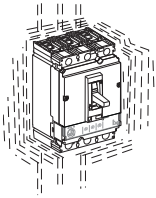


PowerPact™ H-, J-, and L-Frame Circuit Breakers

General Information

Vibration



PowerPact H-, J-, and L-frame devices resist mechanical vibration.

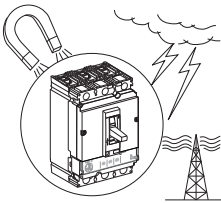
Tests are carried out in compliance with standard UL 489 SA and SB for the levels required by merchant-marine inspection organizations (Veritas, Lloyd's, etc.):

PowerPact H-, J-, and L-frame circuit breaker meet IEC 60068-2-6 for vibration:

- 2.0 to 25.0 Hz and amplitude +/- 1.6 mm
- 25.0 to 100 Hz acceleration +/- 4.0 g

Excessive vibration may cause tripping, breaks in connections or damage to mechanical parts.

Electromagnetic disturbances



PowerPact H-, J-, and L-frame devices are protected against:

- overvoltages caused by circuit switching
- overvoltages caused by an atmospheric disturbances or by a distribution-system outage (such as from failure due to lightning)
- devices emitting radio waves (radios, walkie-talkies, radar, etc.)
- electrostatic discharges produced directly by users

PowerPact H-, J-, and L-frame devices have successfully passed the electromagnetic-compatibility tests (EMC) defined by the following international standards:

- IEC/EN 60947-2: Low-voltage switchgear and controlgear, part 2: Circuit breakers:
 - Annex F: Immunity tests for circuit breakers with electronic protection
 - Annex B: Immunity tests for residual current protection
- IEC/EN 61000-4-2: Electrostatic-discharge immunity tests
- IEC/EN 61000-4-3: Radiated, radio-frequency, electromagnetic-field immunity tests
- IEC/EN 61000-4-4: Electrical fast transient/burst immunity tests
- IEC/EN 61000-4-5: Surge immunity tests
- IEC/EN 61000-4-6: Immunity tests for conducted disturbances induced by radio frequency fields
- CISPR 11: Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.

These tests ensure that:

- no nuisance tripping occurs
- tripping times are respected

Tropicalization

The materials used in PowerPact circuit breakers will not support the growth of fungus and mold.

PowerPact circuit breakers have passed the test defined below for extreme atmospheric conditions.

Dry cold and dry heat:

- IEC 68-2-1—dry cold at -55 °C
- IEC 68-2-2—dry heat at +85° C

Damp heat (tropicalization)

- IEC 68-2-30—damp heat (temperature + 55° C and relative humidity of 95%)
- IEC 68-2-52 level 2—salt mist

PowerPact™ H-, J-, and L-Frame Circuit Breakers

General Information

Special Ratings

The H-frame and J-frame circuit breakers also comply with the following special ratings:

- HACR rating
- SWD switch duty rating (applies only to 15 and 20 A / 277 Vac or less, 2P and 3P)
- HID high intensity discharge lighting rating (15–50 A)

The L-frame circuit breakers complies with the following special rating:

- HACR rating

Marine Ratings

UL Marine Listed/CSA Certified Circuit Breakers (UL 489 Supplement SA)

The PowerPact H- and J-frame circuit breakers with thermal-magnetic trip units with D, G, J and L interruption levels meet the UL 489 Supplement SA requirements for use on vessels of any length under or over 65 ft. (19.8 m). The PowerPact H-, J-, and L-frame circuit breakers with Micrologic electronic trip units meet the UL 489 Supplement SA for use on vessels over 65 ft. (19.8 m) in length. Marine circuit breakers must not use aluminum or aluminum alloys for terminal connections and must be calibrated at an ambient temperature of 104° F (40° C). Standard circuit breakers should not be specified or used in the place of marine rated circuit breakers.

Circuit breakers can be ordered with the Marine SA listing by adding the suffix “YA” (marine) to the catalog number.

UL Naval Listed/CSA Certified Circuit Breakers (UL 489 Supplement SB)

The PowerPact H-, J-, and L-frame circuit breakers with Micrologic trip units with D, G, J and L interruption levels meet the UL 489 Supplement SB requirements for use on naval vessels. These circuit breakers are subject to various vibration tests as described in UL 489 Supplement SB. Naval circuit breakers must not use aluminum or aluminum alloys for terminal connections and must be calibrated at an ambient temperature of 122° F (50° C). Standard circuit breakers should not be specified or used in the place of navel rated circuit breakers.

Circuit breakers can be ordered with the Naval SB listing by adding the suffix “YA1” (naval) to the catalog number.

American Bureau of Shipping (ABS)

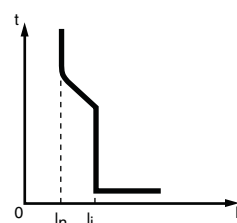
The PowerPact H-, J-, and L-Frame circuit breakers are certified to ABS-NVR (American Bureau of Shipping - Naval Vessel Rules), for use on Naval vessels.

Section 10—Installation Recommendations

Operating Conditions

Temperature Derating

- PowerPact™ H-, J-, and L-frame circuit breakers may be used between -13°F and 158°F (-25 °C and +70 °C). For temperatures higher than 104° F (40° C°) inside the enclosure, devices must be derated.
- Circuit breakers should be put into service under normal ambient, operating-temperature conditions.
- The permissible storage-temperature range for PowerPact H-, J-, and L-frame circuit breakers in the original packing is -58°F¹ and 185°F (-50 °C¹ and +85 °C).



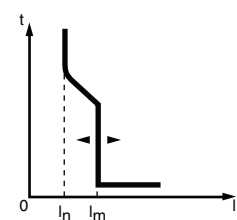
H-Frame Trip Curve

- (I_n) Fixed threshold thermal protection against overload
(I_i) Fixed threshold instantaneous protection against short circuits

Table 131: Temperature Derating for H-Frame Trip Unit Thermal Protection—Long-Time

Temperature ¹		Rating (A) I_n															
°C	°F																
-10	14	23	30	38	46	53	60	68	76	88	103	112	123	137	160	180	221
0	32	21	28	36	43	49	56	63	71	83	97	107	117	131	151	171	207
10	50	20	26	33	40	46	52	59	66	77	90	101	111	126	141	161	194
20	68	18	24	31	37	42	48	54	62	72	84	96	105	120	132	152	180
30	86	17	22	28	34	39	44	50	56	66	77	88	98	110	121	139	165
40	104	15	20	25	30	35	40	45	50	60	70	80	90	100	110	125	150
50	122	12	17	21	25	30	34	38	43	53	62	72	80	86	95	109	131
60	140	9	14	17	20	24	28	31	35	46	53	63	70	72	80	93	111

¹ Shaded areas indicate temperature derated values, non-shaded areas inside an enclosure are standard circuit breaker ampere ratings at 104° F (40° C°).



J-Frame Trip Unit

- (I_n) Fixed threshold thermal protection against overload
(I_m) Adjustable instantaneous protection against short circuits

Table 132: Temperature Derating for J-Frame Trip Unit Thermal Protection—Long-Time

Temperature ¹		Rating (A) I_n					
°C	°F						
-10	14	221		264		289	
0	32	207		247		273	
10	50	194		230		256	
20	68	180		213		240	
30	86	165		194		220	
40	104	150		175		200	
50	122	131		150		176	
60	140	111		124		151	

¹ Shaded areas indicate temperature derated values, non-shaded areas are standard circuit breaker ampere ratings at 104° F (40° C°).

¹ -40°F (-40 °C) for Micrologic trip units with an LCD screen.

PowerPact™ H-, J-, and L-Frame Circuit Breakers

Installation Recommendations

PowerPact H-, J- and L-Frame Circuit Breakers Equipped with Electronic Trip Units

Electronic trip units are not affected by variations in temperature. If the trip units are used in high-temperature environments, the Micrologic™ trip unit setting must nevertheless take into account the temperature limits of the circuit breaker.

Changes in temperature do not affect measurements by electronic trip units.

- The built-in CT sensors with Rogowski coils measure the current.
- The control electronics compare the value of the current to the settings defined for 104°F (40°C).

Because temperature has no effect on the CT measurements, the tripping thresholds do not need to be modified.

However, the temperature rise caused by the flow of current combined with the ambient temperature increases the temperature of the device. To avoid reaching the thermal withstand value, it is necessary to limit the current flowing through the device, that is the maximum I_r setting as a function of the temperature.

The table below indicates the maximum long-time (LT) protection setting I_r (A) depending on the ambient temperature.

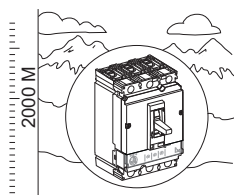
Table 133: Derating Circuit Breakers with Micrologic Trip Units

Type of Device	Rating	Temperature						
		104°F (40°C)	113°F (45°C)	122°F (50°C)	131°F (55°C)	140°F (60°C)	149°F (65°C)	158°F (70°C)
H-Frame								
Unit-mount, plug-in or drawout	60 A	No derating						
	100 A	No derating						
	150 A	No derating						
J-Frame								
Unit-mount	250 A	250	250	250	245	237	230	225
Plug-in or drawout	250 A	250	245	237	230	225	220	215
L-Frame								
Unit-mount	400 A	400	400	400	390	380	370	360
Plug-in or drawout	400 A	400	390	380	370	360	350	340
Unit-mount	600 A	600	600	600	585	570	550	535
Plug-in or drawout	600 A	570	550	535	520	505	490	475

Example. A unit-mount PowerPact L-frame circuit breaker equipped with a Micrologic can have a maximum I_r setting of:

- 400 A up to 122°F (50 °C)
- 380 A up to 140°F (60 °C)

PowerPact™ H-, J-, and L-Frame Circuit Breakers Installation Recommendations



Altitude Derating

Altitude does not significantly affect the characteristics of PowerPact H-, J-, and L-frame circuit breakers up to 6560 ft. (2000 m). Above this altitude, it is necessary to take into account the decrease in the dielectric strength and cooling capacity of air.

The following table gives the corrections to be applied for altitudes above 6560 ft. (2000 m). The breaking capacities remain unchanged.

Table 134: Altitude Derating

Altitude		6560 ft (2000 m)	9840 ft (3000 m)	13120 ft (4000 m)	16400 ft (5000 m)
Dielectric withstand voltage		3000 V	2500 V	2100 V	1800 V
Insulation voltage	V_i	800 V	700 V	600 V	500 V
Maximum operational voltage	V_e	690 V	590 V	520 V	460 V
Average current capacity (A) at 104°F (40°C)	$I_n \times$	1.0	0.96	0.93	0.9

400 Hz Derating

Application of H- and J-frame circuit breakers at frequencies above 60 Hz requires that special consideration be given to the effects of high frequency on the circuit breaker characteristics. Thermal and instantaneous operations must be treated separately.

At frequencies below 60 Hz, the thermal derating of PowerPact H and J-frame circuit breakers is negligible. However, at frequencies above 60 Hz, thermal derating is required.

One of the most common high frequency applications is at 400 Hz.

Table 135: 400 Hz Derating

Circuit Breaker	400 Hz Derating Multiplier
H-Frame	0.90
J-Frame	0.90
L-Frame, 400 A	0.80
L-Frame, 600 A	0.65

For more information, refer to Data Bulletin 0100DB0101, *Determining Current Carrying Capacity in Special Applications*.