Technical data
Type MS325, MS45x, MS49x

Device type		MS325	MS450	MS451	MS495	MS496	MS497
Standards, approvals		UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE	UL, CSA, CE
Rated operating current	A	25	50	50	100	100	100
Current range	A	0.10 - 25	11 - 50	11- 50	40 - 100	28 - 100	11 - 100
Number of poles		3	3	3	3	3	3
Frequency	Hz	50/60	50/60	50/60	50/60	50/60	50/60
Tripping class	A	10	10	20	10	20	10
Max. kAIC & 600V	kAIC	50	50	50	50	100	100
Mechanical life	Operations	100,000	50,000	50,000	50,000	50,000	50,000
Wire range	AWG	14-8	1x18-2; 2x18-3	1x18-2; 2x18-3	2x10-1/0; 1x10-2/0	2x10-1/0;1x10-2/0	2x10-1/0; 1x10-2/0
Terminal torque	in. lbs	14	27 – 40	27 – 40	35 – 53	35 – 53	35 – 53
Terminal tool options		flat screwdriver PZ2	flat screwdriver PZ2	flat screwdriver PZ2	hex allen 4mm	hex allen 4mm	hex allen 4mm
Permissible altitude without derating	m	3000	2000	2000	2000	2000	2000
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
UL Listed for group installation		Yes	Yes	Yes	Yes	Yes	Yes
Self-protected Type E manual combination starter		Yes	Yes	Yes	Yes	Yes	Yes
Accessories							
Terminal shroud		No	Yes	Yes	Yes	Yes	Yes
Auxiliary contacts		Yes	Yes	Yes	Yes	Yes	Yes
Shunt trip		Yes	Yes	Yes	Yes	Yes	Yes
Trip signal contacts		Yes	Yes	Yes	Yes	Yes	Yes
UV release		Yes	Yes	Yes	Yes	Yes	Yes
Busbar		Yes	Yes	Yes	No	No	No
Through door handle		Yes	Yes	Yes	No	No	No

Manual motor starter type		MS325	MS450/451	MS495/496/497
Auxiliary circuits				
Load rating of the auxiliary circuits				
Minimum load at:	24 VDC mA	5	5 mA at 17 VDC	
	12 VDC mA	10	—	
Rated operating at AC 15 to current I_e	24 VAC A	2.5	—	
	230 VAC A	2	3 / 0.5 / 6	
	400 VAC A	1	1.5 / — / 3 ①②	
Rated operating at DC 13 to current I_e	24 VDC A	2.5	— / — / —	
	60 VDC A	2.5	— / 0.15 / —	
	110 VDC A	0.6	0.22 / — / 0.5	
	220 VDC A	0.25	0.1 / — / 0.25	
	440 VDC A	—	— / — 0.1	
Short circuit protection				
back up fuse	gL A	10	gL / gG 10 A	
	aM A	6	—	
Release				
Device for phase failure protection		With	With	
Electromagnetic trips				
Response value set ex-works		7.5 – 12 I_n (.16 - .63)A 9 – 14 I_n (1 - 2.5)A 10 – 15 I_n (4 - 6.3)A 12.5 – 17.5 I_n (9 - 25)A	10.4 I_n – 15.6 I_n	
Undervoltage release				
Pick-up value	% of U_c	≥ 85	≥ 85	
Drop-out value	% of U_c	35 – 75	35 – 70	
Power consumption - Pick-up	VA	0.9	20.2	
Power consumption - Hold	VA	0.9	7.2	
Open circuit shunt release				
Pick-up value	% of U_c	≥ 85	≥ 70	
Relative duty consumption	% ED	—	100 at voltages 50 / 60 Hz to Power	
Pick-up	VA	110 - 240V: 13 - 61 ③	Consult factory	
Hold	VA	—	Consult factory	

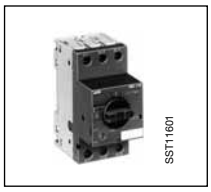
① Correction factors for other frequencies on request.
② On front side 1 chageover contact / on front side 1 NO + 1 NC / at side, 1 NO + 1 NC, 2 NO, 2 NC
③ 24 - 60V: 14.4 - 90vA

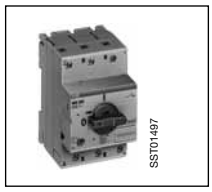
Technical data
Type MS450/451, MS495, 6, 7
Short circuit protection

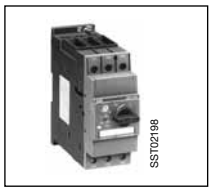
Catalog number	UL 508 — Manual Motor Controller				Motor Disconnect		UL 508 Manual Self-Protected (Type E) Combination Motor Controller	
	Group Installation							
	Max. Short Circuit Current [kA]		Max. Fuse or C.B. per NEC 480V / 600V	For Use With Contactors Below (or larger)	Max. Short Circuit Current [kA]		Max. Short Circuit Current [kA]	
	480Y/277V	600Y/347V			480V	600V	480Y/277V	600Y/347V
MS45x Series								
MS450-16	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-16	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-20	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-20	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-25	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-25	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-32	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-32	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-40	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-40	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-45	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-45	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS450-50	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS451-50	65	25	500	A/AE/AL/AF30,40,50	65	25	65	25
MS49x Series								
MS495-40	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS496-40	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS495-50	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS496-50	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS495-63	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS496-63	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS495-75	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS496-75	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	30
MS495-90	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	~
MS496-90	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	~
MS495-100	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	~
MS496-100	65	30	500	A/AE/AF50,63,75,95,110	65	30	65	~

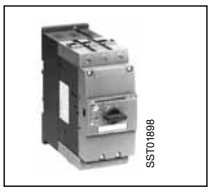
Manual Motor Starters Type Series MS

Technical data









Manual motor starter	**Type**	**MS116**	**MS325; MO325**	**MS450/451; MO450**	**MS495/496/497; MO495/496**

General technical data

Standards: **The devices comply with the major international, European and national regulations IEC 60../EN 60..**		**947-1 947-2 947-4-1 947-5-1**	**947-1 947-2 947-4-1 947-5-1**	**947-1 947-2 947-4-1 947-5-1**	**947-1 947-2 947-4-1 947-5-1**
Disconnector characteristics (to IEC/EN 60947-1)		**yes**	**yes**	**yes**	**yes**
Mechanical service life in **operations**		**100.000**	**100.000**	**50.000**	
Permissible ambient temperature					
- Operating temperature	**°C**	**– 20... + 55/70 ①**	**– 25 ... + 55/70 ①**	**– 20 ... + 60/70 ①**	
- Storage temperature	**°C**	**– 50 ... + 80**	**– 50 ... + 80**	**– 50 ... + 80**	
Temperature compensation		**with**			
Mounting position		**any**			
Permissible altitude	**m**	**3000**	**3000**	**2000**	
Permissible resistance to vibrations ② (IEC 68-2-6)		**10-150 Hz Amplitude 5 g**	**10-150 Hz Amplitude 5 g**	**on request**	**on request**
Permissible resistance to shocks (IEC 68-2-27)	**sinusoidal shock**	**25 g (11 ms)**	**15 g (11 ms)**	**on request**	**on request**
Mounting (mounting hardware not included in scope of delivery)					
Screw fixing		**see accessories**	**see accessories**	**2 x M5**	**2 x M5**
Quick fastening on top-hat rail	**to EN 50022**	**35 mm**	**35 mm**	**35 mm (15 mm high)**	**35 mm,**
	to EN 50023	**–**	**–**	**–**	**75 mm**
Electrical connection of the main conductors (main circuits)					
Type		**Screw terminal**	**Box terminal + bus**	**Box terminal**	**Box terminal**
Screw		**Pozidrive size 2**	**Pozidrive size 2 4 mm**	**Pozidrive size 2**	**Internal hexagon**
	Single-core 1 x mm²	**1 ... 4**	**1 ... 10**	**0.75 ... 35**	**2.5 ... 70**
	2 x mm²	**1 ... 4**	**1 ... 4**	**0.75 ... 25**	**2.5 ... 50**
	Stranded 1 x mm²	**1 ... 4**	**1 ... 10**	**0.75 ... 35**	**2.5 ... 70**
	2 x mm²	**1 ... 4 ③**	**–**	**0.75 ... 25**	**2.5 ... 50**
	Flexible 1 x mm²	**0.75 ... 2.5**	**1 ... 6**	**0.75 ... 25**	**2.5 ... 50**
	2 x mm²	**0.75 ... 2.5**	**–**	**0.75 ... 16**	**2.5 ... 35**
of the auxiliary conductors (auxiliary circuits)					
Type		**Screw terminal**	**Screw terminal ④**	**Screw terminal**	
Screw		**Pozidrive size 2**	**Pozidrive size 1**	**Pozidrive size 2**	
	Single-core 1 x mm²	**1 ... 2.5**	**0.5 ... 2.5**	**0.5 ... 2.5**	
	2 x mm²	**1 ... 2.5**	**0.5 ... 2.5**	**0.5 ... 2.5**	
	Flexible 1 x mm²	**0.75 ... 2.5**	**0.5 ... 2.5**	**0.5 ... 1.5**	
	2 x mm²	**0.75 ... 2.5 ⑤**	**0.5 ... 2.5**	**0.5 ... 1.5**	

① Operating conditions up to 70° C on request

② G-values refer to the mounting position subject to the highest shock sensitivity

③ Also applies to auxiliary switches HKF1 and undervoltage release UA1

④ For auxiliary switch HKF.. Pozidrive 2

⑤ Applies to auxiliary switches HK1 and SK1

Manual motor starter	Type	MS116	MS325; MO325	MS450/451; MO450	MS495/496/497; MO495/496
General electrical data					
Rated insulation voltage U_i					
to EN 60947	**V AC**	**690**	**690**	**690**	**690**
to CSA / U_L / NEMA	**V AC**	**600**	**600**	**600**	**600**
Rated operating voltage U_e **up to**	**V**	**690 AC/440 DC**	**690 AC/440 DC**	**690 AC/440 DC**	**690 AC/440 DC**
Rated impulse strength U_{imp}	**kV**	**6**	**6**	**6**	**6**
Rated continuous thermal current I_{th}	**A**	**16**	**25**	**50**	**100**
Rated frequency ①	**Hz**	**50/60**			
Rated current ranges I_e **(number of ranges)**	**A**	**0.1 ... 16 (12)**	**0.1 ... 25 (14)**	**11 ... 50 (7)**	**28 ... 100 (6)**
Rated service short-circuit breaking capacity I_{cs} and max. permissible back-up fuses see pages 23 / 24.					
DC rated operating voltage					
in the case of series connection of 3 main circuits					
(see wiring diagram, Page 25) **DC 1, 60 V A**		**on request**	**25**	**50**	**100**
DC 3, 60 V A		**on request**	**25**	**50**	**100**
DC 5, 60 V A		**on request**	**25**	**50**	**100**
Short circuit capacity for DC-rating		on request			
Auxiliary circuits					
Load rating of the auxiliary circuits					
Minimum load at:	**24 V DC mA**	**5 mA at 17 VDC**	**5**	**5 mA at 17 VDC**
	12 V DC mA	**–**	**10**	**–**
Auxiliary contact for front mounting	**AC15**	**24V, 3.0 A 230V, 1.5 A**	**24V, 4.0 A 120V, 3.0 A 230V, 2.0 A**	**24V, 4.0 A 230V, 3.0 A**
	DC13	**24V, 1.0 A 60V, 0.7 A 110 V, 0.3 A 220 V, 0.1 A**	**24V, 2.0 A 60V, 2.5 A 110 V, 0.6 A 220 V, 0.25 A**	**24V, 1.0 A 48V, 0.3 A 60 V, 0.15 A**
Auxiliary and signal contact	**AC15**	**24V, 6.0 A 230V, 4.0 A 400 V, 3.0 A**	**24V, 4.0 A 120V, 3.0 A 230V, 2.0 A**	**24V, 6.0 A 230V, 4.0 A 400 V, 3.0 A**
	DC13	**24V, 2.0 A 110 V, 0.5 A 220 V, 0.25 A**	**24V, 2.0 A 60V, 2.5 A 110 V, 0.6 A 220 V, 0.25 A**	**24V, 1.0 A 110 V, 0.5 A 220 V, 0.25 A**

① Correction factors for other frequencies on request

Manual motor starter	Type	MS116	MS325; MO325	MS450/451; MO450	MS495/496/497; MO495/496

Release

Device for phase failure protection		with			
Electromagnetic trips **Response value set ex-works**		**7.8 ... 11.7 I_n ① 9.2 ... 13.8 I_n ② 10.0 ... 15.0 I_n ③ 12.0 ... 18.0 I_n ⑥**	**7.5 ... 12 I_n ① 9 ... 14 I_n ② 10 ... 15 I_n ③ 12.5 ... 17.5 I_n ④**	**10.4 I_n ... 15.6 I_n**	
Undervoltage release					
Pick-up value	**% of U_c**	**≥ 85**	**≥ 85**	**≥ 85**	
Drop-out value	**% of U_c**	**35 ... 75**	**35 ... 75**	**35 ... 70**	
Power consumption Pick-up	**VA**	**9.0**	**0.9**	**20.2**	
Hold	**VA**	**3.0**	**0.9**	**7.2**	
Open-circuit shunt release					
Pick-up value	**% of U_c**	**≥ 70**	**≥ 85**	**≥ 70**	
Relative duty	**% ED**	**100**	**–**	**100, max. 5 sec ⑦**	
Power consumption Pick-up	**VA**	**9.0**	**110-240V: 13-61 ⑤**	**on request**	
Hold	**VA**	**3.0**	**–**	**on request**	

Internal resistance values

Setting ranges A from		to	Resistance per phase in Ω resp. MS4.. in mΩ MS116	MS325	MS450	MS451	MS495/MS497	MS496
0.1	...	**0.16**	66	71.1	–	–	–	–
0.16	...	**0.25**	25.5	27.1	–	–	–	–
0.25	...	**0.4**	10.38	12.3	–	–	–	–
0.4	...	**0.63**	4.36	5.17	–	–	–	–
0.63	...	**1.0**	1.602	2.09	–	–	–	–
1.0	...	**1.6**	0.645	0.805	–	–	–	–
1.6	...	**2.5**	0.2795	0.34	–	–	–	–
2.5	...	**4.0**	0.1035	0.141	–	–	–	–
4.0	...	**6.3**	0.0433	0.051	–	–	–	–
6.3	...	**9.0**	–	0.0224	–	–	–	–
6.3	...	**10.0**	0.0217	–	–	–	–	–
8,0	...	**12,0**	0.0148	–	–	–	–	–
9.0	...	**12.5**	–	0.0122	–	–	–	–
10.0	...	**16.0**	0.0088	–	–	–	–	–
11.0	...	**16.0**	–	–	13.3	13.8	17.3	–
12.5	...	**16.0**	–	0.0081	–	–	–	–
14.0	...	**20.0**	–	–	8.74	8.74	11.3	–
16.0	...	**20.0**	–	0.0048	–	–	–	–
18.0	...	**25.0**	–	–	5.43	5.83	7.11	–
20.0	...	**25.0**	–	0.0035	–	–	–	–
22.0	...	**32.0**	–	–	3.60	4.10	4.75	–
28.0	...	**40.0**	–	–	2.56	2.90	3.28	3.28
36.0	...	**45.0**	–	–	1.80	2.20	–	–
36.5	...	**50.0**	–	–	–	–	2.24	2.52
40.0	...	**50.0**	–	–	1.46	1.82	–	–
45.0	...	**63.0**	–	–	–	–	1.40	1.40
57.0	...	**75.0**	–	–	–	–	0.95	1.00
70.0	...	**90.0**	–	–	–	–	0.60	0.63
80.0	...	**100.0**	–	–	–	–	0.54	0.57

① Current ranges 0.16 to 0.63 A
② Current ranges 1 to 2.5 A
③ Current ranges 4 to 6.3 A
④ Current ranges 9 to 25 A
⑤ 24-60 V: 14.4-90 VA
⑥ Current ranges 10 to 16 A
⑦ Relative duty at voltages, R1001: 20 to 70 V
R1002: 70 to 190 V
R1003: 190 to 330 V
R1004: 330 to 500 V at 50/60 Hz or DC

Short-circuit protection MS116, setting ranges, short-circuit strength and max. back-up fuses

				Maximum rated current of the short-circuit fuses if $I_{cc} > I_{cs}$ ①														
	from		to	at 230 V AC			at 400 V AC			at 440 V AC			at 500 V AC			at 690 VAC		
				I_{cu}	I_{cs}	gL, gG	I_{cu}	I_{cs}	gL, gG	I_{cu}	I_{cs}	gL, gG	I_{cu}	I_{cs}	gL, gG	I_{cu}	I_{cs}	gL, gG
	A		A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
Setting ranges	0.1	...	**0.16**	**Short-circuit proof** up to I_{cc} = 50 kA									**Short-circuit proof** up to I_{cc} = 30 kA					
		to																
	1.0	...	**1.6**															
	1.6	...	**2.5**							**10**	**10**	**25**	**10**	**10**	**25**	**5**	**5**	**25**
	2.5	...	**4.0**							**6**	**6**	**25**	**6**	**6**	**25**	**2**	**2**	**25**
	4.0	...	**6.3**							**6**	**6**	**63**	**6**	**6**	**63**	**2**	**2**	**40**
	6.3	...	**10.0**							**6**	**6**	**63**	**6**	**6**	**63**	**2**	**2**	**50**
	8.0	...	**12.0**	**25**	**25**	**80**	**25**	**25**	**80**	**6**	**6**	**63**	**6**	**6**	**63**	**2**	**2**	**50**
	10.0	...	**16.0**	**16**	**16**	**80**	**16**	**16**	**80**	**4**	**4**	**63**	**4**	**4**	**63**	**2**	**2**	**63**

Short-circuit protection MS325 / MO325, setting ranges, short-circuit strength and max. back-up fuses

				Maximum rated current of the short-circuit fuses if $I_{cc} > I_{cs}$ ①									
	from		to	at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 VAC	
				I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM
	A		A	kA	A	kA	A	kA	A	kA	A	kA	A
				Fuse types: Diazed, l.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)									
Setting ranges	0.1	...	**0.16**	**Short-circuit proof** **No back-up fuse required up to I_{cc} = 100 kA**									
		to											
	1.0	...	**1.6**										
	1.6	...	**2.5**									**40**	**25**
	2.5	...	**4.0**							**60**	**35 / 40**	**10**	**40**
	4.0	...	**6.3**					**70**	**50**	**40**	**50**	**7**	**40**
	6.3	...	**9.0**					**50**	**80**	**30**	**80**	**5**	**50**
	9.0	...	**12.5**			**75**	**80**	**45**	**80**	**27**	**80**	**4.5**	**50**
	12.5	...	**16.0**			**60**	**100**	**40**	**100**	**25**	**100**	**4**	**50**
	16.0	...	**20.0**			**55**	**100**	**35**	**100**	**22**	**100**	**3.5**	**50**
	20.0	...	**25.0**			**50**	**125**	**30**	**125**	**20**	**125**	**3**	**50**

Short-circuit protection MS325 / MO325, setting ranges, short-circuit strength and max. back-up fuses

				Maximum rated current of the short-circuit fuses if $I_{cc} > I_{cs}$ ①									
	from		to	at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 VAC	
				I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM	I_{cs}	gL, aM
	A		A	kA	A	kA	A	kA	A	kA	A	kA	A
				Fuse types: Diazed, l.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)									
Setting ranges	0.1	...	**0.16**	**Short-circuit proof** **No back-up fuse required up to I_{cc} = 50 kA**									
		to											
	1.0	...	**1.6**										
	1.6	...	**2.5**									**40**	**25**
	2.5	...	**4.0**									**10**	**40**
	4.0	...	**6.3**							**40**	**50**	**7**	**40**
	6.3	...	**9.0**							**30**	**80**	**5**	**50**
	9.0	...	**12.5**					**45**	**80**	**27**	**80**	**4.5**	**50**
	12.5	...	**16.0**					**40**	**100**	**25**	**100**	**4**	**50**
	16.0	...	**20.0**					**35**	**100**	**22**	**100**	**3.5**	**50**
	20.0	...	**25.0**					**30**	**125**	**20**	**125**	**3**	**50**

① I_{cs} = Rated service short-circuit breaking capacity, I_{cu} = Rated ultimate short-circuit capacity, I_{cc} = Prospective short-circuit current at installation location.
I_{cs} = I_{cu} in the case of MS325 and MS116!

Manual Motor Starters Type Series MS

Technical data

Short-circuit protection MS450 / MS451 / MO450, setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$ ①														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
11 ... 16	Short-circuit-proof No back-up fuse required up to I_{cc} = 100kA			25	50	100	25	50	100	6	12	63	3	5	63
14 ... 20				25	50	125	25	50	100	6	12	80	3	5	63
18 ... 25				25	50	125	15	30	100	6	12	80	3	5	63
22 ... 32				25	50	125	15	30	125	5	10	100	2	4	63
28 ... 40				25	50	160	15	30	125	5	10	100	2	4	63
36 ... 45				25	50	160	15	30	125	5	10	100	2	4	63
36 ... 50				25	50	160	15	30	125	5	10	100	2	4	80

Short-circuit protection MS495 / MO495, setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$ ①														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
28 ... 40	Short-circuit-proof No back-up fuse required up to I_{cc} = 100kA			25	50	125	20	40	125	6	12	100	6	3	63
36 ... 50				25	50	125	20	40	125	6	12	100	6	3	80
45 ... 63				25	50	160	20	40	160	6	12	100	6	3	80
57 ... 75				25	50	160	20	40	160	4	8	125	5	3	100
70 ... 90				25	50	160	20	40	160	4	8	125	5	3	125
80 ... 100				25	50	160	20	40	160	4	8	125	5	3	125

Short-circuit protection MS496 / MO496, setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$ ①														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
28 ... 40	Short-circuit-proof No back-up fuse required up to I_{cc} = 100kA						25	50	160	9	18	160	6	12	80
36 ... 50							25	50	160	7.5	15	160	5	10	100
45 ... 63							25	50	200	7.5	15	160	4	7.5	100
57 ... 75							25	50	200	5	10	160	3	6	125
70 ... 90							25	50	200	5	10	160	3	6	160
80 ... 100							25	50	200	5	10	160	3	6	160

Short-circuit protection MS497, setting ranges, short-circuit strength and max. back-up fuses

Setting ranges in A	Maximum rated current of the short-circuit fuses if $I_{cu} > I_{cu}$ ①														
	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A	I_{cs} in kA	I_{cu} in kA	gL,gG in A
11 .. 16	Short-circuit-proof No back-up fuse required up to I_{cc} = 100kA						25	50	100	15	30	80	7	15	63
14 ... 20							25	50	100	15	30	80	7	15	63
18 ... 25							25	50	100	15	30	80	7	15	63
22 ... 32							25	50	125	11	22	100	7	15	63
28 ... 40							25	50	160	9	18	160	6	12	80
36 ... 50							25	50	160	7.5	15	160	5	10	100
45 ... 63							25	50	200	7.5	15	160	4	7.5	100
57 ... 75							25	50	200	5	10	160	3	6	125
70 ... 90							25	50	200	5	10	160	3	6	160
80 .. 100							25	50	200	5	10	160	3	6	160

① I_{cs} = Rated service short-circuit breaking capacity, I_{cu} = Rated ultimate short-circuit breaking capacity I_{cc} = pProspective short-circuit current at installation location.

Coordination acc. IEC / EN 60947-4-1

The following table lists the combinations of motor protection switches and contactors according to assignment type 2 in compliance with IEC / EN 60947-4-1

Assignment type 2, 400 V - 50 Hz, 50 kA, normal start

Motor output AC-3 and design current three phase cage motor 1500 rp/min. 380/400 V P_e/kW	I_e/A	**Motor protecting switch type**	**Setting range** A ... A	**Contactor Type**	**Maximum current permitted for the combination** A
0.06	0.22	**MS325-0.25**	0.16 ... 0.25	A9	0.25
0.09	0.33	**MS325-0.4**	0.25 ... 0.4	A9	0.4
0.12	0.42	**MS325-0.63**	0.40 ... 0.63	A9	0.63
0.18	0.72	**MS325-1**	0.63 ... 1	A9	1
0.25	0.83	**MS325-1**	0.63 ... 1	A9	1
0.37	1.2	**MS325-1.6**	1 ... 1,6	A9	1.6
0.55	1.5	**MS325-1.6**	1 ... 1.6	A9	1.6
0.75	2	**MS325-2.5**	1.6 ... 2.5	A9	2.5
1.1	2.6	**MS325-4**	2.5 ... 4	A9	4
1.5	3.5	**MS325-4**	2.5 ... 4	A12	4
2.2	5	**MS325-6.3**	4 ... 6.3	A12	6.3
3	6.6	**MS325-9**	6.3 ... 9	A26	9
4	8.5	**MS325-9**	6.3 ... 9	A26	9
5.5	11.5	**MS325-12.5**	9 ... 12.5	A26	12.5
7.5	15.5	**MS325-16** **MS450-20**	12.5 ... 16 14 ... 20	A26 A26	16 16
9	18.3	**MS325-20**	16 ... 20	A26	20
11	22	**MS3265-25** **MS450-25**	20 ... 25 18 ... 25	A30 A30	25 25
15	30	**MS450-32**	22 ... 32	A30	30
18.5	37	**MS450-40**	28 ... 40	A40	40
22	44	**MS450-50**	40 ... 50	A50	50
30	60	**MS495-63**	45 ... 63	A63	63
37	72	**MS495-75**	57 ... 75	A95	75
45	85	**MS495-90**	70 ... 90	A95	90
55	98	**MS495-100**	80 ... 100	A110	100

Further coordination tables on request

Forward current integrals (I^2t curves) on request

Peak forward current curves on request

Reliable line protection

Protection of PVC-insulated lines
against thermal overload in the event of short circuit:

In compliance with VDE 0100 section 430 and 523, cables
and lines must be protected against overheating and short circuit.

The table opposite indicates which conductor cross-section are safely protected by motor protection switches in the event of short circuit.

Manual motor starter type	min. protected conductor cross section at 380 / 415 V AC, Cu mm²				
MS325	4	2.5	1.5	1.0	0.75
0,16 to 6					
10					
20					
25					

Times to trip

Selection table for suitability of the motor protection switches for motors of enclosure Ex e

Time to trip of the motor protection switches as a function of a multiple of the setting current (tolerance ± 20 % of the time to trip).
PTB approvals, see below.

Setting range of the manual motor starter		Time to trip of the motor protection switches at					
		3	**4**	**5**	**6**	**7.2**	**8**
		times the setting current, 3-pole, starting from cold state.					
A	**A**	s	s	s	s	s	s
Manual motor starter, Type MS325							
0.1 ...	**0.16**	15	9	6.5	4.8	3.7	3.2
0.16 ...	**0.25**	16	10	6.8	5.2	4	3.6
0.25 ...	**0.4**	16	9.7	6.5	5	3.8	3.3
0.4 ...	**0.63**	17	10.2	7.3	5.7	4.4	3.9
0.63 ...	**1.0**	17.5	10.2	7.2	5.5	4.2	3.8
1.0 ...	**1.6**	17	10	7.1	5.6	4.4	4
1.6 ...	**2.5**	18	10.3	7.5	5.9	4.7	4.2
2.5 ...	**4.0**	18.4	11.5	8.1	6.4	5	4.6
4.0 ...	**6.3**	19	12	8.5	6.7	5.3	4.9
6.3 ...	**9.0**	18.2	11.5	7.9	6	4.5	3.8
9.0 ...	**12.5**	19	11.5	8	6	4.6	4
12.5 ...	**16**	19.5	11.5	7.5	5.4	4	3.3
16 ...	**20**	20	11.5	7.8	5.7	4,2	3.5
20 ...	**25**	20	10.4	7	5	3.7	3.2

Ident-numbers of manual motor starters for motors with EEx e-Protection:

Type	Ident-No.	
MS325	3.53 - 1357/94	National Institute for Standards and Technology
MS450, MS495, MS497	Ex - 99.Y.74976	KEMA

Approvals and certificates

Device-Type	Approvals, certificates			Ship's classification societies			
Test mark			EEx e				
Abbreviation Validity	CSA Canada	USA	ATEX	GL Germany	LRS Great Britain	BV France	DNV Norway
MS116	■	■		■	■	■	□
MS325	■	■	□	■	■	□	■
MS450	■	■	□	■	■	■	
MS495	■	■	□	■	■	■	
MS497	■	■	□	■	■	■	

Other approvals CCC/CB/GOST etc. on request

■ Approval for standard available
□ Approval process ongoing