

Thermal Overload Relays



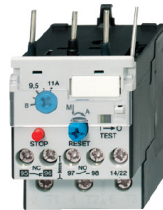
Thermal Overload Relays for plug-in mounting

Technical Datasheet

For contactors MC(MCD)-10 to MC(MCD)-22						Wiring Diagram
Setting Range		Type		Pack Pcs.	Weight kg/pc.	
D.O.L. (A)	$\Upsilon\Delta$ (A)	Manual Reset	Auto Reset			
0.12 - 0.18	-	U12/16E0.18-MC	U12/16A0.18-MC	1	0.10	<p>Manual Reset</p>
0.18 - 0.27	-	U12/16E0.27-MC	U12/16A0.27-MC	1	0.10	
0.27 - 0.4	-	U12/16E0.4-MC	U12/16A0.4-MC	1	0.10	
0.4 - 0.6	-	U12/16E0.6-MC	U12/16A0.6-MC	1	0.10	
0.6 - 0.9	-	U12/16E0.9-MC	U12/16A0.9-MC	1	0.10	
0.8 - 1.2	-	U12/16E1.2-MC	U12/16A1.2-MC	1	0.10	
1.2 - 1.8	-	U12/16E1.8-MC	U12/16A1.8-MC	1	0.10	
1.8 - 2.7	-	U12/16E2.7-MC	U12/16A2.7-MC	1	0.10	
2.7 - 4	-	U12/16E4-MC	U12/16A4-MC	1	0.10	
4 - 6	7 - 10.5	U12/16E6-MC	U12/16A6-MC	1	0.10	
6 - 9	10.5 - 15.5	U12/16E9-MC	U12/16A9-MC	1	0.10	
8 - 11	14 - 19	U12/16E11-MC	U12/16A11-MC	1	0.10	
10 - 14	18 - 24	U12/16E14-MC	U12/16A14-MC	1	0.10	
13 - 18	23 - 31	U12/16E18-MC	U12/16A18-MC	1	0.10	
17 - 23	30 - 40	U12/16E23-MC	U12/16A23-MC	1	0.10	
22 - 30	38 - 52	U12/16E30-MC	U12/16A30-MC	1	0.13	



For contactors MCION-S to MC40-S						Wiring Diagram
Setting Range		Type	Pack Pcs.	Weight kg/pc.		
D.O.L. (A)	$\Upsilon\Delta$ (A)					
0.12 - 0.18	-	MCOR-1-0.18	1	0.14	<p>Manual and Auto Reset</p>	
0.18 - 0.27	-	MCOR-1-0.27	1	0.14		
0.27 - 0.4	-	MCOR-1-0.4	1	0.14		
0.4 - 0.6	-	MCOR-1-0.6	1	0.14		
0.6 - 0.9	-	MCOR-1-0.9	1	0.14		
0.8 - 1.2	-	MCOR-1-1.2	1	0.14		
1.2 - 1.8	-	MCOR-1-1.8	1	0.14		
1.8 - 2.7	-	MCOR-1-2.7	1	0.14		
2.7 - 4	-	MCOR-1-4	1	0.14		
4 - 6	7 - 10.5	MCOR-1-6	1	0.14		
6 - 9	10.5 - 15.5	MCOR-1-9	1	0.14		
8 - 11	14 - 19	MCOR-1-11	1	0.14		
10 - 14	18 - 24	MCOR-1-14	1	0.14		
13 - 18	23 - 31	MCOR-1-18	1	0.14		
17 - 24	30 - 41	MCOR-1-24	1	0.14		
23 - 32	34 - 55	MCOR-1-32	1	0.14		



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For contactors MC24-S to MC40-S					
Setting Range					
D.O.L. (A)	$\Upsilon \Delta$ (A)	Type	Pack Pcs.	Weight kg/pc.	Wiring Diagram
10 - 14	18 - 24	MCOR-2-14	1	0.30	<p>T1 T2 T3 Manual and Auto Reset</p>
14 - 20	24 - 35	MCOR-2-20	1	0.30	
20 - 28	35 - 48	MCOR-2-28	1	0.30	
28 - 42	48 - 73	MCOR-2-42	1	0.30	



For contactors MC50-S to MC74-S					
Setting Range					
D.O.L. (A)	$\Upsilon \Delta$ (A)	Type	Pack Pcs.	Weight kg/pc.	Wiring Diagram
20 - 28	35 - 48	MCOR-3-28	1	0.40	<p>T1 T2 T3 Manual and Auto Reset</p>
28 - 42	48 - 73	MCOR-3-42	1	0.40	
40 - 52	70 - 90	MCOR-3-52	1	0.40	
52 - 65	90 - 112	MCOR-3-65	1	0.40	
60 - 74	104 - 128	MCOR-3-74	1	0.40	



Thermal Overload Relays for separate mounting

For contactors MC90-S to MC115-S						
Setting Range						
D.O.L. (A)	Υ	Δ (A)	Type	Pack Pcs.	Weight kg/pc.	Wiring Diagram
60 - 90		104 - 156	MCOR-4-90	1	0.90	<p>Manual Reset</p>
80 - 120		140 - 207	MCOR-4-120	1	0.90	

For contactors MC151-S to MC176-S							
Setting Range							
D.O.L. (A)	Υ	Δ (A)	Type	Pack Pcs.	Weight kg/pc.	Wiring Diagram	
120 - 180		208 - 312	MCOR-5-180	1	1.5	<p>Manual and Auto Reset</p>	
For contactors MC210-S up to MC316-S, Busbars included							
144 - 216		250 - 374	MCOR-6-216	1	1.8		
216 - 320		374 - 554	MCOR-6-320	1	1.8		
For contactors MC315-S, MC450-S, MC550-S, MC700-S, MC860-S							
240 - 360		416 - 623	MCOR-7-360	1	4.1		
360 - 540		623 - 935	MCOR-7-540	1	4.1		
540 - 800		935 - 1385	MCOR-7-800	1	4.1		

Thermal Overload Relays



Accessories

Technical Datasheet

Set for Single Mounting on DIN-Rail with terminals					
For overload relays	Cable Cross-section (mm ²)		Type	Pack Pcs.	Weight kg/pc.
	Solid or stranded	Flexible			
U12/16..-MC	0.75 - 6	0.75 - 4	U12SM-MC	1	0.035
Additional Terminals with fingertouch protection					
MCOR-1	0.75 - 6	0.75 - 4	U3/32SM	1	0.035
Set for Single Mounting on DIN-Rail					
MCOR-2, MCOR-3	-	-	U3/42G	1	0.030
Connecting Wire Set for MCOR-2,MCOR-3 with Single Mounting					
MCOR-2	150mm lang 10mm ²		LG5830-4	1	0.060
MCOR-3	250mm lang 10mm ²		LG5830-2	1	0.100
Additional Terminals with fingertouch protection					
3-pole for MCOR-2	4 - 35	6 - 25	LG7559	1	0.052



Thermal Overload Relays, tripping times for selection to motors of protection degree EEx e

Relays With Standard Tripping Characteristic

Setting Range Tripping time depending on the multiple of the current setting from cold condition (tolerance ±20% of the tripping time)						
A	I _A /I _N 3	I _A /I _N 4	I _A /I _N 5	I _A /I _N 6	I _A /I _N 7.5	I _A /I _N 8
MCOR-1..	S	S	S	S	S	S
0.12 - 0.18	16.1	9.6	6.8	5.3	4.2	3.7
0.18 - 0.27	16.6	9.7	6.7	5.2	4.1	3.6
0.27 - 0.4	19.4	11.4	7.9	6.1	4.7	4.2
0.4 - 0.6	18.7	10.9	7.6	5.9	4.6	4.0
0.6 - 0.9	19.2	11.2	7.7	5.9	4.6	4.1
0.8 - 1.2	20.8	12.3	8.5	6.6	5.2	4.6
1.2 - 1.8	25.5	14.1	9.8	7.6	5.9	5.2
1.8 - 2.7	26.6	15.6	10.9	8.3	6.5	5.7
2.7 - 4	22.7	13.6	9.5	7.4	5.8	5.1
4 - 6	22.2	13.3	9.3	7.1	5.6	4.9
6 - 9	20.4	11.9	8.2	6.1	4.7	4.0
8 - 11	20.9	11.8	7.9	5.7	4.3	3.5
10 - 14	21.3	11.7	7.4	5.1	3.7	3.0
13 - 18	21.2	12.1	8.0	6.2	4.6	4.1
17 - 24	20.4	12.0	8.6	6.3	4.5	3.7
23 - 32	20.2	10.2	6.7	4.7	3.4	2.8
MCOR-2..	S	S	S	S	S	S
10 - 14	21.8	11.4	7.0	5.0	3.7	2.8
14 - 20	22.4	11.2	6.7	4.5	3.2	2.4
20 - 28	21.8	10.8	6.5	4.5	3.3	2.5
28 - 42	25.2	13.3	8.0	5.5	4.0	3.1
MCOR-3..	S	S	S	S	S	S
20 - 28	21.8	10.8	6.5	4.5	3.3	2.5
28 - 42	25.2	13.3	8.0	5.5	4.0	3.1
40 - 52	18.3	9.2	5.6	3.9	2.8	2.2
52 - 65	17.8	8.7	5.2	3.4	2.5	1.9

Thermal Overload Relays



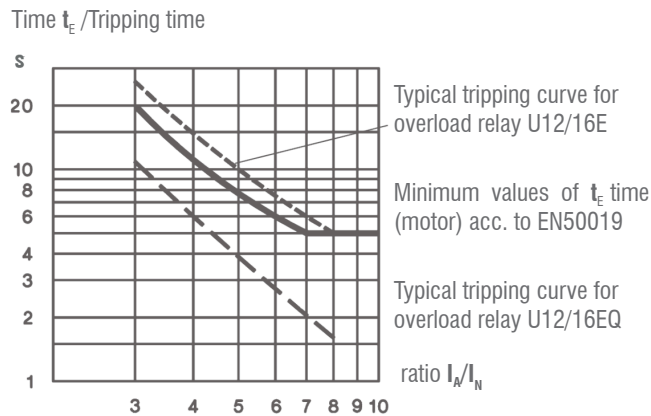
Thermal Overload Relays, tripping times for selection to motors of protection degree EEx e

Technical Datasheet

Relays With Standard Tripping Characteristic

Setting Range Tripping time depending on the multiple of the current setting from cold condition (tolerance $\pm 20\%$ of the tripping time)						
A	I_A/I_N 3	I_A/I_N 4	I_A/I_N 5	I_A/I_N 6	I_A/I_N 7.5	I_A/I_N 8
MCOR-4-..	S	S	S	S	S	S
60 - 90	19.5	13.5	11.0	10.0	9.5	8.5
80 - 120	18.0	11.0	10.0	9.0	8.5	8.0
MCOR-7-..	S	S	S	S	S	S
260 - 360	23.3	14.1	10.0	7.6	6.1	5.4
340 - 480	23.0	13.8	9.6	7.6	6.1	5.4
440 - 620	20.5	12.4	9.0	7.0	5.5	5.0
560 - 800	21.0	12.5	9.0	7.0	5.6	5.2
U12/16E(A)..-MC	S	S	S	S	S	S
0.12 - 0.18	18.5	10.4	7.2	5.5	4.3	3.6
0.18 - 0.27	16.7	9.8	6.5	5.0	4.1	3.5
0.27 - 0.4	19.4	12.1	8.2	5.9	4.9	4.2
0.4 - 0.6	18.7	11.2	8.0	6.0	4.9	4.1
0.6 - 0.9	19.7	11.6	8.1	6.1	4.9	4.2
0.8 - 1.2	22.9	13.6	10.0	7.3	6.0	5.2
1.2 - 1.8	22.2	13.2	9.2	7.6	5.8	5.3
1.8 - 2.7	23.0	13.7	9.3	7.6	5.7	5.1
2.7 - 4	24.0	14.4	9.9	7.8	5.9	5.1
4 - 6	24.7	13.8	9.9	7.3	5.6	4.8
6 - 9	22.0	13.4	8	5.7	4.1	3.5
8 - 11	17.4	9.2	5.9	4.1	2.9	2.3
10 - 14	26.4	12.9	7.6	5.2	3.5	2.8
13 - 18	14.7	7.7	4.8	3.2	2.3	1.7
17 - 23	16.2	8.4	5.0	3.6	2.4	1.8
22 - 30	16.8	8.5	5.0	3.6	2.3	1.9

When selecting a standard overload, refer to the tripping curve. Determine the values of the starting current ratio I_A/I_N and the time t_E which is marked on the label of the motor. The overload must trip within the t_E time, which means that the tripping curve from cold condition must be (20% due to tolerance) below the co-ordination point I_A/I_N and the time t_E . I_A = Starting current of motor I_N = Rated current of motor t_E = t_E -time of motor



Example of selection for thermal overload relay: Technical data of a motor protection EEx e $P_N = 1.5kW$ $I_N = 3.6A$ $I_A/I_N = 5$ t_E time = 8s
 1) U12/16E 4 (2.7 - 4A) Tripping time at $5 \times I_N = 9.9s$ $9.9s + 20\% \text{ tolerance} = 11.9s > t_{E \text{ Motor}} = 8s$ The device U12/16E 4 is not suitable

Thermal Overload Relays



Technical Datasheet

Thermal Overload Relays, Fuses for MCOR-1, MCOR-2, MCOR-3, U12/16E, MCOR-4, MCOR-5, MCOR-6, MCOR-7

Type	Setting Range		Max. Fuse Size According to Coordination-type			aM (A)	Fuse UL (A)	SCCR (kA)
	D.O.L. (A)	$\Upsilon \Delta$ (A)	Quick (A)	Slow, gL(gG) (A)	Slow, gL(gG) (A)			
MCOR-1	0.12 - 0.18	-	0.5 ²	0.5 ²	25	-	15	5
	0.18 - 0.27	-	1.0 ²	1.0 ²	25	-	15	5
	0.27 - 0.4	-	2	2	25	-	15	5
	0.4 - 0.6	-	2	2	25	-	15	5
	0.6 - 0.9	-	4	4	25	-	15	5
	0.8 - 1.2	-	4	4	25	2	15	5
	1.2 - 1.8	-	6	6	25	2	15	5
	1.8 - 2.7	-	10	10	25	4	15	5
	2.7 - 4	-	16	10	25	4	15	5
	4 - 6	7 - 10.5	20	16	25	6	15	5
	6 - 9	10.5 - 15.5	35	25	35	10	25	5
	8 - 11	14 - 19	35	25	35	16	30	5
	10 - 14	18 - 24	50	35	63	16	40	5
	13 - 18	23 - 31	50	35	63	20	50	5
	17 - (23)24	30 - (40)41	63	50	63	25	60	5
	22 - (30)32	40 - (52)55	80	63	80	35	70	5
MCOR-2	10 - 14	18 - 24	50	35	80	16	40	5
	14 - 20	24 - 35	63	50	80	25	60	5
	20 - 28	35 - 48	80	63	80	35	80	5
	28 - 42	48 - 73	100	80	150	50	110	5
MCOR-3	20 - 28	35 - 48	100	80	150	35	80	5
	28 - 42	48 - 73	125	100	150	50	110	5
	40 - 52	70 - 90	160	100	150	63	200	5
	52 - 65	90 - 112	160	125	150	80	250	10
MCOR-4	60 - 9	104 - 156					300	10
	80 - 120	140 - 207					-	10
MCOR-5, MCOR-6, MCOR7	All ranges		For short circuit protecting overload relays with current transformer use fuse according to the contactor of the combination				-	-
							-	-

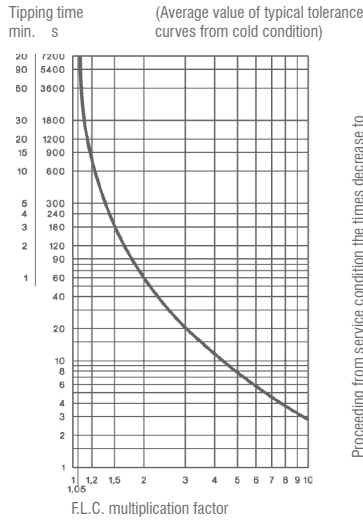
Thermal Overload Relays

Tripping Characteristics for MCOR-1, MCOR-2, MCOR-3, U12/16E..-MC

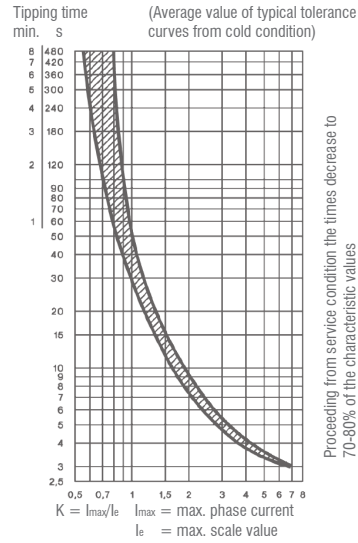


Technical Datasheet

With three-phase load



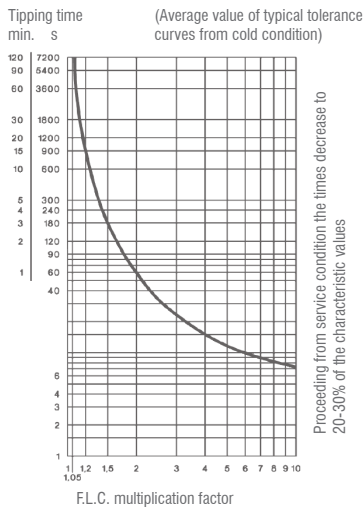
With two-pole load



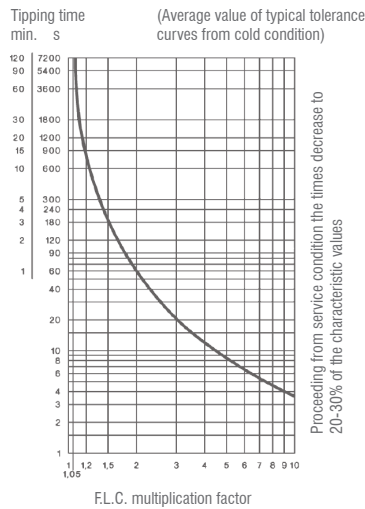
1) Coordination-type according to IEC 947-4-1: "2": Light contact welding accepted. Thermal overload relay must not be damaged. "1": Welding of contactor and damage of the thermal overload relay allowed. 2) Miniature fuse. 3) Suitable for use on a capability of delivering not more than.

Tripping Characteristics for MCOR-4, MCOR-5, MCOR-6, MCOR-7

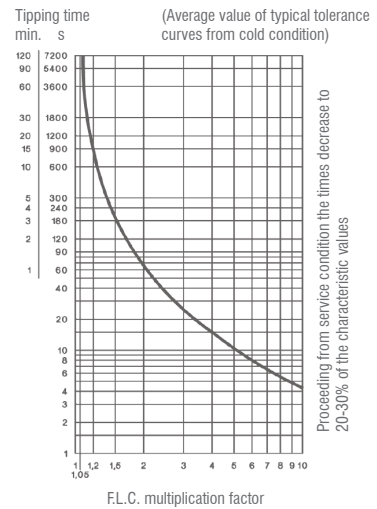
MCOR-4 with three-phase load



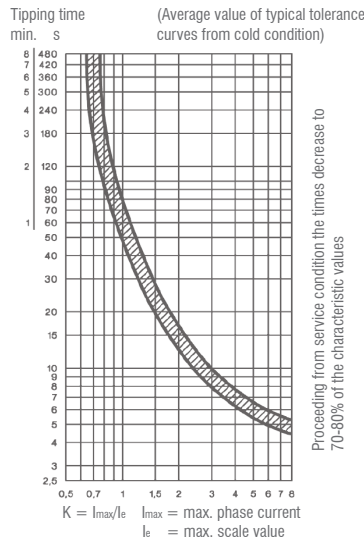
MCOR-5, MCOR-6 with three-phase load



MCOR-7 with three-phase load



MCOR-4 with two-pole load



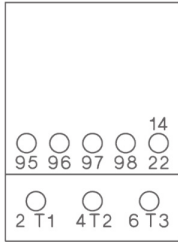
Thermal Overload Relays



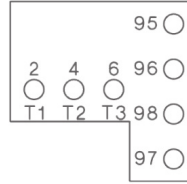
Position of Terminals

Technical Datasheet

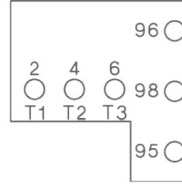
MCOR-1



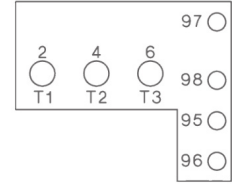
U12/16EXX-MC



U12/16A



MCOR-2, MCOR-3



Data according to IEC 947-4-1, IEC 947-5-1, VDE 0660, EN 60947-4-1, EN 60947-5-1

Type		MCOR-1	U12/16 ⁹⁾	MCOR-2	MCOR-3	MCOR-4	MCOR-5	MCOR-6	MCOR-7	
Rated inaulation voltage U ¹⁾	V~	690	690	690	690	750	1000	1000	1000	
Permissible ambient temperature	Operation open °C						-25 to +60		-25 to +55	
	Storage °C						-50 to +70		-40 to +70	
Tip class according to IEC 947-4-1	10A	10A	10A	10A	10A	20	10A	10A	10	
Cable cross-section	Main connector solid or nstranded mm ²	0.75-6	0.75-6+0.75-2.5 ²⁾	0.75-10	4.35 ²⁾	3)	7)	-	7)	
	Flexible mm ²	1-4	0.75-4+0.5-2.5 ²⁾	0.75-6	2.25 ²⁾					
	Flexible when multicore cable end mm ²	0.75-4	0.5-2.5+0.5-1.5	0.75-6	4.25					
	Cables per clamp number	2	1+1	2	1					
	Auxiliary connector solid mm ²			0.75-2.5 ²⁾					1-2.5 ²⁾	
	Flexible mm ²			0.5-2.5 ²⁾					1-2.5 ²⁾	
	Flexible when multicore cable end mm ²			0.5-1.5					1-2.5 ²⁾	
Cables per clamp number			2					2		
Type		MCOR-1	U12/16A...MC	U12/16E...MC		MCOR-2 MCOR-3	MCOR-4	MCOR-5 MCOR-6	MCOR-7	
Auxiliary contacts Rated inaulation voltage U ¹⁾	Same potential V~	690	690	690	690	690	690	690	500	
	Different potential V~	440	-	440	440	250	440	440	500	
Utilization category AC15 Rated operational current I ₀	24V A	3	4	5	5	4	5	3	4 ²⁾	
	230V A	2	2.5	3	3	2.5	3	2	2.5	
	400V A	1	1.5	2	2	1.5	2	1	1.5	
	690V A	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.6	
Utilization category DC13 Rated operational current I ₀	24V A	1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
	110V A	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
	220V A	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Short circuit prot. (without welding 1kA) highest fuse rating	gL (gG) A	4	4	6	6	6	6	4	6	
Type		MCOR-1	U12/16A...MC	U12/16E...MC	MCOR-2		MCOR-3		MCOR-4	
Setting range		All	To 23A	22-30A	To 28A	28-42A	To 52A	52-65A	All	
Power loss per current path (max.)	Minimum setting value W	1.1	1.1	1.7	1.3	1.3	2.0	2.9	1.1	
	Maximum setting value W	2.3	2.3	3.7	2.6	3.3	3.7	4.5	2.5	

Thermal Overload Relays



Technical Datasheet

Data according to cULus

Type		MCOR-1	U12/16A..-MC	U12/16E..-MC	MCOR-2	MCOR-3
Rated insulation voltage	V~	600	600	600	600	600
Rated current	A	32	23	23	42	74
Auxiliary contacts Rated voltage	Same potential V AC	600	600	600	600	600
	Different potential V~	150	-	150	150	150
Switching capacity AC of aux. contacts	VA	500	500	500	600	600
	A	2	3	4	4	4

In case of higher ambient temperature use the following formula: $(\text{Ambient temperature} - 20) \times 0.125 = \text{correction factor in \% of the full load motor current}$.

Example: Ambient temperature 70°C, Full load motor current 7A $(70 - 20) \times 0.125 = 6.25\%$ Setting value: $7A + 6.25\% = 7.44A$

- 1) Suitable for: earthed-neutral systems, overvoltage category I to III, pollution degree 3 (standard-industry): $U_{imp} = 4kV$ (at 440V), $6kV$ (at 690V)
Data for other conditions on request.
- 2) Maximum cable cross-section with prepared conductor.
- 3) Without terminals, suitable for bushing one connector $70mm^2$ (stranded) per phase.
- 4) Switching capacity of the start contact: AC15 300VA, max. 1.5A, DC13 (max. 220V) 30W, max. 2.5A
- 5) Switching capacity of the make contact: AC15 400VA, max. 1.7A, DC13 (max. 220V) 10W, max. 1A
- 6) U12/16E 30: Cable cross-section for main connector like type U3/42, one connector only.
- 7) Busbar sets see accessories page 105

Overload Relay (thermal) Single phase protection Temperature compensation Trip and alarm contacts

Type	U12/16..-MC	MCOR-1	MCOR-2	MCOR-3	MCOR-4
Number of Setting Ranges from	16 0.12-30A	16 0.12-32A	4 10-42A	5 20-74A	2 60-120A
Busbar sets	-	-	-	-	-
Type	MCOR-5	MCOR-6	MCOR-7		
Number of Setting Ranges from	1 120-180A	2 144-320A	3 240-800A		
Busbar sets	integrated	integrated	SU840/550	SU840/860	