Special Applications

Protection of Industrial Control Panels

PowerPact H-, J-, and L-frame circuit breakers are also used in industrial control panels. They serve as an incoming devices or can be combined with contactors to protect motor feeders:

- compliance with worldwide standards including IEC 60947-2 and UL 508 / CSA C22.2 N°14
- overload and short-circuit protection
- installation in universal and functional type

PowerPact H-, J-, and L-frame circuit breakers equipped for motor protection functions as described in the following pages can be used in industrial control panels. The accessories for the PowerPact H-, J-, and L-frame circuit breakers are suitable for the special needs of these applications.

400 Hz Applications

Impact on Protective Devices

The current in 400 Hz systems have higher losses caused by eddy currents and an increase in the skin effect (reduction in the useful cross-sectional area of conductors). The higher losses cause additional temperature rise in circuit breakers subjected to the higher frequency current. To remain within the rated temperature-rise limits of devices, current derating is required. For circuit breakers equipped with Micrologic electronic trip units, only the current rating (Ir) must be derated. See Table 14. On circuit breakers equipped with thermal-magnetic trip units, the current rating (In) must be derated and the magnetic trip setting Im must be increased. See Table 15.

Breaking Capacity in 400 Hz, 480 V Systems

The power levels of 400 Hz applications rarely exceed a few hundred kW with relatively low short-circuit currents, generally not exceeding four times the rated current.

Circuit Breaker	Max. Breaking Capacity AIR at 400 Hz
H-frame	10 kA
J-frame	10 kA
L-frame	10 kA

Micrologic Electronic Trip Units

Micrologic™ 3.2/3, 5.2/3 A or E and 6.2/3 with A or E measurement functions are suitable for 400 Hz. The use of electronics offers the advantage of greater operating stability when the frequency varies. However the units are still subject to temperature rise caused by the frequency.

The practical consequences are:

- limit settings: see the I_r derating table below
- the long-time, short-time and instantaneous pick-ups are not modified (see pages 87 or 89)
- the accuracy of the displayed measurements is 2% (Class II)

Table 14: Current Derating Maximum I_r Setting

Circuit Breaker	Maximum Setting Coefficient	Max I_r Setting at 400 Hz
H-Frame, 150 A	0.9	135
J-Frame, 250 A	0.9	225
L-Frame, 400 A	0.8	320
L-Frame, 600 A	0.65	390

Thermal-Magnetic Trip Units

Thermal-magnetic trip units require the current rating (I_n) to be derated and the magnetic trip setting (I_m) to be increased.

Table 15: Current Rating (In) and Magnetic Trip Setting (Im) Rerating

Circuit Breaker	Maximum Setting Coefficient	Max I_r Setting at 400 Hz	Magnetic I_m Coefficient at 400 Hz
H-Frame, 150 A	0.9	135	1.6
J-Frame, 250 A	0.9	225	1.6
L-Frame, 400 A	0.8	320	1.6
L-Frame, 600 A	0.65	390	1.6

Auxiliary Switch (OF) in 400 Hz Networks

Table 16: Electrical Characteristics of Auxiliary Switches

Contact		Standard		Low Level	
Utilization cat. (IEC 60947-5-1)		AC12	AC15	AC12	AC15
Operational current	24 V	6 A	6 A	5 A	3 A
	40 V	6 A	6 A	5 A	3 A
	110 V	6 A	5 A	5 A	2.5 A
	200/240 V	6 A	4 A	5 A	2 A
	380/415 V	6 A	2 A	5 A	1.5 A

Shunt Trip (MX) or Undervoltage Trip (MN) Voltage Release at 400 Hz and 440 V

For circuit breakers on 400 Hz systems, only 125 Vdc undervoltage trip (MN) or shunt trip (MX) releases may be used. The release must be supplied by the 400 Hz system through a rectifier bridge (to be selected from the table below) and an additional resistor with characteristics depending on the system voltage.

Table 17: Rectifier Bridges for MN or MX Releases

Voltage	Rectifier	Additional Resistor
220/240 V	Thomson 110 BHz or General Instrument W06 or Semikron SKB at 1.2/1.3	4.2 kΩ-5 W
380/240 V	Semikron SKB at 1.2/1.3	10.7 kΩ-10 W