

# PowerPact® Circuit Breakers for Control Panel Disconnects

## Class 0611

Retain for future use.

### Introduction

The electrical power system in most facilities usually requires limited maintenance or adjustment. In contrast, industrial control panels are routinely accessed to adjust automation and/or control components and therefore have unique safety and operating requirements for disconnecting from the power circuit. As the primary link between a facilities's electrical power system and the control/automation equipment, the control panel disconnect must provide reliable operation and meet system performance requirements. In addition, control panel builders are often faced with quick turn around times, ever changing specifications, and last-minute alterations.

The PowerPact® Molded Case Circuit Breaker offer has been designed to meet the required flexibility and high performance demanded of the panel disconnect. With certifications covering US and International markets, performance ratings unmatched in the industry, a variety of operating mechanisms, termination possibilities, and field installable accessories the PowerPact Molded Case Circuit Breaker is the optimum choice for control panel disconnect applications.

### Certifications

PowerPact Molded Case Circuit Breakers are recognized globally for performance, quality, reliability, and safety. Certified to US and International standards the PowerPact family of molded case circuit breakers can be used in applications around the world. Certifications include, but are not limited to UL, IEC, CSA, NOM, and the CE mark.

For information on standards compliance that are not listed see the respective product catalog or contact 1-888-SquareD. Circuit breakers should be applied according to the National Electric Code and other applicable local wiring codes.

### Performance Ratings

**Table 1: UL 489 Interrupting Rating System**

	D	G	J	L
<b>Vac (Delta)</b>				
240 Vac	25 kA	65 kA	100 kA	125 kA
480 Vac	18 kA	35 kA	65 kA	100 kA
600 Vac	14 kA	18 kA	25 kA	50 kA <sup>1</sup>
<b>Frame (■ = available)</b>				
H-frame (15–150 A)	■	■	■	■
J-frame (150–250 A)	■	■	■	■
D-frame <sup>1</sup> (150–600 A)	—	■	■	■ <sup>1</sup>
M-frame (300–800 A)	—	■	■	—
P-frame <sup>1, 2</sup> (100–1200 A)	—	■	■	■ <sup>1</sup>

<sup>1</sup> D-frame and P-frame rating = 25 kA for 600 Vac

<sup>2</sup> P-frame is also available in a 50 kA, K-interrupting level at 600 Vac.

PowerPact Molded Case Circuit Breakers are available in a variety of voltage, ampacity, and interruption ratings to meet many applications. The PowerPact range covers panel applications from 240 V through 600 V with ampacities from 15 A to 1,200 A and interruption ratings as high as 125 kA at 240 V and 100 kA at 480 V.

Circuit breakers are available as standard 80% rated devices and 100% rated devices to meet your requirements. *For more information on applying 80% and 100% rated devices see data bulletin 0600DB0702.*

To simplify the selection process, all PowerPact circuit breaker interruption ratings follow a simple code based on the 2nd letter (D, G, J, or L) of the catalog number. Each letter designates a specific interruption rating, at a specific voltage, for the entire range of PowerPact Molded Case Circuit Breakers. Refer to Table 1 for these ratings.

## Common Frame Sizes

**Table 2: Dimensions (3-pole Unit Mount)**

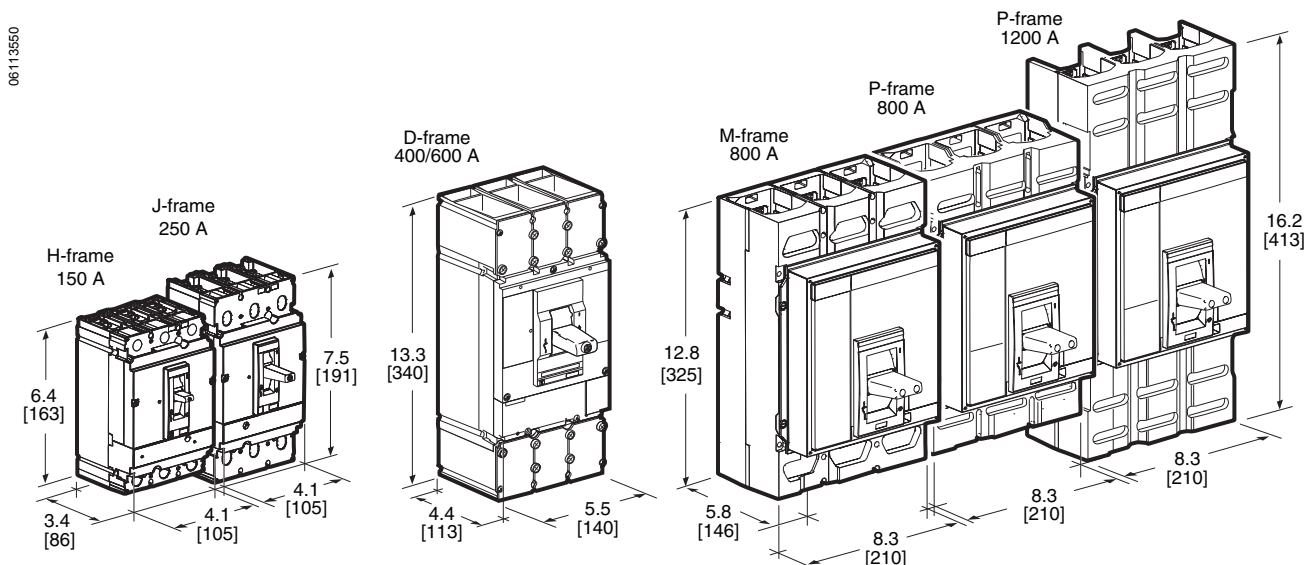
Dim.	H-frame		J-frame		D-frame		M-frame		P-frame	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
H	6.4	163	7.5	191	13.3	340	12.8	325	16.2	413
W	4.1	105	4.1	105	5.5	140	8.3	210	8.3	210
D	3.4	86	3.4	86	4.4	113	5.8	146	5.8	146

PowerPact® Molded Case Circuit Breakers are designed around three common frame sizes. Each frame size has common mounting hole configurations, handle operators, trim features, and actuator position.

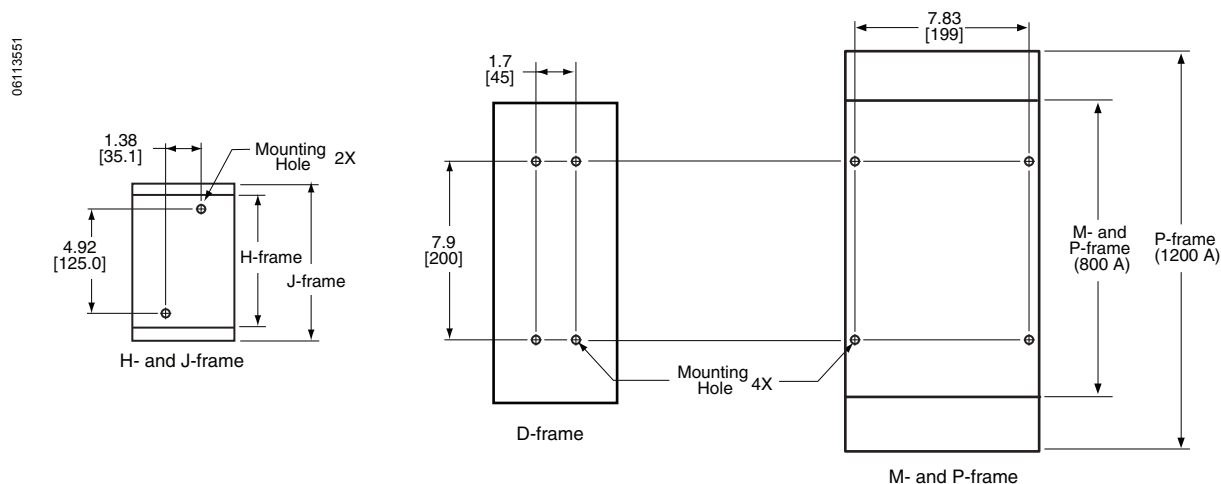
The use of common frame sizes reduces the number of main disconnect configurations needed to meet a variety of end-user applications. This provides the ability to standardize panel designs around three broad ranges of main disconnect ampacity requirements thereby reducing engineering design time and inventory costs. Regardless of the interruption ratings required, the size and mounting of the circuit breaker is determined by the ampacity frame size. This eliminates the confusion and spacing challenges typically presented when applications call for high interruption ratings that were not anticipated.

The PowerPact H-frame (150 A) and PowerPact J-frame (250 A) circuit breakers consolidate panel designs for 15 A to 250 A applications. The PowerPact D-frame circuit breaker is designed for applications from 150 A to 600 A. The PowerPact M-frame (800 A) and PowerPact P-frame (1200 A) circuit breakers combine to meet 300 A to 1200 A requirements.

**Figure 1: Common Frame Sizes**



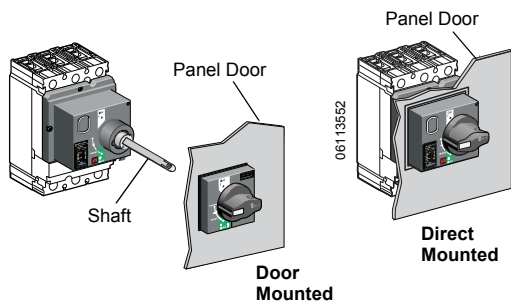
**Figure 2: Common Mounting Holes**



## Operating Mechanisms

PowerPact® Molded Case Circuit Breakers are complemented by a broad offering of operating mechanisms and ratings specifically designed to be used as the main panel disconnect for control panel applications. Three basic designs minimize the selection process and easily cover the PowerPact Molded Case Circuit Breaker offer from 15 A to 1200 A. Available styles include an IEC rotary operating handle, a NEMA style rotary handle, and a flange mounted operating handle.

### IEC Style Rotary Operating Handles



IEC style rotary operating handles are designed for door mounted or direct mounted applications. The handle operators maintain suitability for isolation and can be locked in the off position by the use of a padlock meeting Lockout/Tagout requirements. When interconnected to the circuit breaker the handle provides visible indication of on, tripped and off status. Each model is available with a black handle or a red handle on a yellow bezel to distinguish between distribution power and machine control when required.

Door Mounted operators utilize a shaft that interlinks the handle operator to the circuit breaker for applications requiring variable depth adjustments between the circuit breaker and the panel door. The handle mechanisms can be used on NEMA 1, 3R, and 12 enclosures.

Direct Mounted operators are designed to connect directly to the front of the circuit breaker. The operator cover may be positioned to extend through a panel cut out if required. Features of these handle operators are outlined in Table 3.

**Table 3: IEC Style Handle Operator Features<sup>1</sup>**

Feature	Door Mounted	Direct Mounted (to circuit breaker)
Handle Padlock	The rotary handle may be locked in the OFF position with up to three padlocks.	
Standard Configuration	The panel door may only be opened with the circuit breaker in the OFF position.	The panel door may be opened in either the ON or OFF position.
Door Interlock	The standard configuration allows the panel door to be opened only in the OFF position. The handle may be easily reconfigured to allow the panel door to be opened in either the ON or OFF position.	The standard configuration allows the panel door to be opened in either the ON or OFF position. The door interlock feature may be engaged by loosening a screw inside the handle. This will require the circuit breaker to be in the OFF position before the panel door may be opened.
Open Door Interlock	Not available	To ensure that the circuit breaker may not be energized with the panel door open, the open door interlock may be utilized. This feature is built into the direct mount handle and is engaged by loosening a different screw inside the mechanism. This will ensure that the circuit breaker may only be turned ON with the panel door closed.
Bypass Feature	A discrete bypass button is also provided in both types of handles allowing the panel door to be opened with the circuit breaker in the ON position.	

<sup>1</sup> HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH. When bypass button is used, apply appropriate personal protective equipment (PPE). Electrical equipment should only be serviced and maintained by qualified electrical personnel following applicable standards such as NFPA 70E. Failure to follow these instructions will result in death or serious injury.

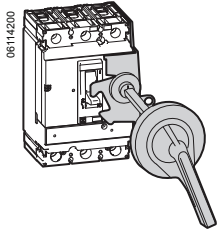
**Table 4: Handle Operators (Complete Kits)**

Operator Style	NEMA Ratings	Operator Type	Advantages	Versions Available	Circuit Breakers	Mounting Depth	Part Number
	3R, 12	Door Mounted Rotary Handle	Small operator with similar look and operation to other control components	Direct Mount (black)	H and J	7.5–24 in. (19.1–61 cm)	S29337 <sup>1</sup>
				Extended Door Mount (black)			S29338 <sup>1</sup>
	Telescoping (black)			S29343 <sup>1</sup>			
	Direct Mount (red)			S29339 <sup>1</sup>			
	Extended Door Mount (red)			S29340 <sup>1</sup>			
	Direct Mount (black)			32598 <sup>1</sup>			
	Direct Mount (red)			32600 <sup>1</sup>			
	Telescoping (black)			32603 <sup>1</sup>			
	Direct Mount (black)			D	8.2–23.8 in. (20.8–60.5 cm)	33878 <sup>2</sup>	
	Direct Mount (black)					P	

<sup>1</sup> IEC operating handle part numbers are for field-installable kits. Please reference catalogs for factory-installed kit numbers.

<sup>2</sup> P-frame IEC handle operators are factory installed only.

**NEMA Style Operating Mechanisms**



Class 9421 NEMA Door Mounted Rotary Operating Handles are designed for door mounted variable depth applications. Door mounted operators utilize a shaft that interlinks the handle operator to the circuit breaker when the panel door is in the closed position. The heavy duty, all-metal construction features on, off, and trip indication via handle position. The handle assembly can be used to lock the door in the closed position with up to three padlocks to meet Lockout/Tagout requirements. The mechanism is capable of locking in the off position independent of the handle operator. This is useful when the breaker must be locked in the off position when the panel door is open.

**Table 5: Component Parts for Door Mounted Mechanisms**

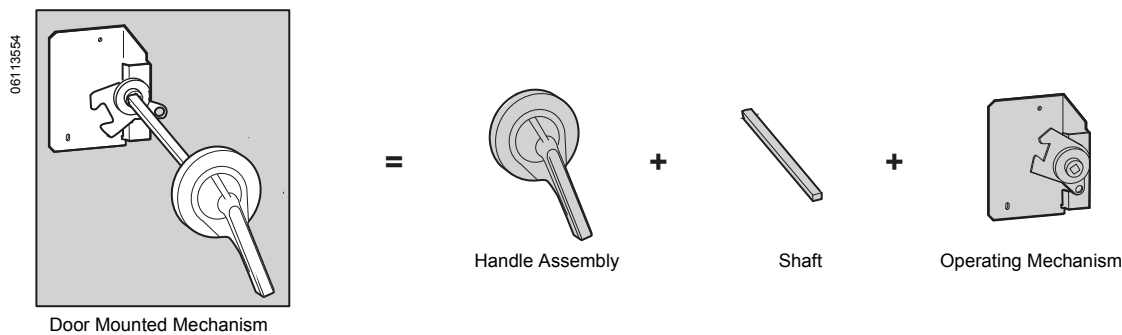
		Handle Assemblies			Standard Shaft (Support Bracket Not Required)			Long Shaft (Support Bracket Included)			Operating Mechanism <sup>1</sup>
		Type <sup>2</sup>	Frame	Part No.	Type	Mounting Depth <sup>3</sup> Min.–Max	Part No.	Type	Mounting Depth <sup>3</sup> Min.–Max	Part No.	Part No.
Standard	NEMA Type 3,4 (Painted)	6 in.	H & J	9421LH6	LS8	5.5–10.25 in. (14–26 cm)	9421LS8	LS10	5.5–21.38 in. (14–54.3 cm)	9421LS10	9421LJ7
			D			7.25–12.06 in. (18.4–30.6 cm)		LS13	7.25–22.63 in. (18.4–57.5 cm)		
		8 in.	M & P	9421LHP8		7.19–11.63 in. (18.3–29.5 cm)		LS10	7.19–22.25 in. (18.3–56.5 cm)		
	NEMA Type 3, 4, 4x (Chrome Painted)	6 in.	H & J	9421LC46	LS8	5.5–10.25 in. (14–26 cm)	9421LS8	LS10	5.5–21.38 in. (14–54.3 cm)	9421LS10	9421LJ7
			D			7.25–12.06 in. (18.4–30.6 cm)		LS13	7.25–22.63 in. (18.4–57.5 cm)		
		8 in.	M & P	9421LCP48		7.19–11.63 in. (18.3–29.5 cm)		LS10	7.19–22.25 in. (18.3–56.5 cm)		
Special 3-inch	NEMA Type 3,4 (Painted)	3 in.	H & J	9421LH3	LS8	5.5–10.25 in. (14–26 cm)	9421LS8	LS10	5.5–21.38 in. (14–54.3 cm)	9421LS10	9421LJ7
	NEMA Type 3, 4, 4x (Chrome Painted)			9421LC43							

<sup>1</sup> Operating mechanism includes lockout.

<sup>2</sup> 8-inch handle assemblies are available but not recommended for H-, J-, and D-frame.

<sup>3</sup> Mounting depth is measured from circuit breaker mounting surface (control panel) to outside of enclosure.

**Figure 3: Component Parts for Door Mounted Mechanisms**



Class 9422 flange mounted operating mechanisms are available in two distinct styles: variable depth or cable operated. The handle operating mechanisms have the capability of accepting 1 to 3 padlock attachments to meet Lockout/Tagout requirements to insure safety compliance. The bracket mounted operators remain connected to the circuit breaker at all times. The units are designed for installation flexibility for variable depth applications and are field convertible to meet both right and left flanged mounted requirements. Cable operated mechanisms provide maximum installation flexibility for tall and/or deep enclosures. Cables come with terminations already installed on both ends to save on installation time and are available in 36, 60, 84, and 120 inch lengths.

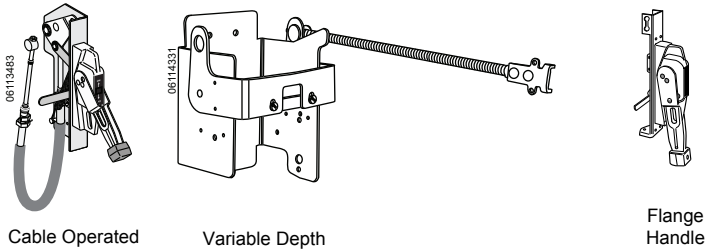
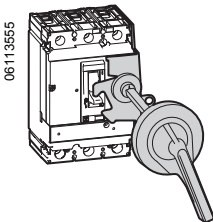
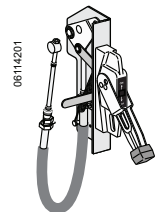
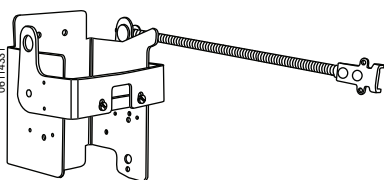



Table 6: Handle Operators (Complete Kits)

Operator Style	NEMA Ratings	Operator Type	Advantages	Versions Available	Circuit Breakers	Mounting Depth	Part Number					
 <p>NEMA Class 9421</p>	1, 3R, 12	Door Mounted Rotary Handle	Robust and cost effective solution for a door mounted disconnect	Complete kit with 6-in. (15.2 mm) handle <sup>1</sup>	H and J	(short shaft) 5.5–10.75 in. (14–27.3 cm)	9421LJ1					
	1, 3R, 12					(long shaft) 5.5–21.4 in. (14–54.3 cm)	9421LJ4					
	1, 3R, 12				(short shaft) 7.25–12.1 in. (18.4–30.7 cm)	9421LD1						
					D	(long shaft) 7.25–22.6 in. (18.4–57.4 cm)	9421LD4					
					M and P	(short shaft) 7.2–11.6 in. (18.3–29.5 cm)	9421LW1					
						(long shaft) 7.2–22.25 (18.3–56.5 cm)	9421LW4					
 <p>NEMA Class 9422</p>	1, 3, 3R, 4, 4X	Cable Operated	Ideal for tall, deep enclosures where placement flexibility is required	Operating mechanism only, handle ordered separately	H and J	cable: 36 in. (91.4 cm)	9422CSF30 <sup>2</sup>					
						cable: 60 in. (152.4 cm)	9422CSF50 <sup>2</sup>					
						cable: 84 in. (213.4 cm)	9422CSF70 <sup>2</sup>					
										D	cable: 120 in. (304.8 cm)	9422CSF10 <sup>2</sup>
											cable: 36 in. (91.4 cm)	9422CSJ30 <sup>2</sup>
											cable: 60 in. (152.4 cm)	9422CSJ50 <sup>2</sup>
											cable: 120 in. (304.8 cm)	9422CSJ10 <sup>2</sup>
										M and P	cable: 36 in. (91.4 cm)	9422CMP30 <sup>2</sup>
											cable: 50 in. (127 cm)	9422CMP50 <sup>2</sup>
						cable: 120 in. (304.8 cm)	9422CMP10 <sup>2</sup>					
 <p>NEMA Class 9422</p>	1, 3, 3R, 4, 4X	Variable Depth	For custom-built enclosures where right or left-hand actuation is important	Operating mechanism only, handle ordered separately	H and J	5.88–17.75 in. (14.9–45.1 cm)	9422RQ1 <sup>2</sup>					
					D	9.00–17.75 in. (22.9–45.1 cm)	9422RS1 <sup>2</sup>					
					M and P	9.00–18.38 in. (22.9–46.7 cm)	9422RM1 <sup>2</sup>					

Continued on next page

Table 6: Handle Operators (Complete Kits) — Continued

Operator Style	NEMA Ratings	Operator Type	Advantages	Versions Available	Circuit Breakers	Mounting Depth	Part Number
 NEMA Class 9422	1, 2, 3, 3R, 4	Flange Handle	Can be used with cable operated and variable depth mechanisms	6 in. (15.2 cm) sheet steel flange handle only	H, J, and D	N/A	9422A1
					M and P	N/A	9422AP1
	4, 4X			6 in. (15.2 cm) stainless steel flange handle only	H, J, and D	N/A	9422A2
					M and P	N/A	9422AP2

<sup>1</sup> Refer to Digest for component parts.

<sup>2</sup> Handle must be ordered separately.

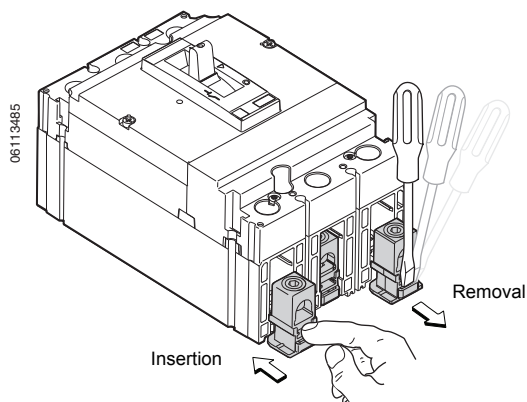
## Terminations

A wide variety of terminal options are available for PowerPact molded case circuit breakers. The terminations are designed to be extremely versatile and easy to install.

### Snap-In Terminals

The PowerPact® H- and J-frame circuit breakers are equipped with a unique snap-in terminal design that makes converting between busbar and lug options easy. The terminal nut or mechanical lug is set on a plastic retainer that slides and snaps into place. This makes it possible to easily convert to a distribution lug or add a control wire.

Figure 4: H- and J-Frame Snap-In Terminals



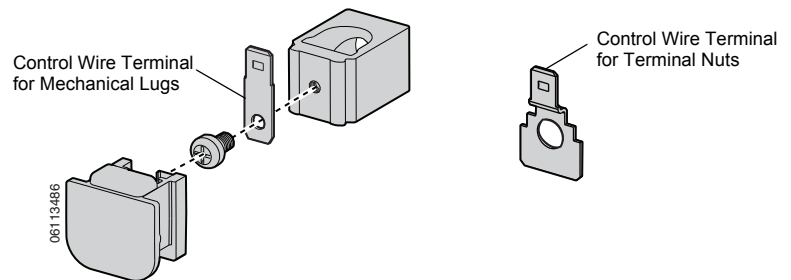
## Mechanical Lugs

Mechanical lugs are the standard offering, and are available in either aluminum or copper. Both the aluminum and copper mechanical lugs can be equipped with a control wire terminal kit that attaches to the bottom of the lug, creating a 1/4 inch slip connect terminal. The control wire is ideally suited for powering control transformers from the main circuit breaker. These lugs are available factory installed or as field-installable kits.

### NOTE:

- Similar connections are available for 600 A D-frame circuit breakers.
- PowerPact M- and P-frame circuit breakers can be ordered with special lugs with control wire taps.

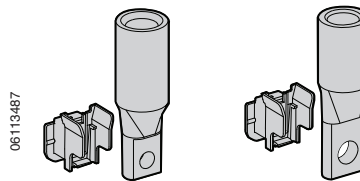
Figure 5: Control Wire Terminals for H- and J-Frame Circuit Breakers



## Crimp Lugs

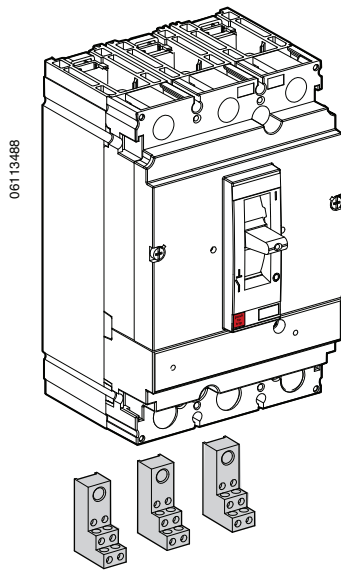
Crimp lugs are available in both aluminum and copper and cover the entire range of available wire sizes. The kits include all of the mounting hardware and terminal inserts necessary to completely convert the circuit breaker.

Figure 6: Crimp Lugs for H- and J-Frame



**Power Distribution Lugs**

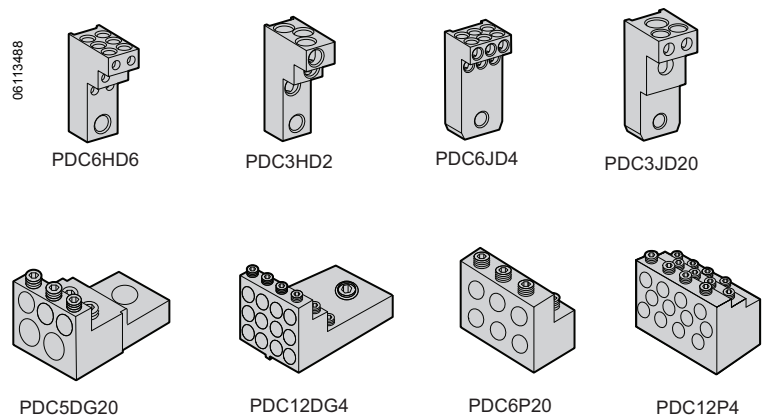
Power distribution lugs can be used for multiple load connections on one circuit breaker and provide additional benefits for UL508A compliance. When distribution lugs are attached to the circuit breaker, the lugs assume the Short Circuit Current Rating (SCCR) of that circuit breaker, and don't require stand-alone ratings. They can be used to replace standard distribution blocks to save time and space. Field installable kits include tinned aluminum lugs (for copper wires only) and all the required mounting hardware. The distribution lugs are for use on the "Load" end only and on UL 508 or UL 1995/CSA22.2 No. 236 control panel specifications. Long terminal shields, or phase isolators, are available to maintain isolation between phases. Use catalog number S37449 for H-frame long lug shields and catalog number S37450 for J-frame long lug shields.



H-Frame Example

**Table 7: Power Distribution Lugs**

Use with Circuit Breaker	Circuit Breaker Ampere Rating	Number of Wires Per Terminal	Wire Range	Catalog Number	Qty. in Kit
HD, HG, HJ, HL	15–150 A	6	14–6 AWG Cu	PDC6HD6	3
		3	14–2 AWG Cu	PDC3HD2	3
JD, JG, JJ, JL	150–250 A	6	14–4 AWG Cu	PDC6JD4	3
	150–250 A	2	14–1 AWG Cu	PDC3JD20	3
		+1	12–2/0 AWG Cu		
D-frame	150–600 A	2	4–1 AWG Cu	PDC5DG20	3
		+3	14–6 AWG Cu		
		12	14–4 AWG Cu	PDC12DG4	3
M- and P-frame	250–1200 A	6	12–2/0 AWG Cu	PDC6P20	3
				PDC6P204	4
	250–1200 A	12	10–4 AWG Cu	PDC12P4	3
				PDC12P44	4

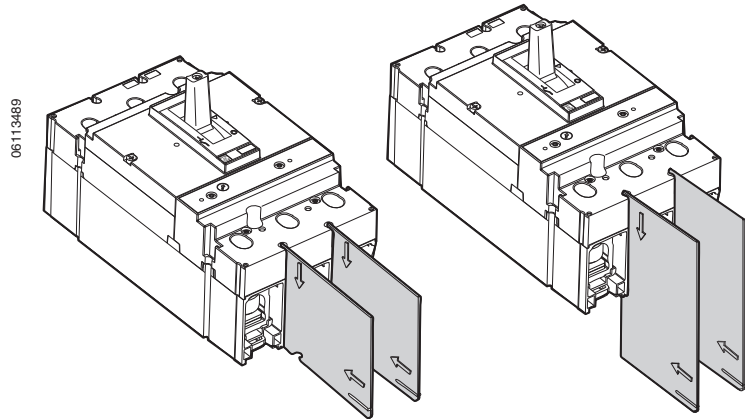




### Phase Barriers and Lug Shields

For additional shielding and protection, phase barriers are available to help isolate phase conductors.

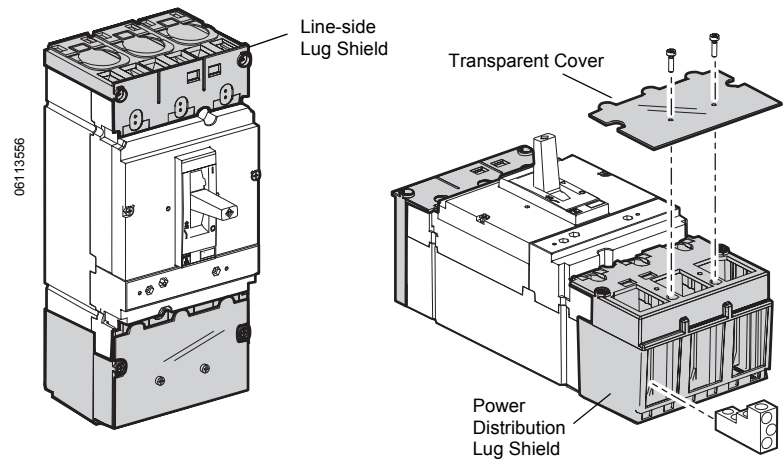
**Figure 7: Phase Barriers (J-Frame Examples)**



Safety is a key element of the panel disconnect. When the main disconnect is used to turn the power off in the panel, the lugs and conductors on the top, or line side, of the circuit breaker are still energized. Optional lug shields may be mounted on the line-side where power enters the panel to provide IP20 isolation, which indicates a degree of protection from tools or fingers touching live parts.

When crimp lugs or power distribution lugs are added to the load end of the circuit breaker they protrude outside of the circuit breaker. The PowerPact® H- and J-frame circuit breakers can be equipped with optional lug shields that provide some isolation of these parts. The covers are fitted with a transparent cover allowing terminations to be inspected or re-tightened without removing the covers.








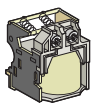
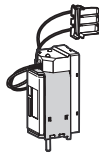
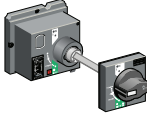
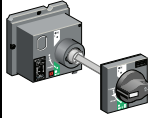
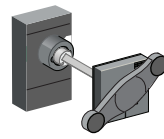



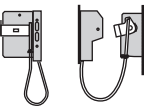
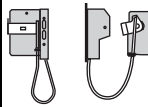
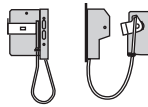


**Figure 8: Optional Lug Shields (J-Frame Examples)**



## Common Accessories

A key feature of PowerPact® Molded Case Circuit Breakers are the common accessories that are versatile and easy to install. These molded case circuit breakers can be easily configured to add auxiliary switches, alarm contacts, rotary handles, motor operators, padlocks, and a variety of terminal options. The use of common accessories provides the ability to respond to late specification changes without requiring expensive delays associated with factory modifications. This also allows customers to reduce inventory without sacrificing flexibility. Table 8 shows the common features and accessories for the PowerPact family of circuit breakers.

**Table 8: Common Features and Accessories (PowerPact Circuit Breakers)**

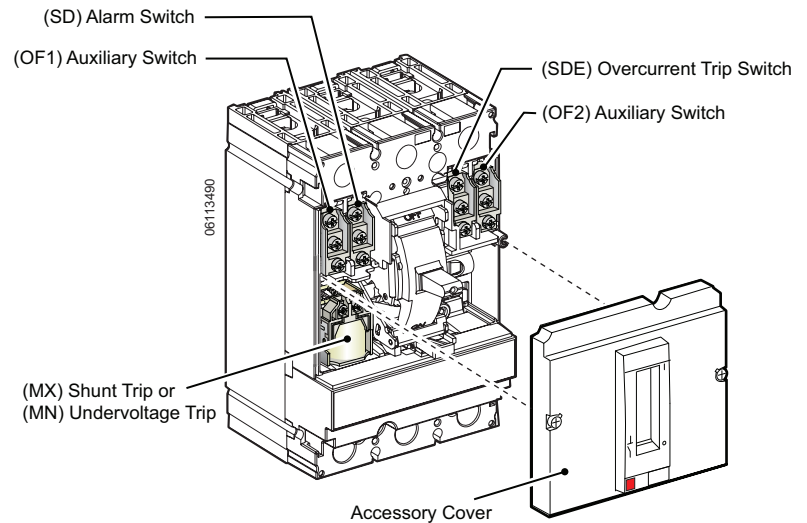
Common Design Features	H-frame 150 A	J-frame 250 A	D-frame 600 A	M-frame 800 A	P-frame 800 A	P-frame 1200 A
<ul style="list-style-type: none"> <li>Mounting Holes</li> <li>Door Trim</li> <li>Handle Accessories</li> </ul>						
<ul style="list-style-type: none"> <li>Auxiliary Switches</li> <li>Alarm Switches</li> </ul>						
<ul style="list-style-type: none"> <li>Shunt Trip</li> <li>Undervoltage Release</li> </ul>						
<ul style="list-style-type: none"> <li>IEC Operators</li> </ul>			N/A			
<ul style="list-style-type: none"> <li>Operating Mechanism</li> </ul>						
<ul style="list-style-type: none"> <li>NEMA Rotary Handle</li> </ul>	3-inch				N/A	
	6-inch			N/A		
	8-inch <sup>1</sup>			8-inch		
<ul style="list-style-type: none"> <li>NEMA Cable or Variable Depth Mechanism</li> </ul>						
<ul style="list-style-type: none"> <li>NEMA Flange Handle</li> </ul>						

<sup>1</sup> 8 inch handles are available but not recommended for H-, J-, and D-frame.

Careful attention was given to ease of installation and reliable operation. For example, as shown in Figure 9, the H- or J-frame auxiliary cover can be removed with two screws and the accessories can be snapped into place. The switches, shunt trip, and UVR can also be easily installed or removed with common tools. This creates a product that is easily configured.

The accessory cover has several locations for wire routing. The instruction materials shipped with the devices provide clear steps and graphics to ensure proper installation.

**Figure 9: Easy Access to Accessories (H-frame Shown)**



## Overcurrent Trip Switch

The overcurrent trip switch can be installed in addition to the alarm switch. This switch provides a contact that indicates that the circuit breaker has tripped due to an overcurrent condition. This contact will not be actuated when the circuit breaker is tripped via the shunt trip, undervoltage release, or push-to-trip button. The overcurrent trip indication is ideal for signaling the circuit breaker tripped due to an overload or short circuit condition. This additional alarm switch can be wired to a pennant light or included into a control scheme that requires the system be inspected before being reenergized.

The PowerPact® P-frame circuit breakers are also available with ET and Micrologic® monitoring capabilities. Features in the Micrologic trip unit include universally interchangeable rating plugs and adjustable long-time pickups. The Micrologic family consists of four models with progressively increasing levels of functionality, from basic overcurrent protection to advanced protection, communications, and power metering/monitoring. This allows the circuit breaker to replace other parts of the panel and become integrated into energy management software.

## Conclusion

The combination of innovation, performance, reliability and safety provide UL-type control panel builders with a comprehensive product solution. High interrupting ratings, common design elements, versatile connection options, and field-installable accessories allow for consolidated panel designs and the flexibility to meet late specification changes or customer-specific requirements. The PowerPact® family of circuit breakers, along with the unmatched worldwide service and support of Schneider Electric, set the standard for reliability and performance.

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