

Unusual Environmental Conditions

Trip Unit Temperatures

Eaton’s thermal-magnetic circuit breakers are temperature sensitive. At ambient temperatures below 40 °C (104 °F), circuit breakers carry more current than their continuous current rating. Nuisance tripping is not a problem under these lower temperature conditions, although consideration should be given to closer protection coordination to compensate for the additional current carrying capability. In addition, the actual mechanical operation of the breaker could be affected if the ambient temperature is significantly below the 40 °C standard.

For ambient temperatures above 40 °C, breakers will carry less current than their continuous current rating. This condition promotes nuisance tripping and can create unacceptable temperature conditions at the terminals. Under this condition, the circuit breaker should be recalibrated for the higher ambient temperature.

Electronic trip units are insensitive to ambient temperatures within a certain temperature range. The temperature range for most Eaton electronic trip units is –20 °C to +55 °C (–4 °F to 131 °F). However, at very low ambient temperatures, the mechanical parts of the breaker could require special treatment, such as the use of special lubricants. If the ambient temperature exceeds 40 °C significantly, damage to the electronic circuitry and other components could result. Eaton includes temperature protective circuits in its designs to initiate a tripping operation and provide self-protection, should the internal temperature rise to an unsafe level.

Circuit Breaker Temperatures

The temperature of the air surrounding a circuit breaker is the ambient temperature. In the mid-1960s, industry standards were changed to make all standard breakers calibrated to a 40 °C ambient temperature. For any ambient temperature application above or below 40 °C, it is recommended that the breaker manufacturer be consulted as to any possible re-rating, recalibration or special procedures, before the circuit breaker is selected and applied.

Table 27.3-12. Derating for Non-Compensated Thermal-Magnetic Breakers Calibrated for 40°C

Breaker Ampere Rating at 40°C	Ampere Rating		
	25 °C (77 °F)	50 °C (122 °F)	60 °C (140 °F)
F-Frame/EG-Frame			
15	17	13	11
20	22	18	16
25	32	21	18
30	33	27	24
35	41	32	27
40	45	34	29
50	55	46	42
60	66	56	52
70	77	65	60
90	99	84	78
100	110	94	87
125	137	116	105
150	165	138	125
GD-Frame			
15	—	14	13
20	—	19	18
25	—	24	22
30	—	28	27
35	—	33	31
40	—	38	36
45	—	43	40
50	—	48	45
60	—	57	54
70	—	67	63
80	—	76	72
90	—	86	81
100	—	96	91
J-Frame/JG-Frame			
70	79	63	55
90	102	81	71
100	115	89	76
125	140	114	102
150	171	134	116
175	200	156	134
200	230	178	153
225	252	205	183
250	281	227	201
K-Frame			
100	121	90	79
125	145	116	106
150	188	132	111
175	210	159	141
200	243	180	157
225	255	212	198
250	294	230	208
300	364	270	236
350	412	322	291
400	471	368	333
L-Frame/LG-Frame			
300	330	276	252
350	385	325	301
400	440	372	340
500	550	468	435
600	660	564	525
M-Frame			
300	332	277	252
350	388	322	292
400	444	368	334
450	495	418	383
500	550	468	435
600	660	564	525
700	770	658	613
800	880	754	704

Humidity/Moisture—Corrosion

Molded-case circuit breakers are suited for operation in 0 to 95% non-condensing humidity environments. As is the case with all electrical equipment, application in a condition or environment above this humidity level should be avoided. The ability of molded-case circuit breakers to perform their protective function is negatively affected by exposure to condensation or water, as well as the minerals, particles and contaminants that may be present in them. Prolonged humidity exposure and/or the presence of corrosive elements can result in damage to key operating components and/or severely compromise the breaker’s operational integrity. It may adversely impact breaker contact condition and reduce the insulation and dielectric properties of the circuit breaker. In electronic trip circuit breakers, functionality may be similarly compromised by these conditions. To prevent these effects, the breaker should be protected by the proper NEMA rated enclosure for its installation environment, and kept dry through the use of space heaters in the enclosure. If such operating conditions cannot be met, special treatment of the circuit breaker should be considered to minimize the possibility of operational problems.

Most Eaton molded-case circuit breaker cases are molded from glass polyester that does not support the growth of fungus. In addition, a special moisture- and fungus-resisting treatment is recommended for any parts that are susceptible to the growth of fungus.

Altitude

Low voltage circuit breakers must be progressively derated for voltage, current carrying and interrupting rating at altitudes above 6000 ft (1829 m). The thinner air at higher altitudes reduces cooling and dielectric characteristics compared to the denser air found at lower altitudes. Refer to Eaton for additional application details.

Shock/Vibration

Where high shock is an anticipated condition, hi-shock Navy MIL-SPEC type breakers are recommended. Molded-case circuit breakers can be supplied to meet the following marine specifications, several of which require vibration testing: U.S. Coast Guard CFR 46, ABS–American Bureau of Shipping, IEEE 45, UL 489 Supplement SA Marine, UL 489 Supplemental SB Naval, ABS/NVR, Lloyds of London and DNV. See **Page 27.2-20** for additional information on Navy MIL-SPEC and marine circuit breakers.