PowerPact M-Frame Circuit Breaker Data Sheets

What's in This Document

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SQUARE D™

by Schneider Electric

PowerPact M-Frame General Information

PowerPact™ M-frame electronic trip molded case circuit breakers are designed to protect electrical systems from damage caused by overloads, short circuits, and ground faults. All circuit breakers are designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent. Electronic trip molded case circuit breakers use an electronic trip system to signal the circuit breaker to open automatically.

The PowerPact M-frame (800 A frame size) circuit breakers:

- are dual rated to UL489 and IEC 60947-2.
- are equipped with a basic ET1.0 electronic trip system, which has a fixed long-time (overload) setting and an adjustable instantaneous (short-circuit) trip setting.
- are available in 300, 350, 400, 450, 500, 600, 700, and 800 A ratings
- are available in two- and three-pole unit-mount and I-Line versions

Termination Options

Termination **Letter**	**Termination Option**
F	No Lugs
L	Lugs both ends
M	Lugs ON end Terminal Nut Kit Off end
P	Lugs OFF end Terminal Nut Kit On end

PowerPact M-Frame Codes and Standards

PowerPact M-frame electronic trip circuit breakers and switches are manufactured and tested in accordance with the following standards:

- UL 489[1]
- IEC Standard 60947-2
- CSA C22.2 No 5
- Federal Specification W-C-375B/GEN
- NEMA AB1
- NMX J-266
- UTE, VDE, BS, CEI, UNE, CCC

Circuit breakers should be applied according to guidelines detailed in the NEC and other local wiring codes.

1. PowerPact M-frame circuit breaker is in UL File E10027.

PowerPact M-Frame Interruption Ratings

The interrupting rating is the highest current at rated voltage the circuit breaker is designed to safely interrupt under standard test conditions. Circuit breakers must be selected with interrupting ratings equal to or greater than the available short-circuit current at the point where the circuit breaker is applied to the system (unless it is a branch device in a series rated combination). Interrupting ratings are shown on the front of the circuit breaker. For grounded B phase interrupting ratings, see Data Bulletin 2700DB0202.

UL/IEC Circuit Breaker Interrupting Ratings

Circuit Breaker	UL/CSA Rating (50/60 Hz)				IEC 60947-2 Rating (50/60 Hz)			
	3 Phase			Grounded B Phase (1Ø-3Ø)	240 Vac		380/415 Vac	
	240 Vac	480 Vac	600 Vac	240 Vac 2P	Icu	Ics	Icu	Ics
MG	65 kA	35 kA	18 kA	65 kA	50 kA	25 kA	35 kA	20 kA
MJ	100 kA	65 kA	25 kA	65 kA	65 kA	35 kA	50 kA	25 kA

PowerPact M-Frame Application Ratings

PowerPact M-Frame Voltage, Frequency and Withstand Ratings

The voltage rating is the highest voltage for the electrical system on which the circuit breaker can be applied. The frequency rating indicates the system frequency for which the circuit breaker is intended. The withstand rating is used to improve system coordination by maximizing the current level at which the circuit breaker trips with no intentional delay. The withstand rating is the level of RMS symmetrical current that a circuit breaker can carry in a closed position for a stated period of time.

Voltage, Frequency, and Withstand Ratings

Circuit Breaker	Voltage Rating	Frequency Rating	Withstand Rating at 480 Vac[2]
MG, MJ	600 Vac	50/60 Hz (UL and IEC)	10 kA (0.5 sec)

PowerPact M-Frame Enclosure Sizes

All M-frame circuit breakers are available as standard rated circuit breakers.

Minimum Enclosure Sizes for Fixed-Mounted Circuit Breakers

Circuit Breaker Rating	Enclosure Dimensions (h x w x d)		Ventilation Area	
	3P Circuit Breaker	4P Circuit Breaker	Top	Bottom
M-Frame, ≤ 800 A, Standard Rated	51.9 x 20.25 x 7.75 in. (1318.3 x 514.4 x 196.9 mm)	51.9 x 23.01 x 7.75 in. (1318.3 x 584.4 x 196.9 mm)	—	—

2. A system coordination study should be done for optimum circuit breaker coordination.

PowerPact M-Frame Operation Ratings

Temperature Re-Rating Values

To meet the requirements of the UL489 Standard, molded case circuit breakers are designed, built and calibrated for use on 50/60 Hz ac systems in a 40°C (104°F) ambient environment. Electronic trip circuit breakers, however, are designed to react only to the magnitude of the current flowing through the circuit breaker and are inherently ambient insensitive. Both UL/IEC and IEC-only circuit breakers may be operated at temperatures between -25°C and +70°C (-13°F and 158°F). For temperatures other than 40°C (104°F), the circuit breakers must be re-rated as shown.

Temperature Re-Rating Values

Maximum Ambient Temperature												
°F	158	140	122	104	86	77	68	50	32	14	-4	-13
°C	70	60	50	40	30	25	20	10	0	-10	-3	-25
Current	0.75	0.83	0.92	1	1.07	1.11	1.14	1.21	1.27	1.33	1.39	1.42

PowerPact M-Frame Altitude

Circuit breakers are suitable for use at altitudes up to 13,100 ft. (4000 m). For altitudes higher than 6560 ft. (2000 m), circuit breakers must be derated as shown

Altitude Derating Values Per ANSI C37.20.1 Table 10

Altitude	**≤ 6,600 ft. (≤ 2,000 m)**	**8,500 ft. (2,600 m)**	**13,000 ft. (3,900 m)**
Voltage	1	0.95	0.8
Current	1	0.99	0.96

PowerPact M-Frame Trip Unit Details

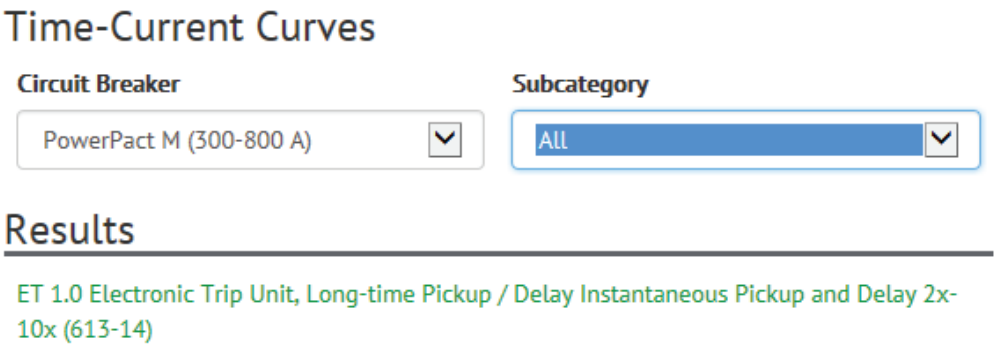
Type ET1.0 trip units are available with M-frame UL/IEC circuit breakers. Circuit breakers with type ET trip units have a fixed ampere rating. The trip units are not field-interchangeable and will not accept any communications or other trip unit accessories. The trip system uses a set of current transformers (called CTs or sensors) to sense current, a trip unit to evaluate the current, and a tripping solenoid to trip the circuit breaker.

The ET1.0 trip system available on PowerPact M-frame circuit breakers is equipped with fixed long-time and adjustable instantaneous tripping functions only. The long-time pickup is fixed at 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.

PowerPact M-Frame Circuit Breaker Trip Curves

Trip curves are available on the Schneider Electric website:

http://www.digestplus-us.schneider-electric.com/additional_product_infos



PowerPact Common Accessories

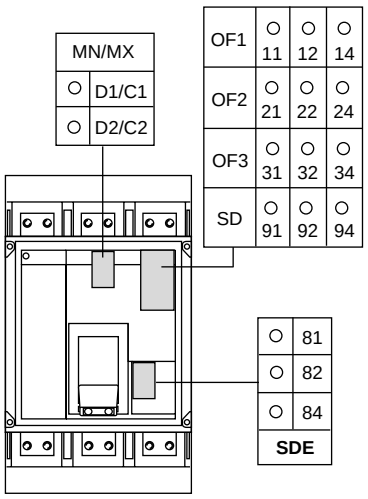
Control Wiring

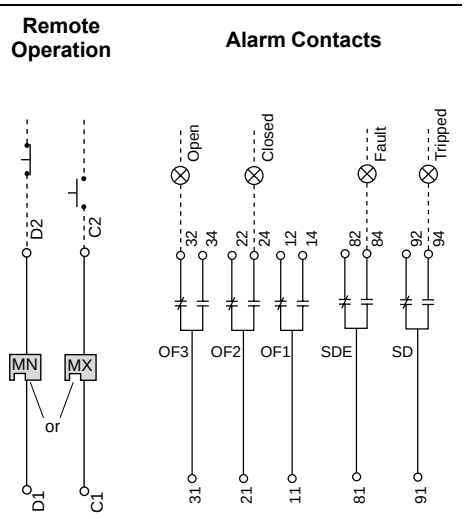
Control wiring is connected to terminals located under the circuit breaker accessory cover.

NOTE: All diagrams show circuit breaker in open position.

Accessory Control Wiring Diagrams

Function	Connector	Description
Auxiliary Contacts	OF	Open/Closed Circuit Breaker Position Contacts
	SD	Bell Alarm
Remote Opera-tion	MN	Undervoltage Trip Device
	MX	Shunt Trip





Shunt Trip and Shunt Close Characteristics

Characteristics		MX1	XF	Min	Max
Voltage Ratings (Vn)	Vac 50/60 Hz	24 Vac		17 Vac	26 Vac
		48 Vac		34 Vac	52 Vac
		120 Vac		60 Vac	132 Vac
		240 Vac		168 Vac	264 Vac
		277 Vac		194 Vac	304 Vac
		380 Vac		266 Vac	418 Vac
		480 Vac		336 Vac	528 Vac
	Vdc	12 Vdc		8 Vdc	13 Vdc
		24 Vdc		17 Vdc	26 Vdc
		48 Vdc		34 Vdc	52 Vdc
		125 Vdc		88 Vdc	137 Vdc
		250 Vdc		175 Vdc	275 Vdc
Operating Threshold		0.7 to 1.1 Vn	0.85 to 1.1 Vn		
Power Consumption (VA or W)	Steady-State/ Inrush	4.5/200			
Circuit Breaker Response Time at Vn[3]		50 ms ±10	70 ms ±10 (NW ≤ 4000 A)		
			80 ms ±10 (NW > 4000 A)		
			55 ms (NT)		

Undervoltage Trip Characteristics

Characteristics		MN
Voltage Ratings (Vn)	Vac 50/60 Hz	24 Vac
		48 Vac
		120 Vac
		240 Vac
		277 Vac
		380 Vac
		480 Vac
	Vdc	12 Vdc
		24 Vdc
		48 Vdc
		125 Vdc
		250 Vdc
Power Consumption (VA or W)	Constant/Inrush	4.5/200
Operating Threshold	Opening	0.35 to 0.70 Vn
	Closing	0.35 Vn
Circuit Breaker Response Time at Vn		90 ms ±5

3. Shunt trip (MX1) and shunt close (XF) circuits must be energized for minimum of 200 ms.

PowerPact M-Frame Accessories

M-frame circuit breakers can be used with a variety of internal and external accessories to increase application versatility and meet the demands of modern electrical distribution systems.

Circuit breaker internal accessories are available either factory installed or field installable. They can be installed in accessory compartments behind the circuit breaker accessory cover.

Factory-Installed Accessories

Factory-installed accessories are internally mounted by the factory. Accessories only available factory installed cannot be removed or repaired in the field. Order factory-installed accessories by adding the correct two-letter suffix to the standard circuit breaker catalog number. To build a catalog number, refer to the product selector or contact a field office.

Field-Installable Accessories

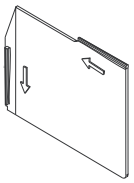
Field-installable accessories can be installed or replaced in the field without affecting the circuit breaker ratings. Field-installable accessories are shipped separately from the circuit breakers. Install and wire field-installable accessories according to the instructions supplied with the circuit breaker and particular accessory. Order field-installable accessories by the catalog number found in the *Schneider Electric Digest.*

Accessory	Field Installable	Factory Installed
Shunt Trip (MX)	Y	Y
Undervoltage Trip (MN)	Y	Y
Adjustable Time Delay Module for Undervoltage Trip	Y	N
Auxiliary Switch (OF)	Y	Y
Alarm Switch (SD)	Y	Y
Full-Function Test Kit	Y	N/A
Mechanical Lug	Y	Y
Compression Lug	Y	Y
Terminal Pad	Y	Y
I-Line Jaws	N	Y
Power Distribution Connectors	Y	Y
Control Wire Terminations	Y	Y
Phase Barriers	Y	N
Electric Joint Compound	Y	N
Door-Mounted Operating Mechanism	Y	Y
Replacement Handles	Y	Y
Long Handle Extension	Y	Y
Accessory Cover Door Escutcheons	Y	N
Padlock Attachment	Y	Y
Keylock	N	Y
Keylock Provision	N	Y
Sub-Feed Lugs	Y	Y

Y = Yes
N = No
N/A = Not Available

PowerPact M-Frame External Accessories

PowerPact M-Frame Phase Barriers



Phase barriers are available for unit-mount circuit breakers with bus connections or with lugs ≤ 800 A.

Phase Barriers

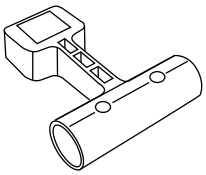
Cat. No.	Qty Per Kit
S33646	3

Electric Joint Compound

I-Line circuit breakers, I-Line busway plug-on units and I-Line panelboards and switchboards are supplied with factory-applied joint compound on the plug-on connectors. The compound is especially formulated for I-Line connections and contributes to the overall performance of the connection.

If the joint compound is removed, it must be reapplied. A two-ounce container of the compound (Cat. No. *PJC7201*) is available.

PowerPact M-Frame Handle Extension



Handle extensions are available for M-frame circuit breakers. Order catalog number 33195.

PowerPact M-Frame Replacement Handles

Replacement toggle handle extensions, including an optional longer handle extension, are available for M-frame circuit breakers.

Description	Field-Installed Cat. No.
Standard Short	*S46998*
Long	*S46996*

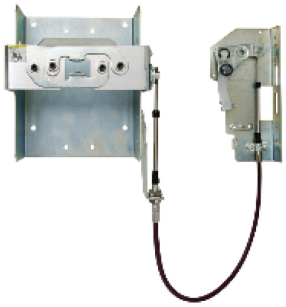
PowerPact M-Frame Door-Mounted Operating Mechanisms

Door-Mounted Operating Mechanism

Door-mounted operating mechanisms are available for M-frame circuit breakers. The Type L door-mounted variable-depth operating mechanism feature heavy-duty, all-metal constructions. They can be padlocked in the OFF position when the enclosure door is open. Handle assemblies can be locked OFF with up to three padlocks, which also locks the door closed. Complete kits include a handle assembly, operating mechanism, and shaft assembly, and are rated for NEMA Type 1, 3R and 12 enclosures. A door drilling template is supplied for ease of installation.

Description		Handle Assembly[4]	Shaft Mounting Depth	Cat. No.
Circuit Breaker Mechanism	Type L	Painted, 8 inch	7.2–11.625 in. (182–295 mm)	LW1
		Painted, 8 inch	7.2–22.25 in. (182–565 mm)	LW4
Handle Assembly[5]	Type 3, 4	Painted, 8 inch	7.2–11.625 in. (182–295 mm)	LHP48
	Type 3, 4, 4X	Chrome Plated, 8 inch		LCP48
Replacement Parts	Handle Assembly	Painted, 8 inch	—	LHP8
	Operating Mechanism	—	—	LW7
	Standard Shaft	—	7.2–11.625 in. (182–295 mm)	LS8
	Long Shaft	—	7.2–22.25 in. (182–565 mm)	LS10

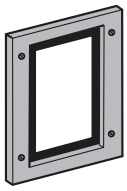
PowerPact M-Frame Flexible Cable Mechanism



Flexible cable mechanisms are for use with Class 9422 handle operators specially designed for tall, deep enclosures where placement flexibility is required.

Flexible Cable Mechanism	No of Poles	Frame Size	Cable Mechanism	
			Length	Type
9422CSJ30	3	1200 A	48 in.	CMP40
			50 in.	CMP50
			120 in.	CMP10

PowerPact M-Frame Door Escutcheons



Accessory cover door escutcheons are available for all M-frame circuit breakers.

Door Escutcheons for M-Frame Circuit Breakers

Description	Field-Installed Cat. No.
Accessory Cover	S33718
Toggle Handle	S33717

4. Painted handles are painted flat black, with the base ring silver.
5. Due to gasketing, NEMA 3 and 4 handle assemblies are NOT trip indicating.

PowerPact M-Frame Locking Accessories

Locks and Interlocking

Device	Description		Factory-Installed Cat. No. Suffix	Field-Installed Cat. No.
Handle Padlocking Device	Removable (Lock Off or On)		—	—
	Removable (Lock Off Only)		—	*S44936*
	Fixed (Lock Off or On)		YP	*S32631*
	Fixed (Lock Off Only)		YQ	*MPRPAF*
Interlocking (Not UL listed)	Mechanical for Circuit Breakers with Rotary Handles[6]		—	*S33890*
Key Locking	Provision Only, Vertical Mount, 1 key interlock including padlock provision, open position only	Kirk	JE1	—
	Provision Only, Vertical Mount, 1 or 2 Locks	Kirk	JA	—
	Provision Only, Horizontal Mount	Kirk	JK	—
	1 Lock	Ronis	JB	—
	Provision and 1 Lock, Vertical Mount	Kirk	JG	—
	Provision and 1 Lock, Horizontal Mount	Kirk	JL	—
		Ronis	JC	—
		Profalux	JF	—
	Provision and 2 Locks Keyed Alike, Vertical Mount	Kirk	JN	—
	Provision and 2 Locks Keyed Differently, Vertical Mount	Kirk	JP	—

6. Not available on M-frame, motor-operated P-frame, or I-Line circuit breakers.