Manual motor starters : System overview

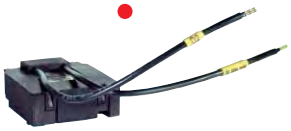
✔ ***Molded enclosure***

✔ ***Short-circuit limiter***

✔ ***Auxiliary switch block side mounting***
LH and RH mounting permitted

✔ ***Auxiliary switch block side mounting***
LH and RH mounting permitted

✔ ***Three phase busbar to accept four units***
incoming supply block



✔ ***Internal mounting :***
electric trip device
alarm signaling switch
auxiliary switch block

✔ ***Busbar adapter***

MSU-K manual motor starters - Accessories overview

			Manual motor starter MSU-K ...	Surface mounting enclosure MSU-C	Flush mounting enclosure MSU-P	Busbar adapter (without limiter) MSU-G 05	Busbar adapter (with limiter) MSU-G 06	Busbar adapter (without or with limiter) MSU-LC 291
								
Short-circuit limiter MSU-L 20			X				X	X
Auxiliary switch block for LH or RH side mounting								
1 N/O + 1 N/C	**MSU-A 1**		○	○	○	○	○	○
2 N/O	**MSU-A 2**		○	○	○	○	○	○
1 E/M + 1 N/C	**MSU-A 3**		○	○	○	○	○	○
2 E/M	**MSU-A 5**		○	○	○	○	○	○
1 c/o contact	**MSU-A 6**		○	○	○	○	○	○
1 PE/N termination	**MSU-A 10**		○	○	○	○	○	○
Undervoltage trip	**MSU-B 1 ... 3**		○	○	○	○	○	○
or								
open circuit release	**MSU-D 1 ... 3**		○	○	○	○	○	○
Alarm contact	**MSU-A 8 ... 9**		○	○	○	○	○	○
Emergency stop button stay-put	**MSU-K 1**			○	○			
as above, key release	**MSU-K 2**			○	○			
as above, spring return	**MSU-K 3**			○	○			
Position lock	**MSU-V 1**			X	X			
3 padlocks								
Indicator light	**MSU-SL ...**			X	X			
N/PE termination	**MSU-N 1**			X	X		X	X
options	X							
alternative options	○							

Manual motor starters
MSU-K
Device selection tables and accessories

- Switch for on / off switching of electrical and electromotive loads
- Thermal overload protection
- Phase failure sensitive (differential tripping feature)
- Magnetic short-circuit trip
- Isolator function
- Motor starter
- Trip-free feature
- Forced opening of contacts
- High breaking capacity
- A range of accessories makes the starter suitable for use as the main switch, in emergency-stop equipment and as an undervoltage monitor
- Trip test of alarm contact
- Lockable

- Approvals : UL CSA
  Accessories only MSU-L 20 ... MSU-A 5 approved

Characteristics

Selection table Manual motor starters with thermal and magnetic trip devices

Max. AC 3 ratings of 3-phase motors 50...60 Hz						Setting range I_r	Tripping current Short-circuit limiter I_{rm}	**Type**	P/N	Weight kg	
220 V 240 V kW	380 V 400 V kW	415 V kW	440 V kW	500 V kW	660 V 690 V kW	A	A				
-	-	-	-	-	-	0.1 ... 0.16	1,9	**MSU-K 0016**	1 364 101 01	0.25	
-	-	-	-	-	-	0.16 ... 0.25	3	**MSU-K 0025**	1 364 102 01	0.25	
-	-	-	-	-	-	0.25 ... 0.40	4,8	**MSU-K 0040**	1 364 103 01	0.25	
-	-	-	-	-	0.37	0.40 ... 0.63	7,5	**MSU-K 0063**	1 364 104 01	0.25	
-	-	-	-	0.37	0.75	0.63 ... 1	12	**MSU-K 010**	1 364 105 01	0.25	
-	0.37	-	-	0.75	1	1 ... 1.6	19	**MSU-K 016**	1 364 106 01	0.25	
0.37	0.75	1.1	1.1	1.1	1.5	1.6 ... 2.5	30	**MSU-K 025**	1 364 107 01	0.25	
0.75	1.5	1.1	1.5	2	3	2.5 ... 4	48	**MSU-K 040**	1 364 108 01	0.25	
1.1	2.2	2.2	2.2	3	4	4 ... 6.3	75	**MSU-K 063**	1 364 109 01	0.25	
2.2	4	3	3	5.5	7.5	6.3 ... 10	120	**MSU-K 10**	1 364 110 01	0.25	
4	7.5	7.5	7.5	10	11	10 ... 16	190	**MSU-K 16**	1 364 111 01	0.25	
5.5	10	9	9	11	15	16 ... 20	240	**MSU-K 20**	1 364 112 01	0.25	
5.5	11	11	11	15	18.5	20 ... 25	300	**MSU-K 25**	1 364 113 01	0.25	

Accessories

			Type	P/N	
Short-circuit limiter		Iu = 32 A, Ve ... 415 V	**MSU-L 20**	3 364 051 01	
Electrical trip device (1 per manual motor controller)	Under-voltage trip	110/120 V 50/60 Hz	**MSU-B 1**	3 364 052 25	
		220/240 V 50/60 Hz	**MSU-B 2**	3 364 052 40	
		380/440 V 50/60 Hz	**MSU-B 3**	3 364 052 59	
		Other voltages on request			
	Open circuit trip	110/120 V 50/60 Hz	**MSU-D 1**	3 364 053 25	
		220/240 V 50/60 Hz	**MSU-D 2**	3 364 053 40	
		380/440 V 50/60 Hz	**MSU-D 3**	3 364 053 59	
		Other voltages on request			
Auxiliary switch blocks :	side mounting	1 N/O + 1 N/C	**MSU-A 1**	3 364 054 01	
	side mounting	2 N/C	**MSU-A 2**	3 364 054 02	
	side mounting	1 E/M + 1 N/C	**MSU-A 3**	3 364 054 03	
	side mounting	2 E/M	**MSU-A 5**	3 364 054 05	
	side mounting	1 c/o contact for increased cont. reliability	**MSU-A 6**	3 364 054 06	
	internal fitting	1 N/O + 1 N/C	**MSU-A 7**	3 364 054 07	
	internal fitting	1 N/C alarm cont. (alarm signalling switch)	**MSU-A 8**	3 364 054 08	
	internal fitting	1 N/O alarm cont. (alarm signalling switch)	**MSU-A 9**	3 364 054 09	
	side mounting	PE and N termination	**MSU-A 10**	3 364 054 10	

Notes

Recommendation : it is recommended that 4 A to 25 A units are spaced 10 mm apart.
Technical details and dimensions pages 1697, 1700
Selection criteria page 1695

Accessories

Description

MSU-L 20

MSU-ST 31
MSU-ST 32

MSU-G 4

MSU-G 05

MSU-G 03

MSU-A 1

MSU-B/-D...
MSU-A

Characteristics

	Type	P/N	
Busbar adapter, I_u 32 A, V_e 660 V, 54 mm wide, for mounting a MSU-K manual motor starter (including accessories) on busbars with a cross section of 12 x 5 mm or 12 x 10 mm with a busbar spacing of 40 mm.	**MSU-G 05**	3 364 006 01	
Busbar adapter, I_u 32 A, V_e 660 V, 54 mm wide, for mounting a MSU-K manual motor starter (including accessories) with I_e limiter, otherwise as above.	**MSU-G 06**	3 364 007 01	
Busbar adapter, I_u 32 A, V_e 660 V, 54 mm wide, to accept MSU-K manual motor starter (including accessories) with or without I_e limiter MSU-L 20 or contactor, for 12, 15, 20 or 30 mm busbars, 5 mm thick, busbar spacing 60 mm.	**MSU-LC 291**	3 364 027 01	
Busbar adapter, I_u 32 A, V_e 660 V, 54 mm wide, for MSU-K manual motor starter and contactors up to 11 kW (2 mounting rails), otherwise as above.	**MSU-LC 292**	3 364 028 01	
3-phase busbar system (I_{th} = 80 A, V_i = 660 V) 3-phase with 4 terminals for supply by means of incoming supply block MSU-G 4. Expandable as required, provided the I_{th} allows it. Basic version for max. 4 MSU-K starters. For parallel connection of, e.g., 11 MSU-K, 4 MSU-G 03 are necessary.	**MSU-G 03**	3 364 008 01	
Incoming supply block 80 A, V_i 660 V for connection of the supply lead when using the 3-phase busbar system MSU-G 03	**MSU-G 4**	3 364 056 01	
Set of links 3 pole (Contactor - Manual motor starter)	**MSU-VS 3**	3 366 070 00	
Protecting cap, 3 pole, for unused phase terminals on the 3-phase busbars (packing unit : 10 each)	**MSU-DS S**	3 364 057 01	
Busbar support for 3 copper busbars, 12 or 15 mm wide and 5 mm thick; the busbar spacing can be 40 or 50 mm, as required (dynamic short-circuit rating 50 kA with 50 mm busbars and 500 mm support spacing). Packing unit : 1 set = 2 complete busbar supports including captive fixing screws.	**MSU-ST 31**	3 364 010 01	
Busbar support as above, but for 60 mm busbar spacing, copper busbars 12...30/5 mm	**MSU-ST 32**	3 364 029 01	

Notes

Typical applications page 1701

Dimensions pages 1700-1701

Accessories

Description

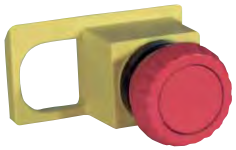
MSU-SL ...

MSU-V 1

MSU-C ...

MSU-N 1

MSU-K 1



MSU-P

Characteristics

		Degr. of prot.	Type	P/N	
Molded enclosure with ground protection	Surface mounting type (RAL 7032) Surface mounting type (RAL 7032) Flush mounting type (RAL 7032)	IP 41 IP 55 IP 41	**MSU-C 1** **MSU-CE 1** **MSU-P 1**	3 364 058 01 3 364 058 02 3 364 059 01	
Assembly kit for IP 55	Enclosure MSU-C 1 Enclosure MSU-P 1		**MSU-E 1** **MSU-E 2**	3 364 060 01 3 364 060 02	
Position lock for molded enclosure with 3 padlocks in the off position Interlocking device for 3 padlocks with 8 mm shackle dia		IP 55	**MSU-V 1**	3 364 015 01	
Emergency stop button, stayput, red on yellow surface, resetting by pulling		IP 41	**MSU-K 1**	3 364 061 01	
* **Emergency stop button**, stayput, red on yellow surface, resetting with key			**MSU-K 2**	3 364 062 01	
Emergency stop button, spring return, red on yellow surface			**MSU-K 3**	3 364 073 01	

	Operational voltage	Color	Type	P/N	
Indicator lights with fixed connection lead and neon lamp	110 V .... 120 V AC/DC	red white green	**MSU-SL-1** **MSU-SL-2** **MSU-SL-3**	3 364 063 01 3 364 063 07 3 364 063 02	
	220 V ... 240 V AC/DC	red white green	**MSU-SL-4** **MSU-SL-5** **MSU-SL-6**	3 364 064 01 3 364 064 07 3 364 064 02	
	380 V ... 440 V AC/DC	red white green	**MSU-SL-7** **MSU-SL-8** **MSU-SL-9**	3 364 065 01 3 364 065 07 3 364 065 02	
N or PE termination for fitting into MSU-C+P enclosures (1additional pc.)			**MSU-N 1**	3 364 066 01	

Notes

* Follow special mounting instructions when fitting into molded enclosure !

Dimensions page 1700

MSU-K manual motor starters

Rated short-circuit breaking capacity I_{cn} in accordance with IEC 947-2
Selection criteria

Setting range	230 V			400 V			415 V			500 V			690 V		
	I_{cu} [1]	I_{cs} [2]	max. fuse	I_{cu}	I_{cs}	max. fuse	I_{cu}	I_{cs}	max. fuse	I_{cu}	I_{cs}	max. fuse	I_{cu}	I_{cs}	max. fuse
A	kA	kA	(gL/gG) A	kA	kA	(gL/gG) A	kA	kA	(gL/gG) A	kA	kA	(gL/gG) A	kA	kA	(gL/gG) A
0.1...0.16	65	65	o	65	65	o	65	65	o	65	65	o	42	42	o
0.16...0.25	65	65	o	65	65	o	65	65	o	65	65	o	42	42	o
0.25...0.4	65	65	o	65	65	o	65	65	o	65	65	o	42	42	o
0.4...0.63	65	65	o	65	65	o	65	65	o	65	65	o	42	42	o
0.63...1	65	65	o	65	65	o	65	65	o	65	65	o	1	1	20
1...1.6	65	65	o	65	65	o	65	65	o	65	65	o	1	1	20
1.6...2.5	65	65	o	65	65	o	10	5	25	3	1.5	25	1	0.5	20
2.5...4	65	65	o	10	5	35	10	5	35	3	1.5	35	1	0.5	25
4...6.3	65	37.5	o	10	5	50	10	5	50	3	1.5	50	1	0.5	35
6.3...10	10	5	80	4	2	80	4	2	80	3	1.5	50	1	0.5	35
10...16	6	3	80	4	2	80	3.5	1.7	80	3	1.5	63	1	0.5	35
16...20	6	3	80	4	2	80	2.5	1.2	80	1.5	0.7	63	1	0.5	50
20...25	6	3	80	4	2	80	2.5	1.2	80	1.5	0.7	63	1	0.5	50

o : up to the listed value of I_{cu} or I_{cs}, there is no fuse necessary.
If the short-circuit current exceeds the (I_{cs}), a fuse is necessary.

Short-circuit limiting

To increase the I_{cu}/I_{cs}, the MSU-K can be combined with the short-circuit limiter MSU-L20.

For this combination there are the following values for rated service short-circuit breaking capacity :

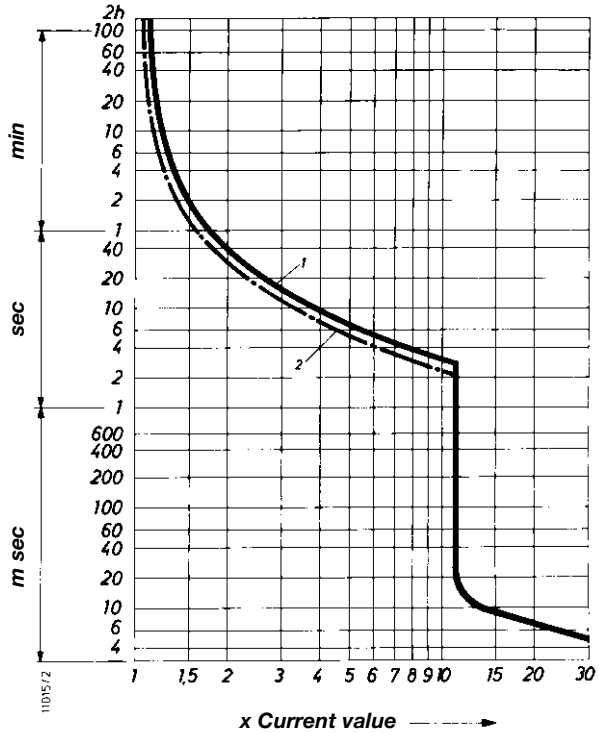
Rated current I_n	230 V		400 V...415 V	
	I_{cu}	I_{cs}	I_{cu}	I_{cs}
A	kA	kA	kA	kA
< 2.5	65	65	65	65
< 6.3	65	65	50	50
< 25	50	50	50	50

Notes

[1] I_{cu} = Rated maximum short-circuit breaking capacity

[2] I_{cs} = Rated service short-circuit breaking capacity

Trip curves / Selection criteria



Typical tripping characteristics
1 Three-phase trip curve
2 Two-phase trip curve (phase failure sensitive)

(Single phase- or DC-operating : the contacts in series)

The "characteristic curve" of the thermal overcurrent trip device shows tripping for all setting ranges as a function of the multiple of the set current value, and represents the mean value of the scatter bands in the cold condition.

When switchgear is at operating temperature, the trip time of the thermal overcurrent trip device is reduced to approx. 25 % of the values shown.

Protection of PVC insulated copper leads
from thermal overloading on short-circuit

Type	Setting range	mm²
MSU-K 0016	0.1...0.16 A	0.75
MSU-K 063	4...6.3 A	
MSU-K 10	6.3...10 A	1.0
MSU-K 16	10...16 A	1.5
MSU-K 20	16...20 A	2.5
MSU-K 25	20...25 A	

Terminal capacities

Type	Conductor type	Number of conductors	Conductor cross section, mm² 1	1,5	2	2,5	4	6	10	16 or 25
MSU-K	solid	1	✘	✘	✘	✘	✘	✘	-	-
(manual		2	✘	✘	✘	✘	✘	✘	-	-
motor	flexible with	1	✘	✘	✘	✘	✘	-	-	-
starter)	wire end ferrule	2	✘	✘	✘	✘	✘	-	-	-
MSU	solid	1	✘	✘	✘	✘	✘	✘	✘	✘
(short		2	✘	✘	✘	✘	✘	✘	✘	-
circuit	flexible with	1	✘	✘	✘	✘	✘	✘	✘	-
limiter)	wire end ferrule	2	✘	✘	✘	✘	✘	✘	✘	✘
MSU-A	solid	1	✘	✘	✘	✘	-	-	-	-
(auxiliary		2	✘	✘	✘	✘	-	-	-	-
switch)	flexible with	1	✘	✘	✘	✘	-	-	-	-
	wire end ferrule	2	✘	✘	-	-	-	-	-	-
MSU	solid	1	✘	✘	✘	✘	✘	✘	✘	✘
(incoming		2	✘	✘	✘	✘	✘	✘	✘	-
supply	flexible with	1	✘	✘	✘	✘	✘	✘	✘	✘ (16)
block)	wire end ferrule	2	✘	✘	✘	✘	✘	✘	-	-

Technical details - MSU-K manual motor starters

Specifications	IEC 947-2, IEC 947-4-1; VDE 0660; VDE 0113 as a main switch + emergency stop switch in enclosure
Approvals	DEMKO, SEMKO, SEV on request, UL, CSA
Climatic-proof	Damp heat, constant, to DIN IEC 68 Part 2 Test 3, damp heat, cyclic, to DIN IEC 68 Part 2 Test 30
Degree of protection	Starter incl. moulded cover IP 20 open Moulded enclosure IP 41/IP 55 Moulded enclosure IP 41/IP 55
Shock resistance	30 g for 20 ms
Vibration resistance	to German Railways standard BN 411 002
Ambient temperature range	-5 ... + 60° C open -5 ... + 40° C enclosed
Temperature compensation	-5 ... + 55° C to IEC 292
Mounting position	inclined up to 90° C from the vertical
Thermal current I_{th}	up to 25 A for manual motor starter MSU-K up to 63 A for incoming supply block up to 32 A for busbar adapter up to 63 A for 3-phase current busbar system up to 32 A for short-circuit limiter
Rated operational current I_e	up to 25 A, 660 V AC/220 V DC, for MSU-K to CSA and UL : 25 A at 600 V AC/220 V DC
Motor switching capacity	11 kW at 400 V/AC 3
Mechanical life	100,000 operations
Electrical life	100,000 operations on AC 3 duty
Max. switching frequency	40 operations/hr
Rated insulation voltage V_i	690 V in accordance with VDE 0660, IGr. C
Rated operational voltage V_e	up to 690 V AC, (up to 600 V AC to CSA and UL) up to 220 V DC
Max. breaking capacity I_{cn}	according to IEC 157-1 (P-1) : o-t-co VDE 0660/T 101 see table page 1695
Let through integral I^2 t max. Let through current Total break time	50,000 A^2 s 4.5 kA at I_{cn} = 6 kA/3 ~ 415 V 7.0 ms
Trip curve	T II
Response value of electromagnetic trip device	about 12 x max. set value of thermal trip device
Undervoltage trip	Pick up : 0.85 to 1.1 U_c, drop out : 0.7 to 0.35 U_c, 2,2 VA, 1 W, voltage should be continuously applied (100 % duty)
Open circuit shunt release	Pick-up at 0.7 to 1.2 x V_c, 50 % duty, power consumption 3.4 VA, 1.6 W
Auxiliary switch : **Thermal currrent I** **Rated operational current I_e**	6 A side mounted : AC 11 : 230 V, 3.5 A / 400 V, 2 A / 500 V, 1 A; DC 11 : 60 V, 1.5 A / 110 V, 1 A / 220 V, 0.5 A internal fitting : AC 11 : 230 V, 2 A / 400 V, 1A / 500 V, 0.5 A DC 11 : 60 V, 0,7 A / 110 V, 0.55 A / 220 V, 0.25 A
Min. switching capacity	4...30 V and 4...100 mA
Rated insulation voltage V_i	500 V
Rated operational voltage V_s	500 V
Back-up fuse	6 A type gl.
Power dissipation	3 conducting paths, continuous current I_u c. 6 W
Terminal size of screws	Main switches M 4 Auxiliary switches M 3,5
Recommended torque	1.8 Nm 1.2 Nm
Terminal capacities	0.75...6 mm^2 solid wire 0.75...2.5 mm^2 stranded wire 0.75...4 mm^2 stranded wire

MSU-K manual motor starters / Specification

Description of equipment	MSU-K manual motor starters with thermal and magnetic tripping devices are 3-pole manual switching devices (power circuit breakers) - to switch electric and electrical loads on or off - to protect these loads from overload and short circuit They comply with the requirements of VDE 0660, VDE 0113, IEC 292 and IEC157-1 in relation to - isolator characteristic - motor switch - trip-free mechanism - positive opening of contacts - high breaking capacity - phase failure sensitivity in accordance with VDE 0660, Part 104, IEC 292 Additional components allow the following important functions to be obtained : - main switch through locking in the OFF position - emergency stop device through various mushroom-head push buttons - protection on power failure through low voltage tripping device - open-circuit trip shunt release - alarm signalling switch - alarm contact
Special features **High breaking capacity**	MSU-K manual motor starters have a high breaking capacity up to 6.3 A : ∞ up to 10 A; 6 kA, up to 25 A : 4 kA at 400 V. This is made possible by a modern design, by which very short break times are achieved. Because of this, the circuit breakers have become limiters. The advantages are : - Back-up fuses are only necessary at rated equipment currents > 2,5 A and 400 V. - The dynamic and thermal loading of electrical installation components at short-circuit is reduced.
Short-circuit limiter	By the use of the short-circuit current limiter, the short-circuit breaking capacity of the MSU circuit breakers of ≥ 6.3 A-25 A rated current at 380/415 V is increased to 50 kA. Fuses can largely be eliminated.
Temperature compensation	To achieve high tripping accuracy over a large ambient temperature range, MSU-K manual motor starters are temperature compensated from -5°C ... +55°C
Integrable shunt release and alarm contacts	Undervoltage or open-circuit tripping devices, as well as alarm contacts, can be integrated in the equipment. Contour and dimensions of the equipment remain unchanged.
Operating safety in accordance with VBG 4	The equipment cap covers the terminal screws. This meets the safety requirements of VDE 0106 Part 100 and VBG 4.
Simple mounting	The manual motor starter is easily clipped on to a mounting rail (DIN EN 50 022) by an integral snap-on mount.
Convenient and rapid connection	Captive terminal screws supplied in the "open" position allow time-saving and simple connection : insert the wire, tighten screws, done. Time and effort for unscrewing of the terminal is eliminated and terminal parts can no longer go astray.
Easy auxiliary switch mounting	Auxiliary switches are necessary for signalling or for interlocking circuitry. ENTRELEC-SCHIELE has selected modular construction to avoid mistakes during assembly. Simple adaptation to requirements is possible and stocking reduced.
Modular construction	The equipment is designed such that its shape is identical with that of automatic circuit breakers. Because of this, it can easily be installed in flush-mounted distribution systems. When an auxiliary switch is attached, the manual motor starter has the same overall width as a 3-pole automatic circuit breaker.
Accessories **Protective casing**	To ensure optimum protection against dust and water in all applications, the range includes three types of enclosures, of impact-resistant insulation material and of protection types IP 41 and IP 55. The protection level can be increased to IP 55 by an additional kit. The circuit breaker can be clipped into all types of casing. The sizes of enclosures are such that even switchgear with an auxiliary switch attached to it can easily be fitted and the terminal compartment for cable connection is ample in size.
Auxiliary switches for side mounting, on right and left hand side	Five different auxiliary switch blocks can be supplied. After removing the front cover, the block can be snapped in without tools.
Auxiliary switch for internal fitting	Remove the front cover and snap in the auxiliary switch block.
Three-phase busbars for V_u = 660 V, I_u = 80 A	Our three-phase busbars for 4 connections are suitable for parallel connection of any number of manual motor starters with auxiliary switch blocks fitted provided the I_{th} of 63 A is not exceeded. The first busbar is used - in combination with the incoming supply block MSU-G 4 - for supplying the system and for parallel connection of the first manual motor starter. Manual motor starters can be connected additionally to each additional busbar in parallel, as required, and without cutting the bar to length. The incoming supply can also be connected at the center or on both sides. The gives good load distribution. Typical applications page 1701. Additional covering is not necessary, because both switchgear and busbars are safe to touch (satisfy VDE 0106 Part 100) in the basic versions. Unused outlets have a shock protection cover.

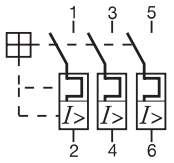
MSU-K manual motor starters / Specification

Incoming supply block	Problem-free supply to the busbar system is made possible with the incoming supply block. It is safe to touch (satisfies VDE 0106) in the basic version.
Short-circuit limiter I_u = 32 A	By attaching the short-circuit limiter to the manual motor starter, back-up fuses can be dispensed with for all non-intrinsically safe equipment ≥ 2,5 A - 25 A at 400 V. The rated breaking capacity I_{cn} (of the combination of manual motor starter and short-circuit limiter) is increased as a result of heavy current limitation and short break time (see page 1695). With this, it is possible to use the switchgear combination in the power system where the prospective short-circuit current exceeds the "normal" switching capacity of the manual motor starter. The short-circuit limiter can be used - taking into account the continuous current I_u - as individual or group protection for several MSU-K ... manual motor starters. Typical applications page 1701.
Busbar adapter	Various busbar adapters are available. They allow manual motor starters MSU-K ... to be snapped onto busbar systems of 40 or 60 mm phase spacing. The manual motor starters are first snapped on to the adapter and attached to connecting leads - which lead to spring-loaded contacts - on the input side. When clipped on the busbars the contact springs tap off voltage directly and the manual motor starters/adapter unit locks itself. By operating a latch, the adapter can be unlocked, allowing it to be changed easily. Important advantages are : - simple and space-saving assembly - convenient replacement of switchgear - problem-free parallel connection, even of switchgear with high rated current Typical applications page 1701.
Shunt release	**Undervoltage trip MSU..B** for protection from hazardous re-starting of machines after power failure.
Open circuit shunt release	**Open circuit shunt release MSU-D..** for control and interlocking purposes are inserted under the switchgear cover.
Mounting of the shunt release and alarm contact	After removing the cover, these can be clipped in with a "handle" and the connections on the knock-out of the cover are turned outwards. The above assembly procedure also applies to alarm contacts.
Emergency stop button	When manual motor starters are to be used as emergency stop devices, this can be done with emergency stop button sets - MSU-K 3 (spring return) - MSU-K 2 (stay put, released by key) - MSU-K 1 (stay put, released by pulling) Fixing is with 4 screws from the inside of the cover.
Interlocking devices	When used as a main switch, the manual motor starter must be lockable in the off position in accordance with VDE 0113. This requirement can be fulfilled using the interlocking device MSU-V 1. It is fixed with 4 screws from the inside of the casing (only with MSU-C and MSU-P) and is located such that by-passing of the interlock - e.g. by removing the casing cover - is impossible.
Indicator light	For visual indication of the switch position (enclosed equipment), the indicator light MSU-SL can be supplied. After breaking out a knock-out on the casing cover, the light is pushed through from the front and fastened with screws from the rear and is then electrically connected.
Alarm contact	The alarm contact MSU-A has alarm signaling function. Ist N/O or N/C contact is actuated when thermal or electromagnetic release - fault - takes place. It does not respond to manual actuation of the MSU-K.

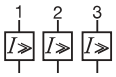
MSU-K manual motor starter :
Circuit diagrams / dimensions

Circuit diagrams

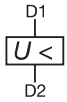
Manual motor starter
MSU-K



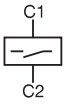
Current limiter
MSU-L20



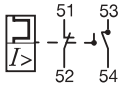
Undervoltage trip
MSU-B..



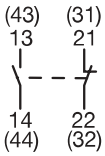
Open circuit trip
MSU-D..



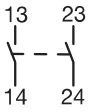
Alarm contact
MSU-A 8 (1 N/C)
MSU-A 9 (1 N/O)



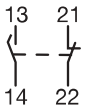
Auxiliary switch blocks
MSU-A 1 + (MSU-A 7)



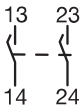
MSU-A 2



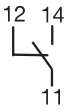
MSU-A3



MSU-A 5

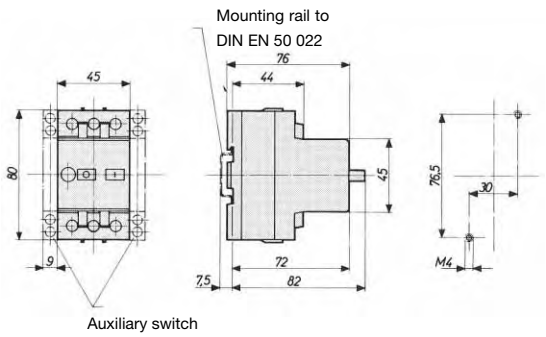


MSU-A 6

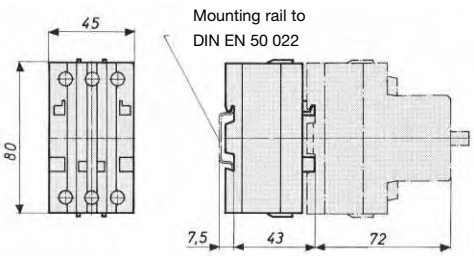


Dimensions

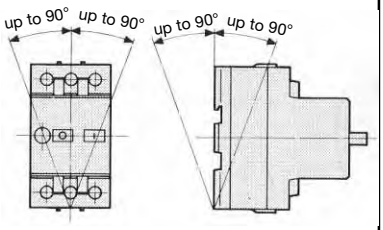
Manual motor starter MSU-K



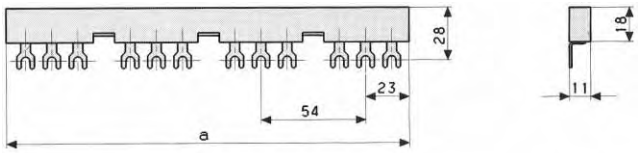
Manual motor starter MSU-K
with short-circuit limiter



Mounting positions

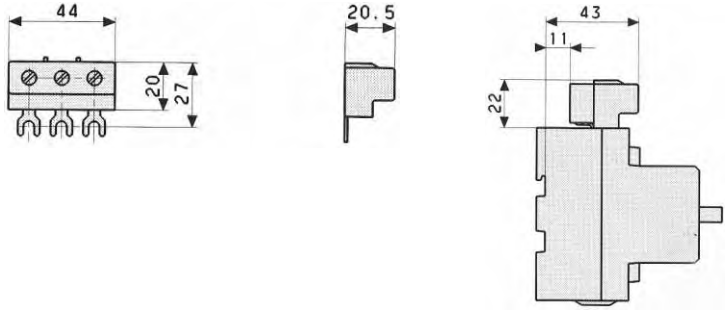


3-phase busbar MSU-G03

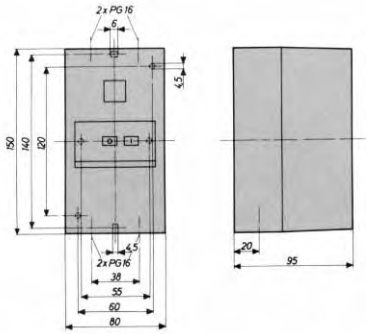


a = 208

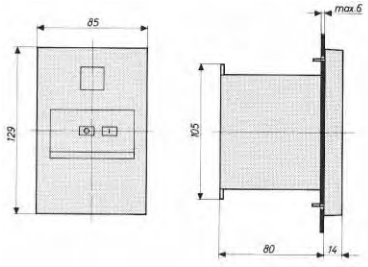
Incoming supply block MSU-G04



Molded enclosure, surface mounting types MSU-C 1, MSU-CE 1



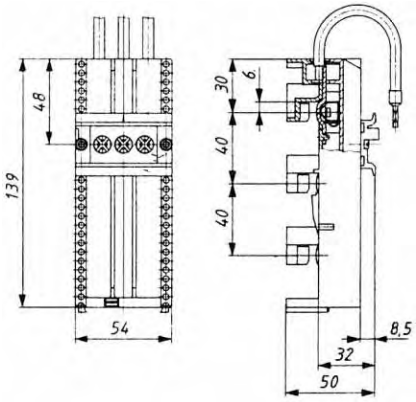
Molded enclosure, flush mounting type MSU-P 1 cut-out 118 x 72 mm



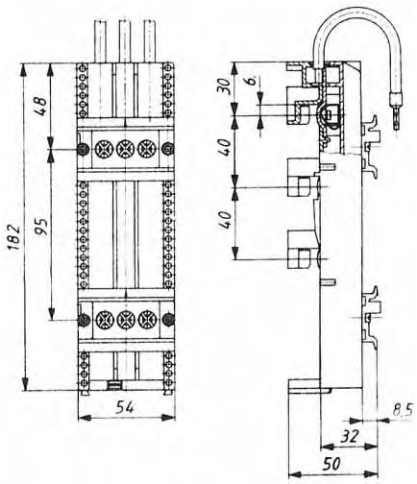
Dimensions / typical applications

Busbar adapter

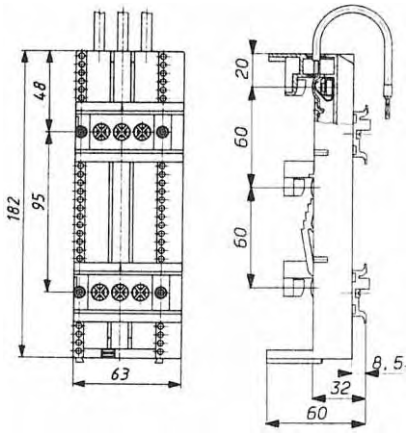
MSU-G 05



MSU-G 06

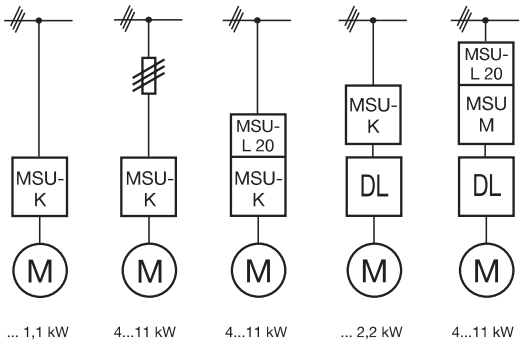


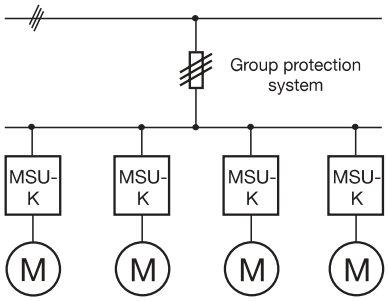
MSU-LC 291 1 rail or
MSU-LC 292 2 rail

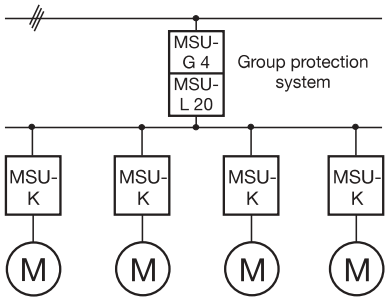


Typical applications

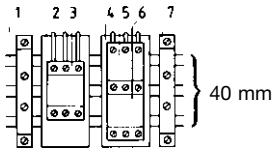
Types of protection



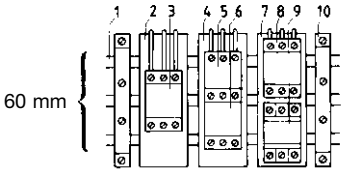




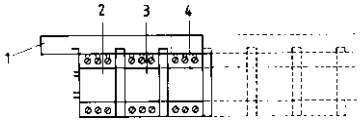
Modular construction
mounting to busbar



Busbar spacing :



Busbar supply
for 4 MSU-K or more



*1. Copper busbars 12-30/5 mm
2. Busbar adapter MSU-G 05
3. Manual motor starter MSU-K ...
or
4. Busbar adapter MSU-G 06
5. Current limiter MSU-L 20
6. Manual motor starter MSU-K
7. Busbar support MSU-ST 31

*1. Copper busbars 12-30/5 mm
2. Busbar adapter MSU-LC 291
3. Manual motor starter MSU-K ...
or
4. Busbar adapter MSU-LC 291
5. Current limiter MSU-L 20
6. Manual motor starter MSU-K ...
or
7. Busbar support MSU-LC 292
8. Manual motor starter MSU-K ...
9. Contactor DL ... 11 kW
10. Busbar support MSU-ST 32

1. 3-phase busbar MSU-G 03
2. Manual motor starter MSU-K ...
3. Manual motor starter MSU-K ...
4. Manual motor starter MSU-K ...
Supply via terminal block MSU-G 4

DL = K range contactors DL 4 K ... DL 11 K, *200-447 A