

# Molded Case Circuit Breakers

REFERENCE

## Unusual Operating Conditions

**Note:** The information provided on this and the next page is intended for reference and recommendation only. Because several variables can act on a circuit breaker's performance at the same time, the data below is based less on controlled testing, than on experience and engineering judgment. Contact Siemens for further information on special conditions and treatment.

### High Ambient Temperatures

Because standard thermal-magnetic breakers are temperature sensitive and calibrated for a specific ambient of 40°C (104°F) (average enclosure temperature), the presence of an ambient higher will cause the breaker to carry less current than its name-plate rating, in other words, causing the breaker to "derate" (see Table 1). Similarly, the safe current carrying capacity of a circuit conductor is based upon an ambient temperature of 30°C (86°F) (average air temperature) and the presence of a higher ambient will reduce its safe current carrying capacity, causing it to "derate." Thus, it can be seen from Table 1 that in the presence of a fluctuating temperature, a thermal-magnetic breaker will derate nearly parallel with its connected circuit conductors and maintain close circuit protection. If the application temperature exceeds 40°C (104°F) and is known, either a breaker especially calibrated for the higher ambients or one oversized according to Table 1 may be selected. It should be noted that in a case such as this, the circuit conductors should be oversized as well.

Siemens Sensitrip® III and Type SB Encased Systems Breakers are insensitive to temperature changes. However, they do include circuitry to protect the components from abnormally high temperatures.

### Moisture — Corrosion

For atmospheres having high moisture content and / or where fungus growth is prevalent, a special preventive treatment may be required.

Where the air is heavily laden with corrosive elements, breakers made with special corrosion-resistant finishes are recommended.

### Altitude

Reduced air density at altitudes greater than 6600 ft. (2000 meters) affects the ability for a molded case circuit breaker to transfer heat and interrupt faults. Therefore, circuit breakers applied at these altitudes should have interrupting insulation and continuous currents derated as indicated in Table 2.

**Table 2 — Altitude Correction**

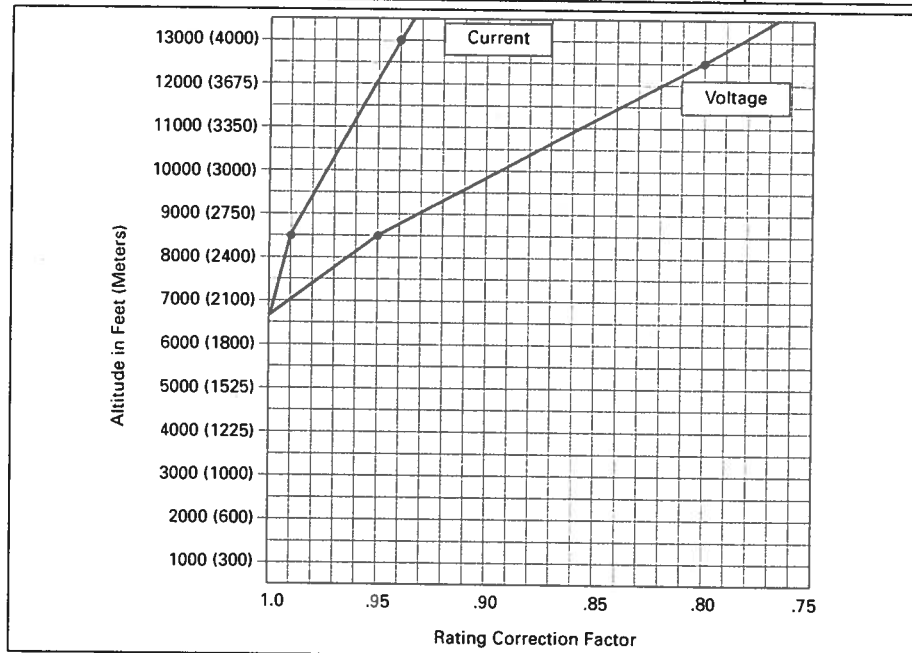
Altitude in feet (meters)	Rating Correction Factor	
	Continuous Current	Voltage
6600 (and below) (2000)	1.00	1.00
8500 (2600)	0.99	0.95
13000 (4000)	0.96	0.80

① Values for intermediate altitudes may be derived by linear interpolation, see Figure 1.

**Table 1 — Temperature Derating Data for Thermal-Magnetic Breakers**

Reference Ampere Rating at 40° C (104° F)	Relative Ampere Rating at:			Siemens Breaker Types	
	25° C (77° F)	50° C (122° F)	60° C (140° F)		
15	17	13	11	ED2	
20	22	18	16		
25	28	23	21		
30	33	28	26		
35	39	30	25		
40	44	37	34		
50	55	46	42		
60	66	56	52		
70	77	65	60		
90	99	84	78		
100	110	94	87		
125	137	114	100	QJ2 QJH2 QH2-H	
150	165	136	120		
175	192	159	140		
200	220	182	160		
225	247	205	180		
250	275	235	220	JXD2	
300	330	276	252		
350	385	325	301		
400	440	372	340		
500	550	468	435		
600	660	564	525	MXD6, MD6 HMXD6 HMD6 CMD6	
700	770	658	613		
800	880	754	704		
900	990	828	749	NXD6, ND6 HNXD6 HND6 CND6	
1000	1100	900	825		
1200	1320	1090	1000		
1400	1540	1304	1148		
1600	1760	1500	1320		
1800	1980	1690	1485		
2000	2200	1880	1650		
					PXD6, PD6 HPXD6, HPD6 CPD6
					FXD6 FD6 HFD6 CFD6
				LXD6 LD6 HLD6 HLD6 CLD6	

CIRCUIT BREAKERS



**Figure 1 — Altitude Adjustment Chart**

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REFERENCE

## Unusual Operating Conditions

### 400 / 415HZ Systems<sup>①</sup>

Siemens molded case circuit breakers can be applied for overcurrent protection on 400/415HZ systems, commonly used to power computer installations, and in conjunction with certain aircraft, military and other specialty equipment. Below are basic guidelines.

#### Circuit Breaker Derating Required

This table lists the maximum continuous current carrying capacity for Siemens breakers at 400/415HZ. Due to the increased resistance of the copper sections resulting from the skin effect produced by eddy currents at these frequencies, circuit breakers in many cases require derating. The thermal derating on these devices is based upon 100%, three-phase application in open air in a maximum of 40° C (104° F) with 48 in. (1219 mm) of the specified cable (75° C) of bus at the line and load side. Additional derating of not less than 20% will be required if the circuit breaker is to be utilized in an enclosure. Further derating may be required if the enclosure

contains other heat generating devices or if the ambient temperatures exceed 40° C (104° F).

#### Cable and Bus Sizing

The cable and bus sizes to be utilized at 400/415HZ are not based on standard National Electric Codes tables for 60HZ application. Larger cross sections are necessary to 400/415HZ to avoid exceeding component temperature limits. All bus bars specified are based upon mounting the bars in the vertical plane to allow maximum air flow. All bus bars are spaced at a minimum of 0.25 in. (6 mm) apart. Mounting of bus bars in the horizontal plane will necessitate additional drafting. Edgewise orientation of the bus may change the maximum ratings indicated. If additional information is required for other connections of cable or bus, contact Siemens for information.

#### Application Recommendations

It is recommended that thermal indicating devices be placed on the line and load terminals or T-connectors of

the center pole. These are usually the hottest terminals with a balanced load. A maximum temperature of 75° C (35° C over a maximum ambient of 40° C) would verify the maximum rating for the particular application. Temperature profiles taken on these breakers can be correlated to ensure that the hottest points within the breaker are within the required temperature limits.

#### Factory Configuration

When required, molded case circuit breakers may be factory calibrated for 400/415HZ application. These breakers are specially labeled for 400/415HZ usage and their nameplate current rating will include the necessary derating factory. The highest "Maximum Continuous Amperes" rating at 400/415HZ, found in Table 17.35 approximately equals the highest specially calibrated 400/415HZ nameplate ampere rating available for a given frame size. Contact Siemens for ordering information on other breakers applied in 400/415HZ systems.

CIRCUIT BREAKERS

### 400 / 415HZ Breakers

Siemens Breaker Type	Maximum Continuous Ampere Rating At 40° C (104° F) <sup>②</sup>			75° C (167° F) Copper Cable per Pole	
	60HZ		400/415HZ	No of Pieces	Wire Size
	Open Air	Open Air <sup>③</sup>	Enclosed After Derating		
ED2, ED4, ED6, HED4, HED6, CED6	15	15	12	1 pc.	#14
	20	20	16	1 pc.	#12
	25	25	20	1 pc.	#10
	30	30	24	1 pc.	#10
	35	35	28	1 pc.	#10
	40	40	32	1 pc.	#8
	45	43	34	1 pc.	#8
	50	48	38	1 pc.	#8
	60	57	46	1 pc.	#6
	70	67	54	1 pc.	#4
	80	76	61	1 pc.	#4
	90	86	69	1 pc.	#3
	100	95	76	1 pc.	#3
	110	105	84	1 pc.	#2
125	119	95	1 pc.	#1	
FD6, FXD6, HFD6, HFXD6, CFD6	70	63	50	1 pc.	#4
	80	72	58	1 pc.	#4
	90	80	64	1 pc.	#3
	100	90	72	1 pc.	#3
	110	95	75	1 pc.	#2
	125	105	84	1 pc.	#1
	150	125	100	1 pc.	#1/0
	175	140	112	1 pc.	#2/0
	200	160	128	1 pc.	#3/0
	225	180	144	1 pc.	#4/0
	250	200	160	1 pc.	250 kcmil
JXD2, JD6, JXD6, HJD6, HJXD6, HHJD6, HHJXD6, CJD6	200	170	136	1 pc.	#3/0
	225	190	152	1 pc.	#4/0
	250	210	168	1 pc.	250 kcmil
	300	240	192	1 pc.	350 kcmil
	350	260	208	1 pc.	500 kcmil
	400	300	240	2 pcs.	#3/0
JD6, JXD6, HJD6, HJXD6 100% Rated	200	170	170	2 pcs.	#3/0
	225	190	190	2 pcs.	#4/0
	250	210	210	1 pc.	250 kcmil
	300	240	240	1 pc.	350 kcmil
	350	260	260	1 pc.	500 kcmil
400	300	300	2 pcs.	#3/0	

Siemens Breaker Type	Maximum Continuous Ampere Rating At 40° C (104° F) <sup>②</sup>			75° C (167° F) Copper Cable per Pole		
	60HZ		400/415HZ	No of Pieces	Wire Size	
	Open Air	Open Air <sup>③</sup>	Enclosed After Derating			
LD6, LXD6, HLD6, HLXD6, HHLXD6, HHLXD6, CLD6	250	210	168	1 pc.	250 kcmil	
	300	240	192	1 pc.	350 kcmil	
	350	260	208	1 pc.	500 kcmil	
	400	300	240	2 pcs.	#3/0	
	450	340	272	2 pcs.	#4/0	
	500	375	300	2 pcs.	250 kcmil	
	600	420	336	2 pcs.	350 kcmil	
	LD6, LXD6, HLD6, HLXD6, 100% Rated	250	210	210	1 pc.	250 kcmil
		300	240	240	1 pc.	350 kcmil
		350	260	260	1 pc.	500 kcmil
400		300	300	2 pcs.	#3/0	
450		340	340	2 pcs.	#4/0	
500		375	375	2 pcs.	250 kcmil	
600		420	420	2 pcs.	350 kcmil	
500		400	320	2 pcs.	250 kcmil	
MD6, MXD6, HMD6, HMXD6, CMD6		600	430	360	2 pcs.	350 kcmil
		700	500	400	3 pcs.	250 kcmil
	800	560	448	3 pcs.	300 kcmil	
	MD6, MXD6, HMD6, HMXD6, CMD6 100% Rated	500	400	400	2 pcs.	250 kcmil
		600	430	430	2 pcs.	350 kcmil
700		500	500	3 pcs.	250 kcmil	
800		560	560	3 pcs.	300 kcmil	
800		560	448	3 pcs.	300 kcmil	
ND6, NXD6, HND6, HNXD6, CND6	900	600	480	3 pcs.	350 kcmil	
	1000	650	520	3 pcs.	400 kcmil	
	1200	780	624	4 pcs.	350 kcmil	
	ND6, NXD6, HND6, HNXD6, CND6	900	600	600	3 pcs.	350 kcmil
		1000	650	650	3 pcs.	400 kcmil
1200		780	780	4 pcs.	350 kcmil	
PD6, PXD6, HPD6, HFXD6, CPD6, 100% Rated		1200	780	624	4 pcs.	400 kcmil
		1400	850	680	4 pcs.	500 kcmil
	1600	960	768	5 pcs.	500 kcmil	
	PD6, PXD6, HPD6, HFXD6, CPD6	1200	780	780	4 pcs.	400 kcmil
		1400	850	850	4 pcs.	500 kcmil
1600		960	960	5 pcs.	500 kcmil	
RD6, RXD6, HRD6, HRXD6 80% Rated		1600	960	768	5 pcs.	500 kcmil
		1800	1080	864	5 pcs.	500 kcmil
	2000	1200	960	6 pcs.	500 kcmil	

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controlled testing, than on experience and engineering judgment. Contact Siemens for further information on special conditions and treatment.

② Additional derating may be required if the ambient

temperature is greater than 40° C (104° F).  
③ Calculated after derating to compensate for the heating of the copper conductor, caused by the skin effect generated by eddy currents produced at 400/415HZ.