

AEG

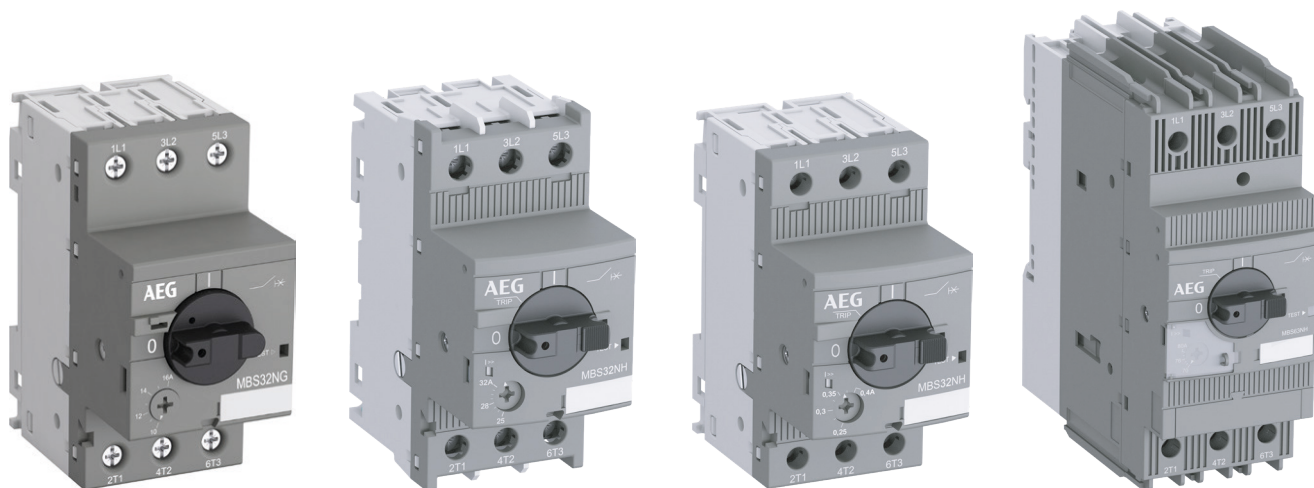
ELETTRA.IT

TECHNICAL GUIDE

MBS manual motor starters



MBS manual motor starters



Fuseless protection saves costs, space and ensures a quick reaction under overload and short-circuit condition by switching off the motor within milliseconds. The full range of MBS manual motor starters offers protection from 0.25 A to up to 80 A.

Protection and control

Protect equipment and installations

AEG MBS manual motor starters provide protection and control in almost every situation by protecting motor loads from short-circuits, overloads and phase failures while also controlling the current flow through a simple ON/OFF switch

Continuous operation

Secure uptime

Fuseless motor protection reduces maintenance costs and downtimes by avoiding fuse replacement after faults. Furthermore, MBS32NH and MBS63NH feature a magnetic trip indicator making troubleshooting easier.

Speed up your projects

Simplified design

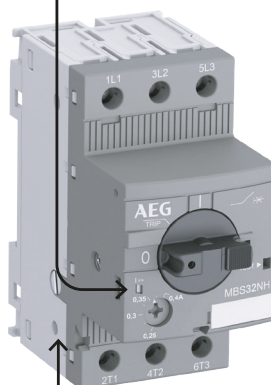
MBS manual motor starters can be connected easily with AEG contactors using the respective accessory. Additionally, the main range of accessories is shared across multiple starters, making logistics and planning simpler.

MBS manual motor starters



Right solution for your application

MBS32NG offers protection up to 32 A and a breaking capacity up to 50 kA – all in a 45 mm wide housing. They are designed to meet requirements of most standard applications.

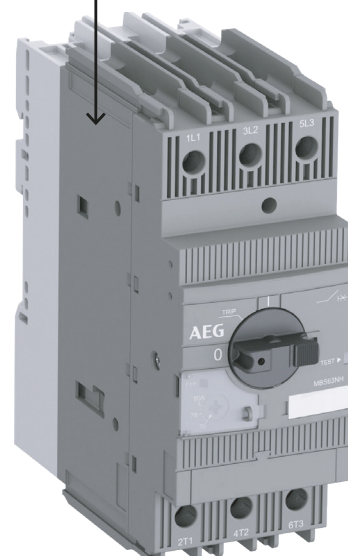


Troubleshooting made easy

MBS32NH and MBS63NH feature a magnetic trip indicator. This way, every tripping event will be distinguished, making troubleshooting a lot easier and faster.

All-in-one

MBS manual motor starters offer fuseless protection against short-circuits, phase failures and overloads including disconnect function – all in one single compact product.



High performance in compact size

MBS32NH and MBS63NH cover short-circuit breaking capacities up to 100kA. In addition, every manual motor starter is temperature compensated up to 60°C.

Protection wherever you are

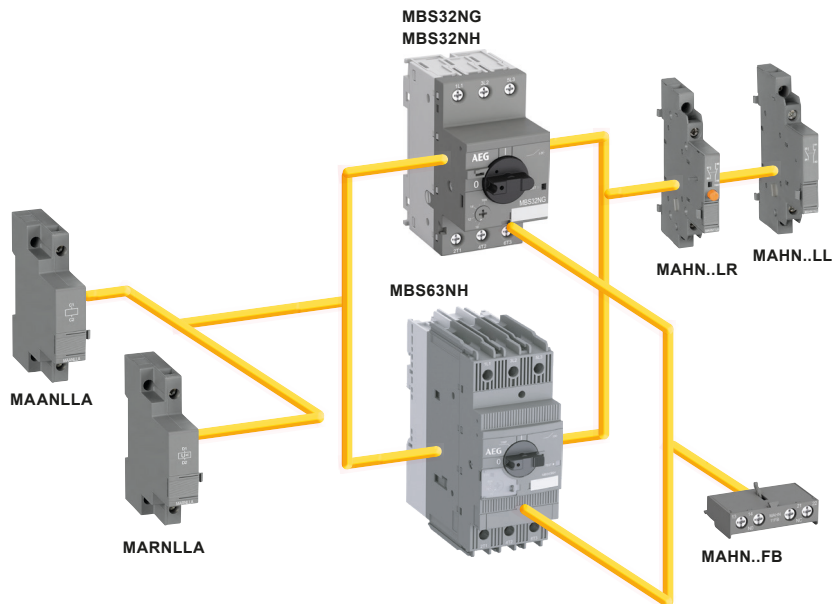
MBS manual motor starters are suitable for worldwide use. The wide range of certifications covers standards like IEC (CB) and cULus.

Ready for IE3 motors

MBS manual motor starters comply with the latest IE3 N/H and NE/HE motors. NE/HE requires utilization category AC-3e.

MBS manual motor starters

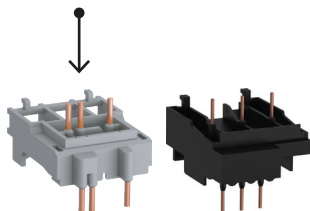
The right accessories for your applications



Wide range of accessories

Various accessories like auxiliary contacts, signaling contacts, shunt trips, undervoltage releases as well as busbars are available to enhance the functionality of MBS manual motor starters.

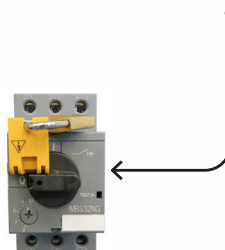
Save wiring time
and avoid mistakes by
using a connecting link



Easy to connect

Save wiring time and avoid mistakes by using a connecting link between MBS manual motor starters and AEG contactors. This creates harmonious and compact starter combinations that are easy to mount.

With a lockable handle
maintenance will be safe
for every technician



Safety at work

With a lockable handle maintenance will be safe for every technician. MBS32NH and MBS63NH handles are lockable without additional accessories. Use MAS1 padlock adapter to make MBS32NG lockable.

MBS32NG manual motor starters

0.25 to 32 A – with thermal and electromagnetic protection



MBS32NG - 160

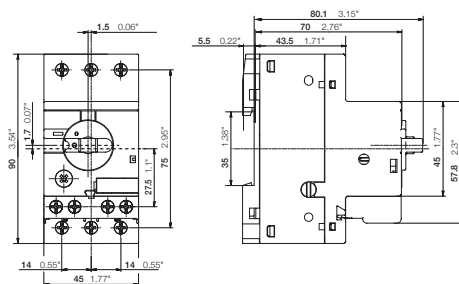


MBS32NG - 320

MBS32NG is a compact and economic range for motor protection up to 15 kW (400 V) / 32 A in width of 45 mm. Further features are the built-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter is suitable for three- and single-phase applications. Auxiliary contacts, signaling contacts, undervoltage releases, shunt trips and locking devices for protection against unauthorized changes are available as accessory.

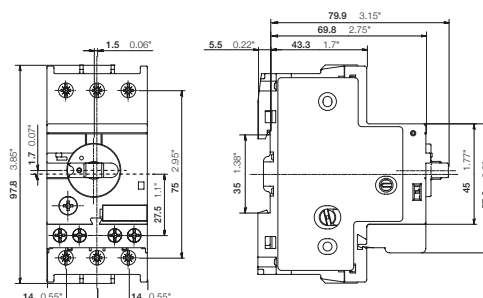
Rated operational power 400 V AC-3, AC-3e kW	Setting range A	Short-circuit breaking capacity Ics at 400 V AC kA	Rated instantaneous short-circuit current setting Ii A	Type	Order code	Weight (1 pce) kg
0.09	0.25 ... 0.40	50	5.00	MBS32NG-004	4TQE561503R0000	0.225
0.18	0.40 ... 0.63	50	7.90	MBS32NG-006	4TQE561504R0000	0.225
0.25	0.63 ... 1.00	50	12.5	MBS32NG-010	4TQE561505R0000	0.225
0.55	1.00 ... 1.60	50	20.0	MBS32NG-016	4TQE561506R0000	0.265
0.75	1.60 ... 2.50	50	31.3	MBS32NG-025	4TQE561507R0000	0.265
1.50	2.50 ... 4.00	50	50.0	MBS32NG-040	4TQE561508R0000	0.265
2.20	4.00 ... 6.30	50	78.8	MBS32NG-063	4TQE561509R0000	0.265
4.00	6.30 ... 10.0	50	150	MBS32NG-100	4TQE561510R0000	0.265
5.50	8.00 ... 12.0	25	180	MBS32NG-120	4TQE561512R0000	0.265
7.50	10.0 ... 16.0	16	240	MBS32NG-160	4TQE561511R0000	0.265
7.50	16.0 ... 20.0	10	300	MBS32NG-200	4TQE561513R0000	0.310
11.0	20.0 ... 25.0	10	375	MBS32NG-250	4TQE561514R0000	0.310
15.0	25.0 ... 32.0	10	480	MBS32NG-320	4TQE561515R0000	0.310

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



MBS32NG ≤ 16 A, MBS32NG with MAHN..FB ≤ 16 A

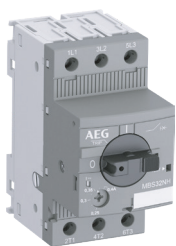
Main dimensions mm, inches



MBS32NG ≥ 20 A, MBS32NG with MAHN..FB ≥ 20 A

MBS32NH manual motor starters

0.10 to 32 A – with thermal and electromagnetic protection



MBS32NH-100



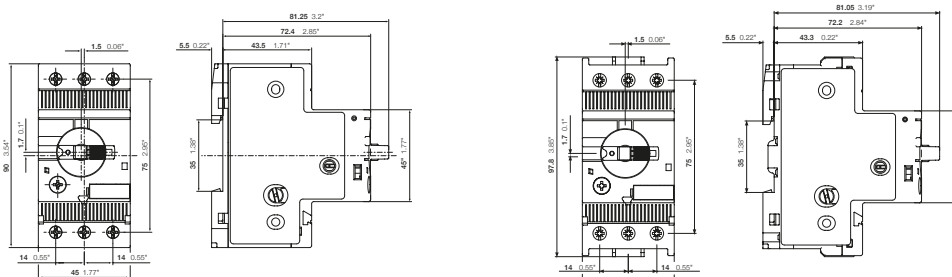
MBS32NH-320

MBS32NH is a compact and powerful range for motor protection up to 15 kW (400 V) / 32 A in width of 45 mm. This type has also a clear and reliable indication of fault in a separate window in the event of short-circuit tripping. Further features are the built-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication.

The manual motor starter is suitable for three- and single-phase applications. The handle is lockable to protect against unauthorized changes. Auxiliary contacts, signaling contacts, undervoltage releases, shunt trips, three-phase feeder terminals are available as accessory. These are suitable throughout the MBS32NG/ MBS32NH/MBS63NH range.

Rated operational power 400 V AC-3, AC-3e	Setting range	Short-circuit breaking capacity Ics at 400 V AC	Rated instantaneous short-circuit current setting Ii	Type	Order code	Weight (1 pce)
kW	A	kA	A			kg
0.03 (1)	0.10 ... 0.16	100	2.00	MBS32NH-001	4TQE562501R0000	0.225
0.06	0.16 ... 0.25	100	3.10	MBS32NH-002	4TQE562502R0000	0.225
0.09	0.25 ... 0.40	100	5.00	MBS32NH-004	4TQE562503R0000	0.225
0.18	0.40 ... 0.63	100	7.90	MBS32NH-006	4TQE562504R0000	0.225
0.25	0.63 ... 1.00	100	12.5	MBS32NH-010	4TQE562505R0000	0.225
0.55	1.00 ... 1.60	100	20.0	MBS32NH-016	4TQE562506R0000	0.265
0.75	1.60 ... 2.50	100	31.3	MBS32NH-025	4TQE562507R0000	0.265
1.50	2.50 ... 4.00	100	50.0	MBS32NH-040	4TQE562508R0000	0.265
2.20	4.00 ... 6.30	100	78.8	MBS32NH-063	4TQE562509R0000	0.265
4.00	6.30 ... 10.0	100	150	MBS32NH-100	4TQE562510R0000	0.265
5.50	8.00 ... 12.0	100	180	MBS32NH-120	4TQE562512R0000	0.265
7.50	10.0 ... 16.0	100	240	MBS32NH-160	4TQE562511R0000	0.265
7.50	16.0 ... 20.0	100	300	MBS32NH-200	4TQE562513R0000	0.310
11.0	20.0 ... 25.0	50	375	MBS32NH-250	4TQE562514R0000	0.310
15.0	25.0 ... 32.0	30	480	MBS32NH-320	4TQE562515R0000	0.310

Note: Manual motor starters should always be selected so that the actual motor current is within the setting range.
(1) 690 V



MBS32NH ≤ 10 A

MBS32NH ≥ 12 A

Main dimensions mm, inches

MBS63NH manual motor starters

30 to 80 A – with thermal and electromagnetic protection

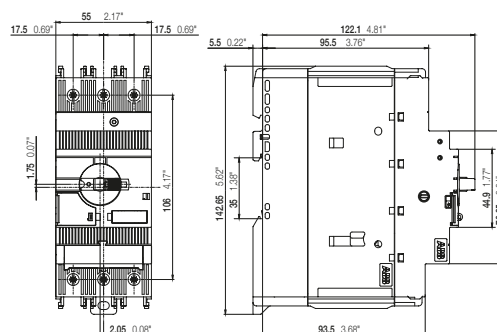


MBS63NH-650

MBS63NH is a compact and powerful range for motor protection up to 45 kW (400 V) / 80 A in width of 55 mm. This type has also a clear and reliable indication of fault in a separate window in the event of short-circuit tripping. Further features are the built-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter is suitable for three- and single-phase applications. The handle is lockable to protect against unauthorized changes. Auxiliary contacts, signaling contacts, undervoltage releases and shunt trips are available as accessory. These are suitable throughout the MBS32NG/MBS32NH/MBS63NH-range.

Rated operational power 400 V AC-3, AC-3e kW	Setting range A	Short-circuit breaking capacity Ics at 400 V AC kA	Rated instantaneous short-circuit current setting Ii A	Type	Order code	Weight (1 pce) kg
22	30 ... 42	50	630	MBS63NH-420	4TQE563515R0000	0.970
22	40 ... 54	30	810	MBS63NH-540	4TQE563516R0000	0.970
30	52 ... 65	30	975	MBS63NH-650	4TQE563517R0000	0.980
37	62 ... 73	30	1022	MBS63NH-730	4TQE563518R0000	1.000
45	70 ... 80	30	1120	MBS63NH-800	4TQE563519R0000	1.000

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



MBS63NH

Main dimensions mm, inches

MBS32NG, MBS32NH, MBS63NH

Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	MBS32NG	MBS32NH	MBS63NH
Standards	IEC/EN 60947-2, IEC/EN 60947-4-1, IEC/EN 60947-1		
Rated operational voltage U _e	690 V AC	690 V AC / 250 V DC	690 V AC / 250 V DC
Rated frequency	50/60 Hz	DC, 50/60 Hz	DC, 50/60 Hz
Operational frequency	50/60 Hz	0 ... 400 Hz	0 ... 400 Hz
Trip class	10A	10	10
Number of poles	3		
Duty time	100%		
Mechanical durability	100000 cycles	100000 cycles	50000 cycles
Electrical durability	up to 10 A	up to 100000 cycles	up to 25000 cycles
	up to 16 A	100000 cycles	25000 cycles
	20 ... 65 A	50000 cycles	25000 cycles
	65 ... 80 A	—	20000 cycles
Rated impulse withstand voltage U _{imp}	6 kV	6 kV	8 kV
Rated insulation voltage U _i	690 V	690 V	1000 V
Rated operational current I _e	See ordering details		
Rated operational current DC-5 I _e 3 conducting paths in series up to 250 V	—	See "Rated operational current I _e "	See "Rated operational current I _e "
Rated instantaneous short-circuit current setting I _i	See ordering details		
Rated service short-circuit breaking capacity I _{cs}	See table "Short-circuit breaking capacity and back-up fuses"		
Rated ultimate short-circuit breaking capacity I _{cu}	See table "Short-circuit breaking capacity and back-up fuses"		
Rated service short-circuit breaking capacity DC I _{cs} 3 conducting paths in series up to 250 V	—	10 kA	100 kA
Suitable for use in IT networks	Yes		

Short-circuit breaking capacity and back-up fuses - MBS32NG

I_{cs} Rated service short-circuit breaking capacity

I_{cu} Rated ultimate short-circuit breaking capacity

I_q (I_{cc}) Rated conditional short-circuit current

- No back-up fuse required, because short-circuit proof up to I_{cu} (for I_{cu} see table below)

Type	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I _{cs} kA	I _{cu} kA	gG, aM A	I _{cs} kA	I _{cu} kA	gG, aM A	I _{cs} kA	I _{cu} kA	gG, aM A	I _{cs} kA	I _{cu} kA	gG, aM A	I _{cs} kA	I _{cu} kA	gG, aM A
MBS32NG-004	50	50	-	50	50	-	50	50	-	30	30	-	30	30	-
MBS32NG-006	50	50	-	50	50	-	50	50	-	30	30	-	30	30	-
MBS32NG-010	50	50	-	50	50	-	50	50	-	30	30	-	30	30	-
MBS32NG-016	50	50	-	50	50	-	50	50	-	30	30	-	30	30	-
MBS32NG-025	50	50	-	50	50	-	10	10	25 (1)	10	10	25 (1)	30	5	25 (1)
MBS32NG-040	50	50	-	50	50	-	6	6	25 (1)	6	6	25 (1)	30	2	25 (1)
MBS32NG-063	50	50	-	50	50	-	6	6	63 (1)	6	6	63 (1)	5	2	40 (1)
MBS32NG-100	50	50	-	50	50	-	6	6	63 (1)	6	6	63 (1)	2	2	50 (1)
MBS32NG-120	25	25	80 (1)	25	25	80 (1)	6	6	63 (1)	6	6	63 (1)	2	2	50 (1)
MBS32NG-160	16	16	80 (1)	16	16	80 (1)	6	6	63 (1)	4	4	63 (1)	2	2	63 (1)
MBS32NG-200	10	15	125 (1)	10	15	125 (1)	3	6	125 (1)	3	4	125 (1)	2	2	80 (1)
MBS32NG-250	10	15	125 (1)	10	15	125 (1)	3	6	125 (1)	3	4	125 (1)	2	2	100 (1)
MBS32NG-320	10	10	125 (1)	10	10	125 (1)	3	6	125 (1)	3	4	125 (1)	2	2	100 (1)

(1) Maximum rated current of the back-up fuse for short circuit up to 50 kA if I_{cc} > I_{cs}

MBS32NG, MBS32NH, MBS63NH

Technical data

Ics **Rated service short-circuit breaking capacity**

Icu Rated ultimate short-circuit breaking capacity

Iq (Icc) **Rated conditional short-circuit current**

- No back-up fuse required, because short-circuit proof up to Icu (for Icu see table below)

Short-circuit breaking capacity and back-up fuses - MBS32NH

Type	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC			250 V DC (2)		
	Ics	Icu	gG, aM	Ics	Icu	gG, aM	Ics	Icu	gG, aM	Ics	Icu	gG, aM	Ics	Icu	gG, aM	Ics	Icu	gG
	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
MBS32NH-001	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-002	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-004	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-006	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-010	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-016	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-025	100	100	-	100	100	-	100	100	-	100	100	-	100	100	-	10	10	-
MBS32NH-040	100	100	-	100	100	-	30	30	35 (1)	20	20	35 (1)	3	3	32 (1)	10	10	-
MBS32NH-063	100	100	-	100	100	-	30	30	63 (1)	20	20	63 (1)	3	3	50 (1)	10	10	-
MBS32NH-100	100	100	-	100	100	-	20	20	100 (1)	20	20	100 (1)	3	3	50 (1)	10	10	-
MBS32NH-120	100	100	-	100	100	-	20	20	100 (1)	20	20	100 (1)	3	3	63 (1)	10	10	-
MBS32NH-160	100	100	-	100	100	-	20	20	125 (1)	20	20	125 (1)	3	3	63 (1)	10	10	-
MBS32NH-200	100	100	-	100	100	-	20	20	125 (1)	20	20	125 (1)	3	3	80 (1)	10	10	-
MBS32NH-250	50	50	125 (1)	50	50	125 (1)	20	20	125 (1)	10	10	125 (1)	3	3	100 (1)	10	10	-
MBS32NH-320	25	50	125 (1)	25	50	125 (1)	20	20	125 (1)	10	10	125 (1)	3	3	100 (1)	10	10	-

(1) Maximum rated current of the back-up fuse for short-circuit up to 100 kA if Icc > Ics

(2) 3 poles in series

Short-circuit breaking capacity and back-up fuses - MBS63NH

Type	230 V AC			400 V AC			415 V AC			440 V AC			500 V AC			690 V AC			250 V DC (2)		
	Ics	Icu	gG	Ics	Icu	gG	Ics	Icu	gG	Ics	Icu	gG	Ics	Icu	gG	Ics	Icu	gG	Ics	Icu	gG
	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
MBS63NH-420	50	50	125 (1)	50	50	125 (1)	50	50	125	50	50	125 (1)	30	30	125 (1)	10	10	100 (1)	100	100	-
MBS63NH-540	30	50	125 (1)	30	50	125 (1)	30	45	125	30	45	125 (1)	20	20	125 (1)	6	8	100 (1)	100	100	-
MBS63NH-650	30	50	125 (1)	30	50	125 (1)	30	45	125	30	45	125 (1)	20	20	125 (1)	6	8	100 (1)	100	100	-
MBS63NH-730	30	30	200 (1)	30	30	200 (1)	18	18	200 (1)	18	18	200 (1)	10	10	200 (1)	6	8	160 (1)	100	100	-
MBS63NH-800	30	30	200 (1)	30	30	200 (1)	18	18	200 (1)	18	18	200 (1)	10	10	200 (1)	6	8	160 (1)	100	100	-

(1) Rated back-up fuse for short-circuit up to 100 kA

(2) 3 poles in series

MBS32NG, MBS32NH, MBS63NH

Technical data

Main circuit – Utilization characteristics according to UL/CSA

Type	MBS32NG	MBS32NH	MBS63NH
Standards	UL 60947-1, UL 60947-4-1 (UL 508), CSA C22.2 No.60947-4-1 (CSA C22.2 No.14)		
Rated operational voltage Ue acc. to UL/CSA	600 V AC	600 V AC	600 V AC
Trip class	10A	10	
Motor ratings	Horsepower	See table "Motor ratings, three phase"	
	Full Load Amps (FLA)	See table "Motor ratings, three phase"	
	Locked Rotor Amps (LRA)	See table "Motor ratings, three phase"	

UL/CSA ratings overview

Type	MBS32NG	MBS32NH	MBS63NH
Manual Motor Controller	●	●	●
Manual Motor Controller, Suitable as Motor Disconnect	●	●	●
Manual Motor Controller, Suitable for use in Group Installations	●	●	●
Manual Motor Controller, Suitable for Tap Conductor Protection in Group Installations	-	●	●
Manual self-protected Combination Motor Controller (Type E)	-	-	-
Combination Motor Controller (Type F)	-	-	-

MBS32NG, MBS32NH, MBS63NH

Technical data

UL/CSA Motor ratings, three phase – MBS32NG

Type	110-120 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
MBS32NG-004	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4
MBS32NG-006	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78
MBS32NG-010	-	1.0	6.0	-	1.0	6.0	-	1.0	6.0	1/2	0.9	8
MBS32NG-016	-	1.6	9.6	-	1.6	9.6	3/4	1.6	12.5	3/4	1.3	10
MBS32NG-025	-	2.5	15.0	1/2	2.2	20	1	2.1	15	1-1/2	2.4	16
MBS32NG-040	-	4.0	16.0	1	4.2	30	2	3.4	25	3	3.9	25.6
MBS32NG-063	1/2	4.4	40	1-1/2	6.4	40	3	4.8	32	5	6.1	36.8
MBS32NG-100	1	8.4	60	3	9.6	64	5	7.6	46	7-1/2	9	50.8
MBS32NG-120	1-1/2	12	80	3	9.6	64	7-1/2	11	63.5	10	11	64.8
MBS32NG-160	2	13.6	100	5	15.2	92	10	14	81	10	11	64.8
MBS32NG-200	3	19.2	128	5	15.2	92	10	14	81	15	17	93
MBS32NG-250	3	19.2	128	7-1/2	22	127	15	21	116	20	22	116
MBS32NG-320	5	30.4	184	10	28	162	20	27	145	25	27	146

UL/CSA Motor ratings, three phase – MBS32NH

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
MBS32NH-001	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96	-	0.16	0.96
MBS32NH-002	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5	-	0.25	1.5
MBS32NH-004	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4	-	0.4	2.4
MBS32NH-006	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78	-	0.63	3.78
MBS32NH-010	-	1	6	-	1	6	-	1	6	-	1	6	1/2	1	6
MBS32NH-016	-	1.6	9.6	-	1.6	9.6	-	1.6	9.6	3/4	1.6	9.6	3/4	1.6	9.6
MBS32NH-025	1/2	2.5	15	1/2	2.5	15	1/2	2.5	15	1	2.5	15	1-1/2	2.5	15
MBS32NH-040	3/4	4	24	3/4	4	24	1	4	24	2	4	24	3	3.9	25.6
MBS32NH-063	1	6.3	37.8	1	6.3	37.8	1 1/2	6.3	37.8	3	4.8	32	5	6.1	36.8
MBS32NH-100	2	7.8	57.5	2	7.5	55	3	9.6	64	5	7.6	46	7 1/2	9	50.8
MBS32NH-120	3	11	73.6	3	10.6	71	3	9.6	64	7 1/2	11	63.5	10	11	64.8
MBS32NH-160	3	11	73.6	3	10.6	71	5	15.2	92	10	14	81	10	11	64.8
MBS32NH-200	5	17.5	105.8	5	16.7	102	5	15.2	92	10	14	81	15	17	93
MBS32NH-250	5	17.5	105.8	7 1/2	24.2	140	7 1/2	22	127	15	21	116	20	22	116
MBS32NH-320	7 1/2	25.3	146	10	30.8	179	10	28	162	20	27	145	25	27	146

UL/CSA Motor ratings, three phase – MBS63NH

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
MBS63NH-420	10	32.2	186.3	10	30.8	179	15	42	232	30	40	218	40	41	232
MBS63NH-540	15	48.3	267	15	46.2	257	20	54	290	40	52	290	50	52	290
MBS63NH-650	20	62.1	334	20	59.4	321	20	54	290	50	65	363	60	62	348
MBS63NH-730	20	62.1	334	20	59.4	321	25	68	365	50	65	363	60	62	348
MBS63NH-800	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.

MBS32NG, MBS32NH, MBS63NH

Technical data

UL/CSA Maximum short-circuit current ratings – MBS32NG

Type	Manual Motor Controllers		for motor disconnect (2)		for group installations	
	Branch circuit protection, max. size per NEC/CEC (1)					
	Fuses	Circuit breaker	480 V	600 V	480 V	600 V
	A	A	kA	kA	kA	kA
MBS32NG-004	Any listed fuses. Size per NEC/CEC	Any listed UL489 / CSA C22.2 N° 5 circuit breaker. Size per NEC/CEC	30	5	30	5
MBS32NG-006			30	5	30	5
MBS32NG-010			30	5	30	5
MBS32NG-016			30	5	30	5
MBS32NG-025			30	5	30	5
MBS32NG-040			18	5	18	5
MBS32NG-063			18	5	18	5
MBS32NG-100			18	5	18	5
MBS32NG-120			18	5	18	5
MBS32NG-160			18	5	18	5
MBS32NG-200			18	5	18	5
MBS32NG-250			18	5	18	5
MBS32NG-320			18	5	18	5

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

(2) Suitable as motor disconnect with padlock adapter MAS1.

UL/CSA Maximum short-circuit current ratings – MBS32NH

Type	Manual Motor Controllers							
	Branch circuit protection, max. size per NEC/CEC (1)		for motor disconnect		for group installations		for tap conductor protection in group installations	
Fuses	Circuit breaker	480 V	600 V	480 V	600 V	480 V	600 V	
A	A	kA	kA	kA	kA	kA	kA	
MBS32NH-001	Any Listed fuses. Size per NEC/CEC	Any Listed UL489 / CSA C22.2 No.5 circuit breaker. Size per NEC/CEC	65	47	65	47	65	47
MBS32NH-002			65	47	65	47	65	47
MBS32NH-004			65	47	65	47	65	47
MBS32NH-006			65	47	65	47	65	47
MBS32NH-010			65	47	65	47	65	47
MBS32NH-016			65	47	65	47	65	47
MBS32NH-025			65	47	65	47	65	47
MBS32NH-040			65	47	65	47	65	47
MBS32NH-063			65	18	65	18	65	18
MBS32NH-100			65	18	65	18	65	18
MBS32NH-120			30	18	30	18	30	18
MBS32NH-160			30	18	30	18	30	18
MBS32NH-200			30	18	30	18	30	18
MBS32NH-250			30	18	30	18	30	18
MBS32NH-320			30	18	30	18	30	18

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

MBS32NG, MBS32NH, MBS63NH

Technical data

UL/CSA Maximum short-circuit current ratings – MBS32NG with LS..N contactors

Type	Motor Disconnect, Group Installations in Group Installations Coordination Type 2		
	Minimum contactor size	480 V	600 V
	kA	kA	
MBS32NG-004	LS04N ... LS07N	30	5
MBS32NG-006	LS04N ... LS07N	30	5
MBS32NG-010	LS04N ... LS07N	30	5
MBS32NG-016	LS04N ... LS07N	30	5
MBS32NG-025	LS07N	30	5
MBS32NG-040	LS11N - LS18N	18	5
MBS32NG-063	LS11N - LS18N	18	5
MBS32NG-100	LS11N - LS18N	18	5
MBS32NG-120	LS11N - LS18N	18	5
MBS32NG-160	LS11N - LS18N	18	5
MBS32NG-200	LS11N - LS18N	18	5
MBS32NG-250	LS15N - LS18N	18	5
MBS32NG-320	LS18N	18	5

MBS32NG, MBS32NH, MBS63NH

Technical data

UL/CSA Maximum short-circuit current ratings – MBS63NH

Type	Manual Motor Controllers		for motor disconnect		for group installations		for tap conductor protection in group installations	
	Branch circuit protection, max. size per NEC/CEC (1)							
	Fuses A	Circuit breaker A	480 V kA	600 V kA	480 V kA	600 V kA	480Y / 277 V kA	600Y / 347 V kA
MBS63NH-420	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
MBS63NH-540			65	30	65	30	65	30
MBS63NH-650			65	30	65	30	65	30
MBS63NH-730			50	10	50	10	50	10
MBS63NH-800			50	10	50	10	50	10

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

General technical data

Type	MBS32NG	MBS32NH	MBS63NH
Pollution degree	3	3	3
Phase loss sensitivity	Yes	Yes	Yes
Disconnect function acc. to IEC/EN 60947-2	Yes	Yes	Yes
Ambient air temperature			
Operation	Open - compensated	-25 ... +55 °C	-25 ... +60 °C
	Open	-25 ... +70 °C	-25 ... +60 °C
	Enclosed (IB132)	0 ... +40 °C	-
Storage		-50 ... +80 °C	-50 ... +80 °C
Ambient air temperature compensation	Acc. to IEC/EN60947-4-1	Acc. to IEC/EN60947-4-1	Acc. to IEC/EN60947-4-1
Maximum operating altitude permissible	2000 m	2000 m	2000 m
Resistance to shock acc. to IEC 60068-2-27	25g / 11 ms	25g / 11 ms	25g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6	5g / 3 ... 150 Hz	5g / 3 ... 150 Hz	5g / 3 ... 150 Hz
Mounting position	Position 1-6 (optional for single mounting)	Position 1-6 (optional for single mounting)	Position 1-6 (optional for single mounting)
Mounting	DIN-rail (EN 60715)	DIN-rail (EN 60715)	DIN-rail (EN 60715)
Recommended screw for mounting plate	-	-	M4
Screw torque for mounting plate	-	-	2 Nm
Minimum distance to other units same type	Horizontal	0 mm	0 mm
	Vertical	150 mm	150 mm
Minimum distance to electrical conductive board	Horizontal, up to 400 V	0 mm	0 mm
	Horizontal, up to 690 V	> 1.5 mm	> 1.5 mm
	Vertical	75 mm	75 mm
Degree of protection	Housing	IP20	IP20
	Main circuit terminals	IP10	IP10

MBS32NG, MBS32NH, MBS63NH

Technical data

Connecting characteristics - Main circuit

Type		MBS32NG ≤ 16 A	MBS32NG ≥ 20 A
Connecting capacity			
 Rigid	1 or 2 x	1 ... 4 mm ²	2.5 ... 6 mm ²
 Flexible with ferrule	1 or 2 x	0.75 ... 2.5 mm ²	1 ... 6 mm ²
 Flexible with insulated ferrule	1 or 2 x	0.75 ... 2.5 mm ²	1 ... 6 mm ²
 Flexible	1 or 2 x	0.75 ... 2.5 mm ²	1 ... 6 mm ²
Stranded acc. to UL/CSA	1 or 2 x	AWG 16-12	AWG 16-8
Stripping length		9 mm	10 mm
Tightening torque		0.8 ... 1.2 Nm / 10 ... 12 lb.in	2.0 Nm / 18 lb.in
Recommended screwdriver		Pozidriv 2	Pozidriv 2

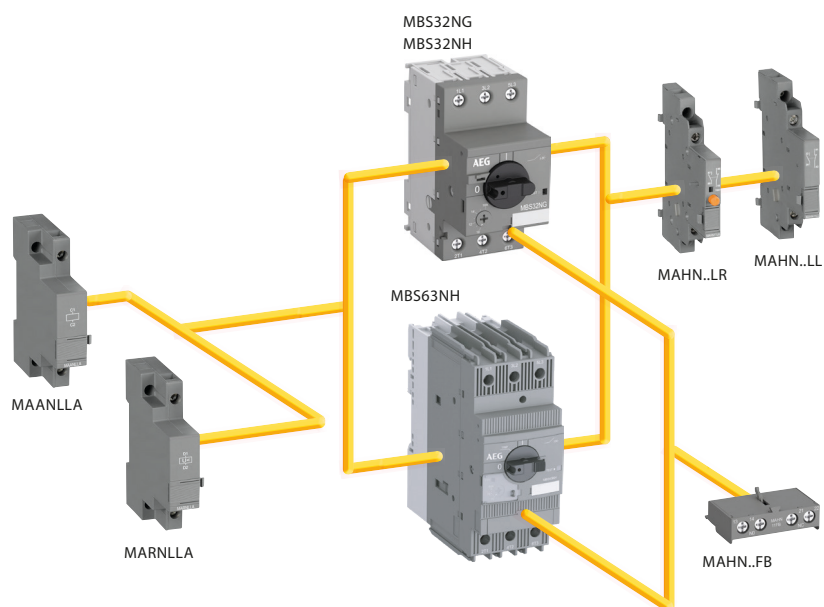
Type		MBS32NH ≤ 10 A	MBS32NH ≥ 12 A
Connecting capacity			
 Rigid	1 or 2 x	1 ... 4 mm ²	1 ... 2.5 mm ² 2.5 ... 6 mm ²
 Flexible with ferrule	1 or 2 x	0.75 ... 2.5 mm ²	0.75 ... 6 mm ²
 Flexible with insulated ferrule	1 or 2 x	0.75 ... 2.5 mm ²	0.75 ... 6 mm ²
 Flexible	1 or 2 x	0.75 ... 2.5 mm ²	1 ... 2.5 mm ² 2.5 ... 6 mm ²
Stranded acc. to UL/CSA	1 or 2 x	AWG 16-12	AWG 16-8
Stripping length		9 mm	10 mm
Tightening torque		0.8 ... 1.2 Nm / 10 ... 12 lb.in	2.0 Nm / 18 lb.in
Recommended screwdriver		Pozidriv 2	Pozidriv 2

Type		MBS63NH
Connecting capacity		
 Rigid stranded	1 or 2 x	1 ... 50 mm ²
 Flexible with ferrule	1 or 2 x	1 ... 35 mm ²
 Flexible with insulated ferrule	1 or 2 x	1 ... 35 mm ²
 Flexible	1 or 2 x	1 ... 35 mm ²
Stranded acc. to UL/CSA	1 or 2 x	AWG 16-0
Stripping length		16 mm
Tightening torque		4.0 Nm / 35 lb.in
Recommended screw driver		Pozidriv 2

Accessories

MBS32NG, MBS32NH, MBS63NH

MBS manual motor starters with accessories



Accessories

MBS32NG, MBS32NH, MBS63NH



MAHN..FB



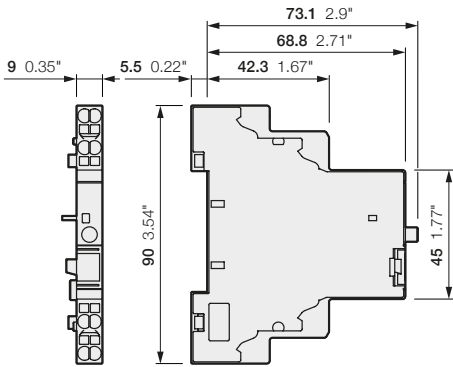
MAHN..LL



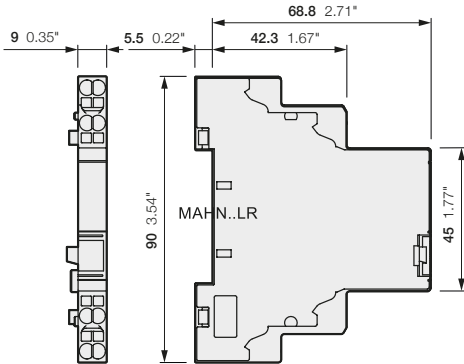
MAHN..LR

MBS32NG, MBS32NH, MBS63NH manual motor starters can be equipped with auxiliary contacts for lateral/ front mounting, signaling contacts for lateral mounting, undervoltage releases and shunt trips. The accessories can be fitted wiring free and without tools. A variety of combinations is possible as required for the application. The auxiliary contacts change position with the main contacts. The signaling contact MAHN..LR signals tripping regardless if it was caused by short-circuit or overload. Undervoltage releases are used for remote tripping of the manual motor starters, specially specially for emergency stop circuits. Shunt trips release the manual motor starters used for remote tripping.

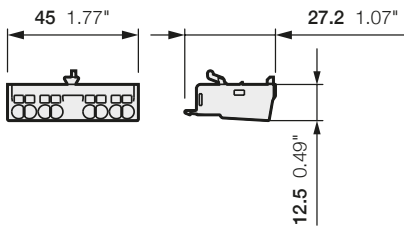
Suitable for	Auxiliary contacts N.O.	Auxiliary contacts N.C.	Description	Type	Order code	Pkg qty	Weight (1 pce) kg
Auxiliary contacts - mountable on the front							
MBS32NG,	1	1		MAHN11FB	4TQE569001R0000	10	0.015
MBS32NH,	1	0		MAHN10FB	4TQE569003R0000	10	0.013
MBS63NH	0	1		MAHN01FB	4TQE569004R0000	10	0.013
Auxiliary contacts - mountable on the right							
MBS32NG,	1	1	max. 2 pieces	MAHN11LL	4TQE569005R0000	2	0.035
MBS32NH,	2	0	max. 2 pieces	MAHN20LL	4TQE569006R0000	2	0.035
MBS63NH							
Signaling contacts - mountable on the right							
MBS32NG,	1	1	for tripped alarm	MAHN11LR	4TQE569008R0000	2	0.035
MBS32NH,	2	0	for tripped alarm	MAHN20LR	4TQE569009R0000	2	0.035
MBS63NH							



MAHN..LR



MAHN..LL



MAHN..FB

Accessories

MBS32NG, MBS32NH, MBS63NH

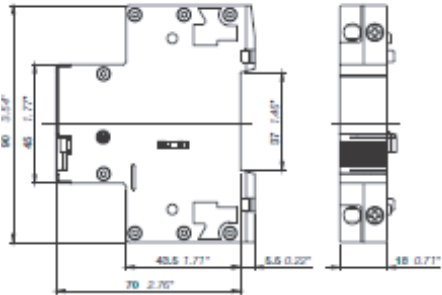


MAANLLA



MARNLLA

Suitable for	Rated control supply voltage		Type	Order code	Pkg qty	Weight (1 pce)
	50 Hz	60 Hz				
	V AC	V AC				kg
Shunt trips – mountable on the left						
MBS32NG, MBS32NH, MBS63NH	20 ... 24	20 ... 24	MAANLLA-24	4TQE569031R0000	1	0.100
	110	110	MAANLLA-110	4TQE569032R0000	1	0.100
	200 ... 240	200 ... 240	MAANLLA-230	4TQE569033R0000	1	0.100
	350 ... 415	350 ... 415	MAANLLA-400	4TQE569034R0000	1	0.100
Undervoltage releases – mountable on the left						
MBS32NG, MBS32NH, MBS63NH	24	-	MARNLLA-24	4TQE569021R0000	1	0.100
	110	120	MARNLLA-110	4TQE569024R0000	1	0.100
	230	240	MARNLLA-230	4TQE569025R0000	1	0.100
	400	-	MARNLLA-400	4TQE569026R0000	1	0.100



MAANLLA, MARNLLA

Main dimensions mm, inches

Accessories

MBS32NG, MBS32NH, MBS63NH

General technical data

Type	MAHN..LL, MAHN..LR	MAHN..FB
Standards	IEC/EN 60947-1, IEC/EN 60947-5-1	
Rated operational voltage U _e	690 V AC / 600 V DC	250 V AC / 250 V DC
Conventional free-air thermal current I _{th}	6 A	5 A
Rated frequency	50/60 Hz	
Rated impulse withstand voltage U _{imp}	6 kV	
Rated insulation voltage U _i	690 V AC	250 V AC
Pollution degree	3	
Ambient air temperature	Operation	-25 ... +60 °C
	Storage	-50 ... +80 °C
Resistance to shock acc. to IEC 60068-2-27	25g / 11 ms	
Resistance to vibrations acc. to IEC 60068-2-6	5g / 3 ... 150 Hz	
I _e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category	24 V, 120 V	3 A
	240 V	1.5 A
	400 V	-
	440 V, 690 V	-
	6 A	-
I _e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category	24 V	1 A
	125 V	0.27 A
	250 V	0.11 A
	440 V, 600 V	-
	2 A	-
Minimum switching capacity	17 V / 5 mA	
Short-circuit protective device	N.C., 95-96	10 A Type gG
	N.O., 97-98	10 A Type gG
Duty time	100 %	
Mounting	Right side of manual motor starters	Front of manual motor starters
Mounting positions	1-6	
Mechanical durability	100000 cycles	-
Electrical durability	100000 cycles	-

Contact utilization characteristics according to UL/CSA

Type	MAHN..LL, MAHN..LR	MAHN..FB
Standards	UL 60947-1, UL 60947-5-1 (UL 508), CSA C22.2 No.60947-5-1 (CSA C22.2 No.14)	
Rated operational voltage U _e acc. to UL/CSA	600 V AC / 600 V DC	250 V AC / 250 V DC
Pilot duty	B600, Q600	B300, R300
AC thermal rated current	5 A	5 A
AC maximum volt-ampere making	3600 VA	3600 VA
AC maximum volt-ampere breaking	360 VA	360 VA
DC thermal rated current	2.5 A	1 A
DC maximum volt-ampere making-breaking	69 VA	28 VA

Connecting characteristics - Auxiliary circuit

Type	MAHN..LL, MAHN..LR	MAHN..FB
Connecting capacity		
 Rigid	1 or 2 x 1 ... 1.5 mm ²	1 ... 2.5 mm ²
 Flexible with ferrule	1 or 2 x 0.75 ... 1.5 mm ²	
 Flexible with insulated ferrule	1 or 2 x 0.75 ... 1.5 mm ²	
 Flexible	1 or 2 x 0.75 ... 1.5 mm ²	1 ... 2.5 mm ²
Stranded acc. to UL/CSA	1 or 2 x AWG 16-14	
Stripping length	8 mm	
Tightening torque	0.8 ... 1.2 Nm / 7 lb.in	
Recommended screw driver	Pozidriv 2	

Accessories

MBS32NG, MBS32NH, MBS63NH

General technical data

Type	MARNLLA		MAANLLA
Standards	IEC/EN 60947-1, IEC/EN 60947-5-1, UL 60947-1, UL 60947-5-1 (UL 508), CSA C22.2 No.60947-4-1 (CSA C22.2 No.14)		
Rated control supply voltage	see ordering details		AA1-24: 20-24 V 50/60 Hz; 20-70 V 50/60 Hz ON-Period = 5 s ⁽¹⁾ , 20-70 V DC ON-Period = 5 s ⁽¹⁾ AA1-100: 110 V 50/60 Hz; 110-200 V 50/60 Hz ON-Period = 5 s ⁽¹⁾ , 110-200 V DC ON-Period = 5 s ⁽¹⁾ AA1-230: 200-240 V 50/60 Hz, 200-350 V 50/60 Hz ON-Period = 5 s ⁽¹⁾ , 200-350 V DC ON-Period = 5 s ⁽¹⁾ AA1-400: 350-415 V 50/60 Hz, 350-500 V 50/60 Hz ON-Period = 5 s ⁽¹⁾ , 350-500 V DC ON-Period = 5 s ⁽¹⁾
Rated frequency	see ordering details		50/60 Hz, DC
Operating voltage	Tripping	0.35 ... 0.7 x Us	0.7 ... 1.1 x Us
	Coil operating voltage	0.85 ... 1.1 x Us	-
Power consumption	Holding	AC	on request
		DC	on request
Rated impulse withstand voltage Uimp	6 kV		6 kV
Rated insulation voltage Ui	690 V		690 V
Pollution degree	3		3
Ambient air temperature	Operation	-25 +60 °C	-25 +60 °C
	Storage	-50 ...+80 °C	-50 ...+80 °C
Resistance to shock acc. to IEC 60068-2-27	15g / 11 ms		15g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6	5g / 3 ... 150 Hz		5g / 3 ... 150 Hz
Mounting	left side of manual motor starters		
Mounting positions	-		-

(1) ON-Period: max. 5 s actuation time. Please consider 15 min OFF-period after max. 5 s ON-period, for voltages above the rated values.

The mechanical and electrical durability of manual motor starters in combination with MARNLLA/MAANLLA is reduced. Values are provided on request.

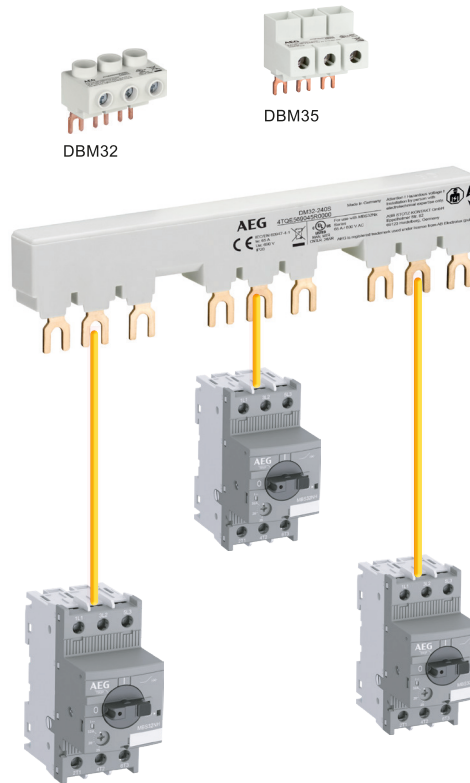
Connecting characteristics - Auxiliary circuit

Type	MARNLLA		MAANLLA
Connecting capacity			
 Rigid	1 or 2 x	1 ... 4 mm²	
 Flexible with ferrule	1 or 2 x	0.75 ... 2.5 mm²	
 Flexible with insulated ferrule	1 x	0.75 ... 2.5 mm²	
	2 x	0.75 ... 1.5 mm²	
 Flexible	1 or 2 x	0.75 ... 2.5 mm²	
Stranded acc. to UL/CSA	1 or 2 x	AWG 16-12	
Stripping length	10 mm		
Tightening torque	0.8 ... 1.2 Nm / 7 lb.in		
Recommended screwdriver	Pozidriv 2		

Accessories

MBS32NG, MBS32NH

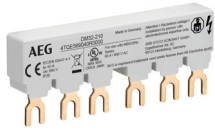
Manual motor starters with three-phase busbar systems



Three-phase busbar up to 65 A

Accessories

MBS32NG, MBS32NH



DM32-210



DBM35

Three-phase busbars

Three-phase busbars ensure a quick and safe connection and are therefore a cost effective solution. A variety of different three-phase busbars up to 65 A are in the assortment. Between 2 and 4 manual motor starters with none, one or two lateral auxiliary contacts can be connected. Different three-phase feeder terminals are available according to the application.

Suitable for	Rated operational current	Number of manual motor starters	Number of lateral auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce)
	A						kg

Three-phase busbars

MBS32NG, MBS32NH	65	2	0	DM32-210	4TQE569040R0000	10	0.034
	65	3	0	DM32-240	4TQE569041R0000	10	0.055
	65	4	0	DM32-207	4TQE569042R0000	10	0.077
	65	5	0	DM32-208	4TQE569043R0000	10	0.098
	65	2	1	DM32-210S	4TQE569044R0000	10	0.036
	65	3	1	DM32-240S	4TQE569045R0000	10	0.060
	65	4	1	DM32-207S	4TQE569046R0000	10	0.087
	65	5	1	DM32-208S	4TQE569047R0000	10	0.108

Suitable for	Rated operational current	Rated cross section	Mounting form	Type	Order code	Pkg qty	Weight (1 pce)
	A	mm ²					kg

Three-phase feeder terminals

MBS32NG, MBS32NH	65	25	Flat	DBM32	4TQE560950R0000	10	0.038
	100	35	Flat	DBM35	4TQE560951R0000	10	0.060

Accessories

MBS32NG, MBS32NH

General technical data

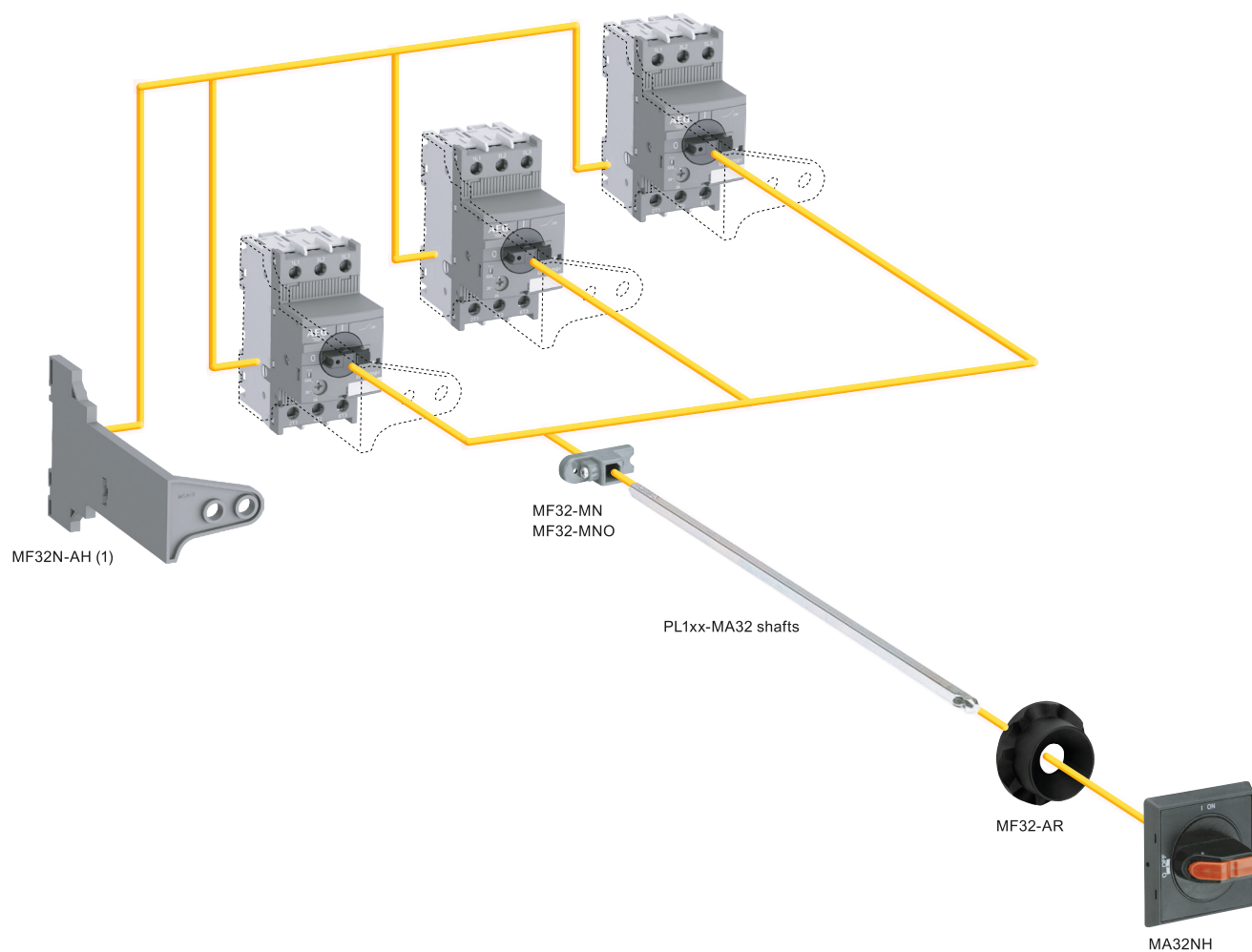
Type	DBM32	DBM35
Standards	IEC/EN 60947-4-1, IEC/EN 60947-1, UL 60947-1, UL 60947-4-1 (UL 508), CSA C22.2 No.60947-4-1 (CSA C22.2 No.14)	
Rated operational voltage U _e	600 V AC / 600 V DC	
Rated operational voltage U _e acc. to UL/CSA	600 V AC	
Rated operational current I_e	65 A	100 A
Rated operational current I _e acc. to UL/CSA	65 A	92 A
Rated frequency	50/60 Hz	
Rated impulse withstand voltage U _{imp}	6 kV	
Rated insulation voltage U _i	690 V AC	
Pollution degree	3	
Ambient air temperature	Operation	-25 ... +70 °C
	Storage	-50 ... +80 °C
Resistance to shock acc. to IEC 60068-2-27	25g / 11 ms	
Resistance to vibrations acc. to IEC 60068-2-6	5g / 3 ... 150 Hz	

Electrical connection - Main circuit

Type	DBM32	DBM35
Connecting capacity		
 Rigid	1 x 2.5 ... 25 mm ²	10 ... 35 mm ²
 Flexible with ferrule	1 x -	-
 Flexible with insulated ferrule	1 x -	-
 Flexible	1 x 2.5 ... 16 mm ²	10 ... 35 mm ²
Stranded acc. to UL/CSA	1 x AWG 14 ... 4	AWG 8 ... 2
Flexible acc. to UL/CSA	1 x AWG 14 ... 6	AWG 8 ... 2
Stripping length	10 mm	12 mm
Tightening torque	2.5 Nm / 22 lb.in	4.5 Nm / 40 lb.in
Recommended screwdriver	Pozidriv 2	Hexagon SW4

Accessories

MBS32NG, MBS32NH, MBS63NH



(1) MF32N-AH fits to MBS32NG, MBS32NH

Accessories

MBS32NG, MBS32NH



MAS1

Suitable for	Description	Type	Order code	Pkg qty	Weight (1 pce) kg
MBS32NG	Padlock adapter	MAS1	4TQE569018R0000	10	0.003



MI65-Y

MI65 are IP65 (NEMA Type 12) enclosures for single manual motor starter installation. Additional mounting of auxiliary and signaling contacts, shunt trips and undervoltage release is possible. The handle is lockable in OFF position. For detailed specification see installation instruction.

Suitable for	Description	Color	Type	Order code	Pkg qty	Weight (1 pce) kg
IP65 enclosures (NEMA Type 12)						
MBS32NG, MBS32NH	Padlockable max. 3 padlocks with bail diameter 4 ... 6.5 mm	Yellow/red	MI65-Y	4TQE569015R0000	1	0.370
		Grey/black	MI65-G	4TQE569014R0000	1	0.370



MI65-G

IP65 door mounting kits (NEMA Type 12)						
MBS32NG, MBS32NH	Padlockable max. 3 padlocks with bail diameter 4 ... 6.5 mm	Yellow/red	MIT65-Y	4TQE569072R0000	1	0.170
		Grey/black	MIT65-G	4TQE569071R0000	1	0.170

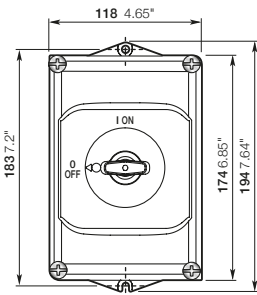
Indication I-O-T and ON-OFF-T.



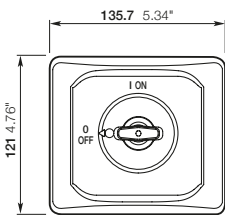
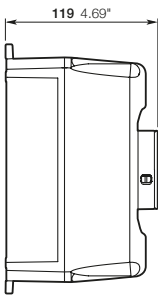
MIT65-Y



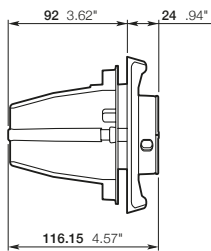
MIT65-G



MI65-...



MIT65-...



Main dimensions mm, inches

Accessories

MBS32NG, MBS32NH, MBS63NH



MA32NHB



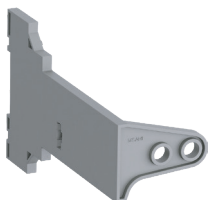
MA32NHR



MF32-MN



MF32-AR



MF32N-AH

With this solution of door coupling rotary mechanisms it is possible to operate manual motor starters in the back of a switch cabinet from outside. The door coupling mechanism prevents opening of the door of a switch cabinet with the manual motor starter in ON position.

The complete mechanism includes handle, shaft, driver, shaft alignment ring and shaft supporter.

Most accessories fit for 6 mm shafts with a maximum length of 180 mm. The degree of protection for handles MA32NH is IP64 (NEMA Type 1, 3R, 12).

Suitable for	Description	Color	Type	Order code	Pkg qty pce	Weight (1 pce) kg
IP64 handles (NEMA Type 1, 3R, 12)						
MBS32NG,	Padlockable max. 3 padlocks with bail diameter 5 ... 8 mm, door interlock in ON position defeatable, for use with PL1xx-MA32 shafts.	Black	MA32NHB ⁽¹⁾	4TQE569060R0000	1	0.065
MBS32NH,		Yellow	MA32NHR ⁽¹⁾	4TQE569061R0000	1	0.065
MBS63NH						
Driver						
MBS32NG,	Coupling driver for use with PL1xx-MA32 shafts from 6mm up to 180mm.		MF32-MN ⁽²⁾	4TQE569062R0000	1	0.002
MBS32NH,			MF32-MNO ⁽³⁾	4TQE569063R0000	1	0.002
MBS63NH						
Shaft alignment ring						
MBS32NG,	The MF32-AR supports the long shafts for alignment to the handle inlet. It makes closing panel doors more easy.		MF32-AR	4TQE569064R0000	1	0.010
MBS32NH,						
MBS63NH						
Shaft supporter						
MBS32NG,	With the MF32N-AH it is possible to support the shaft in the extension of handle (MA32NH). It is mandatory for the usage of shafts >130 mm.		MF32N-AH	4TQE569065R0000	1	0.035
MBS32NH						

(1) Indication I-O and ON-OFF (recommended for MBS32NG)

(2) Coded - Positioning of ON indication dependent on mounting orientation of the MBS

(3) Uncoded - Positioning of ON indication independent of mounting orientation of the MBS.

AEG

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