

# Manual motor starter MS165



Manual motor starters (also known as motor protection circuit breakers or manual motor protectors) are electromechanical protection devices for the main circuit mainly used to switch motors manually ON/OFF and protect them fuseless against short-circuits, overloads and phase failures.

Fuseless 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. Fuseless starter combinations are setup together with contactors.

### Description

- Overload protection – trip class 10
- Phase loss sensitivity
- Disconnect function
- Temperature compensation from -25 ... +60 °C
- Adjustable and sealable current setting for overload protection
- Suitable for three- and single-phase applications
- Trip-free mechanism
- Status indication for short-circuit trip
- Clear switch position indication ON/OFF/TRIP
- Lockable handle

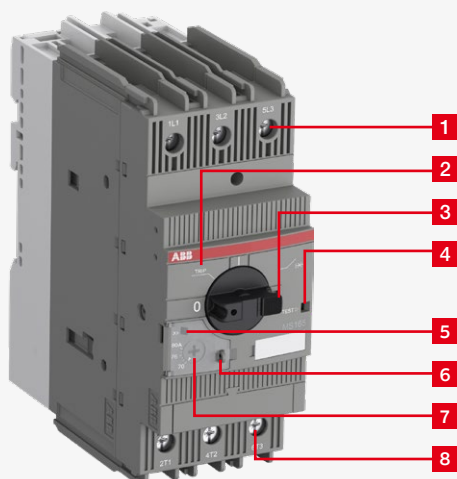


### Order data

MS165 screw terminals

Setting range	Rated operational power 400 V AC-3 kW	Type	Order code	Weight  Pkg (1 pce)  kg
A				
10 ... 16	7.5	MS165-16	1SAM451000R1011	0.95
14 ... 20	7.5	MS165-20	1SAM451000R1012	0.95
18 ... 25	11	MS165-25	1SAM451000R1013	0.96
23 ... 32	15	MS165-32	1SAM451000R1014	0.97
30 ... 42	22	MS165-42	1SAM451000R1015	0.97
40 ... 54	22	MS165-54	1SAM451000R1016	0.97
52 ... 65	30	MS165-65	1SAM451000R1017	0.98
62 ... 73	37	MS165-73	1SAM451000R1018	0.98
70 ... 80	45	MS165-80	1SAM451000R1019	0.98

Note: Manual motor starters should always be selected so that the actual motor current is within the setting range.



### Functional description

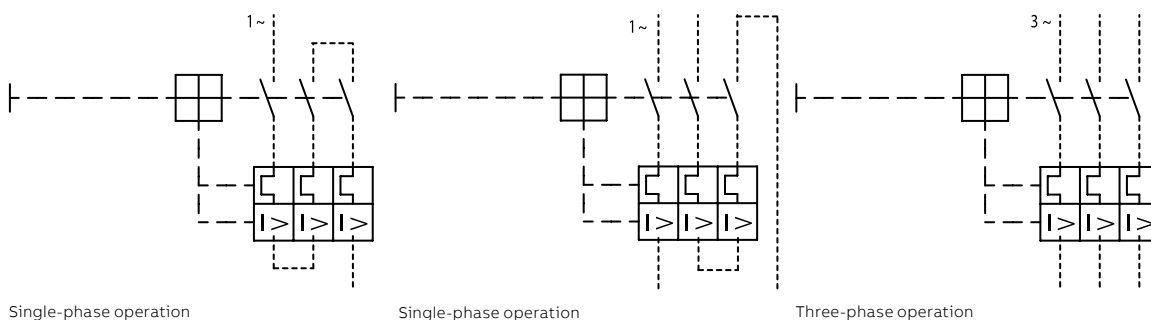
1. Terminals 1L1, 3L2, 5L3
2. Switch position TRIP
3. Lockable handle
4. Test function
5. Status indication for short-circuit
6. Sealable cover
7. Current setting range / Adjustable current setting for overload protection
8. Terminals 2T1, 4T2, 6T3

### Application

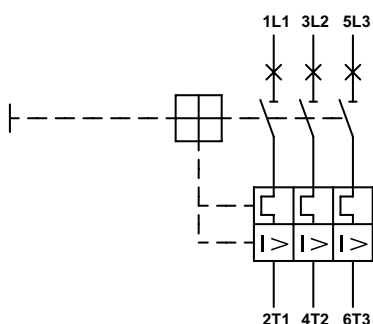
Manual motor starters (also known as motor protection circuit breakers or manual motor protectors) protect the load and the installation against short-circuits and overloads. They are three pole protection devices with thermal tripping elements for overload protection and electromagnetic tripping elements for short-circuit protection. Furthermore, they provide a disconnect function for safe isolation of the installation and the supply and they can be used for manual switching of loads.

Manual motor starters have a setting scale in amperes, which allows 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

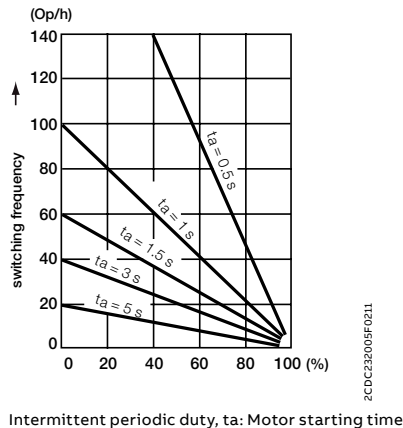


### Wiring diagram

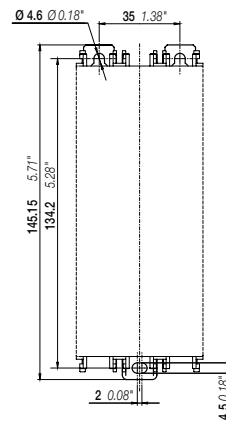
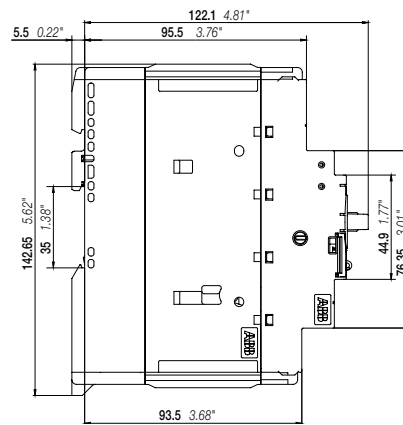
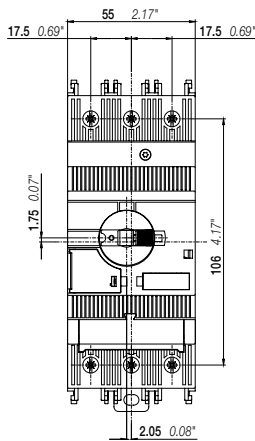


**Resistance and power loss per pole**

Type	Setting range		Resistance per pole $\Omega$	Power loss per pole	
	lower value A	upper value A		at lower value W	at upper value W
MS165-16	10	16	14.9	1.49	3.81
MS165-20	14	20	9.3	1.82	3.72
MS165-25	18	25	5.8	1.88	3.63
MS165-32	23	32	4.3	2.27	4.4
MS165-42	30	42	3.1	2.79	5.47
MS165-54	40	54	2.4	3.84	6.99
MS165-65	52	65	1.9	5.14	8.03
MS165-73	62	73	1.8	6.92	9.59
MS165-80	70	80	1.7	8.33	10.88



**Main dimensions**  
in mm, inches



MS165

MS165 drilling plan





**Technical data IEC/EN**Data at  $T_A = 40\text{ °C}$  and at rated values, if nothing else indicated**Main circuit**

Terminal marking	1L1-3L2-5L3 2T1-4T2-6T3
Rated operational voltage $U_e$	690 V AC / 250 V DC (3 poles in series)
Setting range - thermal overload protection	see table "Order data" on page 1
Rated operational current $I_e$	see table below
Rated operational current DC-5 $I_e$ (250 V DC) 3 poles in series	see "Rated operational current $I_e$ "
Rated instantaneous short-circuit current setting $I_i$	see table below
Rated service short-circuit breaking capacity $I_{cs}$	see table "Short-circuit breaking capacity and back-up fuses" on page 6
Rated ultimate short-circuit breaking capacity $I_{cu}$	see table "Short-circuit breaking capacity and back-up fuses" on page 6
Rated service short-circuit breaking capacity DC $I_{cs}$ (250 V DC) 3 poles in series	100 kA
Trip class	10
Rated frequency	DC, 50/60 Hz
Frequency range	DC, 15 ... 415 Hz
Number of poles	3
Resistance per pole	see table "Resistance and power loss per pole" on page 3
Power loss per pole	see table "Resistance and power loss per pole" on page 3

**Isolation data**

Rated impulse withstand voltage $U_{imp}$	8 kV
Rated insulation voltage $U_i$	1000 V
Pollution degree	3

**Electrical connection**

	stranded	1/2 x 1 ... 50 mm <sup>2</sup>
	flexible with ferrule	1/2 x 1 ... 35 mm <sup>2</sup>
	flexible with ferrule insulated	1/2 x 1 ... 35 mm <sup>2</sup>
	flexible without ferrule	1/2 x 1 ... 35 mm <sup>2</sup>
Stripping length		16 mm
Tightening torque		4 Nm
Recommended screw driver		Pozidriv 2

Type	Rated instantaneous short-circuit current setting $I_i$ A	Rated operational current $I_e$ A
MS165-16	240	16
MS165-20	300	20
MS165-25	375	25
MS165-32	480	32
MS165-42	630	42
MS165-54	810	54
MS165-65	975	65
MS165-73	1022	73
MS165-80	1120	80

**General data**

Mechanical durability		50000
Electrical durability		25000 (1)
Duty time		100%
Operating frequency without early tripping		up to 15 operations/h or 60 operations/h with 40% duty ratio, if the motor breaking current $6 \times I_n$ and the motor starting time does not exceed 1 s
Dimensions (W x H x D)		see drawing "Dimensions" on page 3
Weight		see table "Order data" on page 1
Mounting on DIN rail		TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715 TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715
Mounting position		position 1-6 (optional for single mounting)
Group mounting		on request
Minimum distance to other units same type	horizontal	0 mm
	vertical	150 mm
Minimum distance to electrical conductive board	horizontal, up to 400 V	0 mm
	horizontal, up to 690 V	> 1.5 mm
	vertical	75 mm
Degree of protection	housing / main circuit terminals	IP20 / IP10
Utilization category		A
Maximum operating altitude permissible		2000 m
Maximum operating frequency		50 cycles/h (2)
Recommended screw for mounting plate		M4
Screw torque for mounting plate		2 Nm

(1) for MS165-73 and MS165-80: 20000

(2) for MS165-73 and MS165-80: 15 cycles/h

**Environmental data**

Ambient air temperature		
Operation	open - compensated	-25 ... +60 °C
	open	-25 ... +60 °C
Storage		-50 ... +80 °C
Ambient air temperature compensation		acc. to IEC/EN 60947-4-1
Resistance to vibrations acc. to IEC 60068-2-6		5g / 3 ... 150 Hz
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms

**Standards / directives**

Standards	IEC/EN 60947-1
	IEC/EN 60947-2
	IEC/EN 60947-4-1
	UL 60947-1
	UL 60947-4-1
	CSA-C22.2 No. 60947-1 CSA-C22.2 No. 60947-4-1
Low Voltage Directive	2014/35/EU
RoHS Directive	2011/65/EC

### Short-circuit breaking capacity and back-up fuses

Ics Rated service short-circuit breaking capacity

Icu Rated ultimate short-circuit breaking capacity

- No back-up fuse required, because short-circuit proof up to 100 kA

Type	230 V AC			400 V AC			440 V AC			500 V AC		
	Ics kA	Icu kA	gG A	Ics kA	Icu kA	gG A	Ics kA	Icu kA	gG A	Ics kA	Icu kA	gG A
MS165-16	100	100	-	100	100	-	75	75	125*	40	40	125*
MS165-20	100	100	-	100	100	-	75	75	125*	40	40	125*
MS165-25	100	100	-	100	100	-	50	50	125*	30	30	125*
MS165-32	100	100	-	100	100	-	50	50	125*	30	30	125*
MS165-42	50	50	125*	50	50	125*	50	50	125*	30	30	125*
MS165-54	30	50	125*	30	50	125*	30	45	125*	20	20	125*
MS165-65	30	50	125*	30	50	125*	30	45	125*	20	20	125*
MS165-73	30	30		30	30		6	8		6	8	
MS165-80	30	30		30	30		6	8		6	8	

Type	690 V AC			250 V DC **		
	Ics kA	Icu kA	gG A	Ics kA	Icu kA	gG A
MS165-16	10	10	63*	100	100	-
MS165-20	10	10	63*	100	100	-
MS165-25	10	10	80*	100	100	-
MS165-32	10	10	100*	100	100	-
MS165-42	10	10	100*	100	100	-
MS165-54	6	8	100*	100	100	-
MS165-65	6	8	100*	100	100	-
MS165-73	6	8				
MS165-80	6	8				

\*) Rated back-up fuse for short-circuit up to 100 kA



\*\*) 3 poles in series

### Technical data UL/CSA

#### Main circuit

Maximum operational voltage	600 V
Motor ratings	Horsepower
	see table below
	Full Load Amps (FLA)
	see table below
	Locked Rotor Amps (LRA)
	see table below

#### Electrical connection

Type	<b>MS165</b>
Connecting capacity	
 stranded	1/2 x AWG 16 ... 0
 flexible without ferrule	1/2 x AWG 16 ... 0
Stripping length	16 mm
Tightening torque	35 lb-In
Recommended screw driver	Pozidriv 2
Recommended screw for mounting plate	M4
Screw torque for mounting plate	18 lb-In

#### Motor ratings, single-phase

Type	120 V AC			220 ... 240 V AC		
	hp	FLA	LRA	hp	FLA	LRA
MS165-16	1	16	96	2	12	72
MS165-20	1 1/2	20	120	3	17	102
MS165-25	2	24	144	3	17	102
MS165-32	2	24	144	5	28	168
MS165-42	3	34	204	7 1/2	40	240
MS165-54	3	34	204	10	50	300
MS165-65	5	56	336	10	50	300
MS165-73	5	73	435	15	73	435
MS165-80	5	80	435	15	80	435

**Motor ratings, three-phase**

Type	200 V AC			208 V AC			220 ... 240 V AC			440 ... 480 V AC			550 ... 600 V AC		
	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA	hp	FLA	LRA
MS165-16	3	11	73.6	3	10.6	71	5	15.2	92	10	14	81	10	11	64.8
MS165-20	5	17.5	105.8	5	16.7	102	5	15.2	92	10	14	81	15	17	93
MS165-25	5	17.5	105.8	7 1/2	24.2	140	7 1/2	22	127	15	21	116	20	22	116
MS165-32	7 1/2	25.3	146	10	30.8	179	10	28	162	20	27	145	30	32	174
MS165-42	10	32.2	186.3	10	30.8	179	15	42	232	30	40	218	40	41	232
MS165-54	15	48.3	267	15	46.2	257	20	54	290	40	52	290	50	52	290
MS165-65	20	62.1	334	20	59.4	321	20	54	290	50	65	363	60	62	348
MS165-73	20	62.1	334	20	59.4	321	25	68	365	50	65	363	60	62	348
MS165-80	25	78.2	420	25	74.8	404	30	80	435	60	77	435	75	77	434

hp           Horsepower  
 FLA         Full Load Amps  
 LRA         Locked Rotor Amps

Note: Manual motor starters should always be selected so that the actual motor current is within the setting range; see ordering detail pages. Horsepower (hp) ratings are for reference only.

**Maximum short-circuit current ratings**

Type	Manual Motor Controllers								Manual self-protected Combination Motor Controllers (Type E)	
	Branch circuit protection, max. size per NEC/CEC (1)		for motor disconnect		for group installations		for tap conductor protection in group installations		480Y / 277 V	600Y / 347 V
	Fuses	Circuit breaker	480 V	600 V	480 V	600 V	480 V	600 V		
A	A	kA	kA	kA	kA	kA	kA	kA	kA	
MS165-16	Any listed fuses. Size per NEC/CEC	Any listed UL489 / CSA C22.2 No.5 circuit breaker. Size per NEC/CEC	65	30	65	30	65	30	65	30
MS165-20			65	30	65	30	65	30	65	30
MS165-25			65	30	65	30	65	30	65	30
MS165-32			65	30	65	30	65	30	65	30
MS165-42			65	30	65	30	65	30	65	30
MS165-54			65	30	65	30	65	30	65	30
MS165-65			65	30	65	30	65	30	65	30
MS165-73			50	10	50	10				
MS165-80	50	10	50	10						

<sup>(1)</sup> NEC: NFPA®70 National Electrical Code®; CEC: CSA C22.1 Canadian Electrical Code.

**Maximum short-circuit current ratings – MS165 with AF contactors**

Type	Manual self-protected Combination Motor Controllers (Type F) Coordination type 1				Manual self-protected Combination Motor Controllers (Type F) Coordination type 2			
	Minimum contactor size	480Y / 277 V	Minimum contactor size	600Y / 347 V	Minimum contactor size	480Y / 277 V	Minimum contactor size	600Y / 347 V
		kA		kA		kA		kA
MS165-16	AF09 ... AF38	65	AF09 ... AF38	50	AF26 ... AF38	65	AF09 ... AF38	30
MS165-20	AF26 ... AF38	65	AF26 ... AF38	50	AF26 ... AF38	65	AF09 ... AF38	30
MS165-25	AF26 ... AF38	65	AF26 ... AF38	50	AF26 ... AF38	65	AF40 ... AF65	30
MS165-32	AF26 ... AF38	65	AF26 ... AF38	50	AF26 ... AF38	65	AF40 ... AF65	30
MS165-42	AF40 ... AF65	65	AF40 ... AF65	30	AF40 ... AF65	65	AF40 ... AF65	30
MS165-54	AF40 ... AF65	65	AF40 ... AF65	30	AF40 ... AF65	65	AF40 ... AF65	30
MS165-65	AF40 ... AF65	65	AF40 ... AF65	30	AF40 ... AF65	65	AF40 ... AF65	30



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