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## Circuit Breakers

DIN rail-mounted equipment protection

# To choose a circuit breaker, determine the following:

## The normal current load (nominal current)

Specify the size of the breaker in amps based on the normal current load.

## Possible types of failure

Match the short-circuit and overload protection requirements to the performance characteristics of the breaker.

## Rupture capacity

Specify the breaker, knowing the maximum fault current that can be repeatedly (3x minimum) interrupted without failure of the breaker.

## Maximum interrupting capacity

Choose the breaker, knowing the maximum current at a given voltage that the breaker can interrupt safely without damage to surrounding components.

## The wire size the breaker must accommodate

Determine if the breaker can accept the wire sizes required.

## How fast the circuit breaker must react to a fault condition

Specify a breaker by selecting a speed that avoids nuisance tripping but protects against component damage.

## How many poles are needed

Determine the number of poles needed that are connected electrically and structurally.

## Functional requirements of the breaker

Define the requirements for visual inspection, switching, auxiliary circuits or space.

## Environmental factors – temperature, moisture, vibration

Determine if there are unusual conditions in which the breaker must operate.



## DIN rail-mounted

# Thermal Miniature and Thermal Magnetic Circuit Breakers



## Thermal Miniature Circuit Protection (TCP)

Thermal circuit protectors use heat-sensitive bimetallic elements that respond to overload electrical currents.

- **Thermal Miniature Circuit Protectors** are compact protectors designed to interrupt an electric current under overload conditions. The protector can accommodate ten nominal currents ranging from 0.10 A to 10 A.

After an overload has occurred, TCP breakers are easily reset by pushing the reset button. The breakers can be plugged into UK 6-FSI/C (screw) or ST 4-FSI/C (spring) terminal blocks for convenient DIN rail mounting.



## Thermal Magnetic Circuit Breakers (TMC)

Thermal Magnetic circuit breakers interrupt an electrical current under overload or short-circuit conditions. They have both thermal circuit interruption and magnetic interruption functions. The thermal function uses heat-sensitive bimetallic elements that respond to overload currents. The magnetic function responds to very high current overloads such as those that might occur during short-circuit conditions.

- **TMC 42** breakers are available in one- or two-pole configuration for currents ranging from 0.10 to 16 amps. TMC 42 breakers can be snapped directly on a DIN rail. They are reset by pushing a red reset button.
- **TMC 60** breakers are available in one-, two-, or three-pole configurations for currents ranging from 0.5 to 63 amps. TMC 60-Series breakers can be snapped directly on a DIN rail. They are reset by moving the toggle switch to the green (activation) position.
- **TMC 1** breakers are available in one-, two- or three-pole configurations for currents ranging from 0.1 to 32 amps. This high-density breaker has built-in auxiliary contacts. TMC 1 breakers can be snapped directly on a DIN rail. They are reset by moving the toggle switch to the I (activation) position.

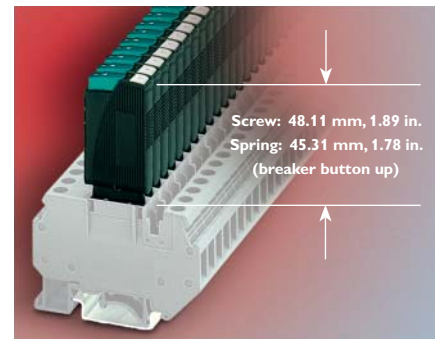




# Thermal (Miniature) Circuit Protectors (TCP)

TCPs are compact circuit protectors designed to interrupt an electric current under overload conditions. There are ten nominal current ratings available, ranging from 0.10 A to 10 A.

TCP protectors are trip-free and reset easily after a current interruption by pushing the reset button. The protector can be plugged into UK 6-FSI/C or ST 4-FSI/C fuse base terminal blocks for convenient DIN rail-mounting.



	[V AC]	[V DC]
Nominal Voltage	250	72

Technical Data	Type	Order No.	Pcs./Pkt.
<b>Thermal Circuit Breaker</b>	Nominal current [A]		
plugged into UK 6-FSI/C or ST 4-FSI/C base terminal blocks	0.10	TCP 0.10	07 12 10 7
	0.25	TCP 0.25	07 12 12 3
	0.50	TCP 0.5	07 12 15 2
	1.00	TCP 1	07 12 19 4
	2.00	TCP 2	07 12 21 7
	3.00	TCP 3	07 12 23 3
	4.00	TCP 4	07 12 25 9
	6.00	TCP 6	07 12 27 5
	8.00	TCP 8	07 12 29 1
	10.00	TCP 10	07 12 31 4

(1) Flat Zack strip, unprinted, 10-section for labeling the upper marker grooves	<b>ZBF 5:WH:</b> <b>Unprinted</b>	08 08 64 2	10
--	--------------------------------------	------------	----

Technical data in accordance with IEC/DIN VDE			
Nominal voltage	[V AC] / [V DC]	250 / 72	
Nominal current	[A]	0.10-10	
Ambient temperature	°C	-20...+60	

Interrupting capacity			
for nominal currents of 0.10 - 4 A	[A]	6x rated current *	
for nominal currents of 6 - 10 A	[A]	8x rated current **	
for short circuit		2,000 Amps	

Insulating material		Polymide (PA), non-reinforced
Inflammability class in accordance with UL 94		V0
Approval data (UL and c/UL)	[V AC] / [V DC] / [A]	250 / 72 / 0.1-10

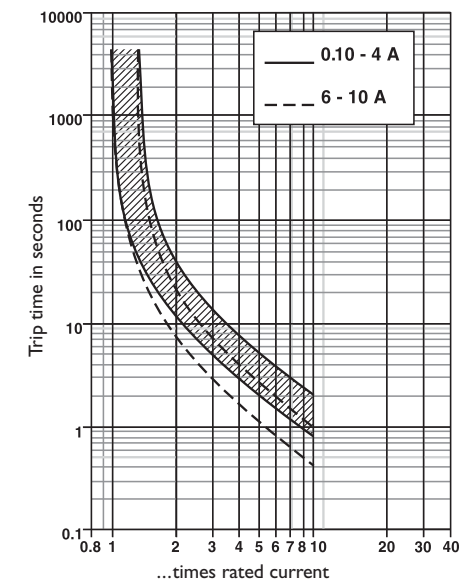
\* If fault current exceeds 6 times I<sub>n</sub>, TCP may require replacing.  
 \*\* If fault current exceeds 8 times I<sub>n</sub>, TCP may require replacing.

## Thermal Miniature Circuit Breaker TCP compared to glass fuses

TCP Feature	TCP	Glass Fuses
Convenience	Reset with reset button when overload is resolved	Storing, ordering and locating issues
Deterioration	Virtually no aging	Age with eventual failure at normal loads
Life expectancy	3,000 operations at current rating, 500 operations at 2x current rating	Unknown
Interruption detection	Visual identification	Status not determined until fuse is removed from its holder
ON / OFF capability	Switch duty actuator allows product to operate as an electrical switch	Not applicable
Hot-swappable	May be removed or replaced under load	Not applicable
Controlled trip	Avoids nuisance trips due to high in-rush currents	Not applicable

## Technical data for TCP

Time/current characteristic curve  
 Ambient temperature 23 C



## Nominal currents and internal resistances

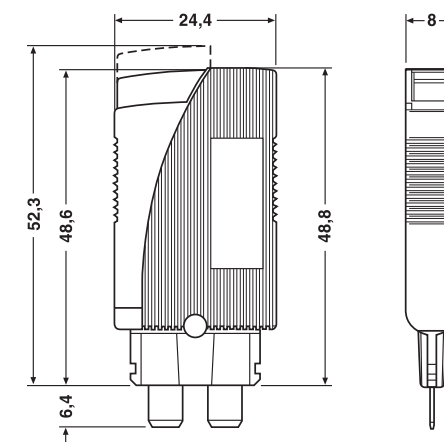
Nominal current [A]	Internal resistance [W]
0.1	81
0.25	14
.5	3.4
1	0.9
2	0.25
3	0.11
4	0.07
6	≤ 0.05
8	≤ 0.05
10	≤ 0.05

The time/current characteristic curve depends on the ambient temperatures. To avoid a premature or late switch-off, the nominal current of the circuit breaker must be multiplied with a temperature factor.

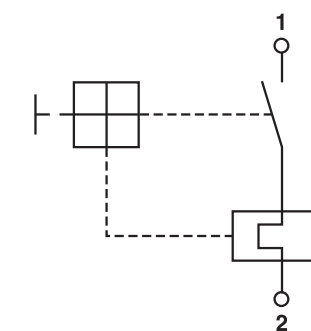
Ambient temperature °F	-4	14	32	73.4	104	122	140
°C	-20	-10	0	23	40	50	60
<b>Temperature factor</b>	<b>0.76</b>	<b>0.84</b>	<b>0.92</b>	<b>1</b>	<b>1.08</b>	<b>1.16</b>	<b>1.24</b>

NOTE: If the TCP circuit protectors are mounted side-by-side with less than the minimum of 1 mm of space for air movement, then do not exceed 80 percent of their rating.

## Dimensional drawing



## Switching diagram

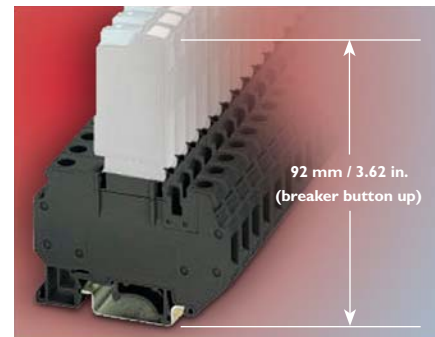


# Thermal Miniature Circuit Protector Base

## Base terminal block with screw connection for accommodating the TCP circuit breaker UK 6-FSI/C

(IEC)	rigid	flexible			
[mm <sup>2</sup> ]	solid	stranded	AWG	[A]	[V]
Connection data	0.2 - 10	0.2 - 6	24 - 8	*	250*

\*The current and voltage are determined by the thermal circuit breaker



Technical Data	Type	Order No.	Pcs./Pkt.
<b>Fuse Terminal Block</b> with universal foot for mounting on NS 32 or NS 35 DIN rails	<b>UK 6-FSI/C</b>	<b>31 18 20 3</b>	<b>50</b>
<b>Fuse Terminal Block</b> as shown above with light indicator	Light indicator / voltage [V DC]	Current [mA]	
	LED red / 12	2.0	<b>UK 6-FSI/C-LED 12</b>
	LED red / 24	2.0	<b>UK 6-FSI/C-LED 24</b>
<b>(1) Fixed Bridge</b> for cross connections in the terminal center, screw heads with insulating collar, 10-position, divisible, with 10 screws	<b>FBI 10-8</b> $i_{max}:34 A$	<b>02 03 26 3</b>	<b>50</b>
<b>(2) Separating Plate</b> for electrical separation of neighboring bridges, can be fitted later, no loss of pitch	<b>TS-KK 3</b>	<b>27 70 21 5</b>	<b>100</b>
<b>(3) Zack Strip, 10-section, white</b>	<b>ZB 8: UNPRINTED</b>	<b>10 52 00 2</b>	<b>10</b>
<b>(4) Screwdriver</b>	<b>SZS 1.0 x 4.0</b>	<b>12 05 06 6</b>	<b>10</b>
<b>Dimensions</b>			
Width / length	[mm / in.]	Width: 8.2 mm / 0.32 in.; Length: 64 mm / 2.52 in.	
Height (NS 35:7.5/NS 35:15/NS 32)	[mm / in.]	NS 35:7.5: 7.5 mm / 0.30 in.; NS 35:15: 15 mm / 0.60 in.	
<b>Technical data in accordance with IEC/DIN VDE</b>			
Fuse type ISO/DIS 8820/DIN 72-581-3	-	C	
Maximum current with single arrangement <sup>1)</sup>	[A]	30	
<b>Maximum power dissipation</b>			
Rated surge voltage / contamination class	[kV] / -	4 / 3	
Surge voltage category / insulation material group	- / -	III / I	
<b>Connection capacity</b>			
Stranded with ferrule without/with plastic sleeve [mm <sup>2</sup> / in. <sup>2</sup> ]	Without: 0.25-6 mm <sup>2</sup> / 0.00039-0.00930 in. <sup>2</sup> ; With: 0.25-4 mm <sup>2</sup> / 0.00039-0.00620 in. <sup>2</sup>		
<b>Multi-conductor connection (2 cond. with same cross section)</b>			
Solid / stranded	[mm <sup>2</sup> ]	Solid: 0.2-2.5; Stranded: 0.2-2.5	
Stranded with ferrule without plastic sleeve	[mm <sup>2</sup> ]	0.25 - 2.5	
Stranded with TWIN ferrule with plastic sleeve	[mm <sup>2</sup> ]	0.5 - 4	
<b>Stripping length</b>	[mm]	10	
<b>Internal cylindrical gauge (IEC 60 947-1)</b>	A5		
<b>Screw thread/torque</b>	- / [Nm] / in. lbs	M 4 / 1.5-1.6 / M 4 / 13.3-14.2	
<b>Insulation material</b>	Polyamide (PA), non-reinforced		
Inflammability class in accordance with UL 94	V0		
Approval data (UL and cUL) <sup>2)</sup>	UL: [V] / [A] / AWG	300 / 30 / 26 - 8	
Nom. voltage / nom. current / conduc. sizes	cUL: [V] / [A] / AWG	300 / 30 / 26 - 8	

<sup>1)</sup> Special arrangement on request

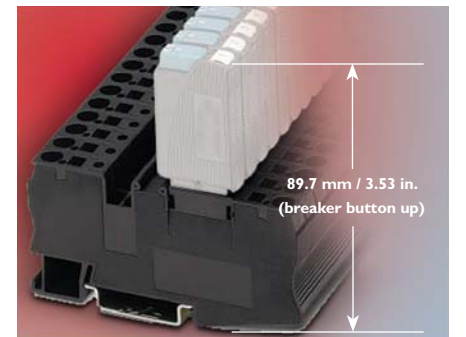
<sup>2)</sup> File number E 140459

# Thermal Miniature Circuit Protector Base

## Base terminal block with spring-cage connection for accommodating the TCP circuit breaker ST 4-FSI/C

(IEC)	rigid	flexible			
[mm <sup>2</sup> ]	solid	stranded	AWG	[A]	[V]
Connection data	0.2 - 6	0.2 - 4	24 - 10	*	400*

\*The current and voltage are determined by the thermal circuit breaker



Technical Data	Type	Order No.	Pcs./Pkt.
<b>Fuse Terminal Block</b> with universal foot for mounting on 35 DIN rail	<b>ST 4-FSI / C</b>	<b>30 36 37 2</b>	<b>50</b>
<b>Fuse Terminal Block, <sup>1)</sup></b> as shown above with light indicator	Light indicator / voltage [V DC]	Current [mA]	
	LED red / 12	2.0	<b>ST 4-FSI / C-LED12</b>
	LED red / 24	2.0	<b>ST 4-FSI / C-LED 24</b>
<b>(1) Insulating stop sleeve</b> , prevents unintentional clamping of the insulation in the case of smaller cross sections			
Cross section range	0.25-0.5 mm <sup>2</sup> / 0.0039-0.0077 in. <sup>2</sup> 0.75-1 mm <sup>2</sup> / 0.00116-0.00155 in. <sup>2</sup>	Gray Black	<b>ISH 4 / 0.5</b> <b>ISH 4 / 1</b>
<b>(2) Plug-in bridge</b> , for cross connections in the terminal center			
	2-position	<b>FBS 2-8</b> $i_{max}:41 A$	<b>30 30 28 4</b>
	3-position	<b>FBS 3-8</b> <b>41A</b>	<b>30 30 29 7</b>
	4-position	<b>FBS 4-8</b> <b>41A</b>	<b>30 30 30 7</b>
	5-position	<b>FBS 5-8</b> <b>41A</b>	<b>30 30 31 0</b>
	10-position	<b>FBS 10-8</b> <b>41A</b>	<b>30 30 32 3</b>
<b>(3) Test adapter</b> , for 4 mm Ø test adapter PS and 4 mm safety test plugs, making contact in the bridge shaft		<b>PAI 4</b>	<b>30 30 92 5</b>
<b>(4) 2.3 mm Ø test plug <sup>2)</sup></b> , consisting of a metal part and a red insulating sleeve		<b>MPS-RD</b>	<b>02 01 55 3</b>
<b>(5) Modular test plug</b> , can be labeled with ZBFM 8		<b>PS 8</b>	<b>30 31 00 5</b>
<b>(6) Zack marker sheet</b> , flat, 50-section, for labeling in the outer marker grooves		<b>ZBFM 8/WH: UNPRINTED</b>	<b>08 00 73 4</b>
<b>(7) Zack strip</b> , 10-section, for labeling in the terminal center		<b>ZB 8: UNPRINTED</b>	<b>10 52 00 2</b>
<b>(8) Screwdriver</b> , for actuating the spring cage		<b>SZF 1 - 0.6x3.5</b>	<b>12 04 51 7</b>
<b>Dimensions</b>			
Width / length	[mm / in.]	Width 8.2 mm / 0.32 in. / Length 86.5 mm / 3.4 in.	
Height (NS 35:7.5/NS 35:15)	[mm / in.]	7.5 mm / 0.30 in. / 15 mm / 0.60 in.	
<b>Technical data in accordance with IEC/DIN VDE</b>			
Fuse type ISO/DIS 8820/DIN 72 581-3	-	C	
Maximum current with single arrangement	[A]	30	
<b>Maximum power dissipation</b>			
Rated surge voltage / contamination class	[kV] / -	6 / 3	
Surge voltage category / insulation material group	- / -	III / I	
<b>Connection capacity</b>			
Stranded with ferrule without / with plastic sleeve	[mm <sup>2</sup> ] / AWG	0.25-4 mm <sup>2</sup> / 24-12	
Stranded with TWIN ferrule with plastic sleeve	[mm <sup>2</sup> ] / AWG	0.5-1 mm <sup>2</sup> / 20-18	
<b>Stripping length</b>	[mm / in.]	10 / 0.39	
<b>Internal cylindrical gauge (IEC 60 947-1)</b>	A4		
<b>Insulation material</b>			
Inflammability class in accordance with UL 94	Polyamide (PA), non-reinforced		
Approval data (UL and cUL)	UL: [V] / [A] / AWG	300 / 30 / 24 - 10	
Nominal voltage/nominal current/conduc. sizes	cUL: [V] / [A] / AWG	300 / 30 / 24 - 10	

<sup>1)</sup> If the fuse is defective, the downstream circuit is not off-load

<sup>2)</sup> Additional colors are available on request

# Thermal Magnetic Circuit Breaker

## TMC 42-01/42-02

One- and two-pole thermal magnetic circuit breaker with tease-free, trip-free, snap action mechanism and two-button operation (M-type TMCBE to IEC 934). The one-pole features a narrow profile housing, recessed terminals, standard DIN rail-mounting and precision CBE performance.

### Typical Applications

Circuit protection for process control systems, equipment manufacturers and instrumentation.

### Approvals

Authority	Voltage Ratings	Current Ratings
VDE, Demko	AC 250V, DC 65V	0.10 to 16 A
UL 1077, CSA	AC 250V, DC 80V	0.10 to 16 A

### Label Slot

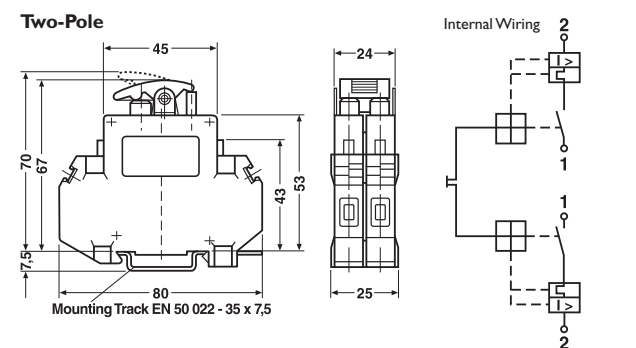
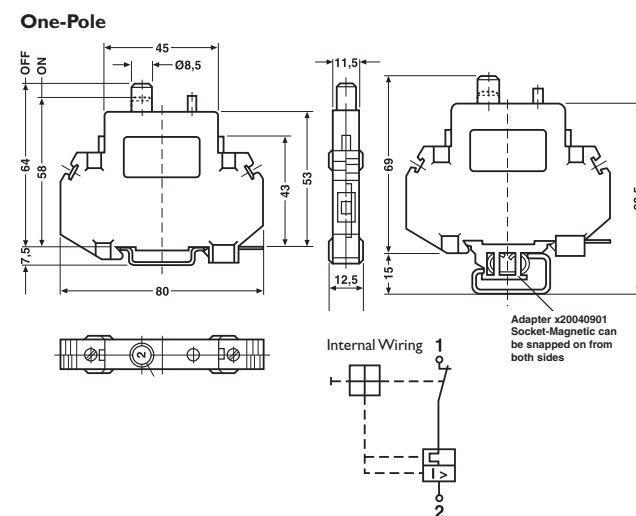


### Technical Data

<b>Maximum Voltage Rating</b>	250V AC, 50 / 60 Hz; 80V DC		
<b>Current Rating Range</b>	42-01 : 0.10...16 A		
<b>Typical Life</b>	5,000 operations at 2 x I <sub>n</sub>		
<b>Temperature Range</b>	0° to 55° C (32° to 131° F)		
<b>Creepage Resistance</b>	PTI 600 to IEC 112		
<b>Insulation Coordination (IEC 664 and 664A)</b>	Rated Impulse Withstand Voltage	Pollution Degree	
Operating Area	4k V	3	
<b>Dielectric Strength (IEC 664 and 664A)</b>	Test Voltage		
Operating Area	AC 4,000V (double insulation)		
<b>Insulation Resistance</b>			
<b>Interrupting Capacity</b>	>100 MΩ (DC 500V)		
<b>(VDE 0660, Part 101, P-2)</b>	0.05 to 0.8 A	Self Limiting	
	1 to 2 A	200 A	
	2.5 to 16 A	400 A	
<b>Interrupting Capacity (UL 1077/EN60934 PC1)</b>	I <sub>N</sub>	U <sub>N</sub>	Self Limiting
	0.05 to 16 A	250V AC	1,000 A
	0.05 to 16 A	80V DC	1,000 A

<b>Environmental Protection (IEC 529/DIN 40050)</b>	Operating Area IP 40, Terminal Area IP 20	
Vibration	5g (57-50 Hz), +0.38 mm (10-57 Hz) to IEC 68-2-6, Test Fc 10 frequency cycles/axis	
<b>Shock</b>	25g (11ms) to IEC 68-2-27, Test Ea	
<b>Corrosion</b>	96 hours at 5% saltspray to IEC 68-2-11, Test Ka	
<b>Humidity</b>	240 hours at 95% RH to IEC 68-2-3, Test Ca	
<b>Weight</b>	Approx. 60g	
<b>Conductor Size</b>	0.5-6mm <sup>2</sup> (AWG 20-AWG 10)	
<b>Recommended Torque</b>	0.8 Nm max	
<b>Mounting Adapter</b>	5650505 (TMC 42 C-Rail Adapter)	

### Dimension

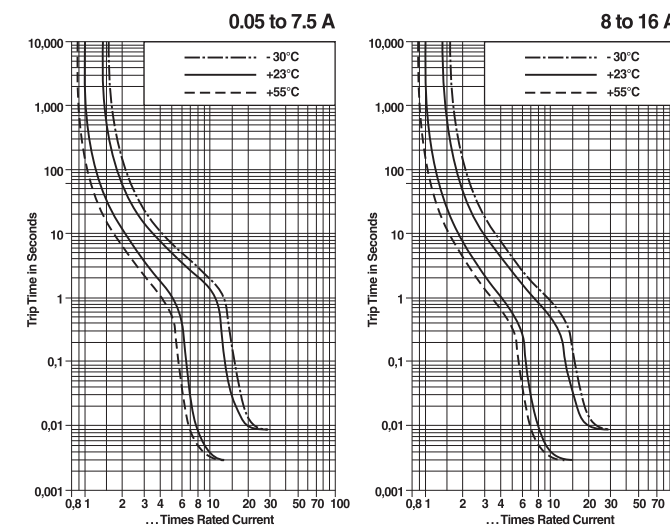


## Standard current ratings and typical internal resistance values

Thermal Magnetic Circuit Breakers					
Ohms	Current Rating	TMC 42-01 One-Pole		TMC 42-02 Two-Pole	
		Type	Part#	Type	Part #
447.00	0.05	TMC42-01-0.05 A	5600509*	N/A	N/A
131.00	0.10	<b>TMC42-01-0.1 A</b>	<b>5530915</b>	TMC42-02-0.1 A	5650123*
40.00	0.20	TMC42-01-0.2 A	5650102*	TMC42-02-0.2 A	5650124*
19.30	0.30	TMC42-01-0.3 A	5650103*	TMC42-02-0.3 A	5650127*
10.40	0.40	<b>TMC42-01-0.4 A</b>	<b>5530944</b>	TMC42-02-0.4 A	5531244*
7.10	0.50	TMC42-01-0.5 A	5650106*	TMC42-02-0.5 A	5531257*
4.30	0.60	TMC42-01-0.6 A	5530960*	TMC42-02-0.6 A	5531260*
3.30	0.70	N/A	N/A	TMC42-02-0.7 A	5650128*
2.50	0.80	TMC42-01-0.8 A	5530986*	TMC42-02-0.8 A	5531286*
1.67	1.00	<b>TMC42-01-1.0 A</b>	<b>5650108</b>	<b>TMC42-02-1.0 A</b>	<b>5531299</b>
1.22	1.22	TMC42-01-1.2 A	5531008*	TMC42-02-1.2 A	5531309*
0.61	1.50	<b>TMC42-01-1.5 A</b>	<b>5650109</b>	TMC42-02-1.5 A	5650129*
0.55	1.80	TMC42-01-1.8 A	5650110*	TMC42-02-1.8 A	5531325*
0.38	2.00	<b>TMC42-01-2.0 A</b>	<b>5600314</b>	<b>TMC42-02-2.0 A</b>	<b>5531338</b>
0.24	2.50	TMC42-01-2.5 A	5650113*	TMC42-02-2.5 A	5650130*
0.19	3.00	<b>TMC42-01-3.0 A</b>	<b>5650114</b>	<b>TMC42-02-3.0 A</b>	<b>5650131</b>
0.16	3.50	TMC42-01-3.5 A	5531053*	TMC42-02-3.5 A	5531367*
0.09	4.00	<b>TMC42-01-4.0 A</b>	<b>5531066</b>	TMC42-02-4.0 A	5650134*
0.09	4.50	TMC42-01-4.5 A	5650115*	TMC42-02-4.5 A	5650135*
0.06	5.00	<b>TMC42-01-5.0 A</b>	<b>5531082</b>	<b>TMC42-02-5.0 A</b>	<b>5651396</b>
0.07	5.50	TMC42-01-5.5 A	5531095*	TMC42-02-5.5 A	5531406*
0.04	6.00	<b>TMC42-01-6.0 A</b>	<b>5531105</b>	TMC42-02-6.0 A	5650136*
0.04	6.50	TMC42-01-6.5 A	5650116*	TMC42-02-6.5 A	5650137*
0.03	7.00	TMC42-01-7.0 A	5650117*	TMC42-02-7.0 A	5531435*
0.02	8.00	<b>TMC42-01-8.0 A</b>	<b>5650120</b>	TMC42-02-8.0 A	5650138*
0.02	9.00	TMC42-01-9.0 A	5531147*	TMC42-02-9.0 A	5531451*
<0.02	10.00	<b>TMC42-01-10 A</b>	<b>5650121</b>	<b>TMC42-02-10 A</b>	<b>5531464</b>
<0.02	11.00	TMC42-01-11 A	5531163*	TMC42-02-11 A	5531477*
<0.02	12.00	TMC42-01-12 A	5650122*	TMC42-02-12 A	5650141*
<0.02	13.00	TMC42-01-13 A	5531189*	TMC42-02-13 A	5531493*
<0.02	14.00	TMC42-01-14 A	5531192*	TMC42-02-14 A	5531503*
<0.02	15.00	<b>TMC42-01-15 A</b>	<b>5600310</b>	<b>TMC42-02-15 A</b>	<b>5600309</b>
<0.02	16.00	<b>TMC42-01-16 A</b>	<b>5531202</b>	TMC42-02-16 A	5650142*

\* Indicates breakers that are made-to-order and may require an 8 to 10 week lead time.

## Typical time / current characteristics at 23 degrees Celsius



Direct Current – Magnetic tripping currents are increased by 30 percent in DC circuits with the effect of shifting the magnetic trip range 30 percent to the right of AC trip curves.

The time/current characteristic curve depends on the ambient temperature prevailing. In order to eliminate nuisance tripping, multiply the circuit breaker current ratings by the derating factor shown below.

Ambient temperature								
°F	-22	-4	14	32	73.4	104	122	140
°C	-30	-20	-10	0	23	40	50	60
<b>Derating factor</b>	<b>0.76</b>	<b>0.79</b>	<b>0.83</b>	<b>0.88</b>	<b>1</b>	<b>1.08</b>	<b>1.16</b>	<b>1.24</b>

# Thermal Magnetic Circuit Breakers - UL 1077

## TMC 60 Series for mounting on 35 mm DIN rail

### Overview

The TMC 60 Series provides supplemental overload and short-circuit protection. An interrupt capacity of 10 kAIC at 480 / 277V AC and DC ratings make the series ideal for a wide range of applications.

These DIN rail-mountable circuit breakers are available in one-, two- and three-pole configurations. An auxiliary contact in S- or H-function status output is also available. The TMC 60 Series is UL recognized, CSA approved and carries the CE mark.

### Typical Application

Circuit protection for power supplies, UPS, controller I/O points, relay/contactors coils, control circuits, appliances and motor circuits.



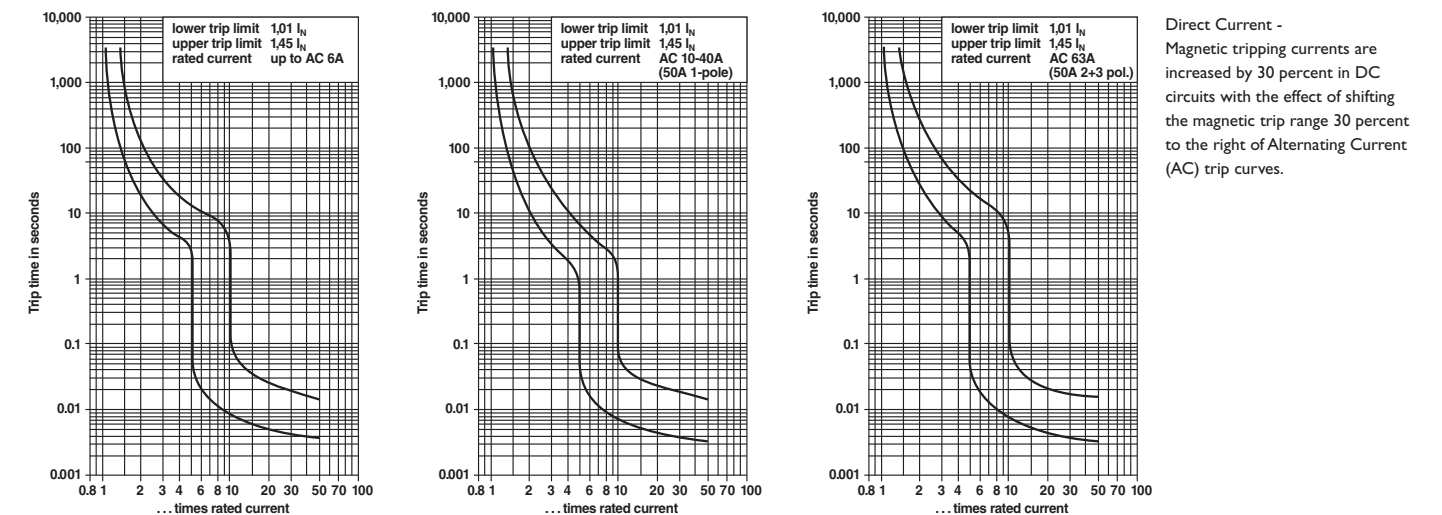
### Technical Data

<b>Maximum Voltage Rating</b>	AC 277 / 480 V	<b>Vibration</b>	3 g (10 to 55 Hz) to IEC 68-2-6
<b>Interrupting Capacity</b>	10,000 Amps	<b>Trip Characteristics</b>	C: 0.5-63A
<b>Current Rating Range</b>	0.05 A to 63 A	<b>Torque</b>	4.5 Nm / 39.8 lb <sub>f</sub> -in
<b>Temperature Range</b>		<b>Vibration (per IEC 60077)</b>	3 g (in x, y, z direction)
Operating Temperature	-25° to +55°C (-13° to +131°F)	<b>Plastics Rating per UL 94</b>	V0
Storage Temperature	-55° to +55°C (-67° to +131°F)	<b>Protection Level</b>	IP 20
<b>Insulation Values (IEC 664 and 664A)</b>	Rated Impulse Withstand Voltage	Pollution Degree	
Operating Area	6.0 kV	3	
<b>Insulation Resistance</b>	>100 MΩ (DC 500V)		
<b>Life at Rated Current Mechanical</b>	6,000 operations (UL tested) 10,000 operations		
<b>Cable Size</b>	max 35 mm <sup>2</sup> / AWG 2 (LINE) max 25 mm <sup>2</sup> / AWG 3 (LOAD) max 2.5 mm <sup>2</sup> / AWG 12 (auxiliary circuits)		
Minimum 1 mm <sup>2</sup> or AWG 16 for all circuits. Use a ferrule with wire sizes smaller than 16 AWG.			
<b>Configuration</b>	1 pole	2 pole	3 pole
<b>Weight</b>	125 g	250 g	375 g

### Standard current ratings and typical internal resistance values

One-pole		Two-pole		Three-pole	
Part Number	Description	Part Number	Description	Part Number	Description
0902014	TMC 61C 0,5A	0902166	TMC 62C 0,5A	0902315	TMC 63C 0,5A
0902027	TMC 61C 01A	0902179	TMC 62C 01A	0902328	TMC 63C 01A
0902030	TMC 61C 02A	0902182	TMC 62C 02A	0902331	TMC 63C 02A
0902043	TMC 61C 03A	0902195	TMC 62C 03A	0902344	TMC 63C 03A
0902056	TMC 61C 04A	0902205	TMC 62C 04A	0902357	TMC 63C 04A
0902069	TMC 61C 06A	0902218	TMC 62C 06A	0902360	TMC 63C 06A
0902072	TMC 61C 10A	0902221	TMC 62C 10A	0902373	TMC 63C 10A
0902085	TMC 61C 13A	0902234	TMC 62C 13A	0902386	TMC 63C 13A
0902098	TMC 61C 16A	0902247	TMC 62C 16A	0902399	TMC 63C 16A
0902108	TMC 61C 20A	0902250	TMC 62C 20A	0902409	TMC 63C 20A
0902111	TMC 61C 25A	0902263	TMC 62C 25A	0902412	TMC 63C 25A
0902124	TMC 61C 32A	0902276	TMC 62C 32A	0902425	TMC 63C 32A
0902137	TMC 61C 40A	0902289	TMC 62C 40A	0902438	TMC 63C 40A
0902140	TMC 61C 50A	0902292	TMC 62C 50A	0902441	TMC 63C 50A
0902153	TMC 61C 63A	0902302	TMC 62C 63A	0902454	TMC 63C 63A

### Typical time/current characteristics at 23 degrees Celsius



(multipole types: all poles symmetrically loaded)

The time/current characteristic curve depends on the ambient temperature prevailing. In order to eliminate nuisance tripping, multiply the circuit breaker current ratings by the derating factor shown at right.

Amps	Temperature														
	-20°C -4°F	-15° +5°	-10° +14°	-5° +23°	0° +32°	+5° +41°	+10° +50°	+15° +59°	+20° +68°	+25° +77°	+30° +86°	+35° +95°	+40° +104°	+45° +113°	+50° +122°
0.5 - 4.0	0.84	0.85	0.87	0.88	0.89	0.91	0.93	0.94	0.96	0.98	1.00	1.02	1.04	1.06	1.09
8.0 - 10	0.75	0.77	0.78	0.81	0.83	0.85	0.88	0.90	0.93	0.96	1.00	1.04	1.09	1.14	1.20
13 - 40	0.79	0.80	0.82	0.84	0.86	0.88	0.90	0.93	0.94	0.97	1.00	1.03	1.06	1.11	1.15
50-60	0.81	0.83	0.84	0.85	0.87	0.89	0.91	0.93	0.94	0.97	1.00	1.02	1.05	1.09	1.12



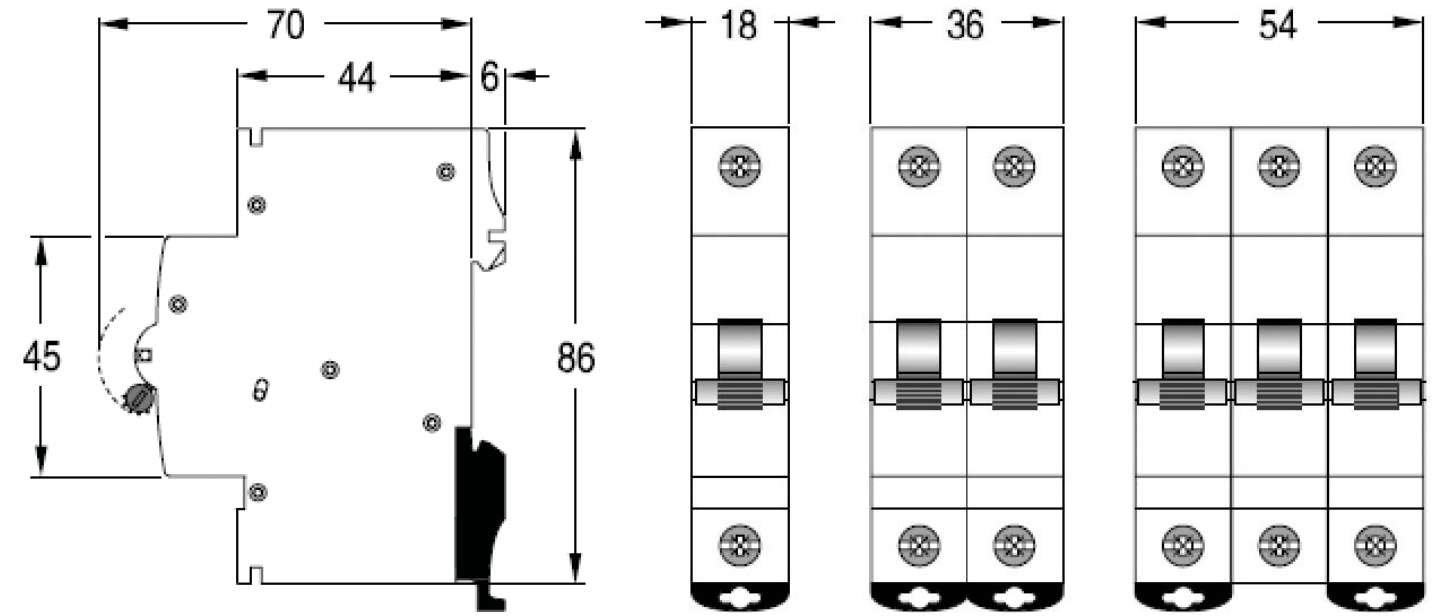
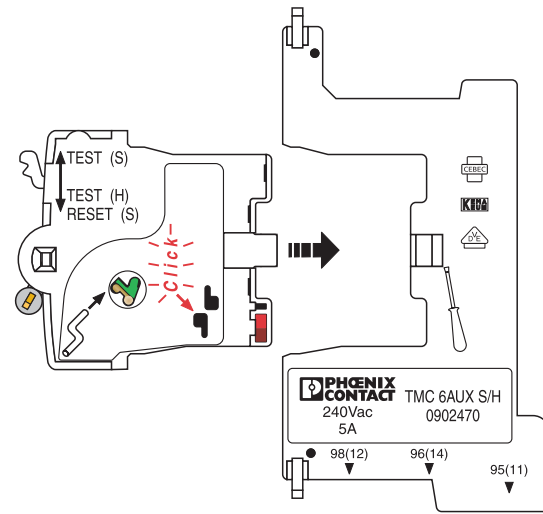
# Thermal Magnetic Circuit Breakers - UL 1077

## TMC 60 Series Accessories

### Technical Data

Auxiliary Contact		
Ratings	Voltage / Current	AC 240 V / 5 A
		DC 24 V / 4 A
	DC 60 V / 1 A	DC 220 V / 0.4 A
Contacts	1 Form C	
Rated Wire Sizes	2.5 mm <sup>2</sup> / 14 AWG	
Weight	70 g	
Contact Functions*	Auxiliary (H) or Signal (S)	

\*The TMC 6AUX S / H can operate as either an auxiliary contact (H function) or a signal contact (S function). The operation of the auxiliary switch is determined at the time of installation. The operation of the auxiliary switch is determined at the time of installation. The signal contact (function S) status provides the automatic trip status of the protection device. The auxiliary (H function) provides the OPEN/ CLOSED status of the protective device. A test button on the front of the auxiliary switch simulates functions S or H. The test button also acts as a reset for the trip signal (function S) contacts.



### Dimensions

Note: all measurements in millimeters

## Accessories



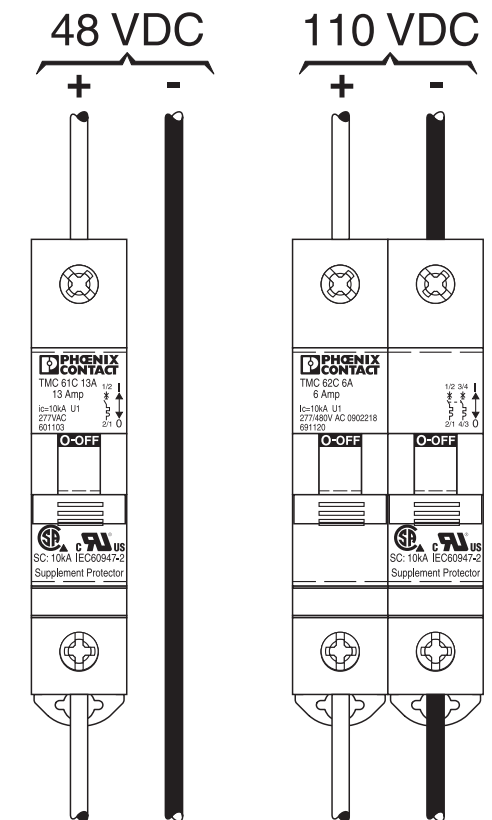
Auxiliary Contact	Lock Out Component	3-Phase Comb Bridge	Single Row Comb Bridge
0902470 TMC 6AUX S / H	0902467 TMC 6LOCKOUT	2809241* 3-Phase / 6 position	2809212* Single Phase / 3 position

\* Available in up to 57 positions



Marking	End Covers
2809128 ZBN 18: UNBEDRUCKT quantity: 10 pieces	2809322 3-Phase bridge end cover

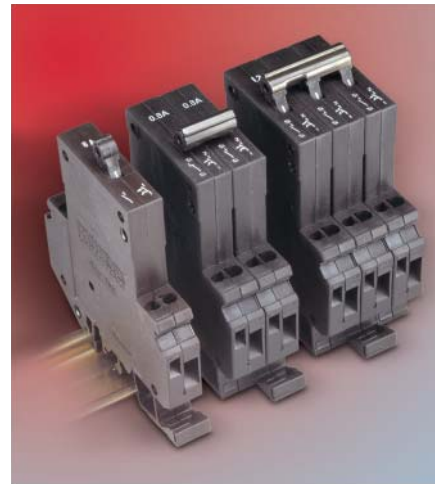
### DC Circuit Wiring



# Thermal Magnetic Circuit Breaker (TMC)

## TMC 1/2/3

One-, two- and three-pole thermal magnetic circuit breakers with trip-free, snap action mechanism and toggle actuation (S-type: IEC 934). Breaker has a universal mounting foot so it can be snapped on both NS 35 and NS 32 mounting rail profiles. Available with auxiliary contact (1 x N / O or 1 x N / C) for status signaling. Two- and three-pole models are internally linked to ensure that all poles trip in the event of an overload on one pole, even if the actuator is held in the ON position. This circuit breaker can be supplied in current ratings to 32 A with a choice of characteristic curves. All screw terminals are recessed for safety.

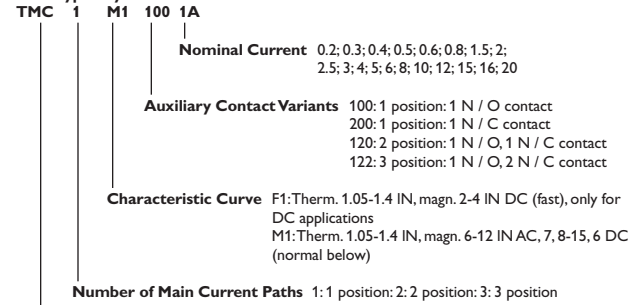


Technical Data	
<b>Maximum Voltage Rating</b>	AC 277V; 3 AC 480 V (50/60 Hz) DC 65 V
<b>Current Rating Range</b>	0.1...32 A non-inductive
<b>Auxiliary Circuit</b>	1 A, AC 277 V / DC 65 V
<b>Typical Life</b>	10,000 operations at 1 x I <sub>N</sub>
<b>Temperature Range</b>	0° to +55°C (+32° to +131°F)
<b>Creepage Resistance</b>	PTI 400 to IEC 112
<b>Insulation Coordination</b>	
<b>(IEC 664 and 664A)</b>	Rated Impulse Withstand Voltage Pollution Degree
Operating Area	2.5 k V 2
Main/Auxiliary Circuit	2.5 k V 2
Pole/Pole	2.5 k V 2
<b>Dielectric Strength (IEC 664 and 664A)</b>	
	Test Voltage
Operating Area	AC 3,000 V (double insulation)
Main / Auxiliary Circuit	AC 3,000 V
Pole / Pole	AC 1,500 V
<b>Insulation Resistance</b>	>100 MΩ (DC 500 V)
<b>Interrupting Capacity (VDE 0660, Part 101, P-2) (AC 250/415 V, DC 65 V)</b>	0.1...5 A 400 A; 6...32 A 800 A Curve T2; 0.1...32 A 15 I <sub>N</sub> Curve M3; 0.1...2 A 200 A AC
<b>Interrupting Capacity (UL 1077/EN 60934 PC 1)</b>	I <sub>N</sub> U <sub>N</sub> Self Limiting
	0.1...16 A AC 277 V 5,000 A
	20...32 A AC 277 V 2,000 A
	0.1...16 A 3 AC 480 V 5,000 A
	20...32 A 3 AC 480 V 2,000 A
	0.1...32 A DC 65 V 2,000 A
<b>Environmental Protection (IEC 529/DIN 40050)</b>	
	Operating Area IP 30 Terminal Area IP 20
<b>Vibration</b>	
	Curve F1: 3g (57-500 Hz) ±0.23 mm (10-57 Hz) Curves M1, M3, T1, T2: 5g (57-500 Hz ±0.38 mm (10-57 Hz) to IEC 68-2-6, Test FC 10 Frequency Cycles/Axis
<b>Shock</b>	
	Curve F1: 25g (11 ms), directions 1-5 10g (11 ms), direction 6 Curves M1, M3, T1, T2 25g (11 ms), directions 1-5 20g (11 ms), direction 6 to IEC 68-2-27, Test Ea
<b>Corrosion</b>	96 hours at 5% saltspray to IEC 68-2-11, Test Ka
<b>Humidity</b>	240 hours at 95% RH to IEC 68-2-3, Test Ca
<b>Weight</b>	Approximately 60g per Pole

### Typical Applications

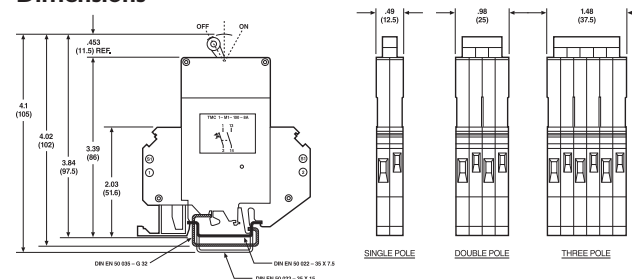
Process control equipment, robotics, machine tool control, communications systems, instrumentation.

#### TMC Type Key for Orders

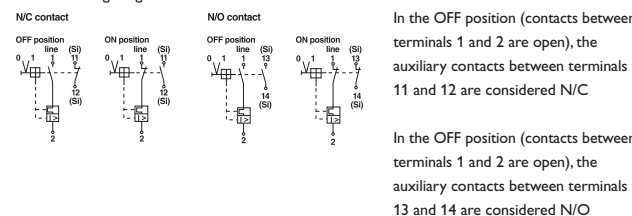


Type Designation Thermal Magnetic Circuit Breaker

### Dimensions



#### Internal Wiring Diagram



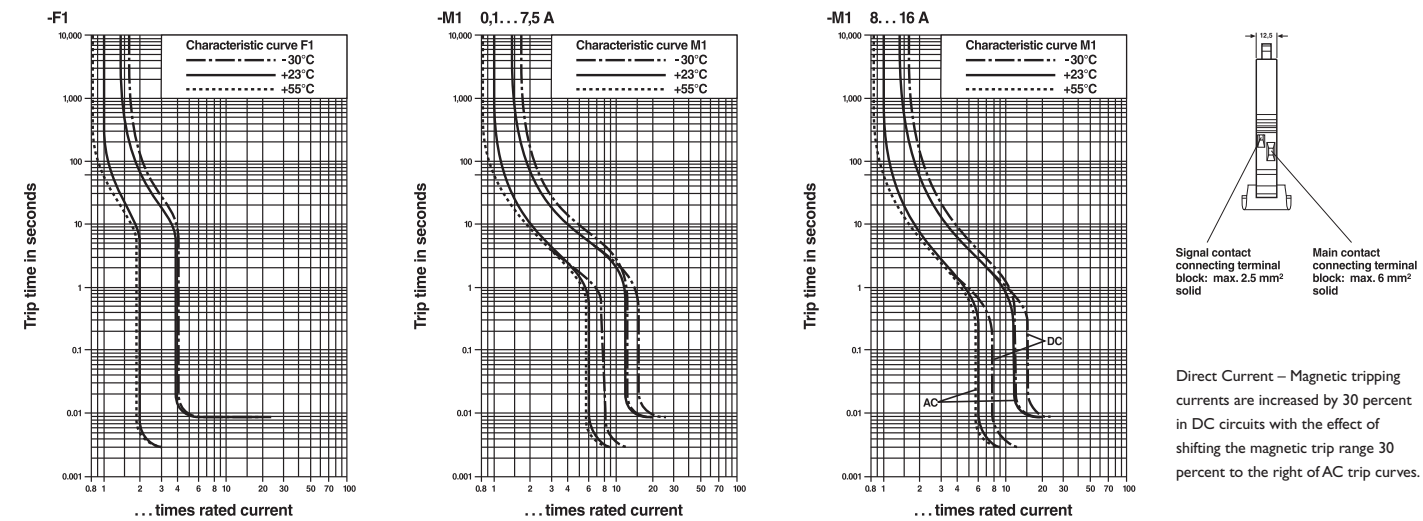
## Standard current ratings and typical internal resistance values

Thermal Magnetic Circuit Breakers							
Internal Resistance per Pole (ohms)	Current Ratings (amps)	TMC 1 M1 100	TMC 1 M1 200	TMC 1 F1 100	TMC 1 F1 200	TMC 2 M1 120	TMC 3 M1 122
		One-Pole N/O Aux.Con.** Part #	One-Pole N/C Aux.Con.** Part #	One-Pole N/O Aux.Con. Part #	One-Pole N/C Aux.Con. Part #	Two-Pole NO/NC Aux.Con. Part #	Three-Pole 1N/O 2N/C Aux.Con. Part #
92	0.1	5650299*	5650418*	N/A	N/A	5650425*	5650467*
26.1	0.2	5531422	5531040*	5650525*	5531231	5650426*	5650470*
11.6	0.3	5650267*	5650416*	5650526*	N/A	5650427*	5650471*
6.6	0.4	5650411*	5650417*	5650527*	N/A	5650428*	5650472*
4.1	0.5	5531370	5531752*	5650528	5651057	5650429*	5650473*
3	0.6	5650412*	5650419*	5531817*	N/A	5650430*	5650435*
1.65	0.8	5531273	5650420*	5650529*	N/A	5650431*	5650436*
1.1	1.0	5531723	5531341*	5531914	5531532	5650254	5532997
0.47	1.5	5531176*	5531558	5650530*	5650282*	5650385*	5650437*
0.28	2.0	5531820	5531448*	5530928	5650352*	5517967*	5650438*
0.183	2.5	5531079*	5650421*	5650531*	N/A	5650432	5650439*
0.124	3.0	5531927	5531545*	5531024	5602531*	5650255	5650440*
0.077	4.0	5530973	5531354*	5531875	5650829*	5650266	5650441*
0.063	5.0	5530931	5531642	5531121	5650830*	5512014	5650384
0.045	6.0	5531969	5600358*	5650532*	5650366*	5530863	5650442*
<0.02	7.0	N/A	N/A	N/A	N/A	5650574	N/A
<0.02	8.0	5531037	5531749*	5531228*	5650831	5517954	5650443*
<0.02	10	5531862	5530957	5650533	5650283*	5511170	5650354
<0.02	12	5531134	5531846*	5650534*	5602532*	5650433*	5518979
<0.02	15	5510757	5650475*	N/A	N/A	5600432	5650353
<0.02	16	5531765	5531943*	5531574	5651032*	5530892	5530876
<0.02	20	5650413*	5650422*	N/A	N/A	5650308	5650445
<0.02	25	5650414*	5650423*	N/A	N/A	5650476*	5650446*
<0.02	32	5650415*	5650424*	N/A	N/A	5650434	5650447

\* Indicates breakers that are made-to-order and may require an 8- to 10-week lead time.

\*\* N/O = Normally Open, N/C = Normally Closed

## Typical time/current characteristics at 23 degrees Celsius



The time / current characteristic curve depends on the ambient temperature prevailing. In order to eliminate nuisance tripping, multiply the circuit breaker current ratings by the derating factor shown below.

Ambient temperature	°F	-22	-4	14	32	50	73.5	86	104	122	140
	°C	-30	-20	-10	0	10	23	30	40	50	60
<b>Multiplication factor</b>		0.76	0.79	0.83	0.88	0.93	1	1.04	1.11	1.19	1.29



# Circuit Protector Comparison Sheet

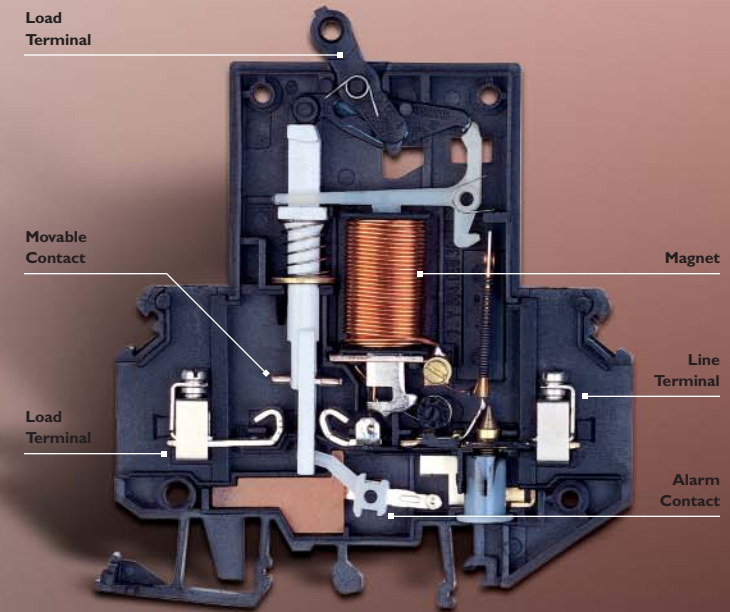
Protector	Type (1)	Breaker Construction	Mechanism	Poles	Amps	UL Voltage	Interrupting Capacity (2) (3)	Maximum Interrupting Capacity (4)	Trip Speed (5)	AWG	Overall Size (mm) HxDxW	Auxiliary Contacts (6)	Trip Free (7)	Tease Free (8)	Bus Connection Available (9)	Characteristics
<b>TMC 42</b> 1 2	Thermal Magnetic	Single Body	Push Button	1, 2	0.1-16	AC 250	Self-Limiting (0.1-8 A)	200A @ AC 250V (0.05-4.5A)	Medium [similar to C-type breaker]	20-8 Sol. 20-10 Str.	70 x 80 x 12	None	Yes	Yes	Yes	General Purpose, High Density Pkg.
						AC 250	200 A (1-2 A)	1,000A @ AC 250 / 125 (0.05-16A)								
						DC 80	400 A (2.5-16 A)	1,000 @ DC 80V (0.05-16A)								
<b>TMC 1</b> 2 3	Thermal Magnetic	Single Body	Toggle	1, 2, 3	0.1-32	AC 277	400 A (0.1-5 A)	5,000A @ AC 277 / 480V (0.1-16A)	Delayed [similar to D-type breaker]	Main – Up  to 10 Sol.	90 x 80 x 12	1 N/O or N/C  2 N/O, N/C  3 N/O, 2 N/C	Yes	Yes	Yes	Trip Speed Options,  Aux. Contacts
						3 AC 480	800 A (6-32 A)	2,000A @ AC 277 / 480V (20-32A)								
						DC 65		2,000A @ DC 65V								
<b>TMC 61</b> <b>TMC 62</b> <b>TMC63</b>	Thermal Magnetic	Single Body	Toggle	1 2 3	0.5-63	AC 277/480 (0.5-63 A)	10,000 A	10,000A @ AC 277 / 480V (0.5-63A) 6,000A @ DC 48V	Medium [C-type breaker]	Line to 2 Load to 3	70 x 95 x 18	Available	Yes	No	Yes	Low to High AC Amperage
<b>TCP</b> Plugs into UK6-FSI/C Screw or ST 4-FSI/C Spring Blk.	Thermal	Two Piece: TCP Plugs in Terminal Blocks	Push Button	1	0.1-10	AC 250 DC 65	6 x Inductive Load (0.1-5 A)  8 x Inductive Load (6-10 A)	AC 250V: 2,000A DC 65V: 200A	Slow [similar to D-type breaker]	26-8 Screw Block; 24-10 Spring Block	92.0 x 64.0 x 8.2 Screw; 89.7 x 86.5 x 8.2 Spring	None	Yes	Yes	Yes Bridge possible on Base Blocks	Plug-in, Thermal only, LED Available on Base Block

- (1) Thermal Magnetic – Thermal provides overload protection; magnetic provides short-circuit protection.
- (2) Interrupting capacity is the maximum fault current that can be repeatedly (3x minimum) interrupted without failure of the breaker.
- (3) Self-limiting means that internal resistance is high enough to restrict the flow of current to a level that will not harm the circuit breaker.
- (4) Maximum current at a given voltage at which the circuit breaker can interrupt safely without damage to surrounding components.
- (5) Review trip curve for precise trip behavior of the breaker.
- (6) N/O means auxiliary contacts are open and N/C means auxiliary contacts are closed when main terminal contacts are open.
- (7) Trip-free means the breaker contacts cannot be forced or held closed during any fault condition (overloads or short circuits).
- (8) Tease-free means breaker contacts cannot be forced close enough for current to arc (and potentially weld together) under a fault condition.
- (9) A bus bar can connect to the supply terminal and can feed a series of breakers.

**TMC 42 Series**



**TMC 1 Series (with Alarm Contact)**





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