

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

MCB - MTC - MT - MTHP

Technical data

TYPE			MTC				MT				
BREAKING CAPACITY	MTC45	MTC60	MTC100	MT 45	MT 60						
	(A) Rated current (In)	2-32	6-32	6-32	6-40				1-63		
	Utilization category	A	A	A	A				A		
	(V) Rated operational voltage (Ue)	230 / 400	230 / 400	230	230 / 400				230 / 400		
	(V) Minimum operating voltage (Ue min)	12 AC/DC	12 AC/DC	12 AC/DC	12 AC/DC				12 AC/DC		
	(V) Maximum operating voltage (Ue max)	440 AC / 220 DC	440 AC / 220 DC	253 AC / 110 DC	440 AC / 220 DC				440 AC / 220 DC		
	(V) Insulation voltage (Ui)	500	500	500	500				500		
	(Hz) Rated frequency	50 / 60	50 / 60	50 / 60	50 / 60				50 / 60		
	(kV) Rated impulse withstand voltage (Uiimp)	4	4	4	4				4		
	Overvoltage category:	III	III	III	III				III		
Number of poles	1	1+N,2	3,4	1+N,2	3,4	1+N,2	1,1+N	2,3,4	1,1+N	2,3,4	
AC - Alternating current IEC 60898 - EN 60898 (A)											
Icn	4500		6000 ⁽¹⁾	6000	10000 ⁽¹⁾	4500		6000			
Ics	1 Icn		1 Icn	0.75 Icn	1 Icn	1 Icn		1 Icn			
AC - Alternating current IEC 60947-2 - EN 60947-2 (kA)											
Icu	230 / 240	4.5	6	6	7.5	7.5	10	4.5	6	10	20
	400 / 415	-	-	4.5	-	6	-	-	6	-	10
Ics	100% Icu		100% Icu		75% Icu		100% Icu		75% Icu		
DC - Direct current IEC 60947-2 - EN 60947-2 (kA)											
Icu (1 pole)	50	6		10		-		6		10	
Ics	6		10		-		6		10		
Icu (2 poles in series)	110	6		10		10 (15 at 50V)		6		10	
Ics	6		10		10 (15 at 50V)		6		6		
Icu (4 poles in series)	220	4.5		6		-		4.5		10	
Ics	4.5		6		-		4.5		10		
Wiring	cable section (mm ²)	rigid	$\leq 1x16 - \leq 1x10+1x6$	$\leq 1x16 - \leq 1x10+1x6$	$\leq 1x16 - \leq 1x10+1x6$	$\leq 1x35 - \leq 2x16 - \leq 1x16+2x10$	$\leq 1x35 - \leq 2x16 - \leq 1x16+2x10$	$\leq 1x35 - \leq 2x16 - \leq 1x16+2x10$	$\leq 1x35 - \leq 2x16 - \leq 1x16+2x10$		
Screwdriver suggested:			PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2		
Electrical endurance:			10000	10000	10000	10000	10000	10000	10000		
Mechanical endurance:			20000	20000	20000	20000	20000	20000	20000		
Max. no. of usable modular accessories:			2	2	2	2	2	2	2		
Upline/downline power supply:			yes	yes	yes	yes	yes	yes	yes		
ON/OFF status displayed:			yes	yes	yes	yes	yes	yes	yes		
Type of residual current device:			-	-	-	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD		
Rated tightening torque:	(Nm)		1.2	1.2	1.2	2	2	2	2		
Degree of protection:	terminals		IP20	IP20	IP20	IP20	IP20	IP20	IP20		
	front		IP40	IP40	IP40	IP40	IP40	IP40	IP40		
Tropicalization:			55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%					
Reference temperature:	(°C)		30	30	30	30	30	30	30		
Operating temperature:	(°C)		-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60		
Stocking temperature:	(°C)		-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70		
Weight:	(g)		135 (per module)	135 (per module)	135 (per module)	140 (per pole)	140 (per pole)	140 (per pole)	140 (per pole)		
Tripping characteristic			C	C	B	C	C	B	D		
Rated currents available In:	(A)		-	-	-	-	1	-	-		
			2	-	-	-	2	-	-		
			-	-	-	-	3	-	-		
			-	-	-	-	4	-	-		
			6	6	6	6	6	6	6		
			10	10	10	10	10	10	10		
			13	13	13	13	13	13	13		
			16	16	16	16	16	16	16		
			20	20	20	20	20	20	20		
			25	25	25	25	25	25	25		
			32	32	32	32	32	32	32		
			-	-	-	40	40	40	40		
			-	-	-	-	50	50	-		
			-	-	-	-	63	63	-		
			-	-	-	-	-	-	-		
			-	-	-	-	-	-	-		

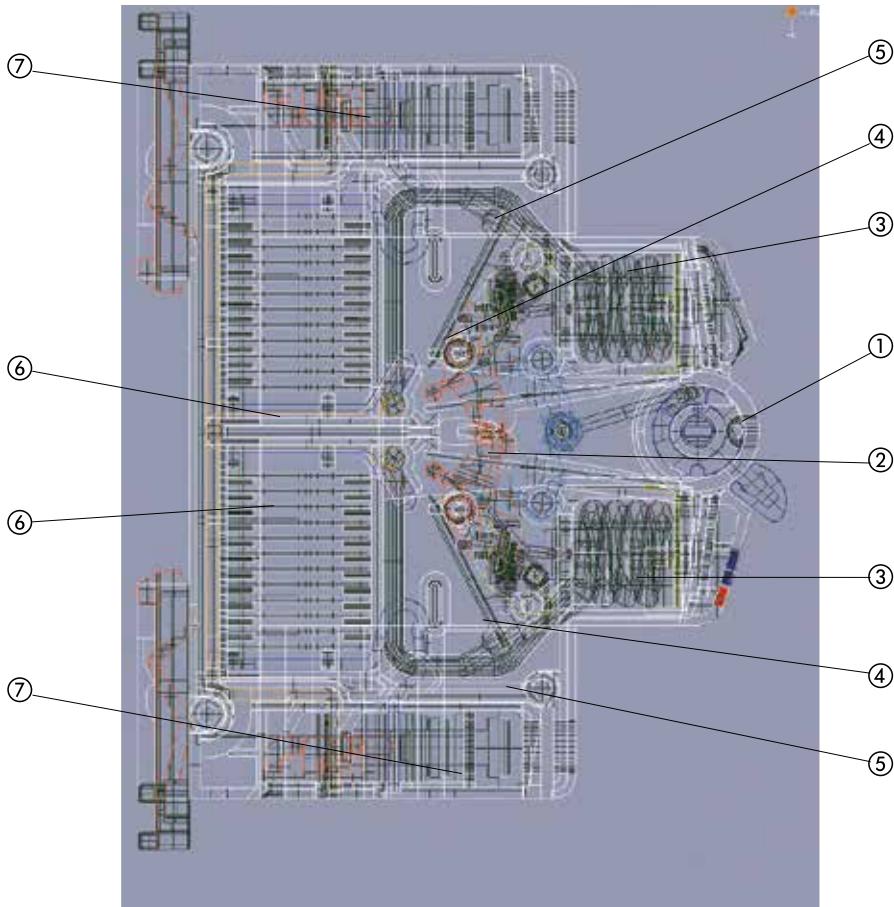
⁽¹⁾ Breaking capacity of the single pole Icn=4500A⁽²⁾ ≤95mm² with reduced connection terminal (width connection < 17mm)

MT												MTHP							
MT 100				MT 250								MTHP 160		MTHP 250					
																			
1-25		32-63		6-20		25		32-40		50-63		63-125		20-63					
A		A		A		A		A		A		A		A					
230/400		230/400		230/400		230/400		230/400		230/400		230/400		230/400					
12 AC/DC		12 AC/DC		12 AC/DC		12 AC/DC		12 AC/DC		12 AC/DC		12 AC/DC		12 AC/DC					
440 AC/220 DC		440 AC/220 DC		440 AC/220 DC		440 AC/220 DC		440 AC/220 DC		440 AC/220 DC		440 AC/220 DC		440 AC/220 DC					
500		500		500		500		500		500		500		500					
50/60		50/60		50/60		50/60		50/60		50/60		50/60		50/60					
4		4		4		4		4		4		6		6					
III		III		III		III		III		III		IV		IV					
1	2	3,4	1	2	3,4	1	2	3,4	1	2	3,4	1	2	3,4	1	2,3,4	1	2	3,4
10000		10000		25000		20000		15000		12500		10000		25000					
0.75 Icn		0.75 Icn		0.75 Icn		0.75 Icn		0.75 Icn		0.75 Icn		0.75 Icn		0.75 Icn					
15	30	25	12,5	25	20	25	50	40	20	40	30	15	30	25	15	25	20	25	30
-	20	15	-	15	12,5	-	30	25	-	25	20	-	20	15	-	15	15	4,5	16
50% Icu		50% Icu		50% Icu		50% Icu		50% Icu		50% Icu		50% Icu		50% Icu		75% Icu			
10	10	20	20	20	20	20	20	20	20	20	20	10	10	20	20	25	25	30	
10	10	15	15	15	25	25	25	25	25	25	25	15	15	25	25	30	30	30	
15	15	20	20	20	25	25	25	25	20	20	20	12	12	25	25	25	25	25	
15	15	25	25	25	25	25	25	25	25	25	25	15	15	25	25	25	25	25	
12	12	20	20	20	20	20	20	20	20	20	20	12	12	20	20	20	20	20	
1x35 - . 2x16 - . 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x70 - ≤ 2x25 - ≤ 2x25+1x10		≤ 1x70 - ≤ 2x25 - ≤ 2x25+1x10			
1x35 - . 2x16 - . 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x35 - ≤ 2x16 - ≤ 1x16+2x10		≤ 1x50 ⁽²⁾ - ≤ 2x25 - ≤ 3x16		≤ 1x50 ⁽²⁾ - ≤ 2x25 - ≤ 3x16			
PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2	PZ2		
10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000		
20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000	20000		
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BD	Add-on RCD BDHP	Add-on RCD BDHP	Add-on RCD BDHP	Add-on RCD BDHP	Add-on RCD BDHP			
2	2	2	2	2	2	2	2	2	2	2	2	3,5 / 3 (terminal)	3,5 / 3 (terminal)	3,5 / 3 (terminal)	3,5 / 3 (terminal)	3,5 / 3 (terminal)			
IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20		
IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40	IP40		
55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%	55°C - RH 95%		
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30		
-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60	-25 +60			
-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70			
145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	145 (per pole)	250 (per pole)	250 (per pole)	250 (per pole)	250 (per pole)	250 (per pole)			
C	B	D				C						C	D		C		C		
-	-	1				-						-	-		-	-	-		
-	-	2				-						-	-		-	-	-		
-	-	3				-						-	-		-	-	-		
-	-	4				-						-	-		-	-	-		
6	6	6				6						-	-		-	-	-		
10	10	10				10						-	-		-	-	-		
13	13	13				-						-	-		-	-	-		
16	16	16				16						-	-		-	-	-		
20	20	20				20						-	-		-	-	20		
25	25	25				25						-	-		-	-	25		
32	32	32				32						-	-		-	-	32		
40	40	40				40						-	-		-	-	40		
50	50	-				50						-	-		-	-	50		
63	63	-				63						-	63		-	-	63		
-	-	-				-						80	80		-	-	-		
-	-	-				-						100	100		-	-	-		
-	-	-				-						125	-		-	-	-		

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

CHARACTERISTICS OF THE NEW KINEMATIC MECHANISM OF THE MTC COMPACT CIRCUIT BREAKERS

The position of the releases on the front, with magnetic turns and opposing arc chute chambers, allows a notable reduction in arc time and short-circuit strain on the mechanism. It has therefore been possible to halve the system and lighten the mechanism, which has short pre-arc times thanks to the reduced energy. The new mechanism has been sized and optimised by means of a sophisticated planning, engineering and testing programme.



- ① Manual control lever with a position coherent with the contacts, allowing the circuit breaker to be used as a switch disconnector (in compliance with Standard CEI 64-8)
- ② Toggle joint tripping mechanism with tripping accelerator for short-circuit condition
- ③ Electromagnets for instantaneous short-circuit tripping
- ④ Silver-graphite contacts to maintain electrical characteristics over time
- ⑤ Magnetic turns in the arc chute chambers
- ⑥ Arc chute chambers with 12 reeds in a ferromagnetic material
- ⑦ Shell-type terminals with anti-loosening tightening system

POWER LOSS VALUES AND TEMPERATURE PERFORMANCE**MTC 45 - 60 - 100 Compact miniature circuit breakers****General characteristics**

The MTC compact miniature circuit breakers are characterised by the reduced overall dimensions they occupy in the board, and their full modularity with electrical auxiliaries and modular accessories. It is therefore possible to position all the equipment necessary to protect and control the service electrical system centrally, in small spaces. The innovations are based on a new kinematic mechanism for activating the circuit breaker (with a world-wide Gewiss patent) which helps to increase normal performance while reducing the occupied overall dimensions by 50%. This new device makes it possible to include a bipolar circuit breaker in a single 18mm module, with both poles protected by both magnetic and thermal release.

Temperature performance

In plant engineering situations where the ambient temperature is higher than the standard 30°C reference temperature, the circuit breakers may be subject to untimely tripping, i.e. inappropriate switch-off, because the rise in temperature is interpreted as overcurrent. In fact ambient temperature affects the initial deformation of the bimetal; at a temperature above 30°, the thermal release intervenes more quickly, acting like a relay with a lower rated current.

It is therefore imperative to take into consideration the temperature performance of the rated current if the circuit breaker is installed in a place with a temperature above 30°. The following tables show the max. operating currents corresponding to the different temperatures.

MTC 45 - 60 - 100 COMPACT MINIATURE CIRCUIT BREAKERS						
In (A)	Temperature					
	10°C	20°C	30°C	40°C	50°C	60°C
2	2.1	2.05	2	1.9	1.8	1.55
6	7.2	6.6	6	5.7	5.3	5
10	11.8	10.8	10	9.6	9.1	8.6
13	15	14	13	12.4	11.7	11
16	18.2	17.2	16	15.2	14.3	13.4
20	22.8	21.4	20	19.5	18.9	18.4
25	28.5	26.8	25	24	23	22
32	36.5	34.2	32	30.8	29.5	28

Temperature performance for installations in boxes with a degree of protection higher than IP54 means multiplying the already derated current values by a coefficient of 0.7.

Power loss per pole

The following table shows the power loss values for the MTC miniature circuit breakers, so you can check the overtemperature values in the board in relation to Standards EN 60439 and CEI 17 - 43. You can also check whether the power loss of the devices is lower than - or equal to - the level that the enclosure is able to disperse, in accordance with Standards CEI 23 - 49 and CEI 23 - 51.

MTC 45 - 60 - 100 COMPACT MINIATURE CIRCUIT BREAKERS																
In (A)	2		6		10		13		16		20		25		32	
	Pole	N	Pole	N	Pole	N										
R (mΩ)	450	1.07	29.4	2.6	20.3	2.6	14.2	2.6	8.7	2.6	5.7	2.6	5.3	2.6	3.4	2.6
P (W)	1.8	0.04	1.06	0.09	2.03	0.26	2.4	0.44	2.22	0.67	2.27	1.04	3.34	2	3.45	2.66

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

POWER LOSS VALUES AND TEMPERATURE PERFORMANCE

MT 45 - MT 60 - MT 100 - MT 250 Miniature circuit breakers

General characteristics

Thanks to a wide range and excellent performance, the MT miniature circuit breakers allow the creation of electrical systems in which the use of MTCs alone would be insufficient.

The MT range, with rated current from 1 to 63A, characteristics B, C and D, and a breaking capacity of 6, 10 and 25 kA, satisfies all installation needs in the commercial, advanced commercial and industrial sectors. Thanks to the full modularity with the residual current devices, electrical auxiliaries and modular accessories, the MT range guarantees the optimum solution for every plant engineering context.

MT 45 - MT 60 - 100 - 250 TEMPERATURE PERFORMANCE						
In (A)	Temperature (°C)					
	15	20	30	40	50	60
1	1.07	1.04	1.00	0.97	0.93	0.90
2	2.14	2.07	2.00	1.93	1.86	1.79
3	3.21	3.11	3.00	2.90	2.79	2.69
4	4.28	4.14	4.00	3.86	3.72	3.58
6	7	6.67	6.00	5.52	4.84	3.96
10	11.2	10.8	10.0	8.9	7.95	7.16
13	14.4	13.9	13.0	11.9	10.9	10
16	17.6	17.1	16.0	14.9	13.9	12.8
20	22	21.3	20.0	17.8	16.1	15.1
25	28.2	27.1	25.0	23.4	21.3	18.8
32	37	35.3	32.0	30.8	27.8	23.1
40	45	43.3	40.0	34.8	30	28
50	57.5	55	50.0	46.7	42.1	36.3
63	70	67.7	63.0	59.9	52.7	41.25

MT 45 - MT 60 - 100 - 250 POWER LOSS PER POLE						
In (A)	Tripping characteristic					
	B		C		D	
P (W)	R (mΩ)	P (W)	R (mΩ)	P (W)	R (mΩ)	
1	-	-	2.20	2200	-	-
2	-	-	2.70	675	-	-
3	-	-	2.30	256	-	-
4	-	-	2.20	138	-	-
6	1.42	39	1.42	39	0.80	22
10	2.13	21	2.13	21	1.20	12
13	2.1	12.4	2.1	12.4	1.3	7.7
16	2.80	11	2.80	11	1.60	6.3
20	2.56	6.4	2.56	6.4	2.10	5.3
25	3.10	5	3.10	5	2.00	3.2
32	3.00	2.9	3.00	2.9	2.40	2.4
40	3.10	1.9	3.10	1.9	2.70	1.7
50	3.87	1.5	3.87	1.5	-	-
63	4.51	1.2	4.51	1.2	-	-

Note: power loss values are suitable also for neutral of 1P+N versions.

MTHP 160 - MTHP 250 High performance miniature circuit breakers

General characteristics

Thanks to a wide range and excellent performance, the MTHP miniature circuit breakers allow the creation of electrical systems in which the use of MTCs and MTs alone would be insufficient. The MTHP range, with rated current from 20 to 125A, characteristics C and D, and a breaking capacity of 10 and 25 kA, satisfies all installation needs in the commercial, advanced commercial and industrial sectors. Thanks to the full modularity with the residual current devices, electrical auxiliaries and modular accessories, the MTHP range guarantees the optimum solution for every plant engineering context.

MTHP 160 - 250 TEMPERATURE PERFORMANCE						
In (A)	Temperature					
	20°C	30°C	40°C	50°C	60°C	
20	21	20	17.5	16	15	
25	26	25	24	22	19	
32	35	32	30	28	23	
40	42	40	35	33	28	
50	55	50	47	42	36	
63	66	63	59	53	48	
80	85	80	75	70	63	
100	107	100	93	87	78	
125	135	125	115	107	97	

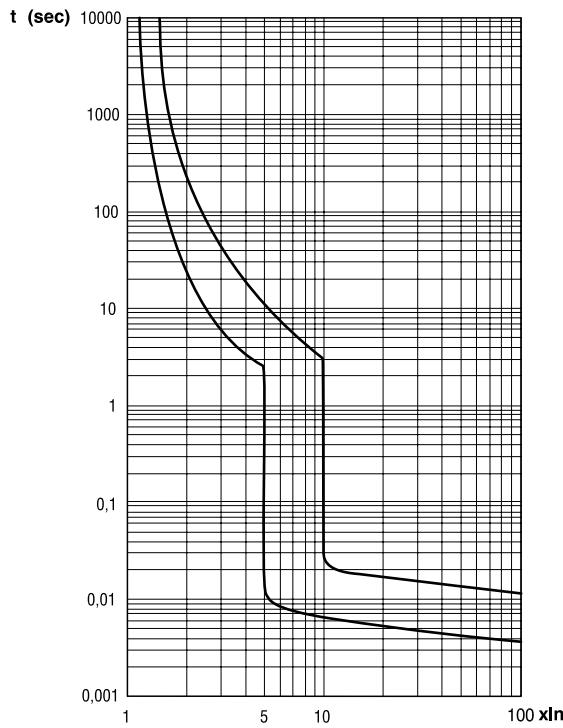
MTHP 160 - 250 POWER LOSS PER POLE									
In (A)	20	25	32	40	50	63	80	100	125
	Power loss (W)								
MTHP 250	2.8	2.7	3.1	3.5	4.2	5.6	-	-	-
MTHP 160	-	-	-	-	-	5.6	5.6	7.4	11

TRIPPING CHARACTERISTICS IN ALTERNATING CURRENT (EN 60898)

MTC 45 - 60 - 100 Characteristic C

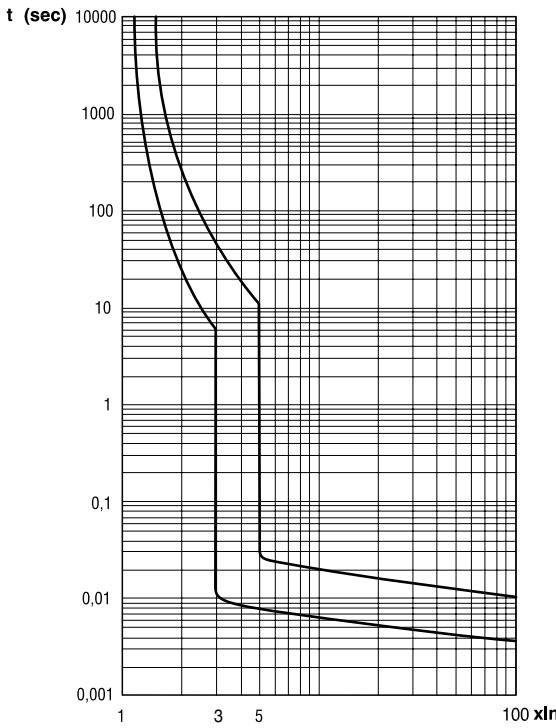
MT 45 - MT 60 - 100 - 250 Characteristic C

MTHP 160 - 250 Characteristic C



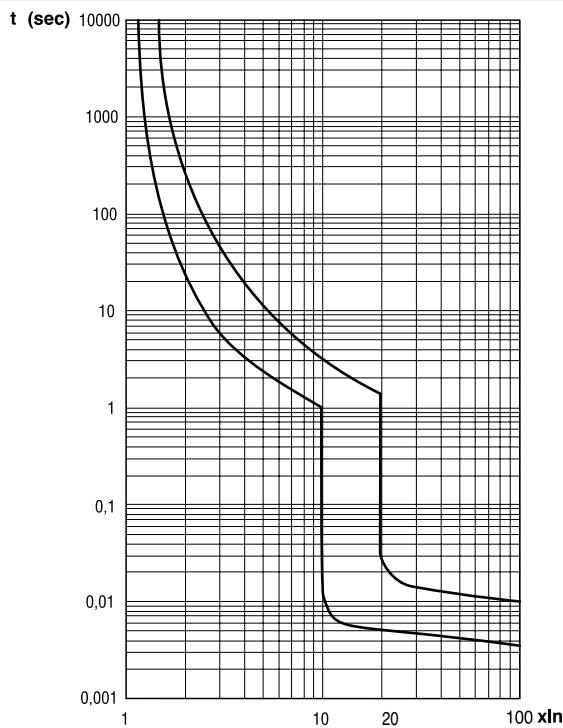
MT 45 - MT 60 - 100 Characteristic B

MTC 60 Characteristic B



MT 60 - 100 Characteristic D

MTHP 160 Characteristic D



Tripping characteristic	B	C	D
I_n	from 6 to 63 A	from 1 to 125 A	from 6 to 100 A
Thermal release			
I_{nf}	1,13 I_n	1,13 I_n	1,13 I_n
I_f	1,45 I_n	1,45 I_n	1,45 I_n
t	< 1 h	< 1 h	< 1 h
Magnetic release			
I_{nf}	3 I_n	5 I_n	10 I_n
I_f	5 I_n	10 I_n	20 I_n
t	instantaneous	instantaneous	instantaneous

 I_n = rated current I_{nf} = conventional non-tripping current I_f = conventional tripping current t = tripping time

B tripping curve: tripping characteristic for the protection of electrical resistive loads (for example: heating) and very long electrical distribution lines.

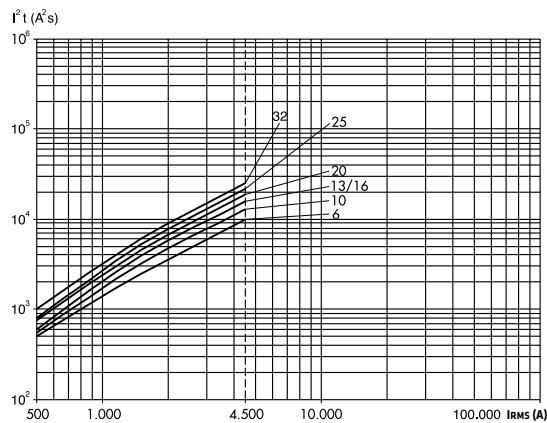
C tripping curve: tripping characteristic for the protection of general electrical resistive or slight inductive loads (for example: fluorescent lamps).

D tripping curve: tripping characteristic for the protection of electrical heavy inductive loads or high starting currents (for example: electrical engines).

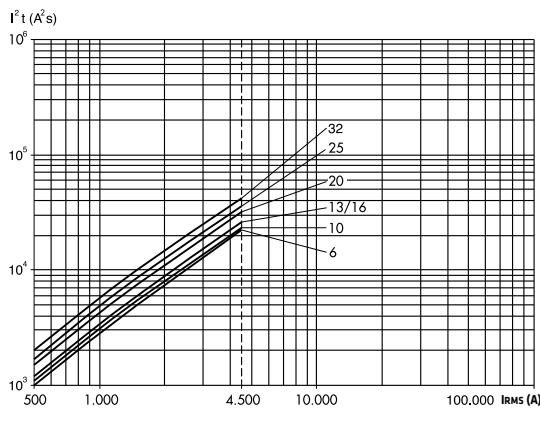
MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MTC MODULAR COMPACT CIRCUIT BREAKERS

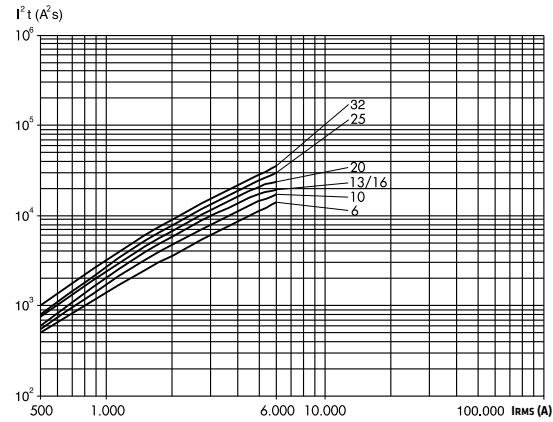
MTC 45 - 1P+N, 2P - 230V versions



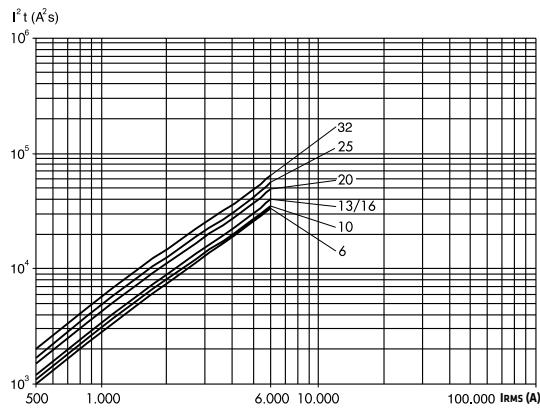
MTC 45 - 1P - 230V and 3P,4P - 230/400V versions



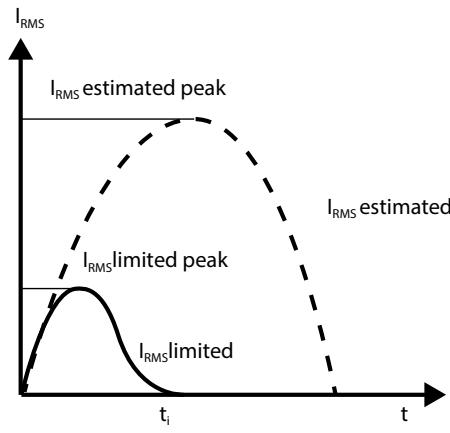
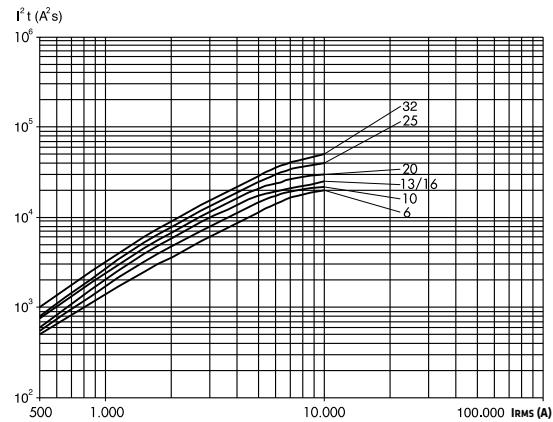
MTC 60 - 1P+N, 2P - 230V versions



MTC 60 - 3P,4P - 230/400V versions



MTC 100 - 1P+N, 2P - 230V versions

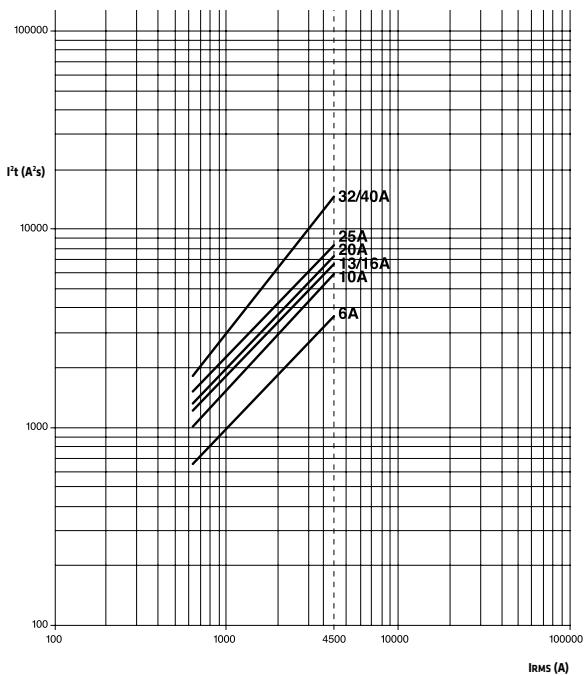


The curves above give the values of the specific let-through energy in relation to the short-circuit current expressed in A. Every curve refers to each rated current value of circuit breaker.

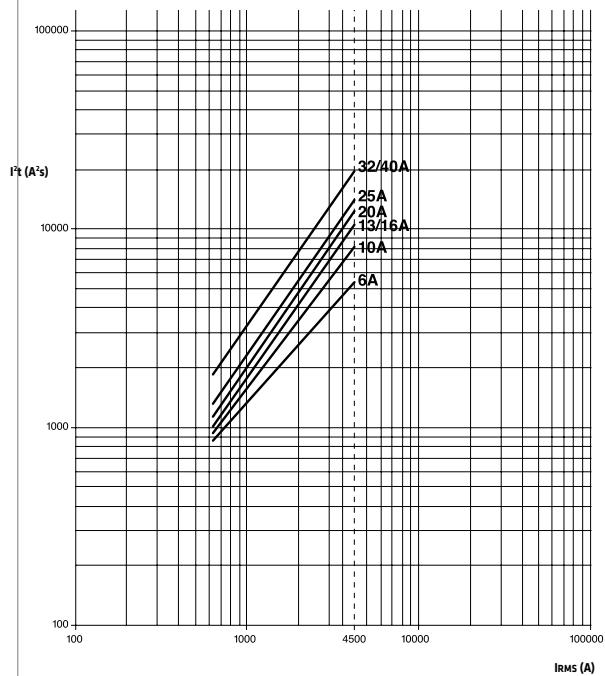
MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MT 45 MODULAR CIRCUIT BREAKERS

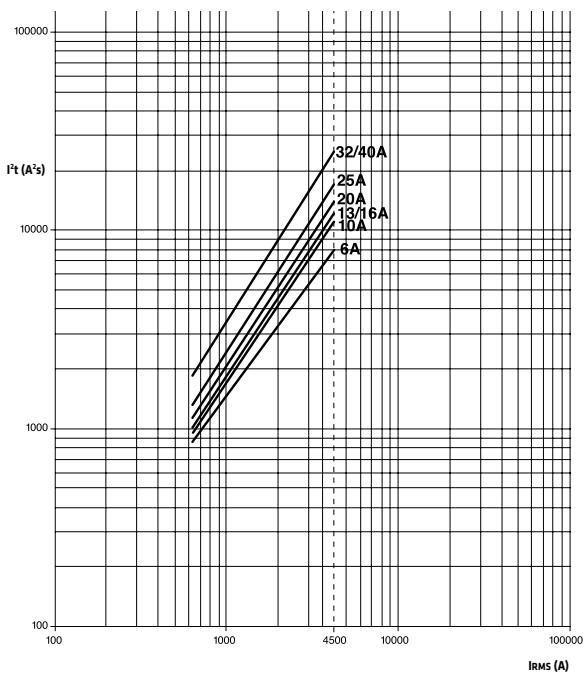
MT 45 - 1P + N 230V C characteristic



MT 45 - 2P 400V C characteristic



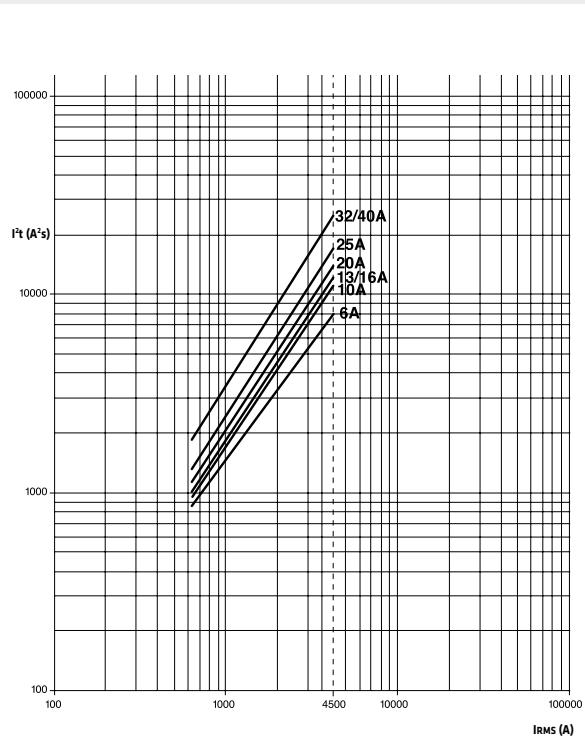
MT 45 - 1P - 230V 3P and 4P 400V C characteristic



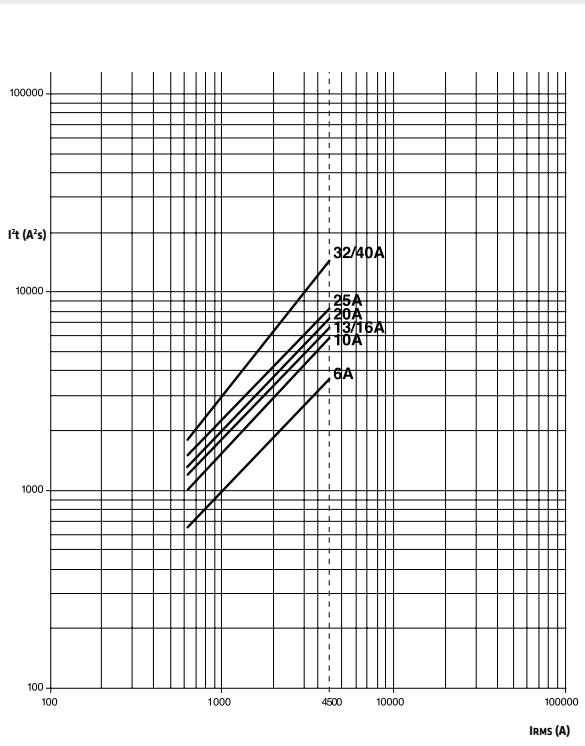
MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MT 45 MODULAR CIRCUIT BREAKERS

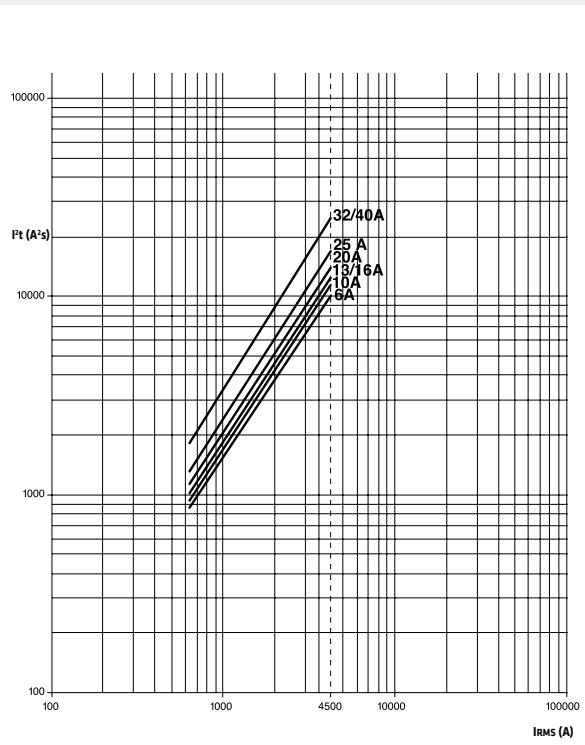
MT 45 - 1P+N 2P 230V B characteristic



MT 45 - 2P 400V B characteristic

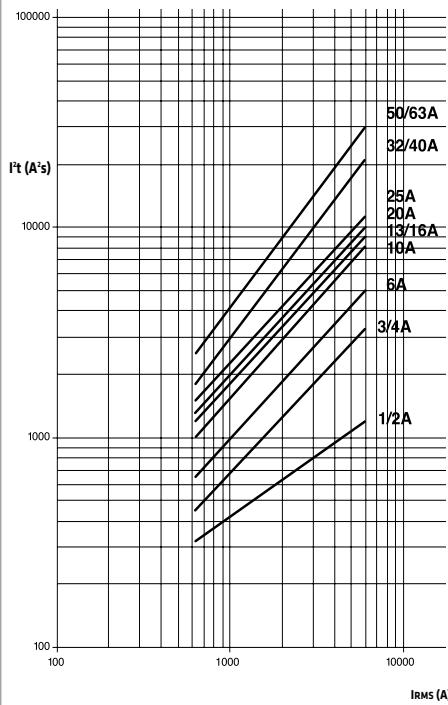


MT 45 - 1P - 230V 3P and 4P 400V B characteristic

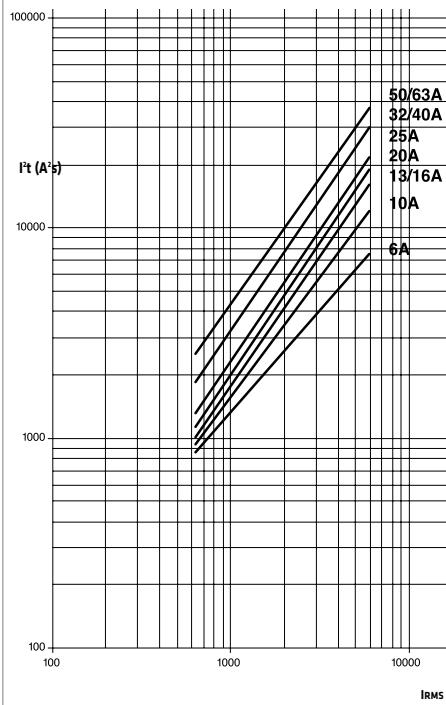


SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MT 60 MODULAR CIRCUIT BREAKERS

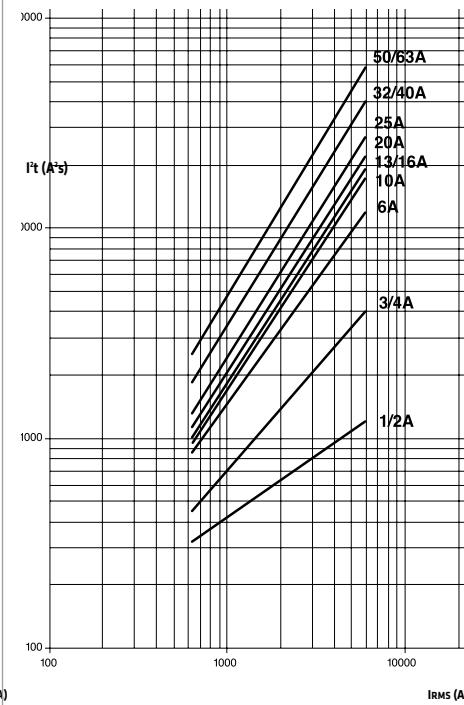
MT 60 - Characteristic C 1P + N 2P 230V



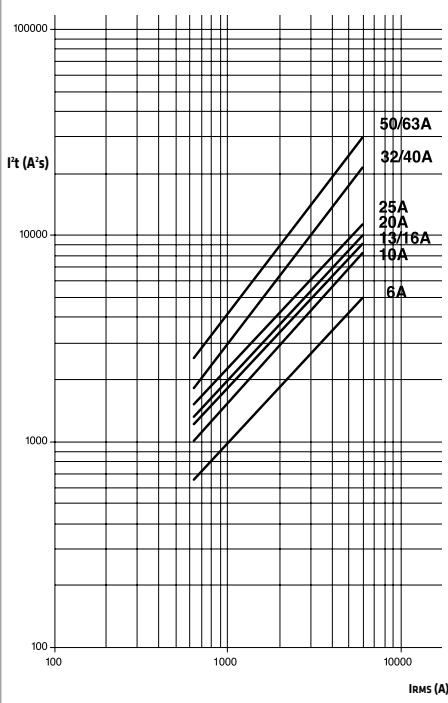
MT 60 - Characteristic C 2P 400V



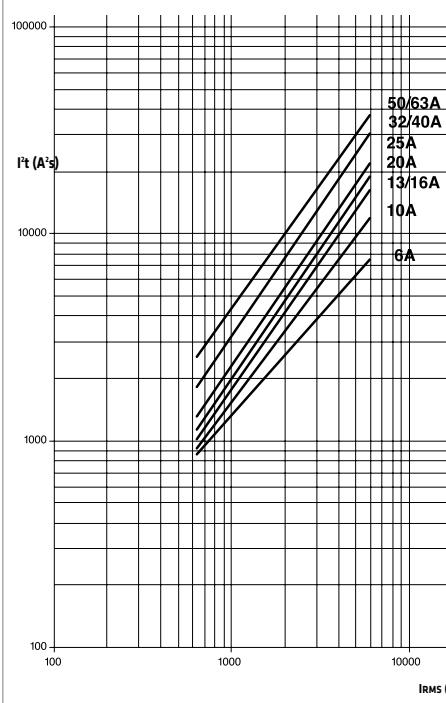
MT 60 - Characteristic C 1P - 230V 3P and 4P 400V



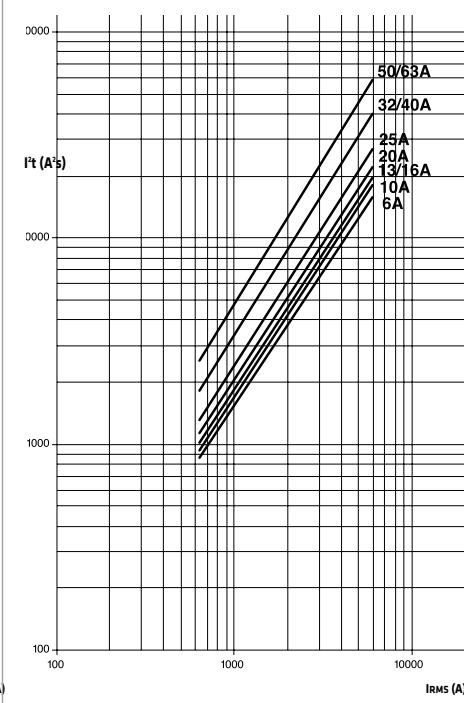
MT 60 - Characteristic B 2P - 230V



MT 60 - Characteristic B 2P 400V

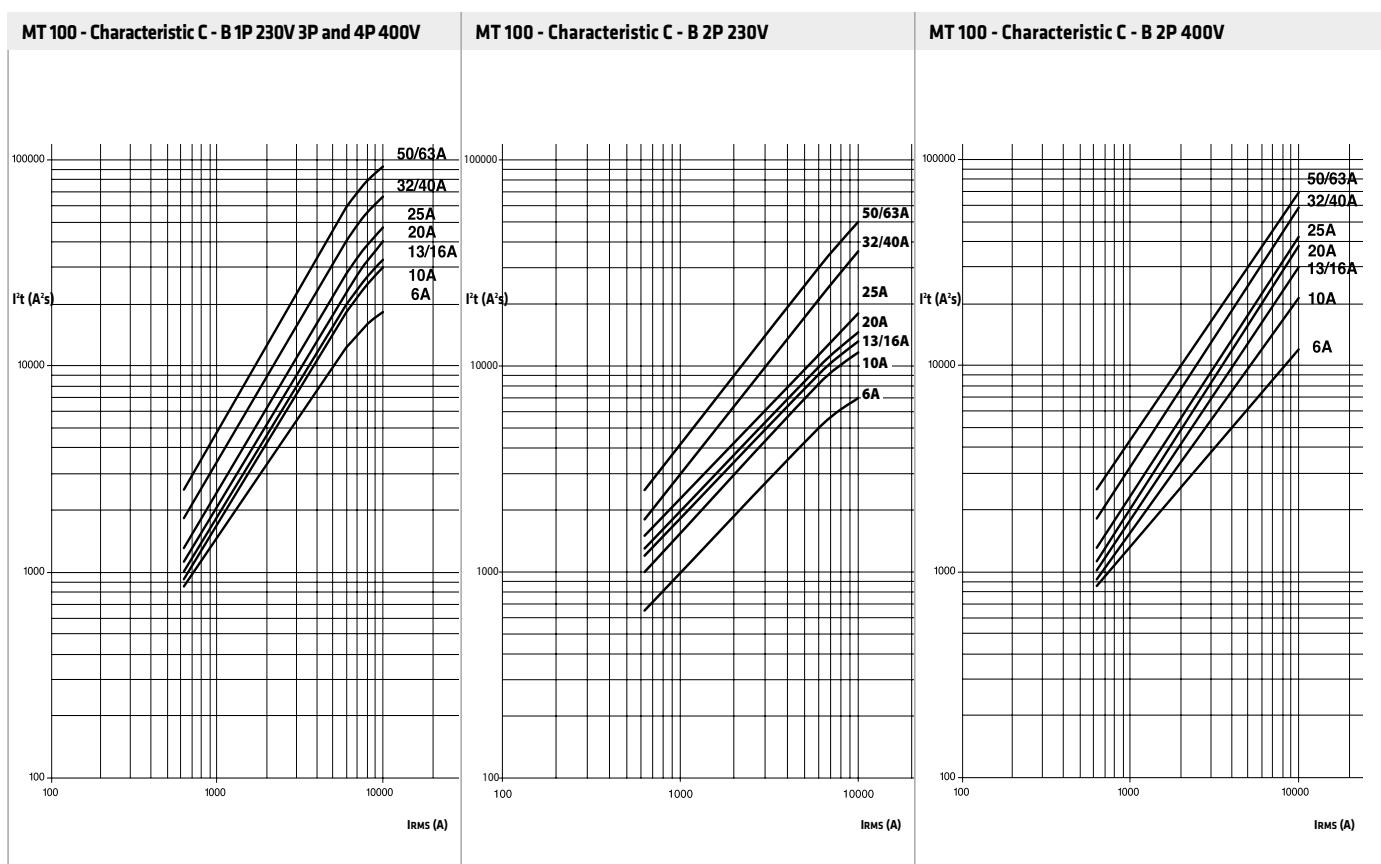
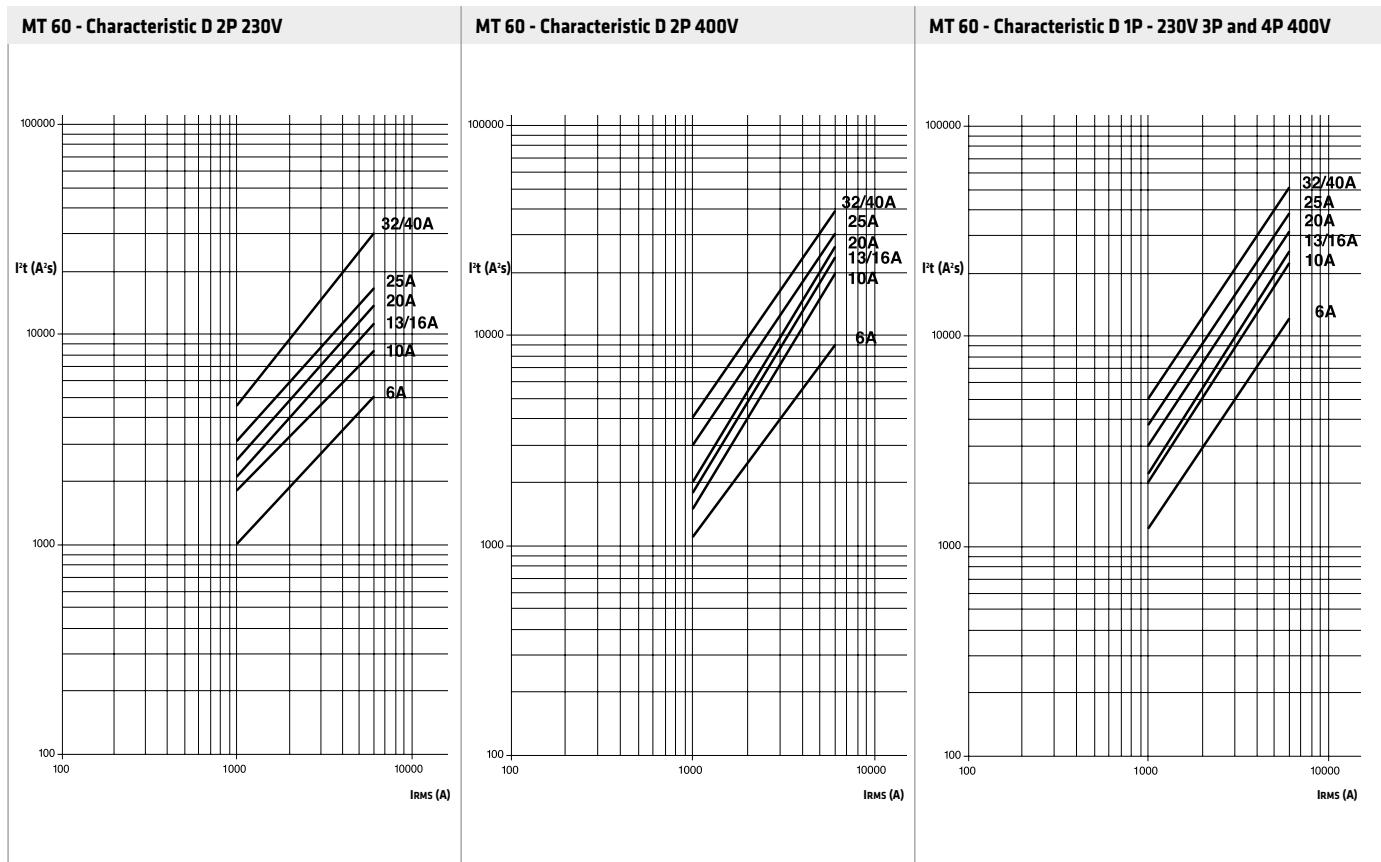


MT 60 - Characteristic B 1P-230V 3P and 4P 400V

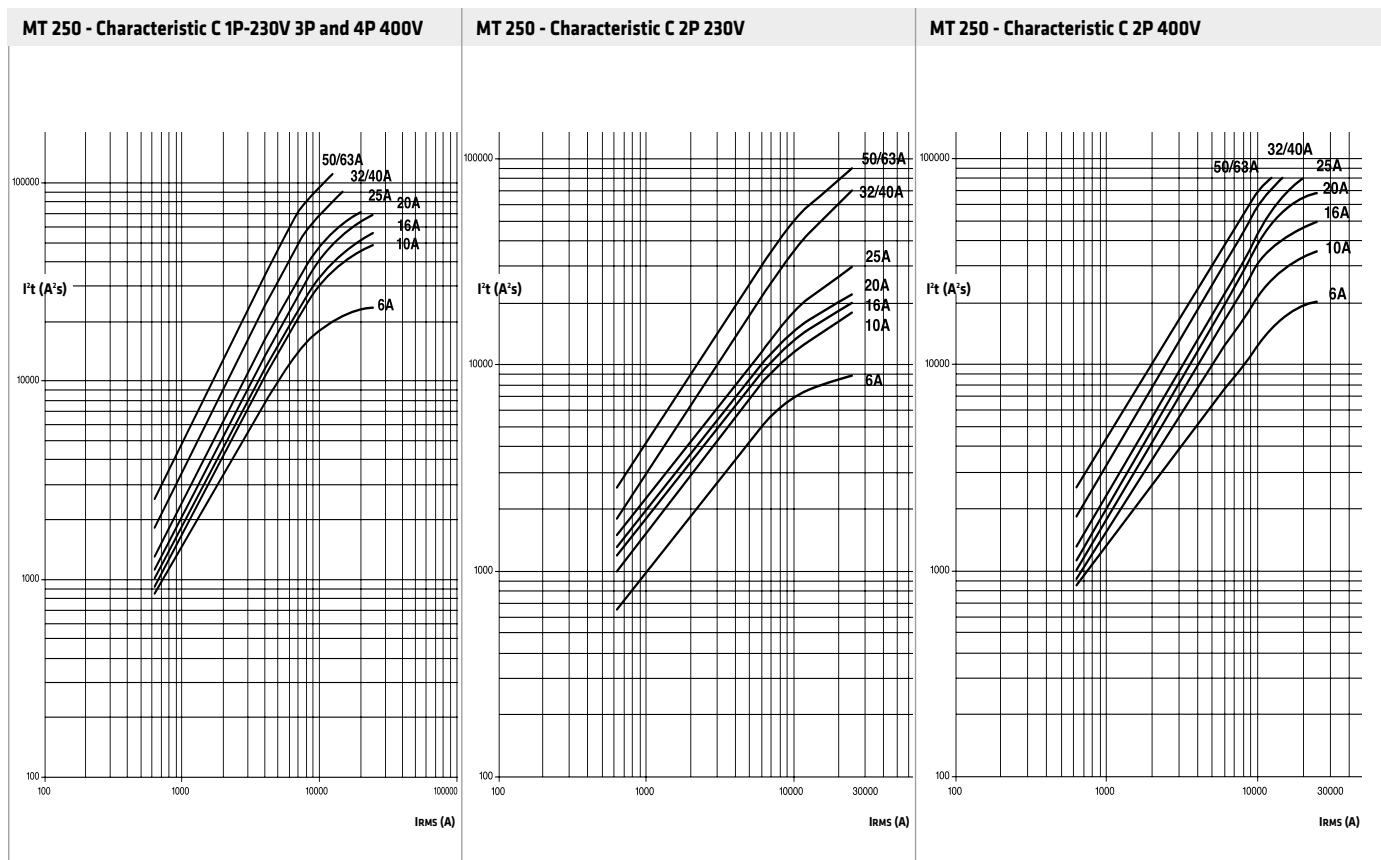
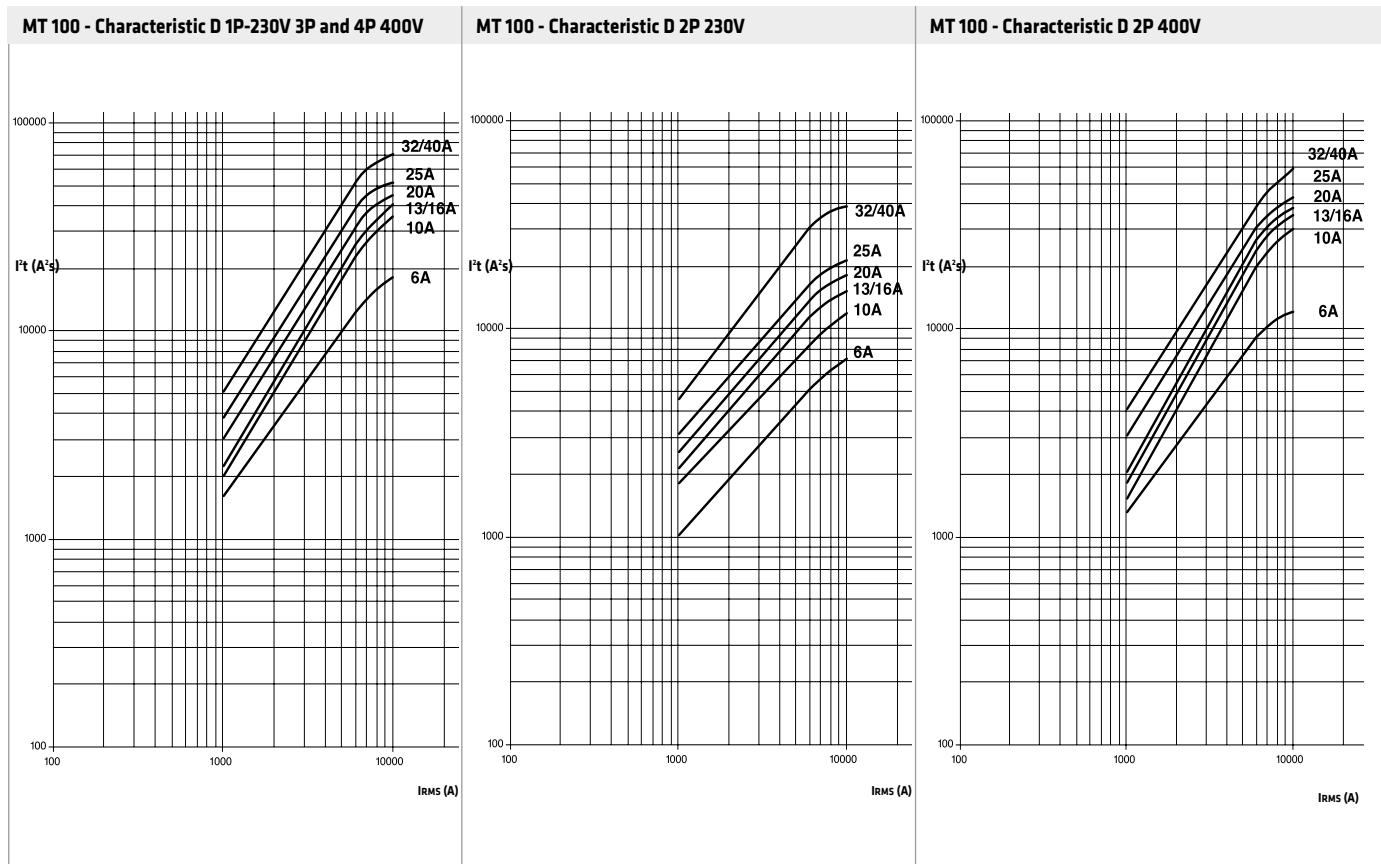


MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MT 60 - MT 100 MODULAR CIRCUIT BREAKERS

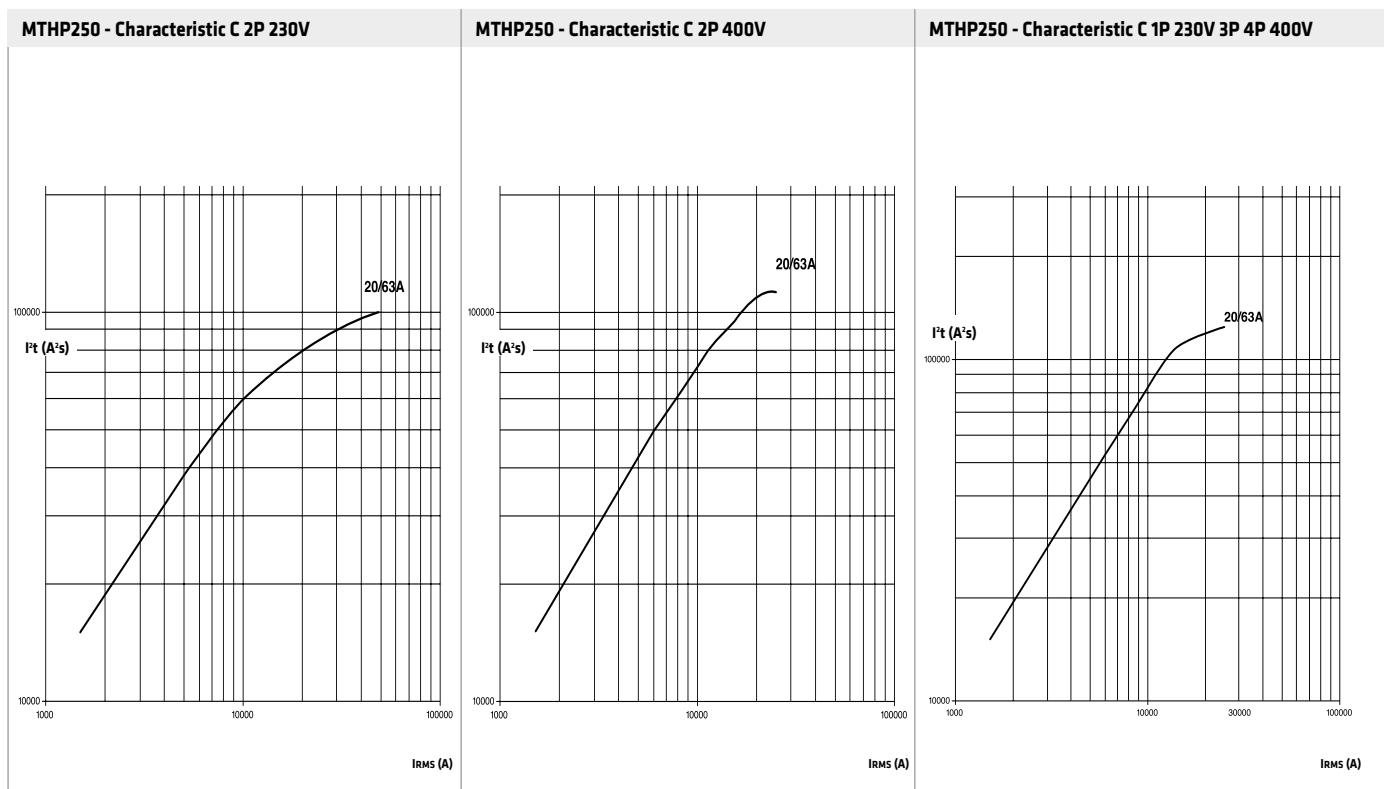


SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MT 100 - MT 250 MODULAR CIRCUIT BREAKERS

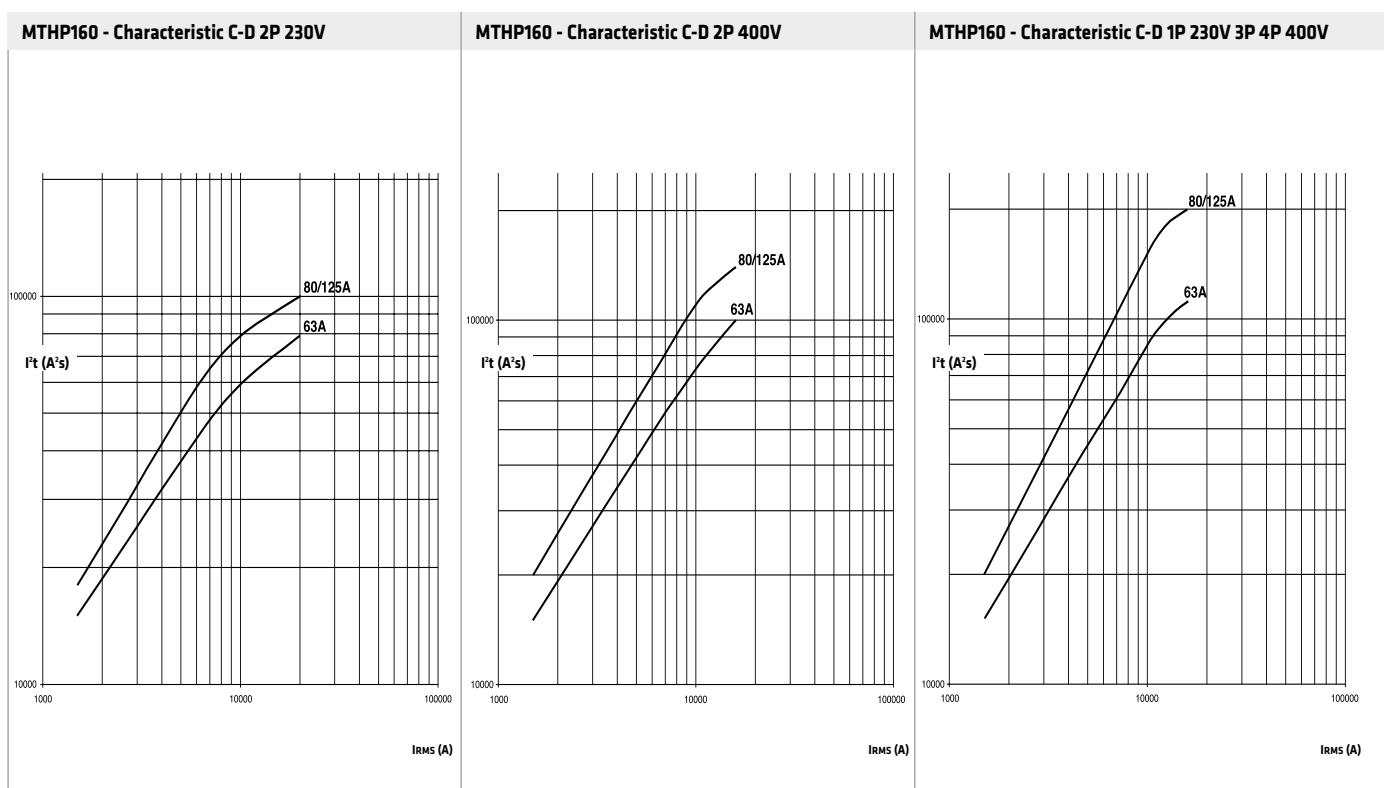


MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MTHP 250 MODULAR CIRCUIT BREAKERS

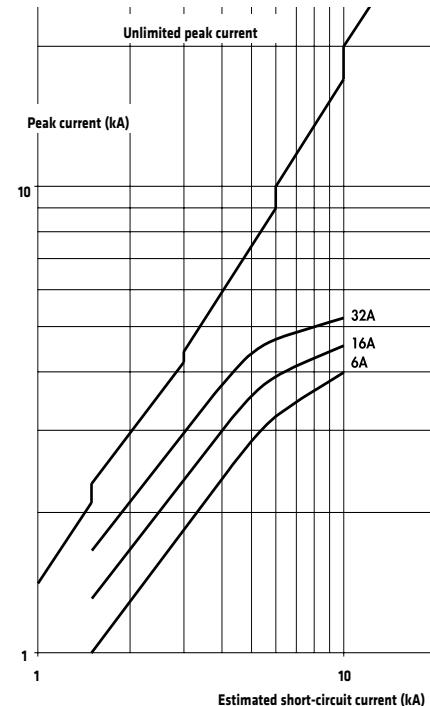


SPECIFIC LET-THROUGH ENERGY CHARACTERISTICS - MTHP 160 MODULAR CIRCUIT BREAKERS

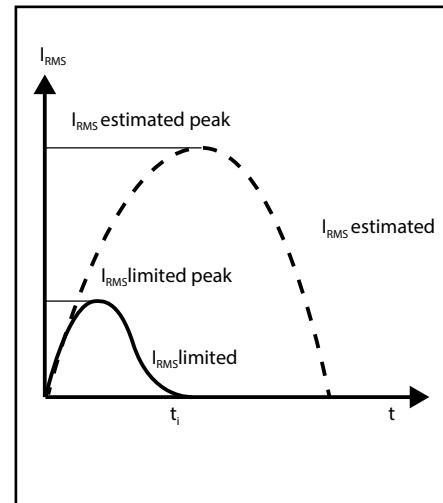
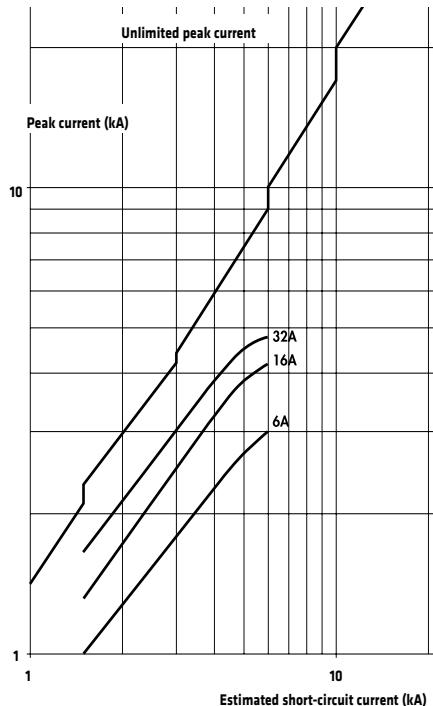


PEAK CURRENT LIMITATION CHARACTERISTICS

MTC - 1P + N 2P 230V version

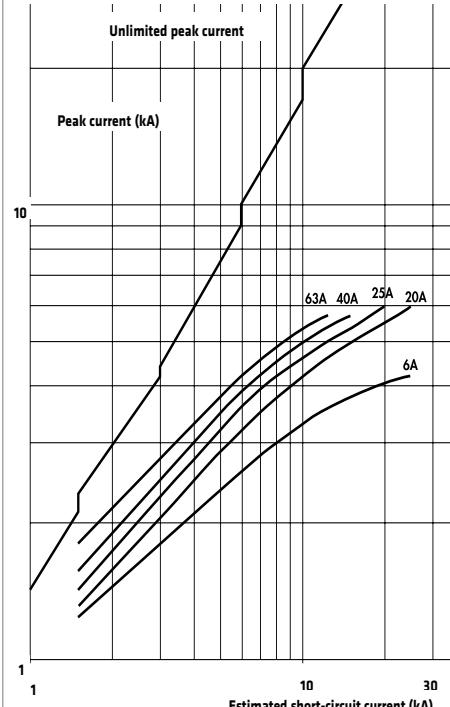


MTC - 1P 230V - 3P 4P 400V version

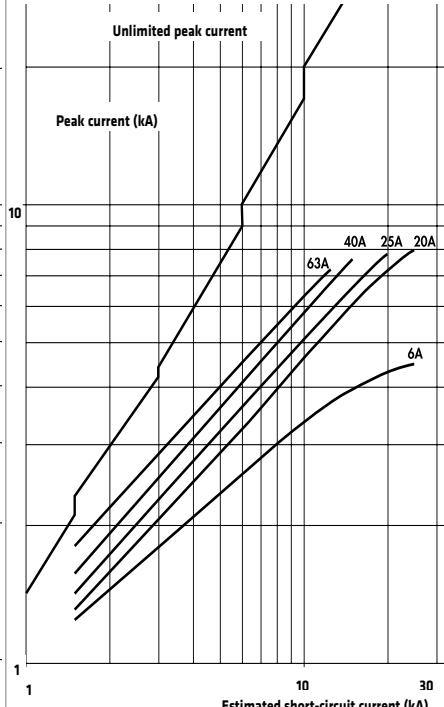


The following curves give the values of the peak current in relation to the estimated short-circuit current expressed in kA. Every curve refers to each rated current value of circuit breaker.

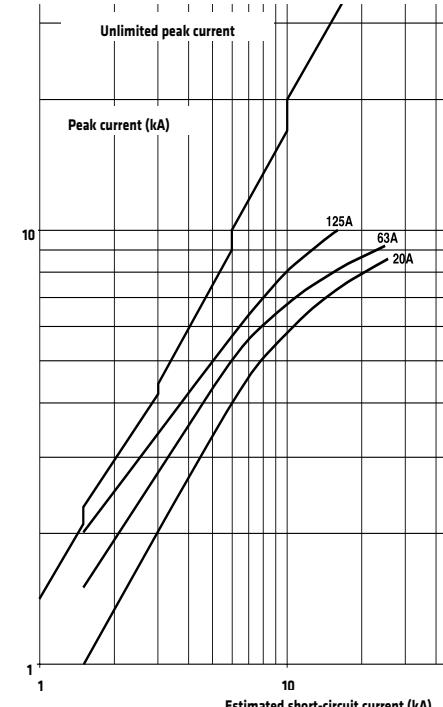
MT - 1P + N 2P 230V version



MT - 1P 230V - 2P 3P 4P 400V version



MTHP - 1P 230V - 2P 3P 4P 400V version



MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

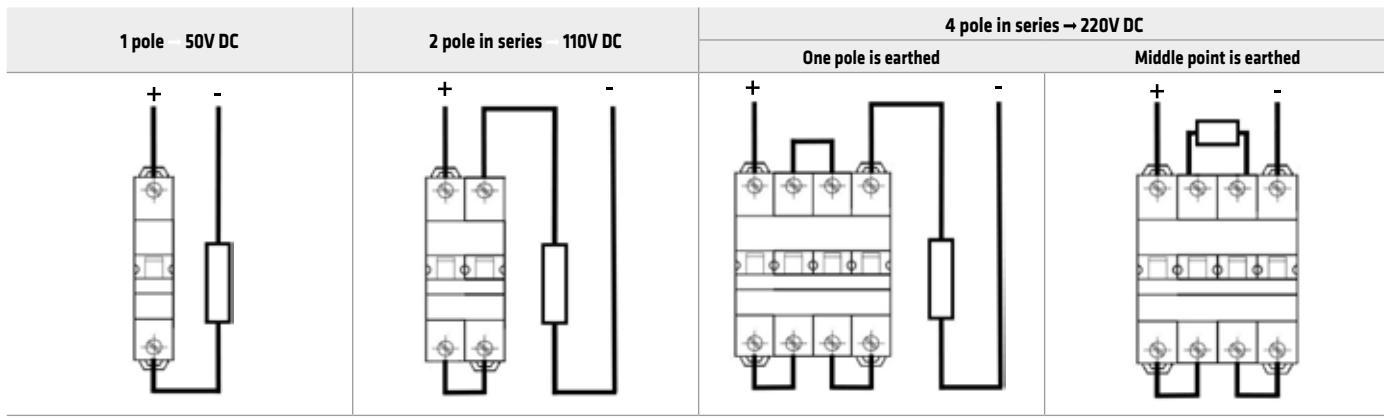
HOW TO CHOOSE CIRCUIT BREAKERS FOR DIRECT CURRENT APPLICATIONS

The interruption of direct current is more difficult to achieve than the alternating current because the direct current doesn't go through zero at each half cycle. Therefore, it is necessary to connect in series the poles of the same circuit breaker so that the increase of the resistance, thus created, causes the decrease of the current until its cancellation.

Moreover, if the operating voltage of the system increases, also the number of poles connected in series must increase.

For a correct choice of a circuit breaker to protect DC electrical loads, it's suggested to keep in mind these following 3 factors:

- Operating voltage**, which effects the number of poles to be connected in series. The maximum operating voltage in direct current for Gewiss circuit breaker is equal to 220V by connecting 4 poles in series (max 50V per pole).



- Short-circuit current**, alleged in the installation point that effects the choice of circuit breaker type.

Circuit breaker type	BREAKING CAPACITY Icu (kA)		
	50	110	220
MTC 45	6	6	4.5
MTC 60	10	10	6
MTC 100	-	10 (*)	-
MT 45	6	6	4.5
MT 60	10	10	10
MT 100	10	15	15
MT 250	20	25	25
MTHP 160	10	15	15
MTHP 250	25	30	25

(*) 15 kA at 50V

- Operating current and the type of electrical load**, which effect the rated current of the circuit breaker and its tripping characteristic.

The rated current of the circuit breaker for DC application must be higher than the operating current of electrical load and must be lower or equal to the capacity of the cable, as well as alternating current situation.

In addition to inrush current, the choice of tripping characteristics must consider that the DC magnetic trip threshold is greater than alternating current. Hereafter the tripping characteristics according to EN 60898 of circuit breakers used in direct current.

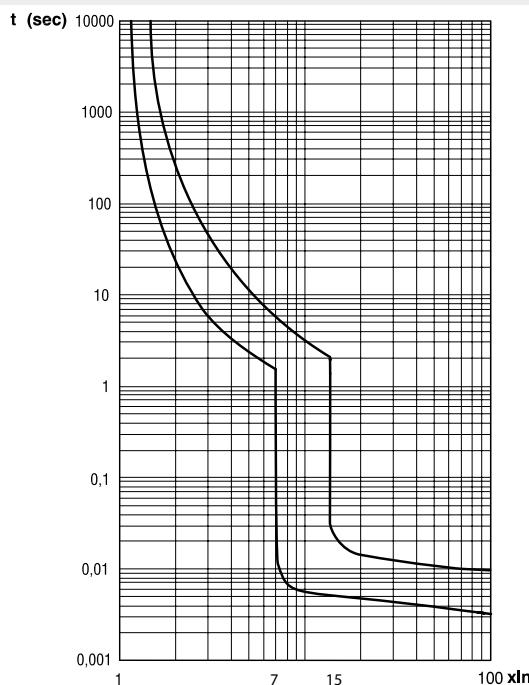
MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

Tripping characteristics in direct current (EN 60898)

MTC 45 - 60 - 100 Characteristic C

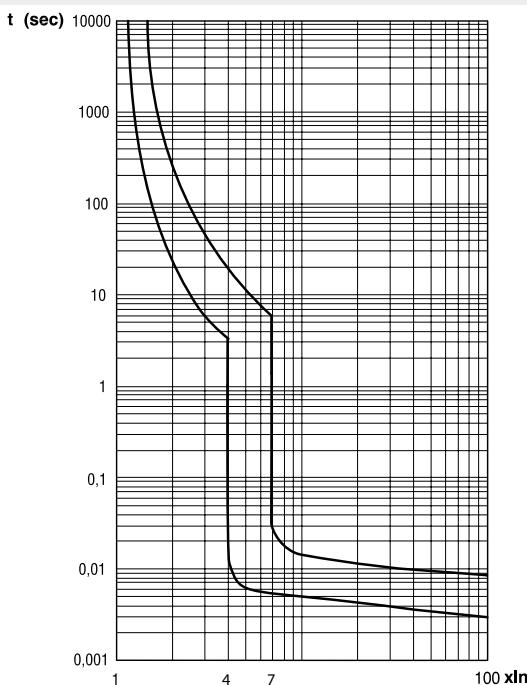
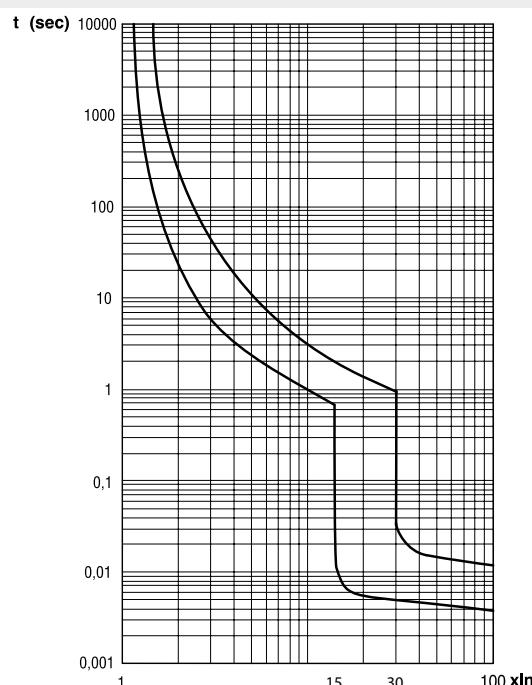
MT 45 - MT 60 - 100 - 250 Characteristic C

MTHP 160 - 250 Characteristic C



MT 45 - MT 60 - 100 Characteristic B

MTC 60 Characteristic B

MT 60 - 100 Characteristic D
MTHP 160 Characteristic D

Tripping characteristic	B	C	D
I_n	from 6 to 63 A	from 1 to 125 A	from 6 to 100 A
Thermal release			
I_{nf}	1,13 I_n	1,13 I_n	1,13 I_n
I_f	1,45 I_n	1,45 I_n	1,45 I_n
t	< 1 h	< 1 h	< 1 h
Magnetic release			
I_{nf}	4 I_n	7 I_n	15 I_n
I_f	7 I_n	15 I_n	30 I_n
t	instantaneous	instantaneous	instantaneous

 I_n = rated current I_{nf} = conventional non-tripping current I_f = conventional tripping current t = tripping time

B tripping curve: tripping characteristic for the protection of electrical resistive loads (for example: heating) and very long electrical distribution lines.

C tripping curve: tripping characteristic for the protection of general electrical resistive or slight inductive loads (for example: fluorescent lamps).

D tripping curve: tripping characteristic for the protection of electrical heavy inductive loads or high starting currents (for example: electrical engines).

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

COORDINATION TABLES BACKUP

Back-up protection means to put two circuit breakers in series using their capacity to limit the short circuit in order to install a downstream circuit breaker with breaking capacity lower than required. Therefore, the upstream circuit breaker (with breaking capacity at least equal to the estimated short circuit current at the point of installation) trips to help the downstream circuit breaker to break the short circuit increasing its breaking capacity. Back-up protection is useful in every electrical installation where the continuity of working is not a fundamental requirement (as instead for selective protection) but there are other priority needs:

- to decrease the costs of electrical system because back-up allows the choice of circuit breakers with lower breaking capacity than required and therefore less expensive;

BACK UP TABLES - 400V AC UPSTREAM - 230V AC DOWNSTREAM (EN 60947-2)								
DOWNSTREAM	UPSTREAM	400V (AC)						
		RANGE		MT60	MT100			MT250
230V (AC)	Range	In [A]		1÷63	1÷25	32÷63	6÷20	25
			Icu [kA]	10	15	12,5	25	20
		MTC/MDC45	6÷32	6	7,5	7,5	10	10
		MTC/MDC60	6÷32	7,5	10	10	15	15
		MTC/MDC100	6÷32	10		15	17,5	17,5
		MT60	1÷63 (1P+N)	10		15	17,5	12,5
			1÷63 (2P)	20			25	
		MT100	1÷25	30				
			32÷63	25				
		MT250	6÷20	50				
			25	40				
			32÷40	30				
			50÷63	25				
	MTHP160	63÷125		20				
	MTHP250	20÷63		50				

BACK UP TABLES - 400V AC UPSTREAM - 400V AC DOWNSTREAM (EN 60947-2)									
DOWNSTREAM	UPSTREAM	400V (AC)							
		RANGE		MT60	MT100		MT250		MTHP160
400V (AC)	Range	In [A]		1÷63	1÷25	32÷63	6÷20	25	32÷125
			Icu [kA]	10	15	12,5	25	15	20÷63
		MTC 45/MDC45	6÷32	4,5	6	7,5	10	10	16
		MTC 60/MDC60	6÷32	6	10	12	15	15	25
		MT 60	1÷63	10		15	18	18	20
		MT 100	1÷25	15			25	20	16
			32÷63	12,5			25	20	25
		MT 250	6÷20	25					36
			25	20					25
			32÷63	15				16	25
	MTHP 160	63÷125		16					
	MTHP 250	20÷63		25					
	MTX160c			16					25
				25					36
				36					
	MTX/E 160			36					
				50					
	MTX 250			70					
				36					
	MTX/E 320			50					
				70					
				120					
				36					
	MTX/E 630			50					
				70					
				120					
				36					
	MTX/E 1000			50					
				70					
				100					
				36					

Note: kA values

For technical information contact the Technical Assistance Service or visit gewiss.com

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

- to limit the size of circuit breakers;
- to maintain existing electrical systems even if they are not still suitable to break the new value of short-circuit.

The following tables cover the possible combinations between Gewiss circuit breakers range for electrical networks 230 and 400V in order the specific let-through energy of upstream circuit breaker is not so high to damage the downstream circuit breaker. The numbers give the value of the breaking capacity expressed in kA considering the combination of the two switches selected.

BACK UP TABLES - 400V AC UPSTREAM - 230V AC DOWNSTREAM (EN 60947-2)												
400V (AC)												
MTHP160		MTHP250		MTX 160c				MTX/E 160			MTX 250	
63÷125		20÷63		160				160			250	
16	25	16	25	36		36		50	70		36	50
7,5	10	7,5	10	10								
10	17,5	10	12,5	16		10	16	16	16	10	16	
12,5	20	16	16	16		16	16	16	16	16	16	
12,5	20	16	16	16		16	16	16	16	16	16	
	25		25	30		25	30	30	30	25	30	
				36		36	40	50	50	36	40	
				36		36	40	50	50	36	40	
							50	50			50	
						36	36	50	50	36	50	
						36	36	50	50	36	50	
							25	36	36	25	36	
												36

BACK UP TABLES - 400V AC UPSTREAM - 400V AC DOWNSTREAM (EN 60947-2)																				
400V (AC)																				
MTX/E 160			MTX 250		MTX/E 320				MTX/E 630				MTX/E 1000				MTSE 1600			
36	50	70	36	50	36	50	70	120	36	50	70	120	36	50	70	100	50	65	100	
10	10	10			10	10	10	10												
20	20	20	16	16	20	20	20	20												
25	30	30	25	30	25	25	25	30												
25	25	25	20	25	25	25	25	30												
30	36	36	30	30	30	30	30	30												
30	36	36	25	25	25	30	30	30												
25	25	30	20	20	20	25	25	25												
25	25	30	20	20	20	25	25	25												
30	30	36	30	30	30	30	30	30												
36	50	70	36	50	30	36	40	50	30	36	40	50	30	36	40	50				
36	50	70	36	50	36	40	65	85	36	40	65	85	36	50	65	70	50	50	50	
50	70		50		50	65	100		50	65	100		50	65	70	50	50	50		
50	70		50		50	65	100		50	65	100		50	65	85	50	65	85		
						70	100		70	100				70	85		65	85		
							120			120					85			85		
						50	65	100		50	65	100		50	65	100		50	50	
							70	100		70	100			70	100		65	85		
						50	65	100		50	65	100		50	65	65	50	50	65	
							70	100		70	100			70	85		65	85		
								120			120				100			100		
									50	65	100		50	65	85	50	50	65		
									70	100			70	85		70	85			
										120				100			100			
											50	65	70	40	40	50				
											70	85				85				
												100								

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

SELECTIVITY TABLES

The following tables show the energy selectivity type combination between each circuit breaker belonging to the Gewiss range. The energy selectivity type, as other types, has the aim to ensure maximum continuity of working, even in the case of fault, supplying only the electrical circuits without fault and tripping the circuit breakers of fault circuits. This coordination requires the upstream circuit breaker is dimensioned enough to let pass the fault current for a time as long as necessary the downstream circuit breaker trips. The energy selectivity can be of two types:

		SELECTIVITY TABLE - 400 Vac UPSTREAM - 400 Vac DOWNSTREAM (EN 60947-2)																					
UPSTREAM DOWNSTREAM		MTX 160c												MTXE 160				MTX 250					
Range	Curve	In	16	20	25	32	40	50	63	80	100	125	160	10	25	63	100	160	63	80	100	125	160
		6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
MTC45 MDC45	C	10		3	3	3	3	T	5	T	T	T	T		T	T	T	T	T	T	T	T	
		16				3	3	T	4,5	T	T	T	T			T	T	T	T	T	T	T	
		20				3		3	3,5	T	T	T	T			T	T	T	T	5,5	T	T	
		25						3	3,5	5,5	T	T	T			T	T	T	T	5,5	T	T	
		32							3	4,5	T	T	T			T	T	T		4,5	T	T	
		6	5,5	5,5	5,5	5,5	5,5	5,5	T	T	T	T	T		T	T	T	T	T	T	T	T	
MTC60/100 MDC60/100	B/C	10			3	3	3	4,5	5	8,5	T	T	T		T	T	T	T	7,5	8,5	T	T	
		16				3	3	4,5	4,5	7,5	T	T	T			T	T	T	5	7,5	T	T	
		20				3		3	3,5	5,5	T	T	T			T	T	T	5	5,5	T	T	
		25						3	3,5	5,5	T	T	T			T	T	T	5	5,5	T	T	
		32							3	4,5	5,5	T	T			T	T	T		4,5	7	T	
		6	5,5	5,5	5,5	5,5	5,5	5,5	T	T	T	T	T										
MT 60	B/C	1	T	T	T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	
		2	T	T	T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	
		3	T	T	T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	
		4	T	T	T	T	T	T	T	T	T	T	T		T	T	T	T	T	T	T	T	
		6	5,5	5,5	5,5	5,5	5,5	5,5	T	T	T	T	T		T	T	T	T	T	T	T	T	
		10			3	3	3	4,5	5,5	8,5	T	T	T		T	T	T	T	7,5	8,5	T	T	
		16					3	4,5	4,5	7,5	T	T	T			T	T	T	5	7,5	T	T	
		20						3	3,5	5,5	7,5	T	T			T	T	T	5	5,5	T	T	
		25							3,5	5,5	7,5	T	T			T	T	T	5	5,5	T	T	
		32								4,5	7	T	T			T	T	T		4,5	7	T	
		40									7	T	T			T	T			7	T	T	
		50										6	T			T	T				6	T	
		63											T										
MT 60	D	6	5,5	5,5	5,5	5,5	5,5	5,5	T	T	T	T	T		T	T	T	T	T	T	T	T	
		10			3	3	3	3	5	7	T	T	T		T	T	T	T	5	8,5	T	T	
		16					2	2	3	5	8	T	T			T	T	T	3	5	8	T	
		20						2	3	4,5	6,5	T	T			T	T	T	3	4,5	6,5	T	
		25							2,5	4	6	8	T			T	T	T	2,5	4	6	9,5	
		32								4	6	8	T			T	T	T		4	6	9,5	
		40									5	8	T			T	T			5	8	T	
MT 100	B/C	6	5,5	5,5	5,5	5,5	5,5	5,5	10,5	T	T	T	T	T		T	T	T	T	10,5	T	T	T
		10			3	3	3	3	5,5	8,5	T	T	T		T	T	T	T	7,5	8,5	T	T	
		16					3	3	4,5	7,5	12	T	T			T	T	T	5	7,5	12	T	
		20						2,5	3,5	5,5	7,5	T	T			T	T	T	5	5,5	8	T	
		25							3,5	5,5	7,5	T	T			T	T	T	5	5,5	8	T	
		32								4,5	7	12	T			T	T	T		4,5	7	12	
		40									7	12	T			T	T			7	12	T	
		50										6	10,5			10,5	10,5				6	10,5	
		63											10,5									10,5	
MT 100	D	6	5,5	5,5	5,5	5,5	5,5	5,5	10,5	T	T	T	T	T		T	T	T	10,5	T	T	T	
		10			3	3	3	3	5	8,5	T	T	T		T	T	T	T	5	8,5	T	T	
		16					2	2	3	5	8	13,5	T			T	T	T	3	5	8	13,5	
		20						2	3	4,5	6,5	11	T			T	T	T	3	4,5	6,5	11	
		25							2,5	4	6	9,5	T			T	T	T	2,5	4	6	9,5	
		32								4	6	9,5	T			T	T	T		4	6	9,5	
		40									5	8	T			T	T			5	8	T	

Note: T= total selectivity - kA values

For technical information contact the Technical Assistance Service or visit gewiss.com

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

- PARTIAL: in case of short circuit, the tripping of the circuit breaker of fault circuit is guaranteed up to the value of the short circuit current expressed in kA, given in the table, depending on the selected circuit breaker. Above this value the selectivity is not ensured because the upstream circuit breaker can trip to cut off power to the electrical system.

- TOTAL: in case of short circuit, the tripping of circuit-breaker of fault circuit is always guaranteed. This situation is indicated with a letter T in the table. The energy selectivity type is useful if it is not possible to set a time delay (time selectivity time) and it is based on the comparison between the two let-through energy characteristics (I^2t) of the two circuit breakers put in series. The two let-through energy characteristics must not have intersection points to obtain total selectivity.

SELECTIVITY TABLES

		SELECTIVITY TABLE - 400 Vac UPSTREAM - 400 Vac DOWNSTREAM (EN 60947-2)																						
		MTX 160c										MTXE 160					MTX 250							
		TM1										SEP/1					TM1							
Range	Curve	In	16	20	25	32	40	50	63	80	100	125	160	10	25	63	100	160	63	80	100	125	160	
MT 250	C	6	5,5	5,5	5,5	5,5	5,5	5,5	10,5	T	T	T	T		T	T	T	T	10,5	T	T	T	T	
		10		3	3	3	3	3	5,5	8,5	T	T	T		T	T	T	T	7,5	8,5	T	T	T	
		16							3	3	4,5	7,5	12	T	T		T	T	T	5	7,5	12	T	T
		20							2,5	3,5	5,5	7,5	T	T		T	T	T	5	5,5	8	T	T	
		25							3,5	5,5	7,5	T	T		T	T	T	5	5,5	8	T	T		
		32							4,5	7	12	T			T	T	T		4,5	7	12	T		
		40								7	12	T			T	T				7	12	T		
		50								6	10,5				10,5	10,5				6	10,5			
MTHP 160	C	63								10,5					10,5								10,5	
		80									6					6								
		100																						
MTHP 160	D	125																						
		80									6	7,5				7,5							9,5	
		100									6					6								
MTHP 250	C	125																						
		20							5,5	5,5	T	T	T	T		T	T	T	2,5	5,5	8	T	T	
		25							3,5	5,5	7,5	T	T		3,5	7,5	T		5	8	T	T		
		32							4,5	7	T	T			7	T		4,5	7	T	T			
		40							7	T	T			7	T			7	T	T				
		50							6	T				T					6	T				
MTX 160c	C	63									T				T								10	
		16									3				3	3	3						3	
		20									3				3	3	3						3	
		25									3				3	3	3						3	
		32									3				3	3	3						3	
		40									3				3	3	3						3	
		50									3				3	3	3						3	
		63									3				3									
		80													3									
		100																						
MTXE 160	C	125																						
		160																						
		10																						
		25																						
		63																						
		100																						
MTX 250	C	160																						
		63																					3	
		80																					3	
		100																						
		125																						
		160																						
		200																						
		250																						

Note: T= total selectivity - kA values

MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

Protection of lighting circuits

Determining the rated current of the circuit breaker

To select the most suitable rated current of the miniature circuit breaker for lighting circuit protection, it is necessary to know the operating current provided by the lighting device manufacturer, or calculated on the basis of the type of lamp and the relative technical data (rated power, power supply voltage and power factor). Once the operating current is known, you should choose the circuit breaker version with the rated current value immediately above this value. The tables below show the maximum number of lamps that can be protected, on the basis of the rated current. For all case, you are advised to choose a circuit breaker with tripping characteristic C.

SINGLE-PHASE 230V AC - THREE-PHASE DISTRIBUTION 400V AC WITH NEUTRAL ⁽¹⁾													
Rated current In (A):	6	10	13	16	20	25	32	40	50	63	80	100	125
FLUORESCENT lamps	Lamp power (W)	Number of lamps per phase											
Single without P.F. correction ($\cos \phi = 0.6$)	18	24	36	61	79	98	122	153	196	245	306	386	490
	36	12	18	30	39	49	61	76	98	122	153	193	245
	58	7	11	19	24	30	38	47	60	76	95	119	152
Single with P.F. correction ($\cos \phi = 0.86$) ⁽²⁾	18	35	52	87	114	140	175	219	281	351	439	553	703
	36	17	26	43	57	70	87	109	140	175	219	276	351
	58	10	16	27	35	43	54	68	87	109	136	171	218
Double with P.F. correction ($\cos \phi = 0.86$) ⁽²⁾	2 x 18	17	26	43	57	70	87	109	140	175	219	276	351
	2 x 36	8	13	21	28	35	43	54	70	87	109	138	175
	2 x 58	5	8	13	17	21	27	34	43	54	68	85	109

⁽¹⁾ Star connection⁽²⁾ The values given are valid for lamps with inductive ballast and starter. In the case of lamps with an electronic power supply, the number of lamps indicated should be halved

THREE-PHASE DISTRIBUTION 230V AC and 400V AC ⁽³⁾		
DISCHARGE lamps	Power (W) ⁽⁴⁾	Current In (A)
Mercury vapor lamp	≤ 700	6
	≤ 1000	10
	≤ 2000	16
Metal halide lamp	≤ 375	6
	≤ 1000	10
	≤ 2000	16
High pressure sodium vapor lamp	≤ 400	6
	≤ 1000	10

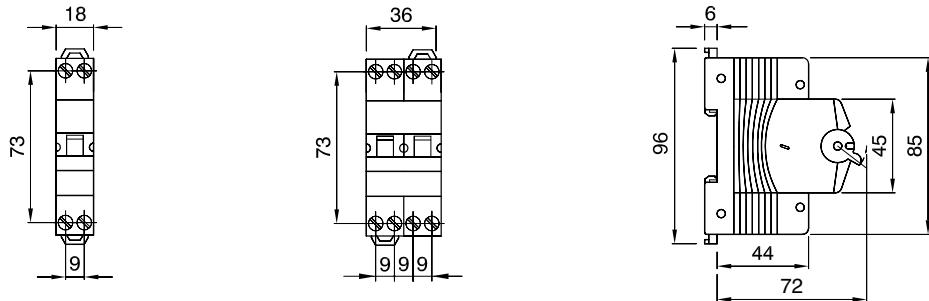
⁽³⁾ With ballast with or without P.F. correction, and star or delta connection⁽⁴⁾ The values given refer to the maximum values for each start-up

SINGLE PHASE DISTRIBUTION 230 V a.c.																
Tripping characteristic C																
Rated current In (A)			6	10	13	16	20	25	32	40	50	63	80	100	125	
SMART LED lamps		Lamp power (W)	Number lamps per phase													
SMART [4] - LB	2L		31	-	10	17	23	32	44	59	78	100	129	168	214	270
	2+2L		62	-	6	10	14	19	26	35	46	59	76	99	126	159
	4L		62	-	6	10	14	19	26	35	46	59	76	99	126	159
	5L		69	-	4	7	10	14	19	26	34	44	57	74	94	119
SMART [4] - HB	4+4L		124	-	3	5	7	9	13	17	23	29	38	49	63	79
	5+5L		138	-	2	3	5	7	9	13	17	22	28	37	47	59
	4x4L		248	-	1	2	3	4	6	8	11	14	19	24	31	39
	4x5L		276	-	-	1	2	3	4	6	8	11	14	18	23	29

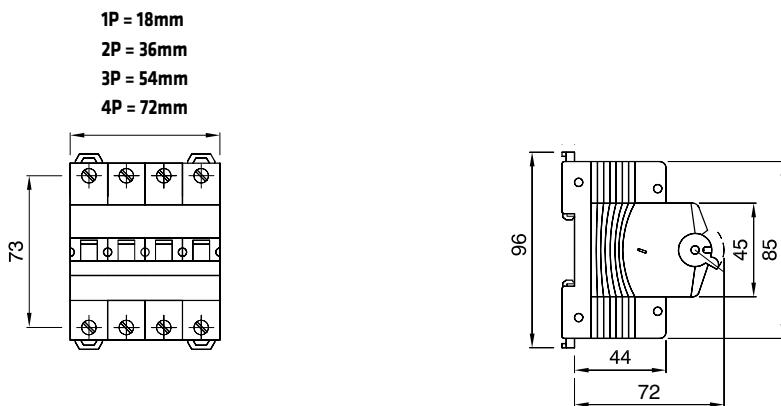
MODULAR CIRCUIT BREAKERS FOR CIRCUIT PROTECTION

Dimension tables

MTC 45 - MTC 60 - MTC 100



MT45 - MT 60 - MT 100 - MT 250



MTHP 160 - MTHP 250

