

# Power-Style™ Low Voltage Switchboards

## QED-2 and Speed-D Merchandised Service Section Switchboards

Catalog  
 2700CT1101  
**2012**  
 Class 2710, 2741, 2742



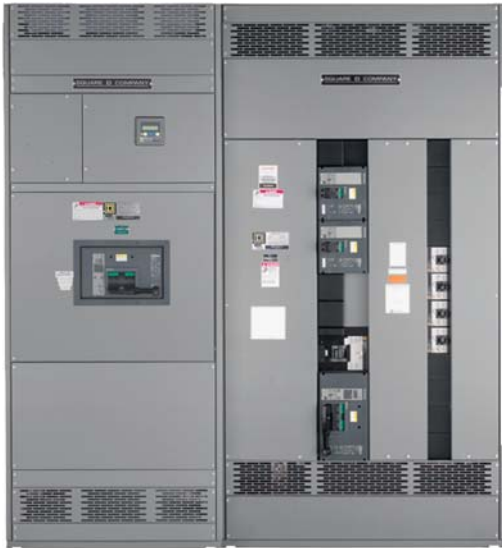
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by Schneider Electric





**PowerPact™ R-frame Main Circuit Breaker on Left  
with I-Line™ Distribution Section on Right**

### Features

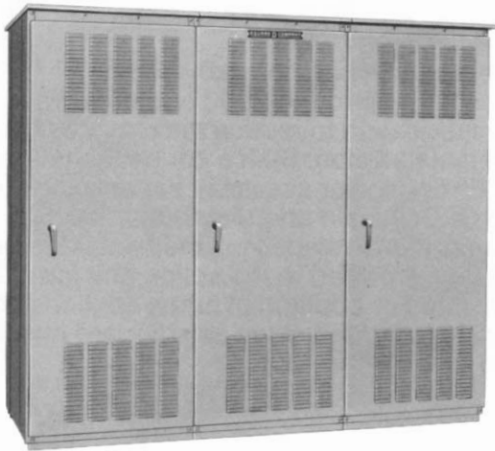
- Sections rated to 5000 A horizontal bus, 3000 A vertical bus
- Single mains to 5000 A
- Six subdivision mains to 4000 A
- Individually mounted feeders to 4000 A
- Suitable for service entrance or distribution
- NEMA Type 1 or Type 3R enclosures
- Front or front and rear accessible
- 91.5 in. (2324 mm) high with base channels
- Section widths available: 12 in. (305 mm), 24 in. (610 mm), 30 in. (762 mm), 36 in. (914 mm), 42 in. (1067 mm), 48 in. (1219 mm), or 54 in. (1372 mm) wide
- Frame depths available: 24 in. (610 mm), 36 in. (914 mm), 48 in. (1219 mm), 54 in. (1372 mm), or 60 in. (1524 mm)
- Voltage to 600 Vac or 250 Vdc
- Factory assembled
- Hot or cold sequence utility metering
- Customer metering
- Surge protective devices (SPD)

Power-Style™ QED-2 switchboards provide a convenient and economical means of distributing electric power. These enclosed, free-standing structures contain circuit breaker or fusible overcurrent protection for services rated up to 5000 A with a maximum voltage of 600 Vac. Power-Style QED-2 switchboards are custom-made for use as service entrance equipment or as distribution centers in commercial, institutional, and industrial applications.

An auxiliary section is also available for cable or bus transition or to provide additional space for connecting the service conductors to the line side of the main. The auxiliary section is a full-height section with a depth to match that of the adjacent section. It can contain customer metering or through bus and incoming lug pads.

The QED-2 frame allows various special components to be mounted in the switchboard. These components include automatic throwover systems, transfer switches, and special metering systems. This flexibility means the QED-2 switchboard can meet customer requirements on the most complicated applications.

**Structures**



**NEMA Type 3R Enclosure Over Three Sections**

The QED-2 switchboard frame has been designed to provide a sturdy platform on which to build Schneider Electric switchboard products. Individual switchboard sections are built from formed steel channels and angles, then secured together with thread-rolling screws. These thread-rolling screws, when compared with regular self-tapping screws, provide superior torque and strip-out resistant qualities.

Section dimensions are determined by the type, size, quantity, and arrangement of the components and devices being installed.

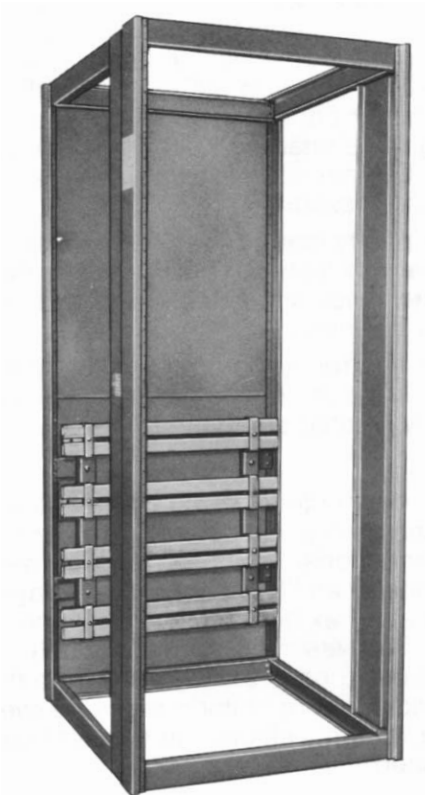
Each section features a removable one-piece top plate, which makes locating the top conduit entry simple. When extra height is required, Schneider Electric can supply a 12 in. (305 mm) or 24 in. (610 mm) high pullbox. (The pullbox is not available with NEMA Type 3R enclosures.)

All covers, doors, and frames are made of formed steel for extra rigidity. A deep front corner channel and side plate covers the sides. The back is covered with removable plates that have formed edges. All covers are secured with slot/hex head thread rolling screws which greatly minimize the chances of thread strip-out.

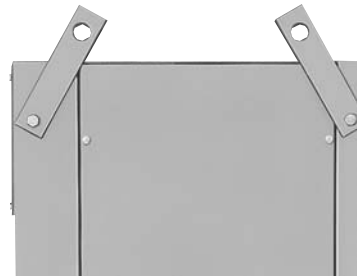
The standard paint finish on all Power-Style QED-2 switchboards is an ANSI #49 medium light gray baked enamel over an iron phosphate pretreatment. Non-standard finishes are an available option when specified.

QED-2 switchboards are available in either NEMA Type 1 indoor or Type 3R outdoor enclosures.

Each QED-2 section 3000 A or less has removable lifting bars and is clearly labeled with handling procedures. The sections are shipped separately to allow the installer extra flexibility when moving the sections to the desired location. Once in place, the sections are secured together, linking the strength of each frame. Optional multiple-section shipments do not have lifting bars.



**QED-2 Frame and Through Bus**



**Lifting Bars Can Be Used On QED-2  
NEMA Type 1 Sections Up To 3000 A**

### Bussing

#### Through Bus

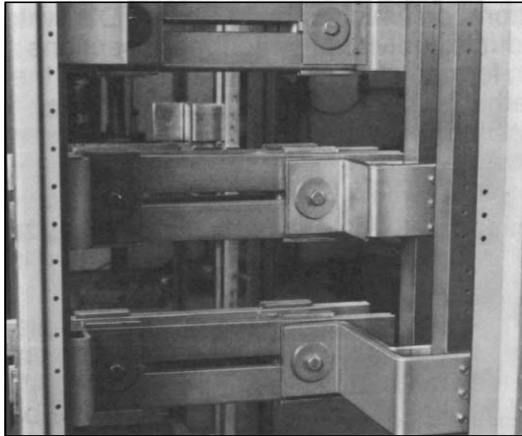
The heart of a switchboard is the horizontal through bus which connects the individual section bussing. The through bus is available in ratings from 1200–5000 A. Power-Style QED-2 through bus uses aluminum or copper rectangular 0.25 in. x 1.5 in. (6 mm x 38mm) or 0.25 in. x 2 in. (6 mm x 51 mm) bus bars. Through bus rated 4000 A has eight bus bars per phase. Connections are made by using an “E” connector assembly.

Bus ampacity ratings have been determined from UL 891 heat rise testing. This method is the most accurate, since actual tests are used for determining optimal bus sizes.

A 100% neutral bus is provided on 3-phase, 4-wire (3Ø4W) and 1-phase, 3-wire (1Ø3W) systems. Ground bus is standard and matches the type of through bus. Optional, increased-size ground bus is available.

#### “E” Connector Assembly

The “E” connector assembly eliminates the alignment problems associated with conventional bus bar connections. The “E” connector assembly, consisting of an “E” connector, carriage bolt, conical washer, and hex nut, requires only one wrench to tighten. This assembly is used on splice connections and connections to through bus from the panel bus. By providing more uniform pressure over the contact surface, a highly efficient and cooler connection is obtained.



4000 A Through Bus Assembly



“E” Connector on 2500 A Through Bus

#### Captive Splice Bars

Captive splice bars are provided on through bus connections through 2500 A. They provide easy installation and reduce the chances of losing parts during installation. Splice connections are made up of splice bars and the “E” connector assembly. For splicing convenience, customers can access the through bus bars in QED-2 main and distribution sections from the front of the switchboard. Slots are provided in the splice bus for ease of assembly. For addition of future sections, through bus is extended to the sides as standard in all sections.



Captive Splice Bus, Distribution To Distribution

## Main Sections

The main devices for overcurrent/short circuit protection and disconnect purposes are available as circuit breakers or fusible switches in Power-Style QED-2 switchboards. These individually mounted main disconnect sections can contain PowerPact™ M-, P-, and R-frame molded case circuit breakers to a maximum of 2500 A. The Masterpact™ NW (stored energy) circuit breaker is available to a maximum of 5000 A and Bolt-Loc™ fusible switches are available to a maximum of 4000 A. Ground fault protection is available through Micrologic™ trip units on the PowerPact P- and R-frame and Masterpact NW circuit breakers. Ground fault protection is available on Bolt-Loc switches with the Type GC ground fault system. Section width varies with mains and options. The Masterpact NW circuit breaker is available in fixed or drawout construction.



**3000 A Masterpact NW  
Main Circuit Breaker  
with PowerLogic  
Power Meter**

## Available Features

- 5000 A maximum disconnects
- 600 Vac maximum
- Individually mounted mains
  - PowerPact MG, MJ (800 A max.)
  - PowerPact PG, PJ, PK, PL (1200 A max.)
  - PowerPact RG, RK, RJ, RL (2500 A max.)
  - Masterpact NW (5000 A max.)
  - Bolt-Loc (electric or manual trip) (4000 A max.)
- Top or bottom feed
- Busway connection available
- Suitable for use as service entrance
- Ground fault protection (not available on PowerPact M-frame)
  - Micrologic trip unit (residual)
  - Bolt-Loc Ground-Censor Type GC (zero sequence)
- Customer metering
  - PowerLogic circuit monitor (communications available)
  - PowerLogic power meter (communications available)
  - ION meter (communications available)
- Utility compartment (hot or cold sequence metering)
- Surge protective device in instrument compartment

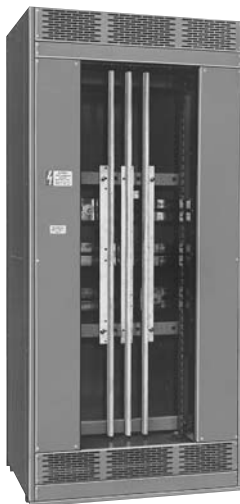
Six subdivision mains are available as individually mounted devices up to a rating of 4000 A. The multiple mains are available as either PowerPact M-, P-, or R-frame circuit breakers, Masterpact NW circuit breakers, or Bolt-Loc fusible switches. All six subdivision mains are connected to the through bus, which is available in ratings up to 5000 A.

### Group-Mounted Distribution Sections



**I-Line Distribution Section**

- 3000 A maximum plated copper vertical bus
- 1600 A maximum plated aluminum vertical bus
- 63 in. (1600 mm) panel height to 2000 A; 72 in. (1829 mm) for 3000 A
- 72 in. (1829 mm) maximum single row circuit breaker mounting space
- 117 in. (2972 mm) maximum double row circuit breaker mounting space
- 1200 A maximum circuit breaker



**QMB Distribution Section with Neutral**

- 3000 A maximum vertical bus
- Plated aluminum or copper vertical bus
- 72 in. (1829 mm) of switch mounting space
- 30–400 A QMB switches mount in 36 in. (914 mm) wide section
- 30–1200 A QMB switches mount in 42 in. (1067 mm) wide section

Power-Style QED-2 switchboard distribution sections are available with either an I-Line™ or QMB group-mounted distribution panel. Each of these interiors mounts to the frame front corner channels with horizontal mounting rails. Connectors secured to the through bus with the “E” connector assembly bring power into the center of each interior bus. The vertical bus feeds power to each branch disconnect. When a neutral is required, it is located at the side of the QMB vertical bus assembly or at the side of the I-Line circuit breaker mounting pan. This convenient neutral location provides for front accessible neutral connections. Ample wireway space is provided for the load side cabling of branch disconnects.

Schneider Electric molded case circuit breakers are available in I-Line plug-on group construction. In this construction, the line end of the circuit breaker plugs directly onto the I-Line panel bus assembly. Branch circuit breakers can be quickly and efficiently installed and wired from the front of the switchboard. I-Line circuit breakers are keyed to mounting slots in the support pan to provide automatic alignment and reduced installation time. The circuit breakers are then secured to the pan with screws. I-Line switchboard sections are available in single row or double row construction. Single row permits mounting of circuit breakers only on one side of the I-Line bus, while double row construction provides for circuit breaker mounting on both sides of the I-Line bus assembly. Different circuit breakers on double row construction can be mounted opposite each other.

QMB fusible switches are group mounted in QED-2 switchboards. The QMB switches are mounted to steel rails and electrically connected by plug-on jaws to the vertical bus. QMB switches through 600 A come standard with Class H fuse clips or with Class R, J, or T clips available as an option. Class L fuse clips are standard on 800 A and 1200 A QMB switches.

QMJ fusible switches are also available and offer a space saving design. These switches come standard with Class J fuse clips.

### Large Feeders

Power-Style QED-2 switchboard distribution sections are also available in individually mounted construction. This type of construction allows for larger feeder ampacities up to 4000 A. The individually mounted feeder devices can contain PowerPact M-, P-, and R-frame and Masterpact NW circuit breakers, or Bolt-Loc fusible switches to a maximum of 4000 A. Ground fault protection is available through Micrologic trip units on PowerPact M-, P-, and R-frame and Masterpact NW circuit breakers. Ground fault protection is available on Bolt-Loc switches with the Type GC ground fault system. Zone interlocking is available as an option between the feeders and main.

## **Layout Instructions**

All dimensions and arrangements shown in this manual are for estimating purposes only and may change without notice due to changes in equipment design. Certified drawings showing the arrangement and dimensions of any switchboard can be supplied by Schneider Electric upon request.

All section depths shown are considered minimum for most switchboard arrangements. However, due to complicated equipment or bussing arrangements, it is sometimes necessary to increase the switchboard depth beyond that indicated in this manual.

Schneider Electric cannot supply switchboards with smaller dimensions than those considered by the company to be the minimum necessary to (1) obtain satisfactory operation or (2) permit ease of installation of the switchboard with reasonable effort by the customer.

For quick layout drawings, see pages 23–26.

## **Layout Selection Procedure**

When determining a layout for Power-Style switchboards, use the following procedure:

1. Determine the physical location of the switchboard and the connected loads it is to supply.
2. Make a single-line diagram of the components.
3. Determine the bus rating required and the minimum ratings for the switchboard (based on voltage, available short circuit current, and load).
4. If equipment is a service entrance switchboard, coordinate with the power company regarding feeder equipment and metering provisions.
5. Determine method of incoming power (I-Line busway, cable, etc.), and select the main device.
6. Determine utility and/or customer metering, if necessary.
7. Decide on branch devices to use; select from branch device section.
8. Determine any special cubicle or bussing features.
9. Sketch a front elevation, including single-line diagram.
10. Write specifications or ordering information.
11. Provide cable lug details and conduit entry/exit location for mains and feeders.



## Incoming Connections

**Line-side lug connections** are available for single main devices, bussed auxiliary sections, utility compartments, I-Line distribution sections, and quick connect generator switchboards. Lugs or studs can be provided as required.

**Transformer connections** are available for Power-Dry II™, Power-Cast II™, Uni-Cast II™, and liquid-filled transformers. These connections require a switchboard depth of 60 in (1524 mm). For more information on dimensions and equipment alignment, see catalog # 6020CT9401, *Power-Zone™ Load Center Unit Substations*.

**Busway connections** are available with a flanged collar (Qwik Flange™) or flanged end. Qwik Flange is available for NEMA Type 1, top feed only. They are available for aluminum bus from 800–4000 A and for copper bus from 800–5000 A. For more details on busway, see catalog # 5600CT9101, *Busway Systems*.

**Connect to existing**—To add a section to an existing switchboard, the following is required:

- Factory order number from the nameplate of the existing switchboard
- Type of existing equipment: QED-2/S, QED-2 Series 2, QED-3, QED-4, or special
- Location of the through bus for the adjacent section: top, middle, or bottom
- Bus bar size if 2000 A or smaller: 1.5 or 2.0 in. (38 or 51 mm)
- Depth of through bus from the front of the switchboard: 19.5, 27.5, or 36.0 in. (495, 699, or 914 mm)

**Special connections** are available for Model 6 motor control centers. Contact your local Schneider Electric representative for more information.

### Auxiliary Section information

Ampacity (A)	Width	Depth
800–2000	24 in. (610 mm)	24 in. (610 mm)
2500	30 in. (762 mm)	
3000	36 in. (914 mm)	36 in. (914 mm)
4000	42 in. (1067 mm)	48 in. (1219 mm)
5000	48 in. (1219 mm)	

### Fire Pump Lugs

Options
• #10-2/0 per phase and neutral
• #6-350 kcmil per phase and neutral

**NOTE:** Requires an auxiliary section.

## Structure Modifications

- Auxiliary section—bussed or unbussed
- Steel barriers between sections
- Bottom closure plate
- Corner sections ( $\leq$  2500 A), loadside wireway section and rear wireway (for large tenant mains only)
- Corrosion resistant base channels (standard for NEMA Type 3R)
- Drip hood (NEMA Type 1; not available for NEMA Type 3R)
- Hinged rear doors (must have rear access)
- Increased depth and width (for increased wire bending space)
- Interior lights and GFI receptacle for NEMA Type 3R enclosure
- Mimic bus nameplate (anodized aluminum or plastic)
- Paint—ANSI 49 (standard), ANSI 61, or special (contact your local Schneider Electric representative)
- Pullbox (NEMA Type 1 enclosure only)
- Reduced height sections—76.5 in. (requires longer lead time)
- Rodent barrier (standard on NEMA Type 3R)
- SIS control wire
- Strip heater and thermostat
- Surge arrester

For additional options, please contact your local Schneider Electric representative.

**Customer Metering**

**PowerLogic™ Power Monitoring and Control**

**NOTE:** Please refer to [www.schneider-electric.us](http://www.schneider-electric.us), Solutions, Power Management Systems for a complete and up-to-date list of feature availability. Some features are optional.

For available configurations/placement options for power meters, circuit monitors, and ION meters, see page 12. For additional clarification, contact your local Schneider Electric representative.

**Power Meter**

Class	Type	Description
3020	PM-820	Power meter module with display 0.25% accuracy with logging, alarms, I/O modules
	PM-850	Same as PM-820 plus trending/forecasting, steady state waveform capture
	PM-870	Same as PM-850 plus disturbance waveform capture, sag/swell metering

**Circuit Monitors**

Class	Type	Description
3020	CMDLC	Liquid crystal display used for both circuit monitors
	CMDVF	Upgrade to vacuum fluorescent display with infrared port
	CM4250	Multi-function, digital instrumentation, data acquisition, control device, cycle-by-cycle event recording
	CM4000T	Same as CM4250 plus transient voltage monitoring, flicker IEC 61000-4-15

**ION 7550/7650 Meters**

Catalog No.	Description
S7550A0C0B6A0A0A	Basic unit: Integrated display, instrumentation, power quality, waveform capture, one RS232/RS485 port, one RS-485 jack, one Type 2 optical port, eight digital inputs, four digital outputs, and three onboard relays
S7550A0C0B6E0A0A	Basic unit plus Ethernet
S7650A0C0B6A0A0A	Basic unit plus additional ION7650 features
S7650A0C0B6E0A0A	Basic unit plus Ethernet and additional ION7650 features
S7650A0C0B6C1A0A	Basic unit plus Ethernet, internal modem, and additional ION7650 features
S7650B1C0B6C1A0A	Basic unit plus Ethernet, 1,024 samples/cycle instead of 512, 10 MB of logging instead of 5 MB, internal modem, and additional ION7650 features

**Input/Output Modules**

Class	Type	Description
3020	IOC44	I/O card with 4 status in, 3 relay out, and 1 KYZ out
	IOX2411	I/O extender module with 4 DC status inputs, 2 DC digital outputs, and 1 analog output
	IOX0404	I/O extender module with 4 status inputs and 4 analog inputs
	IOX08	I/O extender module with 8 status inputs (120 Vac)
	IOX	I/O extender module only, no installed I/O
	PM8-ECC	Ethernet communications card with HTML capabilities for PM8 family
	ECC21	Ethernet communications card with HTML capabilities, for CM3/4 family
Not applicable	PM8M2222	2 digital outputs, 2 digital inputs, 2 analog outputs, and 2 analog inputs
	PM8M26	2 digital outputs and 6 digital inputs
	PM822	2 digital outputs and 2 digital inputs

**Instrument Transformer Requirements ^**

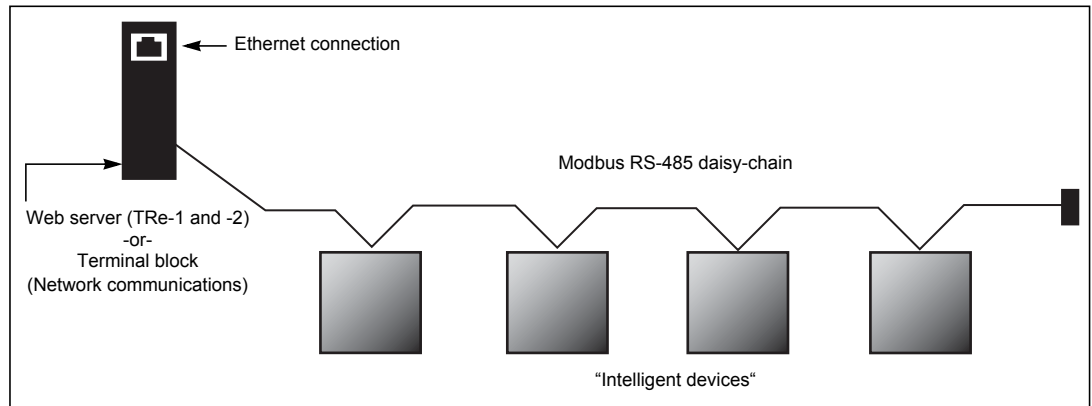
Device	1Ø3W 120/240 V	3Ø3W Delta	3Ø4W			Delta
			Wye			
			208Y/120	480Y/277	600Y/347	
Circuit monitor	2 CTs	2 CTs, 1 CPT <sup>■</sup>	3 CTs	3 CTs	3 CTs, 1 CPT	3 CTs
Power meter	2 CTs	2 CTs, 1 CPT <sup>■</sup>	3 CTs	3 CTs	3 CTs	3 CTs
Ion meter <sup>♦</sup>	2 CTs, 2 PTs	2 CTs, 1 CPT <sup>■</sup> , 3 PTs	3 CTs	3 CTs, 1 CPT, 3 PTs	3 CTs, 1 CPT, 3 PTs	3 CTs, 1 CPT, 3 PTs

<sup>^</sup> Drawout circuit breakers require three CTs for all voltages.

<sup>■</sup> CPT is not required for 240 V Delta.

<sup>♦</sup> PTs are necessary only when Canadian Standards Association (CSA) certification is required.

Transparent Ready™ Equipment (TRe)



Network Communications

One or more “intelligent devices” such as circuit monitors, circuit breakers, or relays are wired in an RS-485 daisy-chain network as a basis for all Transparent Ready Equipment (TRe). In some cases, the web server is external or reserved for the future. In this case, the RS-485 communications are wired to a terminal block for the end user.

In TRe-1 and TRe-2, HTML web pages designed specifically for the power equipment lineup are loaded into the equipment at the factory. In the past, this type of functionality required the development of “custom” HTML pages by an integrator or an HTML-savvy end user. Today, Schneider Electric pre-defines the most popular web pages and provides these “custom” HTML web pages as part of our standard offer.

TRe-1 (with ECC)

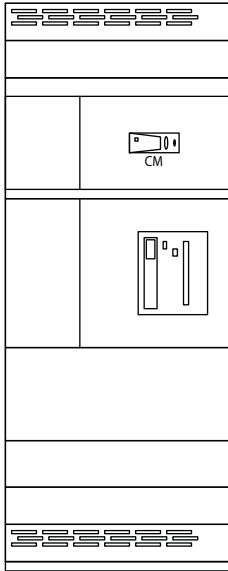
Some TRe-1 applications require the use of a PowerLogic™ circuit monitor, Series 3000 or 4000, and an Ethernet communications card (ECC) that slides into an option slot of the circuit monitor. CM3000 and CM4000 circuit monitors with ECC have been available in most Square D™ brand power equipment since July 2002.

Other TRe-1 applications require the use of a Series 800 PowerLogic power meter and an ECC (PM8ECC). PM800 power meters with PM8ECC have been available in most Square D™ brand power equipment since January 2008.

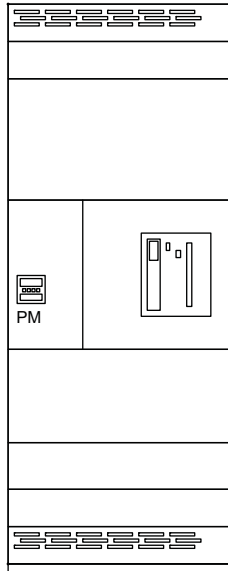
TRe-1 and TRe-2 (with EGX)

Some TRe-1 and all TRe-2 use a PowerLogic EGX (Ethernet communications gateway) to provide real-time power equipment lineup data. Ethernet gateways have been available in Square D™ brand power equipment since 1995.

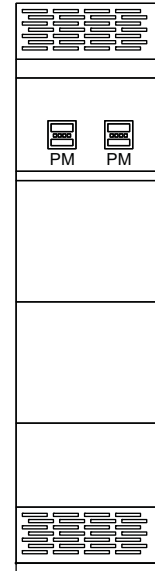
**Metering Configurations (mains shown are non-EUSERC)**



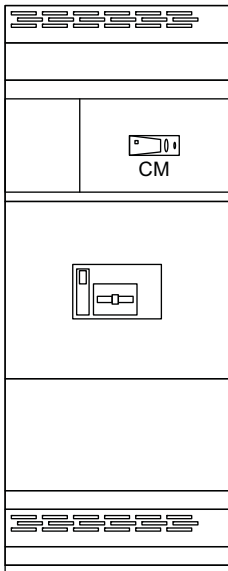
Masterpact NW with  
Circuit Monitor



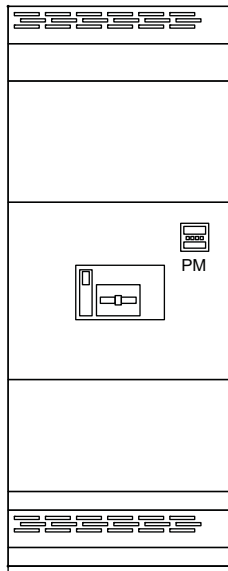
Masterpact NW with  
Power Meter



Power Meter for  
I-Line Circuit Breakers in  
24 in. (610 mm) Wide  
Auxiliary Section



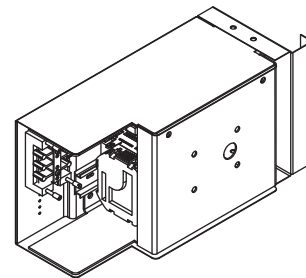
PowerPact R-frame  
with Circuit Monitor



PowerPact R-frame  
with Power Meter

The I-Line mounting assembly for a PowerLogic power meter requires 7.5 in. (191 mm) of mounting space. (The mounting assembly does not connect to the bus stack.)

A CPT also requires 7.5 in. (191 mm) of mounting space.



Circuit monitors and ION meters require an instrument compartment.  
 Power meters can be mounted with the main.

## Electronic Trip Systems

M-frame circuit breakers are available with the ET 1.0 electronic trip system. P-frame and R-frame circuit breakers are available with either the ET1.0I basic electronic trip system or the Micrologic electronic trip system. The Masterpact NW (stored energy) circuit breakers are available with the Micrologic electronic trip system. The sensing system responds to the flow of current through the circuit breaker.

### Thermal Imaging

The thermal imaging function protects the cables or bus bars from overheating in case of low amplitude repetitive faults. Such overheating can be due to repetitive motor starting, fluctuating load, intermittent ground faults, or subsequent closing after a fault. Traditional electronic protection does not protect against repetitive faults because the duration of each overload above the pickup setting is too short to achieve effective tripping. Nevertheless, each overload involves a temperature rise in the installation, the cumulative effect of which could lead to overheating of the system.

The thermal imaging function remembers and integrates the thermal heating caused by each pickup setting overrun. Before tripping, the integrated heating value reduces the associated time delay and, therefore, the reaction of the trip unit is closer to the real heating of the power network system. After tripping, the function will also reduce the time delay when closing the circuit breaker on an overload.

### True RMS Current Sensing

The sensing system responds to the flow of current through the circuit breaker. The trip unit samples the current waveform to provide true RMS protection through the 15th harmonic. This true RMS sensing gives accurate values for the magnitude of a non-sinusoidal waveform. Therefore, the heating effects of harmonically distorted waveforms are accurately evaluated.

The Micrologic H trip unit provides additional sampling of the waveforms to measure and provide waveform capture of harmonic distortion to the 31st harmonic.

### ET Trip System

ET trip units are available with M-, P-, and R-frame UL/IEC circuit breakers. The trip units are not field-interchangeable and do not accept any communications or other trip unit accessories. The trip system uses a set of current transformers (called CTs or sensors) to sense current, a trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker.

#### ET1.0 (M-Frame only)

The ET1.0 trip system is available on M-frame circuit breakers and is equipped with fixed long-time and adjustable instantaneous (LI) tripping functions only. The long-time pickup is 1.0 x sensor rating ( $I_n$ ), while the instantaneous pickup is adjustable (dial settings from 2–10 x  $I_n$ ) with no intentional time delay.

#### ET1.0I (P-Frame and R-Frame only)

The ET1.0I trip system is available on both P-frame and R-frame circuit breakers and is equipped with fixed long-time and adjustable instantaneous (LI) tripping functions only. The long-time pickup is 1.0 x sensor rating ( $I_n$ ), while the instantaneous pickup is adjustable (dial settings from 1.5–12 x  $I_n$ ) with no intentional time delay.

#### ET1.0M (P-Frame only)

The ET1.0M trip system is only available on P-frame motor circuit protectors and provides protection for short circuit conditions only. The trip unit has a single adjustment for instantaneous pickup that, if exceeded, trips the circuit breaker with no intentional delay. Instantaneous trip dial settings are 2–16 x  $I_n$  for 600 A circuit breakers and 1.5–12 x  $I_n$  for 800–1200 A circuit breakers.

**Micrologic™ Electronic Trip Systems**

All Masterpact NW circuit breakers are equipped with the Micrologic trip system as standard. The P-frame and R-frame electronic trip circuit breakers can be equipped with the optional Micrologic trip systems listed in the following table.

**Micrologic Trip Systems**

<b>Model</b>	<b>(LI) Long-time + Instantaneous Protection (UL Listed, IEC Rated)</b>	<b>(LSI) Long-time + Short-time + Instantaneous Protection (UL Listed, IEC Rated)</b>	<b>(LSIG) Long-time + Short-time + Instantaneous Protection + Equipment Ground-fault Protection (UL Listed, IEC Rated)</b>
Micrologic Basic Trip Unit	3.0	5.0	—
Micrologic A Trip Unit	3.0A	5.0A	6.0A
Micrologic P Trip Unit	—	5.0P	6.0P
Micrologic H Trip Unit	—	5.0H	6.0H

Trip units are designed to protect power circuits and loads. Micrologic trip systems use a set of current transformers (called CTs or sensors) to sense current, a trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker. Adjustable rotary switches on the trip unit allow the user to set the proper overcurrent or equipment ground-fault current protection required in the electrical system. If current exceeds a set value for longer than its set time delay, the trip system opens the circuit breaker. Alarms can be programmed for remote indications. Measurements of current, voltage, frequency, power, and power quality optimize continuity of service and energy management.

Integration of protection functions in the Application Specific Integrated Circuit (ASIC) electronic component used in all Micrologic trip units guarantees a high degree of reliability and immunity to conducted or radiated disturbances. On Micrologic P and H trip units, an independent microprocessor manages the advanced functions.

Circuit breakers are shipped with the trip unit long-time pickup switch set at 1.0 and all other trip unit adjustments set at their lowest settings. A qualified consultant or plant engineer must determine the actual settings required for a specific application. A coordination study is recommended to provide coordination between all circuit breakers in the distribution system.

Micrologic Trip Unit Features

Feature	Micrologic Trip Unit (X = Standard Feature; O = Available Option)								
	Standard		Ammeter			Power		Harmonics	
	3.0	5.0	3.0A	5.0A	6.0A	5.0P	6.0P	5.0H	6.0H
Field-installable <sup>▲</sup>	X	X	X	X	X	X	X	X	X
LI	X		X						
LSI		X		X		X		X	
LSIG/Ground-Fault Trip <sup>■</sup>					X		X		X
Ground-Fault Alarm/No Trip <sup>■,♦</sup>						X		X	
Ground-Fault Alarm and Trip <sup>■,♦</sup>							X		X
Adjustable Rating Plugs	X	X	X	X	X	X	X	X	X
True RMS Sensing	X	X	X	X	X	X	X	X	X
UL Listed	X	X	X	X	X	X	X	X	X
Thermal Imaging	X	X	X	X	X	X	X	X	X
Phase-Loading Bar Graph			X	X	X	X	X	X	X
LED for Long-Time Pick-Up	X	X	X	X	X	X	X	X	X
LED for Trip Indication			X	X	X	X	X	X	X
Digital Ammeter			X	X	X	X	X	X	X
Zone-Selective Interlocking <sup>*</sup>				X	X	X	X	X	X
Communications			O	O	O	X	X	X	X
LCD Dot Matrix Display						X	X	X	X
Advanced User Interface						X	X	X	X
Protective Relay Functions						X	X	X	X
Neutral Protection <sup>■</sup>						X	X	X	X
Contact Wear Indication						X	X	X	X
Incremental Fine Tuning of Settings						X	X	X	X
Selectable Long-Time Delay Bands						X	X	X	X
Power Measurement						X	X	X	X
Power Quality Measurements								X	X
Waveform Capture								X	X

- <sup>▲</sup> I-Line circuit breakers are only available with non-interchangeable trip units.
- <sup>■</sup> Requires neutral current transformer on 3-phase, 4-wire circuits.
- <sup>♦</sup> Requires M6C Programmable Contact Module.
- <sup>\*</sup> Not available for 2.0A trip unit as upstream devices.

Rating Plugs for Micrologic 3.0, 5.0, 6.0 A/P/H Trip Units

Standard	Option	Settings (Tolerance 1.05-1.2)
UL/ANSI	Plug A	0.40 - 0.45 - 0.50 - 0.60 - 0.63 - 0.70 - 0.80 - 0.90 - 1.0
	Plug B	0.40 - 0.44 - 0.50 - 0.56 - 0.63 - 0.75 - 0.88 - 0.95 - 1.0
	Plug C	0.42 - 0.50 - 0.53 - 0.58 - 0.67 - 0.75 - 0.83 - 0.95 - 1.0
	Plug D	0.40 - 0.48 - 0.64 - 0.70 - 0.80 - 0.90 - 0.93 - 0.95 - 1.0
	Plug E	0.60 - 0.70 - 0.75 - 0.80 - 0.85 - 0.90 - 0.93 - 0.95 - 1.0
	Plug F	0.84 - 0.86 - 0.88 - 0.90 - 0.92 - 0.94 - 0.96 - 0.98 - 1.0
	Plug G	0.66 - 0.68 - 0.70 - 0.72 - 0.74 - 0.76 - 0.78 - 0.80 - 0.82
	Plug H	0.48 - 0.50 - 0.52 - 0.54 - 0.56 - 0.58 - 0.60 - 0.62 - 0.64

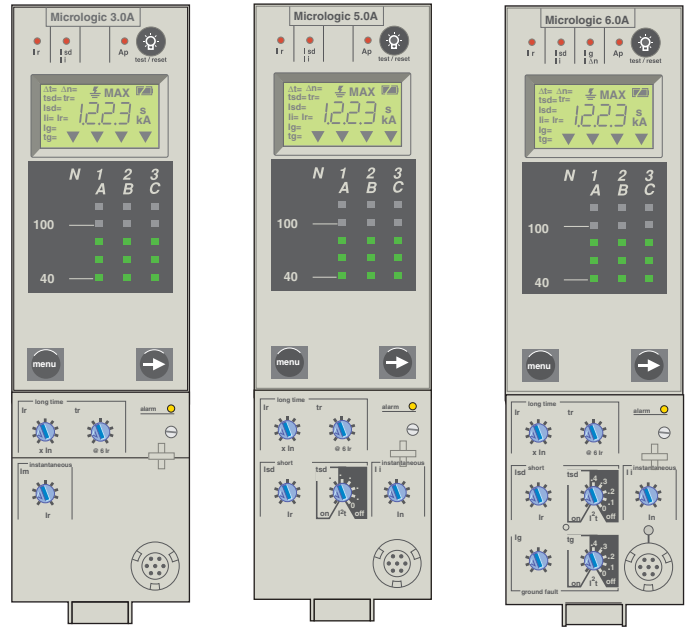
# QED-2 Switchboards

## General and Application Information

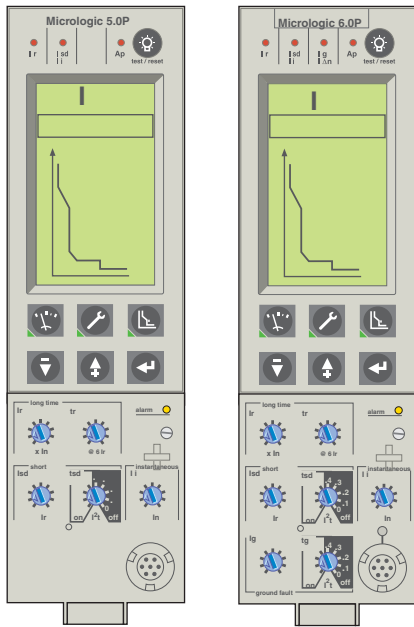
## Electronic Trip Systems



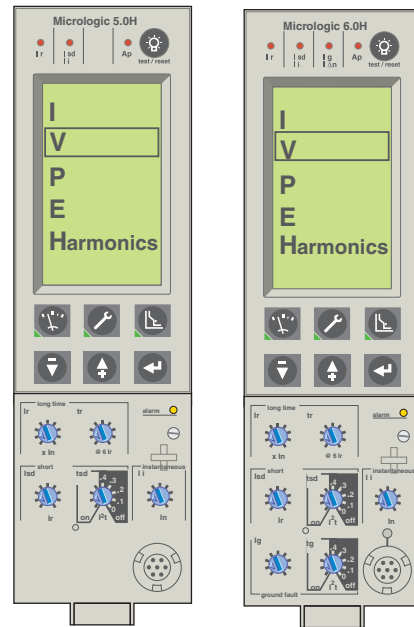
Micrologic 3.0 and 5.0 Standard Trip Units



Micrologic 3.0A, 5.0A and 6.0A Trip Units

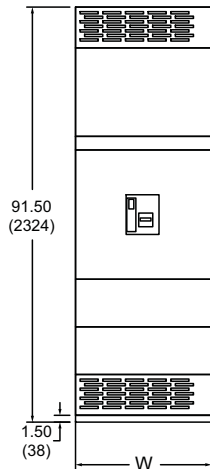


Micrologic 5.0P and 6.0P Trip Units



Micrologic 5.0H and 6.0H Trip Units





For conduit area, see page 40.

Main or Branch Circuit Breaker Selection

Individually Mounted Mains

Electronic Trip Molded Case Circuit Breakers

- MG, MJ, PG, PK, PJ, PL

Micrologic Electronic Trip Molded Case Circuit Breakers

- PG, PG-C, PK, PK-C, PJ, PJ-C, PL, PL-C, RG, RG-C, RK, RK-C, RJ, RJ-C, RL, RL-C

For more information, see catalog # 0612CT0101, *PowerPact M-frame, P-frame, R-frame and NS630b-NS3200 Electronic Trip Circuit Breakers.*

Individually Mounted Circuit Breakers

Breaker Type	% rated	Frame Size	Ampacity Range (A)	SCCR (x 1000)			Dimensions		Line/Load Lug Information <sup>■</sup>	
				240 V	480 V	600 V	Width (W)	Depth (D) <sup>▲</sup>		
MG	80%	800	400–800	65	35	18	30 in. (767 mm)	24 in. (610 mm)	(3) #3/0-500 kcmil Al or Cu	
MJ				100	65	25				
PG				65	35	18				
PG-C	100%	1200	500–1200	65	35	18			36 in. (914 mm)	(4) #3/0 AWG-600 kcmil
PK	80%				50	50				
PK-C	100%			100						
PJ	80%									
PJ-C	100%									
PL	80%									
PL-C	100%									
RG	80%	2500	500–2500	65	35	18				
RG-C	100%			65	65	65				
RK	80%									
RK-C	100%			100	65	25				
RJ	80%									
RJ-C	100%									
RL	80%									
RL-C	100%			125	100	25				

<sup>▲</sup> "D" represents the NEMA Type 1 dimension. For NEMA Type 3R construction, add 11.50 in. (292 mm) to the depth in front and 0.50 in. (13mm) to the depth in rear. Increased depth is required for lug in/lug out on the same side. For PowerPact M- and P-frame circuit breakers, the depth increases to 48 in. (1219 mm); for PowerPact R-frame, the depth increases to 60 in. (1524 mm).

<sup>■</sup> Optional lugs may be available. Contact your local Schneider Electric or distributor representative for more information.

Available Accessories/Options

- Shunt trip
- Undervoltage trip
- Control power transformer (if 120 V control source is not available)
- Auxiliary switches
- Alarm switch
- Key interlock
- Cylinder lock
- Electrical operator (for MG, MJ, PG, PK, PJ, PL)
- Phase failure with capacitor trip
- Padlock attachment

Additional Accessories and Trip Unit Options for Micrologic Trip Circuit Breakers

- Universal test set
- Ground fault push-to-test feature, factory wired for 120 Vac
- Zone selective interlocking interface
- 24 Vdc power supply (Powers the trip unit. Required for harmonic trip unit; recommended for ammeter and power trip unit.)

Trip Unit Options

- LI, LS, LSI, LIG, LSG, LSIG

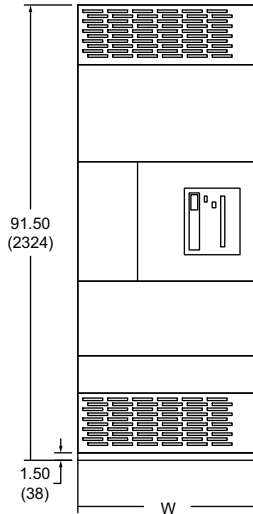
See pages 13-15 for details on Electronic Trip Systems for PowerPact M-, P-, and R-frame circuit breakers.

**Individually Mounted Mains and Feeders**

Masterpact NW (Stored Energy) Circuit Breakers

For more information, see catalog # 0613CT0001, *Masterpact NT/NW Universal Power Circuit Breakers*.

**UL489 and UL 1066 (ANSI Rated)—100% Rated Stationary or Drawout Mounted**



For conduit area, see page 40.

Frame Size	Dimensions		Line/Load Lug Information	
	Width (W)	Depth (D) <sup>■</sup>	Quantity (per phase)	Size (kcmil)
800	36 in. (914 mm)	Stationary Mounted 36 in. (914 mm) Drawout Mounted 48 in. (1220 mm)	3	#3/0 - 750
1600			5	
2000			6	
2500			8	
3000			9	
4000 <sup>♦</sup>	42 in. (1067 mm)	48 in. (1220 mm)	12	
5000 <sup>♦</sup>	48 in. (1220 mm)		15	

<sup>■</sup> "D" represents the NEMA Type 1 dimension. For NEMA Type 3R construction, add 11.50 in. (292 mm) to the depth in front and 0.50 in. (13 mm) to the depth in rear.

<sup>♦</sup> Use ANSI type for fixed-mounted 4000 A and 5000 A NW.

**Available Accessories <sup>▲</sup>**

- Additional auxiliary switches—up to 12
  - Spring charging motor
  - Shunt trip
  - Shunt close
  - Undervoltage trip with or without time delay
  - Key interlock
  - Padlock attachment
  - Phase failure with capacitor trip
  - Communications—wired or unwired
  - Operations counter
  - Transparent breaker cover
  - Electric reset
  - Programmable contact module—2 or 6 contacts
  - Open/Close push-button lock
  - Drawout breaker shutter
  - Shutter padlock
  - Shutter position indicator
  - Cradle cell key interlock
  - Masterpact test kit
  - Circuit breaker lifting and transport truck
- <sup>▲</sup> Contact your local Schneider Electric representative for additional accessories.

**UL 489 Breaker Ratings for Masterpact NW**

Breaker Type <sup>*</sup>	RMS Sym. Amperes (in thousands)		
	240 V	480 V	600 V
WL1, YL1	65	65	50
WL3, YL3	85	100	100
WL7, YL7 <sup>▼</sup>	200	150	100

<sup>\*</sup> WL1, WL3, WL7: 800–3000 A  
 YL1, YL3, YL7: 4000–5000 A

<sup>▼</sup> WL7 and YL7 are only available in drawout construction.

**UL 1066 (ANSI Rated) Breaker Ratings for Masterpact NW**

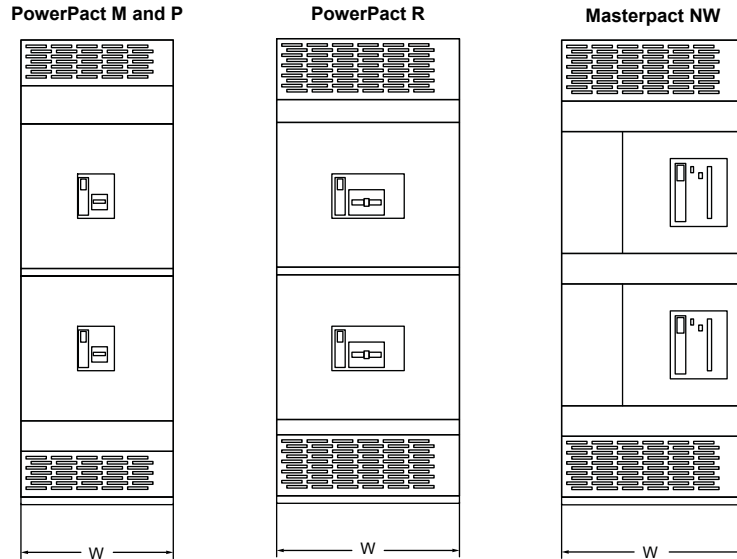
Breaker Type <sup>△</sup>	RMS Sym. Amperes (in thousands)		
	240 V	480 V	600 V
WA2	42	42	42
WA4, YA4	65	65	65
WA5, YA5	85	85	85
WA6, YA6	100	100	100
WA8, YA8 <sup>□</sup>	200	200	130

<sup>△</sup> WA2, WA4, WA8: 800–3200 A  
 WA5, WA6: 800–4000 A  
 YA4, YA8: 4000–5000 A  
 YA5, YA6: 5000 A

<sup>□</sup> WA8 and YA8 are not available in stationary mount.

See pages 13-15 for details on Electronic Trip Systems for Masterpact NW circuit breakers.

Stacked Devices



For conduit area,  
see page 40.

Device Type <sup>▲</sup>	Maximum System Ampacity (A)	Maximum C/B Rating (A)		Minimum Section Width (in.)	Minimum Section Depth (in.)
		Top	Bottom		
MG, MJ, PG, PJ, PK, PL	2500	1200	1200	30	24
	3000				36
	4000				48
RG, RJ, RK, RL	2500	1200	2500	36	24
		2000	2000		36
	3000	1200	2500		
		2000	2000		48
	4000	1200	2500		
		2000	2000		48
Masterpact NW (fixed mounted)	3000	2000	2000	36	
	4000				48
Masterpact NW (drawout)	3000	2000	2000	36	
	4000				

<sup>▲</sup> Cannot stack different device types. For example, MG/PG is acceptable, but PG/RG is not. NWF and NWD cannot be stacked together.

Load Lug Information

Circuit Breaker	Ampacity (A)	Quantity (per phase)	Lug Size (kcmil)
PowerPact M- and P-frame	800	3	3/0 - 500
	1200	4	
PowerPact R-frame	1200	4	3/0 - 600
	1600	5	
	2000	6	
Masterpact NW	800	3	3/0 - 750
	1200	4	
	1600	5	
	2000	6	

# QED-2 Switchboards

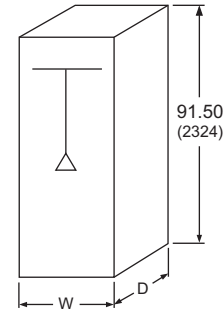
## General and Application Information

## Individually Mounted Circuit Breakers

### Underground Pull Sections (UGPS) and Main Sections

#### Underground Pull Sections

Ampacity (A)	Dimensions		Main Lug Information <sup>▲</sup>	
	Width (W)	Depth (D) <sup>■</sup>	Quantity (per phase)	Size (kcmil)
400–800	30 in. (762 mm)	24 in. (610 mm)	3	#3/0 - 750
1000–1200	36 in. (914 mm)		4	
1600	42 in. (1067 mm)		5	
2000			6	
2500			8	
3000	48 in. (1219 mm)		36 in. (914 mm)	
4000		48 in. (1219 mm)	12	



Dimensions given in INCHES (millimeters).

For conduit area, see page 40.

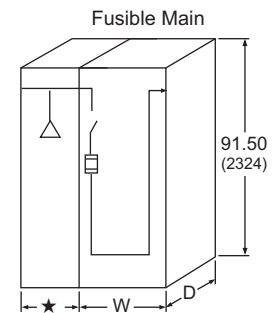
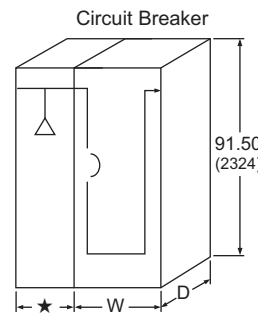
<sup>▲</sup> Lugs or studs are provided, based on utility requirements.

<sup>■</sup> "D" represents NEMA Type 1 dimension without rear wireway. For NEMA Type 3R construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

#### Main Sections (Split Bus) <sup>♦</sup>

For Reverse Feed Mains, see page 21.

Type	Ampacity (A)	Dimensions	
		Width (W)	Depth (D)
<b>Circuit Breaker Mains</b>			
R	2500	42 in. (1067 mm)	36 in. (914 mm)
NW	3000	48 in. (1219 mm)	48 in. (1219 mm)
	4000		
<b>Fusible Main Switches—Fuse Type L</b>			
BP	2000–2500	48 in. (1219 mm)	24 in. (610 mm)
	3000		36 in. (914 mm)
	4000		48 in. (1219 mm)



★ See Underground Pull Section table above.

Dimensions given in INCHES (millimeters).

<sup>♦</sup> For split-bus mains < 2000 A, contact your local Schneider Electric representative.

**Main or Branch Circuit Breaker Selection (EUSERC)**

EUSERC = Electric Utility Service Equipment Requirements Committee

**Individually Mounted Mains**

Electronic Trip Molded Case Circuit Breakers

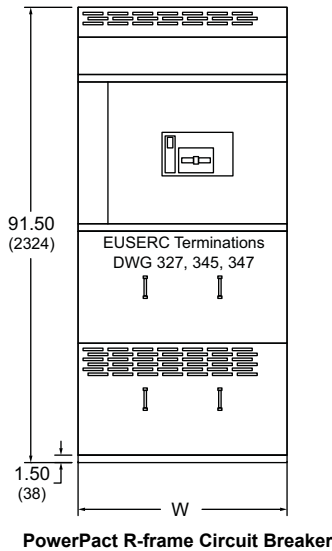
- MG, MJ, PG, PK, PJ, PL

Micrologic Electronic Trip Molded Case Circuit Breakers

- PG, PG-C, PK, PK-C, PJ, PJ-C, PL, PL-C, RG, RG-C, RK, RK-C, RJ, RJ-C, RL, RL-C

For more information, see catalog # 0612CT0101, *PowerPact M-frame, P-frame, R-frame and NS630b-NS3200 Electronic Trip Circuit Breakers.*

**Reverse Feed Mains ^**



For conduit area, see page 40.

Breaker Type <sup>■</sup>	Ampacity (A) <sup>♦</sup>	SCCR (kA)		Dimensions		Main Lug Information	
		240 V	480 V	Width (W)	Depth (D) <sup>*</sup>	Quantity (per phase)	Size (kcmil)
MG	400–800	65	35	36 in. (914 mm)	24 in. (610 mm)	1 (400 A) 2 (600 A) 3 (800 A)	#3/0-750
MJ		100	65				
PG		1000–1200	65				
PK	65		50				
PJ	100		65				
PL	125		100				
RG	1600–2000	65	35	42 in. (1067 mm)	5 (1600 A) 6 (2000 A)		
RK		65	65				
RJ		100	65				
RL		125	100				

<sup>▲</sup> A power meter can be mounted with the main, but a circuit monitor or Surge Protective Device (SPD) requires a trailing auxiliary section.

<sup>■</sup> P- and R-frame circuit breakers are available with a 100% rating. To order, add -C to the end of the breaker type, for example, RK-C.

<sup>♦</sup> Salt River Project (SRP) and Imperial Irrigation District (IID) are limited to 1000 A maximum for reverse feed. City of Riverside (California) is limited to 1200 A maximum for reverse feed.

<sup>\*</sup> "D" represents the NEMA Type 1 dimension. For NEMA Type 3R construction, add 11.50 in. (292 mm) to the depth in front and 0.50 in. (13 mm) to the depth in rear.

**Available Accessories/Options**

- Shunt trip
- Undervoltage trip
- Control power transformer (if 120 V control source is not available)
- Auxiliary switches
- Alarm switch
- Key interlock
- Cylinder lock
- Electrical operator (for MG, MJ, PG, PK, PJ, PL)
- Phase failure with capacitor trip
- Padlock attachment (standard on EUSERC applications)

**Additional Accessories and Trip Unit Options for Micrologic Trip Circuit Breakers**

- Universal test set
- Ground fault push-to-test feature, factory wired for 120 Vac
- Zone selective interlocking interface
- 24 Vdc power supply (Powers the trip unit. Required for harmonic trip unit; recommended for ammeter and power trip unit.)

**Trip Unit Options**

- LI, LS, LSI, LIG, LSG, LSIG

See pages 13-15 for details on Electronic Trip Systems for PowerPact M-, P-, and R-frame circuit breakers.

**Group Mounted Main or Branch Circuit Breakers**

Thermal Magnetic Circuit Breakers

- FA, FH, HD, HG, HJ, HL, QB, QD, QG, QJ, JD, JG, JJ, JL, LA, LH, LC, LI

For more information, see catalog # 0601CT9101, *Thermal-Magnetic / Magnetic Only Circuit Breakers*.

Electronic Trip Molded Case Circuit Breakers

- MG, MJ, PG, PK, PJ, PL

For more information, see catalog # 0612CT0101, *PowerPact M-frame, P-frame, R-frame and NS630b-NS3200 Electronic Trip Circuit Breakers*.

Micrologic Electronic Trip Molded Case Circuit Breakers

- PG, PG-C, PK, PK-C, PJ, PJ-C, PL, PL-C, RG-C, RK-C, RJ-C, RL-C

For more information, see catalog # 0612CT0101, *PowerPact M-frame, P-frame, R-frame and NS630b-NS3200 Electronic Trip Circuit Breakers*.

**Group Mounted I-Line Circuit Breakers**

Breaker Type	% rated	Frame Size	Ampacity Range (A)	SCCR (x 1000)			Mounting Height (inches)			Load Lug Information <sup>▲</sup>					
				240 V	480 V	600 V	3-pole	2-pole	1-pole						
FA (240 V)	80%	100	15-100	10	—	—	4.5	3	1.5	15-30 A #14-#4 AWG Cu or #12-#4 AWG Al					
FA				25	18	14				35-100 A #14-#1/0 AWG Cu or #12-#1/0 AWG Al					
FH				65	25	18				#14-#3/0 AWG Al or Cu					
HD				25	18	14									
HG				65	35	18									
HJ				100	65	25									
HL		150	15-150	125	100	50	4.5	3	#4-300 kcmil Al or Cu						
QB				10	—	—									
QD				25	—	—									
QG				65	—	—									
QJ		225	70-225	100	—	—	4.5	6	6	150-175 A #1/0-#4/0 AWG Al or Cu					
JD				25	18	14				200 A #3/0-350 kcmil Al or Cu					
JG				65	35	18				(1) #1 AWG-600 kcmil or (2) #1 AWG-250 kcmil					
JJ				100	65	25									
JL		400	125-400	125	100	50	7.5	7.5	(2) #4/0 AWG-500 kcmil						
LA				42	30	22				#14-#4 AWG Cu or #12-#4 AWG Al #14-#4 AWG Cu or #12-#1/0 AWG Al					
LH				65	35	25					(1) #4 AWG-350 kcmil Al or Cu				
LC				100	65	35				(1) #1/0 AWG-350 kcmil Al or Cu					
FI		100	20-30 35-100	200	200	100	4.5	4.5	(2) #4/0 AWG-500 kcmil						
KI										110-175 200-250	200	200	100	4.5	4.5
LI	600	300-600	200	200	100	7.5	7.5	(2) #4/0 AWG-500 kcmil							
MG	100%	800	300-800	65	35	18	9	9	(3) #3/0-500 kcmil Al or Cu						
MJ				100	65	25									
PG				1200	100-1200	65				100	65	25	#3/0-500 kcmil Al or Cu (3) for 250-800 A (4) for 1000-1200 A		
PG-C														35	18
PK														50	50
PK-C														100	65
PJ		2500	240-1200	65	100	65	25	(4) #3/0 AWG-600 kcmil							
PJ-C									35	18					
PL									100	65	25				
PL-C									125	100	25				
RG-C		100	65	35	18	15	15								
RK-C		100	65	65											
RJ-C		100	100	25											
RL-C		125	100	25											

<sup>▲</sup> Optional lugs are available. Contact your local Schneider Electric representative.

■ Can't group mount 100% rated 1000 A and 1200 A PowerPact P-frame circuit breakers. Use PowerPact R-frame circuit breakers for this application.

For I-Line interior selection and section dimensions, see page 23.

See pages 13-15 for details on Electronic Trip Systems for PowerPact M- P-, and R-frame circuit breakers.

**Quick Layout Guide**

**Group-Mounted Interiors**

**NOTE:** All sections have a minimum depth of 24 in., unless noted.

**Full-Height I-Line Distribution Sections** (For conduit area, see page 40.)

2000 A Interior <sup>▲</sup>

Width (W)	Max. C/B Frame (A)	
	Left Side	Right Side
36 in.	Q: 250	F: 100
42 in.	L: 600	J,Q: 250
48 in.	R: 1200	J,Q: 250

Mounting space: L = 54 in.  
R = 63 in.

2000 A Interior <sup>▲</sup>

Max. C/B Frame (A)
R: 1200

Mounting space = 54 in.

2000 A Interior <sup>▲</sup>

Max. C/B Frame (A)
R: 1200

Mounting space = 72 in.

3000 A Interior <sup>▲</sup>

Max. C/B Frame (A)	
Left Side	Right Side
R: 1200	J,Q: 250

Mounting space: L = 72 in.  
R = 40.5 in.  
Minimum depth is 36 in.

**Combination Main or UCT and I-Line Distribution Sections <sup>■</sup>**

1000 A, 1600 A, or 2000 A Interior (Based on Main Ampacity) <sup>▲</sup>

Max. C/B Frame (A)	Width (W)	Max. C/B Frame (A)	
		Left Side	Right Side
P: 1200	36 in.	J,Q: 250	F: 100
	42 in.	L: 600	J,Q: 250
	48 in.	R: 1200	J,Q: 250

Mounting space = 18 in.

1600 A Max BP—Lug In  
2000 A Max BP—Through Bus In

Max. C/B Frame (A)	Width (W)	Max. C/B Frame (A)	
		Left Side	Right Side
P: 1200	36 in.	J,Q: 250	F: 100
	42 in.	L: 600	J,Q: 250
	48 in.	R: 1200	J,Q: 250

Mounting space = 45 in.

Main = PowerPact M, P, or R

Max. C/B Frame (A)
P: 1200

Mounting space = 36 in.

1000 A Interior <sup>▲</sup>

Width (W)	Max. C/B Frame (A)	
	Left	Right
36 in.	J,Q: 250	F: 100
42 in.	L: 600	J,Q: 250
48 in.	P: 1200	J,Q: 250

Mounting space = 63 in.

Utility in Combination with I-Line Distribution

Width (W)	Max. C/B Frame (A)	
	Left	Right
36 in.	J,Q: 250	F: 100
42 in.	L: 600	J,Q: 250
48 in.	P: 1200	J,Q: 250

Mounting space = 63 in.

42 in. W = 1200 A Interior <sup>▲</sup>  
48 in. W = 2000 A Interior <sup>▲</sup>

Width (W)	Max. C/B Frame (A)	
	Left	Right
36 in.	—	—
42 in.	P: 1200	J,Q: 250
48 in.	R: 1200	J,Q: 250

Mounting space = 63 in.

<sup>▲</sup> With unknown loading, the minimum ampacity of the interior bus is as follows per UL 891: 1 device = 100% of rating; 2–3 devices = 80% of sum of ratings; 4–6 devices = 70% of sum of ratings; 7–12 devices = 60% of sum of ratings; over 12 devices = 50% of sum of ratings.  
<sup>■</sup> The main can be on top or bottom, depending on the feed direction. The distribution is at the opposite end.

**NOTE:** R main circuit breakers are not available for 42 in. (1067 mm) wide enclosures.

**Auxiliary Sections, NEMA Utility, and Individually Mounted Mains**

**Bussed Auxiliary Sections**

Ampacity (A)	Width (W)
800–2000	24 in.
2500	36 in.
3000–4000	42 in.
5000	48 in.

**NEMA Full Height Utility Compartment**

Ampacity (A)	Width (W)
400–1200	36 in.
1600–4000	42 in.

**PowerPact M, P, and R**

Type	Ampacity (A)	Width (W)
M	800	30 in.
P	1200	
R	2500	36 in.

**Individually Mounted Mains**

**Masterpact NW**

Ampacity (A)	Width (W)	Depth (D)
800–3000	36 in.	36 in.
4000	42 in.	48 in.
5000	48 in.	

**BP Switch**

Ampacity (A)	Width (W)
800–2000	36 in.
2500–3000	42 in.
4000	48 in.

**NOTE:** All drawout NW circuit breakers are 48 in. (1219 mm) deep.

**Stacked Mains**

**PowerPact M and P**

**PowerPact R**

**Masterpact NW**

**BP Switch**

36.00  
(914)  
Minimum

**Depth Dimensions**

System Ampacity (A)	Depth <sup>▲</sup>
400–2500	24 in. (610 mm)
3000	36 in. (914 mm)
4000–5000	48 in. (1219 mm)
<b>Close-Coupled to Transformer</b>	
up to 5000	60 in. (1524 mm)

<sup>▲</sup> For NEMA Type 3R (outdoor) construction, add 11.50 in. (292 mm) to depth in front and 0.50 in. (13 mm) to depth in rear.

Stacked Circuit Breakers	Max. C/B Rating (A)		Width (W)
	Top	Bottom	
PowerPact M- or P-frame	1200	1200	30 in. (762 mm)
PowerPact R-frame	1200	2500	36 in. (914 mm)
	2000	2000	
Masterpact NW	2000	2000	

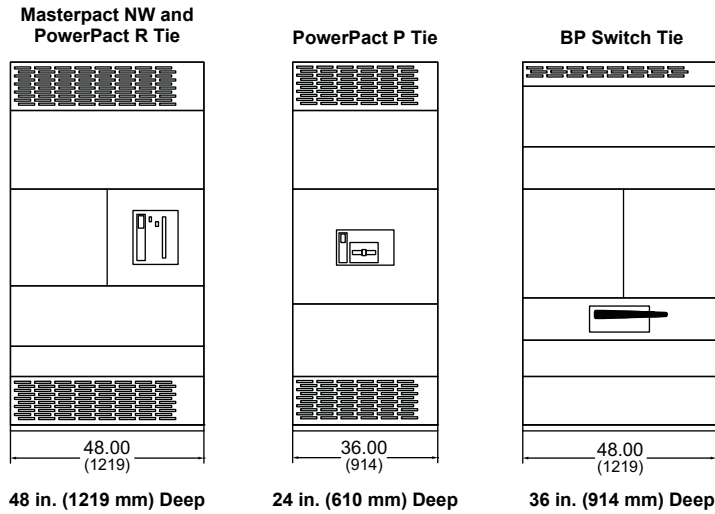
See the "Stacked Devices—Type BP" table on page 27 for maximum switch ampacity and dimensions.



# Quick Layout Guide

# QED-2 Switchboards General and Application Information

## Tie Devices

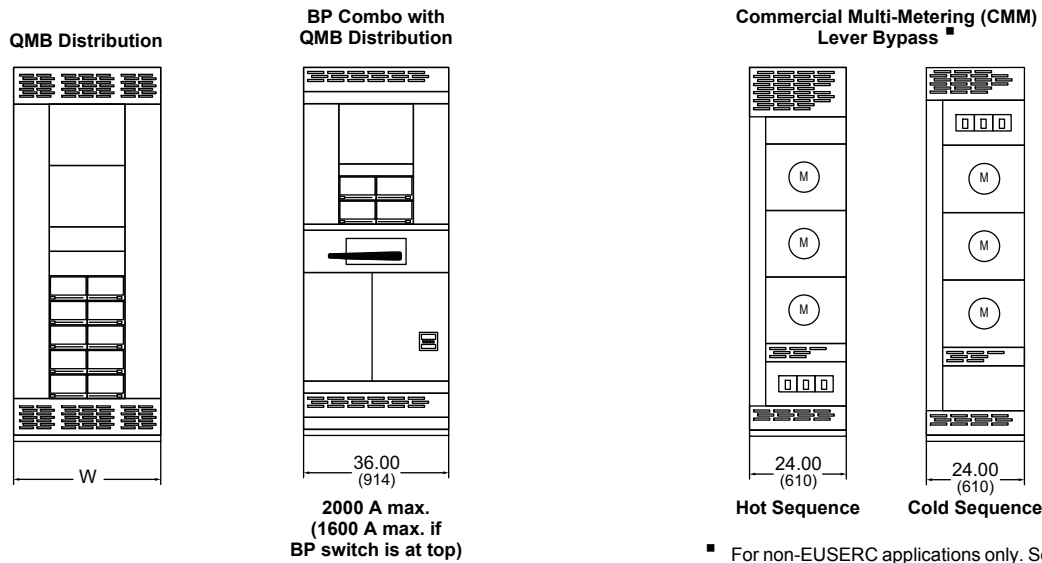


## Depth Dimensions

System Ampacity (A)	Depth <sup>▲</sup>
400–2500	24 in. (610 mm)
3000	36 in. (914 mm)
4000–5000	48 in. (1219 mm)
<b>Close-Coupled to Transformer</b>	
up to 5000	60 in. (1524 mm)

<sup>▲</sup> For NEMA Type 3R (outdoor) construction, add 11.50 in. (292 mm) to depth in front and 0.50 in. (13 mm) to depth in rear.

## Group Mounted Fusible and Lever Bypass CMM

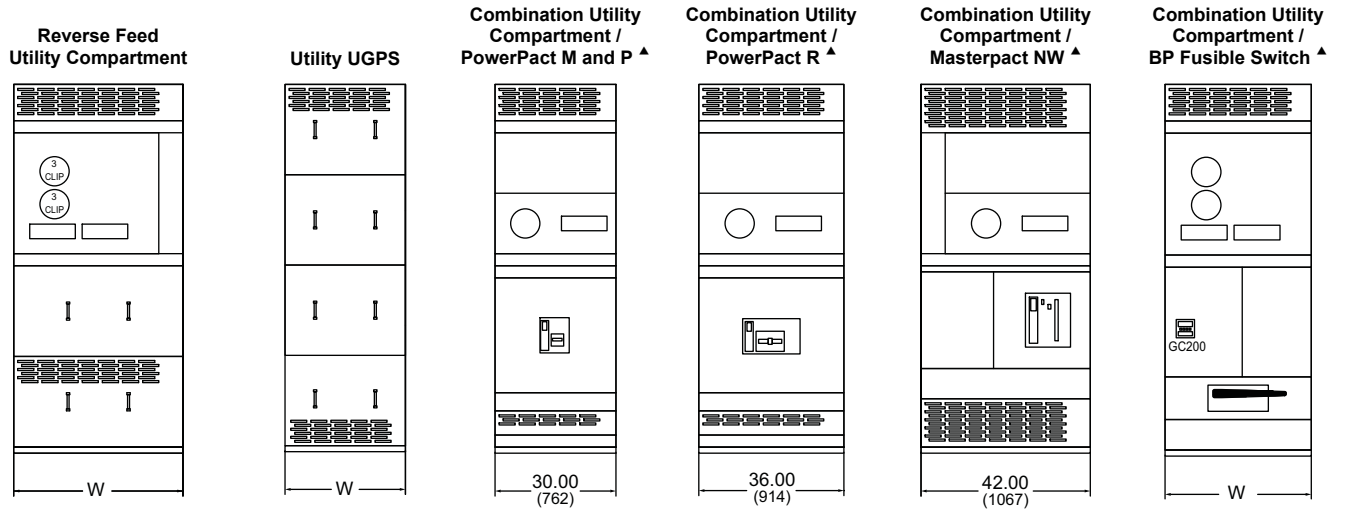


<sup>■</sup> For non-EUSERC applications only. See page 26 for EUSERC CMM options.

Maximum Switch Ampacity (A)	Width (W)	Interior Ampacity (A)
400	36 in. (914 mm)	2000
1200	42 in. (1067 mm)	
(2) 1200	48 in. (1219 mm)	3000

**EUSERC Switchboards**

**UGPS and Utility/Main Combination Sections**



Ampacity (A)	Width (W)
1000	36 in.
1200–2000	42 in.
2500–3000 <sup>■</sup>	48 in.
4000 <sup>■</sup>	54 in.

Ampacity (A)	Width (W)
400–800	30 in.
1000–1200	36 in.
1500–2000	42 in.
2500–4000	48 in.

Ampacity (A)	Width (W)
2000	36 in.
3000	42 in.
4000	48 in.

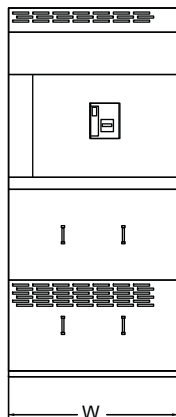
<sup>▲</sup> Requires bottom-feed, full-height UGPS.

<sup>■</sup> EUSERC limit is 2000 A. Check your local utility for 2500, 3000, and 4000 A acceptability.

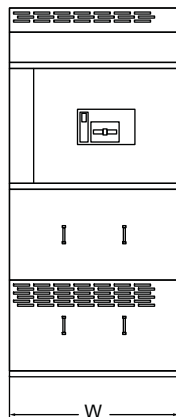
**Reverse Feed Mains and CMM**

**Individually Mounted, Reverse Feed Mains**

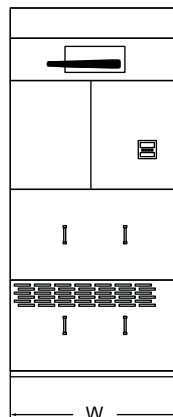
**PowerPact M and P**



**PowerPact R**



**BP Switch**



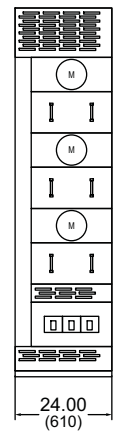
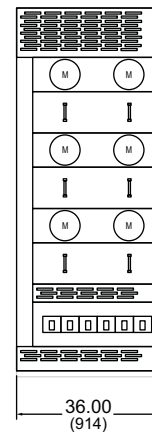
Type	Maximum Ampacity (A)	Width (W)
M	800	36 in.
P	1200	42 in.

Type	Maximum Ampacity (A)	Width (W)
R	2000	42 in.

Ampacity (A)	Width (W)
800–1600	42 in.

**Commercial Multi-Metering (CMM)**

**Hot Sequence**



**6-socket Section**

**3-socket Section**

**Individually Mounted Fusible Switches**

**Fusible Switch Selection (non-EUSERC)**

**BP Main and Branches**

**Individually Mounted Bolt-Loc Type BP Switches (100% Rated)**

Switch Type	Switch Rating (A)	Mounting Height			Section Dimensions	Main Lug Size (kcmil)
		Middle	Top	Bottom	Width (W)	
Bolt-Loc Type BP Fuse Type L Rated 100 kA	800–1600	45 in. (1144 mm)	36 in. (914 mm)	36 in. (914 mm)	36 in. (914 mm)	(4) #3/0-750
	2000		N/A	45 in. (1144 mm)		(5) #3/0-750
	2500				(6) #3/0-750	
	3000				(8) #3/0-750	
	4000		(9) #3/0-750			

**Stacked Devices—Type BP**

System Ampacity (A)	Maximum Switch Ampacity (A)		Minimum Section Dimensions	
	Top	Bottom	Width	Depth <sup>▲</sup>
2000	800	1200	36 in. (914 mm)	36 in. (914 mm)
2500	1200	1200		
	800	1600		
3000	800	2000		
	1200	1600		
4000	800	2000		
	1200	1600		

<sup>▲</sup> With top or bottom through bus, the minimum depth is 48 in.

**Load Lug Information**

Switch Ampacity (A)	Quantity (per phase)	Lug Size (kcmil)
800	3	3/0 - 500
1200	4	
1600	5	3/0 - 600
2000	6	

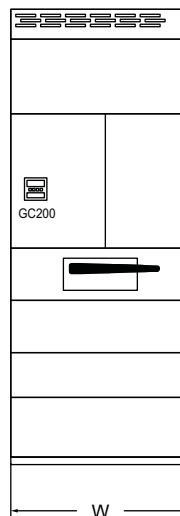
**Depth Dimensions**

System Ampacity (A)	Depth <sup>■</sup>
400–2500	24 in. (610 mm)
3000	36 in. (914 mm)
4000	48 in. (1219 mm)

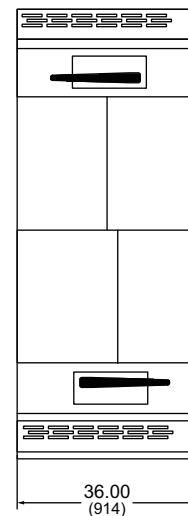
<sup>■</sup> For NEMA Type 3R (outdoor) construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

**Fusible Switch Accessories**

- Electric trip—requires CPT or 120 Vac external power
- Control power transformer
- Capacitor trip power supply
- Blown main fuse detector—requires electric trip and 120 Vac power source for tripping switch
- Unfused switch
- Ground fault push-to-test interface
- Schneider Electric key interlock
- Padlock attachment
- Zone selective interlocking interface
- Phase monitor—for voltage imbalance, low voltage, or phase reversal
- Auxiliary switch



**2500 A BP Fusible Switch with Ground Fault Protection**



**BP Switch Stacked Devices**

For conduit area, see page 40.

**Reverse Feed Fusible Mains**

Type	Ampacity (A)	SCCR		Width (W)	Main Lug Information	
		Fuse Type	240/480 V		Quantity (per phase)	Size (kcmil)
MCS <sup>♦</sup>	400–800	J, T	100 kA	36 in. (914 mm)	3	#3/0 - 750
	800	L				
BP	800–1600			42 in. (1067 mm)	4	

<sup>♦</sup> MCS = molded case switch.

For additional information or clarification on Type BP fusible switches, see instruction bulletin # 9810-1, *Bolt-Loc Type BP Switches, Series 2*, or contact your local Schneider Electric representative.

**QMB/QMJ Main and Branches**

Short circuit rating of QMB/QMJ switches and panel is equal to the lowest fuse interrupting rating to be installed in the switches. Fuses are not included.

DC ratings available on 2-pole switches only. For dc short circuit current rating, contact the fuse manufacturer.

A twin fusible switch equipped with a blank cannot be equipped with a fusible switch in the future.

**Section Options**

- Full height single main with distribution. See the “Single Main Fusible Switch” table below for feeder mounting availability.
- Full height distribution: 72 in. of QMB/QMJ mounting.
- BP switch main in combination with partial height distribution (400 A maximum): 30 in. of QMB/QMJ mounting.
- Utility compartment in combination with group mounted multiple main QMB/QMJ switches (400 A maximum): 30 in. of QMB/QMJ mounting. See the “Utility Compartment with QMB/QMJ Switches b” table below.
- See switch mounting requirements in the “Group Mounted Switches” table on page 29.

**Single Main Fusible Switch—Up to 600 Vac or 250 Vdc Maximum**

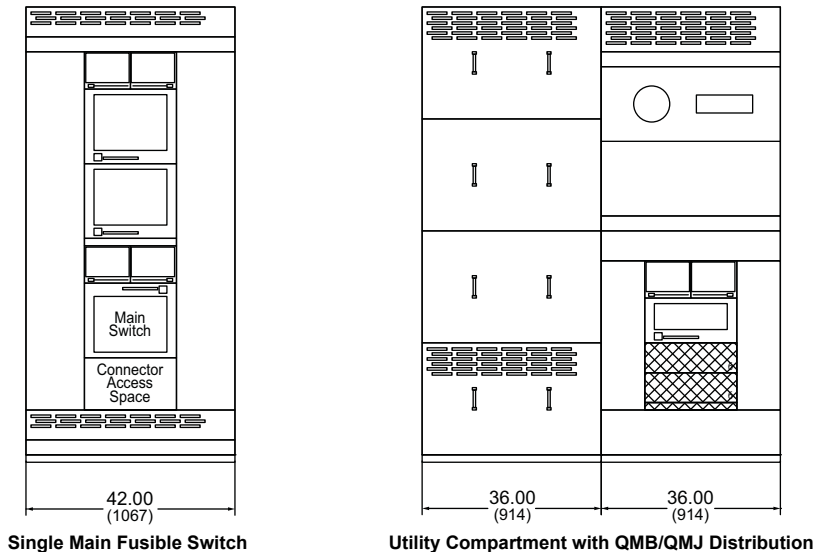
Switch Type	Ampere Rating (A)	Class H, J, R, or L Fuse Provisions				
		QMB	Feeder Mounting (Inches)		Line Lug Information	
		Size (Inches)	Top Feed	Bottom Feed	Quantity (per phase)	Size (Kcmil)
Single switch	400	25.5 in. (648 mm)	46.5 in. (1181 mm)	45 in. (1143 mm)	1	#3/0 - 600
	600 <sup>▲</sup>				2	
	800				3	

<sup>▲</sup> 100,000 A short circuit current rating with Class R fuses to 600 Vac.

**Utility Compartment with QMB/QMJ Switches <sup>■</sup>**

CT Comp. Maximum (A)	Mains Maximum 800 A	Total Mounting Space	Minimum Width (W)	Pull Section Left or Right Bottom Entry	Line Lug Information (per phase)	
					Quantity	Size (kcmil)
400-600	QMB/QMJ	30 in. (762 mm)	36 in. (914 mm)	30 in. (762 mm)	2	#3/0 - 750
800				36 in. (914 mm)	3	
1000				36 in. (914 mm)	4	

<sup>■</sup> Not available with non-EUSERC utilities.



# Group Mounted Fusible Switches

# QED-2 Switchboards General and Application Information

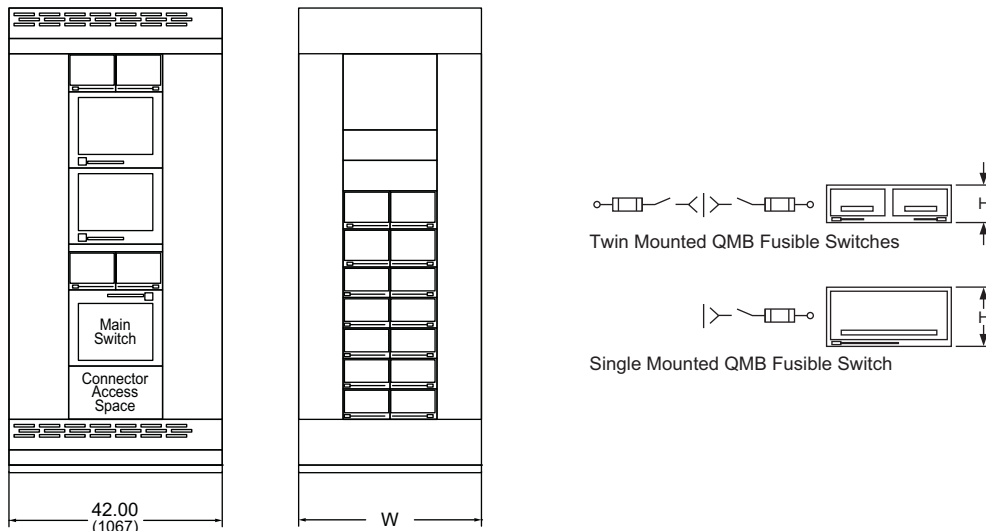
## Group Mounted Switches

Switch Type	Ampere Rating (A)	Mounting Height (H)				Load Lug Information	
		240 Vac / 250 Vdc max		600 Vac / 250 Vdc max			
		Class H, J, R, or L Fuse Provisions				Quantity (per phase)	Size (Kcmil)
		QMB	QMJ	QMB	QMJ		
Twin switch	30 - 30	4.5 in. (114 mm) <sup>▲</sup>	4.5 in. (114 mm)	4.5 in. (114 mm)	4.5 in. (114 mm)	1	#12 - #2 AWG
	30 - Blank			6 in. (152 mm)	6 in. (152 mm)		
	30 - 60	—	—	6 in. (152 mm)	6 in. (152 mm)		—
	30 - 100			7.5 in. (191 mm)	7.5 in. (191 mm)		
	60 - 60	4.5 in. (114 mm) <sup>▲</sup>	6 in. (152 mm)	6 in. (152 mm)	6 in. (152 mm)		#12 - #2 AWG
	60 - Blank	—	—	7.5 in. (191 mm)	6 in. (152 mm)		—
	60 - 100				7.5 in. (191 mm)		6 in. (152 mm)
	100 - 100	6 in. (152 mm) <sup>▲</sup>	6 in. (152 mm)	7.5 in. (191 mm)	6 in. (152 mm)		#14 - 1/0 AWG
	100 - Blank				6 in. (152 mm)		6 in. (152 mm)
200 - 200	—	7.5 in. (191 mm)	—	7.5 in. (191 mm)	—		
Single switch	200	9 in. (229 mm) <sup>▲</sup>	—	9 in. (229 mm)	—	2	#3/0 - 600
	400	15 in. (381 mm)	9 in. (229 mm)	15 in. (381 mm)	9 in. (229 mm)		
	600 <sup>■</sup>	15 in. (381 mm)	15 in. (381 mm)	15 in. (381 mm)	15 in. (381 mm)		
	800	15 in. (381 mm)	15 in. (381 mm)	15 in. (381 mm)	15 in. (381 mm)		
	1200 <sup>◆</sup>	24 in. (610 mm)	24 in. (610 mm)	24 in. (610 mm)	24 in. (610 mm)		

<sup>▲</sup> Use 600 Vac size for QMB with Class J fuse provisions.

<sup>■</sup> 100,000 A short circuit current rating with Class R fuses to 600 Vac.

<sup>◆</sup> 1200 A is a branch switch or group mounted six disconnect main with Class L fuses. This switch is suitable for use on systems to 600 Vac maximum at 100,000 A rms. A single main switch 1200 A must be a Bolt-Loc switch (see page 27).



Group Mounted Switches

Width (W)	Max. Switch Size
36 in. (914 mm)	400 A
42 in. (1067 mm)	1200 A
48 in. (1219 mm)	(2) 1200 A

## **U.S. Utilities (Non-EUSERC)**

The Utilities listed are the only ones for which Schneider Electric Design Engineering currently maintains records. They are available in full height or in combination with a PowerPact M-, P-, or R-frame main breaker, or BP fusible switch unless stated.

- Ameren (MO)
- American Electric Power (OH)
- Appalachian Power Company (VA)
- Baltimore Gas & Electric ▲▪
- Central Illinois Light Company (IL)
- Cincinnati Gas & Electric (OH)
- Columbus Southern Power (OH)
- Commonwealth Edison Company (IL)
- Dayton Power & Light Company (OH)
- Detroit Edison Company (MI)
- Fort Collins, City of (CO)
- Holy Cross Energy (CO)
- Indiana and Michigan Power (IN)
- Indianapolis Power & Light Company (IN) ▲
- Kansas City Power & Light Company (MO)
- Kentucky Power Company (KY)
- Kingsport Power Company (TN)
- Louisville Gas and Electric Company (KY) ▲
- Metropolitan Edison Company (PA)
- NEMA Standard Design
- Ohio Power Company (OH)
- Virginia Electric Power Company (VA) ▲
- Wheeling Power Company (WV)
- Xcel Energy Inc (MN)

### **Cold Sequence Utilities**

- New York State Electric & Gas Corp. (NY)
- Niagara Mohawk Power (NY)
- Northeast Utilities (CT)

▲ Large tenant mains are not available for this utility.

▪ Can only be used in combination with a PowerPact R-frame main circuit breaker.

## **Unlisted Utilities**

There are two ways to have utility compartments built for utility companies that are not listed.

1. The unlisted utility company has no specific design, and just a bussed compartment in the service entrance equipment is required for installing CTs.

For this application, select the listed utility company that best meets the unlisted utility requirements and provide the name of the unlisted utility company. Schneider Electric will build the utility compartment to the design standards of the listed utility selected. The “record” drawings will show the name of the unlisted utility.

2. The unlisted utility has a specific design and does not allow deviation.

For this application, custom design and fabrication are required. The specific utility requirements will have to be provided for pricing and design.

## **Definitions**

**Cold Sequence Metering**—In cold sequence metering, the main disconnecting device is placed ahead of (on the line side of) the current transformer compartment. In this arrangement, the current transformer compartment can be de-energized by switching the main circuit breaker to the OFF position.

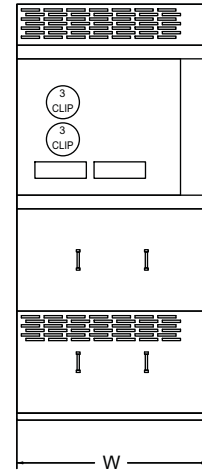
**Hot Sequence Metering**—In hot sequence metering, the main disconnecting device is placed behind (on the load side of) the current transformer compartment. In this arrangement, the current transformer compartment is always energized.

**EUSERC Utilities**

The Electric Utility Service Entrance Requirements Committee (EUSERC) consists of member utilities in the following states: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Wyoming, and Washington.

**Reverse Feed Utility Compartment**

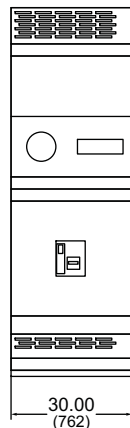
Ampacity (A) <sup>▲</sup>	Width (W)	Depth (D) <sup>■</sup>	Incoming Lug Information <sup>♦</sup>	
			Qty.	Size
400	36	24	1	#3/0-750
600			2	
800			3	
1000			4	
1200	42		5	
1600			6	
2000			8	
2500 <sup>*</sup>	48		36	
3000 <sup>*</sup>		12		
4000 <sup>*</sup>	54	48		



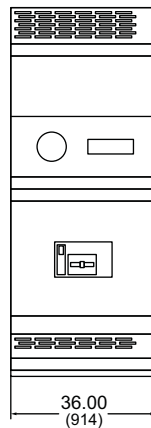
- <sup>▲</sup> Salt River Project (SRP) and Imperial Irrigation District (IID) are limited to 1000 A maximum for reverse feed. City of Riverside (California) is limited to 1200 A maximum for reverse feed.
- <sup>■</sup> "D" represents the NEMA Type 1 dimension. For NEMA Type 3R construction, add 11.50 in. (292 mm) to the depth in front and 0.50 in. (13 mm) to the depth in rear.
- <sup>♦</sup> Lugs or studs are provided based on utility requirements.
- <sup>\*</sup> EUSERC limit is 2000 A. Check your local utility for 2500, 3000, and 4000 A acceptability.

**Utility/Main Combination Sections <sup>▼</sup>**

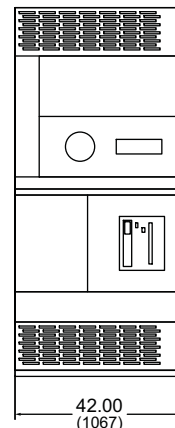
Combination Utility Compartment / PowerPact M and P <sup>▲</sup>



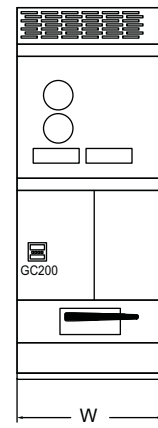
Combination Utility Compartment / PowerPact R <sup>▲</sup>



Combination Utility Compartment / Masterpact NW <sup>▲</sup>



Combination Utility Compartment / BP Fusible Switch <sup>▲</sup>



- <sup>▼</sup> **Restrictions:**  
Lugs Out—Max 2000 A circuit breaker or 1200 A BP fusible switch  
Through Bus Out—Up to 4000 A for circuit breaker or BP fusible switch
- <sup>▲</sup> Requires bottom-feed, full-height UGFS.

Ampacity (A)	Width (W)
2000	36 in.
3000	42 in.
4000	48 in.

Underground Pull Sections—see page 20  
Reverse Feed Mains—see page 21

**Large Tenant Mains > 400–2000 A**

**Circuit Breaker Ratings and Section Dimensions**

Type <sup>▲</sup>	Ampacity (A)	SCCR		Dimensions		Load Lug Information	
		240 V	480 V	Width (W)	Depth (D) <sup>■</sup>	Quantity (per phase)	Size (kcmil)
MG	400–800	65 kA	35 kA	30 in. (762 mm)	24 in. (610 mm)	3	3/0 - 500
MJ		100 kA	65 kA				
PG	1000–1200	65 kA	35 kA				
PK		65 kA	50 kA				
PJ		100 kA	65 kA				
PL		100 kA	100 kA				
RG	1600–2000	65 kA	35 kA	36 in. (914 mm)		6	3/0 - 750
RK		65 kA	65 kA				
RJ		100 kA	65 kA				
RL		100 kA	100 kA				

<sup>▲</sup> P- and R-frame circuit breakers are available with a 100% rating. To order, add -C to the end of the breaker type, for example, RK-C.

<sup>■</sup> "D" represents NEMA Type 1 dimension without rear wireway. For rear wireway add 12 in. (305 mm) to depth. For NEMA Type 3R construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

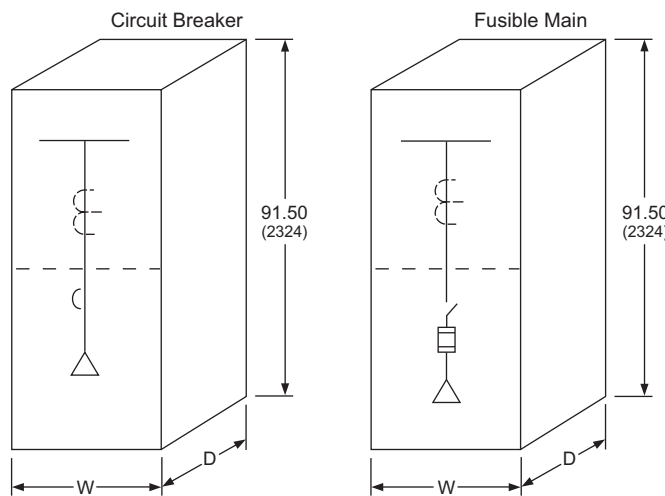
**Fusible Switch Ratings and Section Dimensions**

Type	Ampacity (A)	SCCR		Dimensions		Load Lug Information	
		Fuse Type	240/480 V	Width (W)	Depth (D) <sup>♦</sup>	Quantity (per phase)	Size (kcmil)
MCS <sup>★</sup>	400-600	J, T	100 kA	30 in. (762 mm)	24 in. (610 mm)	3	3/0 - 500
	800	L		36 in. (914 mm)			
BP <sup>▼</sup>	800-1600						

<sup>♦</sup> "D" represents NEMA Type 1 dimension without rear wireway. For rear wireway add 12 in. (305 mm) to depth. For NEMA Type 3R construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

<sup>★</sup> MCS = molded case switch.

<sup>▼</sup> Not available with load lugs, only available with load through bus.



For conduit area, see page 40.

**Top Exit of Load Cables for Large Tenant Main (LTM)**

A loadside wireway section with a minimum width of 12 in. (305 mm) can be used for top exit of load cables. A 12 in. (305 mm) wide section can only accommodate cables for one LTM. A minimum width of 24 in. (610 mm) is required between two LTMs and for NEMA Type 3R applications. Rear load wireway is only available for LTMs; it requires 12 in. (305 mm) of increased depth for other sections in the lineup.



**EUSERC Meter Section—Tenant Mains ≤ 200 A (Hot Sequence)**

**Circuit Breaker Ratings**

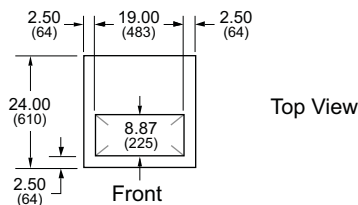
Type	Ampacity (A)	SCCR		Load Lug Information <sup>▲</sup>
		240 V	480 V	
FAL	60–100	22 kA	18 kA	#12 - 1/0 AWG Al or Cu
FHL		65 kA	18 kA	
HJL		100 kA	65 kA	
HDL	110–150	22 kA	18 kA	#4-3/0 kcmil Al or Cu
HGL		65 kA	35 kA	
HJL		100 kA	65 kA	
HLL	175–200	100 kA	100 kA	#4 - 300 kcmil Al or Cu
JDL		22 kA	18 kA	
JGL		65 kA	35 kA	
JJL	110–200	100 kA	65 kA	#4 - 300 kcmil Al or Cu
JLL		100 kA	100 kA	
QDL <sup>■</sup>		22 kA	N/A	
QGL <sup>■</sup>	110–200	65 kA	N/A	#4 - 300 kcmil Al or Cu
QJL <sup>■</sup>		100 kA	N/A	

- <sup>▲</sup> Neutral lug terminations are #6 - 350 kcmil.
- <sup>■</sup> A shunt trip is not available for PowerPact Q-frame circuit breakers.

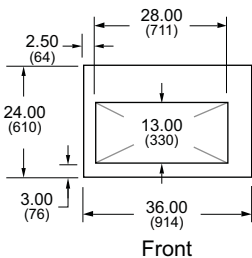
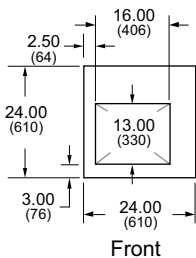
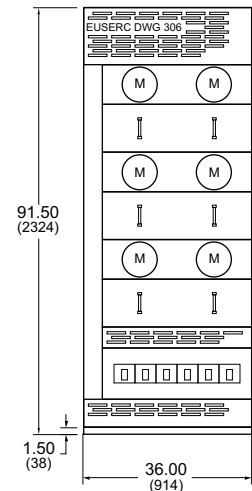
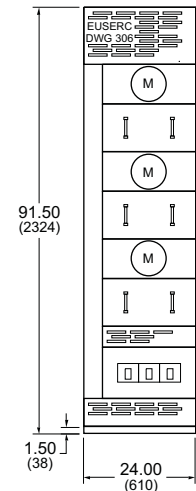
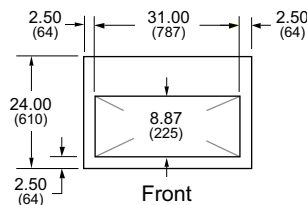
**Fusible Pullout Ratings**

Type	Ampacity (A)	SCCR		Load Lug Information <sup>▲</sup>
		240 V	480 V	
FTL3100	100	100 kA	N/A	#14 - 1/0 AWG
FTL3200	200	100 kA	N/A	#4 - 250 kcmil
FTL43060	60	N/A	100 kA	#14 - #2
FTL43100	100	N/A	100 kA	#14 - 1/0 AWG
FTL43200	200	N/A	100 kA	1/0 AWG - 300 kcmil

**3-Socket Main**



**6-Socket Main**



Floor Plan

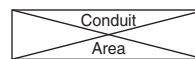
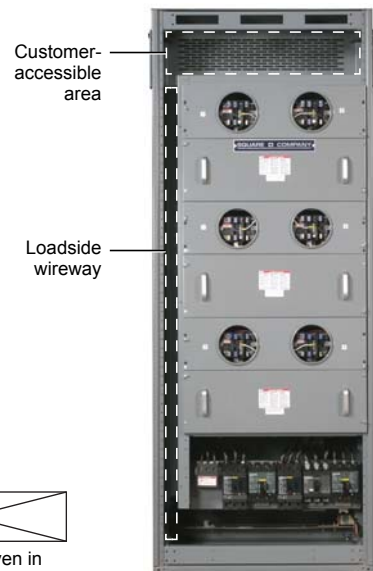
**Depth Dimensions**

System Ampacity (A)	Depth <sup>♦</sup>
400–2500	24 in. (610 mm)
3000	36 in. (914 mm)
4000	48 in. (1219 mm)

<sup>♦</sup> For NEMA Type 3R (outdoor) construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

**Top Exit of Load Cables**

Tenant metering sections come standard with a front accessible loadside wireway in each section for routing of load cables for top exit. Rear load wireway is not required for top exit applications.



Dimensions given in INCHES (millimeters).

# QED-2 Switchboards

## General and Application Information

## Commercial Multi-Metering

### Non-EUSERC Lever Bypass Meter Section—Tenant Mains ≤ 200 A (Hot and Cold Sequence)

#### Circuit Breaker Ratings

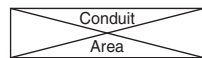
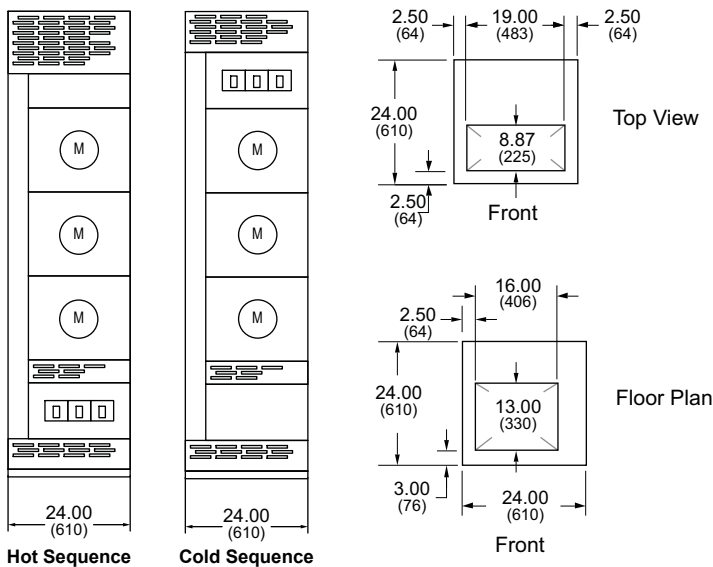
Type	Ampacity (A)	SCCR		Load Lug Information <sup>▲</sup>
		240 V	480 V	
FAL	60–100	22 kA	18 kA	#12 - 1/0 AWG Al or Cu
FHL		65 kA	18 kA	
HJL		100 kA	65 kA	
HDL	110–150	22 kA	18 kA	#4-3/0 kcmil Al or Cu
HGL		65 kA	35 kA	
HJL		100 kA	65 kA	
HLL		100 kA	100 kA	
JDL	175–200	22 kA	18 kA	#4 - 300 kcmil Al or Cu
JGL		65 kA	35 kA	
JJL		100 kA	65 kA	
JLL		100 kA	100 kA	

<sup>▲</sup> Neutral lug terminations are #6 - 350 kcmil.

#### Fusible Pullout Ratings

Type	Ampacity (A)	SCCR		Load Lug Information <sup>▲</sup>
		240 V	480 V	
FTL43060	60	N/A	100 kA	#14 - #2
FTL43100	100	N/A	100 kA	#14 - 1/0 AWG
FTL43200	200	N/A	100 kA	1/0 AWG - 300 kcmil

#### 3-Socket Main



Dimensions given in INCHES (millimeters).

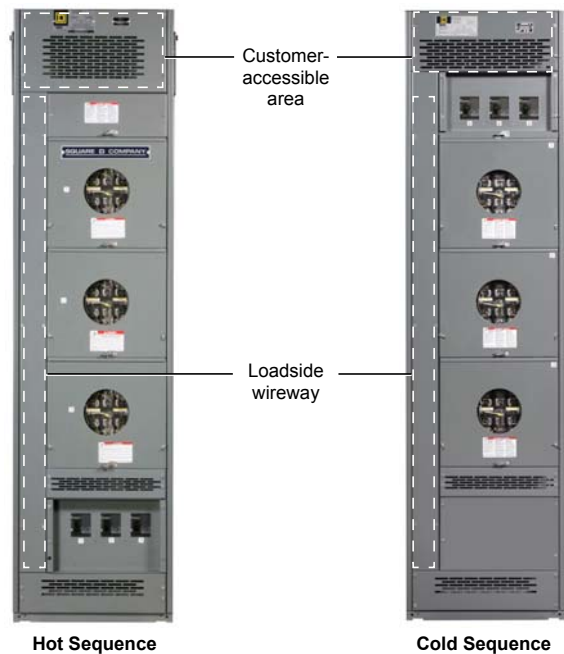
#### Depth Dimensions

System Ampacity (A)	Depth <sup>♦</sup>
400–2500	24 in. (610 mm)
3000	36 in. (914 mm)
4000	48 in. (1219 mm)

<sup>♦</sup> For NEMA Type 3R (outdoor) construction, add 11.50 in. (292 mm) to depth in front, and 0.50 in. (13 mm) to depth in rear.

#### Top Exit of Load Cables

Tenant metering sections come standard with a front accessible loadside wireway in each section for routing of load cables for top exit. Rear load wireway is not required for top exit applications.



**QED-2 Quick Connect Generator Switchboards**

The Square D™ brand Power-Style™ QED-2 Quick Connect Generator Switchboard from Schneider Electric addresses the growing market need for switchboards with quick connect terminals to facilitate connecting generators for temporary back-up power. Common applications include facilities such as nursing homes, hospitals (supplemental equipment not fed by emergency power), and stores with perishable products, that are sensitive to power outages, but typically do not have or require backup power sources.

Customers have become more sensitive to the need for temporary back-up power to reduce the duration of disruptions due to hurricanes, tornadoes, snow storms, brownouts, and other circumstances that can result in prolonged power outages. In these situations, a mobile generator can be brought in to get a facility back on line quickly.



Quick Connect Generator Switchboard NEMA Type 1 Section

**Specifications for Generator Circuit Breaker Section ^**

Ampacity (A)	SCCR (Max)	Number of Sections	Width (Inches)	Depth (Inches)	Incoming Generator Lugs Only	Incoming Generator Lugs and Plug-In Receptacles	Terminals Per Phase/Neutral (Lug or Plug-In Receptacle)
1200	65 k	1	36	24 or 36	Yes	Yes	3
1600							4
2000				5			
2500				7			
3000	50 k		42	36			9
4000				48			12

^ 1200–2500 A use PowerPact R-frame circuit breakers; 3000 and 4000 A use Masterpact NW circuit breakers.

**Specifications for Terminal Section (without circuit breakers)**

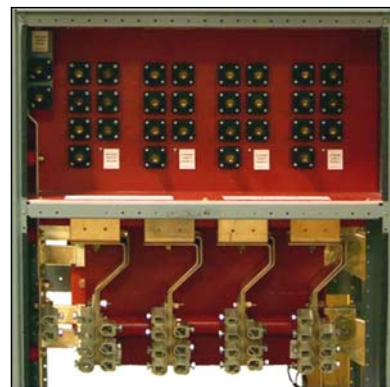
Ampacity (A)	SCCR (Max)	Number of Sections	Width (Inches)	Depth (Inches)	Incoming Generator Lugs Only	Incoming Generator Lugs and Plug-In Receptacles	Terminals Per Phase/Neutral (Lug or Plug-In Receptacle)
1200	65 k	1	36	24 or 36	Yes	Yes	3
1600							4
2000				5			
2500				7			
3000			42	36			9
4000				48			12



Quick Connect Generator Switchboard NEMA Type 3R Section

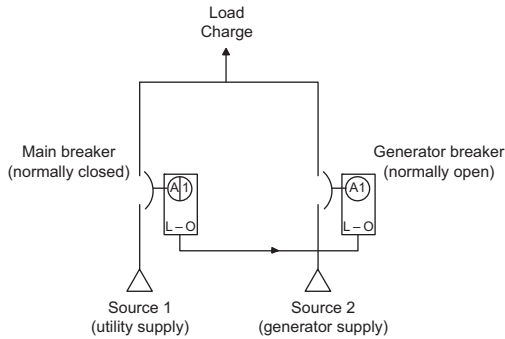


Hubbell Separable Connectors with Type W Cable Installed



Quick Connect Compartment Showing Hubbell Plug-In Receptacles and Lugs for Type W Cable

**Sequence of Operation**



The nameplate on each Quick Connect Generator circuit breaker section provides complete Sequence of Operation instructions. A one-line diagram clearly shows the key interlock scheme for additional clarification. Both the diagram and instructions are written in English and French. An English version of the diagram and sample instructions are shown below.

**Loss of Utility Power**

1. Open all distribution breakers.
2. Open the main breaker and rotate the key A1 to lock the breaker in the open position; key is now removable.
3. Remove generator breaker receptacles cover or generator breaker lugs cover.
4. Connect generator cables to either the receptacles or to the generator breaker incoming lugs per the connection sequence label.
5. Verify proper phase and voltage connection.
6. Remove key from the lock and insert it into the lock on the generator breaker.
7. Rotate key A1 to unlock generator breaker; key is now held captive.
8. Start generator.
9. Verify proper voltage L-L and L-N and proper phase rotation.
10. Close generator breaker, close appropriate distribution breakers.

**Return of Utility Power**

1. Open distribution breakers.
2. Open generator breaker and rotate the key A1 to lock the breaker in the open position; key is now removable.
3. Remove key from the lock and insert into the lock on the main breaker.
4. Shut down generator.
5. Disconnect generator cables per the connection sequence label.
6. Replace all covers.
7. Rotate key A1 to unlock the main breaker; key is now held captive.
8. Close main breaker, close all distribution breakers.

For more information, see data bulletin # 4620DB0701, *Power-Style™ QED-2 Quick Connect Generator Switchboard*, or contact your local Schneider Electric representative.

## Surge Protective Devices (SPD)

These devices help protect AC electrical circuits from the effect of lightning-induced currents, substation switching transients, and internally generated transients resulting from inductive or capacitive load switching. They are available in I-Line mount, QMB mount, or individual mount in the instrument compartment.

### Common Features

- UL 1449 Recognized, 3rd edition
- Copper internal bus for the SPD
- Individually fused suppression modules
- On-Line diagnostics continuously monitor unit
- Thermal cut-out
- Solid state, bi-directional
- Front panel alarm with test/silence switch
- Front panel operational indicators (LEDs) to indicate loss of protection or circuit fully operational including N-G
- High energy parallel design for Category A, B, and C3 applications
- AC tracking filter with EMI/RFI filtering up to -50 dB from 100 kHz to 100 MHz
- Ratings available (per phase): 100 kA, 120 kA, 160 kA, 200 kA, 240 kA, 320 kA, 480 kA

**NOTE:** 320 kA and 480 kA devices can only be mounted in an instrument compartment. If you have a utility compartment, please contact your local Schneider Electric representative.

### Options

- Surge Counter
- Remote Monitor

### I-Line Mount SPD

- Comes with circuit breaker disconnect
- Requires 13.5 in. interior mounting space



I-Line SPD

### QMB Mount SPD

- Comes with QMB unit disconnect
- Requires 9 in. of interior mounting space



QMB SPD

### Instrument Compartment SPD

- Comes with circuit breaker disconnect
- Requires a 19.5 in. instrument compartment

## Reducing Impedance with Internal and Integral SPDs

Internal SPDs do not require the extra several feet of conductor used by externally mounted devices. This is key, because every foot of conductor can increase potentially damaging let-through voltage by as much as 160 V.

Integral SPDs are an internal installation where the suppression modules are mounted directly to the phase bus bars. The elimination of cables and their impedance in the SPD connection gives the lowest possible let-through voltage.

**Automatic Throwover Systems**

**Standard Features**

The following features are standard for a Square D™ brand automatic throwover system. The standard system features a Modicon™ microprocessor, plug-in technology for ease of retrofit/installation, and programmable capability.

Description	Main-Tie-Main	Main-Main	Main-Generator	Main-Tie-Generator
Automatic transfer to alternate source, automatic retransfer to normal source	✓	—	✓	✓
Automatic transfer to alternate source, manual return normal source	—	✓	—	—
Bypass of retransfer delay if emergency fails	✓	✓	✓	✓
Electrically interlocked	✓	✓	✓	✓
Manual circuit breaker close buttons inhibited	✓	✓	✓	✓
Transition delay (2 seconds), open and closed transition	✓	✓	✓	✓
Source loss delay (3 seconds), before transfer	✓	✓	✓	✓
Source stabilization timer (10 seconds) before retransfer	✓	✓	✓	✓
Undervoltage sensing on both sources, standard 100% nominal, 10% differential, adjustable	✓	✓	✓	✓
Phase sequence sensing on both sources, 2 cycles	✓	✓	✓	✓
Phase imbalance, 2%, adjustable	✓	✓	✓	✓
Phase loss, 68% phase loss	✓	✓	✓	✓
Auto/manual keyed switch w/ white light for auto and blue light for manual	✓	✓	✓	✓
Control power transfer	✓	✓	✓	✓
Full automatic mode with drawout breakers in the test position	✓	✓	✓	✓
Open (green) / close (red) lighted push buttons	✓	✓	✓	✓
Test switch—simulates loss of source	✓	✓	✓	✓
Circuit breaker electrical trip lockout w/ amber light indication	✓	✓	✓	✓
Uninterruptible power supply for 120 Vac control power	✓	✓	✓	✓
UPS bypass relay	✓	✓	✓	✓
Sources available (white) lights	✓	✓	✓	✓
Operator interface panel	✓	✓	✓	✓
Wire labels	✓	✓	✓	✓
Fused control circuits with individual blown fuse indication	✓	✓	✓	✓
Over-voltage sensing on generator (59), Standard 125% of nominal, 15% differential, adjustable	—	—	✓	✓
Frequency sensing on generator (81), standard 3 Hz differential, 0.1–3 Hz, adjustable	—	—	✓	✓
Engine start contacts, 5 A @ 120 Vac	—	—	✓	✓
Open transition	✓	✓	✓	✓
Remote alarm contact wired (system inoperative), 5 A @ 120 Vac	✓	✓	✓	✓
Generator exercising unloaded, 30 minutes, once per week	✓	✓	✓	✓
Time delay for engine cool down, 15 minutes unloaded standard	—	—	✓	✓

**NOTES:** For Masterpact NW arrangements, an automatic throwover system is approved for use as a transfer switch per UL1008 for main-main and main-generator construction only. Open-transition systems require a mechanical interlock between the two main circuit breakers; both circuit breakers must be in the same section or in adjoining sections.

Both sources are paralleled during a closed transition. Short circuit contribution is additive from both sources.

## Optional Features

Description	Main-Tie- Main	Main- Main	Main- Generator	Main-Tie- Generator
Closed transition on retransfer				
Sync check (25), 2-seconds maximum paralleling when sources synchronized	✓	✓	✓	✓
Voltage 10%–30% adjustable, phase relationship is 6° to 20° and frequency is 0.15 Hz to 0.5 Hz				
Generator exercise with load switch	—	—	✓	✓
Preferred source selector (Left-Off-Right), Left is standard	✓	✓	—	—
Automatic retransfer to normal switch	✓	✓	✓	✓
Touchscreen HMI	✓	✓	✓	✓
Remote alarm contact (system inoperative), 5 A @ 120 Vac	✓	✓	✓	✓
Closed transition on retransfer				
Sync check (25), 2-seconds maximum paralleling when sources synchronized, voltage 10%–30% adjustable, phase relationship is 6° to 20° and frequency is 0.15 Hz to 0.5 Hz		✓		
Time delay for engine cool down, 15 minutes unloaded standard	—	—	✓	✓
Generator exercise with load switch	—	—	✓	✓
Preferred source selector (Left-Off-Right), Left is Standard	✓	✓	—	—
Automatic retransfer to normal switch	✓	—	—	—

The following circuit breaker accessories are required for automatic throwover system:

1. 120 Vac electrical operation (includes shunt close, shunt trip and electrical operator)
2. One set of auxiliary switches (one normally open and one normally closed)
3. Alarm switch (one normally open contact)
4. Cell position switch (one normally open required for drawout circuit breakers)

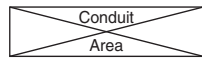
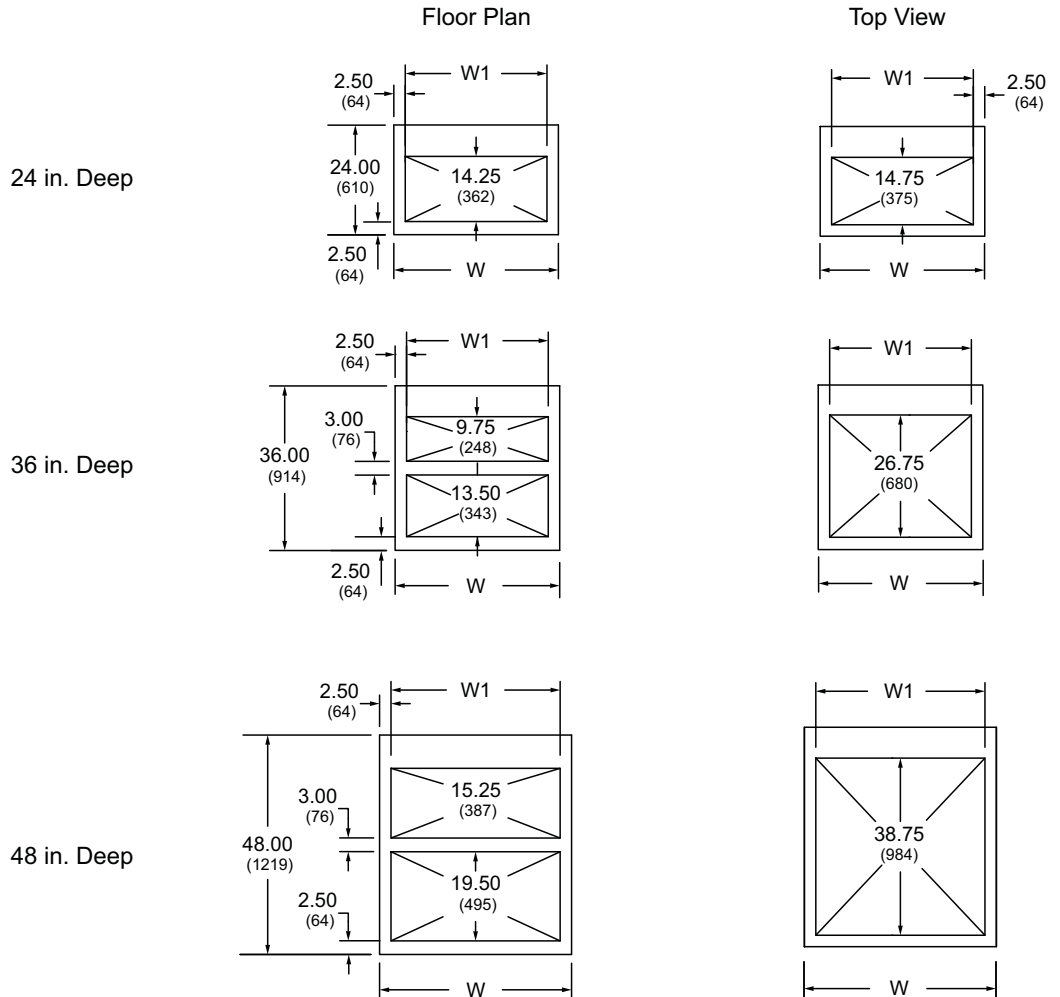
Automatic throwover systems are complex and can require adjustments during start-up.

## Automatic Transfer Switches

Ratings, standard widths, and depths are not available due to variations between manufacturers. Please contact your local Schneider Electric representative for detailed information.

**Conduit Layout**

These drawings are valid for all mains, feeders, and distribution sections based on depth and width. For mains and feeders, top conduit area is not available for bottom exit/entry nor is bottom conduit area available for top exit/entry.



Dimensions given in INCHES (millimeters).

Conduit area is based on a minimum of 10 in. (254 mm) to any obstruction.

Width (W)	30 in. (762 mm)	36 in. (914 mm)	42 in. (1087 mm)	48 in. (1219 mm)	54 in. (1372 mm)
Width (W1)	25 in. (635 mm)	31 in. (787 mm)	37 in. (940 mm)	43 in. (1092 mm)	49 in. (1245 mm)



## Main Circuit Breaker QED-2 Switchboards

The following table contains UL Tested and Certified series combination ratings for Square D™ brand QED-2 Switchboards. The line-side circuit breaker may be a submain, an integral main, or a remote main located in a separate enclosure. The load-side circuit breaker may be a branch, a submain, or an integral main used on the load side of a remote main. These series-combination, short-circuit current ratings (SCCR) shall not exceed the rating of the line-side circuit breaker.

## QED-2 Switchboards: Main Circuit Breaker with I-Line or NQ Distribution

Maximum System Voltage (AC)	Maximum SCCR in RMS Symm Amps (kA)	Line-Side Circuit Breaker	Load Side	
			Square D™ Brand Circuit Breaker	Poles
240	35	MG	FA	1
	42	MA, LA	QD (225 A max.)	2, 3
	50	MG	FA	
		MG	FA (25 A max.)	1
	65	LH (400 A max.)	QD (225 A max.)	2, 3
		MH, PA (1600 A max.)	QD (225 A max.)	
		MG	KA, QD (225 A max.)	
		PG, RG (1200 A max.)	QD (225 A max.)	
		DG	MA (600 A Max.), FH, HD, JD, KA, LA	
		LG	MA (600 A Max.), HD, JD, KA, LA	
	85	RL	FH, KH	2, 3
	100	FC, KC	FA, FH, FD, FG, FJ	
		LC, LX	FH, FD, FG, FJ	
		KC, LC	KA, KH	
		MJ, LC	LA, LH	
		LX	LA, KA	
		PJ	QD (225 A max.)	
		PH (1600 A max.)	QD (225 A max.)	
		RJ (1200 A max.)	QD (225 A max.)	
		LC, LX	MG	
		DJ	MA (600 A max.), MG (600 A max.), FH, HD, HG, JD, JG, KA, LA	
	DL	MG (600 A max.)		
	125	RL	HD, HG, JD, JG, RG	3
			LD, LG	
200	FI, KI	FA, FH, FC, FD, FG, FJ, HD, HG, HJ		
	LI	FH, FC, HD, HG, HJ, KC, LA, LH, KA, KC, KH, HD, HG, HJ, JD, JG, JJ		
	LXI	FH, HD, HG, HJ, LA		
	LXI, KI	KA, KH, HD, HG, HJ, JD, JG, JJ		
	KI, LI, LXI	QD (225 A max.)		

**QED-2 Switchboards: Main Circuit Breaker with I-Line or NQ Distribution**

Maximum System Voltage (AC)	Maximum SCCR in RMS Symm Amps (kA)	Line-Side Circuit Breaker	Load Side			
			Square D™ Brand Circuit Breaker	Poles		
277V	18	LD	FY	1		
	35	DG	FH, FY			
		LG	FH, FY			
	65	FC, KC	FA, FH, FY, FD, FG			
		LC, LX (400 A max.)	FH			
		LC, LX (600 A max.)	FY, FD, FG			
		DJ	FH, FY			
		DL	FY			
		LJ	FH, FY			
	100	LL	FY			
		DL	FH, FJ			
	200	LL	FH, FJ			
		FI, KI	FA, FH, FY, FD, FG, FJ			
		LI, LXI (400 A max.)	FH, HD, HG, HJ			
LI, LXI (600 A max.)		FY, FD, FG, FJ				
480V	22	MG	FA	2,3		
	30	KH, LA, MA, MX	FH, HD			
		PA, PC, PX	FH			
		LA, MA, PA, PC, PX	KA			
	35	MG	FA (25 A max.), FH, KA			
		MG, PG	HD, JD			
		DG	MA (600 A max.), FH, HD, JD, KA, LA			
		LG	MA (600 A max.), FH, HD, JD, KA, LA			
	42		LD		3	
	50	MJ	FH (25 A max.)		2,3	
	65	MJ	KH			
		FC, KC	FA, FH			
			LC, LX (400 A max.)			FH, HD, HG
			KC, LC			KA, KH
		LC	LA, LH			
		LX	KA, LA			
	DJ	MA (600 A max.), FH, HD, HG, JD, JG, KA, LA				
	LJ	MA (600 A max.), FH, HD, HG, JD, JG, KA, LA				
			LD, LG			3
	100	LI	KA, KH		2,3	
		LXI (600 A max.)	KA			
		RL	RG			
DL		MA (600 A max.), FH, HD, HG, HJ, JD, JG, JJ, KA, LA				
LL		MA (600 A max.), FH, HD, HG, HJ, JD, JG, JJ, KA, LA				
		LD, LG, LJ	3			
200	FI, KI	FA, FH, FC				
	LXI (400 A max.)	FH, HJ, HL				
	LI	FH, FC, HJ, HL, KC, LA				
	KI, LI	KA, KH				
480Y/277V	25	FH, KA	FD			
	35	KH, LH	FD			
	65	FC, KC, LC, LX (600 A max.)	FD, FG			
	200	FI, KI, LI, LXI (600 A max.)	FD, FG, FJ			

**Fusible Main QED-2 Switchboards**

The following table contains UL Tested and Certified series-combination ratings for Square D™ brand QED-2 Switchboards. The line-side fused switch may be a submain, an integral main or a remote main located in a separate enclosure. The load-side circuit breaker may be a branch, a submain, or an integral main used on the load side of a remote main. These series-combination, short-circuit current ratings (SCCR) shall not exceed the rating of the line-side fused switch.

**QED-2 Switchboards: Fusible Main with I-Line or NQ Distribution**

Maximum System Voltage (AC)	Maximum SCCR in RMS Symm Amps (kA)	Line-Side Fuse		Load Side
		Maximum Amperage	Fuse Class	Square D™ Brand Circuit Breaker (2- or 3-pole)
240	65	600	J or R	QD
		800	T (600 V)	QD
		1200	L	QD
	100	600	J	HD, HG, HJ, HL, JD, JG, JJ, JL
			J or R	QD, QG (2-pole)
			L or T (600 V)	FA, FH, KA, KH, KC, LA, LH, MA, MH, MX, PG
		800	R	FH, HD, HG, HJ, HL, KA, KH, JD, JG, JJ, JL, LA, LH, MA, MH, MX, PG
			T (600 V)	QD, QG (2-pole)
		1200	L or T (600 V)	FH, KA, KH, LA, LH, MA, MH, MX, PG
			T (600 V)	HD, HG, HJ, HL, JD, JG, JJ, JL
		1200	L	QD, QG (2-pole)
				FH, KH, LA, LH, MA, MH, MX, PG
		2000		KH, MA, MH, MX, PG
		200	600	J
	T (600 V)			FA (3-pole only), FH, FC, KA, KH, KC, LA, LH, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
	600		R	FH, FC, HD, HG, HJ, HL, KH, KC, JD, JG, JJ, JL, LA, LH, LC, MA, MH, MX, NC, NX, PG, PJ, PL
	800		T (600 V)	FH, FC, KA, KH, KC, LA, LH, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
	800		L	FH, FC, KH, KC, LA, LH, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
	1200		T (600 V)	HD, HG, HJ, HL, JD, JG, JJ, JL
	1200		L	FC, KH, KC, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
	2000			NA, NC, NX, PJ, PL

**QED-2 Switchboards: Fusible Main with I-Line or NQ Distribution**

Maximum System Voltage (AC)	Maximum SCCR in RMS Symm Amps (kA)	Line-Side Fuse		Load Side
		Maximum Amperage	Fuse Class	Square D™ Brand Circuit Breaker (2- or 3-pole)
480V	100	600	J	FC, HJ, HL, KA, KH, KC, JJ, JL, LA, LH, LC, MA, MH, MX, NA, PG, PJ
		600	T (600 V)	FC, KA, KH, KC, LA, LH, LC, MA, MH, MX, NA, PG, PJ
		600	R	FC, HJ, HL, KA, KH, KC, JJ, JL, LA, LH, LC, MA, MH, MX, NA, PG, PJ
		800	L or T (600 V)	FC, KA, KH, KC, LA, LH, LC, MA, MH, MX, NA, PG, PJ
		1200	T (600 V)	HJ, HL, JJ, JL
		1200	L	FC, KH, KC, LA, LH, LC, MA, MH, MX, NA, PG, PJ
		1600		KC, LC, MA, MH, MX, NA, PG, PJ
		2000		KC, LC, MG, MH, MJ, MX, NA, PG, PJ
	200	400	J	FA, FH, FC, HJ, HL, KA, KH, KC, JJ, JL, LA, LH, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
		400	T (600 V)	FA, FH, FC, HJ, HL, KA, KH, KC, JJ, JL, LA, LH, LC, MA, MH, MX, NA, NC, NX
		600	J	FC, KA, KH, KC, LA, LH, LC, MA, MG, MH, MJ, MX, NA, NC, NX, PG, PJ, PL
		600	T (600 V)	KA, KH, KC, LA, LH, MA, MH, MX, NA, NC, NX
		600	R	KC, LA, LH, LC, MA, MG, MH, MJ, MX, NC, NX, PG, PJ
		800	T (600 V)	KA, KH, KC, LA, LH, MA, MG, MH, MJ, MX, NA, NC, NX, PG, PJ, PL
		800	L	KC, LA, LH, LC, MA, MH, MX, NA, NC, NX, PG, PJ, PL
1200		KC, LC, MA, MG, MH, MJ, MX, NA, NC, NX, PG, PJ, PL		
2000	NA, NC, NX			

## Specifications

### General

Furnish and install the switchboard(s) as herein specified and shown on the associated electrical drawings. The switchboard(s) shall meet Underwriters Laboratories (UL) requirements and be furnished with a UL service entrance label.

### Structures

The switchboard shall be enclosed, dead front, free standing, front and rear aligned with front and rear accessibility. The switchboard shall be NEMA Type (1 General Purpose) (3R Non-Walk-in Outdoor). The framework shall be of UL gauge steel secured together to support all cover plates, bussing, and component devices during shipment and installation. Formed removable closure plates shall be used on the front, rear, and sides. All closure plates are to be single tool, screw removable. Ventilation shall be provided when required. Each section shall include a single-piece removable top plate.

### Finish

All painted parts shall be pretreated and provided with a corrosion-resistant, UL Listed acrylic baked paint finish. The paint color shall be ANSI #49 medium light gray per ANSI standard Z55.1-1967.

NEMA Type 3R enclosures shall be treated with the same process except that all exterior parts shall be of galvanized steel. All exterior hardware on NEMA Type 3R enclosures shall be plated steel.

### Ability to Withstand a Fault

The entire switchboard shall be suitable for operation at the specified available fault current. The switchboard shall be labeled to indicate the maximum available fault current rating, taking into account the structure, bussing, switchboard main disconnect(s), and switchboard branch circuit devices. The short circuit current rating of the switchboard(s) shall not be less than \_\_\_\_\_ rms symmetrical amperes. The switchboard branch circuit devices short circuit current rating shall be fully rated or determined by UL labeled series connected ratings.

### Bussing

The switchboard through bus shall be (tin-plated aluminum) (tin-plated copper) (silver-plated copper). The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 for temperature rise. The through bus shall have a maximum ampacity of (1200) (1600) (2000) (2500) (3000) (4000) (5000) A and extend the full length of the switchboard. The through bus shall be 100% rated. Provisions shall be provided for future splicing of additional sections from either end. The neutral bus shall be 100% rated.

The switchboard distribution section bus shall be of the same material as the through bus and shall be rated (1200) (1600) (2000) (3000) A. The distribution section neutral plate shall be of copper provided with Cu/Al lugs for the devices installed and future specified devices. The ground bus shall be sized per UL Standard 891 and be of the same material as the through bus.

### Utility Metering Compartments

The switchboard utility metering compartment shall be located in the service entrance section of the switchboard and connected for (hot) (cold) sequence metering. The utility metering compartment shall be (barriered) (unbarriered) and covered with a (single hinged door) (double hinged door) with sealing provisions.

### **Main Disconnect Devices**

The main disconnect device(s) shall be a (molded case circuit breaker) (solid-state trip, molded case circuit breaker) (fused bolted pressure switch). With the main device, (ground fault protection) (with zone interlocking) (undervoltage trip) (phase failure protection) (capacitor trip) (alarm switch) (auxiliary switches) (long time, short time) (long time, short time, instantaneous) shall be provided. Fuses for the bolted pressure switch are to be supplied by the (manufacturer) (user). A PowerLogic (power meter) (circuit monitor) (ION meter) with the appropriate transformers shall be provided, as required.

### **Group Mounted Branch Devices**

The switchboard group-mounted (fusible) (circuit breaker) branch devices are to be front accessible and front connectable. The (fusible) (circuit breaker) connections to the distribution panel bussing shall be of a “blow-on” design such that the connections grip the bus bars firmly under high fault conditions.

### **Individually Mounted Circuit Breakers**

Individually mounted branch circuit breakers shall be of the (molded case)(stored energy) type and be positioned vertically with the operating handles accessible through the hinged front cover plates of the section. Each circuit breaker shall be individually fed by connectors from the main bus of the switchboard.

### **Surge Protective Device (SPD)**

- Listed and Component Recognized in accordance with UL 1449, 3rd edition, to include Section 37.3 highest fault current category. SPD devices shall be UL 1283 listed.
- Provide surge current diversion paths for all modes of protection—L-N, L-G, and N-G—in Wye systems.
- Modular in design. Each mode, including N-G, shall be fused with a 200 kAIR, UL-classified surge-rated fuse and incorporate a thermal cutout device.
- Provide audible diagnostic monitoring by way of audible alarm. Alarm shall activate upon a fault condition. Provide push-to-test switch, and alarm on/off switch to silence alarm.
- If a dedicated breaker for the SPD is not provided, the SPD shall include a UL-classified disconnect switch.
- Meet or exceed the following criteria:
  - Minimum surge current capability (single pulse rated) per phase: (480 kA) (320 kA) (240 kA) (200 kA) (160 kA) (120 kA) (100 kA).
  - UL 1449 suppression voltage rating, voltage L-N, L-G, N-G: (208Y/120 V; 400 V) (480Y/277 V; 600 V).
- EMI/RFI Filtering: up to -30dB 100 kHz with insertion ratio of 50:1 using MIL-STD-220A methodology.
- Provide with one set of NO/NC dry contacts.
- Accessories:
  - Six-digit transient-counter set to total transient surges that deviate from the sine-wave envelope by more than 125 V.

### **Shipping Splits**

Switchboards shall be separated into shipping blocks. Each switchboard section shall be capable of being handled individually with the use of removable lifting bars (where practical) or rollers, and shall be clearly labeled with proper handling procedures.

### Features



EUSERC UCT,  
Single Main Circuit Breaker  
with I-Line Distribution Panel



EUSERC UCT,  
Fusible Multiple Mains

- Ready-to-Install merchandise offering, available from an authorized Schneider Electric distributor or warehouse stock. Some sections are factory assembled only.
- Hot sequence utility compartment per EUSERC requirements
- Suitable for use as service entrance equipment, in either circuit breaker or fusible designs
- UL Listed
- Mains rating 400, 600, or 800A
- Voltage: 120/240, 208Y/120, 240/120, or 480Y/277 Vac
- Systems: 1Ø3W or 3Ø4W
- Maximum SCCR 200 kA fusible, 65 kA circuit breaker
- NEMA Type 1 or Type 3R enclosures
- Full height add-on or stand-alone distribution section
- Distribution interiors in either NQ lighting (240 Vac) or I-Line power (480 Vac) platforms
- Accessories include:
  - Underground pull sections
  - Loadside wireway
  - Bus links for donut-type current transformers
  - Double padlock hasp attachments
  - I-Line plug-on distribution panel for QO circuit breakers
  - Sub-feed circuit breakers from 100 to 225 A

Speed-D service section switchboards are Schneider Electric's quick delivery, merchandised, low-voltage switchboard offer. Speed-D provides a compact design by combining a EUSERC utility CT compartment, a single main circuit breaker or main fusible disconnect, and a distribution panelboard all in one section. A EUSERC utility CT compartment with fusible multiple mains is also available for six disconnect applications.

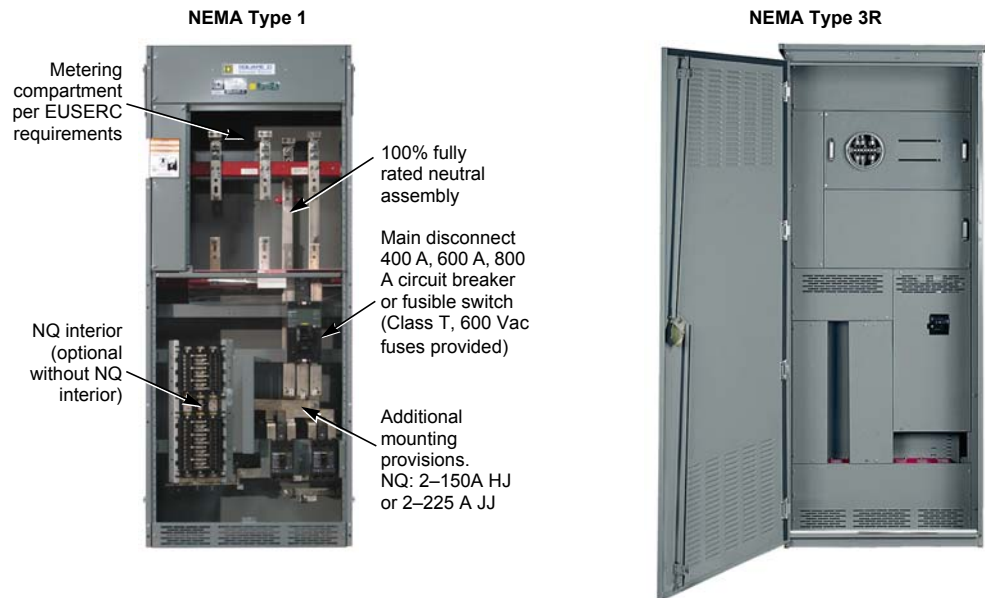
## Structures

Speed-D switchboard enclosures are totally enclosed and front accessible with an ANSI 49 gray, baked-enamel finish. Dimensions are:

- 90 in. H x 14 in. D x 36 in. W for indoor (NEMA Type 1) enclosures
- 90 in. H x 24.5 in. D x 36 in. W for outdoor (NEMA Type 3R) enclosures

Underground pull sections, with and without lug landing, are designed to mount interchangeably on either side of the service section.

Loadside wireway is available for indoor applications to help reduce installation time by providing additional access for top exit of loadside cables.



## Bussing

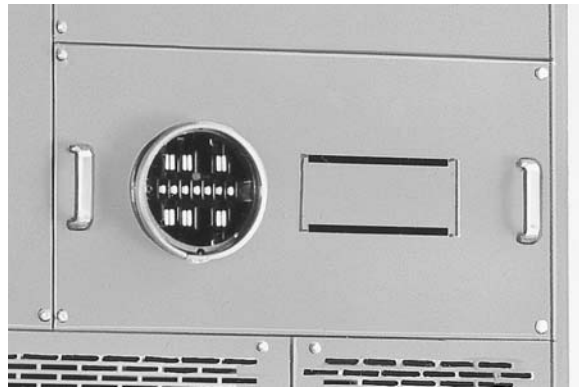
The main circuit breaker version of the Speed-D switchboard comes standard with all copper bus. The main fusible disconnect version comes standard with aluminum/copper bus.

## Metering

Incoming cable lugs are for top feed with one two-barrel #2-600 kcmil lug per phase and neutral, suitable for aluminum or copper cables. An optional single barrel 3/0-750 kcmil lug is available.

Utility metering compartments have provisions for either two, 15-inch blank meter doors or one, 30-inch blank meter door. A 15-inch meter door can accommodate one meter socket and test block. A 30-inch high door can accommodate two meter sockets and test blocks. Meter sockets can be 6-, 8-, 13-, or 15-jaw ringless type, with test block, based on application.





Typical 15-inch meter door with socket and test block provisions.

## Mains

Main circuit breaker types are either LH or MJ. The main fusible device uses a PJ molded case switch and is supplied with Class T fuses. Multiple main or group-mounted fusible devices use QMB/QMJ plug-on fusible switches. Speed-D switchboards can also be ordered as main circuit breaker or main fusible switch without a distribution panel.

## Distribution Panel and Branches

Speed-D switchboards offer provisions for either an NQ distribution lighting panelboard or an I-Line power panelboard.

- NQ panelboard bus is rated 400 A and provides mounting space for QO™/QOB Type (150 A maximum) circuit breakers. The panel interior provides space for mounting 42 single-pole circuit breakers. One or two individually mounted 225 A maximum circuit breakers can be added with bus connectors.
- I-Line distribution bus is rated 400 A, 600 A, or 800 A and will accept 27 inches of I-Line circuit breakers on the left side with a maximum J or K frame size. The right side will accept either a QO plug-on distribution panel (240 V only) or a LA or LH I-Line circuit breaker.

## Layout Instructions

All dimensions and arrangements shown in this manual are for estimating purposes only and may change without notice due to changes in equipment design. The most current PAD drawings are available by visiting the Speed-D product page on [www.schneider-electric.us](http://www.schneider-electric.us).

For available utility meter door configurations, see page 50. For quick layout and conduit drawings, see page 51.

Information on available series ratings can be found on page 52.

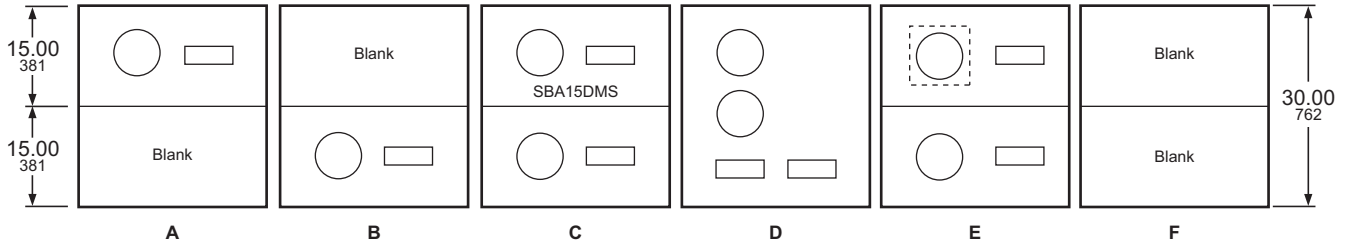
## Ordering Information

Please refer to the Switchboards and Switchgear section of the Schneider Electric Digest for ordering instructions and a complete list of available catalog numbers and pricing. For questions or assistance in product selection, contact your local authorized Schneider Electric distributor or sales representative.

# Speed-D Switchboards

## Technical Information

## Utility Meter Door Configuration

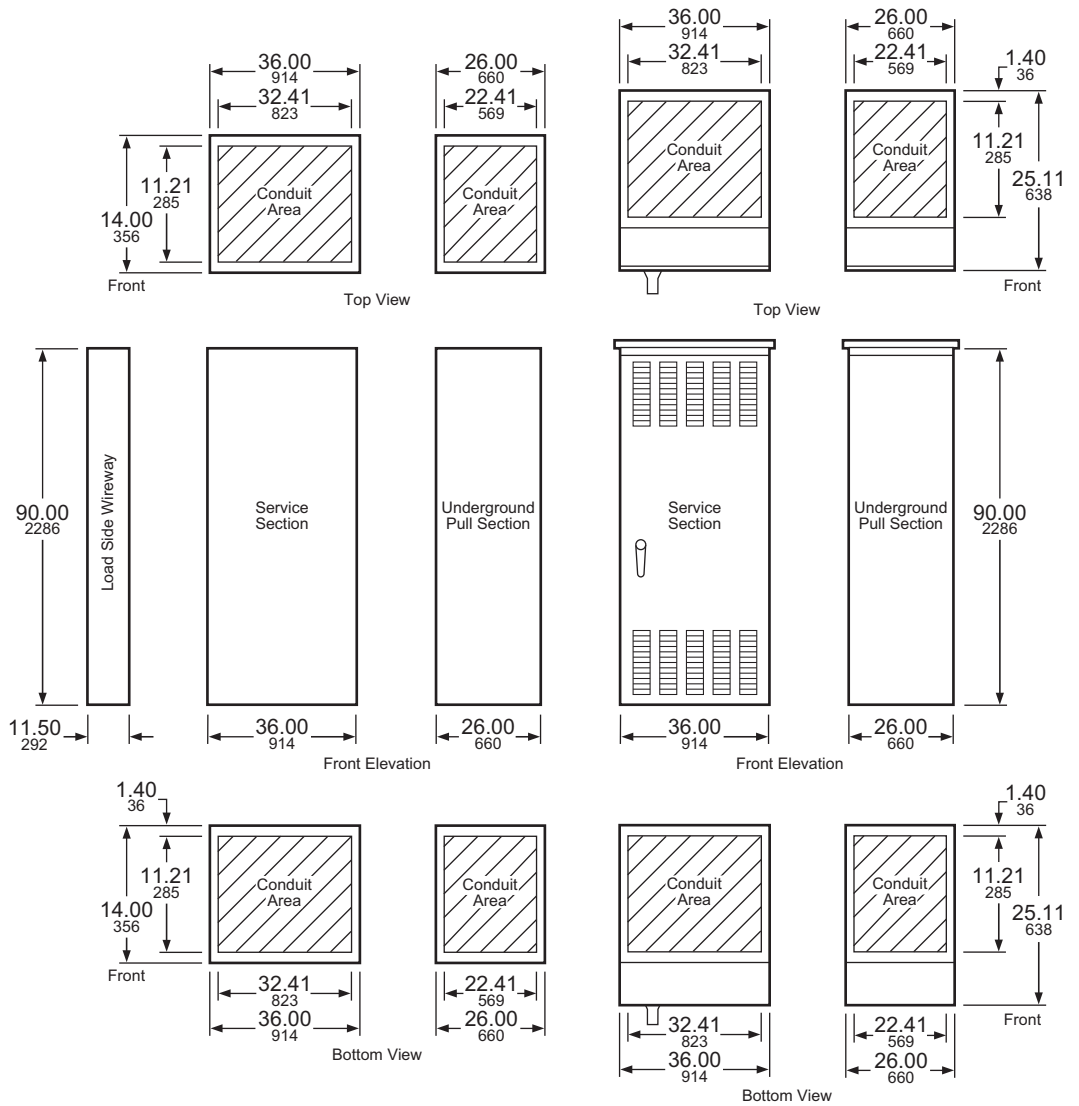


EUSERC Utilities	Meter Door(s)									Socket Jaw Quantity				
	120/240 V 1Ø3W	208Y/120 V 3Ø4W			240/120 V 3Ø4W			480Y/277V 3Ø4W			120/240 V 1Ø3W	208Y/120 V 3Ø4W	240/120 V 3Ø4W	480Y/277 V 3Ø4W
		400 A	600 A	800 A	400 A	600 A	800 A	400 A	600 A	800 A				
Anaheim, CA, City of	B	B	B	B	B	B	B	B	B	B	6	13	13	13
Arizona Public Service	B	B	B	B	B	B	B	B	B	B	6	13	13	13
Burbank, CA, City of	B	B	B	B	B	B	B	B	B	B	4	13	13	13
Clark County PUD	B	B	B	B	B	B	B	B	B	B	6	13	13	13
Glendale, CA, City of	B	B	B	B	N/A	N/A	N/A	B	B	B	5	15	N/A	15
Hawaii Electric Light Company	B	B	B	B	B	B	B	B	B	B	8	13	13	13
Hawaiian Electric Company	B	B	B	B	N/A	N/A	N/A	B	B	B	8	13	N/A	13
Imperial Irrigation District	N/A	B	B	B	B	B	B	B	B	B	N/A	15	15	13
Intermountain Rural Electric Assn.	B	B	B	B	B	B	B	B	B	B	8	15	15	13
Lodi, CA, City of	B	B	B	B	B	B	D	B	D	D	6	15	15	15
Los Angeles, DWP	B	B	B	B	B	B	B	B	B	B	6	13/15	13/15	13/15
Maui Electric Company Ltd	B	B	B	B	N/A	N/A	N/A	B	B	B	8	13	N/A	13
Modesto Irrigation District	B	B	B	B	B	B	B	B	B	B	N/A	13	13	13
Nevada Power Company	B	B	B	B	B	B	B	B	B	B	6	13	13	13
PacifiCorp	NEMA 1	B	B	B	B	B	B	B	B	B	N/A	N/A	N/A	N/A
	NEMA 3R	C	C	C	C	C	C	C	C	C	6	13	13	13
Pacific Gas & Electric	Standard	B	B	B	B	B	B	B	D	D	6	15	15	15
	Below	B	B	B	B	B	B	B	D	D	6	15	15	15
Palo Alto, CA, City of	N/A	B	B	B	B	B	B	B	B	B	N/A	13	13	13
Pasadena, CA, City of	B	B	B	B	N/A	N/A	N/A	B	B	B	5	13	N/A	13
Portland General Electric	NEMA 1	F	F	F	F	F	F	F	F	F	N/A	N/A	N/A	N/A
	NEMA 3R	B	B	B	B	B	B	B	B	B	6	13	13	13
Puget Sound P&L	NEMA 1	F	F	F	F	F	F	F	F	F	N/A	N/A	N/A	N/A
	NEMA 3R	B	B	B	B	B	B	B	B	B	6	13	13	13
Redding, CA, City of	C	C	C	C	C	C	C	C	C	C	13	13	13	13
Riverside, CA, City of	A	A	A	A	A	A	A	A	A	A	6	13	13	13
Roseville, CA, City of	B	B	B	B	B	B	B	B	D	D	6	13	13	13
Sacramento Municipal Utility	B	B	B	B	B	B	B	B	D	D	6	13	13	13
Salt River Project	B	B	B	B	B	B	B	B	B	B	6	13	13	13
San Diego Gas & Electric	A	A	A	A	A	A	A	A	A	A	6	15	15	15
Silicon Valley Power	B	B	B	B	B	B	B	B	B	B	6	13	13	13
Seattle City Light	B	B	B	B	B	B	B	B	B	B	6	13	13	13
Sierra Pacific Power Company	B	B	B	B	B	B	B	B	B	B	6	15	13	13
Snohomish County PUD	NEMA 1	F	F	F	F	F	F	F	F	F	N/A	N/A	N/A	N/A
	NEMA 3R	B	B	B	B	B	B	B	B	B	6	13	13	13
Southern California Edison	B	B	B	D	B	D	D	D	D	D	5	15	15	15
Tacoma, WA, City of	NEMA 1	F	F	F	F	F	F	F	F	F	N/A	N/A	N/A	N/A
	NEMA 3R	B	B	B	B	B	B	B	B	B	6	13	13	13
Tucson Electric Power Company	NEMA 1	F	F	F	F	F	F	F	F	F	N/A	N/A	N/A	N/A
	NEMA 3R	B	B	B	B	B	B	B	B	B	6	13	8	13
Turlock Irrigation District	B	B	B	B	B	B	B	B	B	B	6	13	13	13

Conduit Area Information

NEMA Type 1

NEMA Type 3R



**Speed-D Service Section Switchboards**

The main or distribution device within these switchboards, up to 200 kA, will be the remote line side main for the series combination. Additional ratings are shown in the following tables for circuit breakers located within the service section.

**Type SB Service Section Switchboards: Main Circuit Breaker with I-Line or NQ Distribution**

Maximum System Voltage (Vac)	Maximum SCCR	Line Side Circuit Breaker	Maximum Amperes (A)	Load Side		
				Circuit Breaker	Amperes (A)	Poles
120	42 kA	LH	400	FY	15–20	1
		MJ	600	FH	15–25	2,3
208Y/120	65 kA	MJ	800	QD	70–225	2,3
240	42 kA	LH	400	Q2-H	100–225	2
				Q4	250–400	2
		MJ	600	HD	15–150	2,3
				JD	175–225	2,3
	65 kA	LH	400	QD	70–225	2
				MJ	600	QD
		MJ	800	QD	70–225	2,3
				HD	15–150	2,3
480	30 kA	MJ	800	FH	30–100	2,3
	42 kA				15–25	2,3

**Type SF Service Section Switchboards: Fusible Main with I-Line or NQ Distribution**

Maximum System Voltage (Vac)	Maximum SCCR	Line Side Class T Fuse <sup>^</sup> Maximum Current Rating (A)	Load Side			
			Circuit Breaker	Amperes (A)	Poles	
120/240	42 kA	400	QO-VH	15–30	1	
208Y/120	100 kA	600	QD	70–225	2,3	
240	42 kA	400	QO-VH	15–100	2,3	
			Q4	250–400	2	
		800	FA	15–100	1,2,3	
			Q4	250–400	2,3	
	65 kA	800	QD	70–225	2,3	
			400	HD	15–150	1,2
		HG		15–150	1,2	
		JD		150–250	1,2	
		JG		150–250	1,2	
		100 kA	800	QD	70–225	2,3
400	LA, LH			125–400	2,3	
	480		100 kA	400	HD	15–150
HG					15–150	1,3
JD		150–250			1,3	
JG		150–250			1,3	

<sup>^</sup> 600 V.

### Seismically Qualified Switchboards

Power-Style low voltage switchboards have been seismically qualified to meet the seismic provisions of the International Building Code (IBC), California Building Code (CBC), Office of Statewide Health Planning and Development (OSHPD), and ASCE/SEI 7 based on triaxial shake table testing following the code recognized test protocol ICC ES AC156. An independent test facility conducted all qualification shake table testing to verify compliance to an  $I_p = 1.5$  by verifying post test equipment functionality as required by ASCE 7 for equipment which is part of a seismic designated system.

The shake table earthquake simulation subjected the Power-Style switchboard test specimens to dynamic demands which can be more severe than the code design earthquake for most locations. A certificate of self certification is available on request from your local Schneider Electric representative. The certificate is based on site specific code defined seismic demand requirements for the installed location information supplied to Schneider Electric.

The qualified Power-Style switchboard equipment must be installed, anchored, and restrained in accordance with Schneider Electric installation guidelines (see factory supplied drawings and current instruction manual for additional technical information) and the engineer of record. Anchorage of equipment to the primary building structure is required to validate seismic certification of the equipment. The structural engineer or design engineer of record is responsible for design of the code compliant seismic restraint system for the building equipment. Schneider Electric is not responsible for the specification and performance of seismic restraint and anchorage systems.

### Manufacturer's Certification

As long as the seismic capacity of the equipment exceeds the site-specific demand, a certificate can be generated and issued.

Schneider Electric ensures that code compliance verification is as simple as supplying the job site address. Our certificate clearly states the code requirement and our equipment capability.

This simplicity eliminates the need for the design professional to translate code criteria into an equipment requirement, and then sort out less-than-clear manufacturers' test results to verify compliance to the site-specific code requirement of the project.

For sample certificate and compliance notes, see pages 54 and 55. Contact your local Schneider Electric representative to obtain a seismic certificate.

**Switchboards**

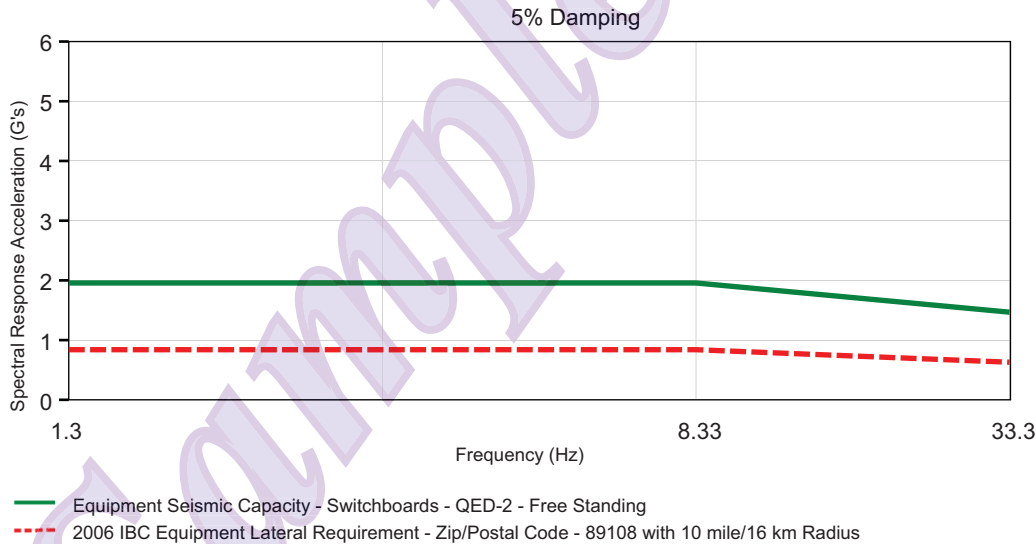
The Schneider Electric equipment referenced in this certificate has been qualified to the site-specific requirements of the listed model building code and/or standard. This certification is based on tri-axial shake table test results conducted in accordance with the AC156 test protocol<sup>3</sup> (Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components):

**International Building Code (IBC), 2006 ICC Edition**

**Product Platform:** Switchboards  
**Product Description:** QED-2  
**Product Type:** Free Standing

Site-Specific Location <sup>1</sup> :	Zip/Postal Code - 89108 with 10 mile/16 km Radius
Code Requirement <sup>2</sup> :	$F_P / W_P = 0.84 \text{ G's}$ , ( $S_{DS} = 0.52$ )
Equipment Capacity <sup>3</sup> :	$F_P / W_P = 1.96 \text{ G's}$ , ( $S_{DS} = 1.22$ )
Importance Factor <sup>4</sup> :	$I_P = 1.5$
Installation Restrictions <sup>5</sup> :	None - Ground level or roof level installations permitted

Plot of Tested Equipment vs. Code Acceleration Demand



## Switchboards

### Compliance Notes

1. The site-specific location is defined as the final geographic location of equipment installation. The seismic certification contained herein is valid for equipment installations located within the following US region, state(s), or geographic coordinate: Zip/Postal Code - 89108 With 10 mile/16 km Radius - Lat/Lon (36.211690,-115.220219). For the purpose of this document, the location is defined as a circle centered at the latitude and longitude with the radius indicated.
2. By reference to ASCE 7-05, the 2006 IBC specifies seismic demand requirements for nonstructural equipment in terms of a lateral force coefficient,  $F_p / W_p$ . The lateral force coefficient is defined in terms of a site-specific ground spectral acceleration factor,  $S_{DS}$ , which varies with geographic location and is adjusted for geotechnical site class effects per Chapter 11 of ASCE 7-05. The lateral force coefficient is also defined in terms of the component amplification factor,  $a_p$ , and a maximum value of two-and-a-half ( $a_p = 2.5$ ) is assumed. The maximum  $S_{DS}$  value for Site Class D (code default site class) was determined using the USGS ground motion data, as required by ASCE 7-05, for the specified location(s) and is used as the 2006 IBC requirement for this seismic certification.
3. Equipment capacity was determined from tri-axial seismic shake table test results as defined in the International Code Council (ICC) Acceptance Criteria for Seismic Qualification by Shake-Testing of Nonstructural Components and Systems (AC156). Per Section 13.2.5 of ASCE 7-05, seismic qualification by testing based upon a nationally recognized testing standard procedure, such as ICC ES AC156, shall be deemed to satisfy the design and evaluation requirements provided that the tested seismic capacity equals or exceeds the seismic demands determined in accordance with Sections 13.3.1 and 13.2.2.
4. An equipment importance factor of 1.5 ( $I_p = 1.5$ ) indicates that equipment functionality was verified before and after seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority.
5. Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system. Anchorage of equipment to the primary building structure is required to validate this seismic certification. The structural engineer or design engineer of record is responsible for detailing the equipment anchorage requirements for the given installation. The installer and manufacturers of the anchorage system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of anchorage systems.

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This document is typical of the seismic certifications available for the referenced product and standards. Actual performance may be configuration dependent. Certificates must be signed and numbered to be valid for construction. Contact your local Schneider Electric representative for additional information or to obtain actual seismic certificates.

**Methodology and Intended Use**

Short-circuit currents are calculated by dividing the secondary full load current of the transformer, based on the self-cooled kVA rating, by the arithmetic sum of the transformer and primary system per unit impedances (assumes transformer X/R identical to primary system X/R). Vectorial addition of per unit impedances produces slightly higher short-circuit currents.

Motor contribution adds to the available short-circuit current. Motor contribution is based on four times the motor full load current (assumes average motor impedance of 25%). Connected motor load is assumed to be 50% at 208 V or 100% for 240 V and above based on the full load amperes of the transformer.

Short-circuit values are based on the percent impedance (%Z) shown. Per NEMA and ANSI standards, actual %Z can vary +/-7.5% due to manufacturing tolerances for transformers shown with 5.75 %Z (2.0 %Z and 4.5 %Z are minimum values). If desired, account for the minimum tolerance by multiplying the XFRMR (Transformer) Alone short-circuit values in the table by 1.081 if the %Z is 5.75%. Motor contribution can be added using the previously mentioned methodology.

Due to transformer design differences, %Z can vary for different types of transformers of the same kVA rating.

Short-circuit currents in the table apply when system power factor is greater than the tested value (X/R is less than the tested value) for the type equipment involved.

**Test pf and X/R Ratio**

Short-circuit currents in the table are given in RMS symmetrical amperes. For a system X/R ratio greater than the test X/R ratio of the overcurrent device in question, the available fault current equivalent RMS symmetrical duty for comparison must be adjusted by a multiplying factor greater than 1.0. The fault current will increase.

See IEEE Std. 242-2001 (Buff Book) and IEEE Std. 1015-1997 (Blue Book) for details.

Device Type	Test pf	Test X/R
UL Molded Case Circuit Breaker Interrupting Rating		
Greater than 20 kA	20%	4.899
Greater than 10 kA to 20 kA	30%	3.179
10 kA and less	50%	1.732
ANSI Power Circuit Breaker, Fused	20%	4.899
ANSI Power Circuit Breaker, Unfused	15%	6.591



Secondary Full Load and Short Circuit Currents

Transformer 3Φ kVA (%Z)	Available Primary Short Circuit kVA	Secondary Distribution Voltage—3 Phase											
		208		240		480		600					
		Full Load Amps	Short Circuit RMS Sym. Amps		Full Load Amps	Short Circuit RMS Sym. Amps		Full Load Amps	Short Circuit RMS Sym. Amps		Full Load Amps	Short Circuit RMS Sym. Amps	
			XFRMR Alone	Plus 50% Motor Load		XFRMR Alone	Plus 100% Motor Load		XFRMR Alone	Plus 100% Motor Load		XFRMR Alone	Plus 100% Motor Load
225 (2%)	50,000	625	25,491	26,740	542	22,092	24,258	271	11,046	12,129	217	8,837	9,703
	100,000		28,069	29,318		24,327	26,492		12,163	13,246		9,731	10,597
	150,000		29,048	30,297		25,175	27,340		12,588	13,670		10,070	10,936
	250,000		29,882	31,131		25,898	28,063		12,949	14,031		10,359	11,225
	500,000		30,540	31,789		26,468	28,633		13,234	14,316		10,587	11,453
Unlimited	31,227	32,476	27,063	29,228	13,532	14,614	10,825	11,691					
300 (4.5%)	50,000	833	16,328	17,993	722	14,151	17,037	361	7,075	8,519	289	5,660	6,815
	100,000		17,348	19,014		15,035	17,922		7,518	8,961		6,014	7,169
	150,000		17,717	19,383		15,355	18,242		7,678	9,121		6,142	7,297
	250,000		18,024	19,690		15,621	18,508		7,810	9,254		6,248	7,403
	500,000		18,261	19,927		15,826	18,713		7,913	9,357		6,331	7,485
Unlimited	18,505	20,170	16,038	18,924	8,019	9,462	6,415	7,570					
500 (4.5%)	50,000	1388	25,234	28,010	1203	21,869	26,681	602	10,935	13,340	482	8,748	10,672
	100,000		27,757	30,533		24,056	28,868		12,028	14,434		9,623	11,547
	150,000		28,714	31,490		24,886	29,697		12,443	14,849		9,954	11,879
	250,000		29,529	32,305		25,592	30,403		12,796	15,202		10,237	12,161
	500,000		30,171	32,947		26,148	30,959		13,074	15,480		10,459	12,384
Unlimited	30,841	33,617	26,729	31,540	13,365	15,770	10,692	12,616					
750 (5.75%)	50,000	2082	28,714	32,878	1805	24,886	32,103	903	12,443	16,051	722	9,954	12,841
	100,000		32,028	36,191		27,757	34,974		13,879	17,487		11,103	13,990
	150,000		33,309	37,472		28,868	36,084		14,434	18,042		11,547	14,434
	250,000		34,410	38,573		29,822	37,039		14,911	18,519		11,929	14,815
	500,000		35,285	39,448		30,580	37,797		15,290	18,898		12,232	15,119
Unlimited	36,205	40,369	31,378	38,595	15,689	19,297	12,551	15,438					
1,000 (5.75%)	50,000	2776	35,816	41,367	2406	31,040	40,663	1203	15,520	20,331	963	12,416	16,265
	100,000		41,122	46,673		35,639	45,261		17,819	22,631		14,256	18,105
	150,000		43,258	48,809		37,490	47,113		18,745	23,556		14,996	18,845
	250,000		45,134	50,685		39,116	48,738		19,558	24,369		15,646	19,495
	500,000		46,651	52,202		40,431	50,053		20,215	25,027		16,172	20,021
Unlimited	48,273	53,825	41,837	51,459	20,918	25,730	16,735	20,584					
1,500 (5.75%)	50,000	4164	47,584	55,911	3609	41,239	55,673	1805	20,620	27,837	1444	16,496	22,269
	100,000		57,429	65,756		49,772	64,205		24,886	32,103		19,909	25,682
	150,000		61,683	70,010		53,458	67,892		26,729	33,946		21,383	27,157
	250,000		65,568	73,895		56,826	71,260		28,413	35,630		22,730	28,504
	500,000		68,820	77,147		59,644	74,077		29,822	37,039		23,857	29,631
Unlimited	72,410	80,737	62,755	77,189	31,378	38,595	25,102	30,876					
2,000 (5.75%)	50,000	5552	56,938	68,041	4812	49,346	68,591	2406	24,673	34,296	1925	19,738	27,436
	100,000		71,632	82,734		62,081	81,326		31,040	40,663		24,832	32,530
	150,000		78,373	89,476		67,924	87,169		33,962	43,584		27,169	34,867
	250,000		84,755	95,858		73,454	92,699		36,727	46,350		29,382	37,080
	500,000		90,267	101,370		78,232	97,477		39,116	48,738		31,293	38,991
Unlimited	96,547	107,650	83,674	102,919	41,837	51,459	33,470	41,168					
2,500 (5.75%)	50,000	6940	64,552	78,430	6015	55,945	80,001	3008	27,972	40,001	2406	22,378	32,000
	100,000		84,113	97,991		72,898	96,954		36,449	48,477		29,159	38,782
	150,000		93,564	107,442		81,089	105,145		40,544	52,572		32,435	42,058
	250,000		102,805	116,683		89,097	113,154		44,549	56,577		35,639	45,261
	500,000		111,029	124,908		96,225	120,281		48,113	60,141		38,490	48,113
Unlimited	120,684	134,562	104,592	128,649	52,296	64,324	41,837	51,459					
3,000 (5.75%)	50,000	8328	70,870	87,524	7217	61,420	90,288	3609	30,710	45,144	2887	24,568	36,115
	100,000		95,168	111,822		82,479	111,346		41,239	55,673		32,991	44,538
	150,000		107,447	124,102		93,121	121,989		46,561	60,994		37,248	48,795
	250,000		119,815	136,470		103,840	132,707		51,920	66,354		41,536	53,083
	500,000		131,136	147,791		113,652	142,519		56,826	71,260		45,461	57,008
Unlimited	144,820	161,475	125,511	154,378	62,755	77,189	50,204	61,751					
3750 (5.75%)	50,000	10409	78,558	99,376	9022	68,084	104,168	4511	34,042	52,084	3609	27,234	41,667
	100,000		109,568	130,386		94,959	131,043		47,479	65,522		37,984	52,417
	150,000		126,169	146,987		109,347	145,431		54,673	72,716		43,739	58,172
	250,000		143,572	164,390		124,429	160,513		62,214	80,257		49,772	64,205
	500,000		160,138	180,956		138,786	174,871		69,393	87,435		55,514	69,948
Unlimited	181,025	201,843	156,889	192,973	78,444	96,487	62,755	77,189					
5,000 (5.75%)	50,000	—	88,118	115,875	—	76,369	124,482	—	38,185	62,241	—	30,548	49,793
	100,000		129,103	156,861		111,890	160,002		55,945	80,001		44,756	64,001
	150,000		152,792	180,549		132,420	180,532		66,210	90,266		52,968	72,213
	250,000		179,079	206,836		155,202	203,314		77,601	101,657		62,081	81,326
	500,000		205,609	233,366		178,195	226,307		89,097	113,154		71,278	90,523
Unlimited	241,367	269,124	209,185	257,297	104,592	128,649	83,674	102,919					





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