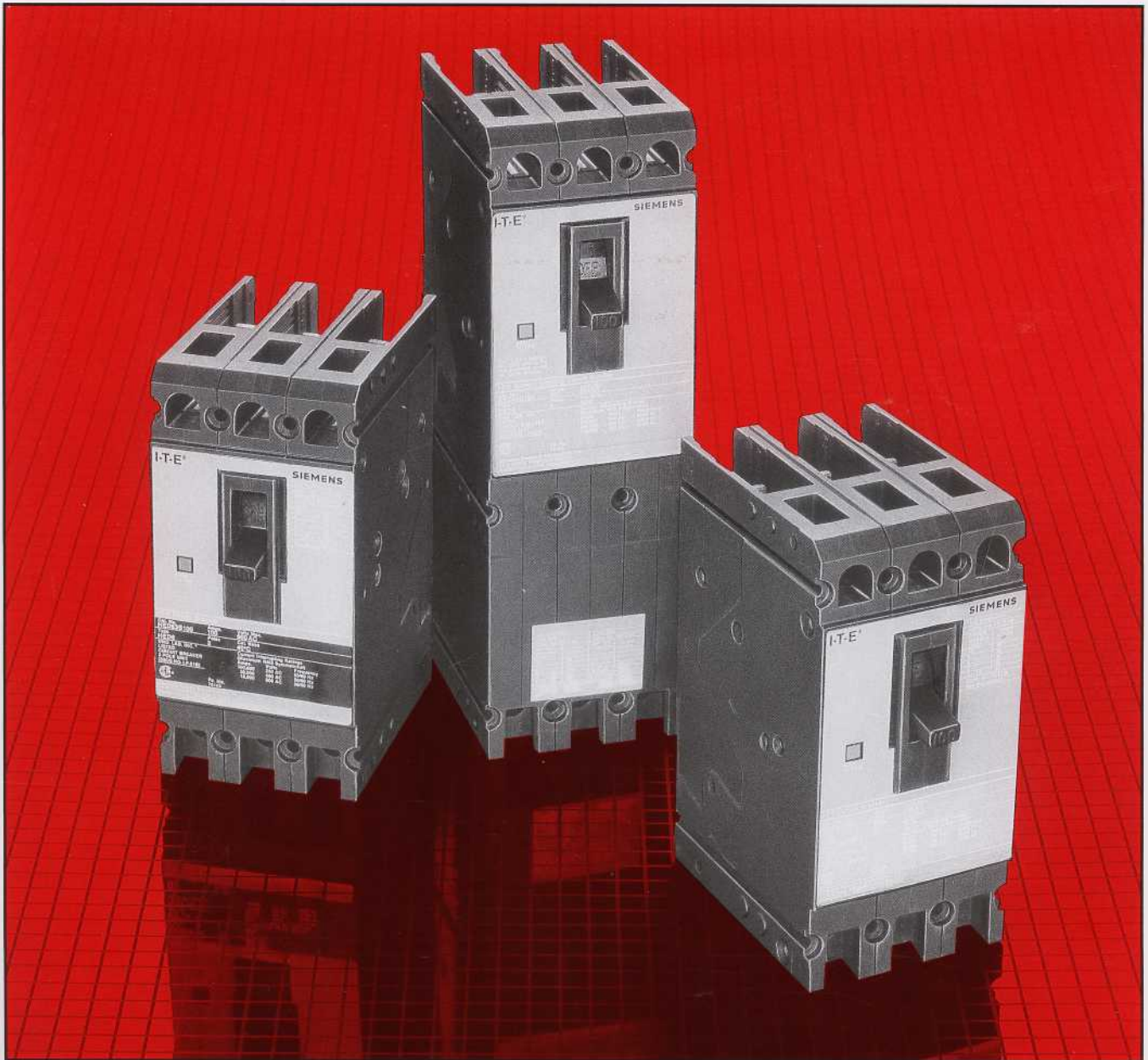


SIEMENS

I-T-E[®] Molded Case Circuit Breakers

ED-Frame
Information and
Instruction Guide



Information and Instructions

General Information

General

ED-Frame Sentron™ Series circuit breakers, as shown on pages 5-9, are for use in individual enclosures, switchboards, panelboards and load centers. They are available as thermal magnetic trip (types ED2, ED4, ED6, HED4, HED6, HHED6, CED6), current limiting (type CED6) instantaneous magnetic trip only (motor circuit protection—types ED6-ETI, CED6-ETI) and molded case switches (types ED2, ED4, ED6, HHED6, CED6).

CED6 type Sentron™ Series circuit breakers combine thermal magnetic construction for overload protection and an additional set of patented “blow-apart” contacts in conjunction with the ED-Frame’s standard patented “blow-apart” contacts. This arrangement provides for current-limiting protection under high fault interrupting conditions as outlined in the National Electric Code, Article 240-1^① and UL 489^② standards. CED6 type ED-Frame circuit breakers are fuseless and therefore require no blown fuses to be located and replaced should a high current fault occur. The common trip feature of the circuit breaker is completely retained so that all poles of the circuit breaker open when caused to trip due to an overload or short circuit.

Pressure wire connectors, suitable for use with aluminum or copper wire are available for all ED-Frame circuit breakers. Rear connection studs or plug-in connector assemblies are also available (1, 2 and 3-pole). The latter mounting arrangement permits removal of the circuit breaker from its leads without physically coming in contact with either the line or load terminals. Special features such as a shunt trip, auxiliary and alarm switches and undervoltage trip devices are available for field adaptation. The installation and/or removal of these devices is to be accomplished by qualified personnel only. These devices are mounted externally and Underwriters Laboratories listed, page 53. Information concerning them is found on pages 16-19 and 51.

Thermal Magnetic

ED2, ED4, ED6, HED4, HED6, HHED6, CED6 type circuit breakers provide complete overload and short circuit protection by use of a time delay thermal trip element and an instantaneous magnetic trip element. Fixed instantaneous trip values are shown in the table below:

Fixed Instantaneous Trip

Ampere Rating	Fixed Instantaneous Band
15-25	400-700
30-125	600-1000

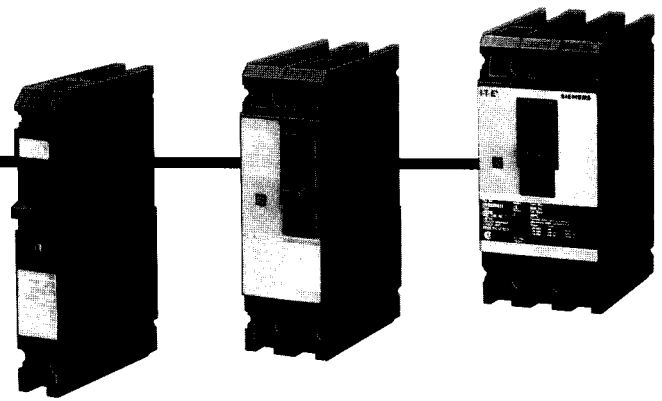
Circuit breakers are calibrated at the factory, under controlled temperature conditions for application at 40°C (104°F) ambient, to meet requirements as outlined in UL-489 standard for molded case circuit breakers. Catalog information is found on pages 48-50.

^① National Electric Code (240-11)

“A current limiting overcurrent protective device, which, when interrupting currents in its current limiting range, will reduce the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit, if the device were replaced with a solid conductor having comparable impedance.”

^② Underwriters Laboratories (UL 489, Par. 2.5)

“A circuit breaker that does not employ a fusible element and that when operating within its current limiting range, limits the let-through I²t to a value less than the I²t of a ½ cycle wave of the symmetrical prospective current.”



Molded Case Switch

A molded case switch is available in the ED2, ED4, ED6, HHED6, CED6 type circuit breakers. This device employs the same operating mechanism as the thermal magnetic and magnetic only units. A preset instantaneous function is factory installed to allow the switch to trip at a value over 1000A and protect itself against high fault conditions. No overload or low fault current protection is provided. This protection must be supplied by separate overcurrent devices. Catalog information is located on pages 48-51.

Interrupting Ratings—Symmetrical RMS Amperes (kA) Based on UL 489 Standards, UL File #E10848

Breaker Type	RMS Symmetrical Amperes (kA)							
	UL A.I.R.							
	AC				DC			
	120	240	277	480	600	125	250	500 ^①
ED2 (1-P)	10	—	—	—	—	10	—	—
ED2 (2,3-P)	—	10	—	—	—	—	5 (2-P)	—
ED4 (1-P)	65	—	22	—	—	5	—	—
ED4 (2,3-P)	—	65	—	18	—	—	30 (2-P)	—
ED6 (2,3-P)	—	65	—	25	18	—	30 (2-P)	18 (3-P)
HED4 (1-P) (15-30 Amps)	100	—	65	—	—	10	—	—
HED4 (1-P) (35-110 Amps)	100	—	25	—	—	10	—	—
HED4 (2,3-P)	—	100	—	42	—	—	30 (2-P)	—
HED6 (2,3-P)	—	100	—	30	18	—	30 (2-P)	25 (3-P)
HHED6 (2,3-P)	—	100	—	65	25	—	—	—
CED6 (2,3-P)	—	200	—	200	100	—	30 (2-P)	50 (3-P)

^① For 500VDC applications the customer’s power supply and load must be wired as shown in Figure 1 on page 4.

Breaker Type	RMS Symmetrical Amperes (kA)		
	IEC A.I.R. (157-P1)		
	Volts AC (50/60 Hz)		
	220/240	380/415	500
ED4 (3-P)	65	18	NA
HED4 (3-P)	100	42	NA
HED6 (3-P)	100	30	NA
CED6 (3-P)	200	200	NA

Breaker Type	IEC A.I.R. (947-2)					
	(Icu)	(Ics)	(Icu)	(Ics)	(Icu)	(Ics)
ED6 (3-P)	65	17	35	9	18	5

Instantaneous Trip

ETI motor circuit interrupters, types ED6-ETI, CED6-ETI (adjustable instantaneous magnetic trip only) are designed for use in welding circuits, motor circuits and combination starters where short circuit protection only is required. When used in combination starters, they serve in conjunction with motor protective relays to offer the best available protection. The relays guard against motor overloads and the circuit breaker provides short circuit protection. Catalog information is located on page 50.

Information and Instructions

Operation and Maintenance

Instantaneous Trip Adjustments

Motor Full Load Amperes	ETI Trip Setting ^①		Breaker Ampere Rating
	Adjustment	Amperes	
.20 - .33	Low	2.6	1
.34 - .45	2	4.5	
.46 - .56	3	6	
.57 - .68	4	7.5	
.69 - .81	High	9	
.53 - .83	Low	7	2
.84 - 1.14	2	11	
1.15 - 1.45	3	15	
1.46 - 1.68	4	19	
1.69 - 2.00	High	22	
.76 - 1.29	Low	10	3
1.30 - 1.75	2	17	
1.76 - 2.29	3	23	
2.30 - 2.68	4	30	
2.69 - 3.18	High	35	
1.23 - 1.99	Low	16	5
2.00 - 2.75	2	26	
2.76 - 3.52	3	36	
3.53 - 4.14	4	46	
4.15 - 4.90	High	54	
2.30 - 3.83	Low	30	10
3.84 - 5.37	2	50	
5.38 - 6.52	3	70	
6.53 - 7.68	4	85	
7.69 - 9.10	High	100	
4.23 - 6.91	Low	55	25
6.92 - 9.61	2	90	
9.62 - 11.91	3	125	
11.92 - 13.83	4	155	
13.84 - 16.40	High	180	
6.15 - 10.37	Low	80	30
10.38 - 14.22	2	135	
14.23 - 18.06	3	185	
18.07 - 20.75	4	235	
20.76 - 24.50	High	270	
8.84 - 14.22	Low	115	40
14.23 - 19.60	2	185	
19.61 - 24.99	3	255	
25.00 - 28.83	4	325	
28.84 - 34.00	High	375	
13.84 - 23.06	Low	180	50
23.07 - 31.52	2	300	
31.53 - 39.99	3	410	
40.00 - 46.14	4	520	
46.15 - 54.50	High	600	
24.23 - 41.52	Low	315	100
41.53 - 56.91	2	540	
56.92 - 68.45	3	740	
68.46 - 76.91	4	890	
76.92 - 90.90	High	1000	
38.46 - 55.37	Low	500	125
55.38 - 70.75	2	720	
70.76 - 84.60	3	920	
84.61 - 96.14	4	1100	
96.15 - 113.60	High	1250	

① All values calibrated within guidelines of UL 489.

Circuit Breaker Operation

With the mechanism latched and the contacts open, the operating handle will be in the OFF position. Moving the handle to the ON position closes the contacts and establishes a circuit through the breaker. Under overload or short circuit conditions sufficient to automatically trip or open the breaker, the operating handle moves to a position between ON and OFF. To relatch the circuit breaker after automatic operation, move the operating handle to the extreme OFF position. The circuit breaker is now ready for reclosing.

The overcenter toggle mechanism is trip free of the operating handle. The circuit breaker, therefore, cannot be held closed by means of the handle should a tripping condition exist. After automatic operation, the handle assumes an intermediate position between ON and OFF, thus displaying a clear indication of tripping.

Maintenance

Experience has shown that properly applied molded case circuit breakers normally do not require maintenance. However, some industrial users may choose to establish an inspection and maintenance procedure to be carried out on a regular basis. For detailed information, consult applicable NEMA publications or your local Siemens sales office.

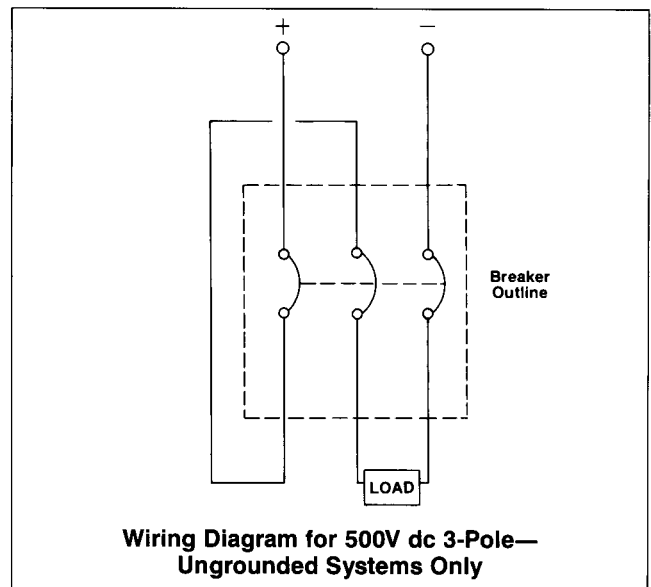
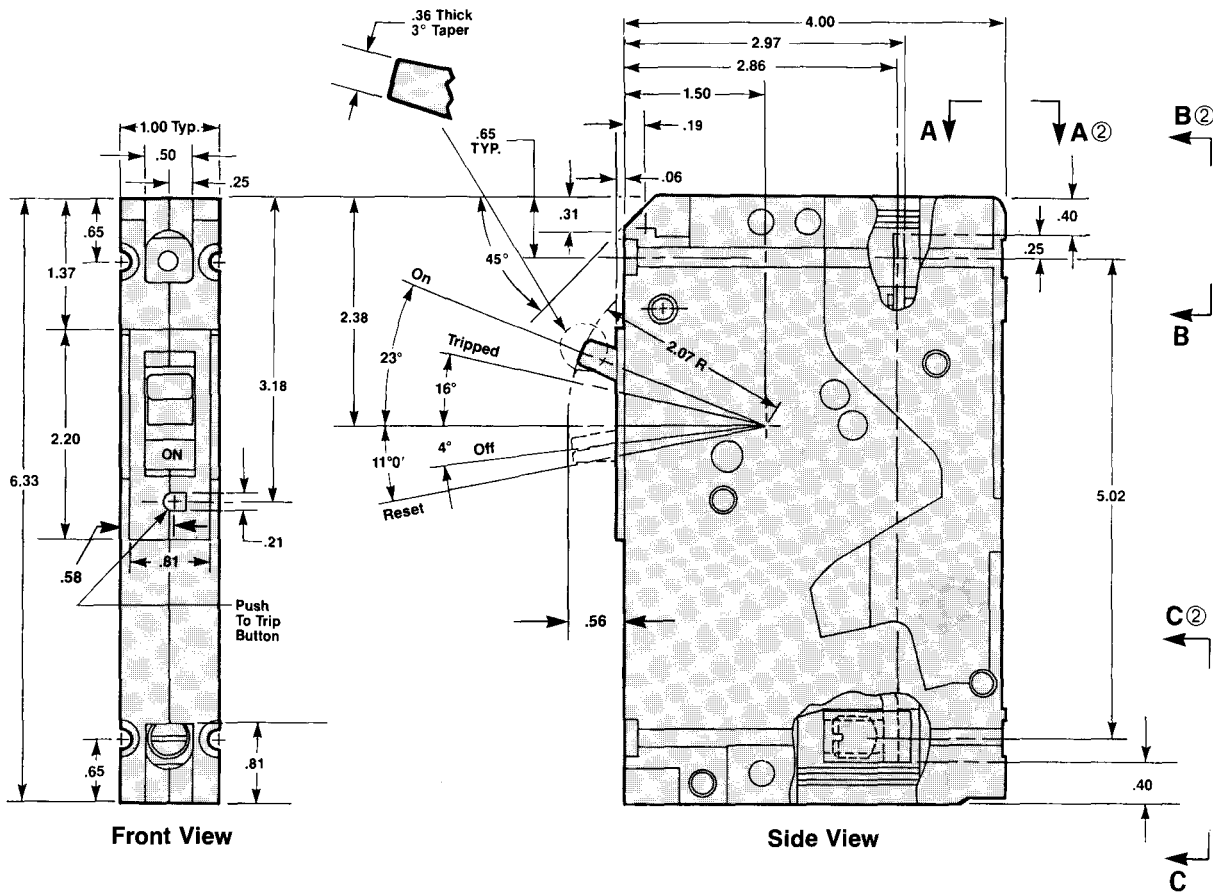


Figure 1

I-T-E ED-Frame Outline Drawings^① — 1-Pole

Types ED2, ED4, HED4,



Handle Operating Forces

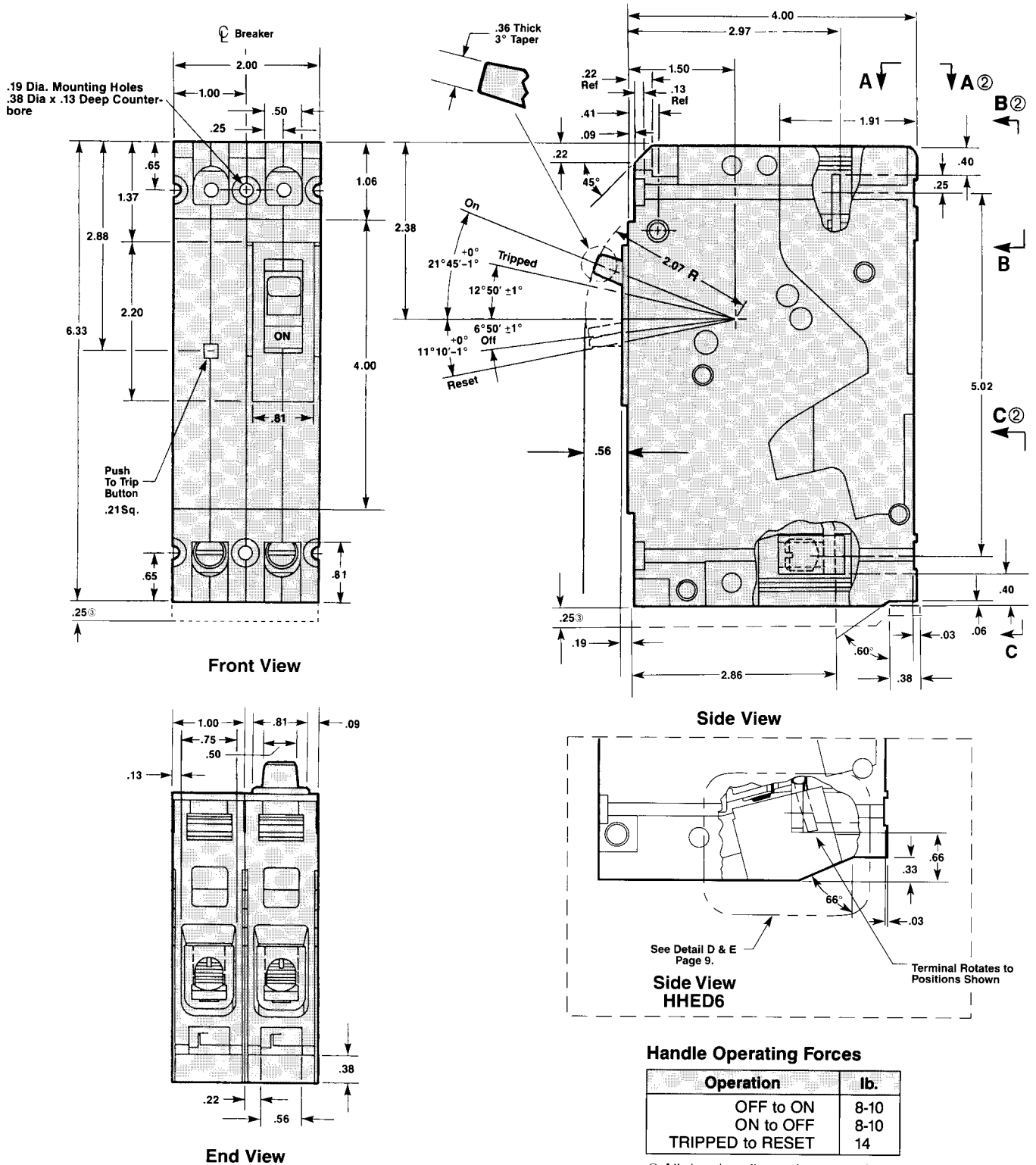
Operation	lb.
OFF to ON	4
ON to OFF	2
TRIPPED to RESET	6

① All drawing dimensions are shown in inches.

② See detail drawings on page 9.

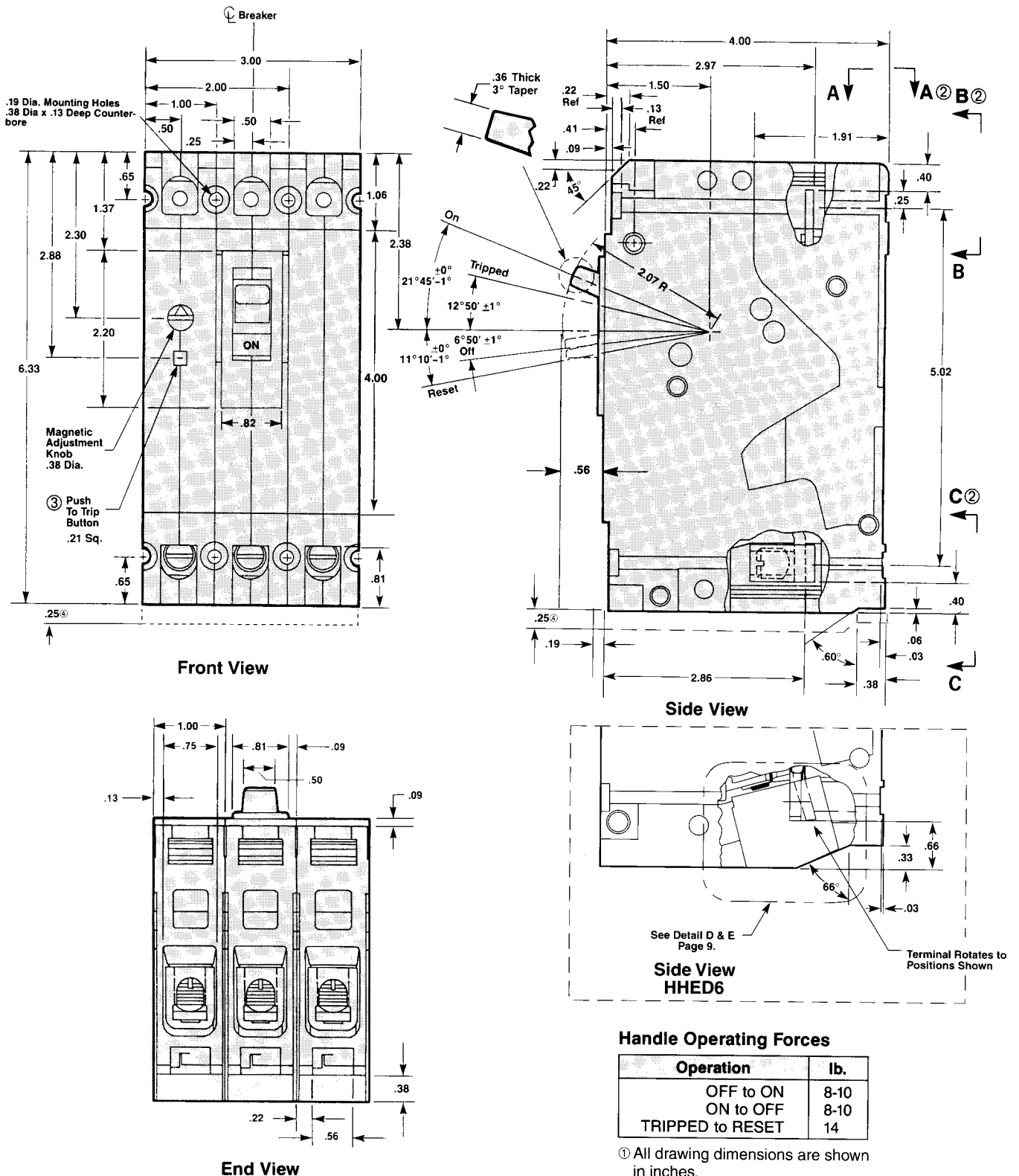
I-T-E ED-Frame Outline Drawings^①—2-Pole

Types ED2, ED4, ED6, HED4, HED6, HHED6



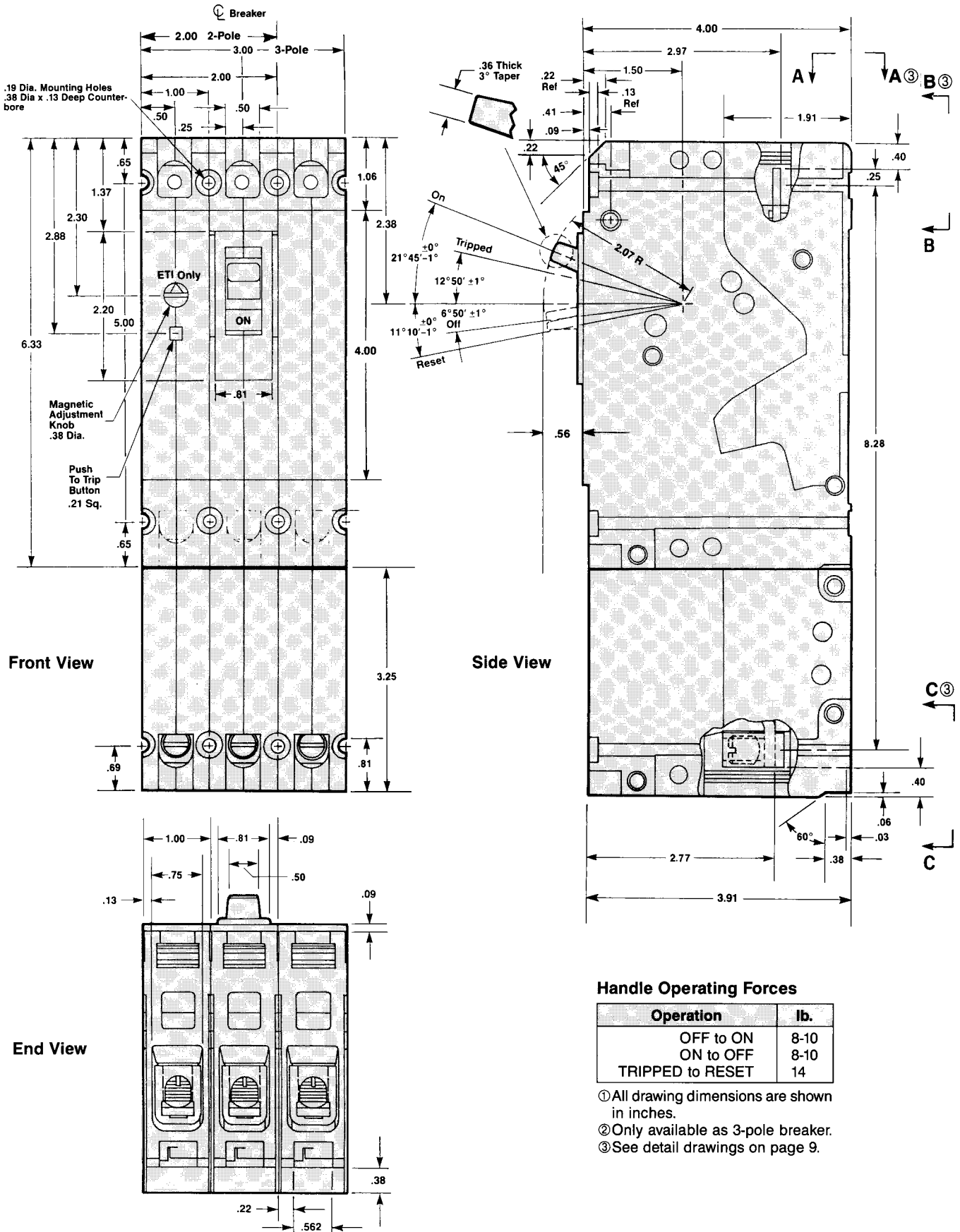
I-T-E ED-Frame Outline Drawings^①—3-Pole

Types ED2, ED4, ED6, HED4, HED6, HHED6, ED6-ETI



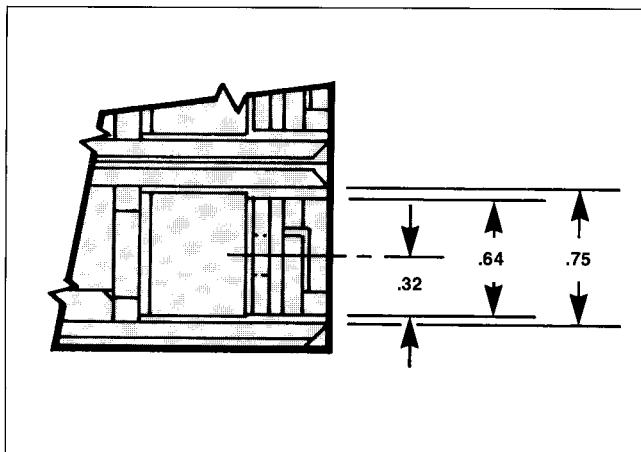
I-T-E ED-Frame Outline Drawings^①—2 and 3-Pole

Types CED6, CED6-ETI^②

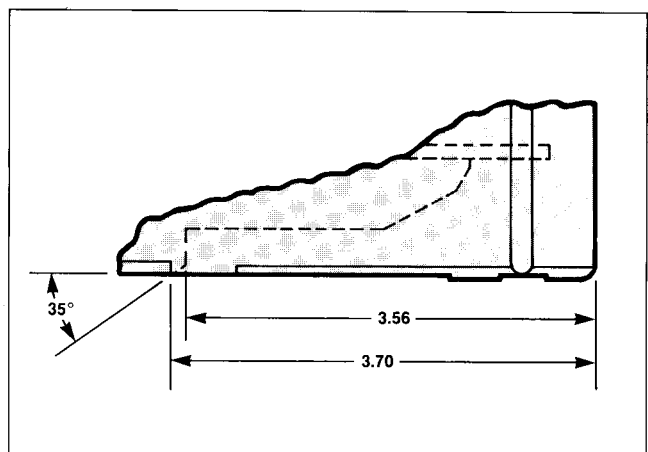


I-T-E ED-Frame Detail Drawings^①—1, 2 and 3-Pole

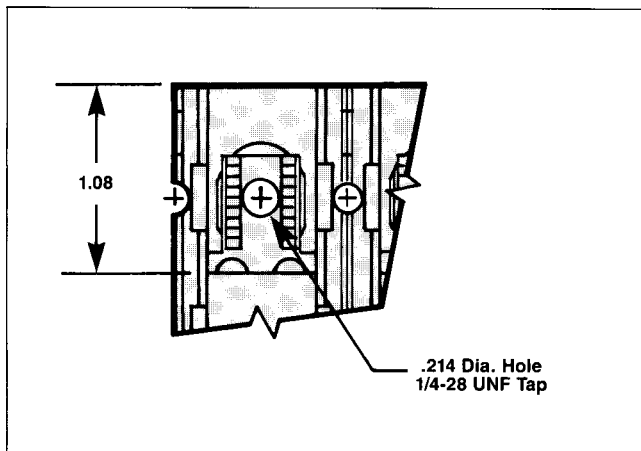
Types ED2, ED4, ED6, HED4, HED6, HHED6,
CED6, ED6-ETI, CED6-ETI



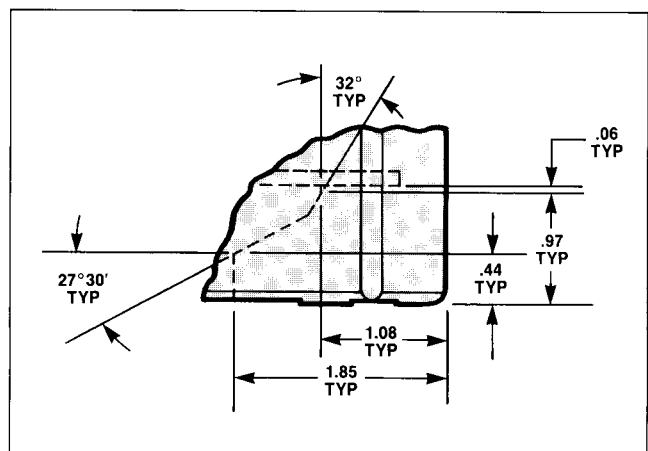
Detail A



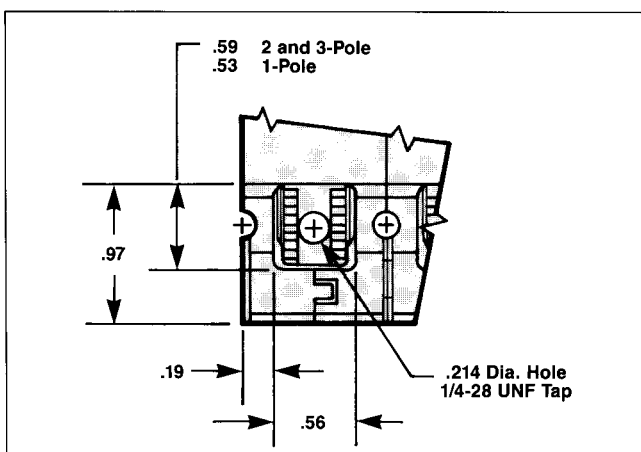
Thermal-Magnetic Breaker Line End Detail



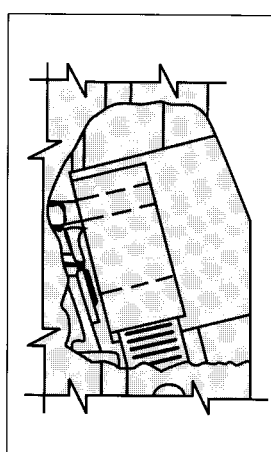
Detail B



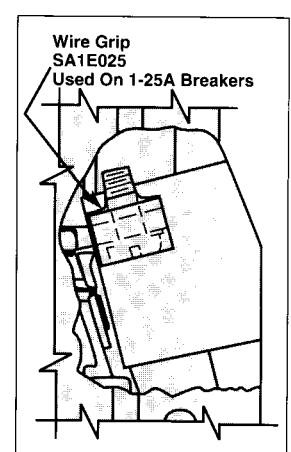
ETI Line End Detail



Detail C



Detail D



Detail E

①All drawing dimensions are shown in inches.

I-T-E Pressure Wire Connectors

⚠ DANGER
Hazardous Voltage.
Will cause death or severe injury.
Turn power off supplying switch-board or panel before installing.

⚠ SAFETY INSTRUCTIONS

- A. Place terminal connector body (1) onto breaker tab (2) in terminal cavity (3) (Figure 1).
- B. Insert cable into connector body between breaker tab and cable set screw, except SA1E025—place cable between breaker tab and connector body.
- C. Hold in place while tightening set screw (4) with a screwdriver or hex wrench on TA1E6125. See Table for proper wire size selection and screw tightening torque.

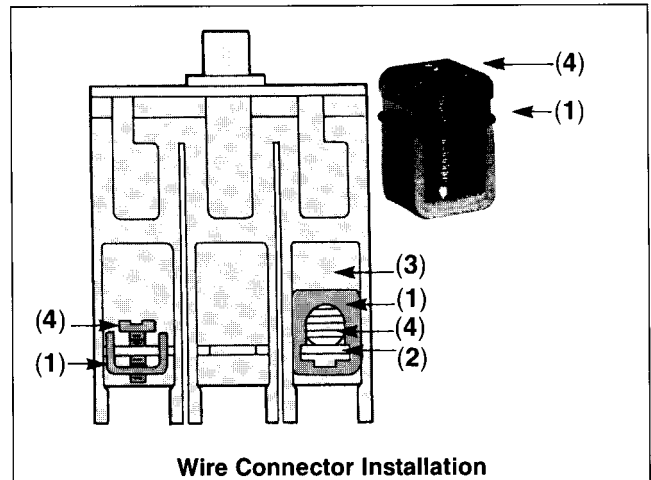


Figure 1

Wire Connectors and Tightening Torque

Connector Catalog Number	UL Connector Wire Range	Cable Wire Size	Cable Set Screw Tightening Torque In./Lb.	ED-Frame Breaker Type
SA1E025	(1 piece) #14-10 AWG (Cu) #12-10 AWG (Al)	#14-10 AWG	32	15-25A 1, 2 & 3-Pole Line & Load Side
LN1E100	(1 piece) #10-#2 AWG (Cu/Al)	#10 AWG #8 AWG #6-4 AWG #3 AWG #2-1/0 AWG	20 36 45 50 60	30-100A 1-Pole Line Side Only 2 or 3-Pole Line & Load Side All CED6 Line Side Only
LD1E060	(1 piece) #10 Cu #8-4 Cu/Al	#10 AWG #8 AWG #6-4 AWG	20 36 45	30-60A 1-Pole Load Side Only CED6 Load Side Only
LD1E100	(1 piece) #4 Cu #3-1/0 Cu/Al	#4 AWG #3-1/0 AWG #2-1/0 AWG	45 50 60	70-100A 1-Pole Load Side Only CED6 Load Side Only
TA1E6125	(1 piece) #3-3/0 Cu #1-2/0 Al	#3-3/0 AWG	80	110-125A 2 or 3-Pole Line & Load Side
TC1ED6150	(1 piece) #10-1/0 Cu	#10-1/0 Cu	100	30-125A 2 or 3-Pole Line & Load Side

I-T-E Shunt Trip and Undervoltage Trip

Electrical Check

Shunt Trip

- Reset and turn the circuit breaker handle to ON position.
- Connect test circuit to accessory terminals 1 and 2 (Figure 1).
- Preset test circuit voltage to 55 percent of the shunt trip voltage rating.
- Apply the 55 percent voltage rating value to the shunt trip device. *It must trip.*
- Remove test leads from terminals 1 and 2. Apply a continuity tester or ohm meter to the 1 and 2 terminals. Assure that coil limit contacts are open.

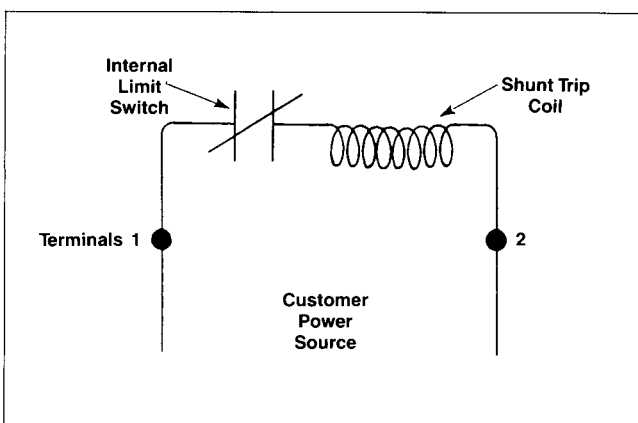


Figure 1

Undervoltage Trip

- With the circuit breaker in the OFF position, apply variable voltage supply leads to the accessory terminals marked 1 and 2 (Figure 2).
- Apply 100 percent of the accessory voltage rating to the undervoltage module.
- Turn the circuit breaker to the ON position. Breaker must remain closed.
- Reduce test voltage. Breaker must trip with voltage level between 70 and 35 percent of marked accessory rating.

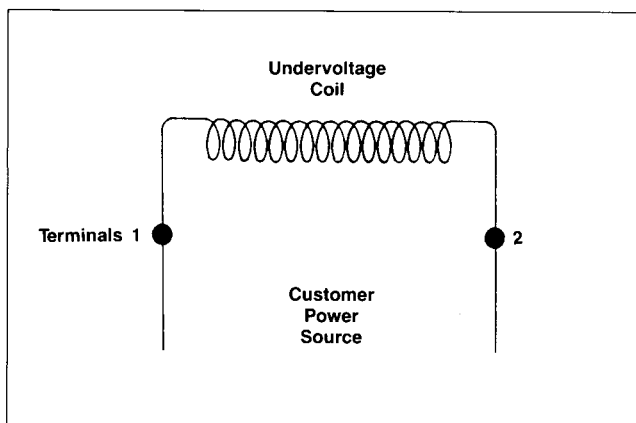


Figure 2

Electrical Data For Shunt Trip

Coil Voltage	Inrush Current At Rated Voltage (Amperes)	Catalog Number
60 Cycles AC		
24	1.200	S17ED60
48	0.800	S18ED60
120	0.395	S01ED60
208	0.265	S02ED60
240	0.165	S03ED60
277	0.190	S15ED60
480	0.145	S04ED60
600	0.080	S06ED60
DC		
24	2.20	S07ED60
48	1.20	S09ED60
125	0.50	S11ED60
250	0.35	S13ED60

Electrical Data For Undervoltage (UV) Trip

Coil Voltage	Sealed-In Current At Rated Voltage (Amperes)	Catalog Number
60 Cycles AC		
120	.030	U01ED60
208	.028	U02ED60
240	.016	U03ED60
277	.013	U16ED60
480	.008	U06ED60
600	.008	U08ED60
DC		
24	.110	U13ED60
48	.060	U14ED60
125	.027	U10ED60
250	.020	U12ED60

Shunt Trip and Undervoltage Trip Wiring Information

Tin plated accessory terminals, with binding head screws are provided. Terminals are suitable for use with No. 14-No. 22 AWG wire (Cu only) or 5/16 in. wide (max.) insulated crimp type connectors. Strip back wire 3/8 in. max.

I-T-E Auxiliary Switch and Bell Alarm Switch

Electrical Check

Auxiliary Switch Kits

Catalog Number	Number of Switches	Ampere Rating of Switch				
		Volts AC			Volts DC	
		120	240	480	125	250
A01ED62	1	5	15	—	.5	.25
A02ED62	2	5	15	—	.5	.25
A01ED64	1	15	15	15	.5	.25

All switch modules have 3 terminals (if single switch unit) 3, 5, 7; or 6 terminals (if double switch unit) 3, 5, 7-4, 6, 8.

Auxiliary Switch

- Use a buzzer or light attached to switch leads 7 and 5 (8 and 6 if double auxiliary switch module). With breaker in ON position, a light or buzzing noise should not be observed.
- Move handle to OFF position. Indicator light or buzzer should turn on.
- Attach test to leads 7 and 3 (8 and 4 if double auxiliary switch module). Light or buzzer should turn off.
- Move handle to ON position. Indicator light or buzzer should turn on. ①

① Should the indicator not function properly during "check" procedure, check for incorrect installation or wiring.

Bell Alarm Switch

- Check continuity of "B" and "B1" contacts per accessory label. See "Bell Alarm Switch" information on page 17 for definition of normal position.

Auxiliary Switch and Bell Alarm Switch Wiring Information

Auxiliary and bell alarm switches are three wire (3W) devices except for catalog number A02ED62B where the bell alarm switch is a two wire (2W) device, using terminals (1 and 2). Terminal connections and function are indicated on the accessory label.

Auxiliary switch contacts are either Type "A" or Type "B". Bell alarm switch contacts on three wire (3W), devices can be open or closed in the normal position. On two wire (2W) bell alarm switches, the contact is open in the normal position. The normal position refers to the deenergized state or OFF position of the circuit breaker. Auxiliary switch contacts are actuated when the circuit breaker closes. Type "A" contacts are OPEN when the breaker is OPEN. Type "B" contacts are CLOSED when the breaker is OPEN. Bell alarm switch contacts are actuated when the circuit breaker TRIPS.

Tin plated accessory terminals, with binding head screws are provided. Terminals are suitable for use with No. 14-No. 22 AWG wire (Cu only), or 5/16 in. wide (max.) insulated crimp type connectors. Strip back wire 3/8 in. max.

Auxiliary and Bell Alarm Switch Terminal Number and Contact Position Diagram

Accessory	Breaker Condition		
	TRIP	OFF	ON
Auxiliary Switch			
Second Auxiliary Switch ①			
Alarm Switch			
Alarm Switch Catalog Number A02ED62B Only			

① Used for devices containing two auxiliary switches, all Shunt Trip and Under-voltage Trip catalog numbers having an "AA" suffix and Auxiliary Switch catalog numbers A02ED62 and A02ED62B.

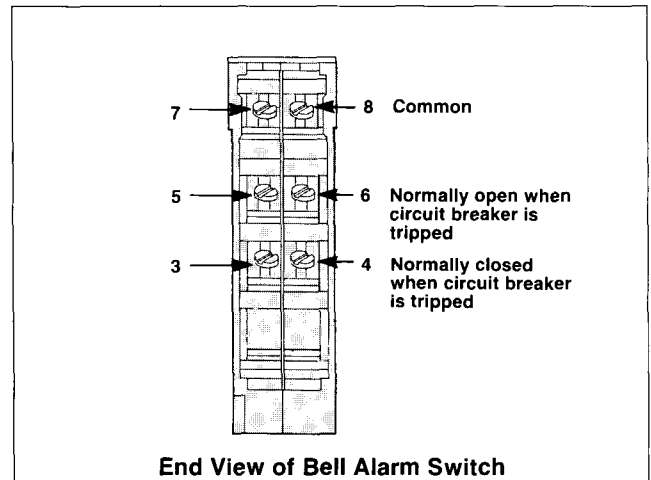
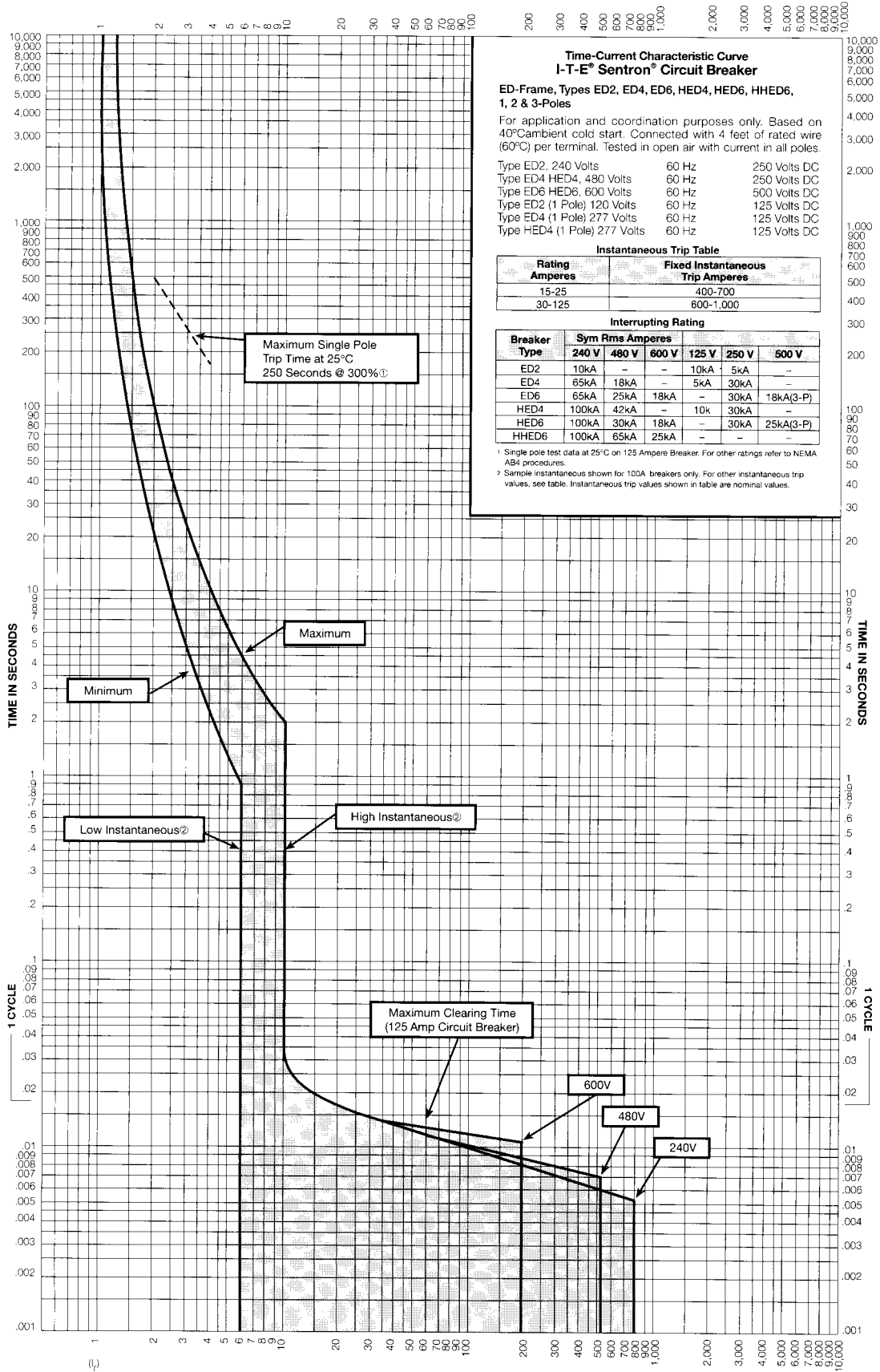


Figure 1

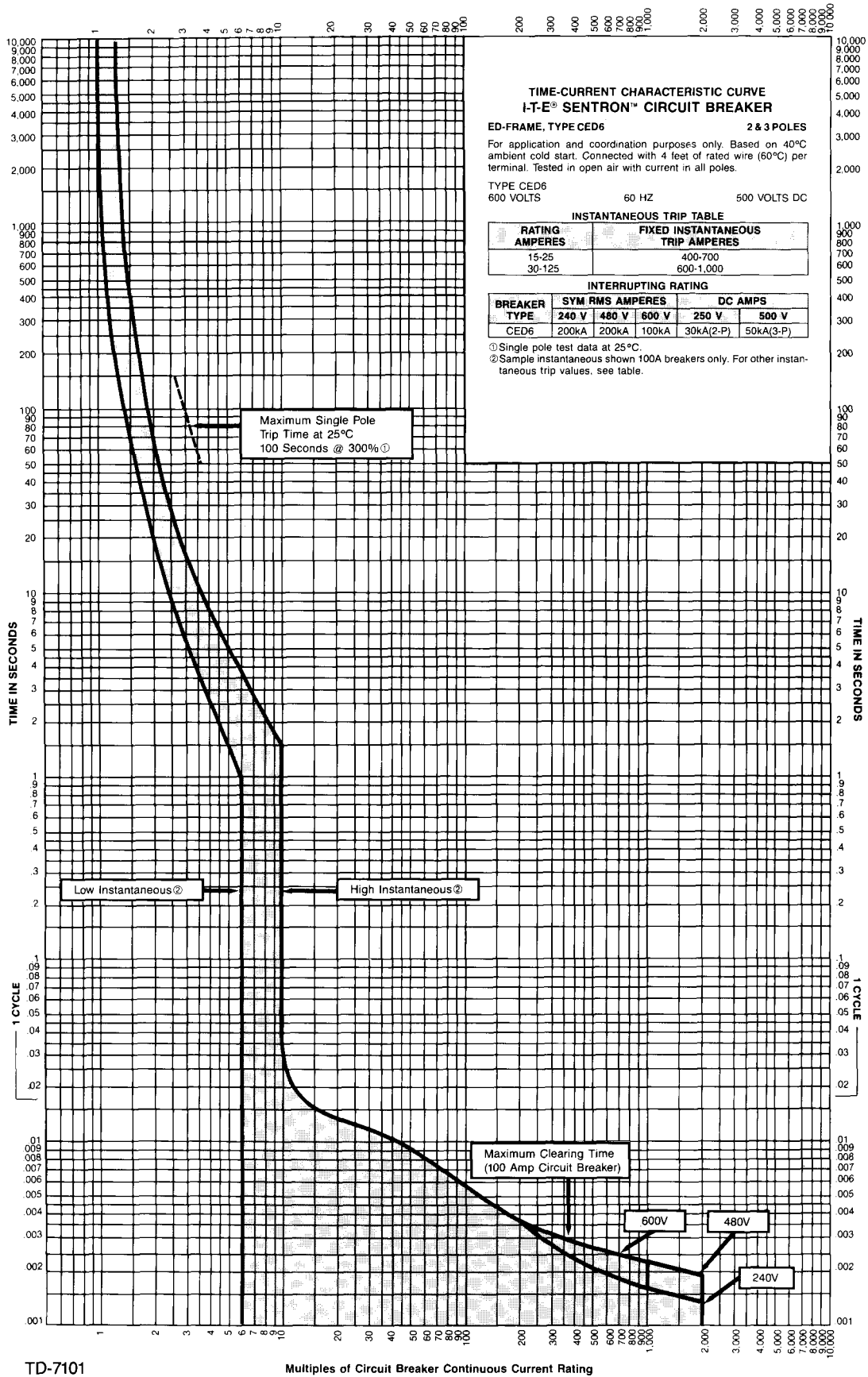
ED-Frame Time Current Curve

Types ED2, ED4, ED6, HED4, HED6, HHED6



ED-Frame Time Current Curve

Type CED6



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