-3)
General Purpose Ventilated and
Harmonic Mitigating (HMT)**
 - 5 - 167kVA single phase
 - 15 - 750kVA three phase
 - 150 degC rise standard
 - N2 ventilated enclosure standard (TENV available)
 - Must order lug kits separately
 - Many options available through Eaton Transformer Flex Center;
TransFlexSupp@eaton.com or
915.401.8316

- **General Purpose Encapsulated (EP, EPT)**
 - .05 - 37.5kVA single phase
 - 3 - 75kVA three phase
 - 115 degC rise standard
 - N3R enclosure standard
 - Many options available through Eaton Transformer Flex Center;
TransFlexSupp@eaton.com or
915.401.8316
- **Other common transformer categories**
 - Motor Drive Isolation
 - Mini Power Centers
 - Totally Enclosed Non – Ventilated (TENV)
 - Class 1 Division 2
 - Open Type
 - Marine Duty
 - Buck Boost
 - Medium Voltage
 - Liquid Filled
 - Instrument and Control

Selection Criteria

Refer to the specifications and one-line for the following information:

- Enclosure type and NEMA rating
- How many phases on secondary side
- Primary (input) voltage
- Secondary (output) voltage
- kVA
- Winding material - Aluminum or Copper
- Temperature rise – 150C, 115C, 80C
- Low Sound – dB below NEMA ST-20

- Optional features
 - K-Factor / HMT required
 - Special taps
 - 200% neutral
 - Electrostatic shields
 - Certified tests and reports
 - Special standards or labels
 - Stainless enclosure (304 or 316)
 - Thermal indicators in coils
 - Infrared viewing window (2"- 4")
 - Integral surge protection
- Field installed accessories
 - Wall-mount brackets
 - Weather shields (gives DS-3 and DT-3 ventilated a N3R rating)
 - Rodent screens
 - Terminal lug kits

Resources

- Website: www.eaton.com (cross references, wiring diagrams and more)
- Customer Support: 1-877-ETN-CARE
- Catalog: Volume 2 Commercial Distribution, Tab 9: Transformers
- Catalog: Consulting Application Guide, Section 19
- Selection Tool: Bid Manager



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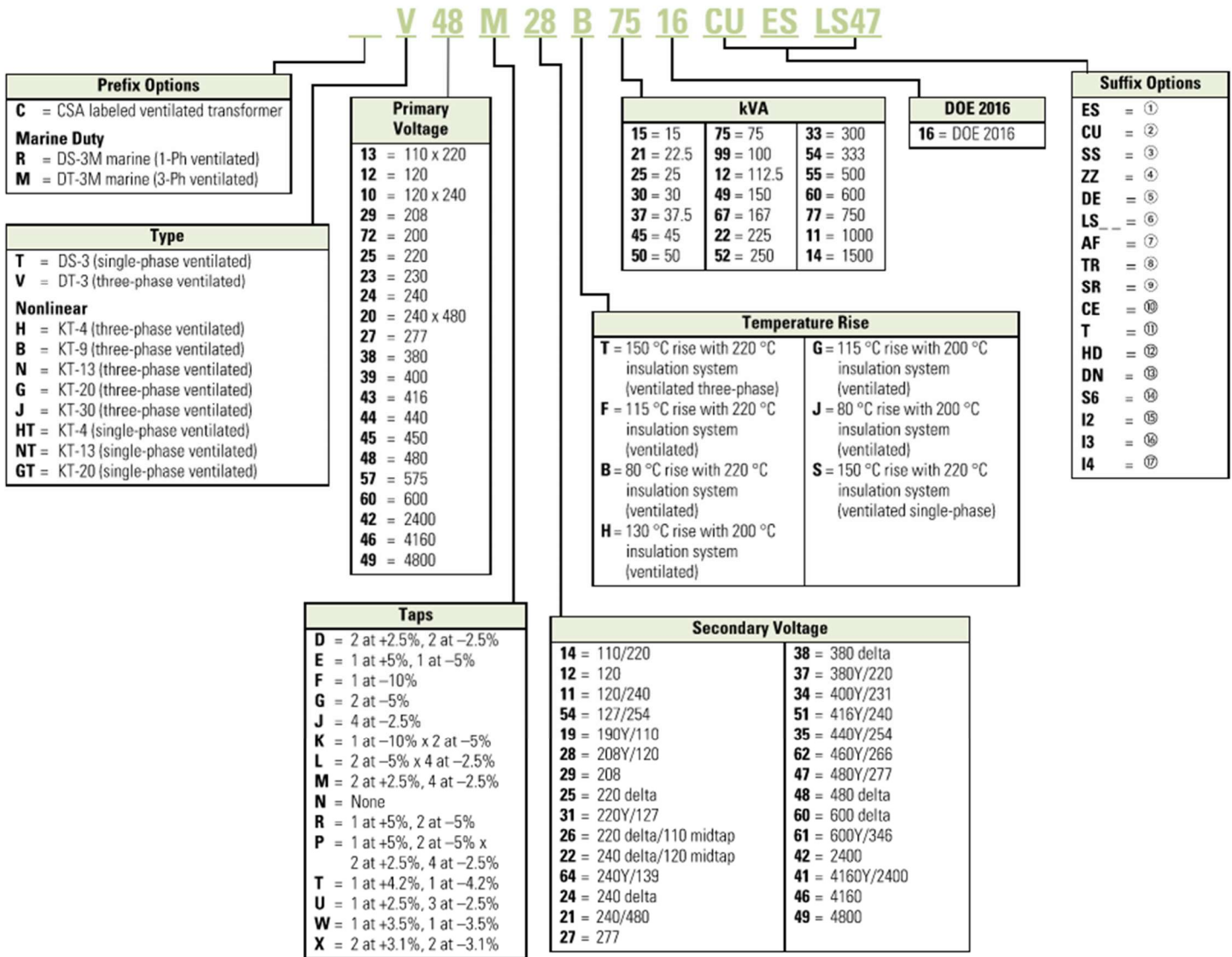
All other trademarks are property of their respective owners.

Catalog Number Selection

Use table for catalog number breakdown only.

Do not use to create catalog numbers because all combinations may not be valid.

DOE 2016 Efficient Transformers, Shielded Isolation, Nonlinear K-Factor, Marine Duty Transformers—
 Example: V48M28B7516CUESLS47



Symbol	Representation
V	
48	
M	
28	
T	
75	
16	

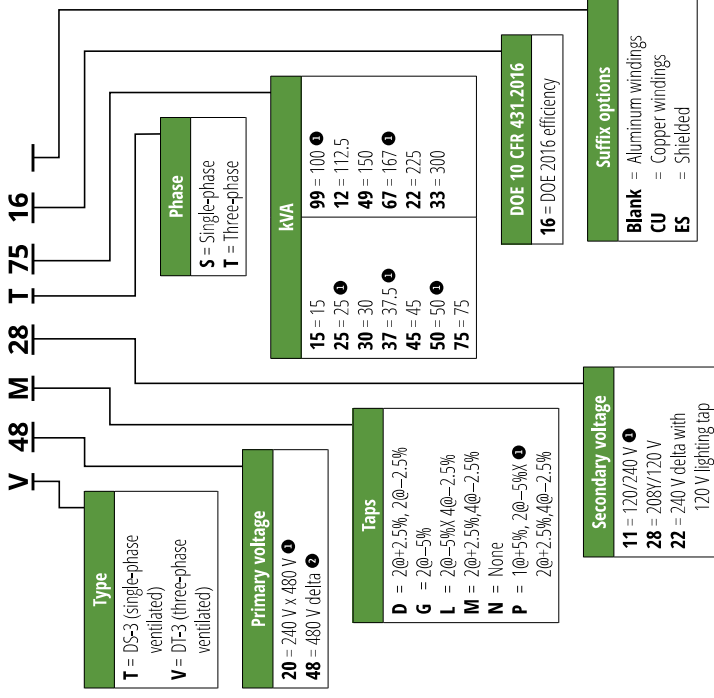
- What is the catalog number to change the above transformer to single phase, 240V secondary?
- What is the catalog number to change the windings to copper?
- Does this transformer come with lugs?

Transformers

Application considerations for proper selection

- What type of enclosure is required?
 - Ventilated
 - Encapsulated
- What is the primary voltage? (input voltage)
 - 240 V x 480 V (single-phase)
 - 480 V delta (three-phase, three-wire)
- What is the secondary voltage? (output voltage)
 - 120/240 V (single-phase)
 - 208Y/120 V (three-phase, four-wire)
 - 240 V delta with 120 V lighting tap
- How many phases?
 - Single-phase
 - Three-phase
- What kVA transformer is required?
 - If single-phase encapsulated, kVAs are: 0.05, 0.075, 0.10, 0.15, 0.25, 0.50, 0.75, 1, 1.5, 2, 3, 5, 7.5, 10, 15, 25, 37.5
 - If single-phase ventilated, kVAs are: 15, 25, 37.5, 50, 75, 100, 167
 - If three-phase encapsulated, kVAs are: 3, 6, 9, 15, 30, 45, 75
 - If three-phase ventilated, kVAs are: 15, 30, 45, 75, 112.5, 150, 225, 300
- If a ventilated transformer was selected
 - Field kits: lug kits or weathershields
 - Select from selection tables

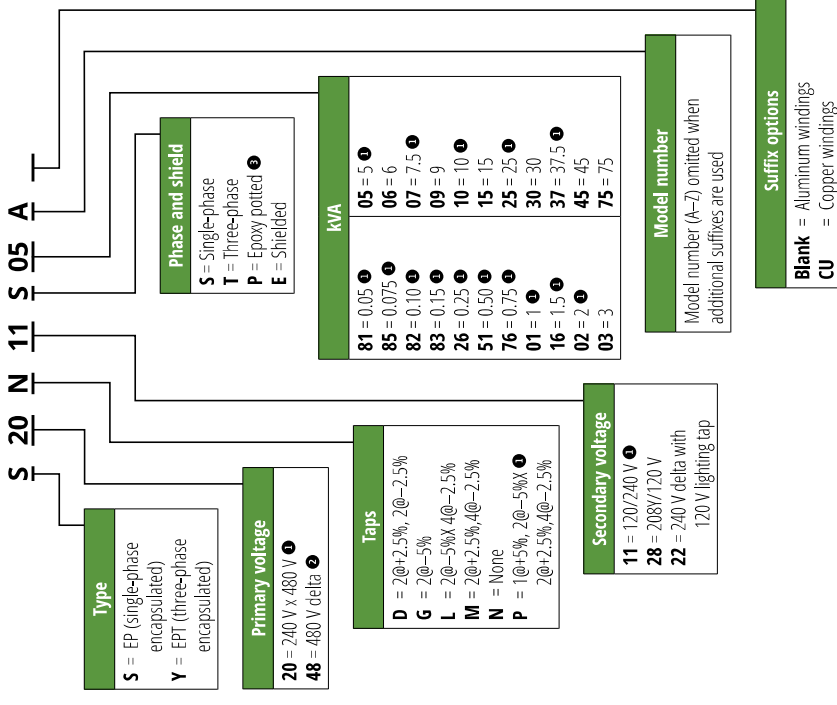
Catalog numbering system—DOE 2016 ventilated transformers



- Typically used with single-phase transformers.
- Three-phase, three-wire.



Catalog numbering system—encapsulated transformers



- Typically used with single-phase transformers.
- Three-phase, three-wire.
- Single-phase 0.25-2 kVA encapsulated transformers only.

General-purpose transformers

Three-phase ventilated, 480 delta—208 Y/120, 150 °C rise, aluminum windings, DOE 2016

kVA	Frame number	Wiring diagram	Weathershield	Typical lug kit	Catalog number
15	939	280B	W557	LKS1	V48M28T1516 ①
30	940	280B	W558	LKS1	V48M28T3016 ①
45	940	280B	W558	LKS1	V48M28T4516 ①
75	942	280B	W559	LKS2	V48M28T7516 ②
112.5	943	280B	W560	LKS2	V48M28T1216 ②
150	943	280B	W560	LKS3	V48M28T4916 ②
225	944	280B	W561	LKS3	V48M28T2216
300	945	280B	W562	LKS3	V48M28T3316

① Suitable for use with wall-mounted bracket WMB05.

② Suitable for use with wall-mounted bracket WMB04.

Three-phase ventilated, 480 delta—240/120 lighting tap, 150 °C rise, aluminum windings, DOE 2016

kVA	Frame number	Wiring diagram	Weathershield	Typical lug kit	Catalog number
15	939	282B	W557	LKS1	V48M22T1516 ①
30	940	282B	W558	LKS1	V48M22T3016 ①
45	940	282B	W558	LKS1	V48M22T4516 ①
75	942	282B	W559	LKS2	V48M22T7516 ②
112.5	943	282B	W560	LKS2	V48M22T1216 ②
150	943	282B	W560	LKS3	V48M22T4916 ②
225	944	282B	W561	LKS3	V48M22T2216
300	945	282B	W562	LKS3	V48M22T3316

① Suitable for use with wall-mounted bracket WMB05.

② Suitable for use with wall-mounted bracket WMB04.

Three-phase encapsulated, 480 delta—208 Y/120, 115 °C rise

kVA	Frame number	Wiring diagram	Catalog number
3	201	70A	Y48G28T03N
6	200	70A	Y48G28T06N
9	103	70A	Y48G28T09N
15	95	72B	Y48D28T15N
30	243	84A	Y48M28T30N
45	244	84A	Y48M28T45N
75	245	84A	Y48M28T75N

Note: For frame drawings and wiring diagrams, refer to www.eaton.com/transformers.

General-purpose transformer sizing tables

Three-phase transformer full load current

kVA	Rated line-line voltage							
	208	240	480	600	2400	4160	4800	4800
3	8.3	7.2	3.6	2.9	0.7	0.4	0.4	0.4
6	16.7	14.4	7.2	5.8	1.4	0.8	0.7	0.7
9	25.0	21.7	10.8	8.7	2.2	1.2	1.1	1.1
15	41.6	36.1	18.0	14.4	3.6	2.1	1.8	1.8
30	83.3	72.2	36.1	28.9	7.2	4.2	3.6	3.6
45	124.9	108.3	54.1	43.3	10.8	6.2	5.4	5.4
75	208.2	180.4	90.2	72.2	18.0	10.4	9.0	9.0
112.5	312.3	270.6	135.3	108.3	27.1	15.6	13.5	13.5
150	416.4	360.9	180.4	144.3	36.1	20.8	18.0	18.0
225	624.6	541.3	270.6	216.5	54.1	31.2	27.1	27.1
300	832.7	721.7	360.9	288.7	72.2	41.6	36.1	36.1
500	1387.9	1202.8	601.4	481.1	120.3	69.4	60.1	60.1
750	2081.9	1804.3	902.1	721.7	180.4	104.1	90.2	90.2
1000	2775.8	2405.7	1202.8	962.3	240.6	138.8	120.3	120.3

Note: Line current = (kVA x 1000) / (line voltage x 1.732).

Single-phase transformer full load current

kVA	Rated line-line voltage								
	120	208	240	277	480	600	2400	4160	4800
0.5	4.2	2.4	2.1	1.8	1.0	0.8	0.2	0.1	0.1
1	8.3	4.8	4.2	3.6	2.1	1.7	0.4	0.2	0.2
1.5	12.5	7.2	6.3	5.4	3.1	2.5	0.6	0.4	0.3
2	16.7	9.6	8.3	7.2	4.2	3.3	0.8	0.5	0.4
3	25.0	14.4	12.5	10.8	6.3	5.0	1.3	0.7	0.6
5	41.7	24.0	20.8	18.1	10.4	8.3	2.1	1.2	1.0
7.5	62.5	36.1	31.3	27.1	15.6	12.5	3.1	1.8	1.6
10	83.3	48.1	41.7	36.1	20.8	16.7	4.2	2.4	2.1
15	125.0	72.1	62.5	54.2	31.3	25.0	6.3	3.6	3.1
25	208.3	120.2	104.2	90.3	52.1	41.7	10.4	6.0	5.2
37.5	312.5	180.3	156.3	135.4	78.1	62.5	15.6	9.0	7.8
50	416.7	240.4	208.3	180.5	104.2	83.3	20.8	12.0	10.4
75	625.0	360.6	312.5	270.8	156.3	125.0	31.3	18.0	15.6
100	833.3	480.8	416.7	361.0	208.3	166.7	41.7	24.0	20.8
167	1391.7	802.9	695.8	602.9	347.9	278.3	69.6	40.1	34.8
250	2083.3	1201.9	1041.7	902.5	520.8	416.7	104.2	60.1	52.1
333	2775.0	1601.0	1387.5	1202.2	693.8	555.0	138.8	80.0	69.4


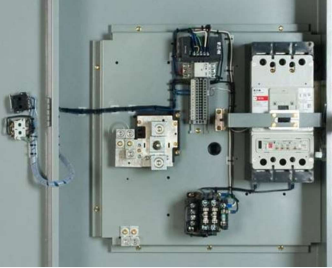

Note: Line current = (kVA x 1000) / line voltage.





Powering Business Worldwide

Safety Switches

Safety Switch Innovative Designs

Eaton Part	Include in Specification	Description	Advantage Over
 <p>Double Door Line Isolation Switch</p>	<p>Internal barrier separating and isolating switch base and fuse base</p> <p>Viewing window and yellow blade mechanism for enhanced visibility for visual confirmation of blade position</p> <p>Interlocking mechanism preventing both doors from being opened when handle is in ON position</p> <p>Complete UL listed assembly</p>	<p>Revolutionary design minimizes exposure, enhances safety and maximizes uptime when accessing load-side fuse compartment</p> <p>Provides dual door construction with barrier separating switch mechanism and fuse compartment, Allows access to fuses without exposure to the line side voltage</p> <p>Available in a full range of ratings – 30A through 1200A, 600VAC max</p> <p>Optional voltage monitors provide additional verification as to whether or not the circuit is open</p> <p>Isolated fuse compartment eliminates exposure to line-side power when changing fuses</p>	<p>Unique to Eaton</p>
 <p>ARMS Enclosed Circuit Breakers</p>	<p>ECB to have factory installed means of reducing energy let through providing code compliance to NEC 240.87</p> <p>Operator initiated maintenance mode to reduce available arcfash energy</p> <p>Complete UL listed assembly</p>	<p>Full line of Enclosed Circuit Breakers with Arcflash Reduction Maintenance System technology – have functionality to reduce the amount of arcfash incident energy downstream</p> <p>Fully factory wired assembly, including an electronic trip circuit breaker, cover controls and other components required to activate Arc Reduction Maintenance System during maintenance</p> <p>Maintenance mode is enabled by a lockable switch or signal that can be incorporated into LOTO and safety procedures – the reduction in incident energy can reduce levels of required personal protection equipment (PPE)</p>	<p>Unique to Eaton</p>
 <p>Quick Connect Switches with Cam-Lok or Posi-Lok</p>	<p>Quick Connect switches to have interlocked compartment doors to prevent energized access per NEC 702.12 with Cam-Lok or Posi-Lok terminals</p> <p>Receptacle door to have interlock preventing the switch from being closed when the door is open, and compartment door from being opened when the switch is closed</p> <p>Receptacle compartment to have a hinged trip door on the bottom to allow connection cables to exit and a front door to access the receptacles</p> <p>Complete UL listed assembly</p>	<p>100Amp–1200Amp ST and DT devices w/ integrated receptacles , factory wired to line or load side of switch, and interlocked to</p> <p>Simplified solutions for temporary power hookup</p> <p>Company Switch – single throw switch for connection of lighting, sound and other portable loads</p> <p>Generator Switch – single throw switch enabling customers to safety connect and disconnect a power source</p> <p>Quick Connect Double Throw – for service entrance applications where utility is the primary source and quick connect receptacles enable the hookup of a secondary power source</p>	<p>Unique to Eaton</p>

Eaton Part	Include in Specification	Description	Advantage Over
 <p>Flex Center Modified Solutions</p>	<p>UL listed safety switches w/ factory enhancements</p> <p>Illuminated indicators and pilot devices permanently installed and wired by manufacturer</p> <p>Solutions tailored for:</p> <ul style="list-style-type: none"> • Customer driven specs • Packaged solutions • Safer designs • Enhanced reliability <p>Custom colors, labels, or graphics</p>	<p>The Switching Devices Flex Center is a custom shop located within the Cleveland, TN manufacturing plant</p> <p>The Flex Center is a solution center that designs and modifies safety switches, enclosed circuit breakers and rotary disconnects for unique customer needs not met by standard products.</p> <p>Some popular modifications include, but certainly not limited to:</p> <ul style="list-style-type: none"> • Integrated surge protective devices • Alternate lug solutions • Viewing windows • Pilot lights • Voltage Indicators / Voltage Testers • Special paint color • Weld receptacles • Key interlocks 	<p>Unique to Eaton</p>
 <p>Heavy Duty Safety Switches with Voltage Indicators</p>	<p>Factory installed visual indication if voltage is present per phase</p> <p>Enhanced visible blade components provide increased visibility over each pole, allowing users to clearly see the trailing edge of the blade</p> <p>Complete UL listed assembly</p>	<p>Eaton's heavy-duty safety switches with viewing windows and integrated voltage indicators provide a safer switching solution</p> <p>UL listed products combine a visible disconnecting means with permanently installed indicators that illuminate whenever voltage is present on any individual phase</p> <p>Full line 30A – 1200A; 240VAC – 600VAC; NEMA type 12/3R and 4X stainless steel</p>	<p>GE and Siemens</p> <p>Schneider to have difficulty with enhanced blade mechanism and UL</p>
 <p>Shunt Trip Safety Switches</p>	<p>Safety switch with factory integrated means of remote opening</p> <p>Heavy-duty safety switch to have factory integrated shunt trip module</p> <p>Switch to be UL 98, CSA 22.2 No. 4 listed</p> <p>Remote disconnect device to have short-circuit ratings of up to 200 KAIC</p>	<p>Designed to enhance personnel safety and protect equipment in commercial and industrial applications. These UL listed heavy-duty safety switches with shunt trip technology can be operated electrically and remotely</p> <p>The shunt trip safety switch can be configured to meet the needs of safety applications in industrial and commercial environments</p> <p>The switches can be signaled to electronically operate the trip mechanism and interrupt the flow of power when a defined electrical condition is detected via protection relay</p> <p>30A – 1200A; 240VAC & 600VAC; NEMA type 12/3R, 4/4X stainless steel</p>	<p>Unique to Eaton</p>

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What's the Difference

General Duty Safety Switch

Certifications

- UL® 98
- NEMA® KS-1

Features

- Fusible or Non-fusible (See reverse side for fuse clip details)
- 30–600A
- 240 Vac maximum
- 1, 2 and 3 pole options
- Short circuit ratings up to 100 kAIC at 240V with class R, J or T type fuses
- Horsepower rated
- B series design for 30–100A
- K series design for 200–600A
- Field or factory installed auxiliary contacts: 200–600A
- Field or factory installed control pole Interlock: 400–600A



Heavy Duty Safety Switch

- UL® 98
- NEMA KS-1
- Seismic qualified; exceeds UBC and California Code Title 24

- Fusible or Non-fusible (See reverse side for fuse clip details)
- 30–1200A
- 600 Vac maximum
- 2, 3, 4 and 6 pole options
- Short circuit ratings up to 200 kAIC at 480V with class R, J or T type fuses
- Horsepower rated
- K series design
- Complete range of field or factory installed accessories
- Extensive modifications available at the Safety Switch Flex Center 1.888.329.9272 or flexswitches@eaton.com
- Industry's shortest lead-time on modified switches

Enclosure Types

- NEMA 1
- NEMA 3R

- NEMA 1
- NEMA 3R
- NEMA 12
- NEMA 7/9
- NEMA 4 painted steel (800A maximum)
- NEMA 4X stainless steel
- NEMA 4X non-metallic (200A maximum)



The Bottom Line

Best for residential and light commercial applications. Light-duty motor and service entrance. Fewer operations, lower voltage and amperage, fewer enclosure and accessory options.

Best for heavy commercial or industrial applications. Motor switching and larger commercial service entrance. More operations, higher voltage and amperage, more enclosure and accessory options. Factory modifications available.

Heavy Duty (DH) Switches Fuse Class Chart

Ampere	Voltage	Factory Fuse Class	R Fuse Kit	T Fuse Kit	J Fuse Kit
30	240	H	DS12FK	n/a	Factory option only
30	600	H	DS16FK	n/a	Factory option only
60	240	H	DS16FK	n/a	DS22JK
60	600	H	DS26FK	n/a	Relocate clips/base
100	240/600	H	DS36FK	n/a	Relocate clips/base
200	240	H	DS46FK	DS426TK	Relocate clips/base
200	600	H	DS46FK	DS466TK	Relocate clips/base
400	240	H	DS56FK	DS526TK	Relocate clips/base
400	600	H	DS56FK	DS556TK	Relocate clips/base
600	240	H	DS66FK	DS626TK	DS600JK
600	600	H	DS66FK	DS666TK	DS600JK
800	240	L		DS726TK	
800	600	L		DS766TK	
1200	240	L		Relocate bases	
1200	600	L		Relocate bases	

General Duty (GH) Switches Fuse Class Chart

Ampere	Voltage	Factory Fuse Class	R Fuse Kit	T Fuse Kit	J Fuse Kit
30	240	H	DG030RB		
60	240	H	DS16FK		
100	240	H	DG100RB		
200	240	H	DS46FK		
400	240	H	DS56FK	DS526TK	
600	240	H	DS66FK	DS626TK	DS600JK

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Heavy Duty Safety Switch Basics



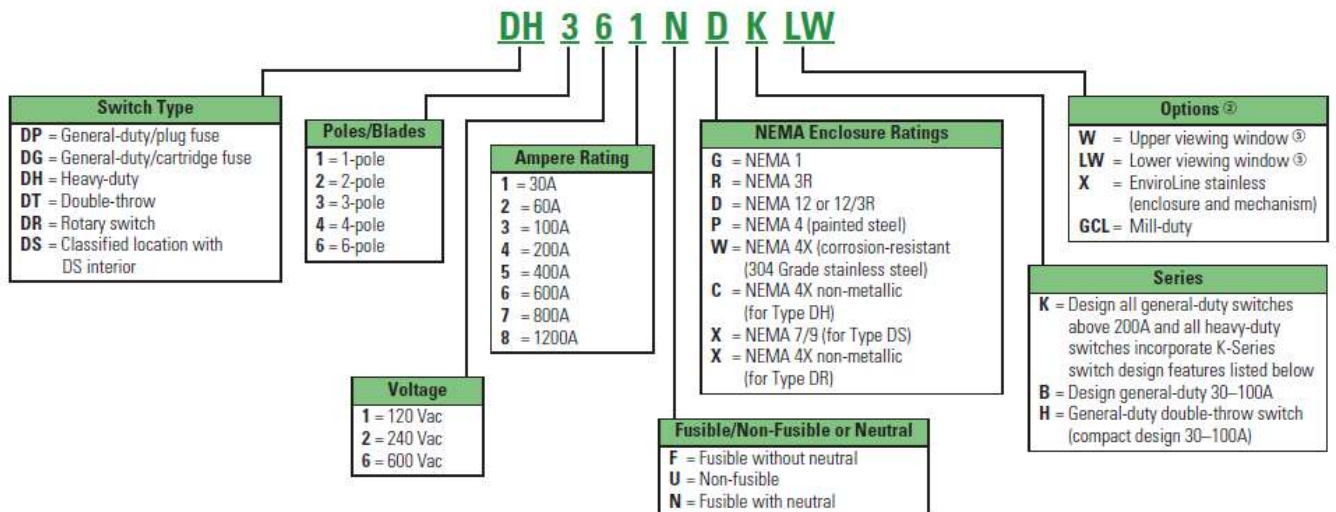
For Additional Assistance:

- Visit www.eaton.com/safetyswitches
- Catalog: volume 2 - commercial distribution, CA08100003E
- Contact the technical resource center (TRC) at 877.386.2273
- Contact the Eaton flex center at 888.329.9272 or flexswitches@eaton.com

Selecting the Right Switch

Steps	Questions to Ask	Common Standard Selections
Step 1	What type of switch?	<ul style="list-style-type: none"> • Heavy Duty (DH) • General Duty (DG) • Double Throw (DT)
Step 2	What amperage rating?	<ul style="list-style-type: none"> • 30A, 60A, 100A, 200A, 400A, 600A, 800A, 1200A
Step 3	What type of protection?	<ul style="list-style-type: none"> • Fusible (F) • Non Fusible (NF)
Step 4	How many poles?	<ul style="list-style-type: none"> • 2p, 3p, 4p, 6p
Step 5	What is the system voltage?	<ul style="list-style-type: none"> • 240 Vac • 480/600 Vac • 600 Vdc
Step 6	What type of enclosure is needed?	<ul style="list-style-type: none"> • NEMA 1 (general indoor) • NEMA 3R (outdoor/drip proof) • NEMA 12 (dust tight) • NEMA 4x (stainless steel, gaskets for spray) • NEMA 7/9 (explosion proof)
Step 7	Additional accessories or custom modifications?	<ul style="list-style-type: none"> • Neutral or ground kits • Auxillary contacts • Custom paint or unique configurations

Converting Function to a Part Number



Safety Switch Accessories

Description	Catalog Number
Neutral Kits/Ground Kits	
30 A DG	DG030NB
60–100 A DG	DG100NB
200 A DG, DH (NEMA 1, 3R enclosures)	DG200NK
30–60 A DH	DH030NK
100 A DH	DH100NK
200 A DH (NEMA 4X, 12 enclosures)	DH200NK
400 A DG, DH	DS400NK
600 A DG, DH	DS600NK
400–600 A Fusible DT, 800–1200 A DH	DS800NK
30–100 A DT	DT100NK
200 A DT	DT200NK
400 A Non-fusible DT	DT400NK
600 A Non-fusible DT	DT600NK
800 A DT	DT800NK
1200 A DT	DT1200NK
Ground Lug Kits¹	
30–100 A DG	DG030GB
30–100 A DH, DT ²	DS100GK
200 A DG, DH, DT	DS200GK
400–600 A DG, 400–1200 A DH, 400–1200 A DT	DS468GK
Ground Lug Kits³	
30–100 A DT, three-pole, four-pole, non-fusible	DT100BK
200 A DT, three-pole, four-pole, non-fusible	DT200BK
400 A DT, three-pole, four-pole, non-fusible	DT400BK
600 A DT, three-pole, four-pole, non-fusible	DT600BK
800 A DT, three-pole, four-pole, non-fusible	DT800BK
Control Pole Kit	
400–600 A DG, 30–1200 A DH, 30–800 A DT	DS16CP
Auxiliary Contact Kits	
All switches (except 30–100 A DG) 1NO/1NC	DS200EK1 ⁴
All switches (except 30–100 A DG) 2NO/2NC	DS200EK2 ⁴
NEMA 7/9 switches (30–100 A) 1NO/1NC	178C265G05
NEMA 7/9 switches (30–100 A) 2NO/2NC	178C265G06
Copper Lug Kits	
30 A DH, DT ⁵	DS16CL
60 A DH, DT ⁵	DS26CL
100 A DH, DT ⁵	DS36CL
200 A DH ⁵	DS46CL
400 A DH (NEMA 4, 4X, 12 enclosures) ⁶	DS56CL
600–800 A DH (NEMA 4, 4X, 12 enclosures) ⁶	DS66CL
Crimp Lug Pad Kit (NEMA 4, 4X, 12 Enclosures)	
400–600 A DH ⁵	DS56CK
800 A DH ⁶	DS76CK
400–800 A neutral DH ³	DS800C

Description	Catalog Number
Fuse Puller Kits	
30 A DH ⁵	DS30FP
60 A DH	DS60FP
100 A DH ⁵	DS100FP
200 A DH ⁵	DS200FP
“J” Fuse Adapter Kits	
60 A 240 V DH ⁵	DS22JK
60 A DT and receptacle switches ⁵	DT400JK
400 A 600 V DT ⁹	DS600JK
600 A 240–600 V DH only ⁶	DS22JK
“R” Fuse Adapter Kits	
30 A DG	DG030RB
100 A DG	DG100RB
30 A 240 V DH, DT	DS12FK
30 A 600 V DH, DT, 60 A 240 V DH, DT, 60 A DG	DS16FK
60 A 600 V DH, DT	DS26FK
100 A 240–600 V DH, DT	DS36FK
200 A 240–600 V DH, DT, 200 A DG	DS46FK
400 A 240–600 V DH, 240 V DT, 400 A DG	DS56FK
600 A 240–600 V DH, 600 A DG	DS66FK
“T” Fuse Adapter Kits	
200 A 240 V DH ⁵	DS426TK
200 A 600 V DH ⁵	DS466TK
400 A 240 V DG, DH ⁶	DS526TK
400 A 600 V DH ⁶	DS566TK
600 A 240 V DG, DH ⁶	DS626TK
600 A 600 V DH ⁶	DS666TK
600 A 240 V ⁶	DT626TK
600 A 600 V ⁶	DT666TK
800 A 240 V DH, DT ⁹	DS726TK
800 A 600 V DH, DT ⁹	DS766TK
1200 A 240 V DH DT ¹⁰	
1200 A 600 V DH DT ¹⁰	
Hookstick handle	
	DH800HSH
Lubricating grease for safety switch blades and contacts (each kit contains three 30 cc tubes of lubricating grease).	
	DSLUBEKIT
Auxiliary Contacts for:	
16-25A three-, four-pole rotary switches, includes holder and contact (1NO/1NC)	CMAC
30-40A three-pole rotary switches, includes holder and contact (1NO)	CRAC3 ⁷
60-125A three-pole rotary switches, includes holder and contact (1NO)	CRAC3 ⁷
30-40A four-pole rotary switches, includes holder and contact (1NO)	CRAC4 ⁷
30-125A three-, four-pole, contact only (1NC)	CRAA ⁷
30-125A three-, four-pole, contact only (1 NO)	CRAB ⁷

¹Ground bar kit is not listed on device publications²Order one kit for three poles³Order one kit for each pole⁴Order one kit per switch⁵Receptacle switches⁶Order one kit for six poles⁷The mechanism is reversed on these contacts

Accessories not applicable to NEMA 7/9 switches

Ground Lug

A factory-installed ground lug is supplied on all NEMA 4, 4X and 12 safety switches, as well as all 400A and higher NEMA 1 and 3R safety switches. A factory-installed ground lug is also supplied on all heavy-duty NEMA 1 and 3R 30–200A switches that do NOT have a factory installed neutral.

Standard Lug Capacities

Ampere Rating	Minimum Wire Size	Maximum Wire Size	Wire Type
30 A DP	#14 #12	#10 #10	CU or Al ²
30 A DG	#14	#6	Cu/Al
30 A DH, DT	#14	#2	Cu/Al
60 A DG	#14	#1/0	Cu/Al
60 A DH, DT	#14	#2	Cu/Al
100 A DG ³	#14	#1/0	Cu/Al
100 A DH, DT	#14	#1/0	Cu/Al
200 A DG, DT	#6	250 kcmil	Cu/Al
200 A DH Type 1 and 3R	#6	250 kcmil	Cu/Al
200 A DH Type 4X and 12	#6	300 kcmil	Cu/Al
400 A DG, DH, DT	(2) #1/0 (1) #1/0	(2) 300 kcmil (1) 750 kcmil	Cu/Al or Cu/Al ²
600 A DG, DH	(1) #2 (1) #1/0	(1) 600 kcmil (1) 750 kcmil	Cu/Al and Cu/Al ⁴
600 A non-fusible DT	(2) 250	(2) 500 kcmil	Cu/Al
800 A DH	(4) #1/0	(4) 750 kcmil	Cu/Al
800 A DT, 600 A fusible DT	(3) #250	(3) 500 kcmil	Cu/Al
1200 A DH, DT	(4) #1/0	(4) 750 kcmil	Cu/Al
Copper-bodied lugs			
30 A Cu	#14	#6	Cu
60 A Cu	#14	#4	Cu
100 A Cu	#6	#1/0	Cu
200 A Cu	#6	250 kcmil	Cu
400 A Cu Type 4, 4X and 12	#1/0	500 kcmil	Cu
600–800 A Cu Type 4, 4X and 12	(2) #1/0	(2) 500 kcmil	Cu

²Single barrel lug that accepts one or two cables per phase as detailed above.

³The maximum size aluminum or copper-clad aluminum wire allowable for applications where the conductor enters or leaves the enclosure through the wall opposite its terminal is #1 gauge.

⁴Double barrel lug that accepts two cables per phase as detailed above.

⁵No copper-bodied lugs are available for 1200 A switches. No copper-bodied lugs are available for larger than 500 kcmil cables. No copper-bodied lugs are available for 400–800 A NEMA 1 or NEMA 3R switches.

***The accessories presented on these pages are common accessories. Please refer to catalog, CA08100003E for a complete offering.**

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February 2018
JACC092018

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Table 28.1-49. Safety Switch Catalog Numbering System—General-Duty

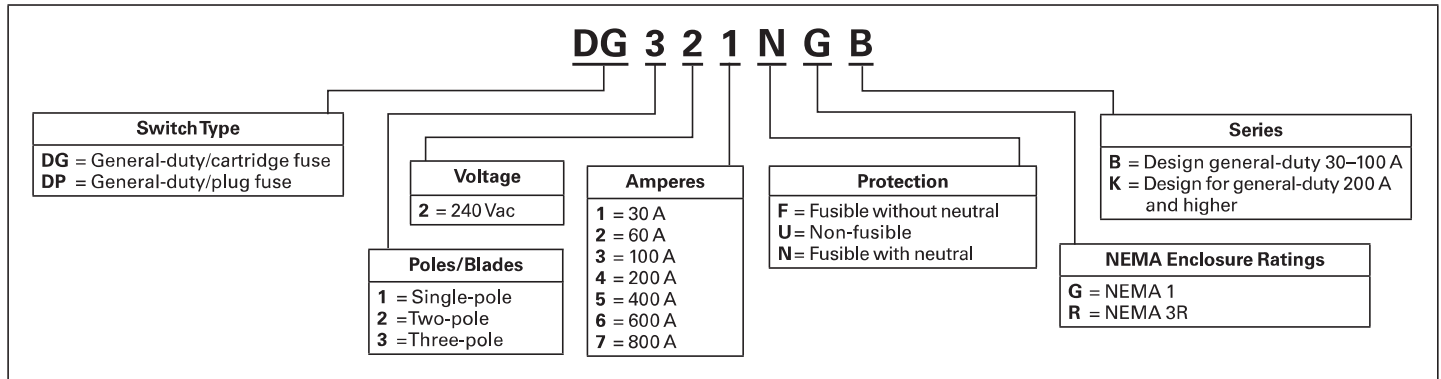
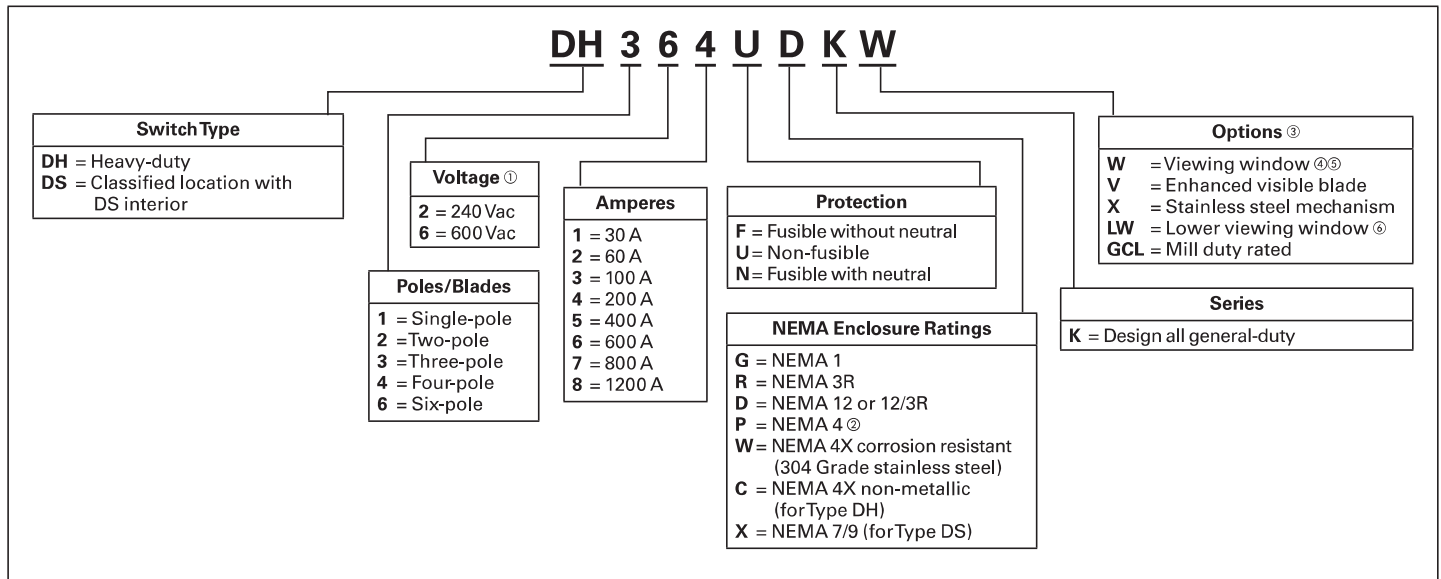


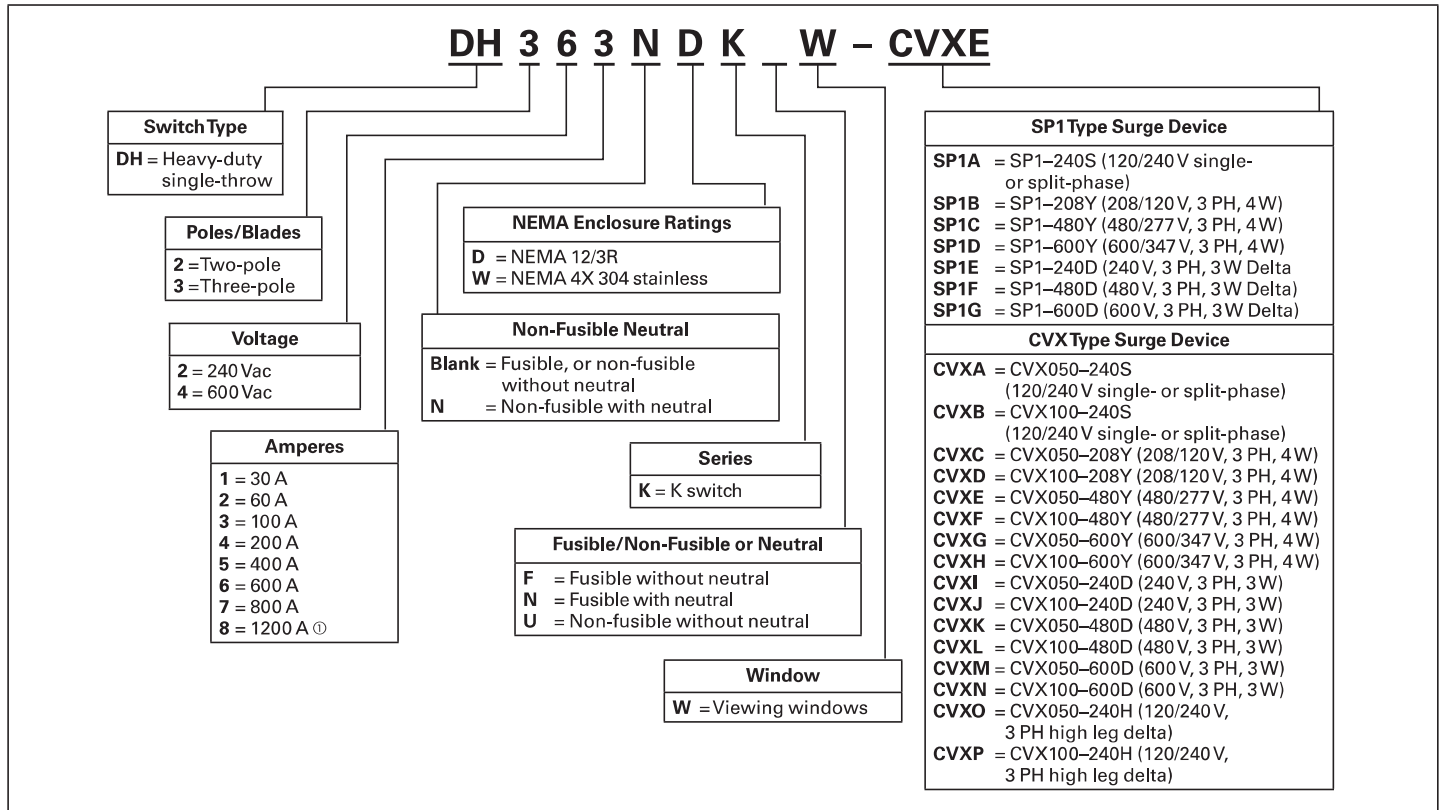
Table 28.1-50. Safety Switch Catalog Numbering System—Heavy-Duty



- ① For DC ratings, check individual switch ratings.
- ② Only available for 400 A and higher safety switches.
- ③ See Modifications-Flex Center for additional available options.
- ④ All window switches feature enhanced visible blade design as standard.
- ⑤ Only available in NEMA 12/3R and NEMA 4X enclosures.
- ⑥ Only available in 200 to 1200 A NEMA 12/3R and NEMA 4X enclosures.

Note: These tables are intended for use in breaking down existing catalog numbers. They are not intended for building new catalog numbers. A factory-installed ground lug is supplied on all safety switches.

Table 28.1-51. Heavy-Duty Safety Switch with Surge Protection Catalog Numbering System



① Available with SP1 type surge device only.

Note: This table is intended for use in breaking down existing catalog numbers. It is not intended for building new catalog numbers.

Table 28.1-52. Auxiliary Power Heavy-Duty Safety Switch Catalog Numbering System

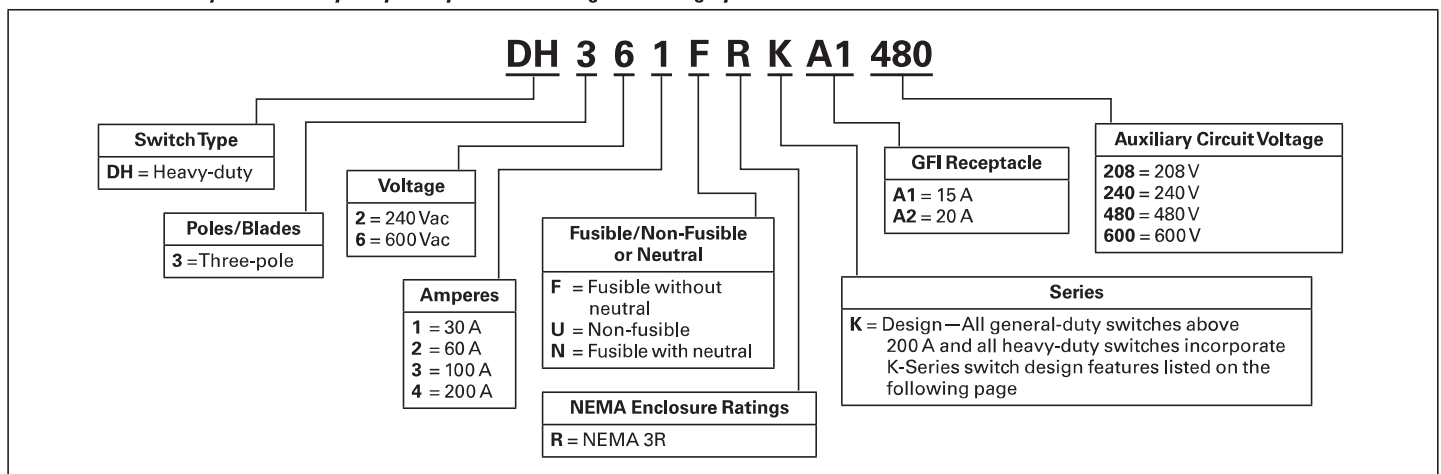
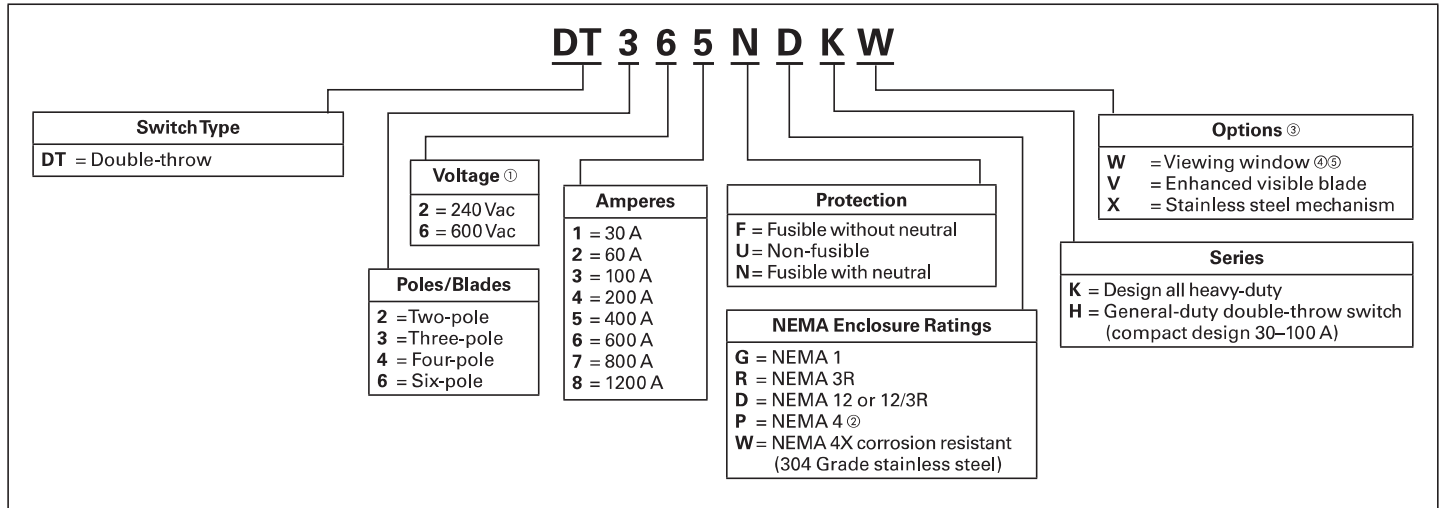


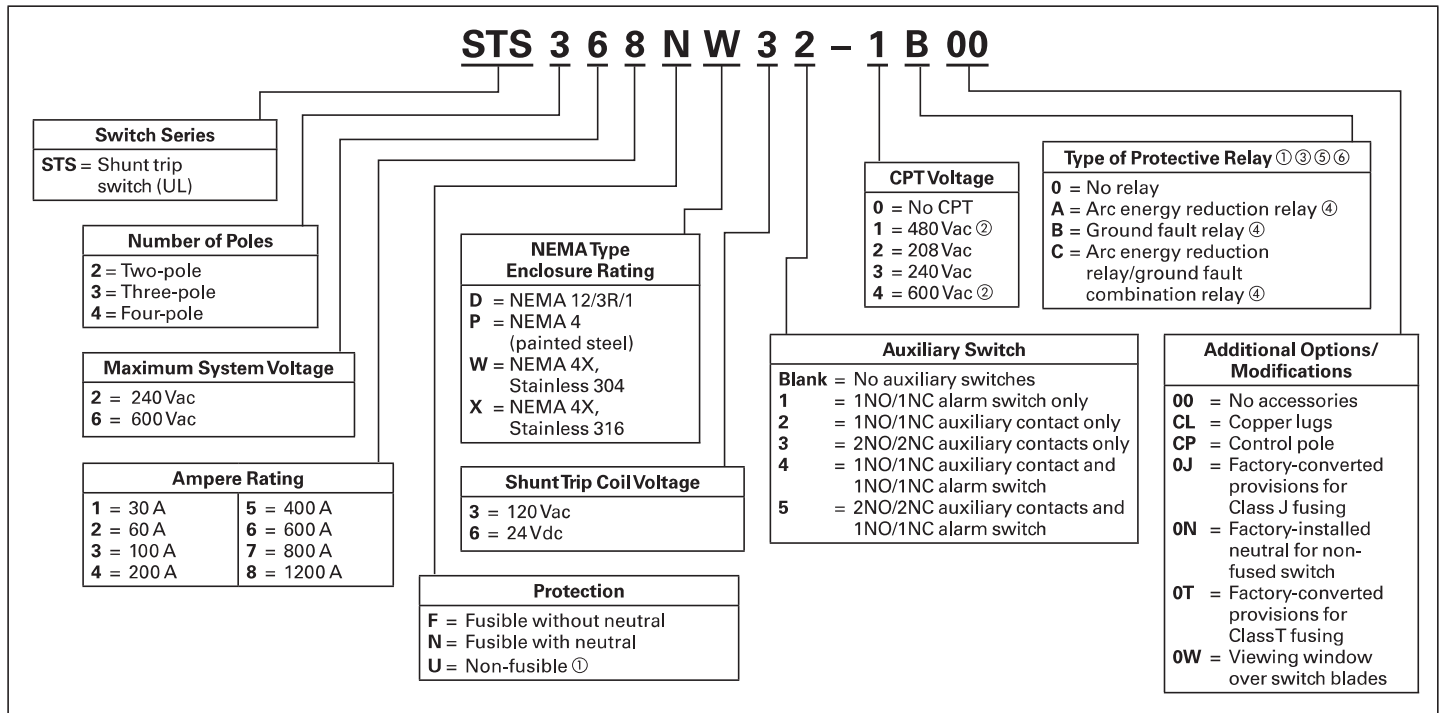
Table 28.1-53. Safety Switch Catalog Numbering System—Double-Throw



- ① For DC ratings, check individual switch ratings.
- ② Only available for 400 A and higher safety switches.
- ③ See Modifications-Flex Center for additional available options.
- ④ All window switches feature enhanced visible blade design as standard.
- ⑤ Only available in NEMA 12/3R and NEMA 4X enclosures.

Note: These tables are intended for use in breaking down existing catalog numbers. They are not intended for building new catalog numbers. A factory-installed ground lug is supplied on all safety switches.

Table 28.1-54. Shunt Trip Safety Switch Catalog Numbering System



- ① Relays can only be used with fusible switches.
- ② Available for 600 Vac switches only.
- ③ Shunt trip safety switch with relay protection must use 120 Vac coils.

- ④ Available for 400–1200 A fusible switches only.
- ⑤ Only one relay option allowed.
- ⑥ Relay viewing window standard with relay option.

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Printed in USA
Publication No. DG008001EN / Z27574
May 2023



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Powering Business Worldwide

Power Defense Circuit Breakers

Power Defense Circuit Breaker

The Power Defense molded case circuit breaker portfolio is globally rated in a small footprint for easy adaptability no matter the application or project requirement. A circuit breaker with communicating electronic trip units and the ability to generate the data to help you optimize your facilities' performance, and to help keep your employees, customers and end-users safe by reducing the risk of arcflash events.



PD 1
15 - 125 A



PD 3
55 - 600 A



PD 5
320 - 1200 A



PD 2
15 - 225 A



PD 4
300 - 800 A



PD 6
700 - 2500 A

Features	PD 1	PD 2	PD 3	PD 4	PD 5	PD 6
Interruption rating @480V	18kA, 25kA, 35kA, 50kA, 65kA, 85kA, 100kA	25kA, 35kA, 50kA, 65kA, 85kA, 100kA	25kA, 35kA, 50kA, 65kA, 85kA, 100kA	35kA, 50kA, 65kA	50kA, 65kA, 85kA, 100kA, 150kA	65kA, 85kA, 100kA
Current limiting available	Yes	Yes	Yes	No	No	No
100% rated available	No	Yes	Yes	Yes	Yes	Yes
Certifications	UL, CSA, CE, CCC	UL, CSA, CE, CCC	UL, CSA, CE, CCC	UL, CSA, CE, CCC	UL, CSA, CE, CCC	UL, CSA, CE, CCC
Replaceable trip unit	No	No	Yes	Yes	Yes	Yes
Common accessories	No	Yes	Yes	Yes	No	No
Thru cover accessories	Yes	Yes	Yes	Yes	No	No
Trip units						
PXR 10		✓	✓	✓		
PXR 20		✓	✓	✓	✓	✓
PXR 20D		✓	✓	✓	✓	✓
PXR 25		✓	✓	✓	✓	✓



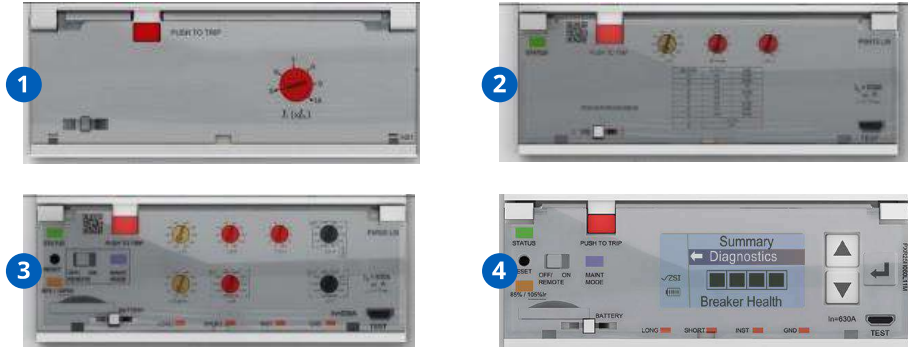
Powering Business Worldwide

Power Xpert Release Trip Units

Power Xpert Release (PXR) Trip Units

The Power Xpert Release (PXR) trip unit has features and flexibility that allow configuration for a wide variety of protection applications. Communication options support integration into supervisory systems to monitor performance and, if desired, control the circuit breaker. Advanced metering of current, voltage, energy and power allow monitoring of real-time energy use.

- 1. **TMTU**
PD1, PD2, PD3, PD4
- 2. **PXR10**
PD2, PD3, PD4
- 3. **PXR20**
PD2, PD3, PD4, PD5, PD6
- 4. **PXR25**
PD2, PD3, PD4, PD5, PD6



Features	TMTU	PXR10	PXR20	PXR25
Power Xpert Protection Manager	No	Yes	Yes	Yes
Electronic Protection Types	None	LSI	LSI/LSIG	LSI/LSIG
Breaker Health	No	No	Yes, via comms or USB	Yes, via LCD, comms or USB
Micro-USB Port	No	Yes, testing and configuration	Yes, testing and configuration	Yes, testing and configuration
ARMS functionality	No	No	ARMS optional on PD3/4/5/6	ARMS optional on PD3/4/5/6
ZSI functionality	No	No	ZSI with indication via relay	ZSI with visual & relay indication
LCD Display	No Display	No Display	No Display	Display is standard
Modbus Communications Option	No	No	Optional Modbus RTU	Embedded Modbus RTU
Programmable Relays and Alarms	No	No	Programmable relays and two programmable load alarms	Programmable load alarm levels
Additional Features	Thermal-Fixed (PD1-PD4) Magnetic-Fixed (PD1 & PD2) Magnetic-Adjustable (PD3 & PD4)	Long Delay with fixed time delay at 10 sec (6x) Short Delay profile with ten settings; eight preset profiles, one programmable via USB port, and an OFF position to provide LI functionality Separately programmable instantaneous setting from 2x In to override value Cause of trip indication via XPCM software	Fully programmable LSI, LSIG Current metering to 2% accuracy Cause-of-trip indication Load alarm at two levels: 85% & 105% Ground Fault optional with Trip/Alarm/Off flexibility Flat and I2t responses standard with Short Delay Cause-of-trip indication	All features and functions of the PXR20 Fully programmable with fine settings Current and Voltage metering to 0.5% accuracy Power & Energy metering to 1% accuracy

Additional features and benefits

Product Description

Eaton's globally accepted Power Defense™ molded case circuit breaker (MCCB) can:

- Connect to your network or the cloud with built in communication capability
- Generate the data to help optimize your facility's performance
- Mitigate arc flash to keep your employees, customers and end users safe

The Power Defense MCCB portfolio is globally adaptive to your footprint no matter the application or project requirement. All frames have the availability of global certifications including IEC, CCC, UL® and CSA®. Eaton's best-in-class support enables you to order readily available product for on-time delivery, across the globe.

Application Description

Power Xpert Release / Electronic Trip Units

Simpler communications • Better protection • Easier energy metering

Embedded in the Power Defense portfolio, Power Xpert® Release (PXR) electronic trip units for global low-voltage commercial and industrial applications are Eaton's latest innovation in circuit protection technology.

They are designed to help you simplify your communications, enhance your protection and support your energy metering.

- Unique Eaton trip unit platform enables you to easily change set points, test and configure circuit breakers, and meter energy and power information
- Enhanced, easy-to-use interface allows you to view and adjust the trip unit settings
- Intuitive interface provides simple scroll through visibility for critical performance metrics such as metering, battery life, zone selective interlock settings and circuit breaker health

Features and Benefits *(Trip Unit Configurations)*

Thermal-Magnetic

- Available with adjustable magnetic settings, and for IEC markets, adjustable thermal settings. For NEMA markets, fixed magnetic and fixed thermal settings are options. Four pole options with 0%, 60% and 100% protection are available

PXR 10

- All of the advantages of an electronic trip unit in a simpler interface, which leads to easy setup. This trip unit is available with LSI protection and includes programmable settings so that it can be tailored for the specific application

PXR 20

- A fully adjustable trip unit with LSI and LSIG protection capabilities. This trip unit offers more advanced features than ever before at this level, including current metering, programmable relays, and optional embedded communications to enable seamless integration into control and communication systems

PXR 25

- Offers more functionality than ever before in a molded case circuit breaker trip unit. 1% accuracy for energy readings, coupled with the option for multiple communication protocols and embedded programmable relays, making this the ultimate example of an intelligent node in a power distribution system
- Leverage the capabilities of this product to eliminate meters and other components from the system, making the power distribution system cost effective and smaller, with increased intelligence and connectivity

Each breaker frame section indicates the full range of trip units available for the frame. The wide range of trip unit options, coupled with field replaceable trip units, enables compatibility with global requirements and allows upgrade from the most basic protective device to a high end, intelligent node in a power system.

Trip Unit Features

Arcflash Reduction Maintenance System (ARMS)

Better Safety and Productivity

For added protection, the Power Defense portfolio offers Eaton's patented Arcflash Reduction Maintenance System to reduce arc flash incident energy. This innovative safety feature can help you:

- Decrease personal protection equipment (PPE) requirements to enhance productivity
- Enhance the safety of your personnel

Industry Standard Communication

Energy monitoring and system status with onboard serial and industrial network communications available through CAM modules in the PXR 20 and 25 will offer a greater view and control into the machine or power distribution system. Available features can offer:

- Easy connection to PLC building management systems, SCADA and cloud based systems
- Remote monitoring and option control of breaker
- Metering and health data

Power Xpert Protection Manager

Simpler Operation, Reduced Maintenance

Once installed, your Power Xpert Release trip unit continues to provide cost savings and advanced functionality through the Power Xpert Protection Manager (PXPM) interface. This intuitive user interface allows for simple trip unit set up and programming, real time reporting of power and energy metering, as well as the ability to check critical performance metrics, to meet your application needs while decreasing maintenance and in field testing time. The testing features and functionality, which can be run through a personal computer, offers savings through labor hour reduction and avoiding the need for expensive proprietary testing kits. Ultimate control and data are at your fingertips:

- Set point Configuration: Allows direct to trip unit or offline set up, including duplication of settings between units
- Control Mode: Capture waveforms, reset TU or set the date/time
- Test Mode: Run secondary injection and create test reports
- Real-Time Data: Provides information regarding all status and metered data direction from the trip unit
- Event Summaries: Stores up to 200 events, detailed information on the most recent (10) trip and (10) alarm events, and time adjustments to the real time clock
- Reports: Allows for the formatting and printing of real time data and of performed secondary injection tests

Breaker Health Feature and Programmable Alarms

Less Costly Downtime

By enabling you to perform predictive and preventive maintenance on your power distribution system prior to component failure, the breaker health feature and programmable alarms will help you avoid costly downtime.

- Communicates circuit breaker status at customer determined levels to prompt for breaker maintenance or inspection
- Provides real time evaluation of breaker condition by tracking and analyzing diagnostic details including breaker operations, short circuit fault levels, operational time, internal temperature and overloads

Zone Selective Interlocking

Reduction in Arc Flash Energy

The zone selective interlocking (ZSI) feature communicates when a phase or ground fault is present.

- The breaker closest to the fault will override any customer defined delay setting and open instantaneously to clear the fault, allowing line side breakers to remain closed and online
- The PXR trip unit displays when the ZSI system is engaged, communicating, and helping to keep you and your employees safe so you no longer have to just trust that the ZSI is operational, unlike with other MCCB offerings
- ZSI is also a proven solution for reducing arc flash incident energy when a fault is present

Enhanced Ground Fault Protection and Coordination

Easier Phase or Ground Fault Detection and Warning

Expanded protection of ground fault increases coordination capabilities and provides ability to turn protection off.

- ON/OFF feature simplifies system testing
- Ground fault trip units combine trip, alarm, and OFF in every unit, with programmable relays for alarm or pre alarm functionality
- Expanded time profile selections include I2t and flat response profiles for more coordination options



Breaker Frame Overview

Power Defense molded case circuit breakers include six frames, PD-1 through PD-6, providing flexibility to meet protection needs up to 2500 A.

PD-1 Compact frame covering range of 15 A through 125 A with fixed thermal magnetic trip unit, and with current limiting options. Additionally, motor circuit protectors covering a range from 3 A through 100 A with adjustable magnetic settings of 3x to 11x.

PD-3 Covers a range of 45 A through 600 A with field installable trip units, including fixed thermal/adjustable magnetic and all PXR electronic trip unit options in two frame options: 400 A and 600 A. PD 3 also has 100% UL ratings and current limiting options. Additionally, motor protection circuit breakers ranging from 45 A through 600 A with PXR electronic trip units, as well as motor circuit protectors ranging from 70 A through 600 A with adjustable magnetic settings from 5x to 10x.

PD-5 Covers a range of 320 A through 1200 A with field installable PXR electronic trip units, PXR 20 and PXR 25, as well as 100% UL rating options.

PD-2 Standard frame covering a range of 15 A through 225 A with trip unit options, from a fixed thermal magnetic to the most advanced Power Xpert™ Release (PXR) electronic units. PD 2 also has current limiting options available. Additionally, motor protection circuit breakers ranging from 15 A through 200 A with PXR electronic trip units, as well as motor circuit protectors ranging from 3 A through 150 A with adjustable magnetic settings from 3x to 10x.

PD-4 Covers a range of 300 A through 800 A with field installable trip units, including fixed thermal/adjustable magnetic, and all PXR electronic trip unit options (PXR 10, PXR 20 and PXR 25), and 100% UL rating options.

PD-6 Covers a range of 700 A through 2500 A with field installable PXR electronic trip units, PXR 20 and PXR 25, as well as 100% UL rating options.

Interrupting Ratings

The Power Defense molded case circuit breaker line is a global product, with interrupting ratings across a broad range of voltages. These interrupting ratings are optimized for power distribution and meet the broadest range of application needs. See each frame for the specific interrupting levels.

Modular Accessories

The Power Defense molded case circuit breakers feature new, modular accessories that are designed to make customization of the breaker for the unique requirements of the application easier than ever before. A common line of auxiliary switch and bell alarms allow for interchangeability between the different Power Defense breaker frames, enabling the final configuration of the breaker at the point of use and minimizing the amount of inventory required. Compact, modular shunt trips and under voltage releases have been designed to be easily installed and removed as the project or application dictates.

Some of the most common accessories and their function are described below. [\(Internal Accessories\)](#)

Auxiliary Switches

Provide circuit breaker primary contact status information. The auxiliary switch is used for remote indication and interlock system verification. These switches mount internal to the breaker in the right side accessory cavity.

Alarm Switches

Used for remote indication of automatic trip operation. The switch automatically resets when the circuit breaker is reset. These switches mount internal to the breaker in the right side accessory cavity.

Shunt Trip

Provides capability to trip the breaker by remote control. Shunt trips are designed to be applied at specific AC or DC voltages. These devices are installed internal to the breaker in the left side accessory cavity.

Undervoltage Release (UVR)

Monitors a voltage, typically of a line voltage, and trips the circuit breaker when the voltage falls below 70% of the nominal voltage designated for the UVR. These devices are installed internal to the breaker in the left side accessory cavity.



Power Xpert Release (PXR) Trip Unit Details

Features	PXR10	PXR20	PXRO20D	PXR25
Protection types	LSI	LSI/LSIG	LSI/LSIG	LSI/LSIG
Status indication	●	●	●	●
USB secondary injection testing	●	●	●	●
Programmable by USB port (PXPM)	●	●	●	●
Independent instantaneous adjustment	●	●	●	●
Adjustable L, S, I, G pickup and time		●	●	●
Cause of trip indication	▲	●	●	●
Load alarm indication with 2 levels		●	●	●
Programmable load alarm levels			●	●
Ground fault protection and alarm		○	○	○
Arcflash Reduction Maintenance System (ARMS) available PD3, PD4, PD5, PD6		○	○	○
Zone Selective Interlocking (ZSI) with indication		○	○	○
Programmable relays		○	●	●
Modbus RTU		○	●	●
CAM module communication		○	○	○
Rotatable LCD display			●	●
Breaker health and diagnostic monitoring		▲	●	●
Voltage metering accurate to 0.5%				●
Power & energy metering accurate to 1%				●

● Standard ○ Optional ▲ Available through USB port (PXPM)

