

# Protection of distribution systems up to 415 V applications

## TM thermal-magnetic and MA magnetic trip units

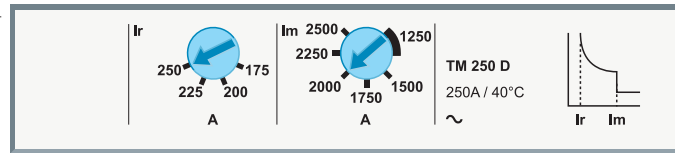
TM thermal-magnetic and MA magnetic trip units can be used on Compact NSX100/160/250 circuit breakers with performance levels B/F/H/N/S/L.

TM trip units are available in 2 versions:

- TM-D, for the protection of distribution cables
- TM-G, with a low threshold, for the protection of generators or long cable lengths.

Vigi modules or Vigirex relays can be added to all the circuit breakers to provide external earth-leakage protection.

### TM-D and TM-G thermal-magnetic trip units



Circuit breakers equipped with thermal-magnetic trip units are used mainly in industrial and commercial electrical distribution applications:

- TM-D, for protection of cables on distribution systems supplied by transformers
- TM-G, with a low pick-up for generators (lower short-circuit currents than with transformers) and distribution systems with long cable lengths (fault currents limited by the impedance of the cable).

#### Protection.....



##### Thermal protection (Ir)

Thermal overload protection based on a bimetal strip providing an inverse time curve  $I^2t$ , corresponding to a temperature rise limit. Above this limit, the deformation of the strip trips the circuit breaker operating mechanism.

This protection operates according to:

- Ir that can be adjusted in amps from 0.7 to 1 times the rating of the trip unit (16 A to 250 A), corresponding to settings from 11 to 250 A for the range of trip units
- a non-adjustable time delay, defined to ensure protection of the cables.

##### Magnetic protection (Im)

Short-circuit protection with a fixed or adjustable pick-up Im that initiates instantaneous tripping if exceeded.

- TM-D: fixed pick-up, Im, for 16 to 160 A ratings and adjustable from 5 to 10 x In for 200 and 250 A ratings
- fixed pick-up for 16 to 63 A ratings.

##### Protection against insulation faults

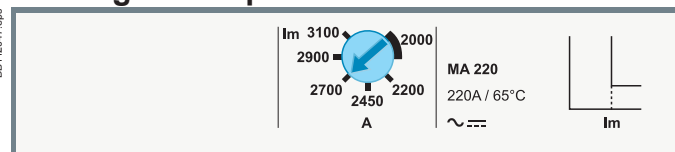
Two solutions are possible by adding:

- a Vigi module acting directly on the trip unit of the circuit breaker
- a Vigirex relay connected to an MN or MX voltage release.

##### Protection versions

- 3-pole:
  - 3P 3D: 3-pole frame (3P) with detection on all 3 poles (3D)
  - 3P 2D: 3-pole frame (3P) with detection on 2 poles (2D).
- 4-pole:
  - 4P 3D: 4-pole frame (4P) with detection on 3 poles (3D).
  - 4P 4D: 4-pole frame (4P) with detection on all 4 poles (same threshold for phases and neutral).

### MA magnetic trip units



In distribution applications, circuit breakers equipped with MA magnetic-only trip units are used for:

- short-circuit protection of secondary windings of LV/LV transformers with overload protection on the primary side.
- as an alternative to a switch-disconnector at the head of a switchboard in order to provide short-circuit protection.

Their main use is however for motor protection applications, in conjunction with a thermal relay and a contactor or motor starter (see "Motor protection", page A-48).

#### Protection.....



##### Magnetic protection (Im)

Short-circuit protection with an adjustable pick-up Im that initiates instantaneous tripping if exceeded.

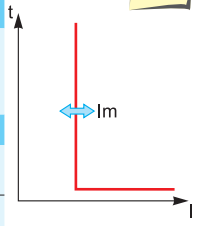
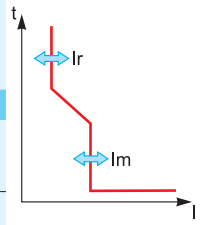
- $I_m = I_n \times \dots$  set in amps on an adjustment dial covering the range 6 to 14 x In for 2.5 to 100 A ratings or 9 to 14 In for 150 to 220 A ratings.

##### Protection versions

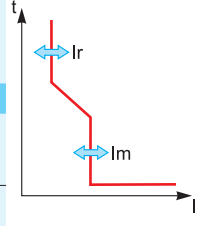
- 3-pole (3P 3D): 3-pole frame (3P) with detection on all 3 poles (3D).
- 4-pole (4P 3D): 4-pole frame (4P) with detection on 3 poles (3D).

**Note:** All the trip units have a transparent lead-sealable cover that protects access to the adjustment dials.

Thermal-magnetic trip units		TM16D to 250D											
Ratings (A)	In at 40 °C <sup>(1)</sup>	16	25	32	40	50	63	80	100	125	160	200	250
Circuit breaker	Compact NSX100	■	■	■	■	■	■	■	■	-	-	-	-
	Compact NSX160	-	-	■	■	■	■	■	■	■	■	-	-
	Compact NSX250	-	-	-	-	-	■	■	■	■	■	■	■
<b>Thermal protection</b>													
Pick-up (A) tripping between 1.05 and 1.20 I <sub>r</sub>	I <sub>r</sub> = I <sub>n</sub> x ...	adjustable in amps from 0.7 to 1 x I <sub>n</sub>											
Time delay (s)	t <sub>r</sub>	non-adjustable											
	t <sub>r</sub> at 1.5 x I <sub>n</sub>	120 to 400											
	t <sub>r</sub> at 6 x I <sub>r</sub>	15											
<b>Magnetic protection</b>													
Pick-up (A) accuracy ±20 %	I <sub>m</sub>	fixed										adjustable	
	Compact NSX100	190	300	400	500	500	500	640	800				
	Compact NSX160/250	190	300	400	500	500	500	640	800	1250	1250	5 to 10xI <sub>n</sub>	
Time delay	t <sub>m</sub>	fixed											
<b>Neutral protection</b>													
Unprotected neutral	4P 3D	no detection											
Fully protected neutral	4P 4D	1 x I <sub>r</sub>											
<b>Magnetic trip units</b>		MA 2.5 to 220											
Ratings (A)	In at 65 °C	2.5	6.3	12.5	25	50	100	150	220				
Circuit breaker	Compact NSX100	■	■	■	■	■	■	-	-				
	Compact NSX160	-	-	-	■	■	■	■	-				
	Compact NSX250	-	-	-	-	-	-	■	■	■			
<b>Instantaneous magnetic protection</b>													
Pick-up (A) accuracy ±20 %	I <sub>m</sub> = I <sub>n</sub> x ...	adjustable in amps from 6 to 14 x I <sub>n</sub> (9 settings)											
Time delay (ms)	t <sub>m</sub>	none											



Thermal-magnetic trip units		TM16G to 250G									
Ratings (A)	In at 40 °C <sup>(1)</sup>	16	25	40	63	80	100	125	160	200	250
Circuit breaker	Compact NSX100	■	■	■	■	■	■	-	-	-	-
	Compact NSX160	-	■	■	■	■	■	■	■	-	-
	Compact NSX250	-	-	-	-	-	-	-	■	■	■
<b>Thermal protection</b>											
Pick-up (A) tripping between 1.05 and 1.20 I <sub>r</sub>	I <sub>r</sub> = I <sub>n</sub> x ...	adjustable in amps from 0.7 to 1 x I <sub>n</sub>									
Time delay (s)	t <sub>r</sub>	non-adjustable									
	t <sub>r</sub> at 1.5 x I <sub>n</sub>	120 to 400									
	t <sub>r</sub> at 6 x I <sub>r</sub>	-									
<b>Magnetic protection</b>											
Pick-up (A) accuracy ±20 %	I <sub>m</sub>	fixed									
	Compact NSX100	63	80	80	125	200	320	-	-	-	-
	Compact NSX160	-	80	80	125	200	320	440	440	-	-
	Compact NSX250	-	-	-	-	-	-	-	440	440	520
Time delay	t <sub>m</sub>	fixed									
<b>Neutral protection</b>											
Unprotected neutral	4P 3D	no									
Fully protected neutral	4P 4D	1 x I <sub>r</sub>									



(1) For temperatures greater than 40 °C, the thermal protection characteristics are modified. See the temperature derating table.