

# Manual motor starter MS116

Manual motor starters are electromechanical protection devices for the main circuit. They are used mainly to switch motors manually ON/OFF and protect them fuse less against short-circuit, overload and phase failures. Fuse less protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds. Fuse less starter combinations are setup together with contactors.



## Description

- Overload protection – trip class 10 A
- Phase loss sensitivity
- Disconnect function
- Temperature compensation from -25 ... +55 °C
- Adjustable current setting for overload protection
- Suitable for three- and single-phase application
- Trip-free mechanism
- Clear switch position indication – ON/OFF

## Ordering details

MS116 screw terminal



Setting range [A]	Type	Trip class	Order code	Packaging unit [Pcs]	Weight [g]
0.10 ... 0.16	MS116-0.16	10A	1SAM250000R1001	1	225
0.16 ... 0.25	MS116-0.25	10A	1SAM250000R1002	1	225
0.25 ... 0.40	MS116-0.4	10A	1SAM250000R1003	1	225
0.40 ... 0.63	MS116-0.63	10A	1SAM250000R1004	1	225
0.63 ... 1.00	MS116-1.0	10A	1SAM250000R1005	1	225
1.00 ... 1.60	MS116-1.6	10A	1SAM250000R1006	1	265
1.60 ... 2.50	MS116-2.5	10A	1SAM250000R1007	1	265
2.50 ... 4.00	MS116-4.0	10A	1SAM250000R1008	1	265
4.00 ... 6.30	MS116-6.3	10A	1SAM250000R1009	1	265
6.30 ... 10.0	MS116-10	10A	1SAM250000R1010	1	265
8.00 ... 12.0	MS116-12	10A	1SAM250000R1012	1	265
10.00 ... 16.0	MS116-16	10A	1SAM250000R1011	1	265

Note: MS116 with pre-assembled auxiliary contact HKF1-11, please order as follow 1SAM250005Rxxxx

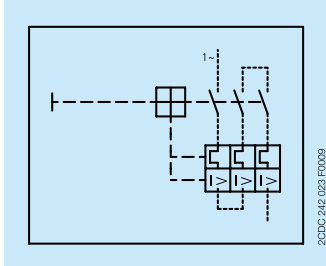
## Application

The manual motor starters protect the load and the installation against short-circuit and overload. They are three pole protection devices with thermal tripping elements for overload protection and electro-magnetic tripping elements for short-circuit protection. Furthermore, they provide a disconnect function for safely isolation of the installation and the supply and can be used for the manual switching of loads.

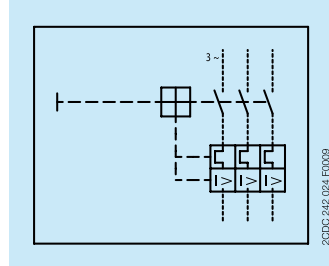
The manual motor starters have a setting scale in Amperes, which allows the direct adjusting of the device without any additional calculation. In compliance with international and national standards, the setting current is the rated current of the motor and not the tripping current (no tripping at  $1.05 \times I$ , tripping at  $1.2 \times I$ ;  $I$  = setting current).

## Operation mode

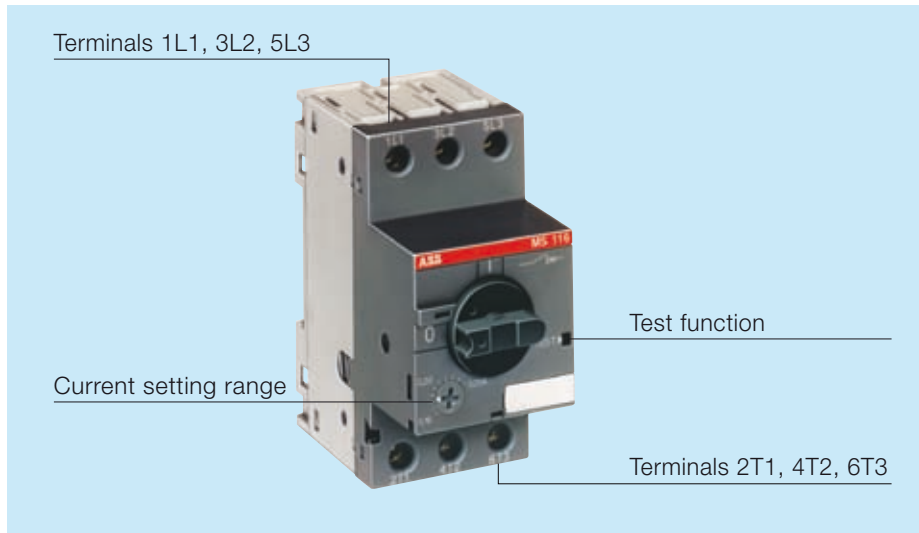
### Single-phase operation



### Three-phase operation



## Connections

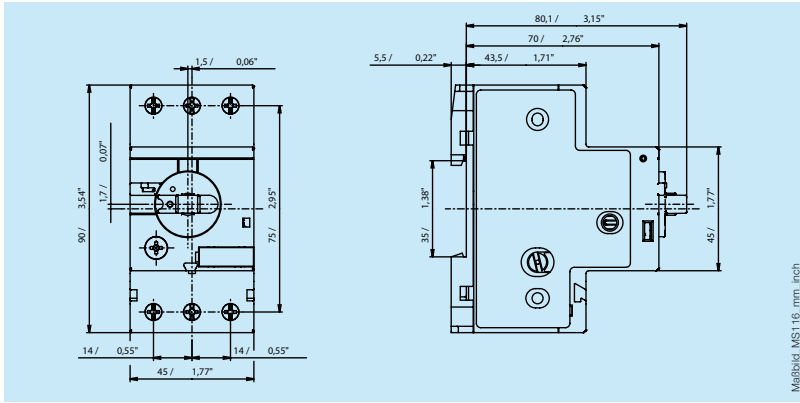


## Resistance and power losses per phase

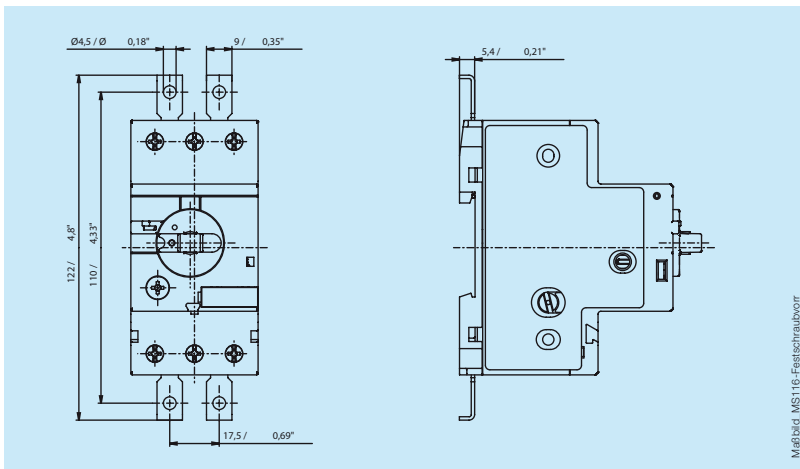
Type	Lower value setting range [A]	Upper value setting range [A]	Resistance per phase [Ω]	Power loss per Phase [W] at	
				Lower value of setting range	Upper value of setting range
MS116-0.16	0.10	0.16	66.00	0.7	1.7
MS116-0.25	0.16	0.25	25.50	0.7	1.7
MS116-0.4	0.25	0.40	10.38	0.7	1.7
MS116-0.63	0.40	0.63	4.36	0.7	1.7
MS116-1.0	0.63	1.00	1.605	0.7	1.7
MS116-1.6	1.00	1.60	0.648	0.7	1.7
MS116-2.5	1.60	2.50	0.272	0.7	1.7
MS116-4.0	2.50	4.00	0.106	0.7	1.7
MS116-6.3	4.00	6.30	0.046	0.7	1.7
MS116-10	6.30	10.0	0.024	0.9	2.4
MS116-12	8.00	12.0	0.016	1.0	2.4
MS116-16	10.0	16.0	0.0108	1.1	2.8

## Dimensions

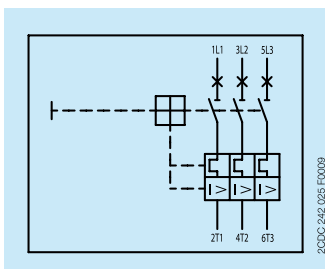
### Manual motor starter MS116



### Manual motor starter MS116 with FS116



## Wiring diagram



Data at  $T_A = 40\text{ °C}$  and at rated values, if nothing else indicated

Type		MS116
<b>Technical data</b>		<b>Terminals</b>
<b>Main circuit</b>		<b>1L1-3L3-5L5</b> <b>2T1-4T2-6T3</b>
Rated operational voltage $U_e$ acc. to IEC/EN 60947-1	AC DC	690 V -
Rated operational current $I_e$		see separate table
Rated current $I_n$ / Conventional free-air thermal current $I_{th}$		see „Rated Operational Current“
Setting range - thermal overload protection		see ordering data
Rated instantaneous short-circuit current setting $I_i$		see separate table
Rated service short-circuit breaking capacity $I_{cs}$		see separate table
Rated ultimate short-circuit breaking capacity $I_{cu}$		see separate table
Trip class acc. to IEC/EN 60947-4-1		see ordering data
Rated frequency acc. to IEC/EN 60947-1		50 / 60 Hz
Number of poles		3
Resistance per phase		see separate table
Power loss per phase	lower value of setting range upper value of setting range	see separate table see separate table
<b>Isolation data</b>		
Rated impulse withstand voltage $U_{imp}$ acc. to IEC/EN 60947-1		6 kV
Rated insulation voltage $U_i$ acc. to IEC/EN 60947-1		690 V
Pollution degree acc. to IEC/EN 60664		3
<b>Electrical connection</b>		
Connecting capacity	solid flexible with ferrule flexible with ferrule isolated flexible without ferrule	1/2 x 1 ... 4 mm <sup>2</sup> 1/2 x 0.75 ... 2.5 mm <sup>2</sup> 1/2 x 0.75 ... 2.5 mm <sup>2</sup> 1/2 x 0.75 ... 2.5 mm <sup>2</sup>
Stripping length		9 mm
Tightening torque		0.8 ... 1.2 Nm
connection screw		M3.5 (Pozidrive 2)
<b>General data</b>		
Mechanical durability		100000
Electrical durability		50000
Duty time		100%
Dimensions (W x H x D)		see dimension drawing
Weight		see ordering data
Mounting		DIN-rail (EN 60715)
Mounting positions		optional for single mounting (position 1-6)
Group Mounting		on request
Minimum distance to other units same type	horizontal vertical	none 150 mm
Minimum distance to electrical conductive wall (earthed)	horizontal vertical	25 mm 75 mm
Degree of protection acc. to IEC/EN 60947-1	enclosure / terminals	IP20
Utilization Category acc. to IEC/EN 60947-2		A
Altitude		up to 2000 m

<b>Type</b>		<b>MS116</b>
<b>Environmental data</b>		
Ambient air temperature range		
Operation	open - compensated	-25 °C ... +55 °C
	open	-25 °C ... +70 °C
Storage		-50 °C ... +80 °C
Temperature compensation		
continuous		
Vibration (sinusoidal) acc. to IEC/EN 60068-2-6 (Fc)		
5 g / 3 - 150 Hz		
Shock (half-sine) acc. to IEC/EN 60068-2-27 (Ea)		
25 g / 11 ms		
<b>Standards / Directives</b>		
Standard		
IEC/EN 60947-2, IEC/EN 60947-4-1, IEC/EN 60947-1, UL 508, CSA 22.2 No. 14		
Low Voltage Directive		
2006/95/EC		
EMC Directive		
2004/108/EC		
RoHS Directive		
2002/95/EC		
<b>Electromagnetic compatibility</b>		
not applicable		
<b>Approvals, markings</b>		
Approvals		
see last page		
Markings		
see last page		
<b>UL/CSA</b>		
Max. operational voltage		
600 V		
General purpose rating at max. 600 VAC		
see separate table		
Motor ratings		
Horse power		see separate table
Full load amps (FLA)		see separate table
Locked rotor amps (LRA)		see separate table
Short circuit rating RMS at 480 VAC		
0.16 ... 2.5 A		30 kA
4.0 ... 16 A		18 kA
Short circuit rating RMS at 600 VAC		
5 kA		
Short-Circuit Protective devices		
see separate table		
<b>Electrical connection</b>		
Connecting capacity		
	solid	1/2 x AWG16 ... AWG12
	stranded	1/2 x AWG16 ... AWG12
	flexible without ferrule	1/2 x AWG16 ... AWG12
Stripping length		
9 mm		
Tightening torque		
10 lb-in		
connection screw		
M3.5 (Pozidrive 2)		

Type	Rated instantaneous short-circuit current setting [A]	Rated operational current [A]
MS116-0.16	1.25 ... 1.87	0.16
MS116-0.25	1.95 ... 2.92	0.25
MS116-0.4	3.12 ... 4.68	0.40
MS116-0.63	4.91 ... 7.37	0.63
MS116-1.0	9.20 ... 13.8	1.00
MS116-1.6	14.7 ... 22.1	1.60
MS116-2.5	23.0 ... 34.5	2.50
MS116-4.0	40.0 ... 60.0	4.00
MS116-6.3	63.0 ... 94.5	6.30
MS116-10	120 ... 180	10.0
MS116-12	144 ... 216	12.0
MS116-16	192 ... 288	16.0

### Short-Circuit protection

Setting range, short-circuit breaking capacity and max. back-up fuse

Maximum rated current of the back-up fuses if  $I_{cc} > I_{cs}$

Setting ranges A ... A	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	$I_{cu}$ kA	$I_{cs}$ kA	gG, aM A	$I_{cu}$ kA	$I_{cs}$ kA	gG, aM A	$I_{cu}$ kA	$I_{cs}$ kA	gG, aM A	$I_{cu}$ kA	$I_{cs}$ kA	gG, aM A	$I_{cu}$ kA	$I_{cs}$ kA	gG, aM A
0.10 ... 0.16	No back-up fuse required up to $I_{cc} = 50$ kA														
0.16 ... 0.25															
0.25 ... 0.40															
0.40 ... 0.63															
0.63 ... 1.00															
1.00 ... 1.60	No back-up fuse required up to $I_{cc} = 30$ kA														
1.60 ... 2.50															
2.50 ... 4.00															
4.00 ... 6.30															
6.30 ... 10.0															
8.00 ... 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

$I_{cs}$  = Rated service short-circuit breaking capacity

$I_{cu}$  = Rated ultimate short-circuit breaking capacity

$I_{cc}$  = Prospective short-circuit current at installation location

$I_{cu} = I_{cs}$  in case of MS116

## UL / CSA ratings

Type	Motor rating, single phase											
	120 V AC			240 V AC			480 V AC			600 V AC		
	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA
MS116-0.16	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96
MS116-0.25	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5
MS116-0.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4
MS116-0.63	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78
MS116-1.0	-	1.0	6.0	-	1.0	6.0	-	1.0	6.0	-	1.0	6.0
MS116-1.6	-	1.6	9.6	1/10	-	-	-	1.6	9.6	-	1.6	9.6
MS116-2.5	-	2.5	15.0	1/6	-	-	1/2	-	-	1/2	-	-
MS116-4.0	1/8	-	-	1/3	-	-	1/2	-	-	1-1/2	-	-
MS116-6.3	1/4	-	-	1/2	-	-	1	-	-	2	-	-
MS116-10	1/2	-	-	1-1/2	-	-	2	-	-	3	-	-
MS116-12	1/2	-	-	2	-	-	3	-	-	5	-	-
MS116-16	1	-	-	2	-	-	5	-	-	7-1/2	-	-

Type	Motor rating, three phase											
	120 V AC			240 V AC			480 V AC			600 V AC		
	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA
MS116-0.16	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96
MS116-0.25	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5
MS116-0.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4
MS116-0.63	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78
MS116-1.0	-	1.0	6.0	-	1.0	6.0	-	1.0	6.0	1/2	-	-
MS116-1.6	-	1.6	9.6	-	1.6	9.6	3/4	-	-	3/4	-	-
MS116-2.5	-	2.5	15.0	1/2	-	-	1	-	-	1-1/2	-	-
MS116-4.0	-	4.0	16.0	1	-	-	2	-	-	3	-	-
MS116-6.3	1/2	-	-	1-1/2	-	-	3	-	-	5	-	-
MS116-10	1	-	-	3	-	-	5	-	-	7-1/2	-	-
MS116-12	1-1/2	-	-	3	-	-	7-1/2	-	-	10	-	-
MS116-16	2	-	-	5	-	-	10	-	-	10	-	-

Type	General purpose rating at max. 600 VAC [A]	Protective devices	
		Fuse K5 / RK5 [A]	Circuit breaker [A]
MS116-0.16	0.16	1200	-
MS116-0.25	0.25	1200	-
MS116-0.4	0.40	1200	-
MS116-0.63	0.63	1200	-
MS116-1.0	1.00	1200	-
MS116-1.6	1.60	1200	-
MS116-2.5	2.50	1200	-
MS116-4.0	4.00	1200	-
MS116-6.3	6.30	1200	-
MS116-10	10.0	1200	-
MS116-12	12.0	1200	-
MS116-16	16.0	1200	-

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## Approvals



cULus UL 508



CCC



GL



GOST-F



GOST-R



RMRS

CB Scheme

## Markings



CE

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