

Technical data for manual motor starters Type MS325

General data

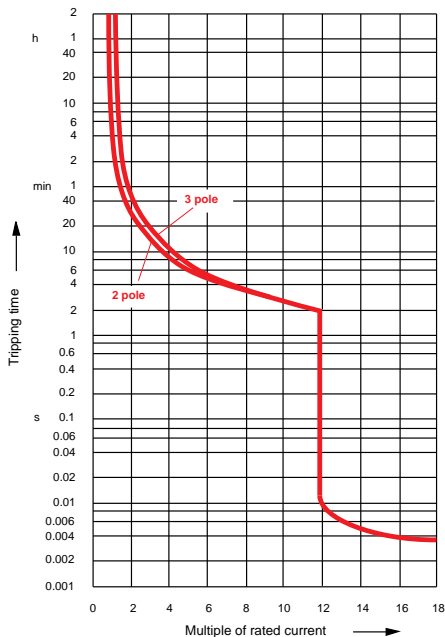
Rated voltage	600 V
Rated current	25 A (14 setting ranges, 0.1 to 25A)
Rated frequency	50 - 60 Hz
Electrical and mechanical life endurance	100,000 operations
Mounting position	Optional
Ambient temperature	-25°C to +50°C
Temperature compensation	-25°C to + 50°C
Wire range	14 - 8 AWG
Standards	
• IEC 157-1, 292-1, 337-1	
• VDE 0660 part 101, 104, 106, 200	
• SEV 1090-1, 1092-1, 1093-1	
Approvals	
• UL: E137861 (MS 325); E90353 (Auxiliary contact blocks)	
• CSA: LR 15332	
• NEMKO, DEMKO, FI, SEV, KEMA, KEUR	

Tripping values

Thermal tripping setting ranges (A)	Magnetic tripping operating current (A)
0.1 - 0.16	1.6
0.16 - 0.25	2.5
0.25 - 0.40	4.0
0.4 - 0.63	6.3
0.63 - 1	12
1 - 1.6	19
1.6 - 2.5	30
2.5 - 4	48
4 - 6.3	75
6.3 - 9	108
9 - 12.5	150
12.5 - 16	192
16 - 20	240
20 - 25	300

Low voltage trip

Rated voltage	400V
Rated frequency	50 - 60 Hz
Rated power	0.9 W
Operating voltage	
• Drop out (% of nominal control voltage)	10% - 75%
• Pull in	80% - 110%



Auxiliary and pilot contacts

Rated voltage	400V
Rated current	6 A
• I _{th}	2 A, 200 V
• AC 11	2 x 14 AWG
Connection cross sections	

Interruption ratings

Thermal setting range (Amps)	High fault short circuit rating 480V kA	Maximum group fuse A	Maximum BCP fuse 600V A
0.10 - 0.16	85	1600	1
0.16 - 0.25	85	1600	1
0.25 - 0.40	85	1600	1
0.40 - 0.63	85	1600	10
0.63 - 1.00	85	1600	10
1.00 - 1.60	85	1600	10
1.60 - 2.50	85	1600	10
2.50 - 4.00	85	1600	15
4.00 - 6.30	30	1600	25
6.30 - 9.00	30	1600	35
9.00 - 12.5	30	1600	50
12.5 - 16.0	30	1600	60
16.0 - 20.0	30	1600	80
20.0 - 25.0	30	1600	100

Maximum switching capacity for DC loads using 3 main current paths in series

DC Load	Voltage	Amps
DC 1	60V	25
	110V	25
	220V	25
	440V	25
DC 2/3	60V	25
	110V	25
	220V	25
	440V	25
DC 4/5	60V	25
	110V	25
	220V	25
	440V	25

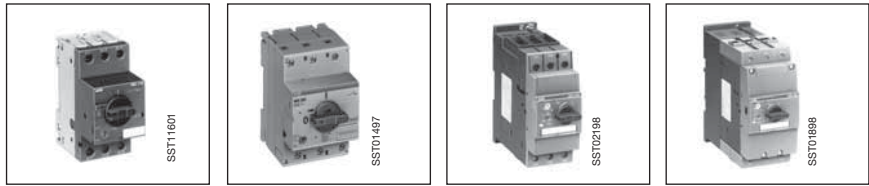
5

Auxiliary leads

Type load	Voltage	Amps	
Carrying capacity of aux. contacts Thermal permanent current I _{th}		6	
	Rated operating for current I_e	AC11 up to 220VAC	2
		380VAC	1.5
500VAC		1.2	
DC11 up to	60VDC	1.5	
	110VDC	1	
	220VDC	0.3	
	440VDC	0.1	

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
Disconnecter characteristics (to IEC/EN 60947-1)		yes	yes	yes	yes
Mechanical service life in operations		100.000	100.000	50.000	
Permissible ambient temperature		with			
- 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 sinusoidal shock (IEC 68-2-27)		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 to EN 50022		35 mm	35 mm	35 mm	35 mm,
on top-hat rail to EN 50023		-	-	(15 mm high)	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 Starters Type Series MS

Technical data

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 (11)	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		5 mA at 17 VDC	5 10	5 mA at 17 VDC
Minimum load at:	24 V DC mA 12 V DC mA	–	–	–
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 Starters Type Series MS

Technical data

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		9.6 ... 14.4 x I _n	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 at voltages 50/60 Hz to on request	
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			Resistance per phase in Ω resp. MS4.. in mΩ					
A			MS116	MS325	MS450	MS451	MS495/MS497	MS496
from	to							
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

Manual Motor Starters Type Series MS

Technical data

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																	
		at 230 V AC			at 400 V AC			at 440 V AC			at 500 V AC			at 690 VAC					
from	to	I_{cu} kA	I_{cs} kA	gL, gG A	I_{cu} kA	I_{cs} kA	gL, gG A	I_{cu} kA	I_{cs} kA	gL, gG A	I_{cu} kA	I_{cs} kA	gL, gG A	I_{cu} kA	I_{cs} kA	gL, gG A			
A	A	Short-circuit proof up to $I_{cc} = 50$ kA									Short-circuit proof up to $I_{cc} = 30$ kA								
Setting ranges	0.1 ... 0.16 to 1.0 ... 1.6	Short-circuit proof up to $I_{cc} = 50$ kA									Short-circuit proof up to $I_{cc} = 30$ kA								
	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									
		at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 VAC	
from	to	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A
A	A	Fuse types: Diazed, I.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)									
Setting ranges	0.1 ... 0.16 to 1.0 ... 1.6	Short-circuit proof No back-up fuse required up to $I_{cc} = 100$ kA									
	1.6 ... 2.5										
	2.5 ... 4.0										
	4.0 ... 6.3										
	6.3 ... 9.0										
	9.0 ... 12.5										
	12.5 ... 16.0	75	80	45	80	27	80	4.5	50		
	16.0 ... 20.0	60	100	40	100	25	100	4	50		
20.0 ... 25.0	55	100	35	100	22	100	3.5	50			
	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									
		at 230 V AC		at 400 V AC		at 440 V AC		at 500 V AC		at 690 VAC	
from	to	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A	I_{cs} kA	gL, aM A
A	A	Fuse types: Diazed, I.v.h.b.c., utilisation categories: gL, aM (VDE), gL/gG (IEC)									
Setting ranges	0.1 ... 0.16 to 1.0 ... 1.6	Short-circuit proof No back-up fuse required up to $I_{cc} = 50$ kA									
	1.6 ... 2.5										
	2.5 ... 4.0										
	4.0 ... 6.3										
	6.3 ... 9.0										
	9.0 ... 12.5										
	12.5 ... 16.0										
	16.0 ... 20.0										
20.0 ... 25.0											

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

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		Motor protecting switch type	Setting range A ... A	Contactor Type	Maximum current permitted for the combination A
	I _e /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	12.5 ... 16	A26	16
		MS450-20	14 ... 20	A26	16
9	18.3	MS325-20	16 ... 20	A26	20
11	22	MS3265-25	20 ... 25	A30	25
		MS450-25	18 ... 25	A30	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 (I² 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 mm ²				
	4	2.5	1.5	1.0	0.75
MS325					
0,16 to 6					
10					
20					
25					

Manual Motor Starters Type Series MS

Technical data

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 $\pm 20\%$ 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 **Ex 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			Ex e				
Abbreviation	CSA	USA	ATEX	GL	LRS	BV	DNV
Validity	Canada	USA		Germany	Great Britain	France	Norway
MS116	■	■		■	■	■	
MS325	■	■	■	■	■	■	■
MS450	■	■	■	■	■	■	
MS495	■	■	■	■	■	■	
MS497	■	■	■	■	■	■	

Other approvals CCC/CB/GOST etc. on request