Customer made Motor starting solution

12/2 **Motor rated operational powers and currents**

12/3 **Customer assembled motor starting solutions**

DOL and reversing starters protected by manual motor starters

12/4 General
12/6 Selection tables
12/10 Wiring diagrams
12/11 Main dimensions

DOL starters protected by moulded-case circuit-breakers and overload relays

12/18 General
12/20 Selection tables
12/24 Wiring diagrams

Main dimensions, starter protected by

12/25 MCCB including motor protection
12/27 MCCB (magnetic only) and thermal overload relays
12/30 MCCB (magnetic only) and electronic overload relays

DOL and reversing starters protected by overload relays

12/34 General
12/36 Selection tables
12/40 Switching frequency diagrams for overload relays
12/41 Wiring diagrams

Main dimensions, starter protected by

12/42 Thermal overload relays

Motor rated operational powers and currents

The currents given below concern standard three-phase four-pole cage motors (1500 r.p.m. at 50 Hz 1800 r.p.m. at 60 Hz). These values are given for guidance and may vary according to the motor manufacturer and depending on the number of poles.

IEC	Motor nominal current: standardized values in grey (according to IEC 60947-4-1 Annex G)									
Motor power	220 V	230 V	240 V	380 V	400 V	415 V	440 V	500 V	660 V	690 V
kW	A	A	A	A	A	A	A	A	A	A
0.06	0.37	**0.35**	0.34	0.21	**0.2**	0.19	0.18	**0.16**	0.13	**0.12**
0.09	0.54	**0.52**	0.50	0.32	**0.3**	0.29	0.26	**0.24**	0.18	**0.17**
0.12	0.73	**0.7**	0.67	0.46	**0.44**	0.42	0.39	**0.32**	0.24	**0.23**
0.18	1	**1**	1	0.63	**0.6**	0.58	0.53	**0.48**	0.37	**0.35**
0.25	1.6	**1.5**	1.4	0.9	**0.85**	0.82	0.74	**0.68**	0.51	**0.49**
0.37	2.0	**1.9**	1.8	1.2	**1.1**	1.1	1	**0.88**	0.67	**0.64**
0.55	2.7	**2.6**	2.5	1.6	**1.5**	1.4	1.3	**1.2**	0.91	**0.87**
0.75	3.5	**3.3**	3.2	2.0	**1.9**	1.8	1.7	**1.5**	1.15	**1.1**
1.1	4.9	**4.7**	4.5	2.8	**2.7**	2.6	2.4	**2.2**	1.7	**1.6**
1.5	6.6	**6.3**	6	3.8	**3.6**	3.5	3.2	**2.9**	2.2	**2.1**
2.2	8.9	**8.5**	8.1	5.2	**4.9**	4.7	4.3	**3.9**	2.9	**2.8**
3	11.8	**11.3**	10.8	6.8	**6.5**	6.3	5.7	**5.2**	4	**3.8**
4	15.7	**15**	14.4	8.9	**8.5**	8.2	7.4	**6.8**	5.1	**4.9**
5.5	20.9	**20**	19.2	12.1	**11.5**	11.1	10.1	**9.2**	7	**6.7**
7.5	28.2	**27**	25.9	16.3	**15.5**	14.9	13.6	**12.4**	9.3	**8.9**
11	39.7	**38**	36.4	23.2	**22**	21.2	19.3	**17.6**	13.4	**12.8**
15	53.3	**51**	48.9	30.5	**29**	28	25.4	**23**	17.8	**17**
18.5	63.8	**61**	58.5	36.8	**35**	33.7	30.7	**28**	22	**21**
22	75.3	**72**	69	43.2	**41**	39.5	35.9	**33**	25.1	**24**
30	100	**96**	92	57.9	**55**	53	48.2	**44**	33.5	**32**
37	120	**115**	110	69	**66**	64	58	**53**	40.8	**39**
45	146	**140**	134	84	**80**	77	70	**64**	49.1	**47**
55	177	**169**	162	102	**97**	93	85	**78**	59.6	**57**
75	240	**230**	220	139	**132**	127	116	**106**	81	**77**
90	291	**278**	266	168	**160**	154	140	**128**	97	**93**
110	355	**340**	326	205	**195**	188	171	**156**	118	**113**
132	418	**400**	383	242	**230**	222	202	**184**	140	**134**
160	509	**487**	467	295	**280**	270	245	**224**	169	**162**
200	637	**609**	584	368	**350**	337	307	**280**	212	**203**
250	782	**748**	717	453	**430**	414	377	**344**	261	**250**
315	983	**940**	901	568	**540**	520	473	**432**	327	**313**
355	1109	**1061**	1017	642	**610**	588	535	**488**	370	**354**
400	1255	**1200**	1150	726	**690**	665	605	**552**	418	**400**
500	1545	**1478**	1416	895	**850**	819	745	**680**	515	**493**
560	1727	**1652**	1583	1000	**950**	916	832	**760**	576	**551**
630	1928	**1844**	1767	1116	**1060**	1022	929	**848**	643	**615**
710	2164	**2070**	1984	1253	**1190**	1147	1043	**952**	721	**690**
800	2446	**2340**	2243	1417	**1346**	1297	1179	**1076**	815	**780**
900	2760	**2640**	2530	1598	**1518**	1463	1330	**1214**	920	**880**
1000	3042	**2910**	2789	1761	**1673**	1613	1466	**1339**	1014	**970**

UL/CSA	Motor nominal current: single and three phase (according to UL 60947-4-1A)									
Motor power	120 V 1-ph	200 V 1-ph	200 V 3-ph	208 V 1-ph	208 V 3-ph	220-240 V 1-ph	220-240 V 3-ph	380-415 V 3-ph	440-480 V 3-ph	550-600 V 3-ph
hp	A	A	A	A	A	A	A	A	A	A
1/10	3	–	–	–	–	1.5	–	–	–	–
1/8	3.8	–	–	–	–	1.9	–	–	–	–
1/6	4.4	2.5	–	2.4	–	2.2	–	–	–	–
1/4	5.8	3.3	–	3.2	–	2.9	–	–	–	–
1/3	7.2	4.1	–	4	–	3.6	–	–	–	–
1/2	9.8	5.6	2.5	5.4	2.4	4.9	2.2	1.3	1.1	0.9
3/4	13.8	7.9	3.7	7.6	3.5	6.9	3.2	1.8	1.6	1.3
1	16	9.2	4.8	8.8	4.6	8	4.2	2.3	2.1	1.7
1-1/2	20	11.5	6.9	11	6.6	10	6	3.3	3	2.4
2	24	13.8	7.8	13.2	7.5	12	6.8	4.3	3.4	2.7
3	34	19.6	11	18.7	10.6	17	9.6	6.1	4.8	3.9
5	56	32.2	17.5	30.8	16.7	28	15.2	9.7	7.6	6.1
7-1/2	80	46	25.3	44	24.2	40	22	14	11	9
10	100	57.5	32.2	55	30.8	50	28	18	14	11
15	135	–	48.3	–	46.2	68	42	27	21	17
20	–	–	62.1	–	59.4	88	54	34	27	22
25	–	–	78.2	–	74.8	110	68	44	34	27
30	–	–	92	–	88	136	80	51	40	32
40	–	–	120	–	114	176	104	66	52	41
50	–	–	150	–	143	216	130	83	65	52
60	–	–	177	–	169	–	154	103	77	62
75	–	–	221	–	211	–	192	128	96	77
100	–	–	285	–	273	–	248	165	124	99
125	–	–	359	–	343	–	312	208	156	125
150	–	–	414	–	396	–	360	240	180	144
200	–	–	552	–	528	–	480	320	240	192
250	–	–	–	–	–	–	604	403	302	242
300	–	–	–	–	–	–	722	482	361	289
350	–	–	–	–	–	–	828	560	414	336
400	–	–	–	–	–	–	954	636	477	382
450	–	–	–	–	–	–	1030	–	515	412
500	–	–	–	–	–	–	1180	786	590	472

1SBC101589S0201

Customer assembled motor starting solutions

ABB Expertise

ABB has acquired years of experience with respect to problems of coordination and is able to make a complete offer based on tests performed in its qualified laboratories. This offer covers 400 V AC, 500 V AC, 690 V AC networks.

A complete database of coordination tables, according to IEC 60947-4-1 (EN 60947-4-1), and UL 60947-4-1 between the branch circuit protective device and the motor starter is available on the ABB Website.

In the coordination tables the following short-circuit protection devices are recommended:

- Case circuit-breakers (MCCBs)
- Miniature circuit-breakers (MCBs)
- Switch-disconnector-fuses (aM, gG and BS)
- Manual motor starters (MMS).

Select Optimized Coordination tool (SOC)

Selected Optimized Coordination is a web tool for the selection of ABB products to be used in the following applications:

- Motor starting and protection
- Selectivity between protection devices
- Back-up protection
- Other devices protection.

In order to guarantee the best performance and the longest lifetime, devices involved into the applications mentioned above (short-circuit protection devices, contactors, overload relays, softstarters, ...) need to be coordinated.

- The coordination among devices cannot be determined directly: tests in power laboratories shall be carried out to qualify the coordination type at low fault and high fault currents, according to IEC or UL standards.
- ABB coordination tables are the results of such tests and represent the ABB offerings in terms of motor starting and protection, selectivity, back-up and switch-disconnector protection.
- In Selected Optimized Coordination all available ABB coordination tables are stored and easily accessible.

Website access:

http://applications.it.abb.com/SOC/Page/Selection.aspx

How to combine assemble and wire starter components

The section "customer assembled motor stating solutions" in this catalog gives the components lists and wiring diagrams to assemble the most typical motor starting solutions.

It covers direct-on-line Starters, reversing starters or star-delta starters protected with manual motor starters or with thermal overload relays for Type I or type II coordination for normal starting time.

Note:

In order to confirm your starter combination ratings according to ABB's lattest coordination test results, or to see other coordination of components please refer to the above mentioned SOC tool. SOC tool get constant updates and additions

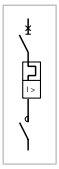
General remarks applicable to all tables

- Each table is defined for a maximum ambient temperature of 40 °C. For higher temperatures, apply a derating factor according to the following rules:
- Fuses: factor of 0.8 applied to In for an ambient temperature of 70 °C
- MCCBs and MCBs: factor of 0.8 applied to In for an ambient temperature of 60 °C
- The starter derating factor depends on the operating conditions of thermal overload relays:
- Factor of 0.9 applied to In for an ambient temperature of 70 °C.
- Each table is defined for motor currents: 3-phase motors, 4-pole
- Normal starting means a starting time < 2 s. - Difficult starting means an accelerating time 10 s < ts < 30 s
- Tripping classes of thermal overload relays according to IEC 60947-4-1 (EN 60947-4-1): 10A and 10
- Tripping classes of electronic overload relays according to IEC 60947-4-1 (EN 60947-4-1): 10E, 20E, 30E selectable
- In the tables with MCCBs, these are fitted with the magnetic relay alone. Setting is always carried out at > 12.3 Ie AC-3 so that the transient current peak occurring during starting does not lead to tripping.

1SBC100497S0201 - Rev. B

DOL and reversing starters protected by manual motor starters

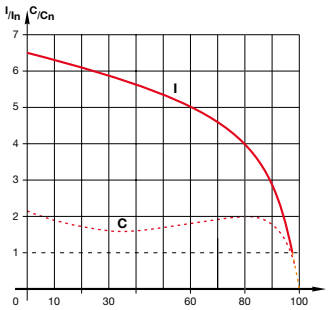
With AF contactors - open type version in kit form



DOL starter
MS132-10 + BEA16-4 + AF09-30-10

Application

Full voltage direct-on-line (DOL) starting and reversing starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



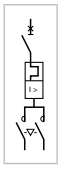
I = current
C = torque
In = nominal current
Cn = nominal torque

Coordination types

The contactor and the manual motor starter control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

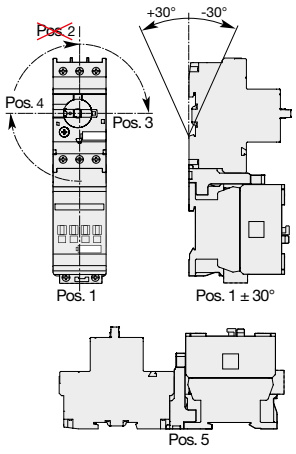


Reversing starter
MS132-10 + BEA16-4 + BER16-4
+ VEM4 + AF09-30-10

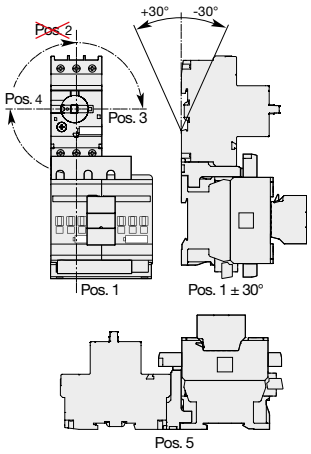
Main Technical Data

Standards		IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.		690 V - 50/60 Hz
Rated insulation voltage Ui		
acc. to IEC 60947-4-1		690 V
acc. to UL / CSA		600 V
Switching frequency		≤ 15 starts/hour - 80 % max. load factor - with max. 1.5 s starting time
		≤ 30 starts/hour - 50 % max. load factor - with max. 1.5 s starting time
Ambient air temperature		
Close to the device	use with MS116	≤ 55 °C
	use with MS132, MS165, MS495	≤ 60 °C
Degree of protection		IP20

Mounting positions



DOL starters

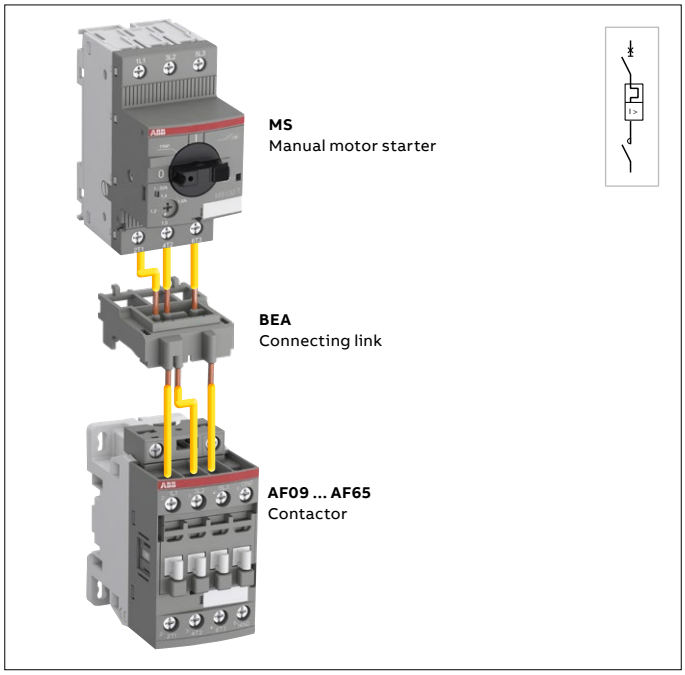


Reversing starters

1SBC101975D0201 - Rev. B

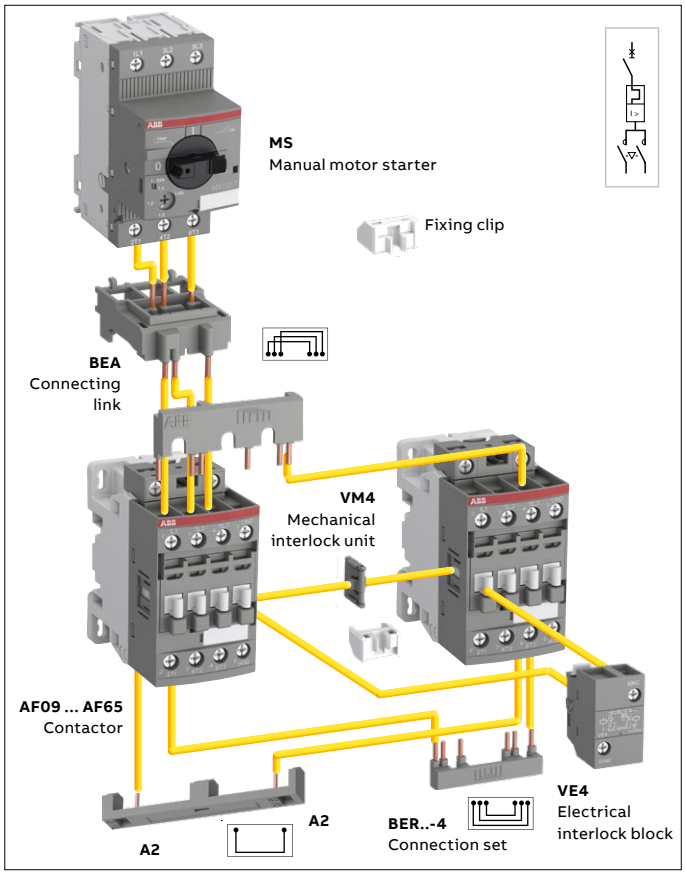
DOL and reversing starters protected by manual motor starters

With AF contactors - open type version in kit form



Direct-on-line starters

You can easily assemble a direct-on-line starter by using the BEA..-4 connecting link 3-pole insulated. It is used to electrically and mechanically connect MS116, MS132 or MS165 manual motor starter and AF09 ... AF65 contactor, AC or DC operated.



Reversing starters

You can easily assemble reversing starter thanks to our complete range of accessories:

- BEA..-4 connecting link 3-pole insulated: it is used to electrically and mechanically connect MS116, MS132 or MS165 manual motor starter and AF09 ... AF65 contactor, AC or DC operated
- For AF09 ... AF38, use VEM4 mechanical and electrical interlock set for reversing starter in 90 mm width. It includes:
  - VM4 mechanical interlock unit including 2 fixing clips
  - VE4 electrical interlock block with A2-A2 connection.
- For AF40 ... AF96, use VM96-4 mechanical interlock unit and additional auxiliary contact blocks for electrical interlocking
- BER..-4 connection set: it assures a safe and simple reversing connection between both contactor main terminals.

Note: for direct mounting on 2 rails 35 mm of MS165 manual motor starter with AF40 ... AF65 contactors, BEA65-4 connecting link must be associated with BPR65-4 35 mm rail hook fixed on each contactor base. Starter combination using BPR65-4 are applicable for MS165 manufactured after week 31, 2016 (date code > 16214).

Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50/60 Hz, Iq = 16 kA up to 18.5 kW and Iq = 50 kA up to 45 kW.

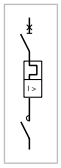
For the full coordination tables, please visit our SOC tool :
https://applications.it.abb.com/SOC/Selectivity

1SBC101917S0201 - Rev. B

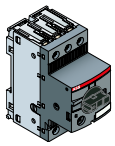
DOL starters protected by MS manual motor starters

Coordination type 1

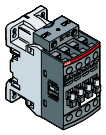
Coordination type 1, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz



Manual motor starters



Contactors



Accessories

BEA..-4

CA4-10

IEC AC-3, 400 V Rated operational power kW	current A	Type (1)	Order code	Current setting range A	Magnetic tripping current A	Rated control circuit voltage Uc min. ... Uc max. (2) V 50/60 Hz	V DC	Type (3)	Order code	Allowed setting current A	Type	Order code
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	2.44	24...60	20...60 (5)	AF09Z-30-10-11	1SBL136001R1110	0.25	BEA16-4	1SBN081306T1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	3.9	24...60	20...60 (5)	AF09Z-30-10-11	1SBL136001R1110	0.4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	11.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	28.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	2.5		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	6.3		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	9		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	9		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	12		
						100...250	100...250	AF12-30-10-13	1SBL157001R1310			
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	16		
						100...250	100...250	AF16-30-10-13	1SBL177001R1310			
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	25		1SBN082306T2000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			1SBN010110R1010
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	32	BEA38-4	
						100...250	100...250	AF30-30-00-13	1SBL277001R1300		+ CA4-10	
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60	20...60	AF40-30-00-11	1SBL347001R1100	40	BEA65-4	1SBN083406R1000
						100...250	100...250	AF40-30-00-13	1SBL347001R1300		BPR65-4 (4)	1SBN113405R1000
											CA4-10	
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60	20...60	AF52-30-00-11	1SBL367001R1100	53		1SBN010110R1010
						100...250	100...250	AF52-30-00-13	1SBL367001R1300			
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60	20...60	AF65-30-00-11	1SBL387001R1100	65		
						100...250	100...250	AF65-30-00-13	1SBL387001R1300			
37	66	MS495-75	1SAM550000R1008	57.0...75.0	975	24...60	20...60	AF80-30-00-11	1SBL397001R1100	75		
						100...250	100...250	AF80-30-00-13	1SBL397001R1300			
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60	20...60	AF96-30-00-11	1SBL407001R1100	90		
						100...250	100...250	AF96-30-00-13	1SBL407001R1300			

(1) MS116 manual motor starter can be selected according to the current setting range indicated on the coordination line, up to:
- 15 kW, 400 V - AC-3 at 16 kA
- 4 kW, 400 V - AC-3 at 50 kA.

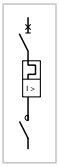
(2) For other control voltages, see "Voltage code table".
(3) AF38 3-pole contactor can be selected for coordination type 1, 16 kA and 50 kA, 18.5 kW, 400 V - AC-3 (BEA65-4 available for AF40 ... AF65 only).
(4) For direct mounting on 2 rails 35 mm of MS165 with AF40 ... AF65: BEA65-4 must be associated with BPR65-4 fixed on contactor base. Applicable for MS165 manufactured after week 31, 2016 (date code > 16114).
(5) AF ... -11 not suitable for direct control by PLC-output.

1SBC101913502O1 - Rev. D

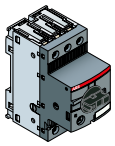
DOL starters protected by MS manual motor starters

Coordination type 2

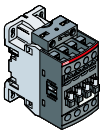
Coordination type 2, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz



Manual motor starters



Contactors



Accessories

BEA..-4

CA4-10

IEC AC-3, 400 V Rated operational power	current	Manual motor starters Type (1)	Order code	Current setting range	Magnetic tripping current	Contactors Rated control circuit voltage Uc min. ... Uc max. (2)		Type (3)	Order code	Allowed setting current	Accessories Type	Order code
kW	A			A	A	V 50/60 Hz	V DC (6)			A		
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	2.44	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.25	BEA16-4	1SBN081306T1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	3.9	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	11.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	28.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	2.5		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	4	BEA26-4	1SBN082306T1000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ CA4-10	1SBN010110R1010
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	4		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	6.3		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	10		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	10		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	12	BEA38-4	1SBN082306T2000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ CA4-10	1SBN010110R1010
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	16		
						100...250	100...250	AF30-30-00-13	1SBL277001R1300			
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	25		
						100...250	100...250	AF30-30-00-13	1SBL277001R1300			
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	32		
						100...250	100...250	AF30-30-00-13	1SBL277001R1300			
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60	20...60	AF40-30-00-11	1SBL347001R1100	40	BEA65-4	1SBN083406R1000
						100...250	100...250	AF40-30-00-13	1SBL347001R1300		BPR65-4 (5)	1SBN113405R1000
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60	20...60	AF52-30-00-11	1SBL367001R1100	53	CA4-10	1SBN010110R1010
						100...250	100...250	AF52-30-00-13	1SBL367001R1300			
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60	20...60	AF65-30-00-11	1SBL387001R1100	65		
						100...250	100...250	AF65-30-00-13	1SBL387001R1300			
37	66	MS495-75	1SAM550000R1008	57.0...75.0	975	24...60	20...60	AF80-30-00-11	1SBL397001R1100	75		
						100...250	100...250	AF80-30-00-13	1SBL397001R1300			
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60	20...60	AF96-30-00-11	1SBL407001R1100	90		
						100...250	100...250	AF96-30-00-13	1SBL407001R1300			

(1) MS116 manual motor starter can be selected according to the current setting range indicated on the coordination line, up to
- 15 kW 400V - AC-3 at 16 kA
- 4 kW, 400 V - AC-3 at 50 kA.

(2) For other control voltages, see "Voltage code table".

(3) AF26 3-pole contactor can be selected for coordination type 2, 16 kA, 7.5 kW, 400 V - AC-3.
AF38 3-pole contactor can be selected for coordination type 2, 16 kA and 50 kA, 18.5 kW, 400 V - AC-3 (BEA65-4 available for AF40 ... AF65 only).

(4) BEA26-4 should be selected with MS116-12 ... MS116-16 and AF26 ... AF38.
BEA38-4 can only be selected with MS116-20 ... MS116-32.

(5) For direct mounting on 2 rails 35 mm of MS165 with AF40 ... AF65: BEA65-4 must be associated with BPR65-4 fixed on contactor base. Applicable for MS165 manufactured after week 31, 2016 (date code > 16114).

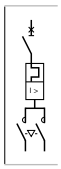
(6) AF ... -11 not suitable for direct control by PLC-output.

1SBC101914S0201 - Rev. D

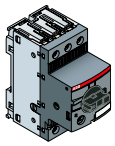
Reversing starters protected by MS manual motor starters

Coordination type 1

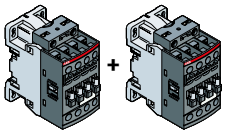
Coordination type 1, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz



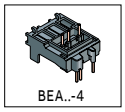
Manual motor starters

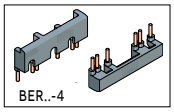


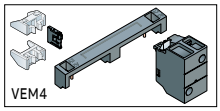
Contactors



Accessories







IEC AC-3, 400 V Rated operational power kW	current A	Type (1)	Order code	Current setting range A	Magnetic tripping current A	Rated control circuit voltage Uc min. ... Uc max. (2) V 50/60 Hz	V DC	Type (3)	Order code	Allowed setting current A	Type	Order code
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	2.44	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.25	BEA16-4	1SBN081306T1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310		+ BER16-4	1SBN081311R1000
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	3.9	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.4	+ VEM4	1SBN030111R1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	11.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	28.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	2.5		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	4		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	6.3		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	9		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	9		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	12		
						100...250	100...250	AF12-30-10-13	1SBL157001R1310			
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	16		
						100...250	100...250	AF16-30-10-13	1SBL177001R1310			
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	25	BEA38-4	1SBN082306T2000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ BER38-4	1SBN082311R1000
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	32	+ VEM4	1SBN030111R1000
						100...250	100...250	AF30-30-00-13	1SBL277001R1300		+ 2x CA4-10	1SBN010110R1010
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60	20...60	AF40-30-00-11	1SBL347001R1100	40	BEA65-4	1SBN083406R1000
						100...250	100...250	AF40-30-00-13	1SBL347001R1300		+ 2x BPR65-4 (4)	1SBN113405R1000
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60	20...60	AF52-30-00-11	1SBL367001R1100	53	+ BER65-4	1SBN083411R1000
						100...250	100...250	AF52-30-00-13	1SBL367001R1300		+ VM96-4	1SBN033405T1000
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60	20...60	AF65-30-00-11	1SBL387001R1100	65	+ 2x CA4-10	1SBN010110R1010
						100...250	100...250	AF65-30-00-13	1SBL387001R1300		+ 2x CA4-01	1SBN010110R1001
37	66	MS495-75	1SAM550000R1008	57.0...75.0	975	24...60	20...60	AF80-30-00-11	1SBL397001R1100	75	BER96-4	1SBN083911R1000
						100...250	100...250	AF80-30-00-13	1SBL397001R1300		+ VM96-4	1SBN033405T1000
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60	20...60	AF96-30-00-11	1SBL407001R1100	90	+ 2x CA4-10	1SBN010110R1010
						100...250	100...250	AF96-30-00-13	1SBL407001R1300		+ 2x CA4-01	1SBN010110R1001

(1) MS116 manual motor starter can be selected according to the current setting range indicated on the coordination line, up to:
- 15 kW, 400 V - AC-3 at 16 kA
- 4 kW, 400 V - AC-3 at 50 kA.

(2) For other control voltages, see "Voltage code table".

(3) AF38 3-pole contactor can be selected for coordination type 1, 16 kA and 50 kA, 18.5 kW, 400 V - AC-3 (BEA65-4 available for AF40 ... AF65 only).

(4) For direct mounting on 2 rails 35 mm of MS165 with AF40 ... AF65: BEA65-4 must be associated with BPR65-4 fixed on each contactor base. Applicable for MS165 manufactured after week 31, 2016 (date code > 16114).

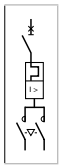
(5) AF ... -11 not suitable for direct control by PLC-output.

1SBC101915S0201 - Rev. C

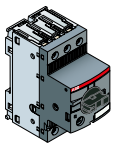
Reversing starters protected by MS manual motor starters

Coordination type 2

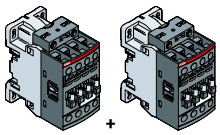
Coordination type 2, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz



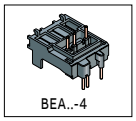
Manual motor starters

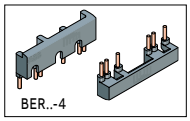


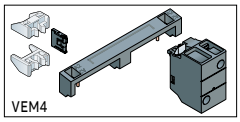
Contactors



Accessories







IEC AC-3, 400 V Rated operational power	current	Type (1)	Order code	Current setting range	Magnetic tripping current	Rated control circuit voltage Uc min. ... Uc max. (2)		Type (3)	Order code	Allowed setting current	Type (4)	Order code
kW	A			A	A	V 50/60 Hz	V DC			A		
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	2.44	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.25	BEA16-4	1SBN081306T1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310		+ BER16-4	1SBN081311R1000
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	3.9	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.4	+ VEM4	1SBN030111R1000
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	6.14	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.63		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	11.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	18.4	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	1.6		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	28.75	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	2.5		
						100...250	100...250	AF09-30-10-13	1SBL137001R1310			
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	4	BEA26-4	1SBN082306T1000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ BER38-4	1SBN082311R1000
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	4	+ VEM4	1SBN030111R1000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ 2x CA4-10	1SBN010110R1010
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	6.3		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	10		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	10		
						100...250	100...250	AF26-30-00-13	1SBL237001R1300			
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	12	BEA38-4	1SBN082306T2000
						100...250	100...250	AF26-30-00-13	1SBL237001R1300		+ BER38-4	1SBN082311R1000
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	16	+ VEM4	1SBN030111R1000
						100...250	100...250	AF30-30-00-13	1SBL277001R1300		+ 2x CA4-10	1SBN010110R1010
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	25		
						100...250	100...250	AF30-30-00-13	1SBL277001R1300			
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	32		
						100...250	100...250	AF30-30-00-13	1SBL277001R1300			
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60	20...60	AF40-30-00-11	1SBL347001R1100	40	BEA65-4	1SBN083406R1000
						100...250	100...250	AF40-30-00-13	1SBL347001R1300		+ 2x BPR65-4 (5)	1SBN113405R1000
												1SBN083411R1000
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60	20...60	AF52-30-00-11	1SBL367001R1100	53	+ BER65-4	1SBN033405T1000
						100...250	100...250	AF52-30-00-13	1SBL367001R1300		+ VM96-4	1SBN010110R1010
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60	20...60	AF65-30-00-11	1SBL387001R1100	65	+ 2x CA4-10	1SBN010110R1001
						100...250	100...250	AF65-30-00-13	1SBL387001R1300		+ 2x CA4-01	
37	66	MS495-75	1SAM550000R1008	57.0...75.0	975	24...60	20...60	AF80-30-00-11	1SBL397001R1100	75	BER96-4	1SBN083911R1000
						100...250	100...250	AF80-30-00-13	1SBL397001R1300		+ VM96-4	1SBN033405T1000
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60	20...60	AF96-30-00-11	1SBL407001R1100	90	+ 2x CA4-10	1SBN010110R1010
						100...250	100...250	AF96-30-00-13	1SBL407001R1300		+ 2x CA4-01	1SBN010110R1001

(1) MS116 manual motor starter can be selected according to the current setting range indicated on the coordination line, up to
- 15 kW 400V - AC-3 at 16 kA
- 4 kW, 400 V - AC-3 at 50 kA.

(2) For other control voltages, see "Voltage code table".

(3) AF26 3-pole contactor can be selected for coordination type 2, 16 kA, 7.5 kW, 400 V - AC-3.
AF38 3-pole contactor can be selected for coordination type 2, 16 kA and 50 kA, 18.5 kW, 400 V - AC-3 (BEA65-4 available for AF40 ... AF65 only).

(4) BEA26-4 should be selected with MS116-12 ... MS116-16 and AF26 ... AF38.
BEA38-4 can only be selected with MS116-20 ... MS116-32.

(5) For direct mounting on 2 rails 35 mm of MS165 with AF40 ... AF65: BEA65-4 must be associated with BPR65-4 fixed on each contactor base. Applicable for MS165 manufactured after week 31, 2016 (date code > 16114).

(6) AF ... -11 not suitable for direct control by PLC-output.

1SBC101916S0201 - Rev. D

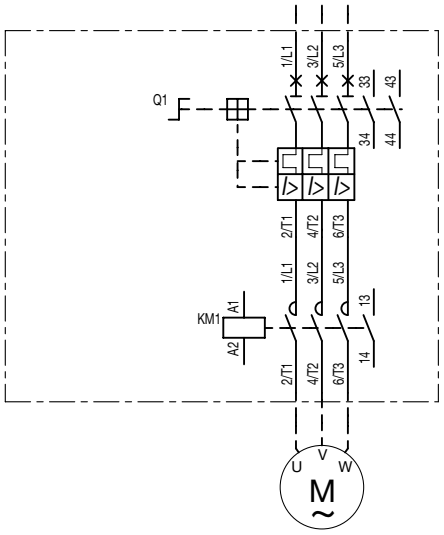
DOL and reversing starters protected by manual motor starters

With AF contactors - open type version in kit form

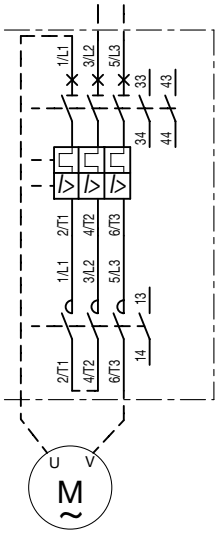
Wiring diagrams

Direct-on-line starters

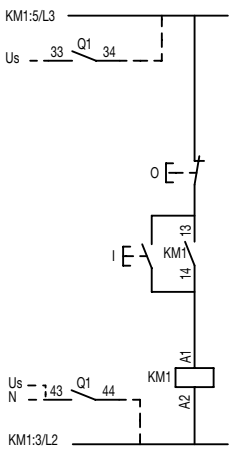
Power circuit



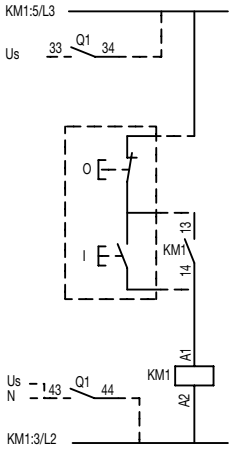
1-phase



AC or DC local control



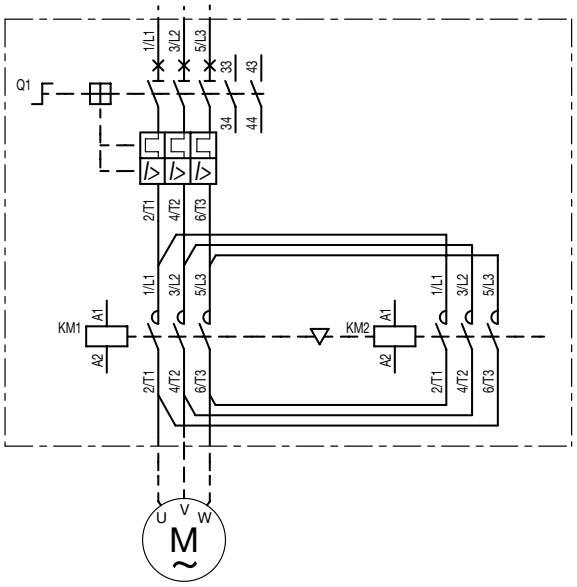
AC or DC remote control



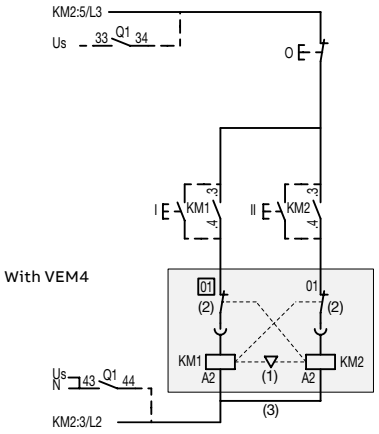
Note: coil Uc 12-20 V DC : A1+, A2-

Reversing starters

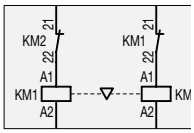
Power circuit



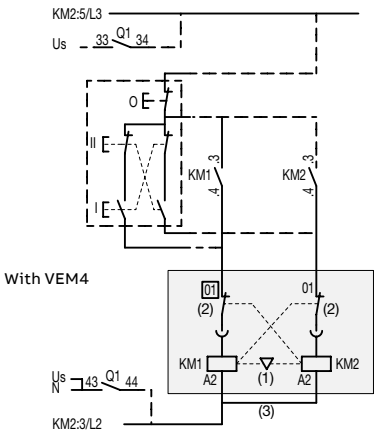
AC or DC local control



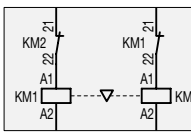
With VM



AC or DC remote control



With VM

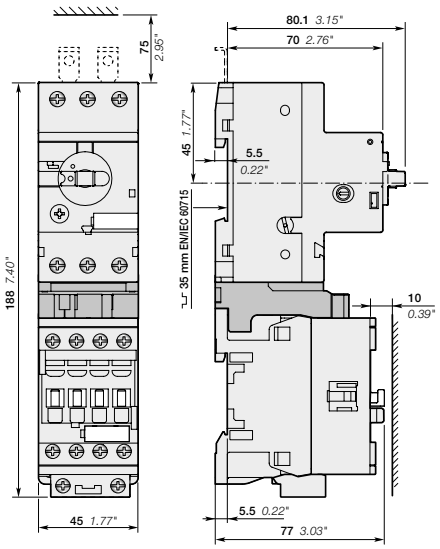


Note: - VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection
(Except for coil Uc 12-20 V DC : use VM4 with CA4).
- coil Uc 12-20 V DC : A1+, A2-

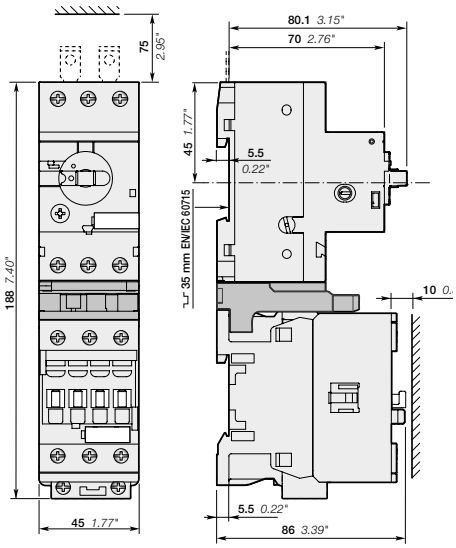
1SBC101918S0201

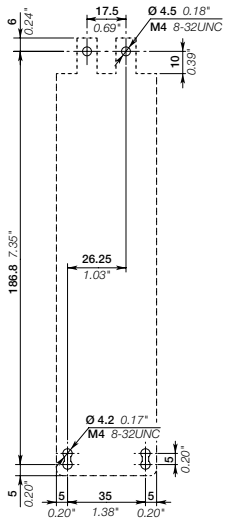
DOL starters protected by MS116 manual motor starters

With AF contactors - open type version in kit form



MS116-0.16 ... MS116-16
+ BEA16-4
+ AF09, AF12, AF16





MS116-0.16 ... MS116-16
+ BEA26-4
+ AF26, AF30, AF38

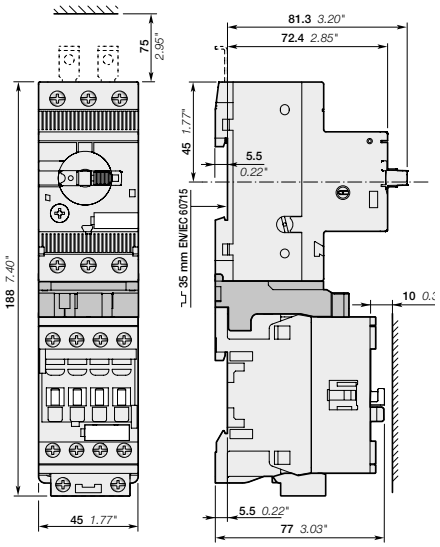
Note: contactor lateral distance to grounded component 2 mm 0.08" min.
Coordination tables for MS166 available is our SOC tool :
https://applications.it.abb.com/SOC/Selectivity

Main dimensions mm, inches

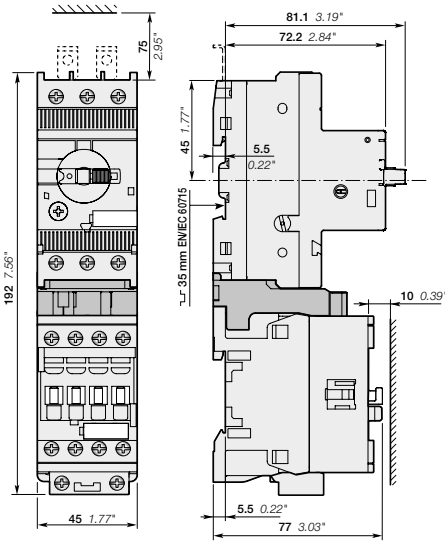
1SBC101919S0201

DOL starters protected by MS132 manual motor starters

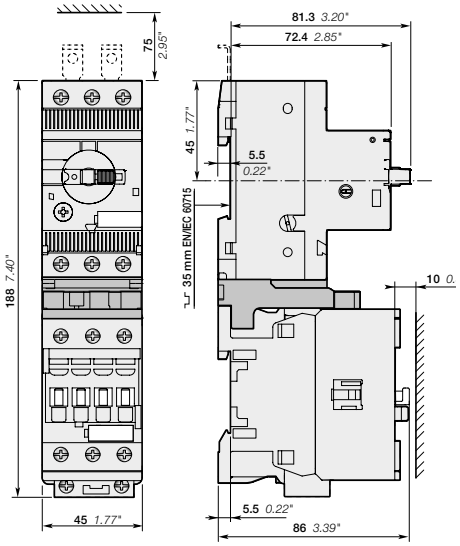
With AF contactors - open type version in kit form



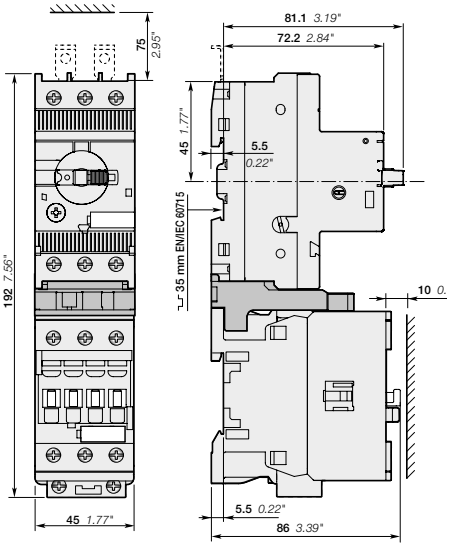
MS132-0.16 ... MS132-10
+ BEA16-4
+ AF09, AF12, AF16



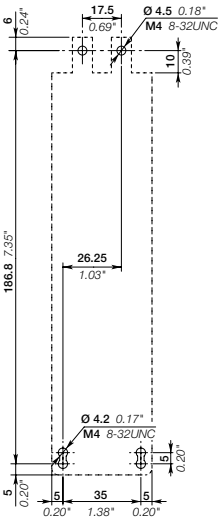
MS132-12 ... MS132-25
+ BEA16-4
+ AF09, AF12, AF16



MS132-0.16 ... MS132-10
+ BEA26-4
+ AF26, AF30, AF38



MS132-12 ... MS132-32
+ BEA38-4
+ AF26, AF30, AF38



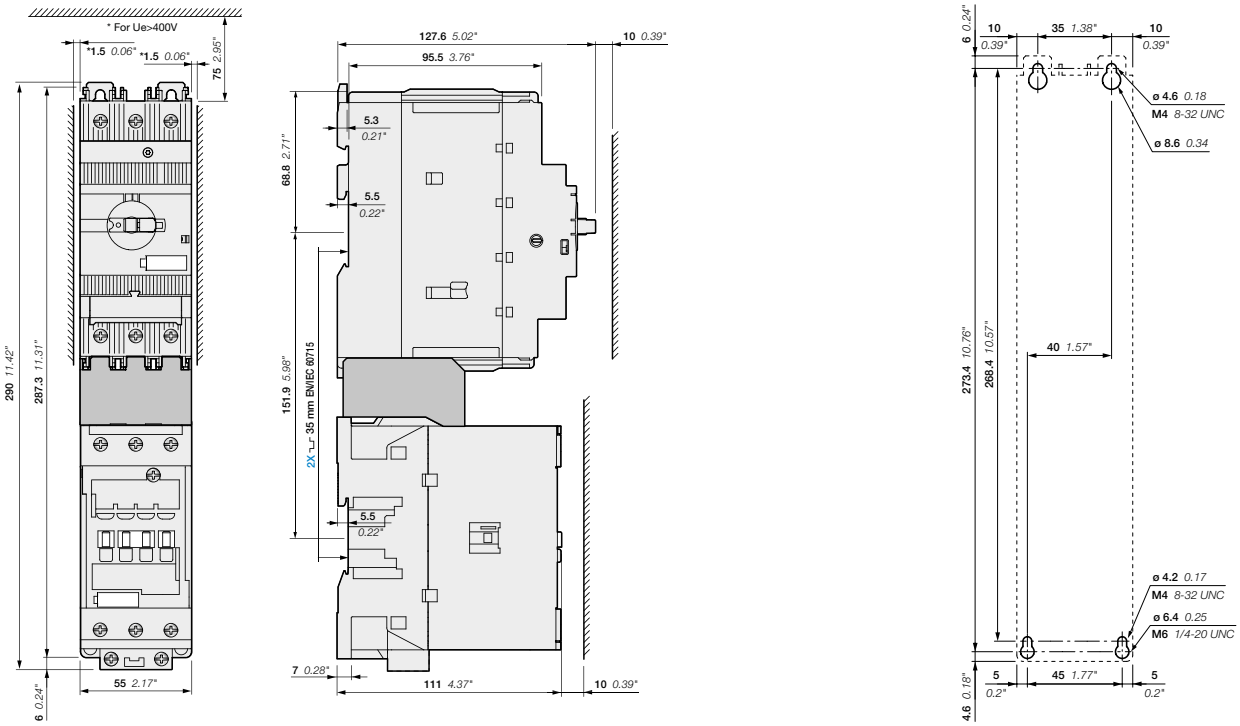
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

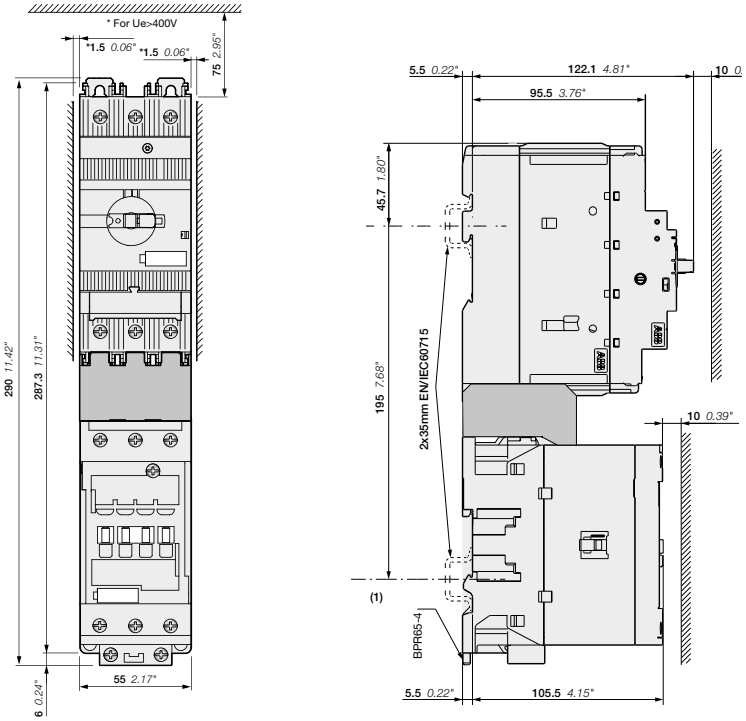
1SBC101923S0201 - Rev. A

DOL starters protected by MS165 manual motor starters

With AF contactors - open type version in kit form



MS165
+ BEA65-4
+ AF40, AF52, AF65



MS165
+ BEA65-4
+ AF40, AF52, AF65 + BPR65-4

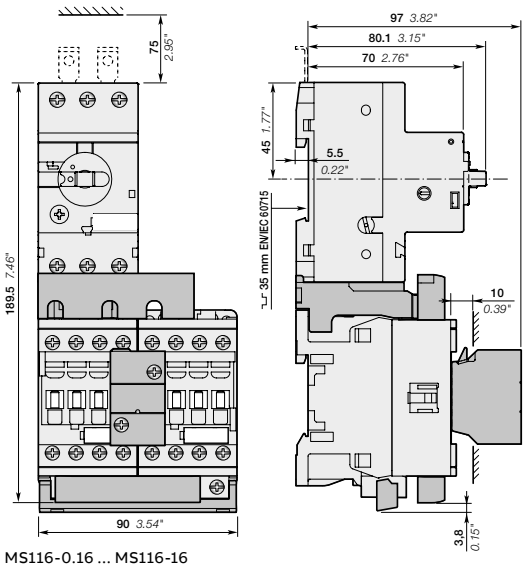
Note: for Ue > 400 V, contactor lateral distance to grounded component 1.5 mm 0.06" min.
(1) Assembly on fixed DIN Rails for DOL starter with BPR65-4 rail hook

Main dimensions mm, inches

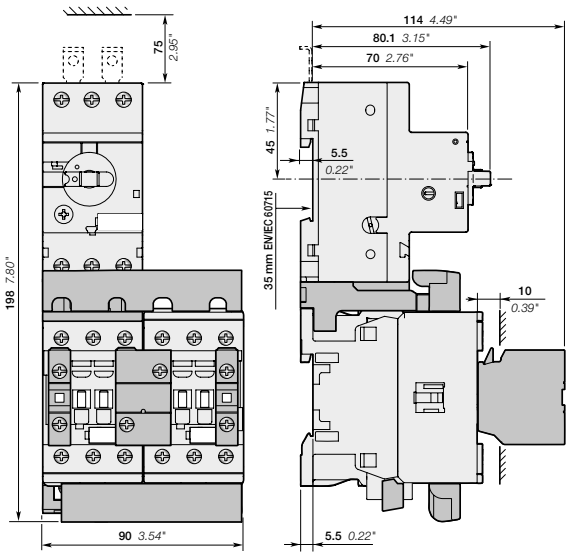
1SBC100088S0201 - Rev. B

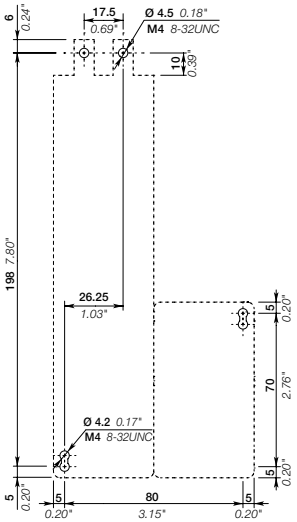
Reversing starters protected by MS116 manual motor starters

With AF contactors - open type version in kit form



MS116-0.16 ... MS116-16
+ BEA16-4, BER16-4, VEM4
+ AF09, AF12, AF16





MS116-0.16 ... MS116-16
+ BEA26-4, BER38-4, VEM4, CA4-10
+ AF26, AF30, AF38

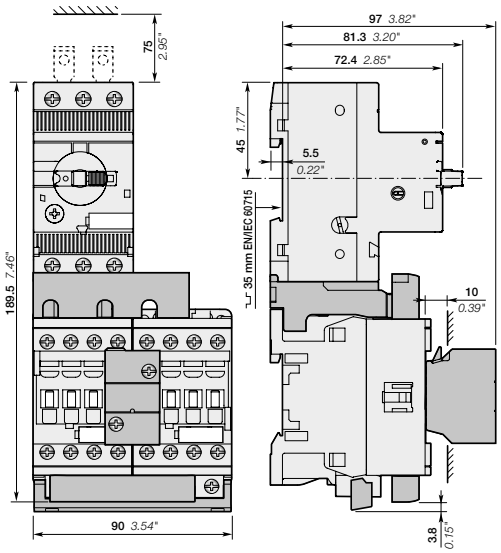
Note: contactor lateral distance to grounded component 2 mm 0.08" min.
Coordination tables for MS166 available is our SOC tool :
https://applications.it.abb.com/SOC/Selectivity

Main dimensions mm, inches

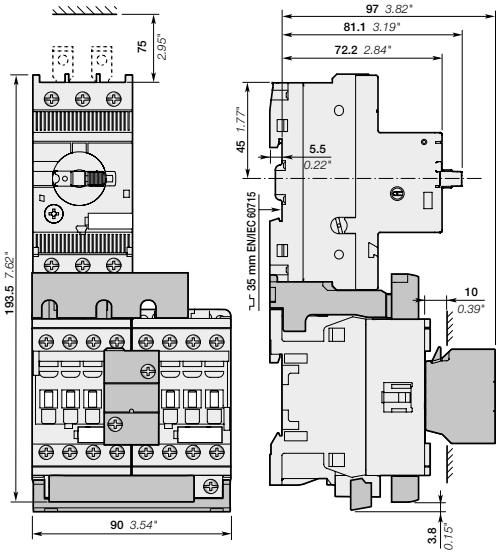
1SBC101924S0201

Reversing starters protected by MS132 manual motor starters

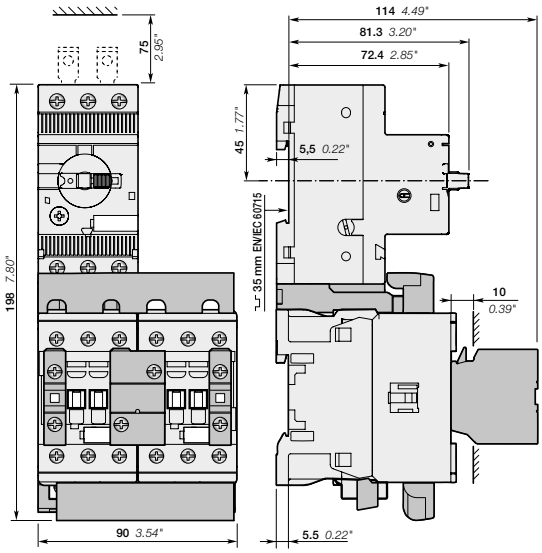
With AF contactors - open type version in kit form



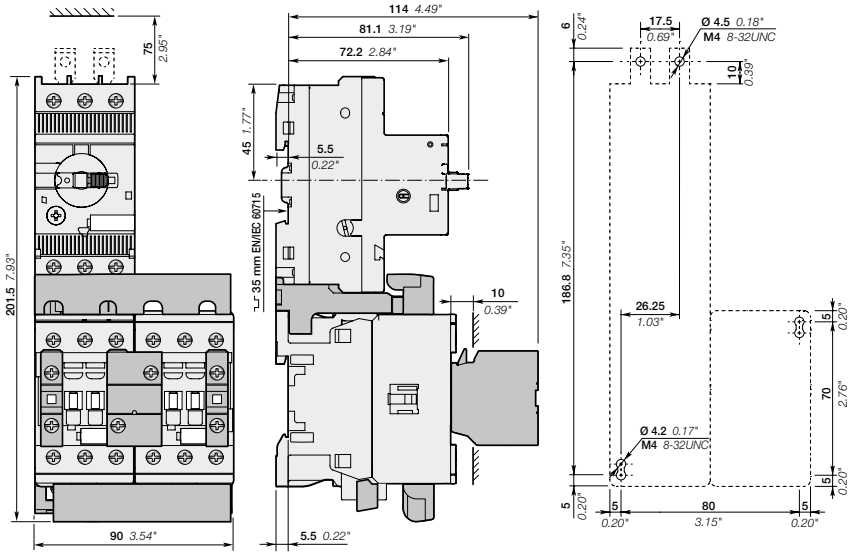
MS132-0.16 ... MS132-10
+ BEA16-4, BER16-4, VEM4
+ AF09, AF12, AF16



MS132-12 ... MS132-25
+ BEA16-4, BER16-4, VEM4
+ AF09, AF12, AF16



MS132-0.16 ... MS132-10
+ BEA26-4, BER38-4, VEM4, CA4-10
+ AF26, AF30, AF38



MS132-12 ... MS132-32
+ BEA38-4, BER38-4, VEM4, CA4-10
+ AF26, AF30, AF38

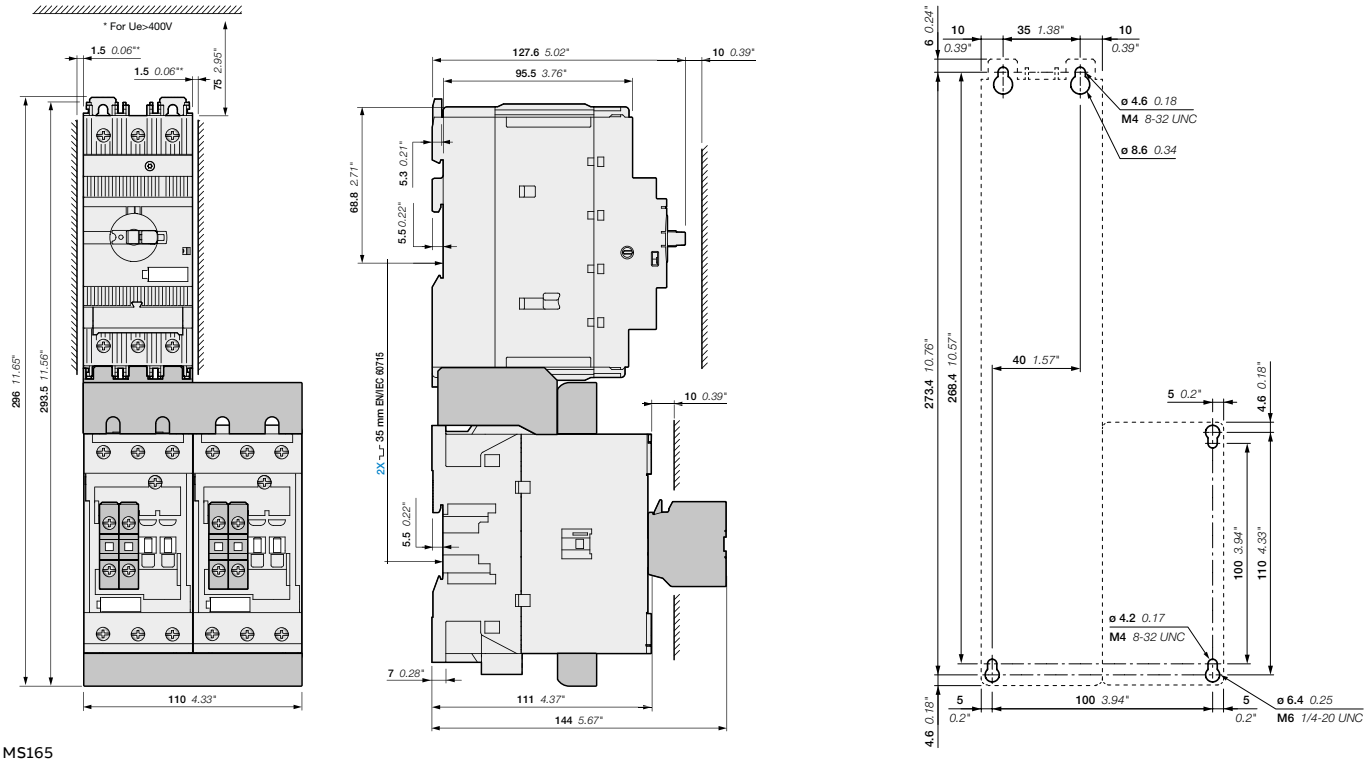
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

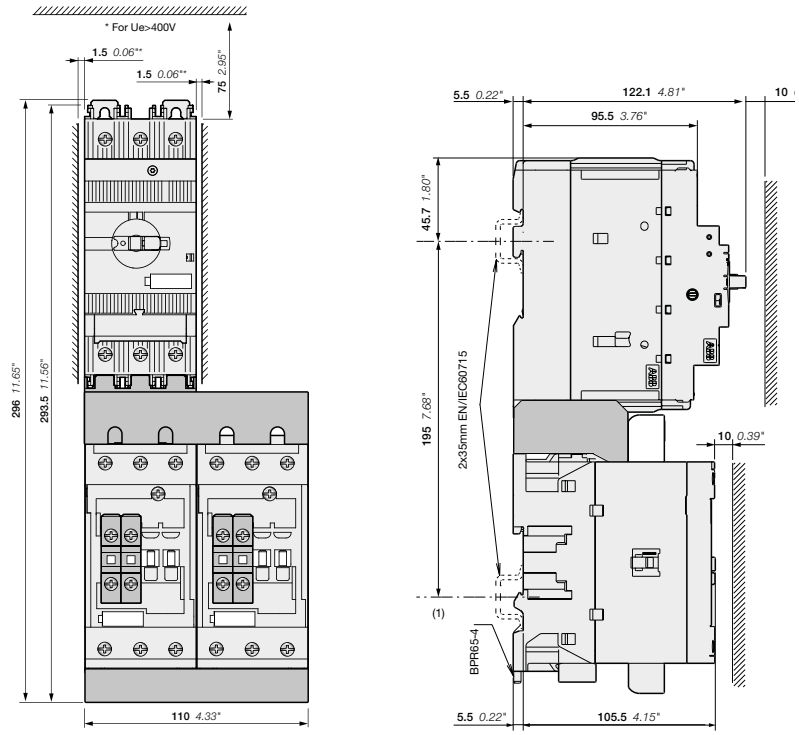
1SBC101925S0201

Reversing starters protected by MS165 manual motor starters

With AF contactors - open type version in kit form



MS165
+ BEA65-4, BER65-4, VM96-4
+ AF40, AF52, AF65



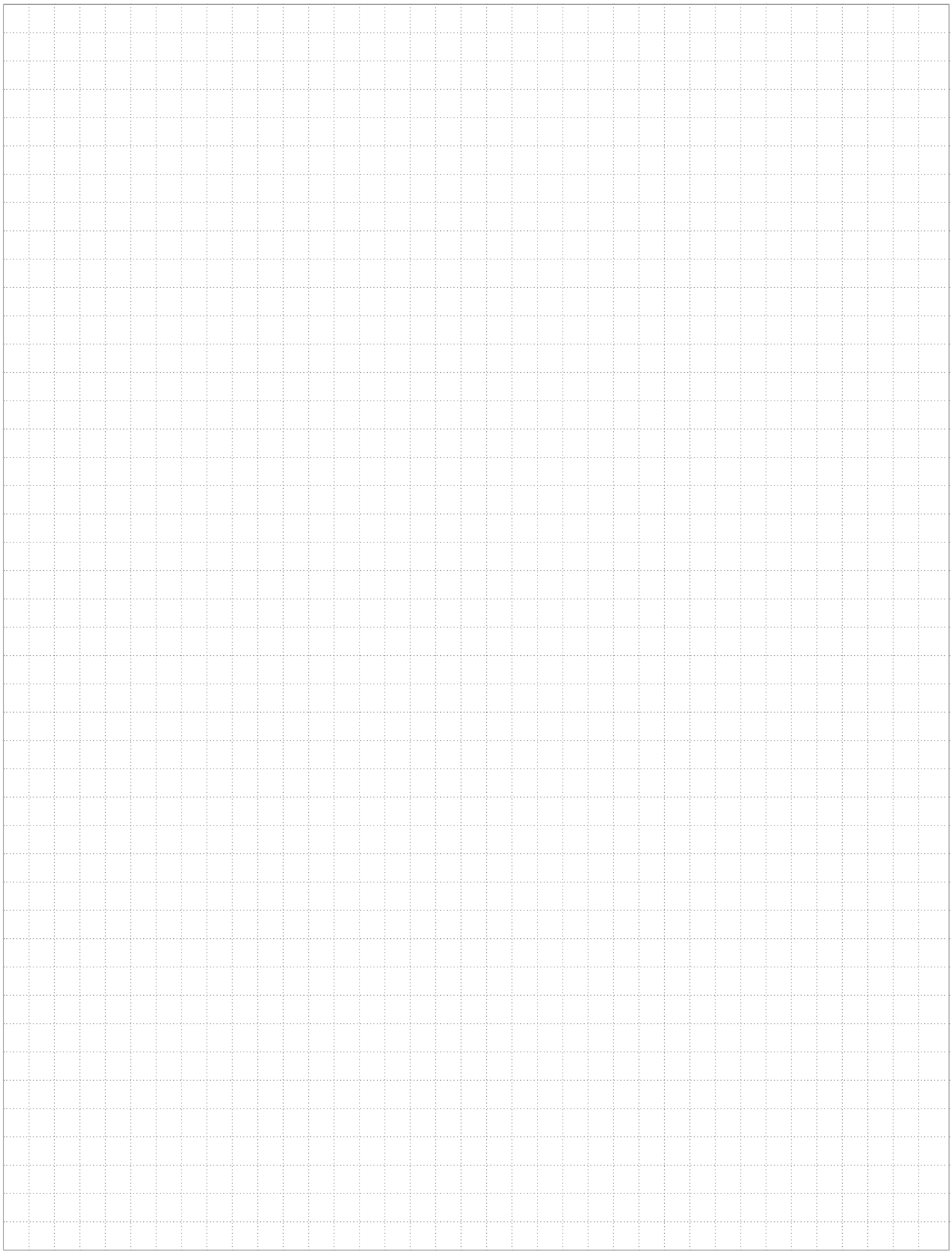
MS165
+ BEA65-4,
+ AF40, AF52, AF65 + 2x BPR65-4

Note: for Ue > 400 V, contactor lateral distance to grounded component 1.5 mm 0.06" min.
(1): Assembly on fixed DIN Rails for reverser starter with BPR65-4 rail hook

Main dimensions mm, inches

1SBC100091S0201 - Rev. A

Notes



DOL starters protected by moulded-case circuit-breakers and overload relays

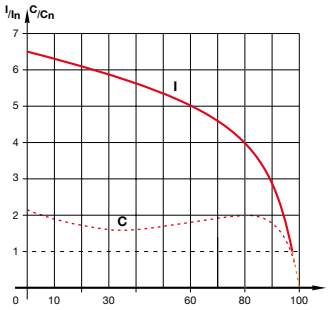
With AF contactors - open type version in kit form

XT2S 160 + BEA140/XT2 + AF140-30-11

XT2S 160 + BEA140/XT2 + AF140-30-11 + EF146

Application

Full voltage direct-on-line (DOL) starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



I = current
C = torque
In = nominal current
Cn = nominal torque

Coordination types

The contactor and the moulded-case circuit-breaker control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1/ EN 60947-4-1) defining the anticipated level of service continuity as follow:

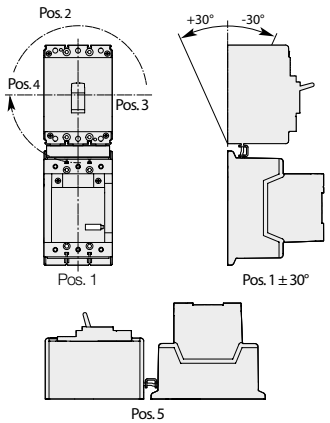
Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

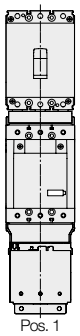
Main Technical Data

Standards	**IEC 60947-4-1 / EN 60947-4-1**
Rated operational voltage Ue max.	400 V - 50/60 Hz
Rated insulation voltage Ui	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Switching frequency	≤ 15 starts/hour - 80 % max. load factor - with max. 1.5 s starting time ≤ 30 starts/hour - 50 % max. load factor - with max. 1.5 s starting time
Ambient air temperature	
Close to the device	< 55 °C
Degree of protection	IP20

Mounting positions



Direct-on-line
MCCB + AF



Direct-on-line
MCCB + AF + OL

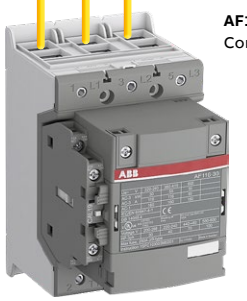
1SBC101973S0201

DOL starters protected by moulded-case circuit-breakers and overload relays

With AF contactors - open type version in kit form

MCCB
Moulded-case circuit-breaker including motor protection

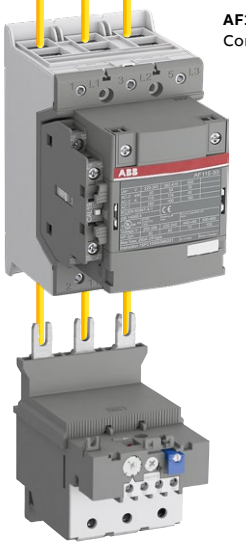
BEA
Connection bar



AF116 ... AF370
Contactor

MCCB
Moulded-case circuit-breaker (magnetic only)

BEA
Connection bar



AF116 ... AF370
Contactor

TF
Thermal overload relay
EF
Electronic overload relay

You can easily assemble a direct-on-line starter by using the BEA connection bars. It is used to electrically connect MCCB moulded-case circuit-breaker and AF116 ... AF370 contactor, AC or DC operated.

Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50/60 Hz, Iq = 50 kA up to 200 kW.

For the full coordination tables, please visit our SOC tool : **https://applications.it.abb.com/SOC/Selectivity**

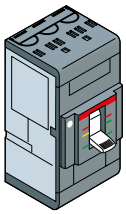
1SBC101973S0201

DOL starters protected by MCCB including motor protection

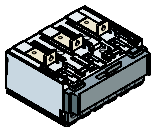
Coordination type 1 or 2

Coordination type 1 or 2, AC-3, 50 kA, 400 V, 50/60 Hz

MCCB

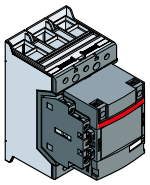


+



IEC		Magnetic triping current setting	Max. allowed thermal setting	Base			Trip unit	
AC-3, 400 V				Type	Order code		Type	Order code
Rated power kW	Rated current A	A						
55	97	1440	116	XT2S 160	1SDA068164R1	+	Ekip M-LIU In160	1SDA067355R1
75	132	1920	140	XT2S 160	1SDA068164R1	+	Ekip M-LIU In160	1SDA067355R1
90	160	2400	190	T4S 250 PR222MP In200	1SDA054527R1		Included	-
110	195	2880	205	T5S 400 PR222MP In320	1SDA054553R1		Included	-
132	230	3600	265	T5S 400 PR222MP In400	1SDA054554R1		Included	-
160	280	4400	305	T5S 400 PR222MP In400	1SDA054554R1		Included	-

Contactors



Connection bars

Control voltage Uc min. ... Uc max.		Type	Order code	Type	Order code
V 50/60 Hz	V DC				
24...60	20...60	AF116-30-11-11	1SFL427001R1111	BEA140/XT2	1SFN084206R1000
100...250	100...250	AF116-30-11-13	1SFL427001R1311		
24...60	20...60	AF140-30-11-11	1SFL447001R1111		
100...250	100...250	AF140-30-11-13	1SFL447001R1311		
24...60	20...60	AF190-30-11-11	1SFL487002R1111	BEA205/T4	1SFN084806R1001
100...250	100...250	AF190-30-11-13	1SFL487002R1311		
24...60	20...60	AF205-30-11-11	1SFL527002R1111		
100...250	100...250	AF205-30-11-13	1SFL527002R1311		
24...60	20...60	AF265-30-11-11	1SFL547002R1111	BEA370/T5	1SFN085406R1000
100...250	100...250	AF265-30-11-13	1SFL547002R1311		
24...60	20...60	AF305-30-11-11	1SFL587002R1111		
100...250	100...250	AF305-30-11-13	1SFL587002R1311		

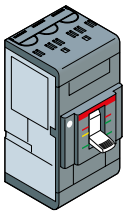
1SBC101975S0201

DOL starters protected by MCCB (magnetic only) and overload relays

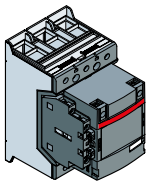
Coordination type 1 or 2

Coordination type 1 or 2, AC-3, 50 kA, 400 V, 50/60 Hz

MCCB



Contactors

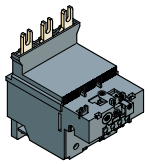
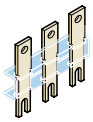


Thermal overload relays

IEC AC-3, 400 V Rated power kW	Rated current A	Magnetic triping current A	Type	Order code	Control voltage Uc min. ... Uc max. V 50/60 Hz	V DC	Type	Order code
55	97	1600	XT2S 160 MA 160	1SDA076530R1	24...60	20...60	AF116-30-11-11	1SFL427001R1111
					100...250	100...250	AF116-30-11-13	1SFL427001R1311
75	132	1920	XT2S 160 MA 160	1SDA076530R1	24...60	20...60	AF140-30-11-11	1SFL447001R1111
					100...250	100...250	AF140-30-11-13	1SFL447001R1311
90	160	2250	XT4S 250 Ekip I In250	1SDA068480R1	24...60	20...60	AF190-30-11-11	1SFL487002R1111
					100...250	100...250	AF190-30-11-13	1SFL487002R1311
110	195	2720	T4S 320 PR221-I In320	1SDA054126R1	24...60	20...60	AF205-30-11-11	1SFL527002R1111
					100...250	100...250	AF205-30-11-13	1SFL527002R1311

Electronic overload relays

55	97	1600	XT2S 160 MA 160	1SDA076530R1	24...60	20...60	AF116-30-11-11	1SFL427001R1111
					100...250	100...250	AF116-30-11-13	1SFL427001R1311
75	132	1920	XT2S 160 MA 160	1SDA076530R1	24...60	20...60	AF140-30-11-11	1SFL447001R1111
					100...250	100...250	AF140-30-11-13	1SFL447001R1311
90	160	2250	XT4S 250 Ekip I In250	1SDA068480R1	24...60	20...60	AF190-30-11-11	1SFL487002R1111
					100...250	100...250	AF190-30-11-13	1SFL487002R1311
110	195	2720	T4S 320 PR221-I In320	1SDA054126R1	24...60	20...60	AF205-30-11-11	1SFL527002R1111
					100...250	100...250	AF205-30-11-13	1SFL527002R1311
132	230	3200	T5S 400 PR221-I In400	1SDA054335R1	24...60	20...60	AF265-30-11-11	1SFL547002R1111
					100...250	100...250	AF265-30-11-13	1SFL547002R1311
160	280	4000	T5S 400 PR221-I In400	1SDA054335R1	24...60	20...60	AF305-30-11-11	1SFL587002R1111
					100...250	100...250	AF305-30-11-13	1SFL587002R1311
200	350	5040	T5S 630 PR221-I In630	1SDA054405R1	24...60	20...60	AF370-30-11-11	1SFL607002R1111
					100...250	100...250	AF370-30-11-13	1SFL607002R1311

	Overload relays				**Connection bars**	
						
	Setting ranges A	**Max. allowed setting current** A	**Type**	**Order code**	**Type**	**Order code**
	80...110	110	TF140DU-110	1SAZ431201R1002	BEA140/XT2	1SFN084206R1000
	110...142	140	TF140DU-142	1SAZ431201R1004		
	130...175	175	TA200DU-175	1SAZ421201R1005	BEA205/XT4	1SFN084806R1000
	155...200	200	TA200DU-200	1SAZ421201R1006	BEA205/T4	1SFN084806R1001
	54...150	116	EF146-150	1SAX351001R1101	BEA140/XT2	1SFN084206R1000
	54...150	140	EF146-150	1SAX351001R1101		
	63...210	190	EF205-210	1SAX531001R1101	BEA205/XT4	1SFN084806R1000
	63...210	205	EF205-210	1SAX531001R1101	BEA205/T4	1SFN084806R1001
	115...380	265	EF370-380	1SAX611001R1101	BEA370/T5	1SFN085406R1000
	115...380	305	EF370-380	1SAX611001R1101		
	115...380	350	EF370-380	1SAX611001R1101		

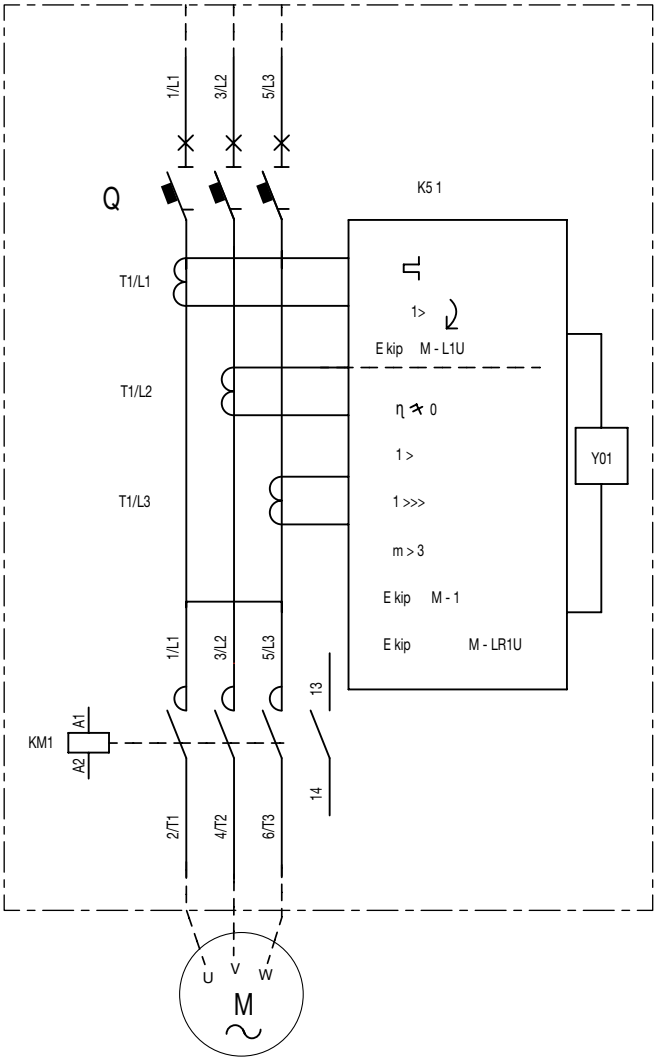
1SBC101974S0201

DOL starters protected by moulded-case circuit-breakers and overload relays

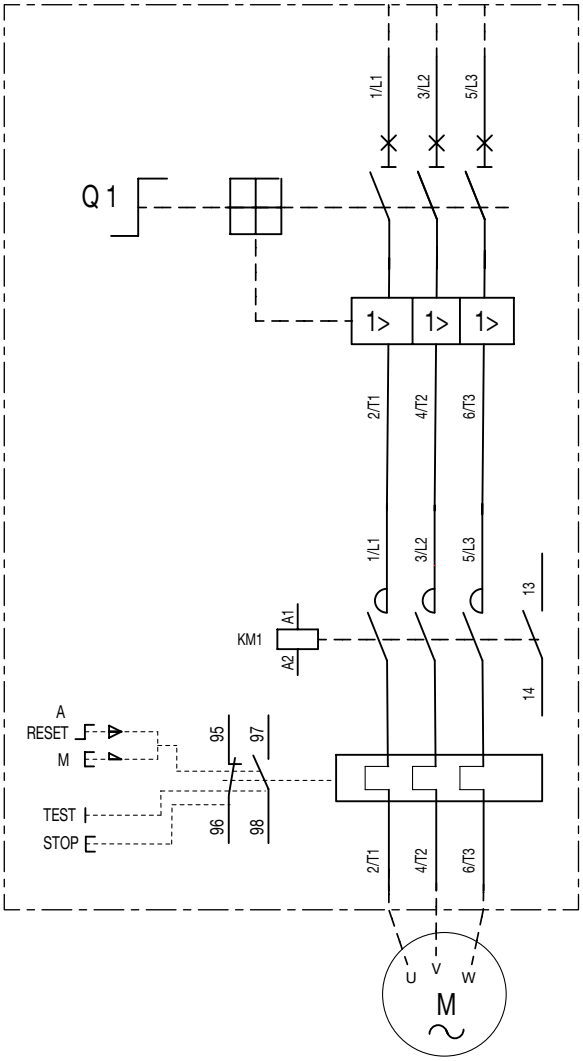
With AF contactors - Open type version in kit form

Direct-on-line starters

Protected by MCCB including motor protection



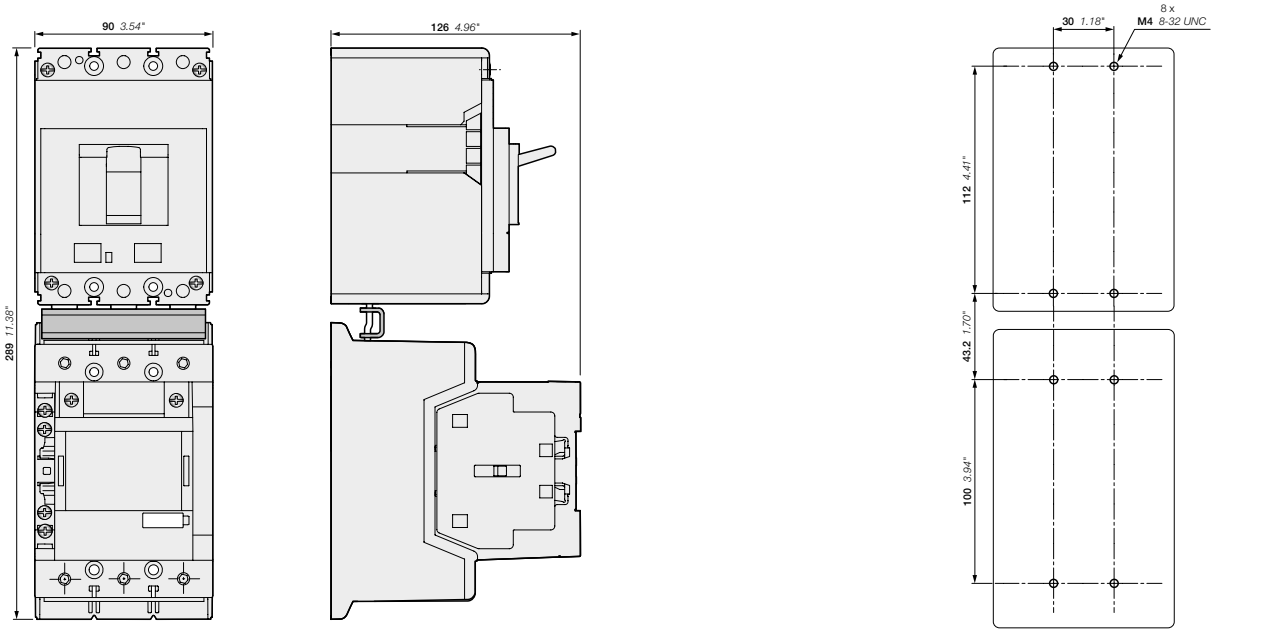
Protected by MCCB (magnetic only) and overload relays



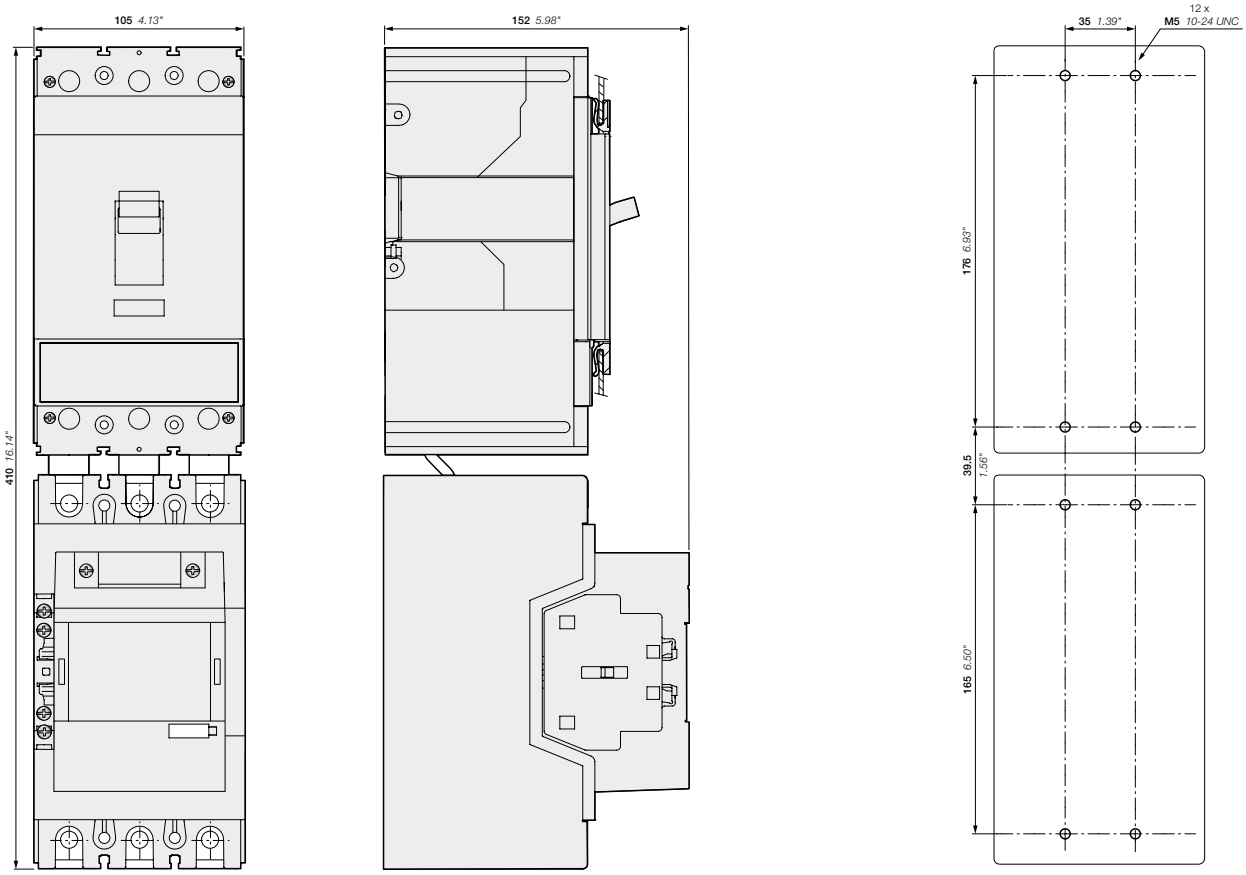
1SBC101976S0201

DOL starters protected by MCCB, including motor protection

With AF contactors - Open type version in kit form



XT2S 160 + Ekip M-LIU In160
+ BEA140/XT2
+ AF116, AF140, AF146



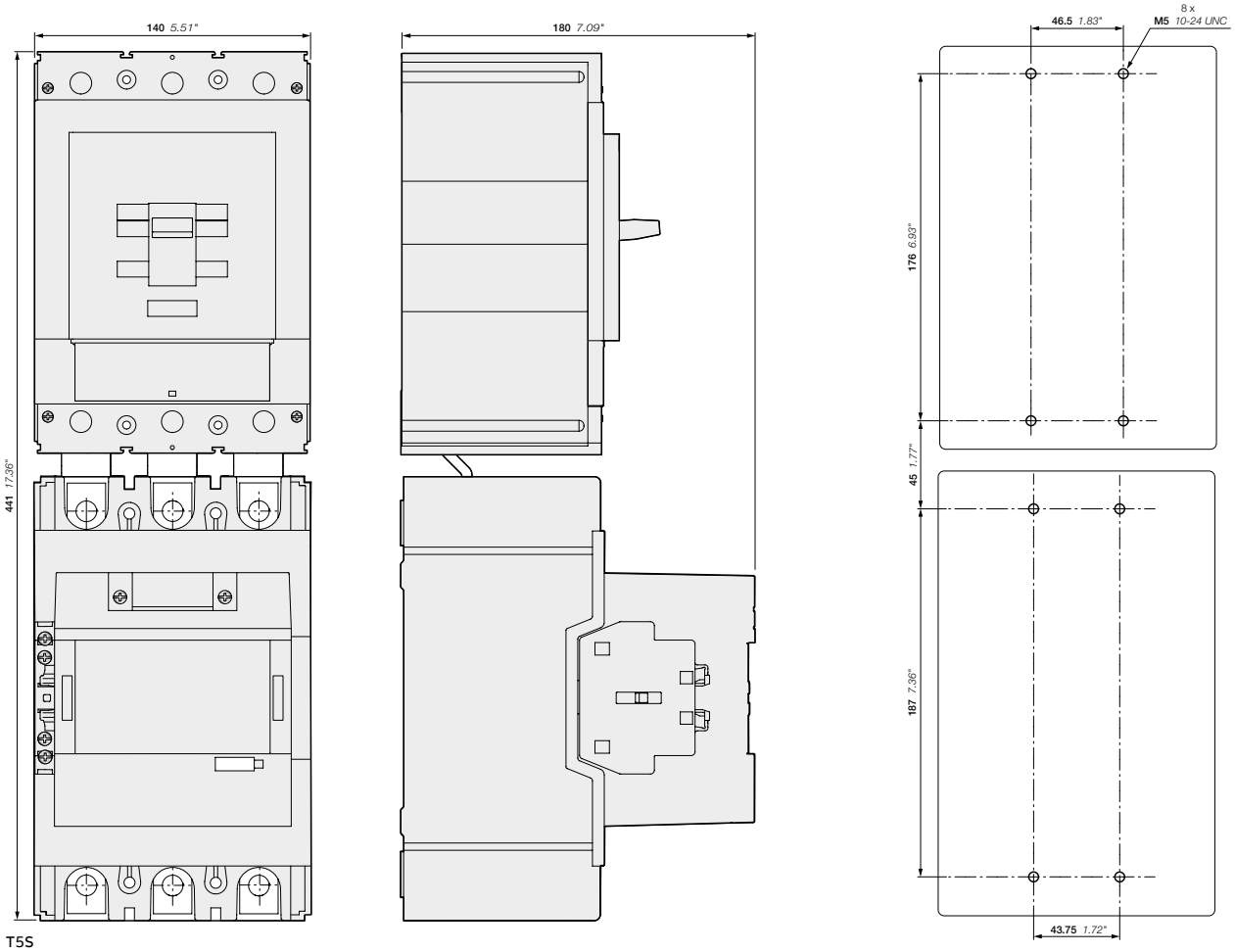
T4S
+ BEA205/T4
+ AF190, AF205

Main dimensions mm, inches

1SFC101187C0201

DOL starters protected by MCCB, including motor protection

With AF contactors - Open type version in kit form



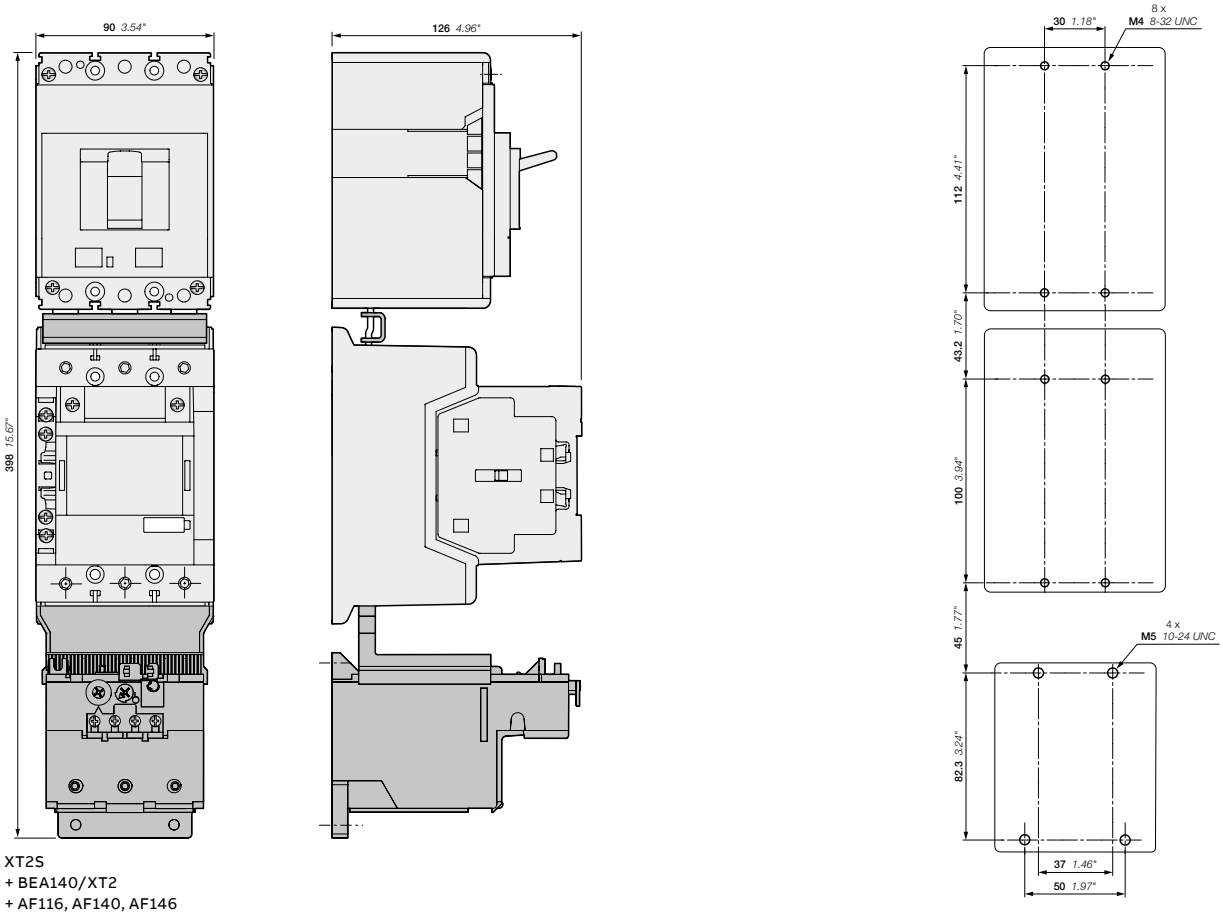
T5S
+ BEA370/T5
+ AF265, AF305, AF370

Main dimensions mm, inches

1SFC101188C0201

DOL starters protected by MCCB (magnetic only) and thermal overload relays

With AF contactors - Open type version in kit form



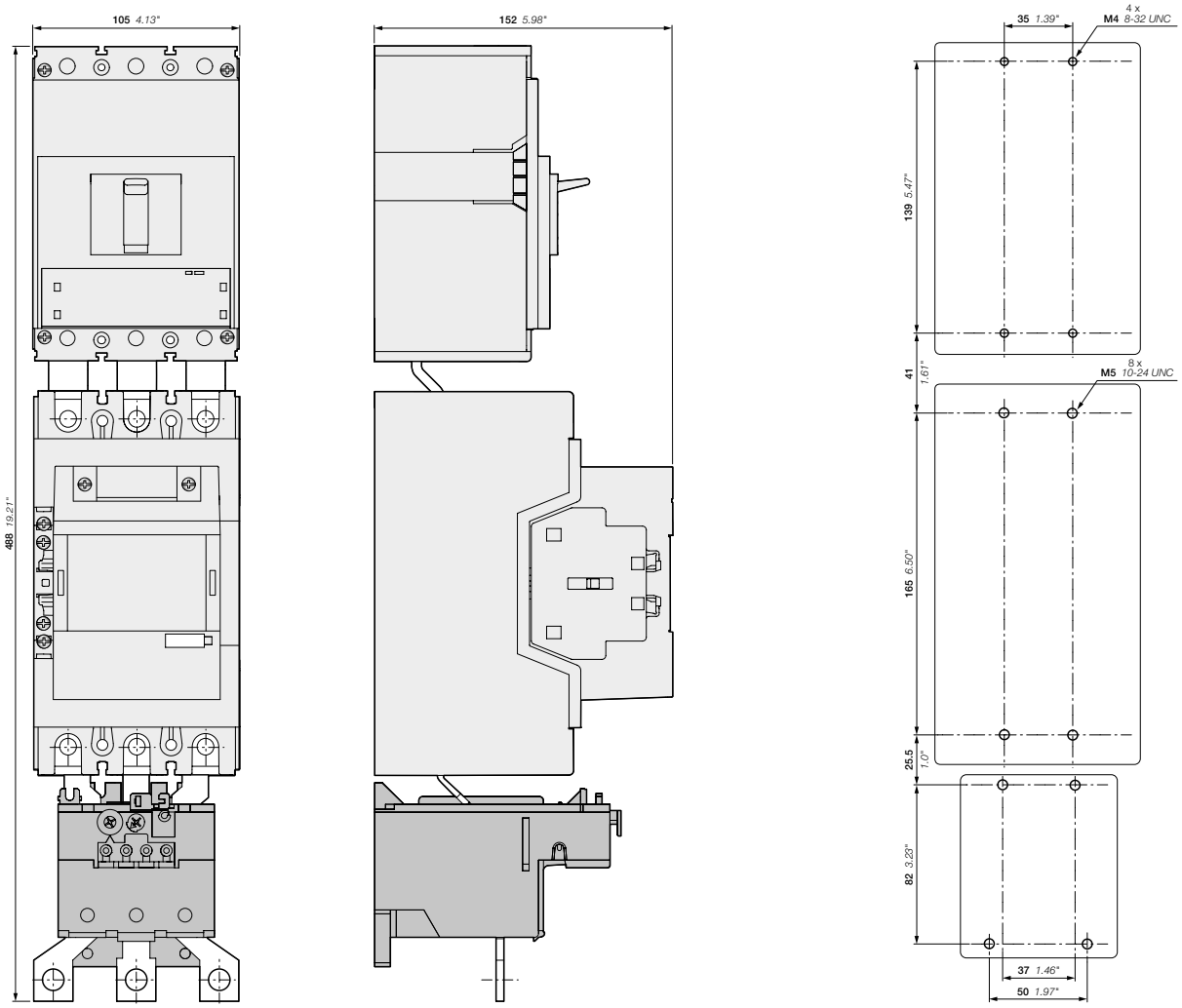
XT2S
+ BEA140/XT2
+ AF116, AF140, AF146
+ TF140 thermal overload relay

Main dimensions mm, inches

1SFC101189C0201

DOL starters protected by MCCB (magnetic only) and thermal overload relays

With AF contactors - Open type version in kit form

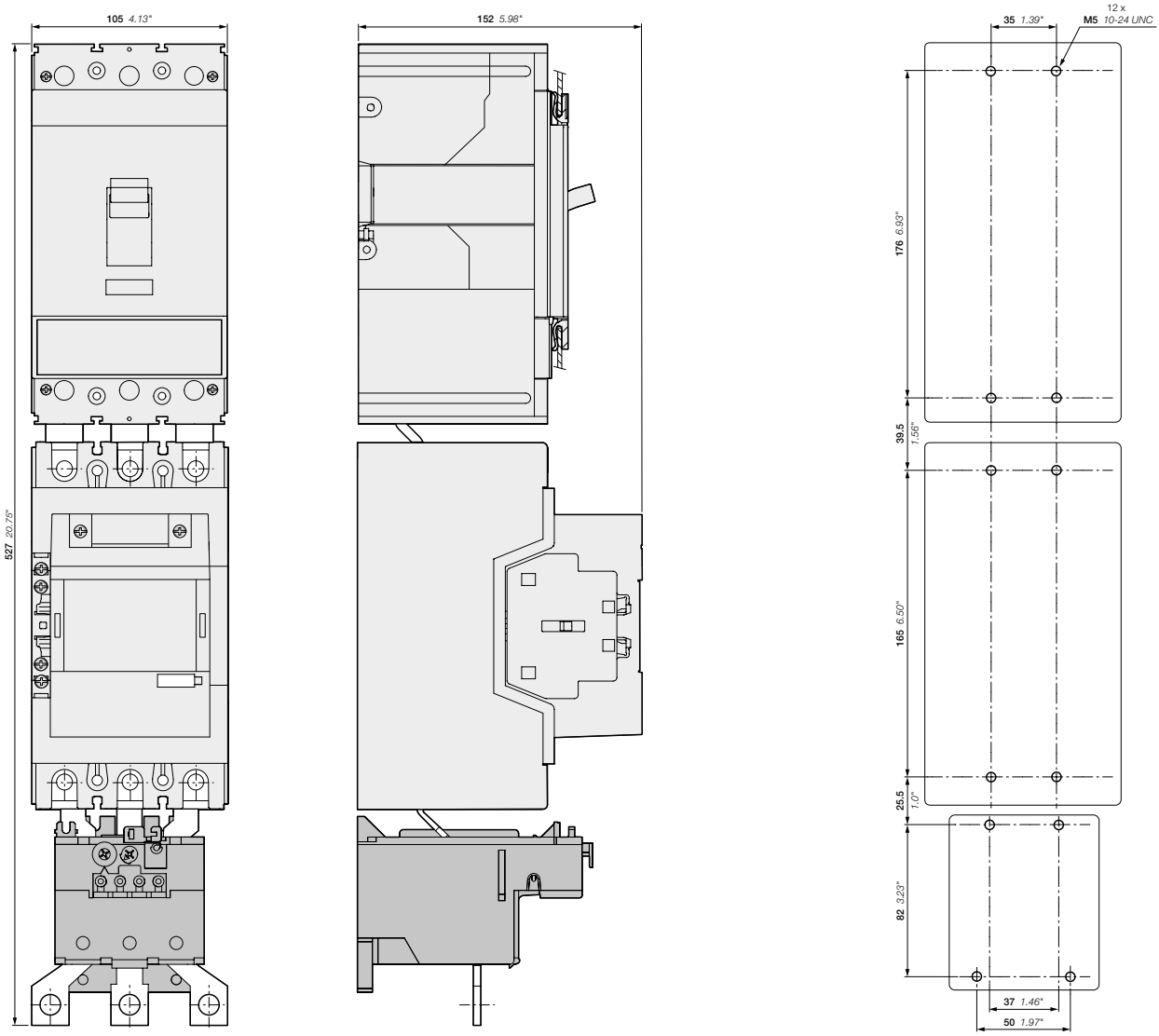


XT4S
+ BEA205/XT4
+ AF190, AF205
+ TA200DU thermal overload relay

Main dimensions mm, inches

DOL starters protected by MCCB (magnetic only) and thermal overload relays

With AF contactors - Open type version in kit form



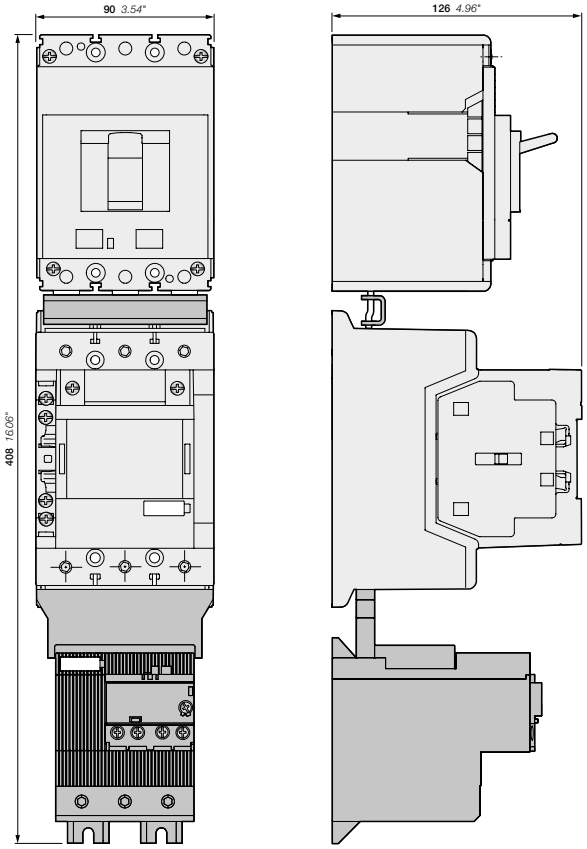
T4S
+ BEA205/T4
+ AF190, AF205
+ TA200DU thermal overload relay

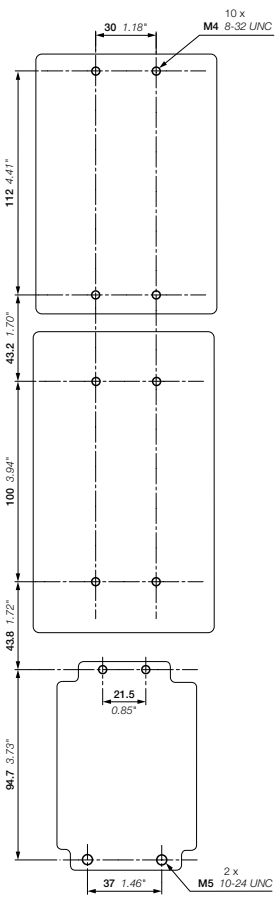
Main dimensions mm, inches

1SFC10119C0201

DOL starters protected by MCCB (magnetic only) and electronic overload relays

With AF contactors - Open type version in kit form





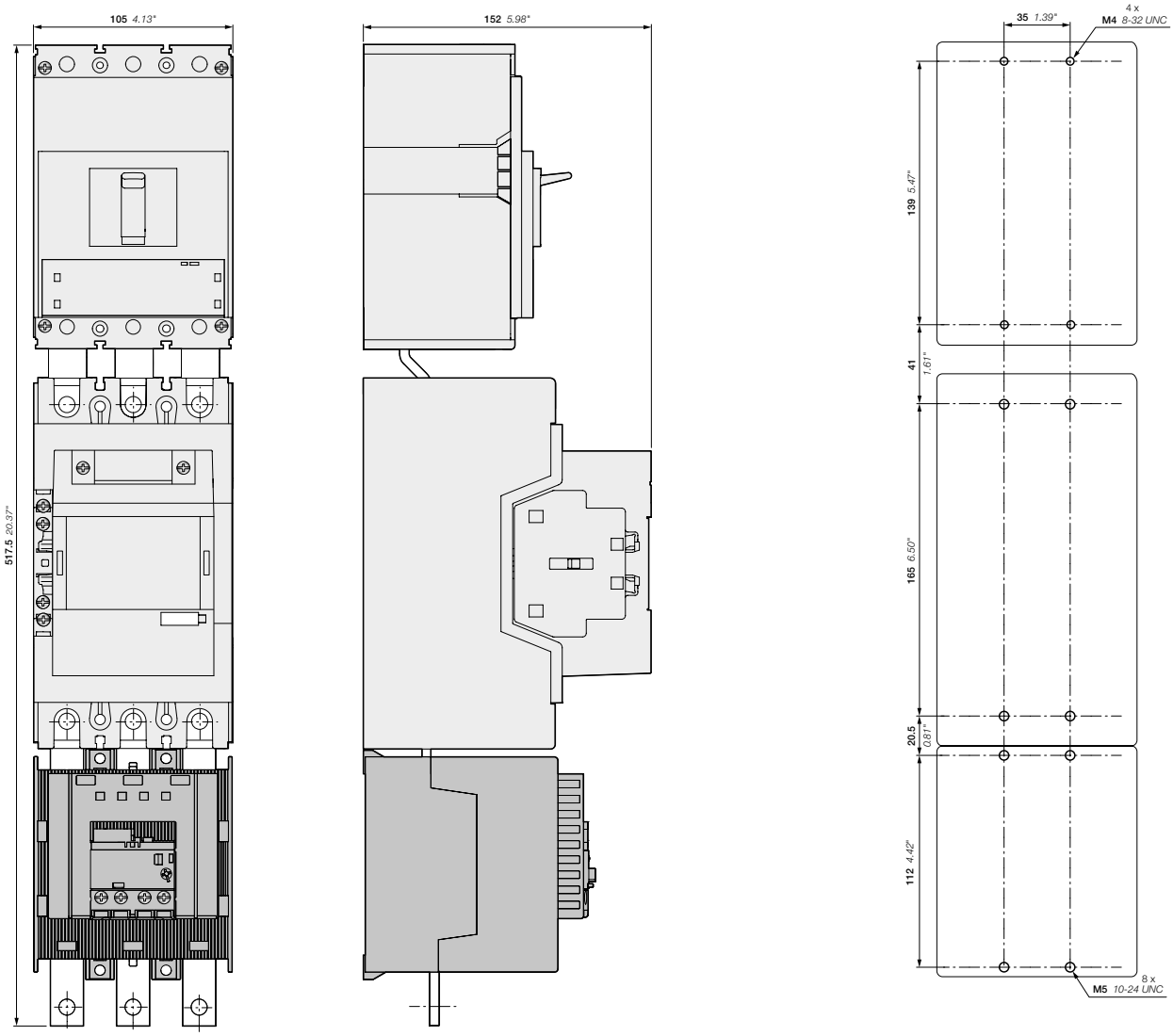
XT2S
+ BEA140/XT2
+ AF116, AF140, AF146
+ EF146 electronic overload relay

Main dimensions mm, inches

1SFC101192C0201

DOL starters protected by MCCB (magnetic only) and electronic overload relays

With AF contactors - Open type version in kit form



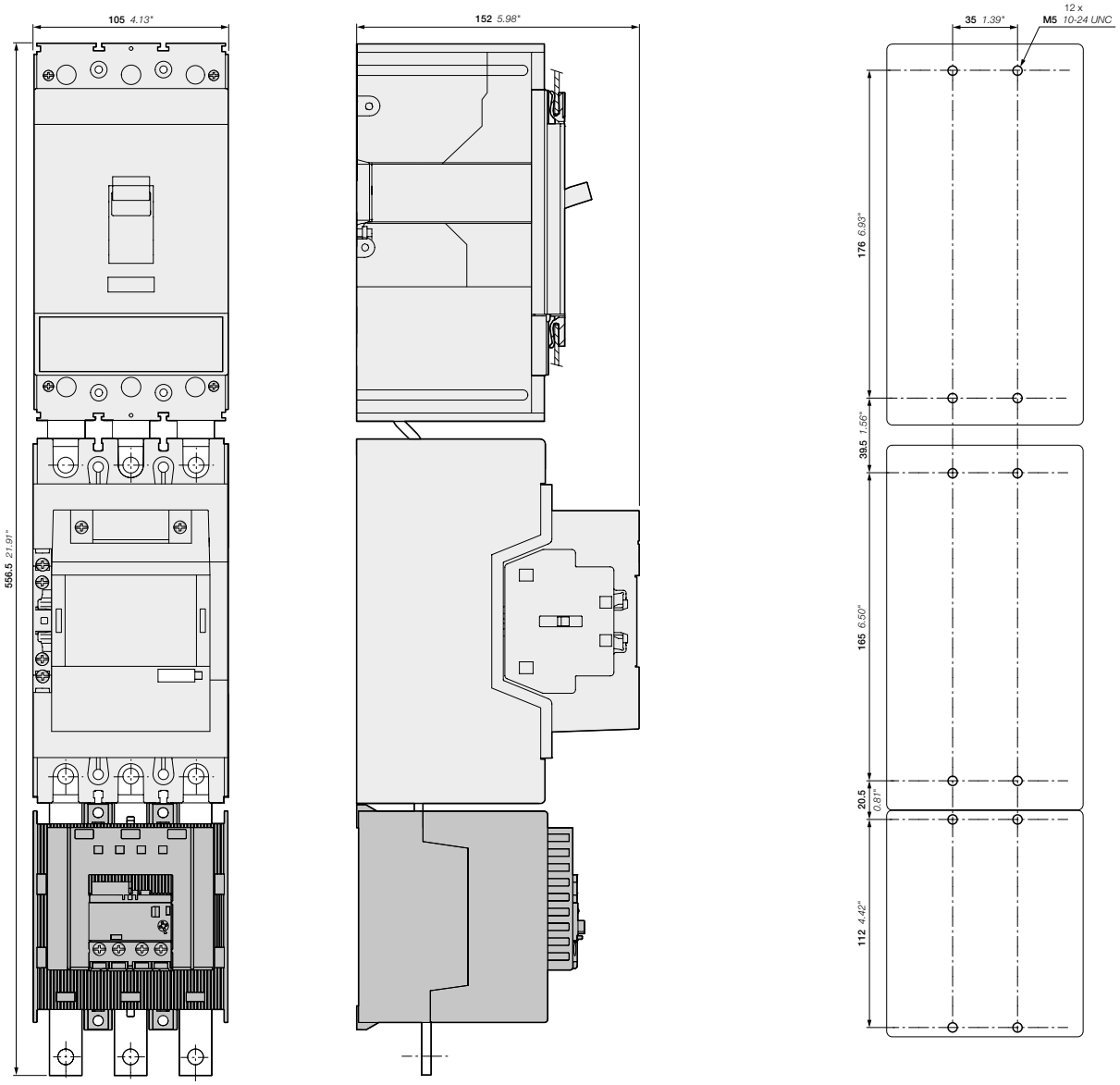
XT4S
+ BEA205/XT4
+ AF190, AF205
+ EF205 electronic overload relay

Main dimensions mm, inches

1SFC101193C0201

DOL starters protected by MCCB (magnetic only) and electronic overload relays

With AF contactors - Open type version in kit form



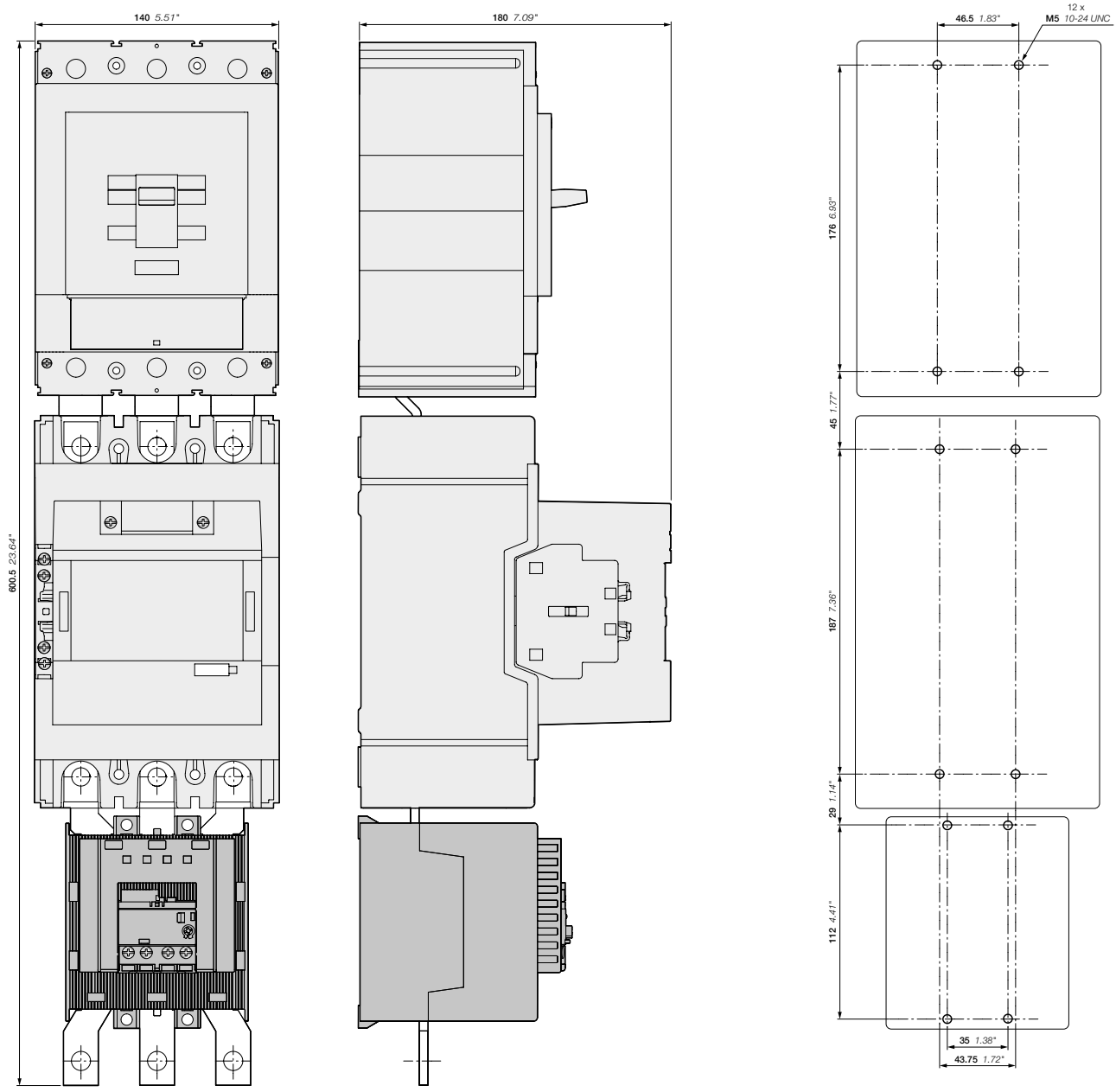
T4S
+ BEA205/T4
+ AF190, AF205
+ EF205 electronic overload relay

Main dimensions mm, inches

1SFC101194C0201

DOL starters protected by MCCB (magnetic only) and electronic overload relays

With AF contactors - Open type version in kit form



T5S
+ BEA370/T5
+ AF265, AF305, AF370
+ EF370 electronic overload relay

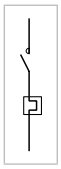
Main dimensions mm, inches

1SFC101195C0201

DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form

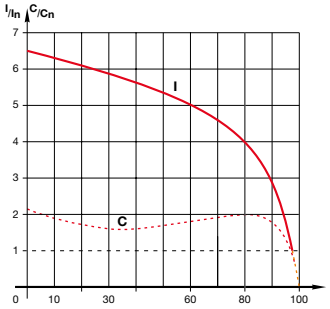
AF09-30-10 + TF42



AF140-30-11 + TF140DU

Application

Full voltage direct-on-line and reversing starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



I = current
C = torque
In = nominal current
Cn = nominal torque

Coordination Types

The contactor, the short-circuit protection device and the thermal overload relay control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

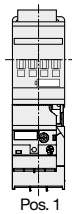
Main Technical Data

Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Ambient air temperature	
Close to the device	≤ 60 °C (TF42: 38 A above ≤ 50 °C)
Degree of protection	IP20
Switching frequency	Refer to "Switching frequency diagrams" page

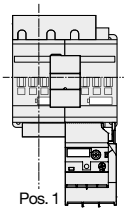
AF09-30-10 + BER16-4 + VEM4 + TF42

AF140-30-11 + BER140-4 + VM19 + TF140DU

Mounting positions



Direct-on-line



Reversing

1SBC101920S0201

DOL and reversing starters protected by overload relays

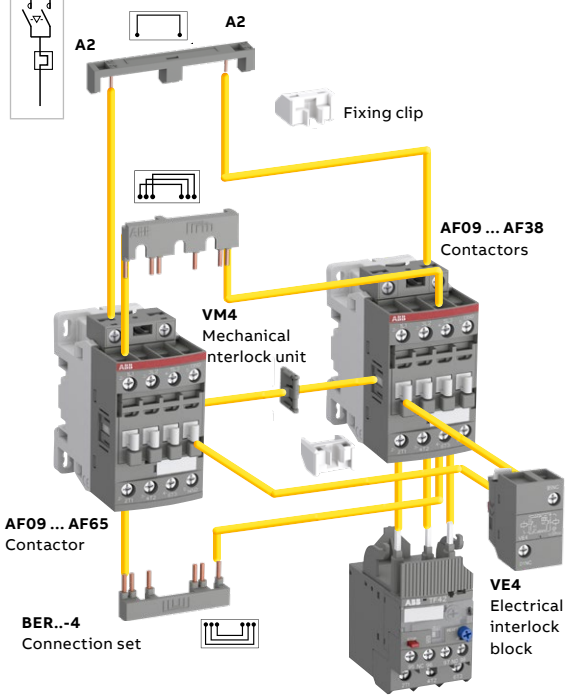
With AF contactors - Open type version in kit form

Direct-On-Line starters

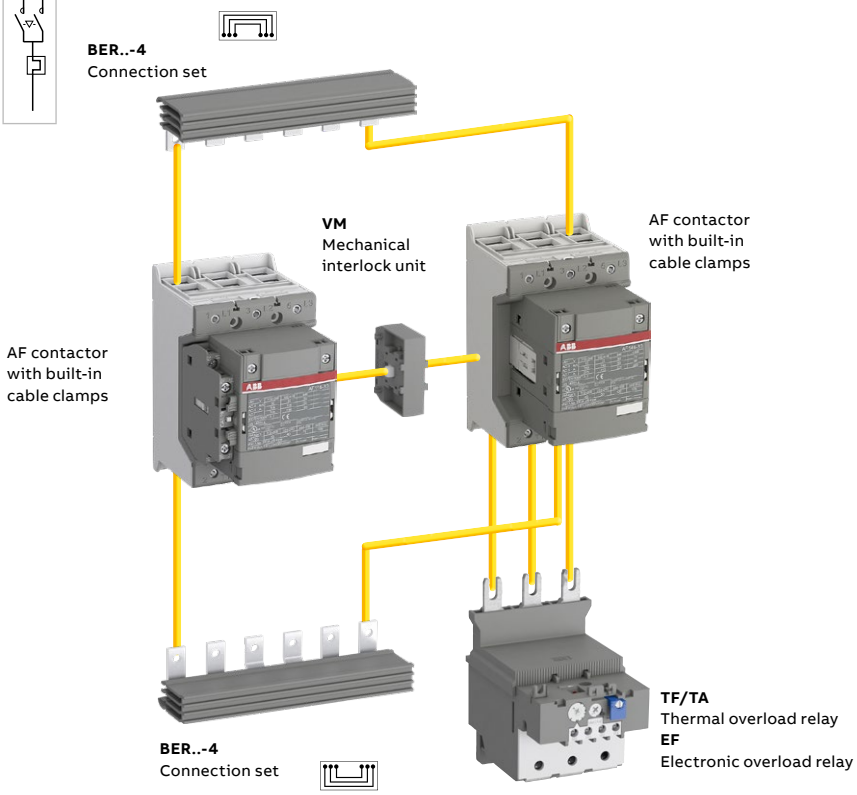
AF09 ... AF96
Contactor

TF
Thermal overload relay
EF
Electronic overload relay

Reversing starters for AF09 ... AF38



Reversing starters for AF116 ... AF370



You can easily assemble a direct-on-line starter by connecting AF contactor and TF thermal overload relay or EF electronic overload relay.
You can also easily assemble reversing starter thanks to our complete range of accessories:

- For AF09 ... AF38, use VEM4 mechanical and electrical interlock set for reversing starter in 90 mm width.
- It includes:
  - VM4 mechanical interlock unit including 2 fixing clips
  - VE4 electrical interlock block with A2-A2 connection.
- For AF40 ... AF370, use VM mechanical interlock unit and additional auxiliary contact blocks for electrical interlocking.
- BER..-4 connection set: it assures a safe and simple reversing connection between both contactor main terminals.

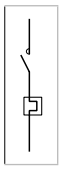
Select now easily and quickly your starter in the following pages at 400 V, up to 200 kW.

For the full coordination tables, please visit our SOC tool :
https://applications.it.abb.com/SOC/Selectivity

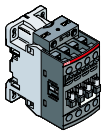
1SBC101920S0201

Direct-on-line starters protected by thermal overload relays

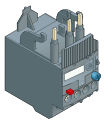
With AF contactors - Open type version in kit form



Contactors



Thermal overload relays



Accessories

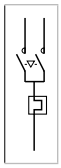
IEC AC-3, 400 V Rated power kW	Rated current A	Control voltage Uc min. ... Uc max. (1) V 50/60 Hz	V DC (2)	Type	Order code	Setting ranges A	Type	Order code
4	8.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	7.60...10.0	TF42-10	1SAZ711201R1043
		100...250	100...250	AF09-30-10-13	1SBL137001R1310			
5.5	11.5	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	10.0...13.0	TF42-13	1SAZ711201R1045
		100...250	100...250	AF12-30-10-13	1SBL157001R1310			
7.5	15.5	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	13.0...16.0	TF42-16	1SAZ711201R1047
		100...250	100...250	AF16-30-10-13	1SBL177001R1310			
11	22	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	20.0...24.0	TF42-24	1SAZ711201R1051
		100...250	100...250	AF26-30-00-13	1SBL237001R1300			
15	29	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	29.0...35.0	TF42-35	1SAZ711201R1053
		100...250	100...250	AF30-30-00-13	1SBL277001R1300			
18.5	35	24...60	20...60	AF38Z-30-00-11	1SBL296001R1100	35.0...38.0/40.0	TF42-38	1SAZ711201R1055
		100...250	100...250	AF38-30-00-13	1SBL297001R1300			
18.5	35	24...60	20...60	AF40-30-00-11	1SBL347001R1100	30.0...40.0	TF65-40	1SAZ811201R1003
		100...250	100...250	AF40-30-00-13	1SBL347001R1300			
22	41	24...60	20...60	AF52-30-00-11	1SBL367001R1100	36.00...47.0	TF65-47	1SAZ811201R1004
		100-250	100-250	AF52-30-00-13	1SBL367001R1300			
30	55	24...60	20...60	AF65-30-00-11	1SBL387001R1100	50.0...60.0	TF65-60	1SAZ811201R1006
		100-250	100-250	AF65-30-00-13	1SBL387001R1300			
37	66	24...60	20...60	AF80-30-00-11	1SBL397001R1100	57.0...68.0	TF96-68	1SAZ911201R1003
		100-250	100-250	AF80-30-00-13	1SBL397001R1300			
45	80	24...60	20...60	AF96-30-00-11	1SBL407001R1100	75.0..87.0	TF96-87	1SAZ911201R1005
		100-250	100-250	AF96-30-00-13	1SBL407001R1300			
55	97	24...60	20...60	AF116-30-11-11	1SFL427001R1111	80...110	TF140DU-110	1SAZ431201R1002
		100-250	100-250	AF116-30-11-13	1SFL427001R1311			
75	132	24...60	20...60	AF140-30-11-11	1SFL447001R1111	100...135	TF140DU-135	1SAZ431201R1003
		100-250	100-250	AF140-30-11-13	1SFL447001R1311			
90	160	24...60	20...60	AF190-30-11-11	1SFL487002R1111	130...175	TA200DU-175	1SAZ411201R1005
		100-250	100-250	AF190-30-11-13	1SFL487002R1311			
110	195	24...60	20...60	AF205-30-11-11	1SFL527002R1111	150...200	TA200DU-200	1SAZ411201R1006
		100-250	100-250	AF205-30-11-13	1SFL527002R1311			

(1) For other control voltages, see "Voltage code table".
Note : for rated power above 110 kW, refer to "Starters protected by electronic overload relays".
(2) AF ... -11 not suitable for direct control by PLC-output.

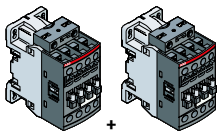
1SBC101921S0201

Reversing starters protected by thermal overload relays

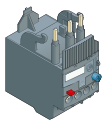
With AF contactors - Open type version in kit form



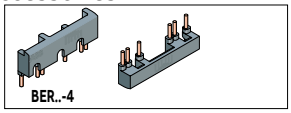
Contactors

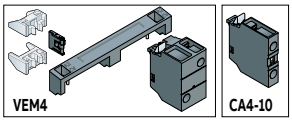


Thermal overload relays



Accessories





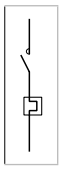
IEC AC-3, 400 V Rated power kW	Rated current A	Control voltage Uc min. ... Uc max. (1) V 50/60 Hz	V DC	Type	Order code	Setting ranges A	Type	Order code	Type	Order code
4	8.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	7.60...10.0	TF42-10	1SAZ711201R1043	BER16-4	1SBN081311R1000
		100...250	100...250	AF09-30-10-13	1SBL137001R1310				+ VEM4	1SBN030111R1000
5.5	11.5	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	10.0...13.0	TF42-13	1SAZ711201R1045		
		100...250	100...250	AF12-30-10-13	1SBL157001R1310					
7.5	15.5	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	13.0...16.0	TF42-16	1SAZ711201R1047		
		100...250	100...250	AF16-30-10-13	1SBL177001R1310					
11	22	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	20.0...24.0	TF42-24	1SAZ711201R1051	BER38-4	1SBN082311R1000
		100...250	100...250	AF26-30-00-13	1SBL237001R1300				+ VEM4	1SBN030111R1000
15	29	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	29.0...35.0	TF42-35	1SAZ711201R1053	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF30-30-00-13	1SBL277001R1300					
18.5	35	24...60	20...60	AF38Z-30-00-11	1SBL296001R1100	35.0...38.0/40.0	TF42-38	1SAZ711201R1055		
		100...250	100...250	AF38-30-00-13	1SBL297001R1300					
18.5	35	24...60	20...60	AF40-30-00-11	1SBL347001R1100	30.0...40.0	TF65-40	1SAZ811201R1003	BER65-4	1SBN083411R1000
		100...250	100...250	AF40-30-00-13	1SBL347001R1300				+ VM96-4	1SBN033405T1000
22	41	24...60	20...60	AF52-30-00-11	1SBL367001R1100	36.00...47.0	TF65-47	1SAZ811201R1004	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF52-30-00-13	1SBL367001R1300				+ 2x CA4-01	1SBN010110R1001
30	55	24...60	20...60	AF65-30-00-11	1SBL387001R1100	50.0...60.0	TF65-60	1SAZ811201R1006		
		100...250	100...250	AF65-30-00-13	1SBL387001R1300					
37	66	24...60	20...60	AF80-30-00-11	1SBL397001R1100	57.0...68.0	TF96-68	1SAZ911201R1003	BER96-4	1SBN083911R1000
		100...250	100...250	AF80-30-00-13	1SBL397001R1300				+ VM96-4	1SBN033405T1000
45	80	24...60	20...60	AF96-30-00-11	1SBL407001R1100	75.0..87.0	TF96-87	1SAZ911201R1005	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF96-30-00-13	1SBL407001R1300				+ 2x CA4-01	1SBN010110R1001
55	97	24...60	20...60	AF116-30-11-11	1SFL427001R1111	80...110	TF140DU-110	1SAZ431201R1002	BER140-4	1SFN084111R1000
		100...250	100...250	AF116-30-11-13	1SFL427001R1311				+ VM19	1SFN030300R1000
75	132	24...60	20...60	AF140-30-11-11	1SFL447001R1111	100...135	TF140DU-135	1SAZ431201R1003		
		100...250	100...250	AF140-30-11-13	1SFL447001R1311					
90	160	24...60	20...60	AF190-30-11-11	1SFL487002R1111	130...175	TA200DU-175	1SAZ411201R1005	BER205-4	1SFN084811R1000
		100...250	100...250	AF190-30-11-13	1SFL487002R1311				+ VM19	1SFN030300R1000
110	195	24...60	20...60	AF205-30-11-11	1SFL527002R1111	150...200	TA200DU-200	1SAZ411201R1006		
		100...250	100...250	AF205-30-11-13	1SFL527002R1311					

(1) For other control voltages, see "Voltage code table".
Note : for rated power above 110 kW, refer to "Starters protected by electronic overload relays".
(2) AF ... -11 not suitable for direct control by PLC-output.

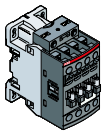
1SBC101925020

Direct-on-line starters protected by electronic overload relays

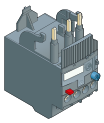
With AF contactors - Open type version in kit form



Contactors



Electronic overload relays



Accessories

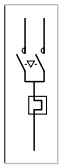
IEC AC-3, 400 V Rated power kW	Rated current A	Control voltage Uc min. ... Uc max. (1) V 50/60 Hz	V DC	Type	Order code	Setting ranges A	Type	Order code
4	8.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105
		100...250	100...250	AF09-30-10-13	1SBL137001R1310			
5.5	11.5	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105
		100...250	100...250	AF12-30-10-13	1SBL157001R1310			
7.5	15.5	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105
		100...250	100...250	AF16-30-10-13	1SBL177001R1310			
11	22	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	9.00...30.0	EF45-30	1SAX211001R1101
		100...250	100...250	AF26-30-00-13	1SBL237001R1300			
15	29	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	9.00...30.0	EF45-30	1SAX211001R1101
		100...250	100...250	AF30-30-00-13	1SBL277001R1300			
18.5	35	24...60	20...60	AF38Z-30-00-11	1SBL296001R1100	15.0...45.0	EF45-45	1SAX211001R1102
		100...250	100...250	AF38-30-00-13	1SBL297001R1300			
18.5	35	24...60	20...60	AF40-30-00-11	1SBL347001R1100	25.0...70.0	EF65-70	1SAX331001R1101
		100...250	100...250	AF40-30-00-13	1SBL347001R1300			
22	41	24...60	20...60	AF52-30-00-11	1SBL367001R1100	25.0...70.0	EF65-70	1SAX331001R1101
		100-250	100-250	AF52-30-00-13	1SBL367001R1300			
30	55	24...60	20...60	AF65-30-00-11	1SBL387001R1100	25.0...70.0	EF65-70	1SAX331001R1101
		100-250	100-250	AF65-30-00-13	1SBL387001R1300			
37	66	24...60	20...60	AF80-30-00-11	1SBL397001R1100	36...100	EF96-100	1SAX341001R1101
		100-250	100-250	AF80-30-00-13	1SBL397001R1300			
45	80	24...60	20...60	AF96-30-00-11	1SBL407001R1100	36...100	EF96-100	1SAX341001R1101
		100-250	100-250	AF96-30-00-13	1SBL407001R1300			
55	97	24...60	20...60	AF116-30-11-11	1SFL427001R1111	54...150	EF146-150	1SAX351001R1101
		100-250	100-250	AF116-30-11-13	1SFL427001R1311			
75	132	24...60	20...60	AF140-30-11-11	1SFL447001R1111	54...150	EF146-150	1SAX351001R1101
		100-250	100-250	AF140-30-11-13	1SFL447001R1311			
90	160	24...60	20...60	AF190-30-11-11	1SFL487002R1111	63...110	EF205-110	1SAX531001R1101
		100-250	100-250	AF190-30-11-13	1SFL487002R1311			
110	195	24...60	20...60	AF205-30-11-11	1SFL527002R1111	63...110	EF205-110	1SAX531001R1101
		100-250	100-250	AF205-30-11-13	1SFL527002R1311			
132	230	24...60	20...60	AF265-30-11-11	1SFL547002R1111	115...380	EF370-380	1SAX611001R1101
		100-250	100-250	AF265-30-11-13	1SFL547002R1311			
160	280	24...60	20...60	AF305-30-11-11	1SFL587002R1111	115...380	EF370-380	1SAX611001R1101
		100-250	100-250	AF305-30-11-13	1SFL587002R1311			
200	350	24...60	20...60	AF370-30-11-11	1SFL607002R1111	115...380	EF370-380	1SAX611001R1101
		100-250	100-250	AF370-30-11-13	1SFL607002R1311			

(1) For other control voltages, see "Voltage code table".
(2) AF ... -11 not suitable for direct control by PLC-output.

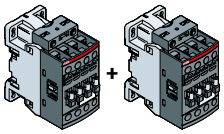
1SBC101948S0201

Reversing starters protected by electronic overload relays

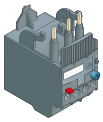
With AF contactors - Open type version in kit form



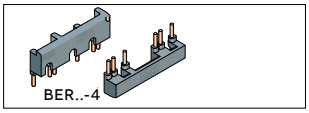
Contactors

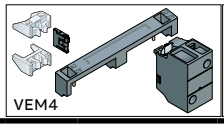


Electronic overload relays



Accessories





IEC AC-3, 400 V Rated power kW	Rated current A	Control voltage Uc min. ... Uc max. (1) V 50/60 Hz	V DC	Type	Order code	Setting ranges A	Type	Order code	Type	Order code
4	8.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105	BER16-4	1SBN081311R1000
		100...250	100...250	AF09-30-10-13	1SBL137001R1310				+ VEM4	1SBN030111R1000
5.5	11.5	24...60	20...60	AF12Z-30-10-11	1SBL156001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105		
		100...250	100...250	AF12-30-10-13	1SBL157001R1310					
7.5	15.5	24...60	20...60	AF16Z-30-10-11	1SBL176001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105		
		100...250	100...250	AF16-30-10-13	1SBL177001R1310					
11	22	24...60	20...60	AF26Z-30-00-11	1SBL236001R1100	9.00...30.0	EF45-30	1SAX211001R1101	BER38-4	1SBN082311R1000
		100...250	100...250	AF26-30-00-13	1SBL237001R1300				+ VEM4	1SBN030111R1000
15	29	24...60	20...60	AF30Z-30-00-11	1SBL276001R1100	9.00...30.0	EF45-30	1SAX211001R1101	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF30-30-00-13	1SBL277001R1300					
18.5	35	24...60	20...60	AF38Z-30-00-11	1SBL296001R1100	15.0...45.0	EF45-45	1SAX211001R1102		
		100...250	100...250	AF38-30-00-13	1SBL297001R1300					
18.5	35	24...60	20...60	AF40-30-00-11	1SBL347001R1100	25.0...70.0	EF65-70	1SAX331001R1101	BER65-4	1SBN083411R1000
		100...250	100...250	AF40-30-00-13	1SBL347001R1300				+ VM96-4	1SBN033405T1000
22	41	24...60	20...60	AF52-30-00-11	1SBL367001R1100	25.0...70.0	EF65-70	1SAX331001R1101	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF52-30-00-13	1SBL367001R1300				+ 2x CA4-01	1SBN010110R1001
30	55	24...60	20...60	AF65-30-00-11	1SBL387001R1100	25.0...70.0	EF65-70	1SAX331001R1101		
		100...250	100...250	AF65-30-00-13	1SBL387001R1300					
37	66	24...60	20...60	AF80-30-00-11	1SBL397001R1100	36...100	EF96-100	1SAX341001R1101	BER96-4	1SBN083911R1000
		100...250	100...250	AF80-30-00-13	1SBL397001R1300				+ VM96-4	1SBN033405T1000
45	80	24...60	20...60	AF96-30-00-11	1SBL407001R1100	36...100	EF96-100	1SAX341001R1101	+ 2x CA4-10	1SBN010110R1010
		100...250	100...250	AF96-30-00-13	1SBL407001R1300				+ 2x CA4-01	1SBN010110R1001
55	97	24...60	20...60	AF116-30-11-11	1SFL427001R1111	54...150	EF146-150	1SAX351001R1101	BER140-4	1SFN084111R1000
		100...250	100...250	AF116-30-11-13	1SFL427001R1311				+ VM19	1SFN030300R1000
75	132	24...60	20...60	AF140-30-11-11	1SFL447001R1111	54...150	EF146-150	1SAX351001R1101		
		100...250	100...250	AF140-30-11-13	1SFL447001R1311					
90	160	24...60	20...60	AF190-30-11-11	1SFL487002R1111	63...110	EF205-110	1SAX531001R1101	BER205-4	1SFN084811R1000
		100...250	100...250	AF190-30-11-13	1SFL487002R1311				+ VM19	1SFN030300R1000
110	195	24...60	20...60	AF205-30-11-11	1SFL527002R1111	63...110	EF205-110	1SAX531001R1101		
		100...250	100...250	AF205-30-11-13	1SFL527002R1311					
132	230	24...60	20...60	AF265-30-11-11	1SFL547002R1111	115...380	EF370-380	1SAX611001R1101	BER370-4	1SFN085411R1000
		100...250	100...250	AF265-30-11-13	1SFL547002R1311				+ VM19	1SFN030300R1000
160	280	24...60	20...60	AF305-30-11-11	1SFL587002R1111	115...380	EF370-380	1SAX611001R1101		
		100...250	100...250	AF305-30-11-13	1SFL587002R1311					
200	350	24...60	20...60	AF370-30-11-11	1SFL607002R1111	115...380	EF370-380	1SAX611001R1101		
		100...250	100...250	AF370-30-11-13	1SFL607002R1311					

(1) For other control voltages, see "Voltage code table".
(2) AF ... -11 not suitable for direct control by PLC-output.

1SBC101949502O1

DOL and reversing starters protected by overload relays

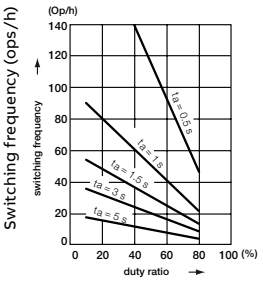
With AF contactors - Open type version in kit form
Switching frequency diagrams

General

Overload relays cannot be operated at any arbitrary switching frequency in order to avoid tripping. Applications involving up to 15 operations per hour are acceptable. Higher switching frequencies are permitted if the duty ratio and the motor starting time are allowed for and if the motor's making current does not appreciably exceed 6 times the rated operating current. Please refer to the adjacent diagram for guideline values for the permitted switching frequency.

Thermal overload relay

Intermittent periodic duty



Duty ratio (%)

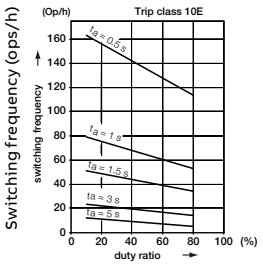
ta: motor starting time

Example:
Starting time of the motor: 1 second - Duty ratio: 40 % means a permitted switching frequency of max. 60 operating cycles per hour.

Electronic overload relay

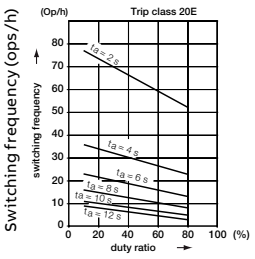
Intermittent periodic duty

Trip class 10E



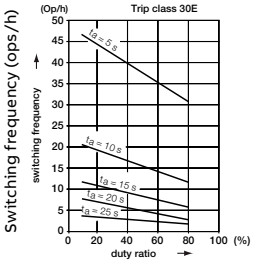
Duty ratio (%)

Trip class 20E



Duty ratio (%)

Trip class 30E



Duty ratio (%)

ta: motor starting time

Exemple for trip class 10E:
Starting time of the motor: 1 second. Duty ratio: 60 % means a permitted switching frequency of max. 60 operating cycles per hour, for a motor breaking current not exceeding 6 x In.

1SBC101945020I

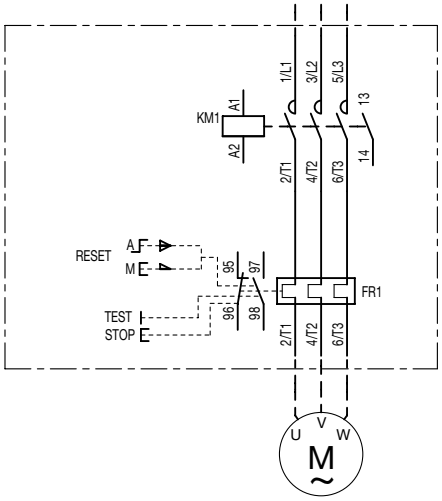
DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form

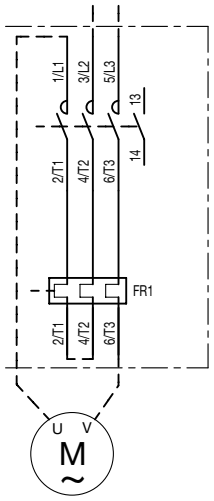
Wiring diagrams

Direct-on-line starters

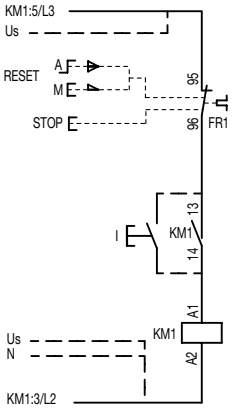
Power circuit



1-phase

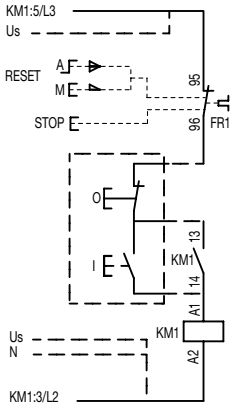


AC or DC local control



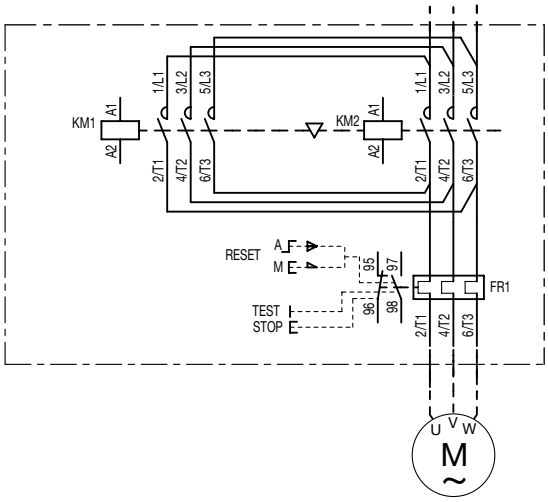
Note: coil Uc 12-20 V DC : A1+, A2-

AC or DC remote control

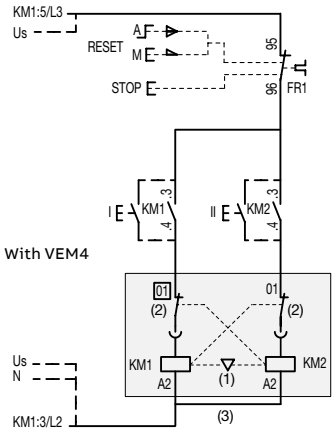


Reversing starters

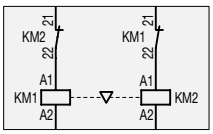
Power circuit



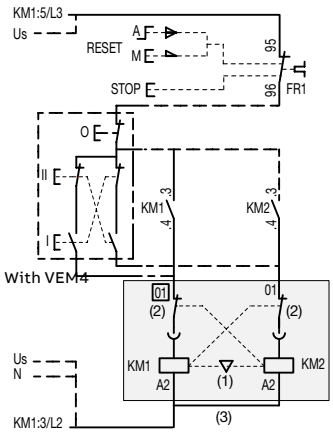
AC or DC local control



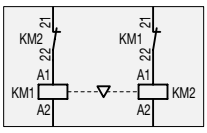
With VM



AC or DC remote control



With VM



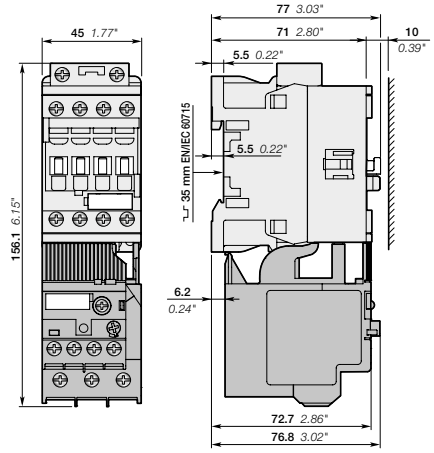
Note: - VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection
(Except for coil Uc 12-20 V DC : use VM4 with CA4).
- coil Uc 12-20 V DC : A1+, A2-

1SBC101926S0201

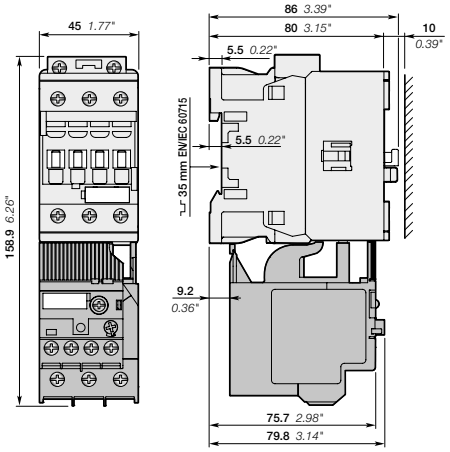
12

DOL starters protected by thermal overload relays

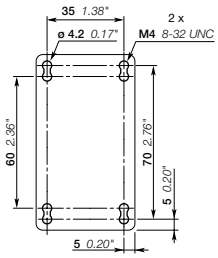
With AF contactors - open type version in kit form



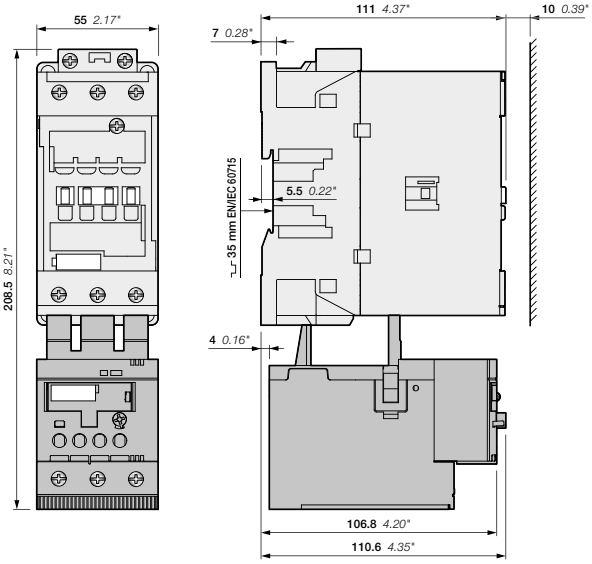
AF09, AF12, AF16
+ TF42 thermal overload relay



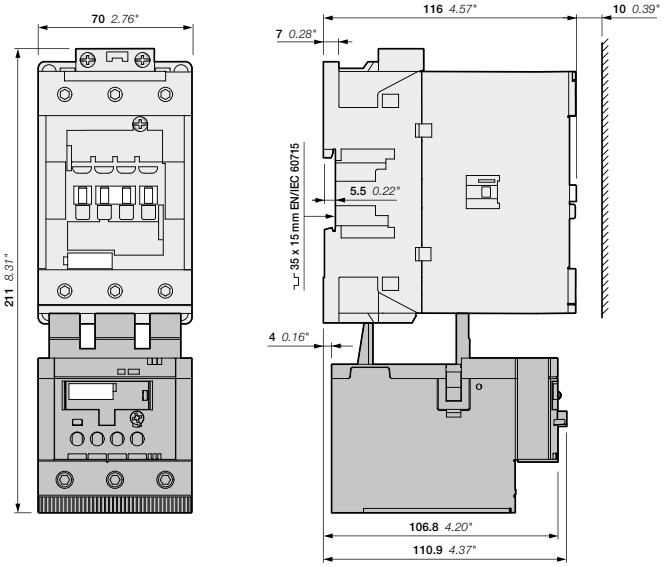
AF26, AF30, AF38
+ TF42 thermal overload relay



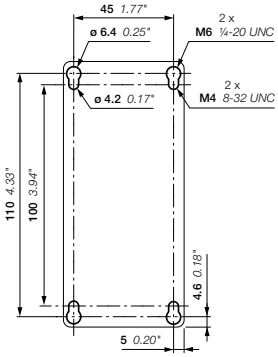
Note: contactor lateral distance to grounded component 2 mm 0.08" min.



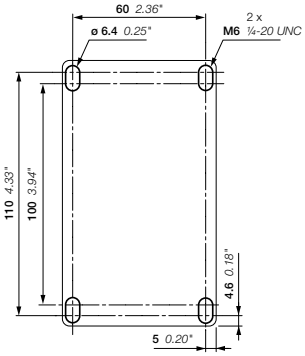
AF40, AF52, AF65
+ TF65 thermal overload relay



AF80, AF96
+ TF96 thermal overload relay



AF40, AF52, AF65
+ TF65 thermal overload relay



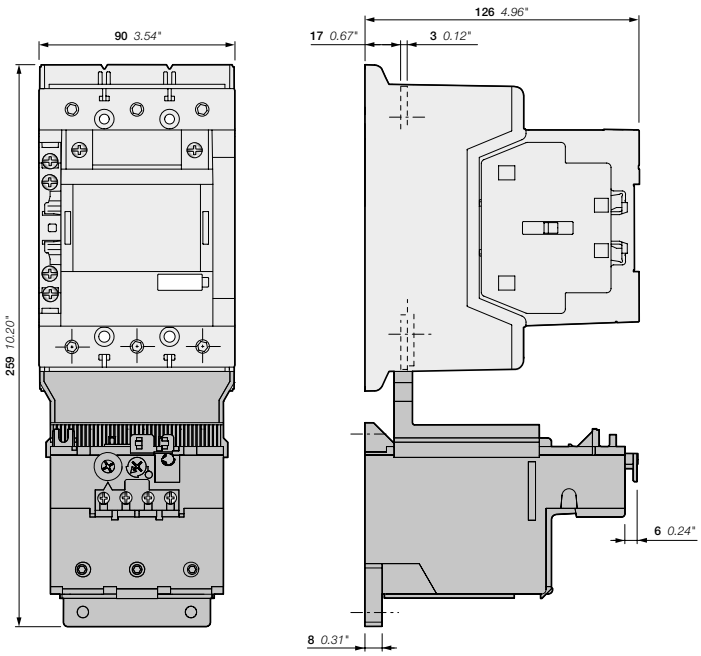
AF80, AF96
+ TF96 thermal overload relay

Main dimensions mm, inches

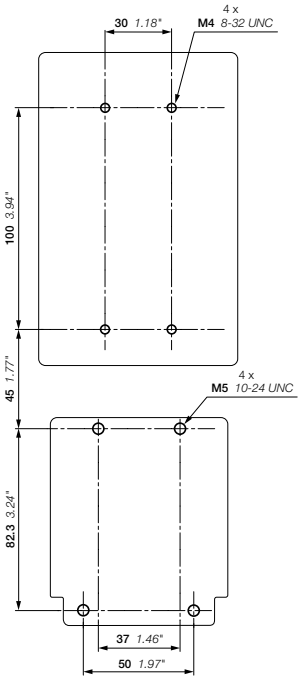
1SBC101927S0201

DOL starters protected by thermal overload relays

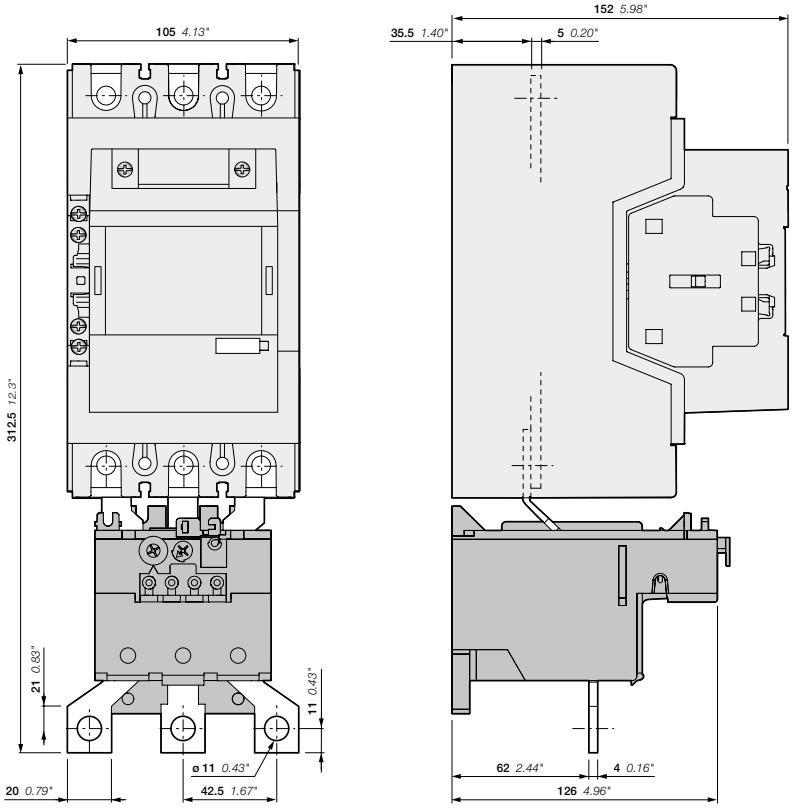
With AF contactors - open type version in kit form



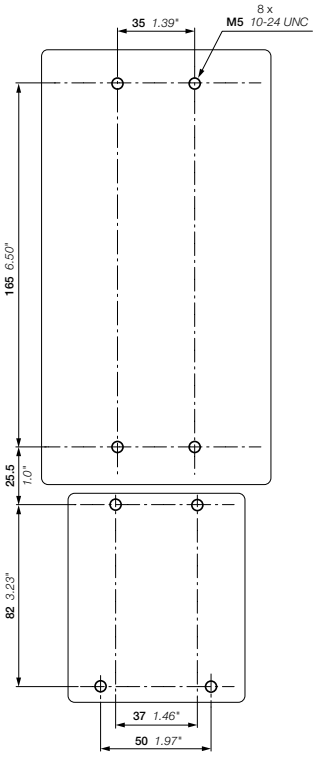
AF116, AF140-30-11(B)
+ TF140 thermal overload relay



AF116, AF140-30-11(B)
+ TF140 thermal overload relay



AF190, AF205-30-11
+ TA200DU thermal overload relay



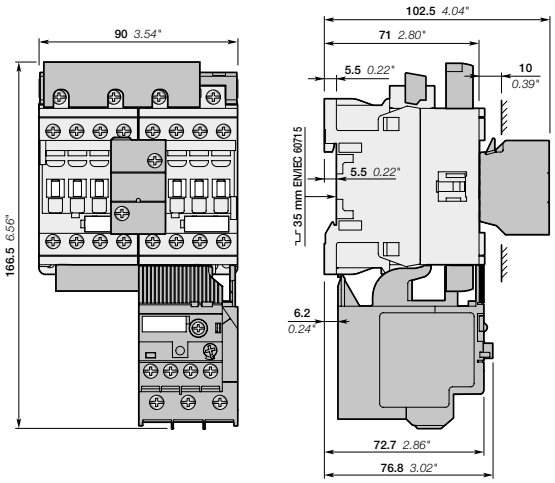
AF190, AF205
+ TA200DU thermal overload relay

Main dimensions mm, inches

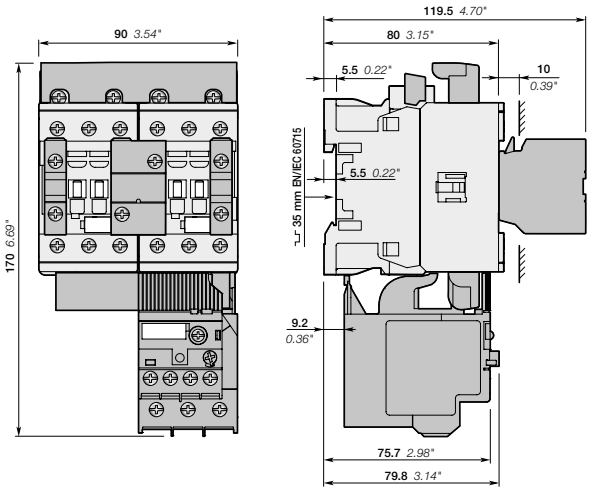
1SFC101156C0201

Reversing starters protected by thermal overload relays

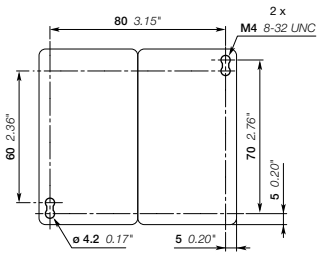
With AF contactors - open type version in kit form



AF09, AF12, AF16
+ BER16-4, VEM4
+ TF42 thermal overload relay



AF26, AF30, AF38
+ BER38-4, VEM4, CA4-10
+ TF42 thermal overload relay



AF09, AF12, AF16, AF26, AF30, AF38

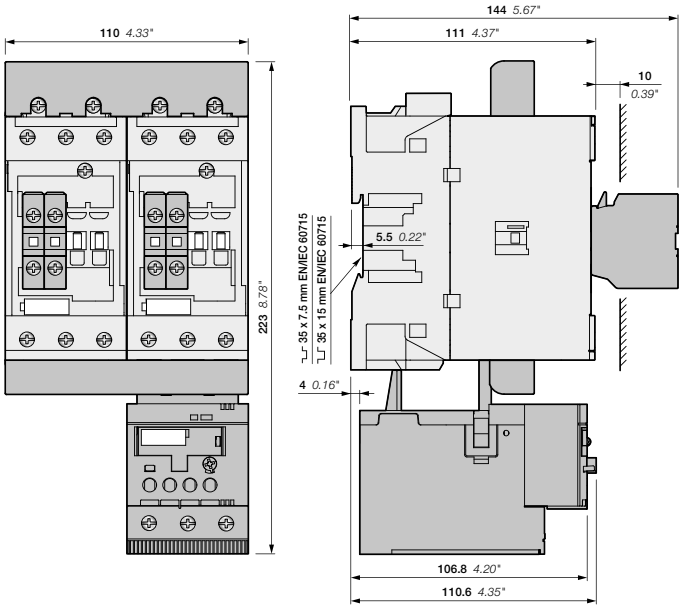
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

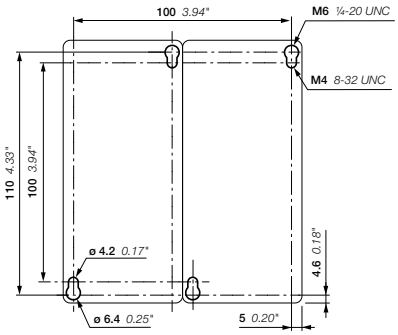
1SBC101928S0201

Reversing starters protected by thermal overload relays

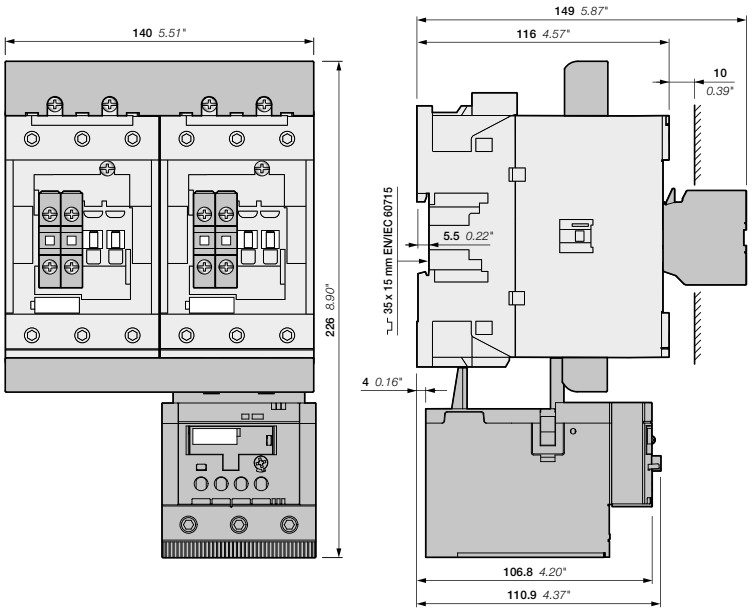
With AF contactors - open type version in kit form



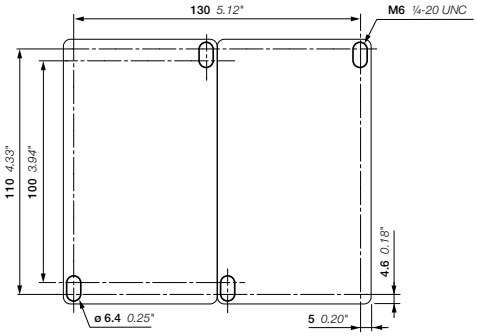
AF40, AF52, AF65
+ BER65-4, VM96-4
+ TF65 thermal overload relay



AF40, AF52, AF65
+ BER65-4, VM96-4
+ TF65 thermal overload relay



AF80, AF96
+ BER96-4, VM96-4
+ TF96 thermal overload relay



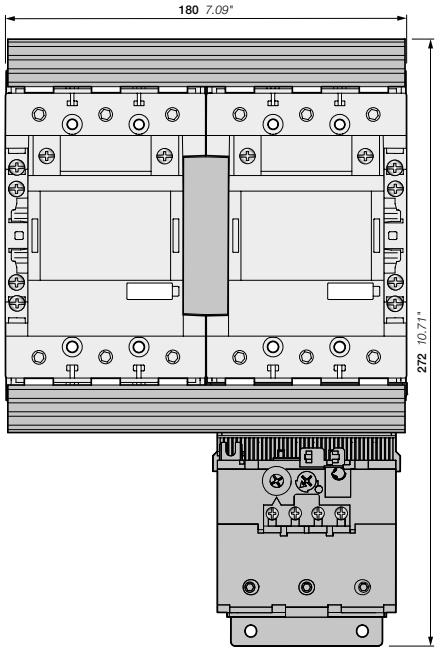
AF80, AF96
+ BER96-4, VM96-4
+ TF96 thermal overload relay

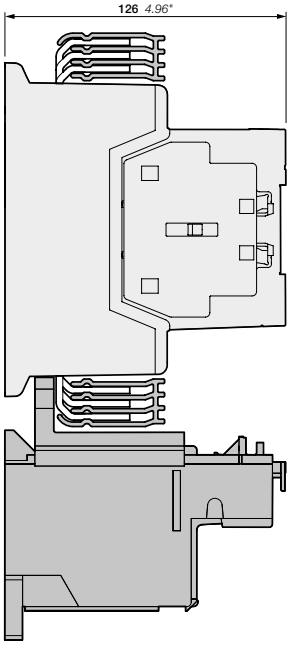
Main dimensions mm, inches

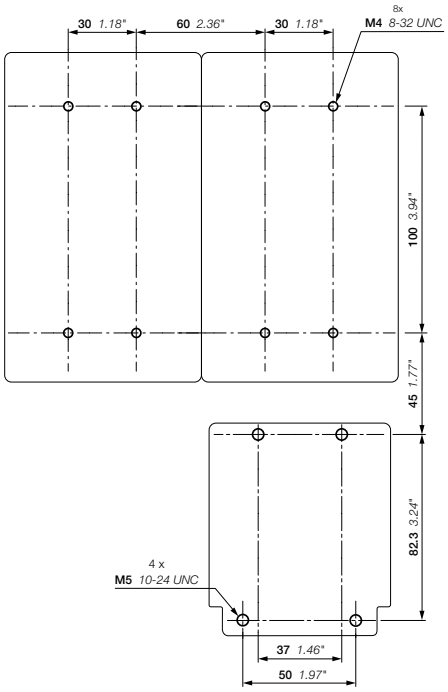
1SBC101929S0201 - Rev. A

Reversing starters protected by thermal overload relays

With AF contactors - open type version in kit form







AF116, AF140, AF146
+ BER140-4, VM19
+ TF140 thermal overload relay

Main dimensions mm, inches

1SFC101158C0201

Motor starting solutions
Open type version, in kit form with screw terminals

Starters protected by manual motor starters
12/50 Overview
12/52 Direct-on-line starters
12/56 Reversing starters
12/60 Dimensions

Starters protected by thermal overload relays
12/62 Direct-on-line and reversing starters
12/66 Star-delta starters
12/70 Dimensions

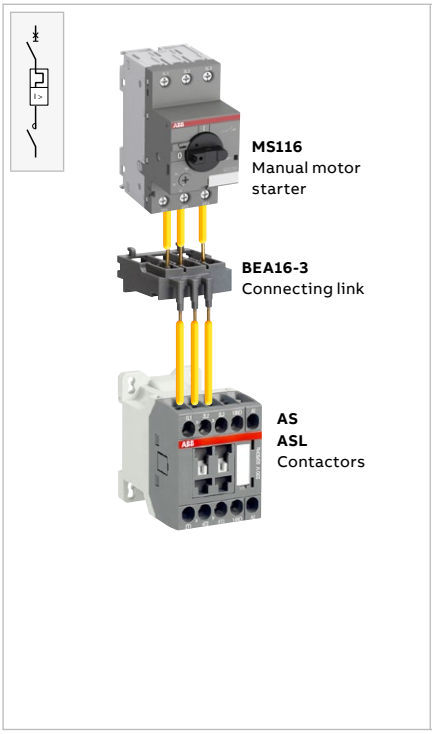
Star-delta starters prtoected by overload relays
12/82 Overview
12/84 Selection tables
12/88 Switching frequency diagrams
12/91 Main dimensions

Motor starting solutions

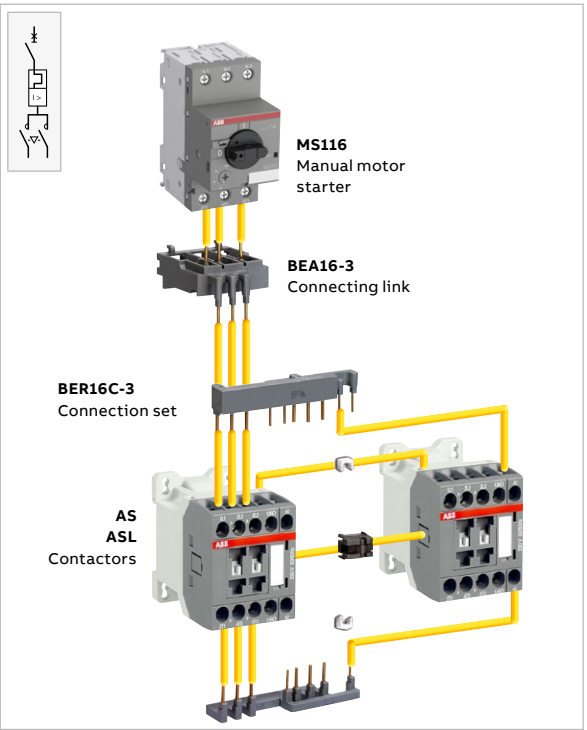
Open type version, in kit form

Starters protected by manual motor starters

Direct-on-line starters

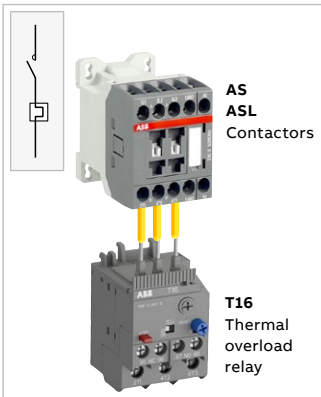


Reversing starters

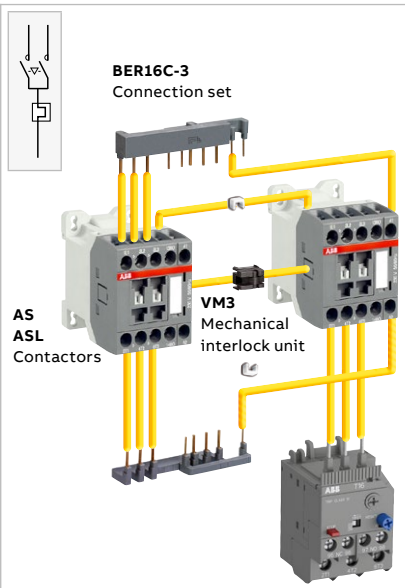


Starters protected by thermal overload relays

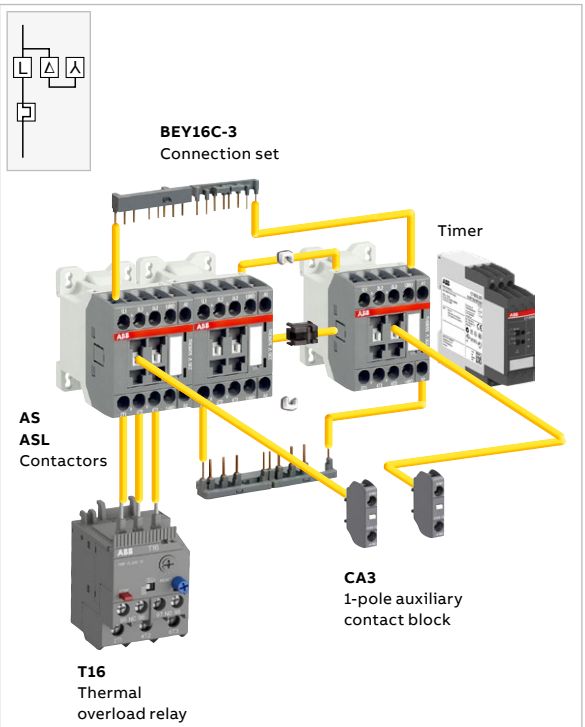
Direct-on-line starters



Reversing starters



Star-delta starters



1SBC101271S0201

Starters protected
by manual motor starters

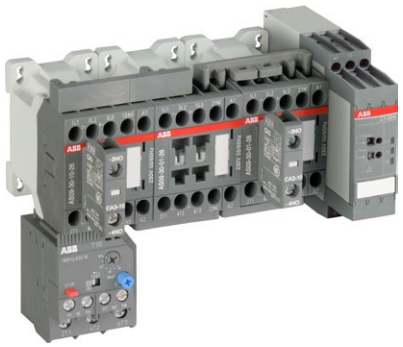
Switching of 3-phase cage motors

		Direct-on-line starters	Reversing starters
Rated power - AC-3, 400 V		**0.06...7.5 kW**	**0.06...7.5 kW**
Short-circuit current Iq		16 kA - 50 kA	16 kA - 50 kA
Coordination type		Type 1 & type 2	Type 1 & type 2
Manual motor starters		**MS116**	**MS116**
Contactors	AC operated	**AS09 ... AS16**	**AS09 ... AS16**
	DC operated	**ASL09 ... ASL16**	**ASL09 ... ASL16**

Starters protected
by thermal overload relays

Switching of 3-phase cage motors

		Direct-on-line starters	Reversing starters
Rated power - AC-3, 400 V		**4...7.5 kW**	**4...7.5 kW**
Contactors	AC operated	**AS09 ... AS16**	**AS09 ... AS16**
	DC operated	**ASL09 ... ASL16**	**ASL09 ... ASL16**
Thermal overload relays		**T16**	**T16**



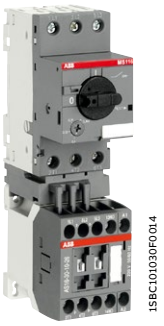
Switching of 3-phase cage motors

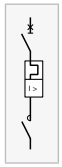
		Star-delta starters
Rated power - AC-3, 400 V		**7.5...11 kW**
Contactors	AC operated	**AS09 ... AS16**
	DC operated	**ASL09 ... ASL16**
Thermal overload relays		**T16**

1SBC101271S0201

Direct-on-line starters protected by manual motor starters

With AS, ASL contactors - open type version in kit form

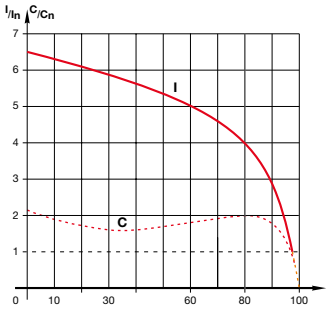




MS116 + BEA16-3 + AS16-30-10

Application

Full voltage direct-on-line starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



I = current
C = torque
In = nominal current
Cn = nominal torque

Coordination types

The contactor and the manual motor starter control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

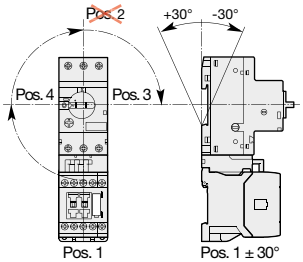
Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

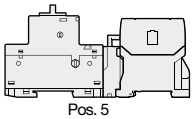
Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

Main technical data

Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui according to IEC 60947-4-1	690 V
Switching frequency	≤ 15 starts/hour - 80 % max. load factor - with max. 1.5 s starting time ≤ 30 starts/hour - 50 % max. load factor - with max. 1.5 s starting time
Ambient air temperature close to the device	≤ 55 °C
Degree of protection	IP20

Mounting positions

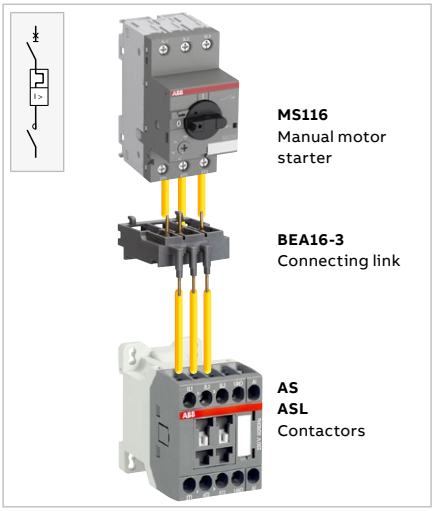




1SBC101272502O1

Direct-on-line starters protected by manual motor starters

With AS, ASL contactors - open type version in kit form

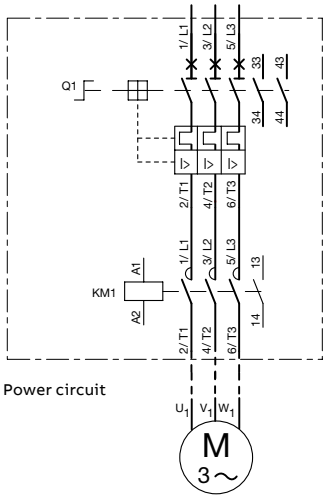


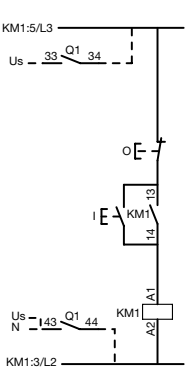
You can easily assemble a direct-on-line starter by using the BEA16-3 connecting link 3-pole insulated. It is used to electrically and mechanically connect MS116 manual motor starter and AS or ASL contactors.

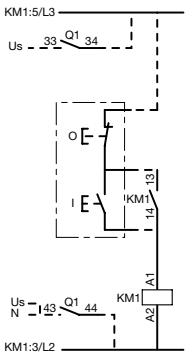
Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50 / 60 Hz, Iq = 16 kA or Iq = 50 kA up to 7.5 kW.

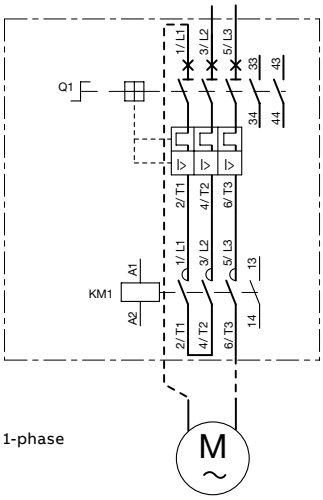
For complete coordination tables with MS116 or MS132, please contact your ABB local sales organization.

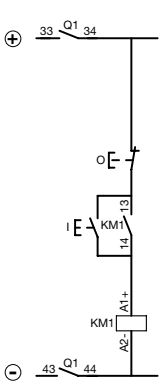
Wiring diagrams

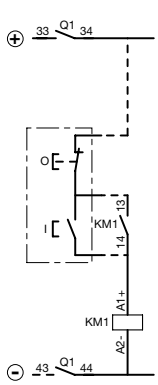












1SBC101272502O1

DOL starters protected by MS116 manual motor starters

With AS contactors - open type version in kit form

Coordination type 1 or type 2, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz

	Manual motor starters						Contactors				
	IEC		Type	Order code	Current setting range	Magnetic tripping current	Rated control circuit voltage Uc (1)		Type	Order code	Allowed setting current
	AC-3, 400 V										
	Rated operational power	current									
	kW	A			A	A	V 50 Hz	V 60 Hz			A
Coordination type 1											
Coordination type 2											
Iq = 16 kA											
Iq = 50 kA											
	0.06	0.2	MS116-0.25	1SAM250000R1002	0.16...0.25	2.44	24	24	AS09-30-10-20	1SBL101001R2010	0.25
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.09	0.3	MS116-0.4	1SAM250000R1003	0.25...0.40	3.9	24	24	AS09-30-10-20	1SBL101001R2010	0.4
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.12	0.44	MS116-0.63	1SAM250000R1004	0.40...0.63	6.14	24	24	AS09-30-10-20	1SBL101001R2010	0.63
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.18	0.6	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	24	AS09-30-10-20	1SBL101001R2010	1
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.25	0.85	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	24	AS09-30-10-20	1SBL101001R2010	1
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.37	1.1	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	24	AS09-30-10-20	1SBL101001R2010	1.6
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.55	1.5	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	24	AS09-30-10-20	1SBL101001R2010	1.6
							230	230	AS09-30-10-26	1SBL101001R2610	
	0.75	1.9	MS116-2.5	1SAM250000R1007	1.60...2.50	28.75	24	24	AS09-30-10-20	1SBL101001R2010	2.5
							230	230	AS09-30-10-26	1SBL101001R2610	
	1.1	2.7	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	24	AS09-30-10-20	1SBL101001R2010	4
							230	230	AS09-30-10-26	1SBL101001R2610	
	1.5	3.6	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	24	AS09-30-10-20	1SBL101001R2010	4
							230	230	AS09-30-10-26	1SBL101001R2610	
	2.2	4.9	MS116-6.3	1SAM250000R1009	4.00...6.30	78.75	24	24	AS09-30-10-20	1SBL101001R2010	6.3
							230	230	AS09-30-10-26	1SBL101001R2610	
	3	6.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	24	AS12-30-10-20	1SBL111001R2010	10
							230	230	AS12-30-10-26	1SBL111001R2610	
	4	8.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	24	AS12-30-10-20	1SBL111001R2010	10
							230	230	AS12-30-10-26	1SBL111001R2610	
	5.5	11.5	MS116-12	1SAM250000R1012	8.00...12.0	180	24	24	AS12-30-10-20	1SBL111001R2010	12
							230	230	AS12-30-10-26	1SBL111001R2610	
	7.5	15.5	MS116-16	1SAM250000R1011	10.0...16.0	240	24	24	AS16-30-10-20	1SBL121001R2010	15.5
							230	230	AS16-30-10-26	1SBL121001R2610	

Note: for multiple packaging, please contact your ABB local sales organization.

(1) Other control voltages see voltage code table.

Main accessories

	Type	Order code
Connecting link for manual motor starter	BEA16-3	1SBN081006T1000

1SBC101383S0201 - Rev. A

DOL starters protected by MS116 manual motor starters

With ASL contactors - open type version in kit form

Coordination type 1 or type 2, AC-3, 16 or 50 kA, 400 V, 50/60 Hz

	Manual motor starters						Contactors			
	IEC		Type	Order code	Current setting range	Magnetic tripping current	Rated control circuit voltage Uc (1)	Type	Order code	Allowed setting current
	AC-3, 400 V									
	Rated operational power	current								
	kW	A			A	A	V DC			A
Coordination type 1										
Coordination type 2										
Iq = 16 kA										
Iq = 50 kA										
	0.06	0.2	MS116-0.25	1SAM250000R1002	0.16...0.25	2.44	24	ASL09-30-10-81	1SBL103001R8110	0.25
	0.09	0.3	MS116-0.4	1SAM250000R1003	0.25...0.40	3.9	24	ASL09-30-10-81	1SBL103001R8110	0.4
	0.12	0.44	MS116-0.63	1SAM250000R1004	0.40...0.63	6.14	24	ASL09-30-10-81	1SBL103001R8110	0.63
	0.18	0.6	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	ASL09-30-10-81	1SBL103001R8110	1
	0.25	0.85	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	ASL09-30-10-81	1SBL103001R8110	1
	0.37	1.1	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	ASL09-30-10-81	1SBL103001R8110	1.6
	0.55	1.5	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	ASL09-30-10-81	1SBL103001R8110	1.6
	0.75	1.9	MS116-2.5	1SAM250000R1007	1.60...2.50	28.75	24	ASL09-30-10-81	1SBL103001R8110	2.5
	1.1	2.7	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	ASL09-30-10-81	1SBL103001R8110	4
	1.5	3.6	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	ASL09-30-10-81	1SBL103001R8110	4
	2.2	4.9	MS116-6.3	1SAM250000R1009	4.00...6.30	78.75	24	ASL09-30-10-81	1SBL103001R8110	6.3
	3	6.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	ASL12-30-10-81	1SBL113001R8110	10
	4	8.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	ASL12-30-10-81	1SBL113001R8110	10
	5.5	11.5	MS116-12	1SAM250000R1012	8.00...12.0	180	24	ASL12-30-10-81	1SBL113001R8110	12
	7.5	15.5	MS116-16	1SAM250000R1011	10.0...16.0	240	24	ASL16-30-10-81	1SBL123001R8110	15.5

Note: for multiple packaging, please contact your ABB local sales organization.

(1) Other control voltages see voltage code table.

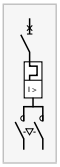
Main accessories

	Type	Order code
Connecting link for manual motor starter	BEA16-3	1SBN081006T1000

1SBC101383S0201 - Rev. A

Reversing starters protected by manual motor starters

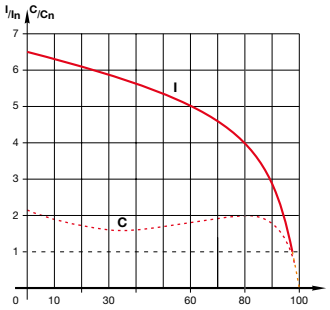
With AS, ASL contactors - open type version in kit form



MS116 + BEA16-3 + VM3 + BER16C-3 + AS16-30-01

Application

Full voltage reversing starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



I = current
C = torque
In = nominal current
Cn = nominal torque

Coordination types

The contactor and the manual motor starter control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

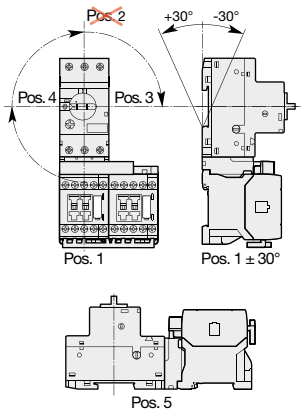
Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

Main technical data

Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui according to IEC 60947-4-1	690 V
Switching frequency	≤ 15 starts/hour - 80 % max. load factor - with max. 1.5 s starting time ≤ 30 starts/hour - 50 % max. load factor - with max. 1.5 s starting time
Ambient air temperature close to the device	≤ 55 °C
Degree of protection	IP20

Note: Minimum switchover delay of 50 ms must be introduced between respective opening and closing of AC operated reversing contactors

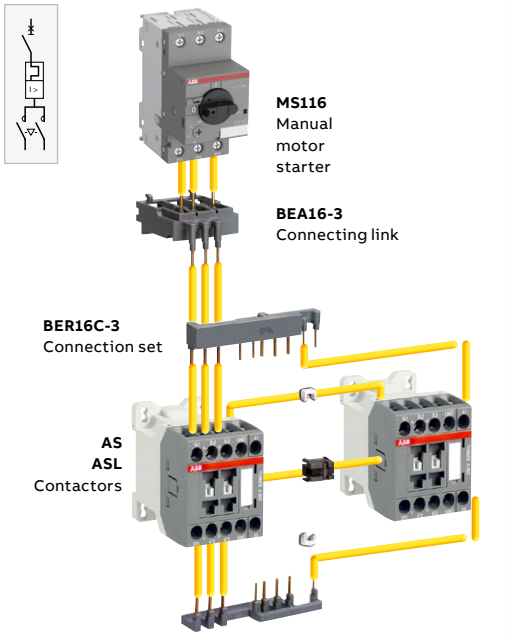
Mounting positions



1SBC101274S0201

Reversing starters protected by manual motor starters

With AS, ASL contactors - open type version in kit form



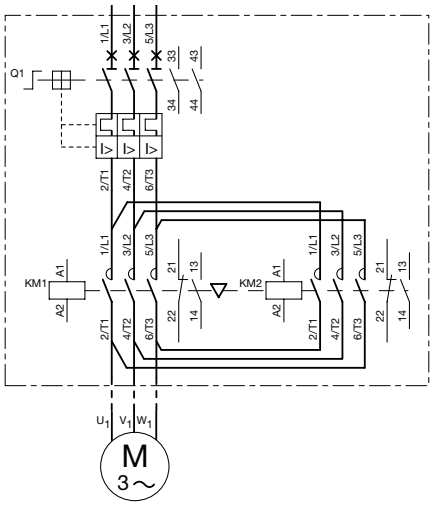
You can easily assemble reversing starter thanks to our complete range of-accessories:

- BEA16-3 connecting link 3-pole insulated: it is used to electrically and mechanically connect MS116 manual motor starter and AS or ASL contactors.
- VM3 mechanical interlock unit: just clip it between the 2 contactors without increasing starter width.
- BER16C-3 connection set: it assures a safe and simple connection between both contactor main terminals and an electrical interlocking between coil and N.C. built-in auxiliary contact terminals of both contactors.

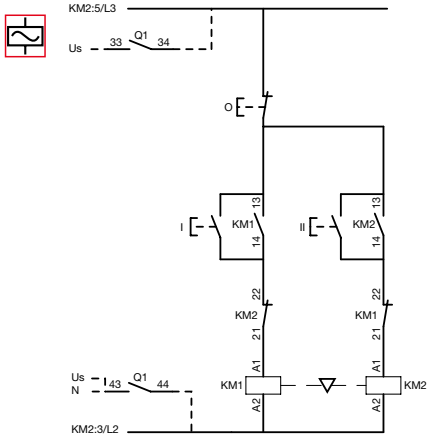
Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50 / 60 Hz, Iq = 16 kA or Iq = 50 kA up to 7.5 kW.

For complete coordination tables with MS116 or MS132, please contact your ABB local sales organization.

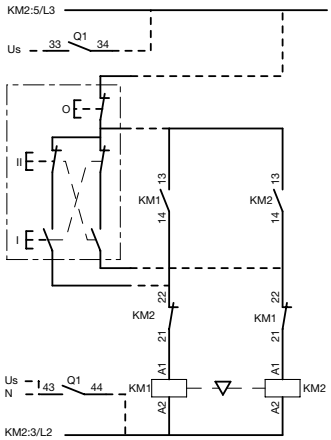
Wiring diagrams



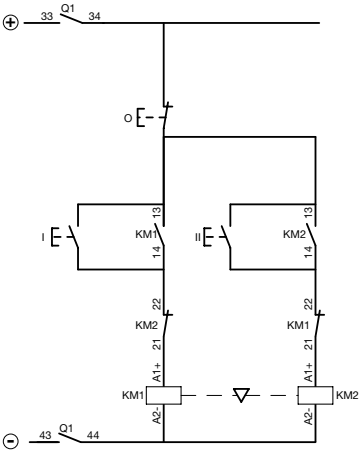
Power circuit



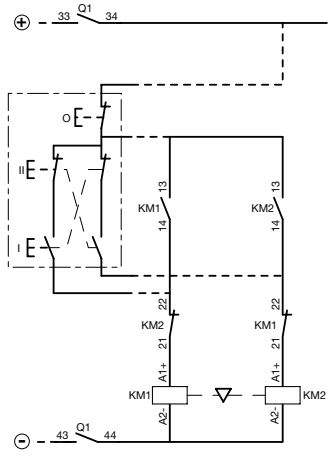
AC local control



AC remote control



DC local control



DC remote control

Reversing starters protected by MS116 manual motor starters

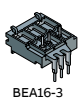
With AS contactors - open type version in kit form

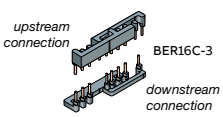
Coordination type 1 or type 2, AC-3, 16 kA or 50 kA, 400 V, 50/60 Hz

	Manual motor starters						Contactors				
	IEC AC-3, 400 V Rated operational power	current	Type	Order code	Current setting range	Magnetic tripping current	Rated control circuit voltage Uc (1)		Type	Order code	Allowed setting current
	kW	A			A	A	V 50 Hz	V 60 Hz			A
Coordination type 1											
Coordination type 2											
Iq = 16 kA											
Iq = 50 kA											
	0.06	0.2	MS116-0.25	1SAM250000R1002	0.16...0.25	2.44	24	24	AS09-30-01-20	1SBL101001R2001	0.25
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.09	0.3	MS116-0.4	1SAM250000R1003	0.25...0.40	3.9	24	24	AS09-30-01-20	1SBL101001R2001	0.4
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.12	0.44	MS116-0.63	1SAM250000R1004	0.40...0.63	6.14	24	24	AS09-30-01-20	1SBL101001R2001	0.63
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.18	0.6	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	24	AS09-30-01-20	1SBL101001R2001	1
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.25	0.85	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	24	AS09-30-01-20	1SBL101001R2001	1
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.37	1.1	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	24	AS09-30-01-20	1SBL101001R2001	1.6
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.55	1.5	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	24	AS09-30-01-20	1SBL101001R2001	1.6
							230	230	AS09-30-01-26	1SBL101001R2601	
	0.75	1.9	MS116-2.5	1SAM250000R1007	1.60...2.50	28.75	24	24	AS09-30-01-20	1SBL101001R2001	2.5
							230	230	AS09-30-01-26	1SBL101001R2601	
	1.1	2.7	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	24	AS09-30-01-20	1SBL101001R2001	4
							230	230	AS09-30-01-26	1SBL101001R2601	
	1.5	3.6	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	24	AS09-30-01-20	1SBL101001R2001	4
							230	230	AS09-30-01-26	1SBL101001R2601	
	2.2	4.9	MS116-6.3	1SAM250000R1009	4.00...6.30	78.75	24	24	AS09-30-01-20	1SBL101001R2001	6.3
							230	230	AS09-30-01-26	1SBL101001R2601	
	3	6.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	24	AS12-30-01-20	1SBL111001R2001	10
							230	230	AS12-30-01-26	1SBL111001R2601	
	4	8.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	24	AS12-30-01-20	1SBL111001R2001	10
							230	230	AS12-30-01-26	1SBL111001R2601	
	5.5	11.5	MS116-12	1SAM250000R1012	8.00...12.0	180	24	24	AS12-30-01-20	1SBL111001R2001	12
							230	230	AS12-30-01-26	1SBL111001R2601	
	7.5	15.5	MS116-16	1SAM250000R1011	10.0...16.0	240	24	24	AS16-30-01-20	1SBL121001R2001	15.5
							230	230	AS16-30-01-26	1SBL121001R2601	

Note: for multiple packaging, please contact your ABB local sales organization.

(1) Other control voltages see voltage code table.


BEA16-3




VM3

Main accessories

	Type	Order code
Connecting link for manual motor starter	BEA16-3	1SBN081006T1000
Connection set for reversing starter	BER16C-3	1SBN081012R1000
Mechanical interlock unit	VM3	1SBN031005T1000

1SBC101273S0201 - Rev. A

Reversing starters protected by MS116 manual motor starters

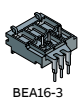
With ASL contactors - open type version in kit form

Coordination type 1 or type 2, AC-3, 16 or 50 kA, 400 V, 50/60 Hz

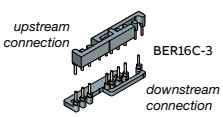
	Manual motor starters						Contactors			
	IEC AC-3, 400 V Rated operational power	current	Type	Order code	Current setting range	Magnetic tripping current	Rated control circuit voltage Uc (1)	Type	Order code	Allowed setting current
	kW	A			A	A	V DC			A
Coordination type 1										
Coordination type 2										
Iq = 16 kA										
Iq = 50 kA										
	0.06	0.2	MS116-0.25	1SAM250000R1002	0.16...0.25	2.44	24	ASL09-30-01-81	1SBL103001R8101	0.25
	0.09	0.3	MS116-0.4	1SAM250000R1003	0.25...0.40	3.9	24	ASL09-30-01-81	1SBL103001R8101	0.4
	0.12	0.44	MS116-0.63	1SAM250000R1004	0.40...0.63	6.14	24	ASL09-30-01-81	1SBL103001R8101	0.63
	0.18	0.6	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	ASL09-30-01-81	1SBL103001R8101	1
	0.25	0.85	MS116-1.0	1SAM250000R1005	0.63...1.00	11.5	24	ASL09-30-01-81	1SBL103001R8101	1
	0.37	1.1	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	ASL09-30-01-81	1SBL103001R8101	1.6
	0.55	1.5	MS116-1.6	1SAM250000R1006	1.00...1.60	18.4	24	ASL09-30-01-81	1SBL103001R8101	1.6
	0.75	1.9	MS116-2.5	1SAM250000R1007	1.60...2.50	28.75	24	ASL09-30-01-81	1SBL103001R8101	2.5
	1.1	2.7	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	ASL09-30-01-81	1SBL103001R8101	4
	1.5	3.6	MS116-4.0	1SAM250000R1008	2.50...4.00	50	24	ASL09-30-01-81	1SBL103001R8101	4
	2.2	4.9	MS116-6.3	1SAM250000R1009	4.00...6.30	78.75	24	ASL09-30-01-81	1SBL103001R8101	6.3
	3	6.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	ASL12-30-01-81	1SBL113001R8101	10
	4	8.5	MS116-10	1SAM250000R1010	6.30...10.0	150	24	ASL12-30-01-81	1SBL113001R8101	10
	5.5	11.5	MS116-12	1SAM250000R1012	8.00...12.0	180	24	ASL12-30-01-81	1SBL113001R8101	12
	7.5	15.5	MS116-16	1SAM250000R1011	10.0...16.0	240	24	ASL16-30-01-81	1SBL123001R8101	15.5

Note: for multiple packaging, please contact your ABB local sales organization.

(1) Other control voltages see voltage code table.



BEA16-3



VM3

Main accessories

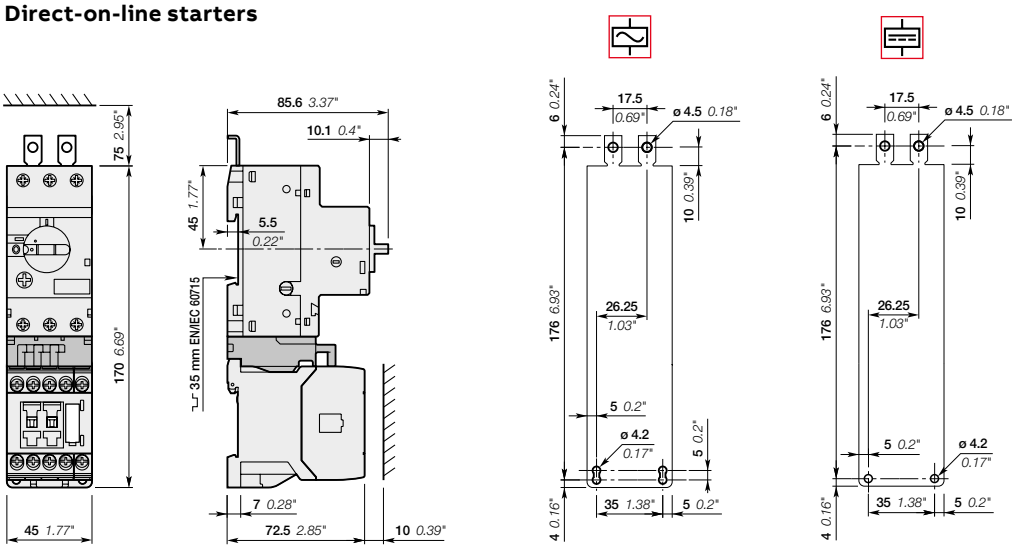
	Type	Order code
Connecting link for manual motor starter	BEA16-3	1SBN081006T1000
Connection set for reversing starter	BER16C-3	1SBN081012R1000
Mechanical interlock unit	VM3	1SBN031005T1000

1SBC101273S0201 - Rev. A

DOL starters protected by MS116 manual motor starters

With AS, ASL contactors - open type version in kit form

Direct-on-line starters



MS116
+ BEA16-3
+ AS09, ASL09, AS12, ASL12, AS16, ASL16

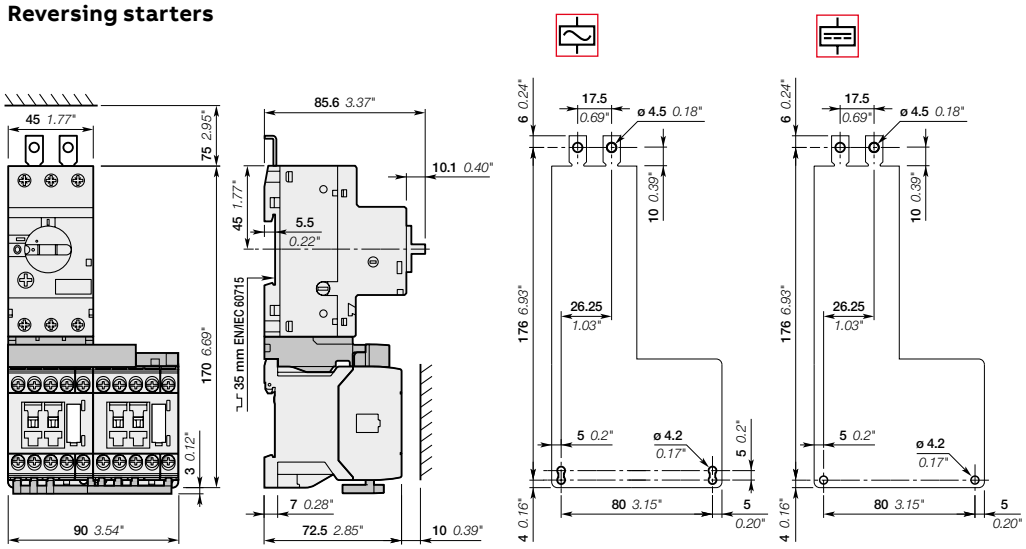
Main dimensions mm, inches

1SBC101279S0201

Reversing starters protected by MS116 manual motor starters

With AS, ASL contactors - open type version in kit form

Reversing starters



MS116
+ BEA16-3 + BER16C-3 + VM3
+ AS09, ASL09, AS12, ASL12, AS16, ASL16

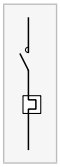
Main dimensions mm, inches

1SBC101278S0201

DOL & reversing starters protected by thermal overload relays

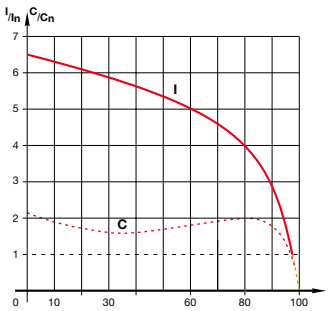
With AS, ASL contactors - open type version in kit form

AS09-30-10 + T16



Application

Full voltage direct-on-line and reversing starting for controlling three-phase asynchronous motors is a simple and economic solution characterised by a high starting torque (1.9 to 2.1 times full-speed torque) and a starting current 5.5 to 7 times nominal current.



I = current
C = torque
In = nominal current
Cn = nominal torque

AS09-30-01 + BER16C + VM3 + T16

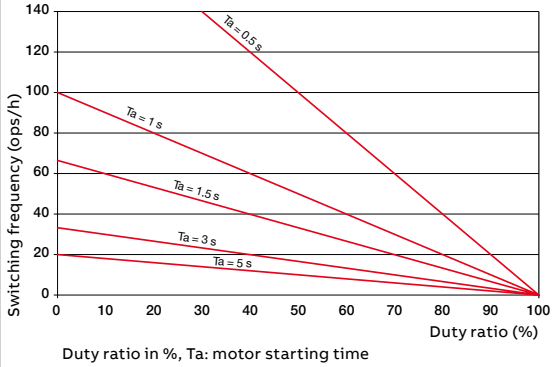
Coordination types

The contactor, the short-circuit protection device and the thermal overload relay control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

Type 2: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will be able to operate afterwards. The risk of contacts light welding is acceptable.

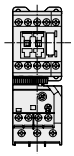
Main technical data

Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui according to IEC 60947-4-1	690 V
Air temperature close to the device	≤ 60 °C
Degree of protection	IP20
Switching frequency Thermal overload relays cannot be operated at any arbitrary switching frequency in order to avoid tripping. Applications involving up to 15 operations per hour are acceptable. Higher switching frequencies are permitted if the duty ratio and the motor starting time are allowed for and if the motor's making current does not appreciably exceed 6 times the rated operating current. Please refer to the adjacent diagram for guideline values for the permitted switching frequency. Example: Starting time of the motor: 1 second Duty ratio: 40 % means a permitted switching frequency of max. 60 operating cycles per hour.	 Duty ratio in %, Ta: motor starting time

Note: Minimum switchover delay of 50 ms must be introduced between respective opening and closing of AC operated reversing contactors

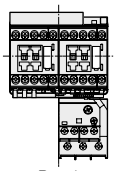
Mounting positions

Direct-on-line



Pos. 1

Reversing



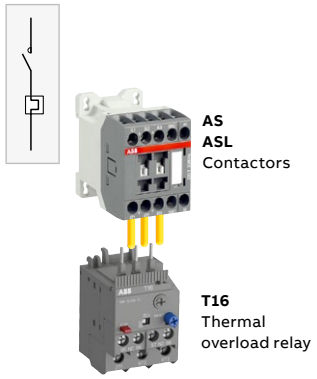
Pos. 1

1SBC101275S0201

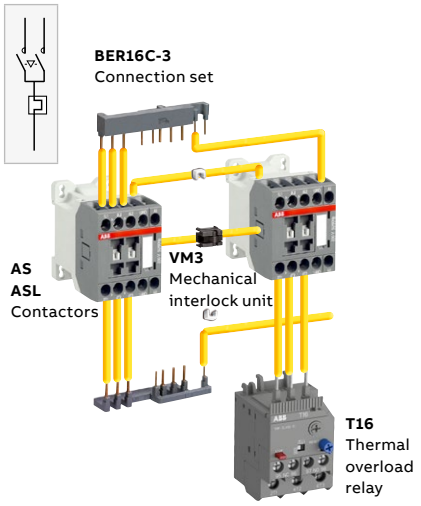
DOL & reversing starters protected by thermal overload relays

With AS, ASL contactors - open type version in kit form

Direct-on-line starters



Reversing starters



You can easily assemble a direct-on-line starter by connecting AS or ASL contactors and T16 thermal overload relay.
You can easily assemble reversing starter thanks to our complete range of accessories:

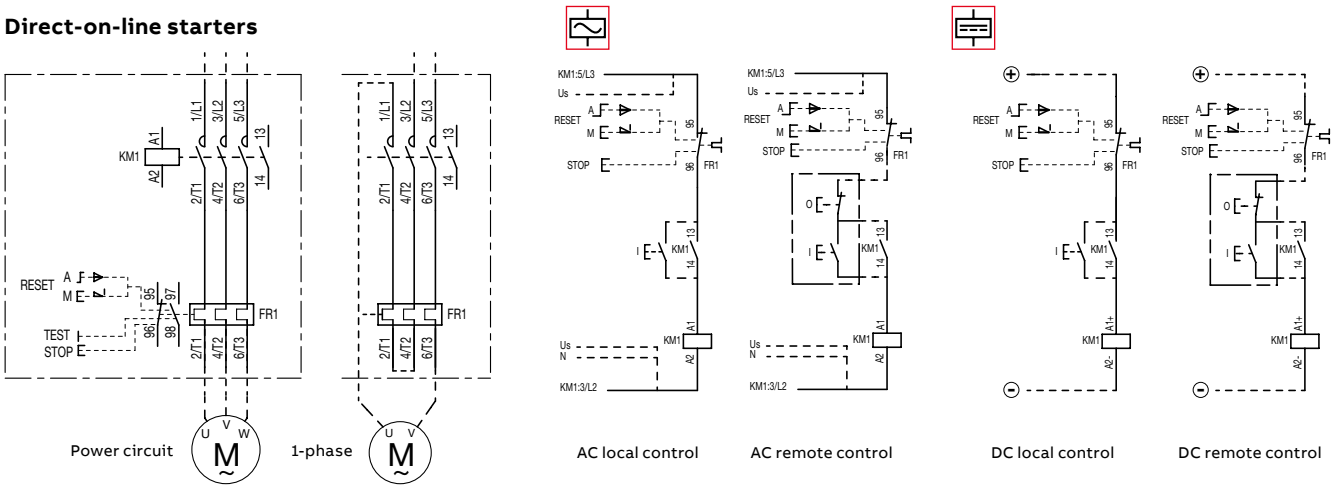
- VM3 mechanical interlock unit: just clip it between the 2 contactors without increasing starter length.
- BER16C-3 connection set: it assures a safe and simple reversing connection between both contactor main terminals and an electrical interlocking between coil and N.C. built-in auxiliary contact terminals of both contactors.

Select now easily and quickly your starter in the following pages at 400 V, up to 7.5 kW.

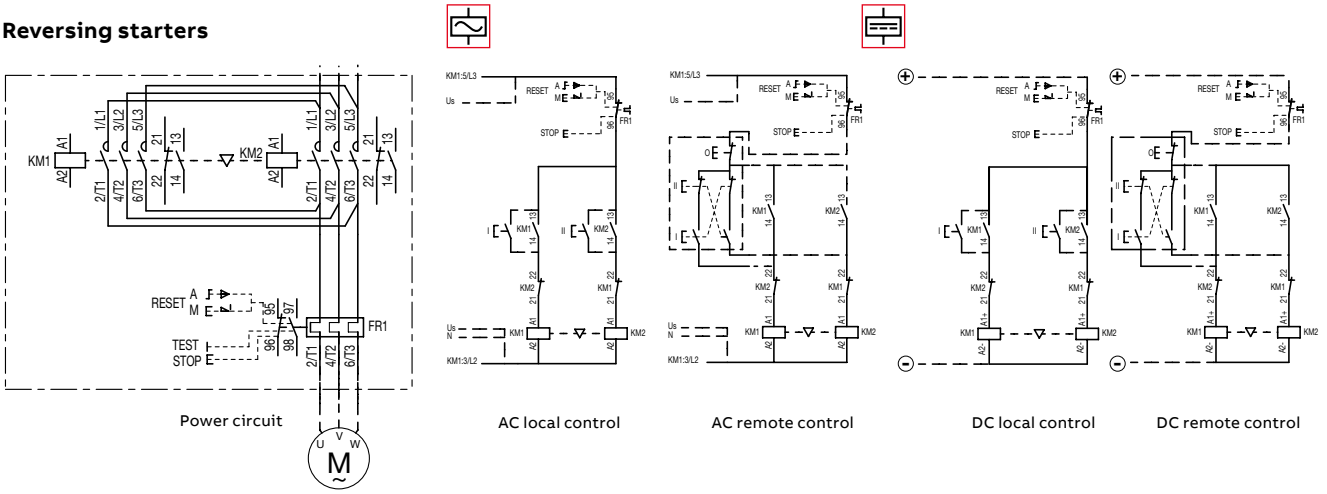
For complete coordination tables, please contact your ABB local sales organization.

Wiring diagrams

Direct-on-line starters



Reversing starters

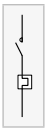


1SBC101275S0201

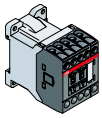
DOL starters protected by thermal overload relays

With AS, ASL contactors - open type version in kit form

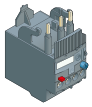
Contactors - AC operated



Contactors



Thermal overload relays



Accessories

IEC AC-3, 400 V Rated operational power kW	current A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Type	Order code	Setting ranges A ... A	Type	Order code	Accessories
4	8.5	24	24	AS09-30-10-20	1SBL101001R2010	7.60...10.0	T16-10	1SAZ711201R1043	-
		230	230	AS09-30-10-26	1SBL101001R2610				
5.5	11.5	24	24	AS12-30-10-20	1SBL111001R2010	10.0...13.0	T16-13	1SAZ711201R1045	-
		230	230	AS12-30-10-26	1SBL111001R2610				
7.5	15.5	24	24	AS16-30-10-20	1SBL121001R2010	13.0...16.0	T16-16	1SAZ711201R1047	-
		230	230	AS16-30-10-26	1SBL121001R2610				

Contactors - DC operated

IEC AC-3, 400 V Rated operational power kW	current A	Rated control circuit voltage Uc (1) DC	Type	Order code	Setting ranges A ... A	Type	Order code	Accessories
4	8.5	24	ASL09-30-10-81	1SBL103001R8110	7.60...10.0	T16-10	1SAZ711201R1043	-
5.5	11.5	24	ASL12-30-10-81	1SBL113001R8110	10.0...13.0	T16-13	1SAZ711201R1045	-
7.5	15.5	24	ASL16-30-10-81	1SBL123001R8110	13.0...16.0	T16-16	1SAZ711201R1047	-

Note: for multiple packaging, please contact your ABB local sales organization.
(1) Other control voltages see voltage code table.

see table below for all setting ranges

Setting ranges A ... A	Type	Order code
0.10...0.13	T16-0.13	1SAZ711201R1005
0.13...0.17	T16-0.17	1SAZ711201R1008
0.17...0.23	T16-0.23	1SAZ711201R1009
0.23...0.31	T16-0.31	1SAZ711201R1013
0.31...0.41	T16-0.41	1SAZ711201R1014
0.41...0.55	T16-0.55	1SAZ711201R1017
0.55...0.74	T16-0.74	1SAZ711201R1021
0.74...1.00	T16-1.0	1SAZ711201R1023
1.00...1.30	T16-1.3	1SAZ711201R1025
1.30...1.70	T16-1.7	1SAZ711201R1028
1.70...2.30	T16-2.3	1SAZ711201R1031
2.30...3.10	T16-3.1	1SAZ711201R1033
3.10...4.20	T16-4.2	1SAZ711201R1035
4.20...5.70	T16-5.7	1SAZ711201R1038
5.70...7.60	T16-7.6	1SAZ711201R1040
7.60...10.0	T16-10	1SAZ711201R1043
10.0...13.0	T16-13	1SAZ711201R1045
13.0...16.0	T16-16	1SAZ711201R1047

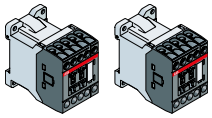
1SBC101280S0201 - Rev. A

Reversing starters protected by thermal overload relays

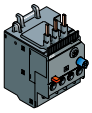
With AS, ASL contactors - open type version in kit form

Contactors - AC operated

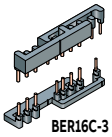
Contactors

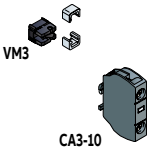


Thermal overload relays



Accessories





IEC AC-3, 400 V Rated operational power kW	current A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Type	Order code	Setting ranges A ... A	Type	Order code	Type	Order code
4	8.5	24	24	AS09-30-01-20	1SBL101001R2001	7.60...10.0	T16-10	1SAZ711201R1043	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010
		230	230	AS09-30-01-26	1SBL101001R2601					
5.5	11.5	24	24	AS12-30-01-20	1SBL111001R2001	10.0...13.0	T16-13	1SAZ711201R1045	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010
		230	230	AS12-30-01-26	1SBL111001R2601					
7.5	15.5	24	24	AS16-30-01-20	1SBL121001R2001	13.0...16.0	T16-16	1SAZ711201R1047	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010
		230	230	AS16-30-01-26	1SBL121001R2601					

Contactors - DC operated

IEC AC-3, 400 V Rated operational power kW	current A	Rated control circuit voltage Uc (1) DC	Type	Order code	Setting ranges A ... A	Type	Order code	Type	Order code
4	8.5	24	ASL09-30-10-81	1SBL103001R8110	7.60...10.0	T16-10	1SAZ711201R1043	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010
5.5	11.5	24	ASL12-30-10-81	1SBL113001R8110	10.0...13.0	T16-13	1SAZ711201R1045	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010
7.5	15.5	24	ASL16-30-10-81	1SBL123001R8110	13.0...16.0	T16-16	1SAZ711201R1047	BER16C-3 + VM3 + 2x CA3-10	1SBN081012R1000 + 1SBN031005T1000 + 1SBN011010T1010

Note: for multiple packaging, please contact your ABB local sales organization.
(1) Other control voltages see voltage code table.

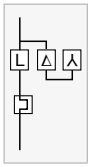
see table below for all setting ranges

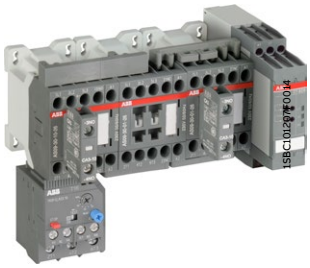
Setting ranges A ... A	Type	Order code
0.10...0.13	T16-0.13	1SAZ711201R1005
0.13...0.17	T16-0.17	1SAZ711201R1008
0.17...0.23	T16-0.23	1SAZ711201R1009
0.23...0.31	T16-0.31	1SAZ711201R1013
0.31...0.41	T16-0.41	1SAZ711201R1014
0.41...0.55	T16-0.55	1SAZ711201R1017
0.55...0.74	T16-0.74	1SAZ711201R1021
0.74...1.00	T16-1.0	1SAZ711201R1023
1.00...1.30	T16-1.3	1SAZ711201R1025
1.30...1.70	T16-1.7	1SAZ711201R1028
1.70...2.30	T16-2.3	1SAZ711201R1031
2.30...3.10	T16-3.1	1SAZ711201R1033
3.10...4.20	T16-4.2	1SAZ711201R1035
4.20...5.70	T16-5.7	1SAZ711201R1038
5.70...7.60	T16-7.6	1SAZ711201R1040
7.60...10.0	T16-10	1SAZ711201R1043
10.0...13.0	T16-13	1SAZ711201R1045
13.0...16.0	T16-16	1SAZ711201R1047

1SBC101280S0201 - Rev. A

Star-delta starters protected by thermal overload relays

With AS, ASL contactors - open type version in kit form





AS09-30-10 + AS09-30-01
+ AS09-30-01 + BEY16C-3 + VM3
+ CT-SDS + CA3-10 + T16

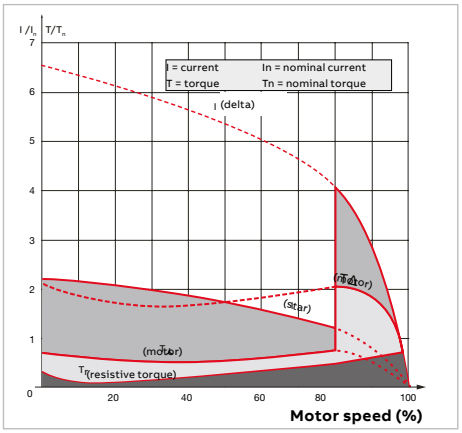
Application

Star-delta starting is the most common method to reduce the starting current of a motor. This system can be used on all the squirrel cage motors, which are normally used in delta connection. In this type of starting, it is recommended to choose motors having high starting torque i.e. much higher than the resistive torque in order to reach sufficient high speed when the motor is connected in star.

When starting:

- Inrush current is reduced to a third of direct starting current
- Motor torque is reduced to a third or even less of direct starting torque.

Transient current is generated when switching from star to delta connection.
During the initial starting phase ("star" connection), the resistive torque of the driven load must remain, irrespective of speed, less than the "star" motor torque until "star-delta" switching occurs. This starting mode is therefore ideal for machines having low starting torque such as pumps, centrifugal compressors, wood-working machines...



Precaution

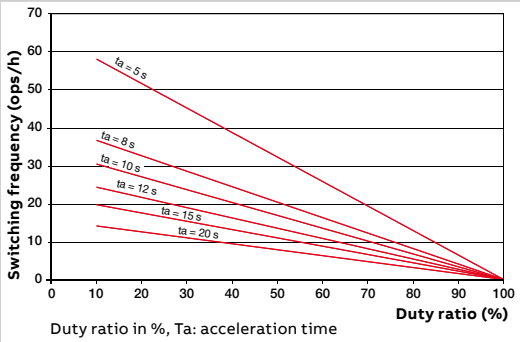
- Motor nominal voltage in delta connection must be equal to that of the mains.
  Example: a motor for 400 V star-delta starting must be designed for 400 V in "delta" connection. Its usual designation is "400 V / 690 V motor". The motor must be constructed with 6 terminal windings
- In order to prevent a high current peak, at least 85 % of nominal speed must be reached before switching from star to delta

Sequence

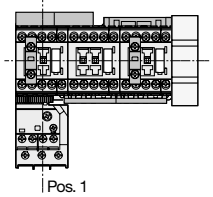
Starting is a three-stage process:

1st stage: "Star" connection - Press the "On" button on the control circuit to close the KM2 "Star" contactor. The KM1 "line" contactor then closes and the motor starts. Countdown of programmed starting time (6 to 10 s) then begins.
2nd stage: "Star" to "Delta" switching - when programmed starting time is over, the KM2 "Star" contactor opens.
3rd stage: "Delta" connection - A transition time (or dwelling time) of 50 ms is fixed between opening of the "star" contactor and closing of the "delta" contactor by the use of CT-SDS timer. This prevent short-circuit between "star" and "delta".

Main technical data

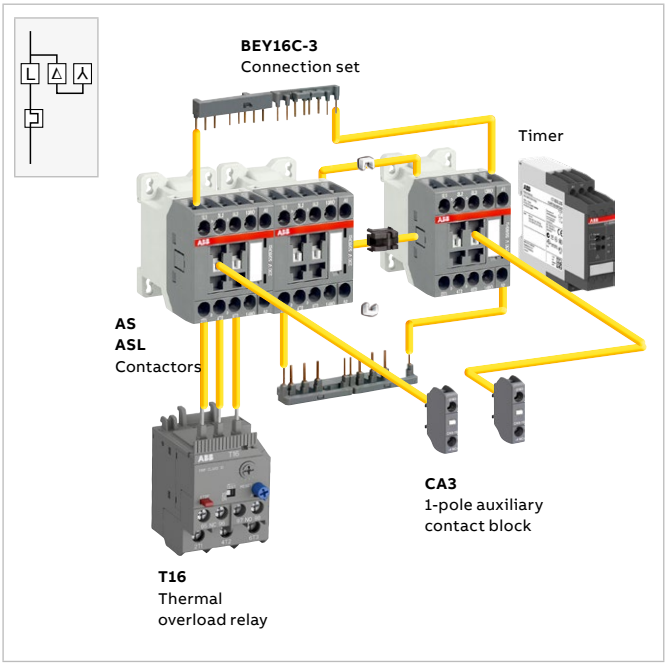
Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui according to IEC 60947-4-1	690 V
Air temperature close to the device	≤ 60 °C
Degree of protection	IP20
Switching frequency Switching frequency/hour, according to acceleration time and load factor. Respect of the following conditions enables utilization of the starter without excessive overheating of the connections or nuisance tripping of the thermal overload relay. Example: – Switching frequency = 15 starts/hr – Motor starting time "Ta" = 7 s (use 8 s curve) – Maximum load factor = 63 %. This corresponds to a 4-minute operating cycle (15 starts/hr) with 7 seconds acceleration, 2.5 minutes operation and 1.5 minutes rest.	 Duty ratio in %, Ta: acceleration time

Mounting positions



Star-delta starters protected by thermal overload relays

With AS, ASL contactors - open type version in kit form



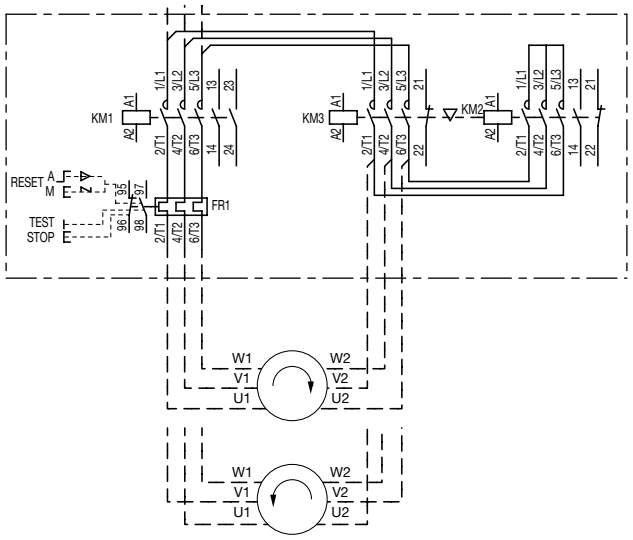
You can easily assemble a star-delta starter thanks to our complete range of accessories:

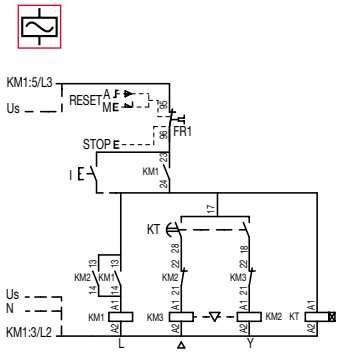
- VM3 mechanical interlock unit: just clip it between the 2 contactors without increasing starter length.
- BEY16C-3 connection set: it assures a safe and simple connection between contactors main terminals and an electrical interlocking between coil and N.C. built-in auxiliary contact terminals of star and delta contactors.

Select now easily and quickly your starter in the following pages at 400 V, up to 11 kW.

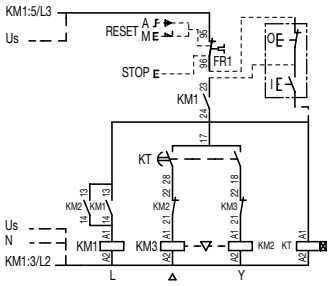
For complete coordination tables, please contact your ABB local sales organization.

Wiring diagrams

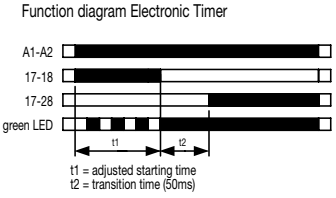


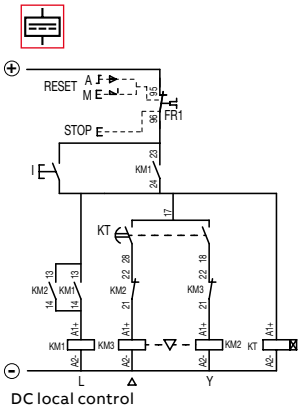


AC local control

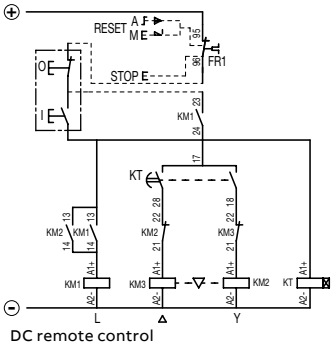


AC remote control





DC local control



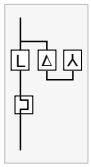
DC remote control

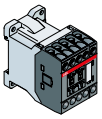
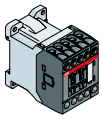
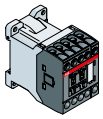
1SBC101288S0201

Star-delta starters protected by thermal overload relays

With AS, ASL contactors - open type version in kit form

Contactors - AC operated



				Line contactor KM1		Delta contactor KM3		Star contactor KM2	
									
IEC		**Rated control circuit voltage Uc (1)**		**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**
AC-3, 400 V Rated operational									
power	**current**								
kW	A	V 50 Hz	V 60 Hz						
7.5	15.5	24	24	AS09-30-10-20	1SBL101001R2010	AS09-30-01-20	1SBL101001R2001	AS09-30-01-20	1SBL101001R2001
		230	230	AS09-30-10-26	1SBL101001R2610	AS09-30-01-26	1SBL101001R2601	AS09-30-01-26	1SBL101001R2601
11	22	24	24	AS12-30-10-20	1SBL111001R2010	AS12-30-01-20	1SBL111001R2001	AS09-30-01-20	1SBL101001R2001
		230	230	AS12-30-10-26	1SBL111001R2610	AS12-30-01-26	1SBL111001R2601	AS09-30-01-26	1SBL101001R2601

Contactors - DC operated

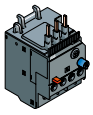
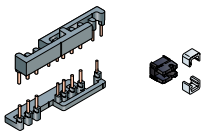
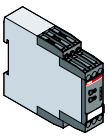
IEC		**Rated control circuit voltage Uc (1)**	**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**
AC-3, 400 V Rated operational								
power	**current**							
kW	A	DC						
7.5	15.5	24	ASL09-30-10-81	1SBL103001R8110	ASL09-30-01-81	1SBL103001R8101	ASL09-30-01-81	1SBL103001R8101
11	22	24	ASL12-30-10-81	1SBL113001R8110	ASL12-30-01-81	1SBL113001R8101	ASL09-30-01-81	1SBL103001R8101

Note: for multiple packaging, please contact your ABB local sales organization.
(1) Other control voltages see voltage code table.

1SBC101281S0201 - Rev. A

Star-delta starters protected by thermal overload relays

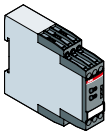
With AS, ASL contactors - open type version in kit form

	Thermal overload relays		Connection sets Mechanical interlock unit		Auxiliary contact block		Electronic timer	
	 The setting current value is: nominal motor current x 0.58							
Setting ranges A ... A	**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**
7.60...10.0	T16-10	1SAZ711201R1043	BEY16C-3 + VM3	1SBN081018R2000 + 1SBN031005T1000	KM1: 1 x CA3-10 KM2: 1 x CA3-10	1SBN011010T1010 1SBN011010T1010	CT-SDS...	see "Ordering Details"
10.0...13.0	T16-13	1SAZ711201R1045	BEY16C-3 + VM3	1SBN081018R2000 + 1SBN031005T1000	KM1: 1 x CA3-10 KM2: 1 x CA3-10	1SBN011010T1010 1SBN011010T1010	CT-SDS...	see "Ordering Details"

Setting ranges A ... A	**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**	**Type**	**Order code**
7.60...10.0	T16-10	1SAZ711201R1043	BEY16C-3 + VM3	1SBN081018R2000 + 1SBN031005T1000	KM1: 1 x CA3-10 KM2: 1 x CA3-10	1SBN011010T1010 1SBN011010T1010	CT-SDS...	see "Ordering Details"
10.0...13.0	T16-13	1SAZ711201R1045	BEY16C-3 + VM3	1SBN081018R2000 + 1SBN031005T1000	KM1: 1 x CA3-10 KM2: 1 x CA3-10	1SBN011010T1010 1SBN011010T1010	CT-SDS...	see "Ordering Details"

see table below for all setting ranges

Setting ranges A ... A	**Type**	**Order code**
0.10...0.13	T16-0.13	1SAZ711201R1005
0.13...0.17	T16-0.17	1SAZ711201R1008
0.17...0.23	T16-0.23	1SAZ711201R1009
0.23...0.31	T16-0.31	1SAZ711201R1013
0.31...0.41	T16-0.41	1SAZ711201R1014
0.41...0.55	T16-0.55	1SAZ711201R1017
0.55...0.74	T16-0.74	1SAZ711201R1021
0.74...1.00	T16-1.0	1SAZ711201R1023
1.00...1.30	T16-1.3	1SAZ711201R1025
1.30...1.70	T16-1.7	1SAZ711201R1028
1.70...2.30	T16-2.3	1SAZ711201R1031
2.30...3.10	T16-3.1	1SAZ711201R1033
3.10...4.20	T16-4.2	1SAZ711201R1035
4.20...5.70	T16-5.7	1SAZ711201R1038
5.70...7.60	T16-7.6	1SAZ711201R1040
7.60...10.0	T16-10	1SAZ711201R1043
10.0...13.0	T16-13	1SAZ711201R1045
13.0...16.0	T16-16	1SAZ711201R1047



CT-SDS...

Ordering details - Main accessories

		Type	Order code	Pkg qty	Weight (1 pce) kg
Electronic timer*	28-48 V DC 24-240 V AC	CT-SDS.22S	1SVR730210R3300	1	0.114
	380-440 V AC	CT-SDS.23S	1SVR730211R2300	1	0.118

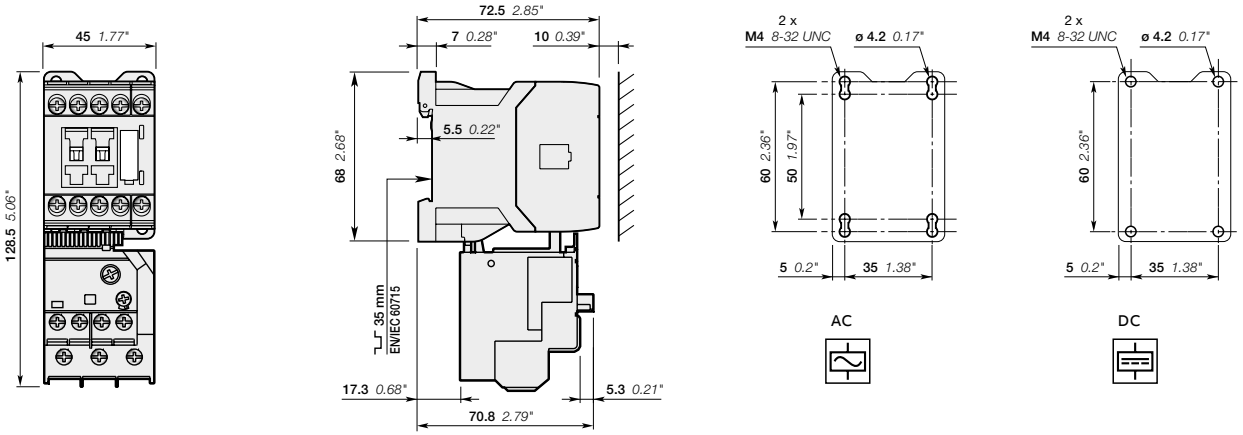
* 7 time ranges (0.05 s - 10 min), 50 ms transition time, 2 n/o contacts, 3 LEDs

1SBC101281S0201 - Rev. A

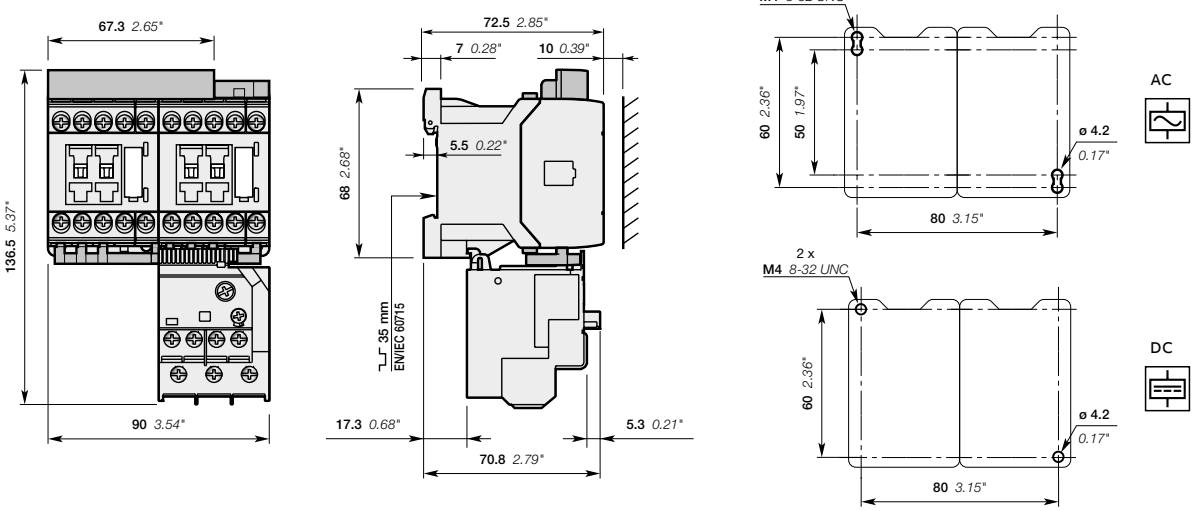
Protected by thermal overload relays

With AS, ASL contactors - open type version in kit form

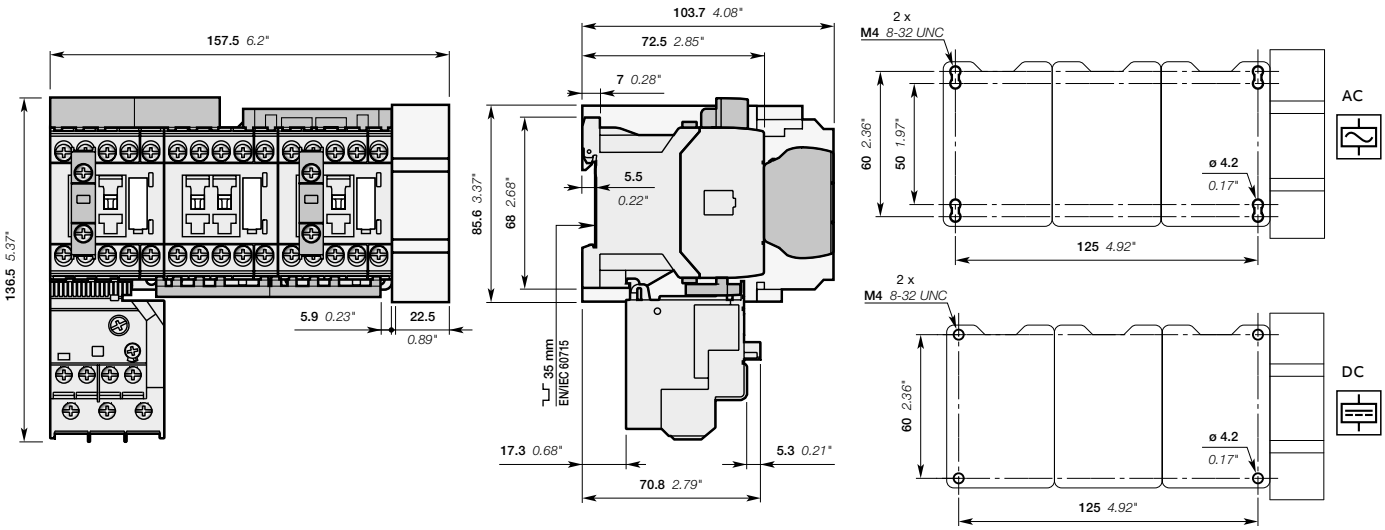
Direct-on-line starters



Reversing starters



Star-delta starters

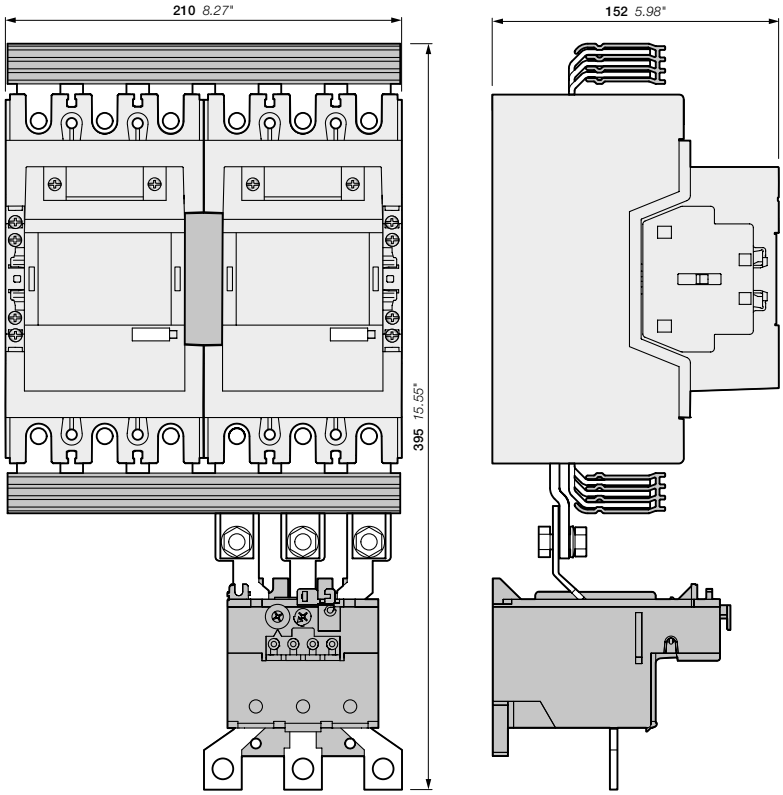


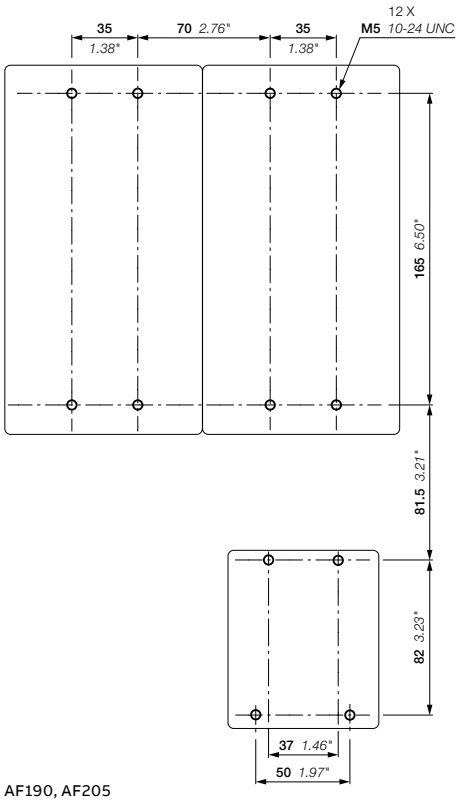
Main dimensions mm, inches

1SBC101293S0201

Reversing starters protected by thermal overload relays

With AF contactors - open type version in kit form





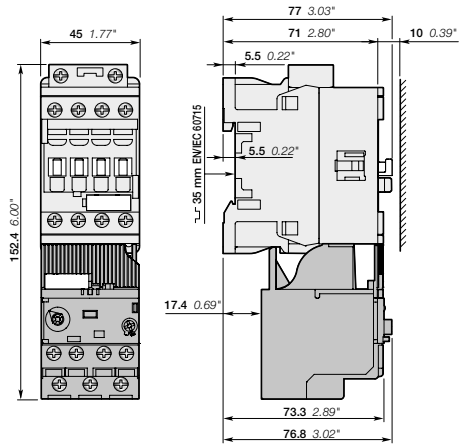
AF190, AF205
+ BER205-4, VM19
+ TA200DU thermal overload relay

Main dimensions mm, inches

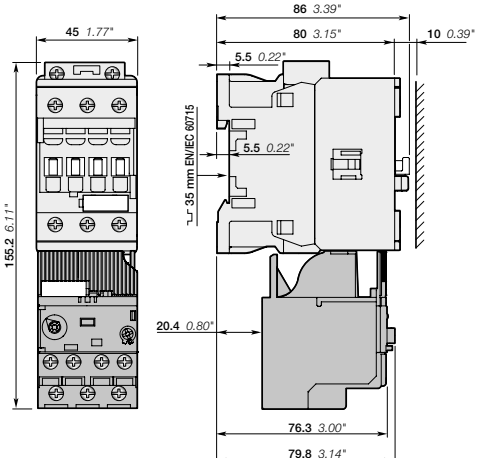
1SFC101159C0201

DOL starters protected by electronic overload relays

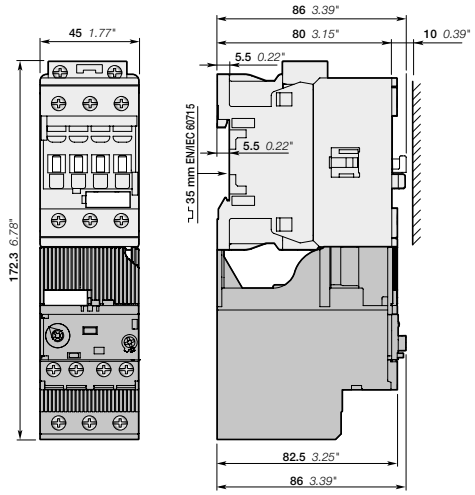
With AF contactors - open type version in kit form



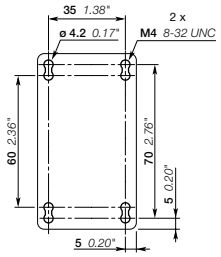
AF09, AF12, AF16
+ EF19 electronic overload relay



AF26, AF30, AF38
+ EF19 electronic overload relay



AF26, AF30, AF38
+ EF45 electronic overload relay



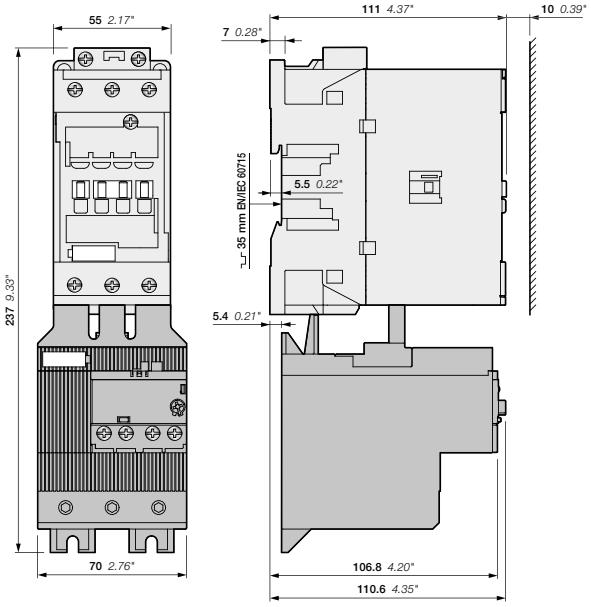
AF09, AF12, AF16, AF26, AF30, AF38
+ EF electronic overload relay

Note: contactor lateral distance to grounded component 2 mm 0.08" min.

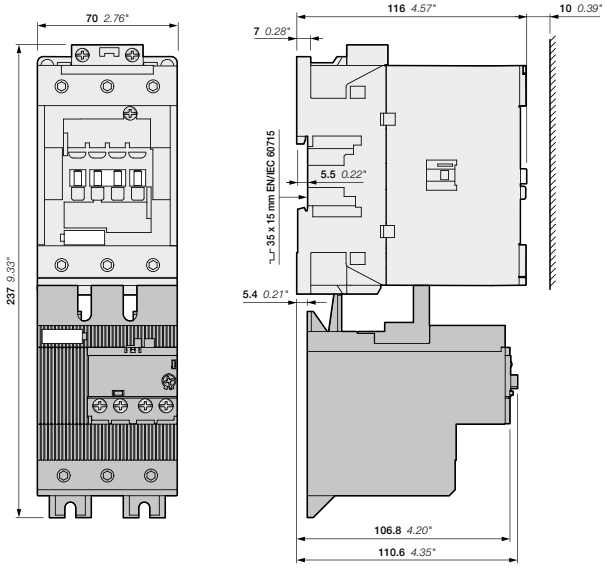
Main dimensions mm, inches

DOL starters protected by electronic overload relays

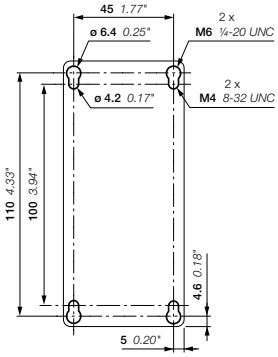
With AF contactors - open type version in kit form



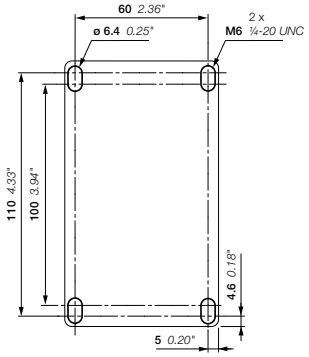
AF40, AF52, AF65
+ EF65 electronic overload relay



AF80, AF96
+ EF96 electronic overload relay



AF40, AF52, AF65
+ EF65 electronic overload relay



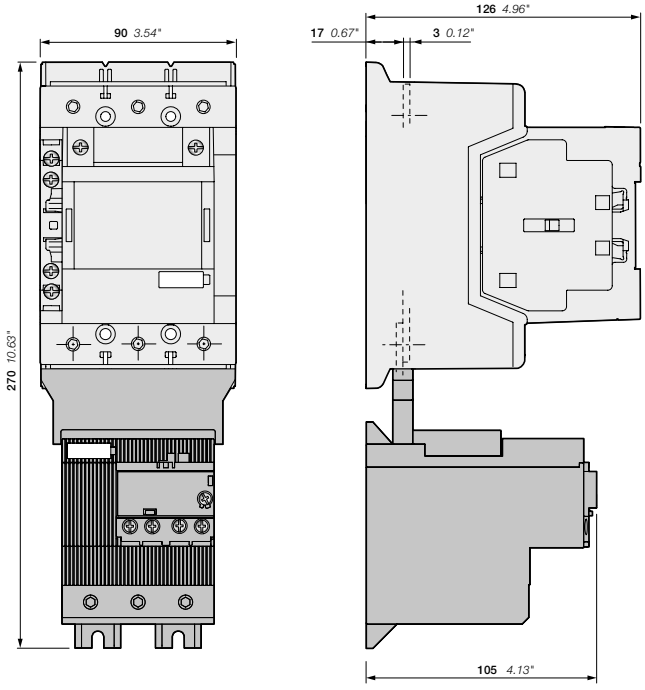
AF80, AF96
+ EF96 electronic overload relay

Main dimensions mm, inches

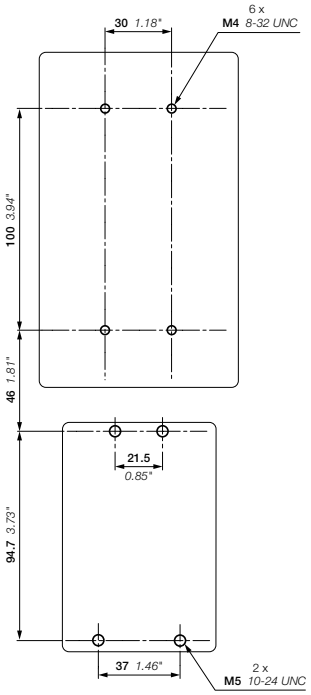
1SBC101951S0201

DOL starters protected by electronic overload relays

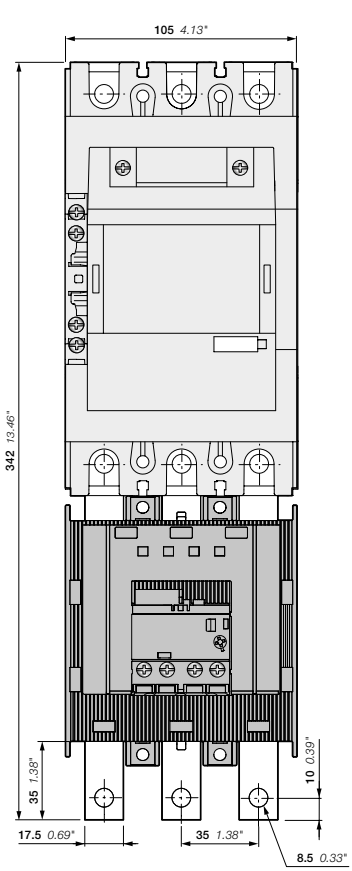
With AF contactors - open type version in kit form

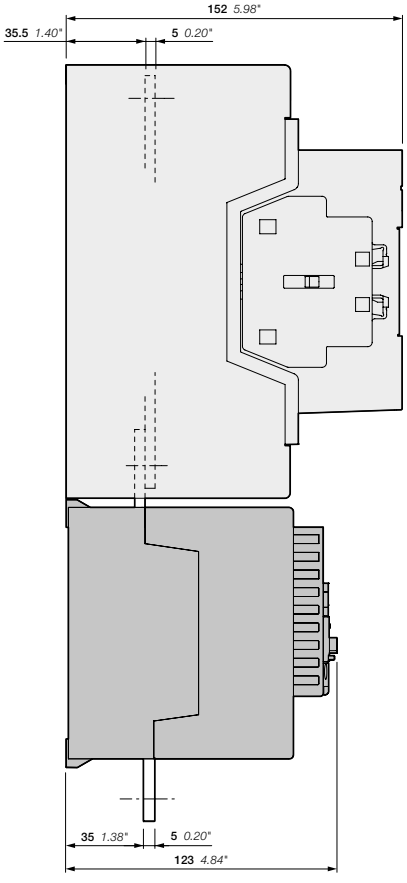


AF116, AF140, AF146-30-11(B)
+ EF146 electronic overload relay

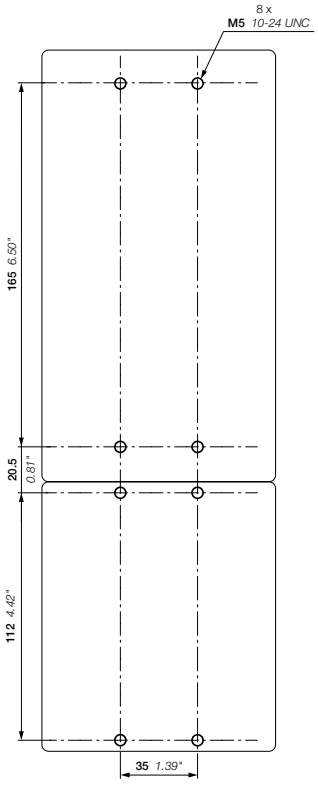


AF116, AF140, AF146-30-11(B)
+ EF146 electronic overload relay





AF190, AF205-30-11
+ EF205 electronic overload relay



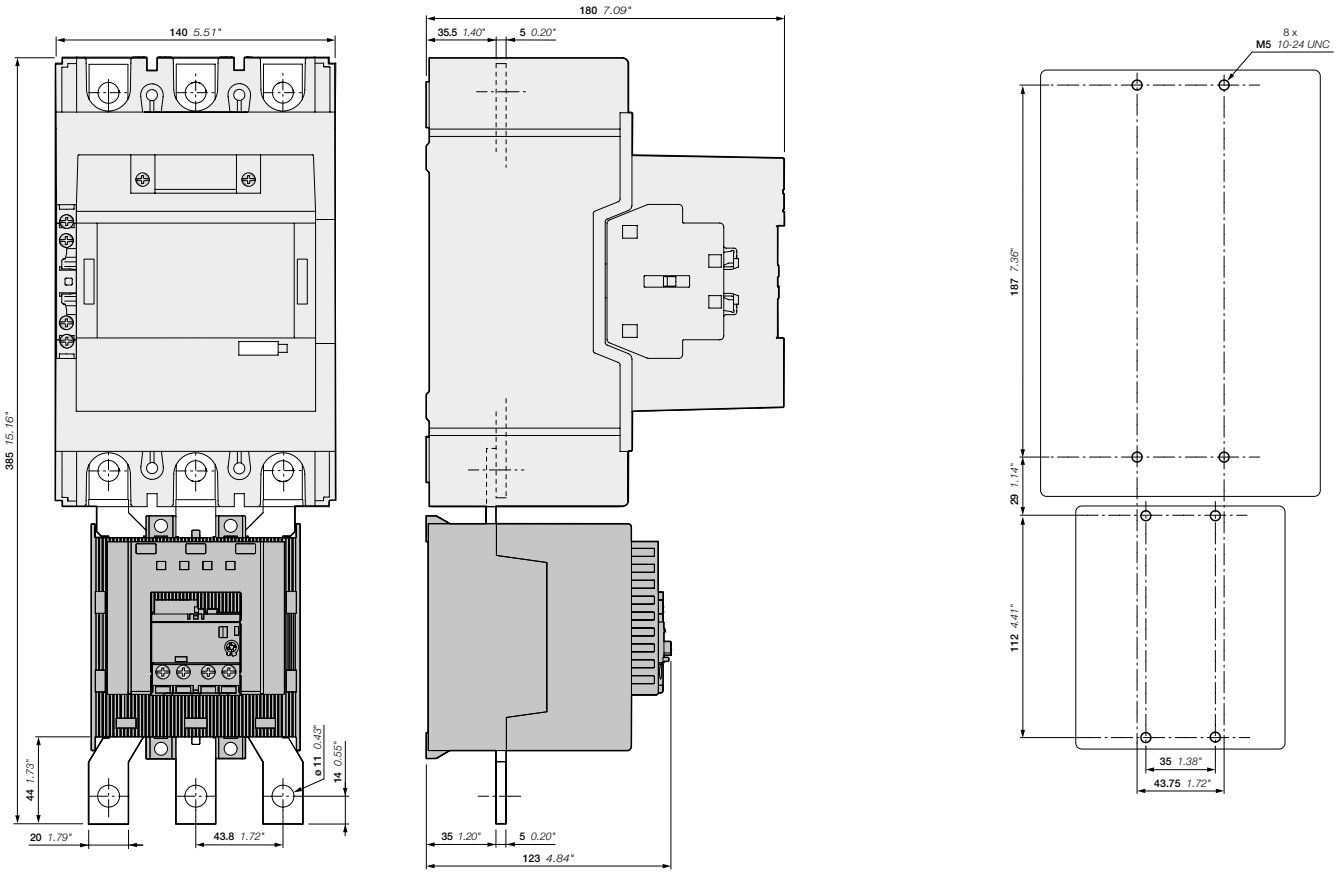
AF190, AF205
+ EF205 electronic overload relay

Main dimensions mm, inches

1SFC101161C0201

DOL starters protected by electronic overload relays

With AF contactors - open type version in kit form



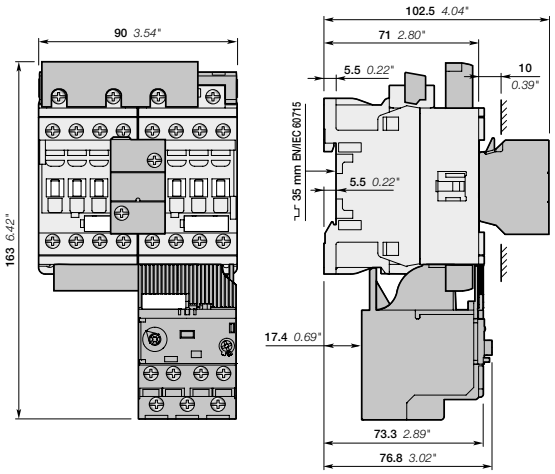
AF265, AF305, AF370-30-11
+ EF370 electronic overload relay

Main dimensions mm, inches

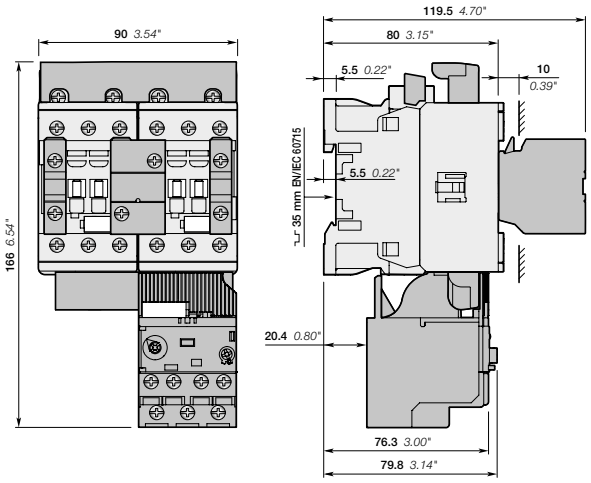
1SFC101157C0201

Reversing starters protected by electronic overload relays

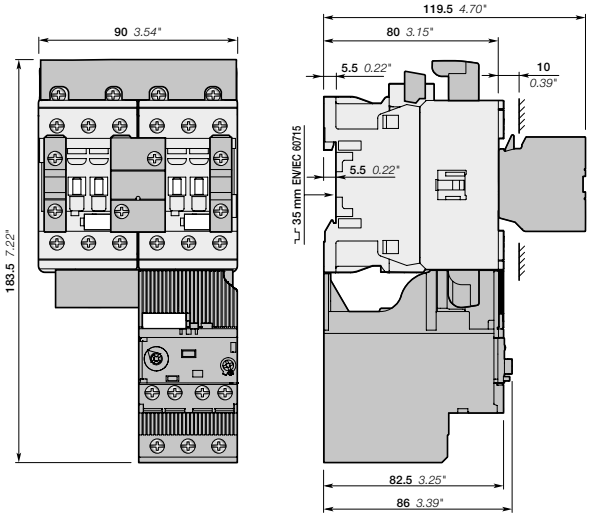
With AF contactors - open type version in kit form



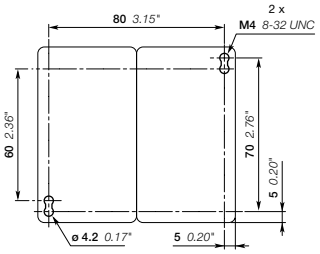
AF09, AF12, AF16
+ BER16-4, VEM4
+ EF19 electronic overload relay



AF26, AF30, AF38
+ BER38-4, VEM4, CA4-10
+ EF19 electronic overload relay



AF26, AF30, AF38
+ BER38-4, VEM4, CA4-10
+ EF45 electronic overload relay



AF09, AF12, AF16, AF26, AF30, AF38

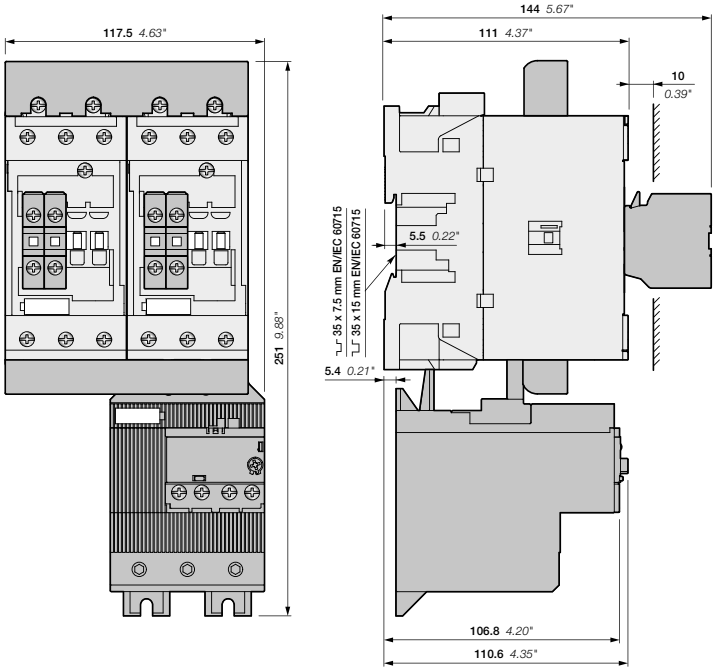
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

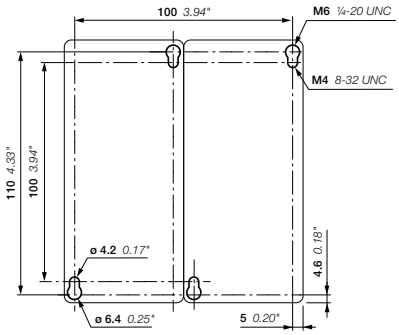
1SBC101925O201

Reversing starters protected by electronic overload relays

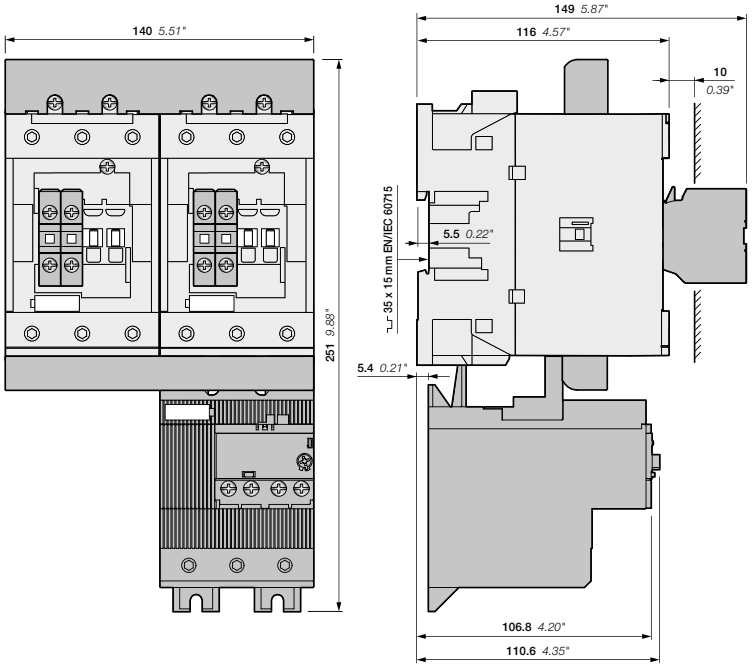
With AF contactors - open type version in kit form



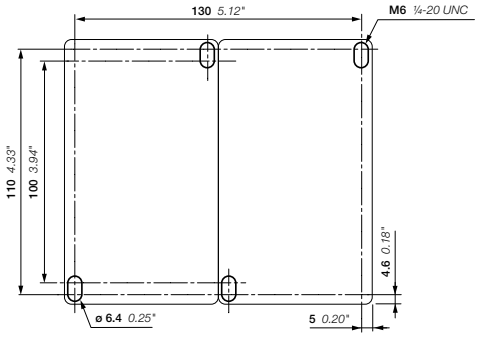
AF40, AF52, AF65
+ BER65-4, VM96-4
+ EF65 electronic overload relay



AF40, AF52, AF65
+ BER65-4, VM96-4
+ EF65 electronic overload relay



AF80, AF96
+ BER96-4, VM96-4
+ EF96 electronic overload relay



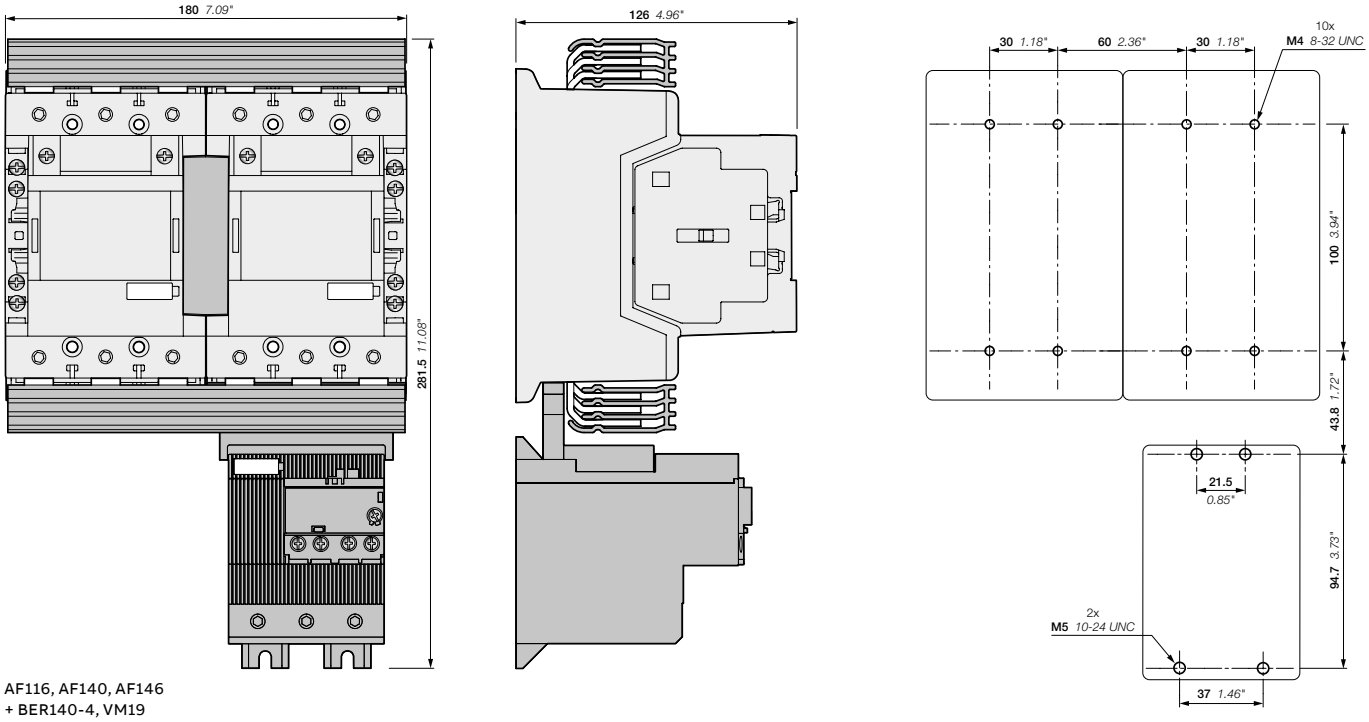
AF80, AF96
+ BER96-4, VM96-4
+ EF96 electronic overload relay

Main dimensions mm, inches

1SBC101953S0201 - Rev. A

Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form



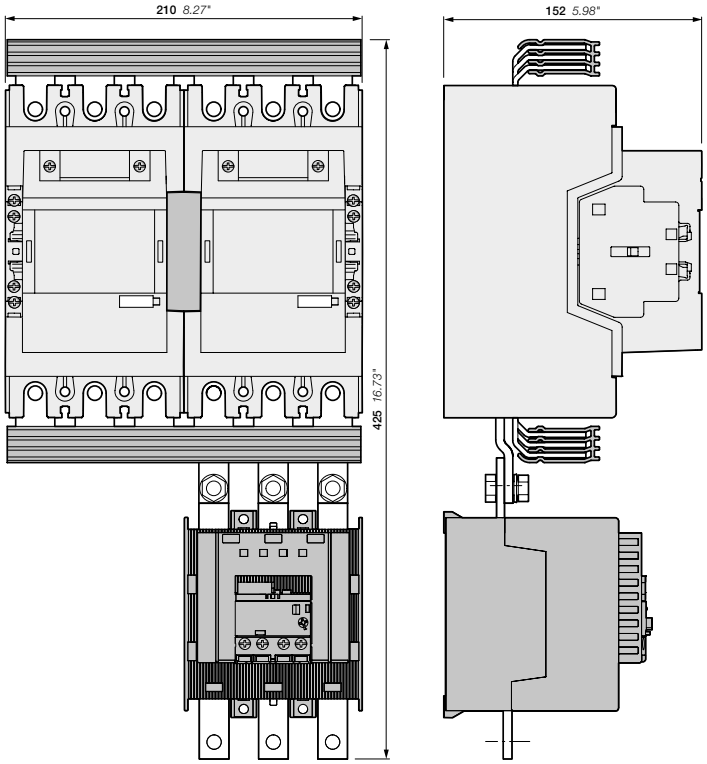
AF116, AF140, AF146
+ BER140-4, VM19
+ EF146 electronic overload relay

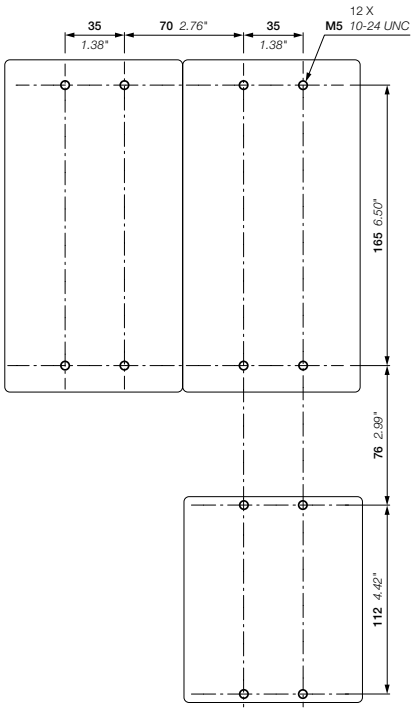
Main dimensions mm, inches

1SFC101162C0201

Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form





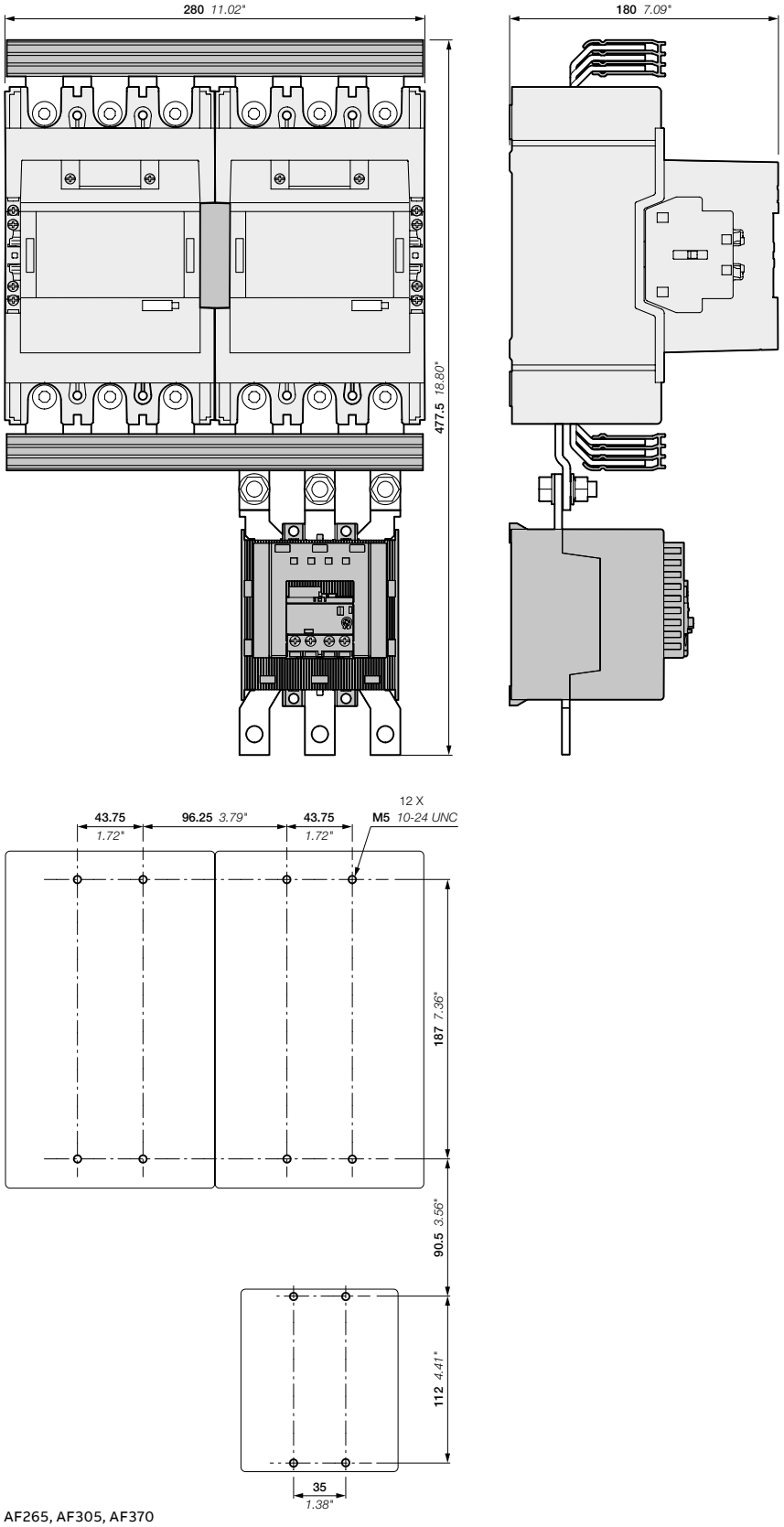
AF190, AF205
+ BER205-4, VM19
+ EF205 electronic overload relay

Main dimensions mm, inches

1SFC101163C0201

Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form

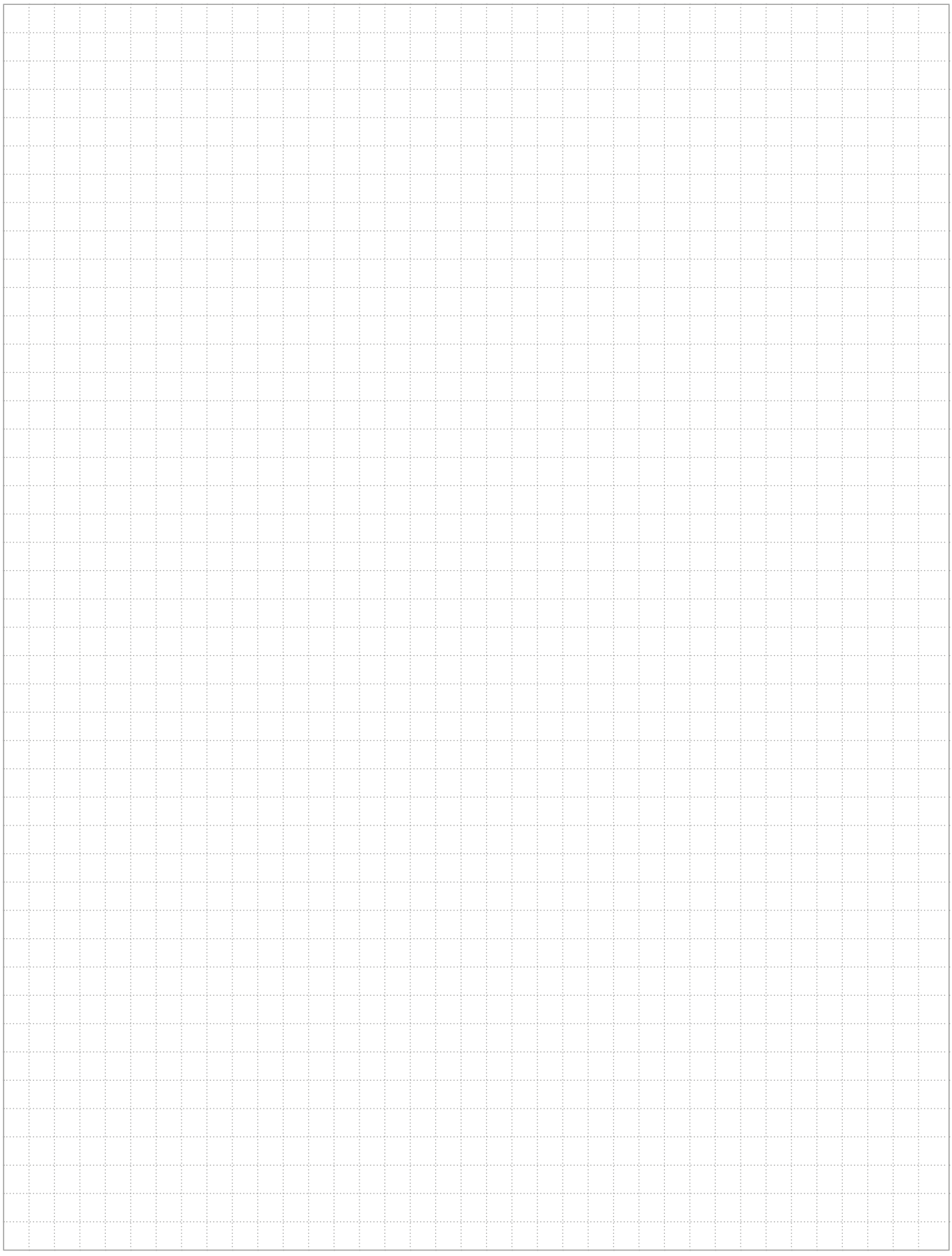


AF265, AF305, AF370
+ BER370-4, VM19
+ EF370 electronic overload relay

Main dimensions mm, inches

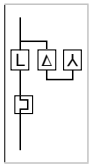
1SFC101160C0201

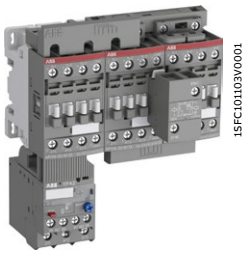
Notes



Star-delta starters protected by overload relays

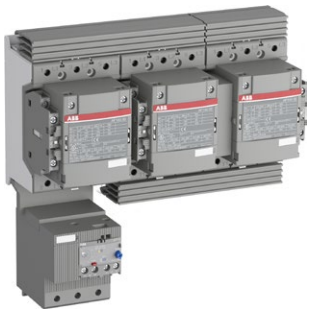
With AF contactors - Open type version in kit form





1SFC101103V0001

AF16-30-10 + AF16-30-10 +
AF09-30-10 + BEY16-4 + VEM4 + TF42

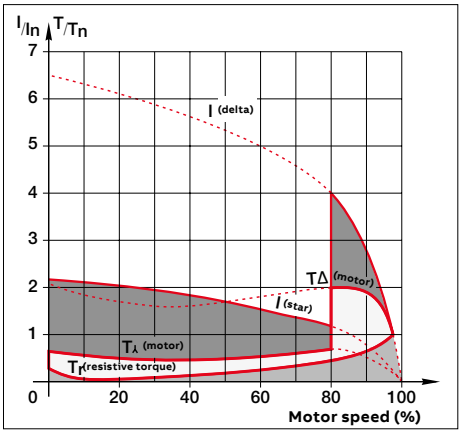


1SFC101104V0001

AF140-30-11 + AF140-30-11 +
AF140-30-11 + BEY140-4 + VM19 + EF146

Application

Star-delta starting is the most common method to reduce the starting current of a motor. This system can be used on all the squirrel cage motors, which are normally used in delta connection. In this type of starting, it is recommended to choose motors having high starting torque i.e. much higher than the resistive torque in order to reach sufficient high speed when the motor is connected in star.



I = current
T = torque

In = nominal current
Tn = nominal torque

When starting:

- Inrush current is reduced to a third of direct starting current
- Motor torque is reduced to a third or even less of direct starting torque.

Transient current is generated when switching from star to delta connection.
During the initial starting phase ("star" connection), the resistive torque of the driven load must remain, irrespective of speed, less than the "star" motor torque until "star-delta" switching occurs.
This starting mode is therefore ideal for machines having low starting torque such as pumps, centrifugal compressors, wood-working machines...

Precaution

- Motor nominal voltage in delta connection must be equal to that of the mains. Example: a motor for 400 V star-delta starting must be designed for 400 V in "delta" connection. Its usual designation is "400 V / 690 V motor". The motor must be constructed with 6 terminal windings
- In order to prevent a high current peak, at least 85 % of nominal speed must be reached before switching from star to delta

Sequence

Starting is a three-stage process:

1st stage: "Star" connection - Press the "On" button on the control circuit to close the KM2 "Star" contactor. The KM1 "line" contactor then closes and the motor starts. Countdown of programmed starting time (6 to 10 s) then begins.

2nd stage: "Star" to "Delta" switching - when programmed starting time is over, the KM2 "Star" contactor opens.

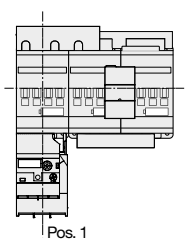
3rd stage: "Delta" connection - Thanks to AF contactors, a transition time (or dwelling time) of 50 ms is already integrated between the opening of the "star" contactor and closing of the "delta" contactor.

Conclusion: An on-delay timer without dwelling time (e.g.: CT-ERS.21S or TEF4-ON) is enough to countdown the programmed starting time (6 to 10 s) during "Star connection". The use of a star-delta timer including a dwelling time is not permitted.

Main Technical Data

Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage Ue max.	690 V - 50/60 Hz
Rated insulation voltage Ui	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Ambient air temperature	
Close to the device	≤ 60 °C (TF42: 38 A above ≤ 50 °C)
Degree of protection	IP20
Switching frequency	Refer to "Switching frequency diagrams" page

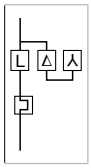
Mounting positions



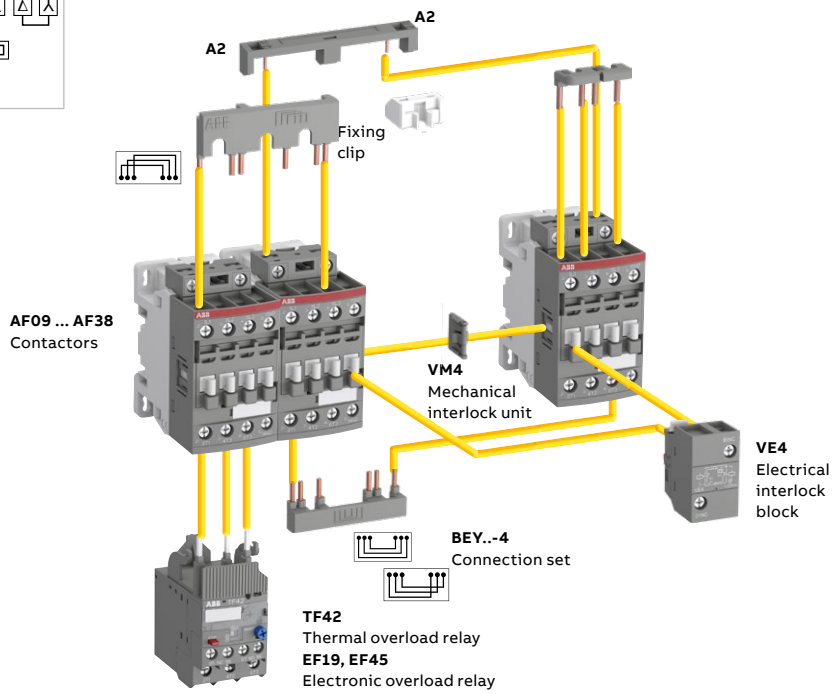
1SBC101956B0201

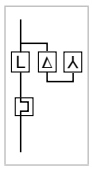
Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form

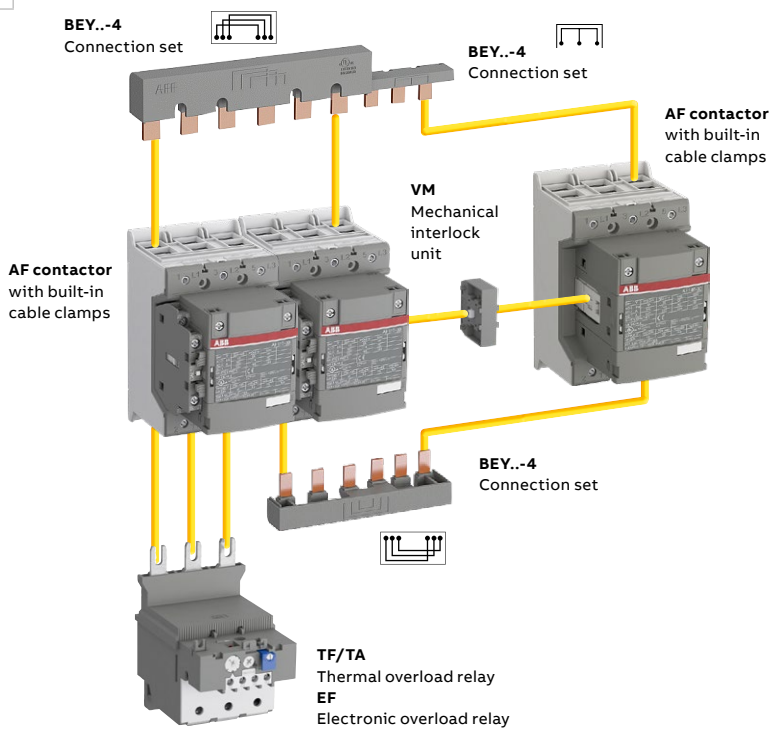


Star-delta starters for AF09 ... AF38





Star-delta starters for AF116 ... AF370



You can easily assemble star-delta starter thanks to our complete range of accessories:

- For AF09 ... AF38, use VEM4 mechanical and electrical interlock set without increasing starter width. It includes:
  - VM4 mechanical interlock unit and 2 fixing clips
  - VE4 electrical interlock block with A2-A2 connection.
- For AF40 ... AF370, use VM mechanical interlock unit and additional auxiliary contact blocks for electrical interlocking.
- BEY..-4 connection set: it assures a safe and simple connection between both contactor main terminals.

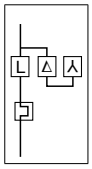
Select now easily and quickly your starter in the following pages at 400 V, up to 200 kW.

For the full coordination tables: **www.abb.com/lowvoltage** then go to the right menu: "**Support**", select: "**Online Product Selection Tools**" then select "**Coordination Tables for motor protection**"

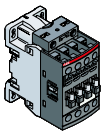
1SBC101956S0201

Star-delta starters protected by thermal overload relays

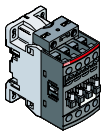
With AF contactors - Open type version in kit form



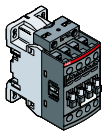
Line contactor KM1



Delta contactor KM3

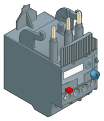


Star contactor KM2

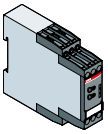


IEC		Control voltage Uc min. ... Uc max. (1)		Line contactor KM1		Delta contactor KM3		Star contactor KM2	
AC-3				Type	Order code	Type	Order code	Type	Order code
Rated power 400 V	Rated current 400 V								
kW	A	V 50/60 Hz	V DC						
7.5	15.5	24...60	20...60	AF09Z-30-10-21	1SBL136001R2110	AF09Z-30-10-21	1SBL136001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF09-30-10-13	1SBL137001R1310	AF09-30-10-13	1SBL137001R1310	AF09-30-10-13	1SBL137001R1310
11	22	24...60	20...60	AF12Z-30-10-21	1SBL156001R2110	AF12Z-30-10-21	1SBL156001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF12-30-10-13	1SBL157001R1310	AF12-30-10-13	1SBL157001R1310	AF09-30-10-13	1SBL137001R1310
15	29	24...60	20...60	AF16Z-30-10-21	1SBL176001R2110	AF16Z-30-10-21	1SBL176001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF16-30-10-13	1SBL177001R1310	AF16-30-10-13	1SBL177001R1310	AF09-30-10-13	1SBL137001R1310
18.5	35	24...60	20...60	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300
22	41	24...60	20...60	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300
25	47	24...60	20...60	AF30Z-30-00-21	1SBL276001R2100	AF30Z-30-00-21	1SBL276001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF30-30-00-13	1SBL277001R1300	AF30-30-00-13	1SBL277001R1300	AF26-30-00-13	1SBL237001R1300
37	66	24...60	20...60	AF40-30-00-11	1SBL347001R1100	AF40-30-00-11	1SBL347001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF40-30-00-13	1SBL347001R1300	AF40-30-00-13	1SBL347001R1300	AF40-30-00-13	1SBL347001R1300
45	80	24...60	20...60	AF52-30-00-11	1SBL367001R1100	AF52-30-00-11	1SBL367001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF52-30-00-13	1SBL367001R1300	AF52-30-00-13	1SBL367001R1300	AF40-30-00-13	1SBL347001R1300
55	97	24...60	20...60	AF65-30-00-11	1SBL387001R1100	AF65-30-00-11	1SBL387001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF65-30-00-13	1SBL387001R1300	AF65-30-00-13	1SBL387001R1300	AF40-30-00-13	1SBL347001R1300
75	132	24...60	20...60	AF80-30-00-11	1SBL397001R1100	AF80-30-00-11	1SBL397001R1100	AF52-30-00-11	1SBL367001R1100
		100...250	100...250	AF80-30-00-13	1SBL397001R1300	AF80-30-00-13	1SBL397001R1300	AF52-30-00-13	1SBL367001R1300
90	160	24...60	20...60	AF96-30-00-11	1SBL407001R1100	AF96-30-00-11	1SBL407001R1100	AF65-30-00-11	1SBL387001R1100
		100...250	100...250	AF96-30-00-13	1SBL407001R1300	AF96-30-00-13	1SBL407001R1300	AF65-30-00-13	1SBL387001R1300
110	195	24...60	20...60	AF116-30-11-11	1SFL427001R1111	AF116-30-11-11	1SFL427001R1111	AF116-30-11-11 (4)	1SFL427001R1111
		100...250	100...250	AF116-30-11-13	1SFL427001R1311	AF116-30-11-13	1SFL427001R1311	AF116-30-11-13	1SFL427001R1311
132	230	24...60	20...60	AF140-30-11-11	1SFL447001R1111	AF140-30-11-11	1SFL447001R1111	AF116-30-11-11	1SFL427001R1111
		100...250	100...250	AF140-30-11-13	1SFL447001R1311	AF140-30-11-13	1SFL447001R1311	AF116-30-11-13	1SFL427001R1311
160	280	24...60	20...60	AF190-30-11-11	1SFL487002R1111	AF190-30-11-11	1SFL487002R1111	AF140-30-11-11	1SFL447001R1111
		100...250	100...250	AF190-30-11-13	1SFL487002R1311	AF190-30-11-13	1SFL487002R1311	AF140-30-11-13	1SFL447001R1311

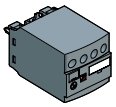
Thermal overload relays (2)



Electronic timers (3)



CT-ERS

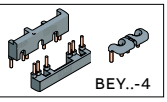


TEF4-ON

Uc = 24...240 V
50/60 Hz or DC

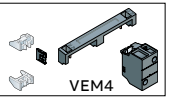
Accessories

Connection sets



BEY..-4

Mechanical and electrical interlock sets



VEM4

Auxiliary contact blocks

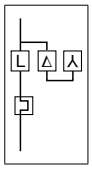
CA4

Setting ranges A	Type	Order code	Type	Order code	Type	Order code	Type	Order code
7.60...10.0	TF42-10	1SAZ721201R1043	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
10.0...13.0	TF42-13	1SAZ721201R1045	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
16.0...20.0	TF42-20	1SAZ721201R1049	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
20.0...24.0	TF42-24	1SAZ721201R1051	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
20.0...24.0	TF42-24	1SAZ721201R1051	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
24.0...29.0	TF42-29	1SAZ721201R1052	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
30.0...40.0	TF65-40	1SAZ811201R1003	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
36.0...47.0	TF65-47	1SAZ811201R1004	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
50.0...60.0	TF65-60	1SAZ811201R1006	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
65.0...78.0	TF96-78	1SAZ911201R1004	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY96-4 + VM96-4	1SBN083913R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
84.0...96.0	TF96-96	1SAZ911201R1006	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY96-4 + VM96-4	1SBN083913R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
100...135	TF140DU-135	1SAZ431201R1003	CT-ERS.21S	1SVR730100R0300	BEY140-4 + VM19	1SFN084413R1000 1SFN030300R1000	-	-
100...135	TF140DU-135	1SAZ431201R1003	CT-ERS.21S	1SVR730100R0300	BEY140-4 + VM19	1SFN084413R1000 1SFN030300R1000	-	-
130...175	TA200DU-175	1SAZ421201R1005	CT-ERS.21S	1SVR730100R0300	BEY190-4 + VM140/190	1SFN084813R1000 1SFN034403R1000	-	-

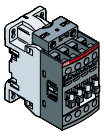
1SBC101959S0201

Star-delta starters protected by electronic overload relays

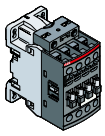
With AF contactors - Open type version in kit form



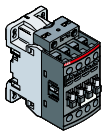
Line contactor KM1



Delta contactor KM3



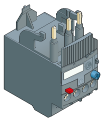
Star contactor KM2



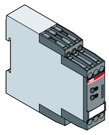
IEC AC-3 Rated power 400 V kW	Rated current 400 V A	Control voltage Uc min. ... Uc max. (1) V 50/60 Hz	V DC	Type	Order code	Type	Order code	Type	Order code
7.5	15.5	24...60	20...60	AF09Z-30-10-21	1SBL136001R2110	AF09Z-30-10-21	1SBL136001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF09-30-10-13	1SBL137001R1310	AF09-30-10-13	1SBL137001R1310	AF09-30-10-13	1SBL137001R1310
11	22	24...60	20...60	AF12Z-30-10-21	1SBL156001R2110	AF12Z-30-10-21	1SBL156001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF12-30-10-13	1SBL157001R1310	AF12-30-10-13	1SBL157001R1310	AF09-30-10-13	1SBL137001R1310
15	29	24...60	20...60	AF16Z-30-10-21	1SBL176001R2110	AF16Z-30-10-21	1SBL176001R2110	AF09Z-30-10-21	1SBL136001R2110
		100...250	100...250	AF16-30-10-13	1SBL177001R1310	AF16-30-10-13	1SBL177001R1310	AF09-30-10-13	1SBL137001R1310
18.5	35	24...60	20...60	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300
22	41	24...60	20...60	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300	AF26-30-00-13	1SBL237001R1300
25	47	24...60	20...60	AF30Z-30-00-21	1SBL276001R2100	AF30Z-30-00-21	1SBL276001R2100	AF26Z-30-00-21	1SBL236001R2100
		100...250	100...250	AF30-30-00-13	1SBL277001R1300	AF30-30-00-13	1SBL277001R1300	AF26-30-00-13	1SBL237001R1300
37	66	24...60	20...60	AF40-30-00-11	1SBL347001R1100	AF40-30-00-11	1SBL347001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF40-30-00-13	1SBL347001R1300	AF40-30-00-13	1SBL347001R1300	AF40-30-00-13	1SBL347001R1300
45	80	24...60	20...60	AF52-30-00-11	1SBL367001R1100	AF52-30-00-11	1SBL367001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF52-30-00-13	1SBL367001R1300	AF52-30-00-13	1SBL367001R1300	AF40-30-00-13	1SBL347001R1300
55	97	24...60	20...60	AF65-30-00-11	1SBL387001R1100	AF65-30-00-11	1SBL387001R1100	AF40-30-00-11	1SBL347001R1100
		100...250	100...250	AF65-30-00-13	1SBL387001R1300	AF65-30-00-13	1SBL387001R1300	AF40-30-00-13	1SBL347001R1300
75	132	24...60	20...60	AF80-30-00-11	1SBL397001R1100	AF80-30-00-11	1SBL397001R1100	AF52-30-00-11	1SBL367001R1100
		100...250	100...250	AF80-30-00-13	1SBL397001R1300	AF80-30-00-13	1SBL397001R1300	AF52-30-00-13	1SBL367001R1300
90	160	24...60	20...60	AF96-30-00-11	1SBL407001R1100	AF96-30-00-11	1SBL407001R1100	AF65-30-00-11	1SBL387001R1100
		100...250	100...250	AF96-30-00-13	1SBL407001R1300	AF96-30-00-13	1SBL407001R1300	AF65-30-00-13	1SBL387001R1300
110	195	24...60	20...60	AF116-30-11-11	1SFL427001R1111	AF116-30-11-11	1SFL427001R1111	AF116-30-11-11 (4)	1SFL427001R1111
		100...250	100...250	AF116-30-11-13	1SFL427001R1311	AF116-30-11-13	1SFL427001R1311	AF116-30-11-13	1SFL427001R1311
132	230	24...60	20...60	AF140-30-11-11	1SFL447001R1111	AF140-30-11-11	1SFL447001R1111	AF116-30-11-11	1SFL427001R1111
		100...250	100...250	AF140-30-11-13	1SFL447001R1311	AF140-30-11-13	1SFL447001R1311	AF116-30-11-13	1SFL427001R1311
160	280	24...60	20...60	AF190-30-11-11	1SFL487002R1111	AF190-30-11-11	1SFL487002R1111	AF140-30-11-11	1SFL447001R1111
		100...250	100...250	AF190-30-11-13	1SFL487002R1311	AF190-30-11-13	1SFL487002R1311	AF140-30-11-13	1SFL447001R1311
200	350	24...60	20...60	AF205-30-11-11	1SFL527002R1111	AF205-30-11-11	1SFL527002R1111	AF190-30-11-11	1SFL487002R1111
		100...250	100...250	AF205-30-11-13	1SFL527002R1311	AF205-30-11-13	1SFL527002R1311	AF190-30-11-13	1SFL487002R1311
250	430	24...60	20...60	AF265-30-11-11	1SFL547002R1111	AF265-30-11-11	1SFL547002R1111	AF205-30-11-11	1SFL527002R1111
		100...250	100...250	AF265-30-11-13	1SFL547002R1311	AF265-30-11-13	1SFL547002R1311	AF205-30-11-13	1SFL527002R1311
315	540	24...60	20...60	AF370-30-11-11	1SFL607002R1111	AF370-30-11-11	1SFL607002R1111	AF265-30-11-11	1SFL547002R1111
		100...250	100...250	AF370-30-11-13	1SFL607002R1311	AF370-30-11-13	1SFL607002R1311	AF265-30-11-13	1SFL547002R1311
355	610	24...60	20...60	AF370-30-11-11	1SFL607002R1111	AF370-30-11-11	1SFL607002R1111	AF305-30-11-11	1SFL587002R1111
		100...250	100...250	AF370-30-11-13	1SFL607002R1311	AF370-30-11-13	1SFL607002R1311	AF305-30-11-13	1SFL587002R1311

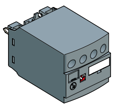
(1) AF09 ... AF370: ambient temperature ≤ 60 °C.
(2) The setting current value is: nominal motor current x 0.58. Overload relay type given for 400 V - AC-3.
For other voltage, select overload relay type according to required nominal motor current x 0.58.
(3) On-delay timer without dwelling-time (e.g.: side-mounted CT-ERS.21S or front-mounted TEF4-ON) is enough to countdown the programmed starting time during "Star connection". In case of use of front-mounted TEF4-ON on-delay timer, mount on KM1 contactor AF26 ... AF96 a side-mounted CAL4-11 auxiliary contact block instead of CA4-10 auxiliary contact block.
(4) AF80 can also be used, but no connection set and mechanical interlock is available for this combination.

Electronic overload relays (2)



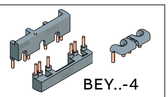
Electronic timers (3)

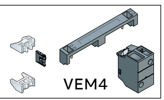

CT-ERS

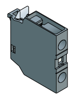

TEF4-ON

Uc = 24...240 V 50/60 Hz or DC

Accessories

Connection sets

BEY..-4

Mechanical and electrical interlock sets

VEM4

Auxiliary contact blocks

CA4

Setting ranges A	Type	Order code	Type	Order code	Type	Order code	Type	Order code
5.70...18.9	EF19-18.9	1SAX121001R1105	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
5.70...18.9	EF19-18.9	1SAX121001R1105	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
5.70...18.9	EF19-18.9	1SAX121001R1105	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY16-4 + VEM4	1SBN081313R2000 1SBN030111R1000	-	-
9.00...30.0	EF45-30	1SAX221001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
9.00...30.0	EF45-30	1SAX221001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
9.00...30.0	EF45-30	1SAX221001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY38-4 + VEM4	1SBN082713R2000 1SBN030111R1000	KM1 : 1 x CA4-10 KM2 : 1 x CA4-10	1SBN010110R1010 1SBN010110R1010
25...70	EF65-70	1SAX331001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
25...70	EF65-70	1SAX331001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
25...70	EF65-70	1SAX331001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY65-4 + VM96-4	1SBN083413R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
36...100	EF96-100	1SAX341001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY96-4 + VM96-4	1SBN083913R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
36...100	EF96-100	1SAX341001R1101	CT-ERS.21S or TEF4-ON	1SVR730100R0300 1SBN020112R1000	BEY96-4 + VM96-4	1SBN083913R2000 1SBN033405T1000	KM1 : 1 x CA4-10 (3) KM2 : 1 x CA4-10 1 x CA4-01 KM3 : 1 x CA4-01	1SBN010110R1010 1SBN010110R1010 1SBN010110R1001 1SBN010110R1001
54...150	EF146-150	1SAX351001R1101	CT-ERS.21S	1SVR730100R0300	BEY140-4 + VM19	1SFN084413R1000 1SFN030300R1000	-	-
54...150	EF146-150	1SAX351001R1101	CT-ERS.21S	1SVR730100R0300	BEY140-4 + VM19	1SFN084413R1000 1SFN030300R1000	-	-
63...210	EF205-210	1SAX531001R1101	CT-ERS.21S	1SVR730100R0300	BEY190-4 + VM140/190	1SFN084813R1000 1SFN034403R1000	-	-
63...210	EF205-210	1SAX531001R1101	CT-ERS.21S	1SVR730100R0300	BEY205-4 + VM19	1SFN085213R1000 1SFN030300R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY265-4 + VM205/265	1SFN085413R1000 1SFN035203R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY370-4 + VM19	1SFN085813R1000 1SFN030300R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY370-4 + VM19	1SFN085813R1000 1SFN030300R1000	-	-

12

1SBC101960S0201

Star-delta starters protected by overload relays

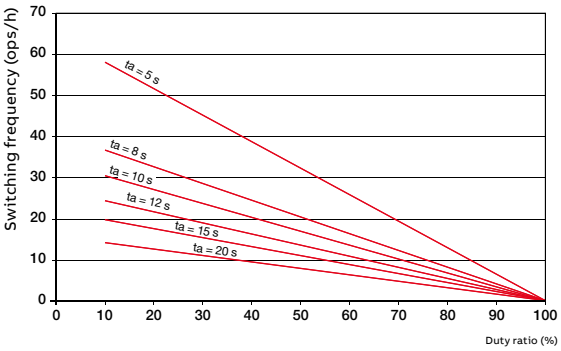
With AF contactors - Open type version in kit form
Switching frequency diagrams

General

Switching frequency/hour, according to acceleration time and load factor. Respect of the following conditions enables utilization of the starter without excessive overheating of the connections or nuisance tripping of the thermal overload relay.

Thermal overload relay

Intermittent periodic duty



ta: motor starting time

Example:
Starting time of the motor: 7 second (use 8s curve) - Duty ratio: 63 % means a permitted switching frequency of max. 15 operating cycles per hour.

This corresponds to a 4 minute operating cycle (15 starts/hr) with 7 seconds acceleration, 2.5 minutes operation and 1.5 minutes rest.

Electronic overload relay : please consult us

1SBC101989R0201

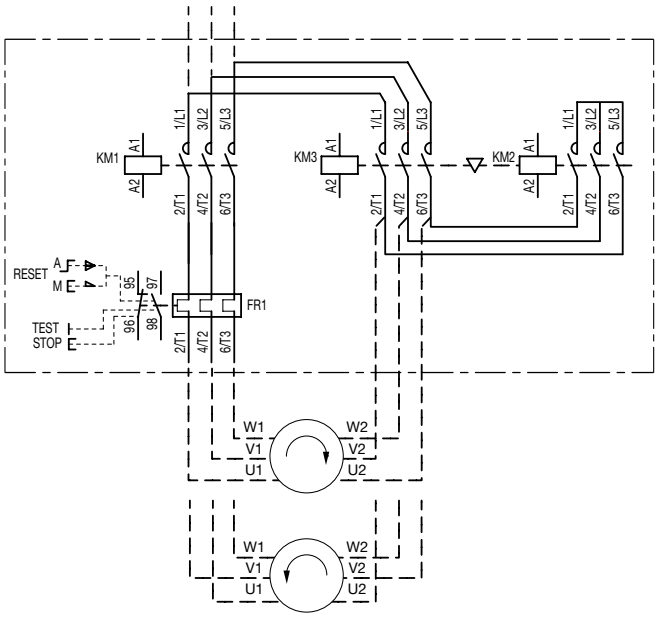
Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form

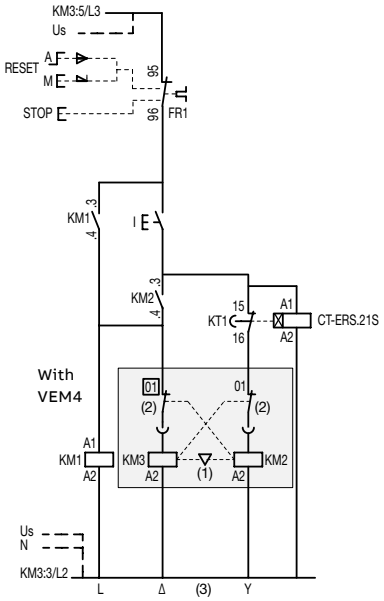
Wiring diagrams with CT-ERS.21S timer

Star-delta starters

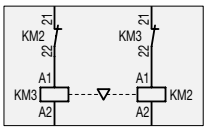
Power circuit



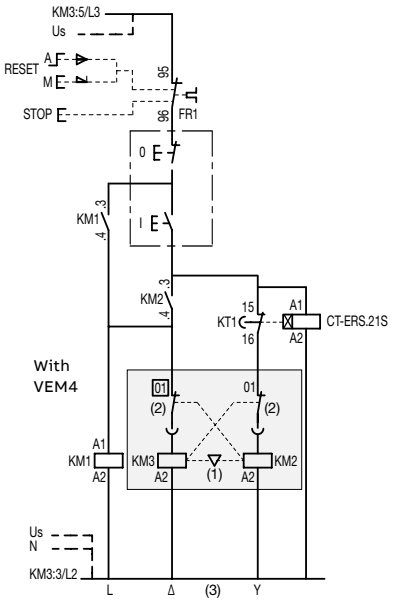
AC or DC local control with CT-ERS.21S timer



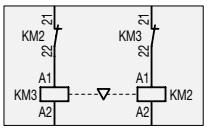
With VM



AC or DC remote control with CT-ERS.21S timer



With VM



Note: - VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection
(Except for coil Uc 12-20 V DC : use VM4 with CA4).
- coil Uc 12-20 V DC : A1+, A2-

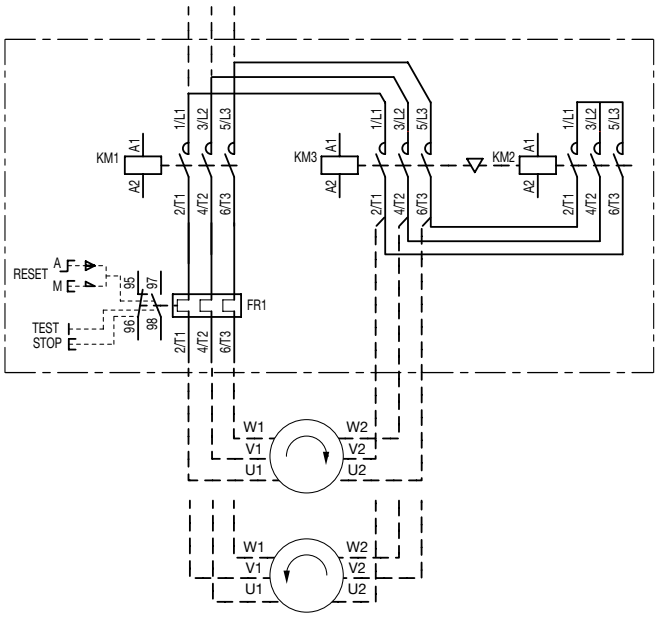
1SBC101975D201

Star-delta starters protected by overload relays

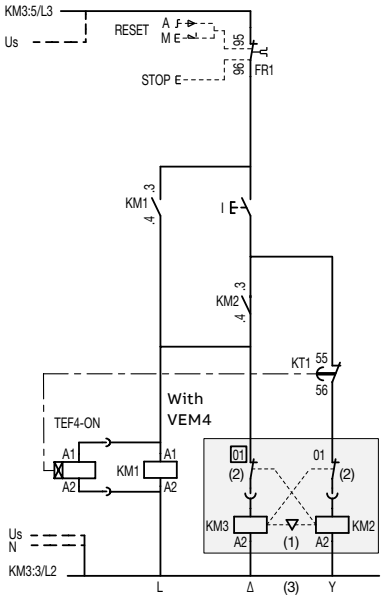
With AF contactors - Open type version in kit form
Wiring diagrams with TEF4-ON timer

Star-delta starters

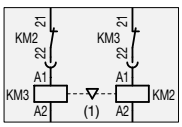
Power circuit



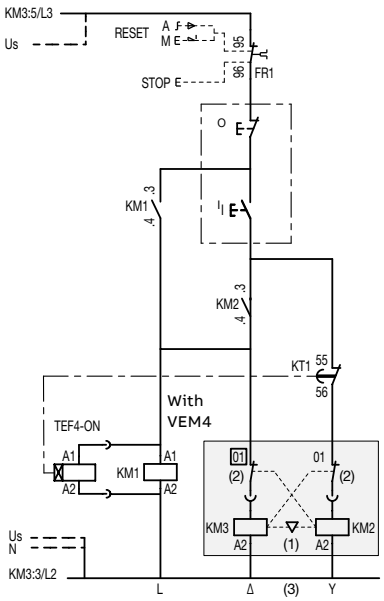
AC or DC local control with TEF4-ON timer
Uc = 24...240 V 50/60 Hz or DC



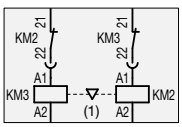
With VM



AC or DC remote control with TEF4-ON timer
Uc = 24...240 V 50/60 Hz or DC



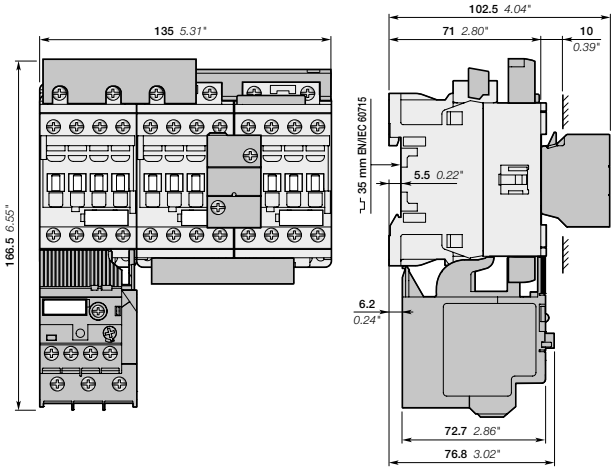
With VM



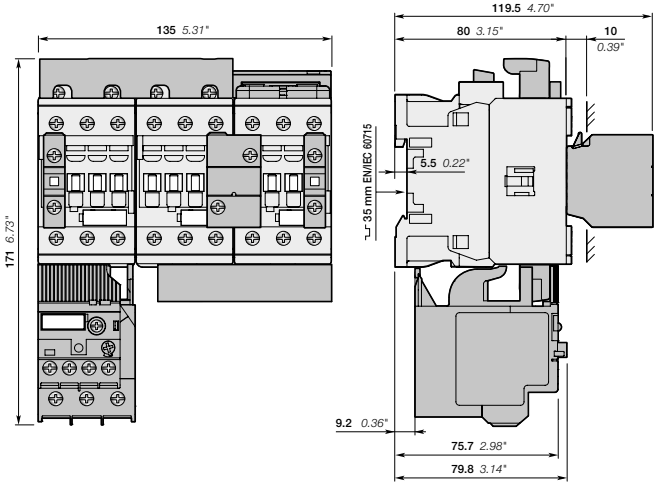
Note: VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection

Star-delta starters protected by thermal overload relays

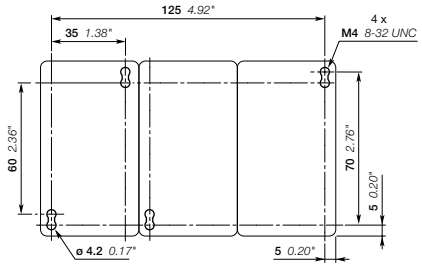
With AF contactors - Open type version in kit form



AF09, AF12, AF16
+ BEY16-4, VEM4
+ TF42 thermal overload relay



AF26, AF30, AF38
+ BEY38-4, VEM4, CA4-10
+ TF42 thermal overload relay



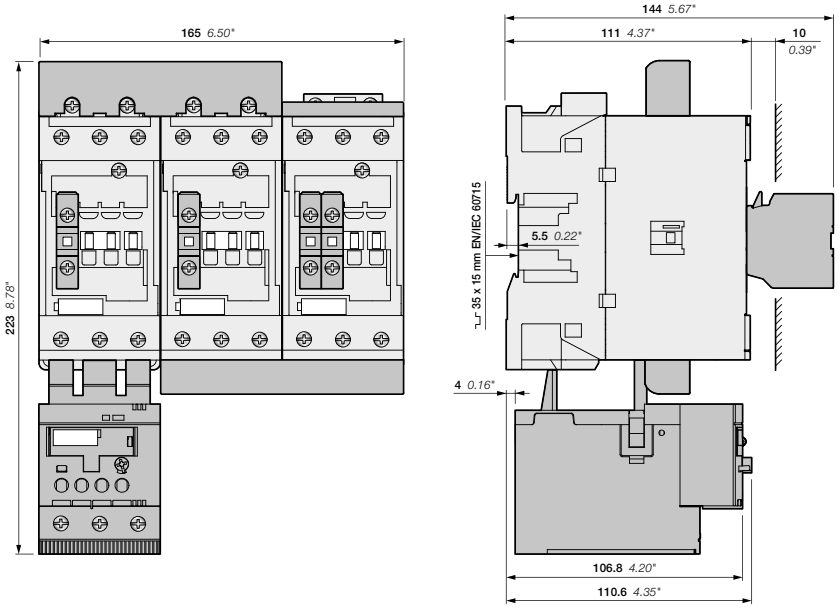
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

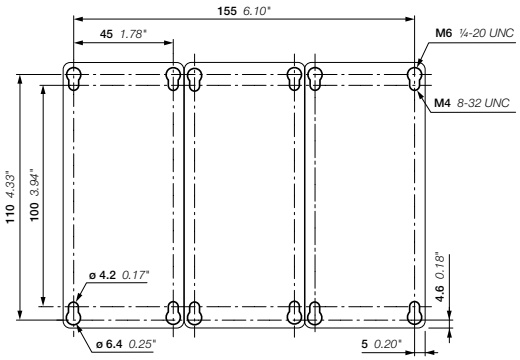
1SBC101963S0201

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



AF40, AF52, AF65
+ BEY65-4, VM96-4, CA4-10, CA4-01
+ TF65 thermal overload relay

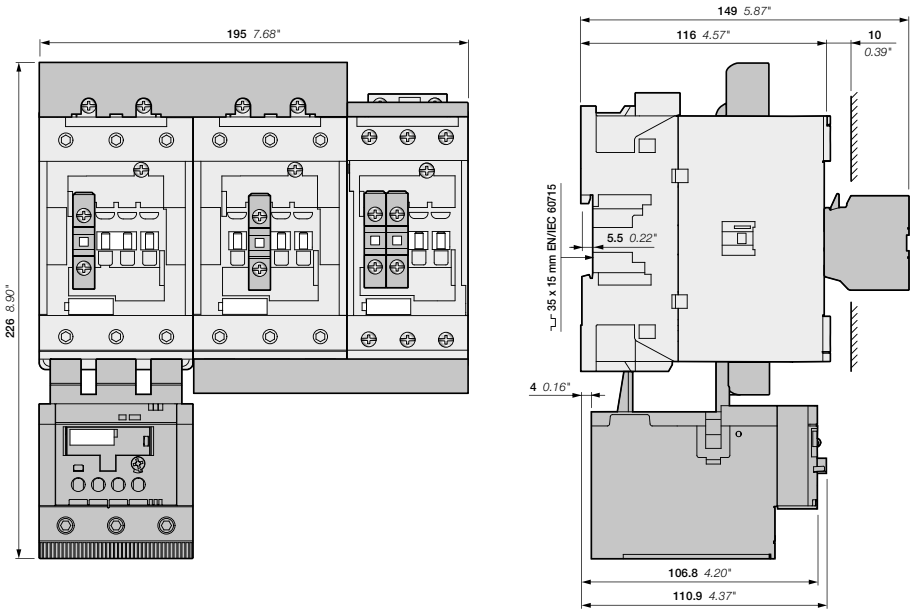


Main dimensions mm, inches

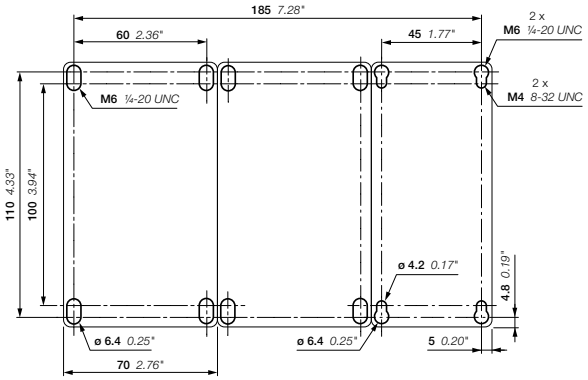
1SBC101964S0201 - Rev. A

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



Line, Delta: AF80, AF96
+ Star: AF52, AF65
+ BEY96-4, VM96-4, CA4-10, CA4-01
+ TF96 thermal overload relay

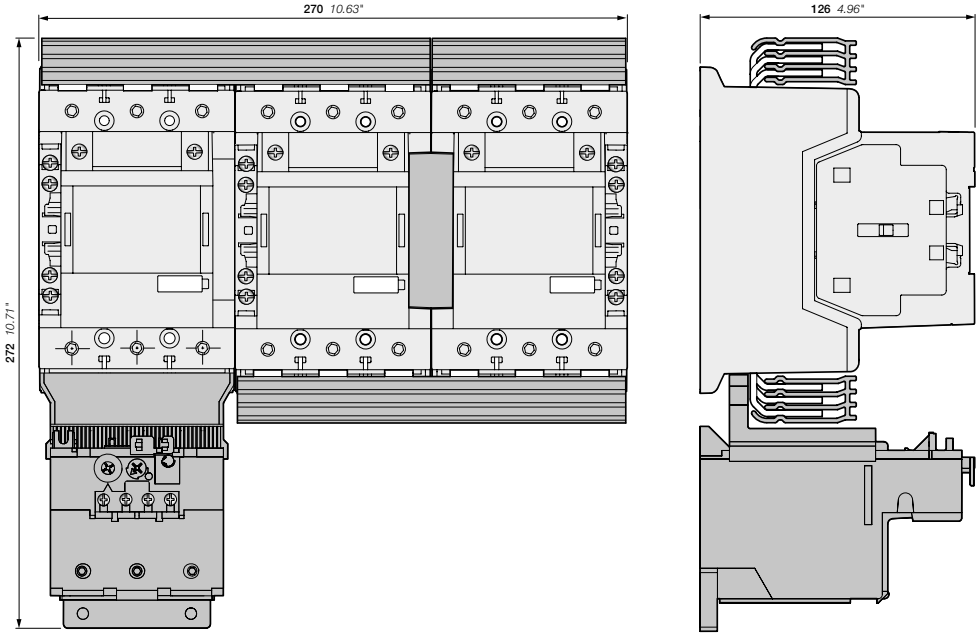


Main dimensions mm, inches

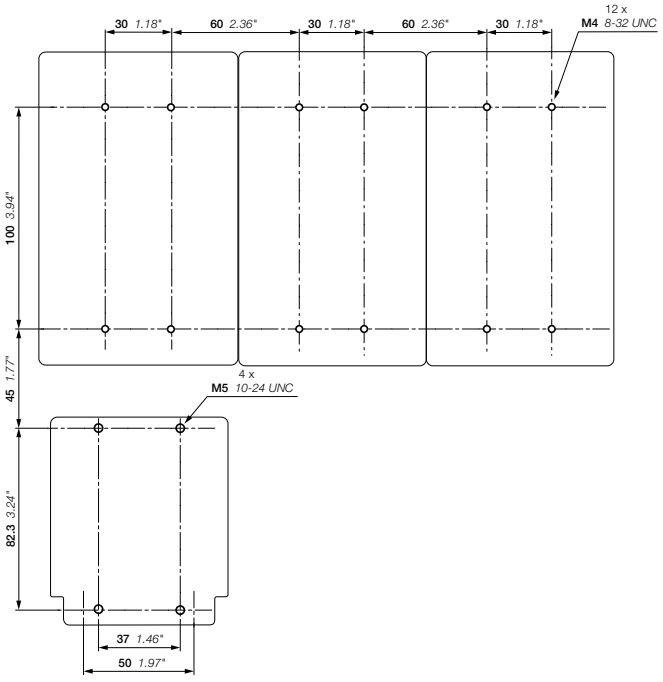
1SBC101965S0201

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



AF116, AF140, AF146
+ BEY140-4, VM19
+ TF140 thermal overload relay

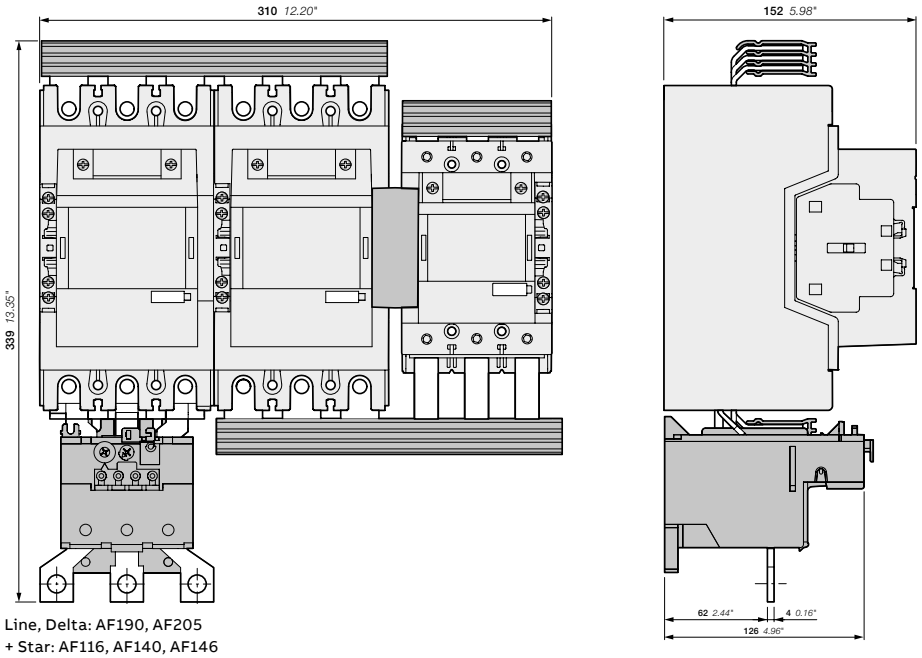


Main dimensions mm, inches

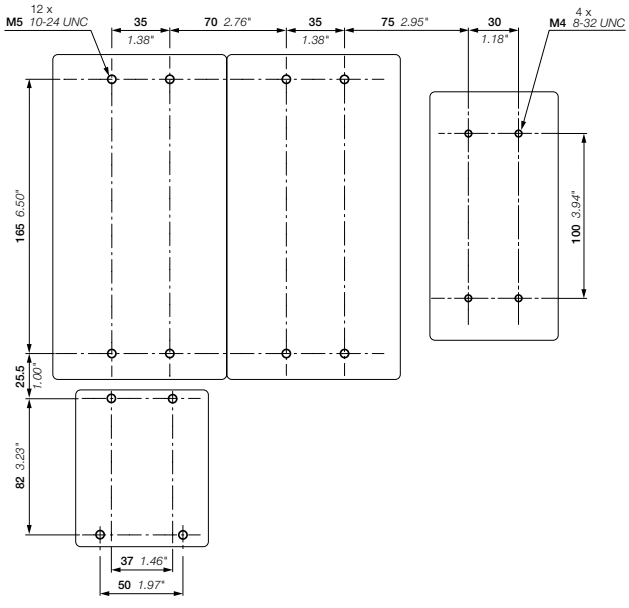
1SFC101170C0201

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



Line, Delta: AF190, AF205
+ Star: AF116, AF140, AF146
+ BEY190-4, VM140/190
+ TA200 thermal overload relay

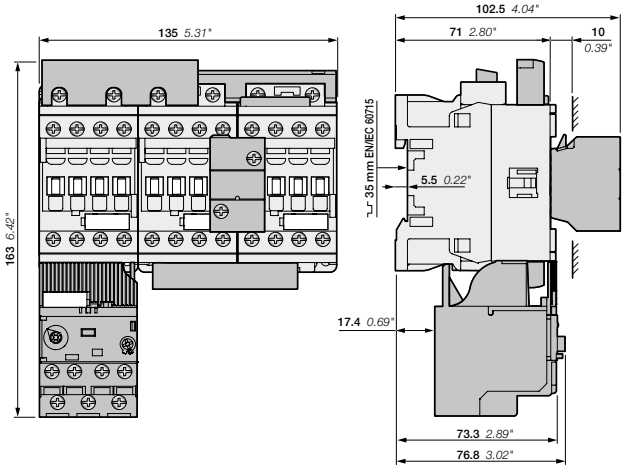


Main dimensions mm, inches

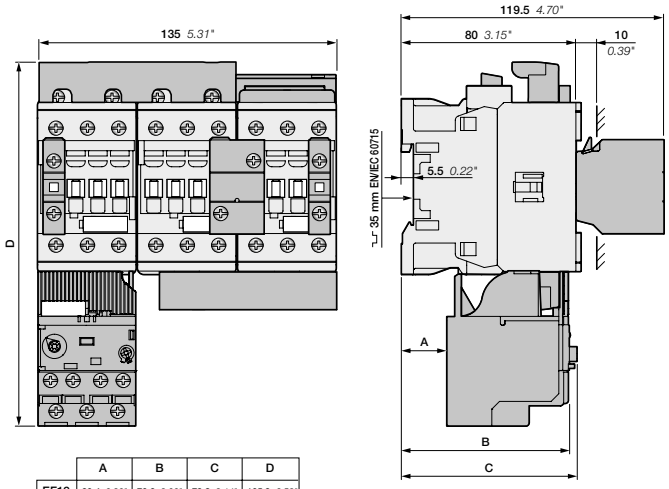
1SFC101171C0201

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form

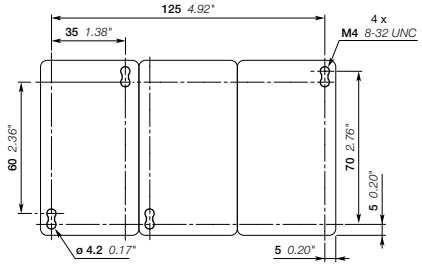


AF09, AF12, AF16
+ BEY16-4, VEM4
+ EF19 electronic overload relay



	A	B	C	D
EF19	20.4 0.80"	76.3 3.00"	79.8 3.14"	165.9 6.53"
EF45	0 0.00"	82.5 3.25"	86 3.39"	183.5 7.22"

AF26, AF30, AF38
+ BEY38-4, VEM4, CA4-10
+ EF19/EF45 electronic overload relay



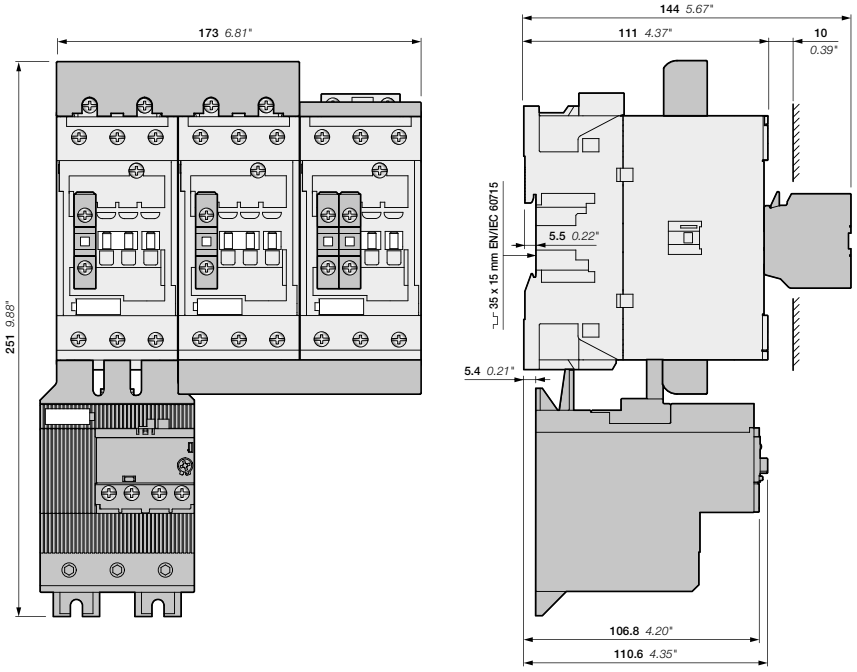
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Main dimensions mm, inches

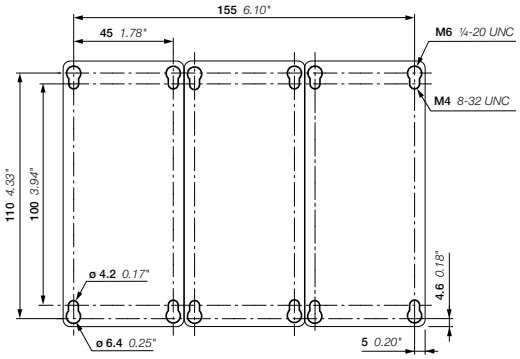
1SBC101966S0201

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



AF40, AF52, AF65
+ BEY65-4, VM96-4, CA4-10, CA4-01
+ EF65 electronic overload relay

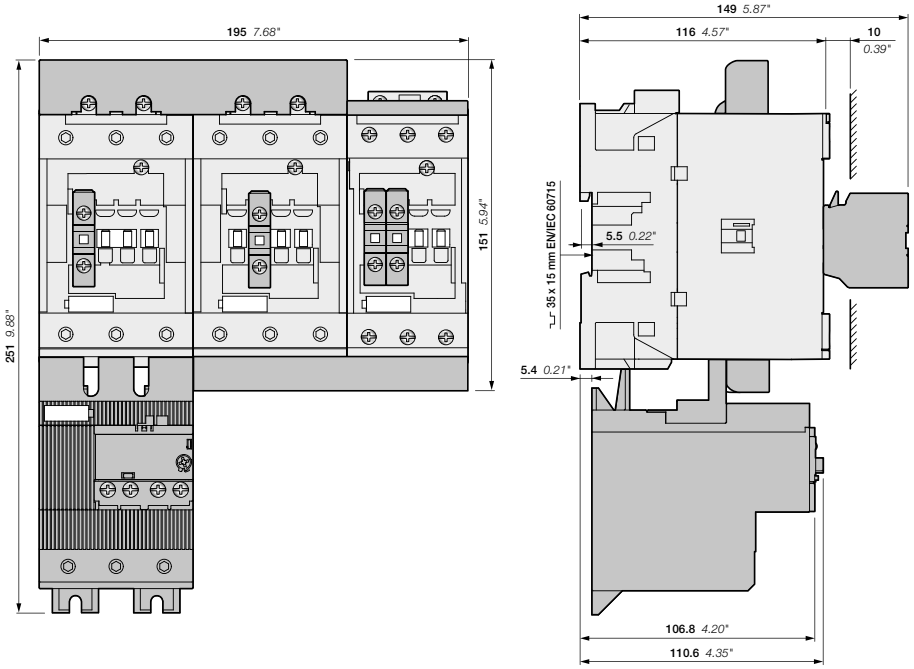


Main dimensions mm, inches

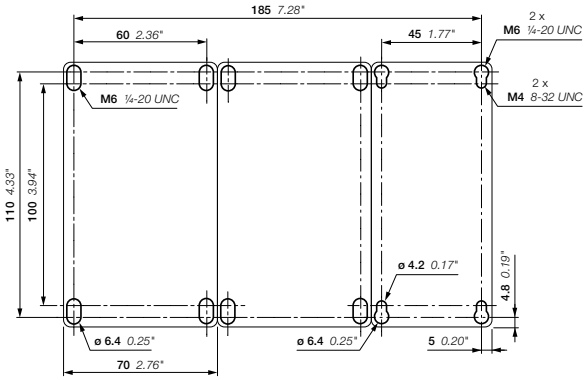
1SBC101967S0201 - Rev. A

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



Line, Delta: AF80, AF96
+ Star: AF52, AF65
+ BEY96-4, VM96-4, CA4-10, CA4-01
+ EF96 electronic overload relay

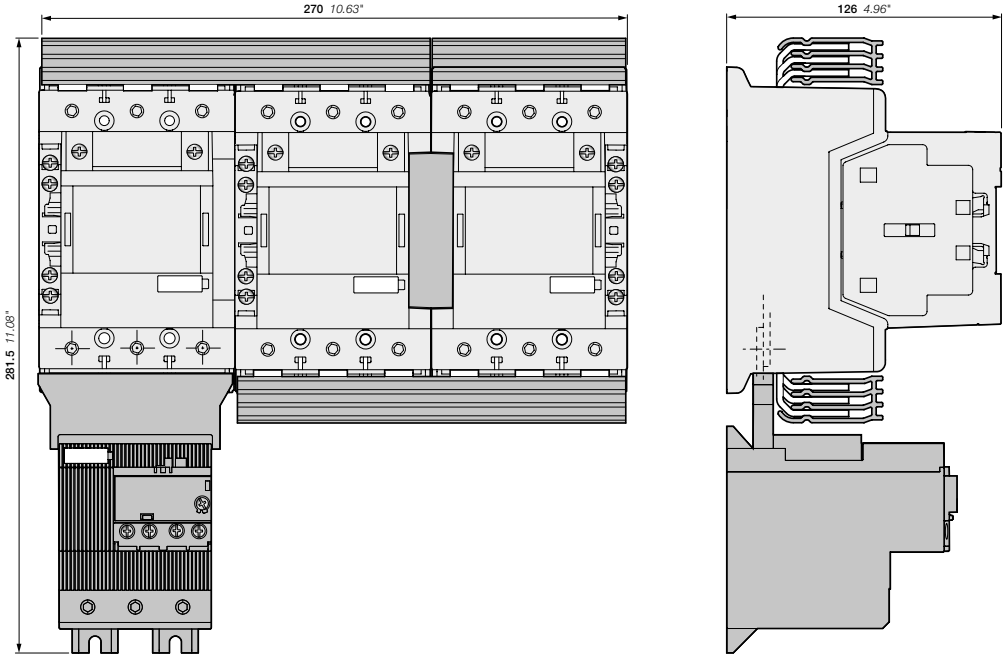


Main dimensions mm, inches

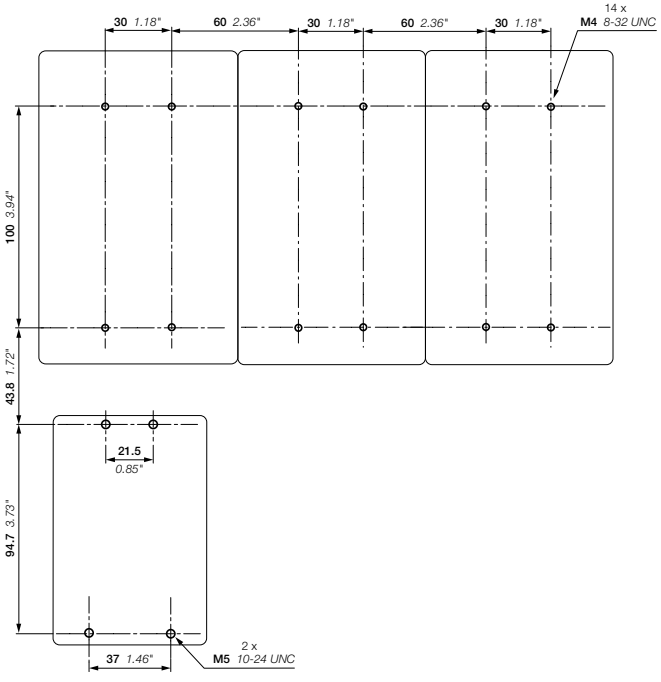
1SBC101968S0201

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



AF116, AF140, AF146
+ BEY140-4, VM19
+ EF146 electronic overload relay

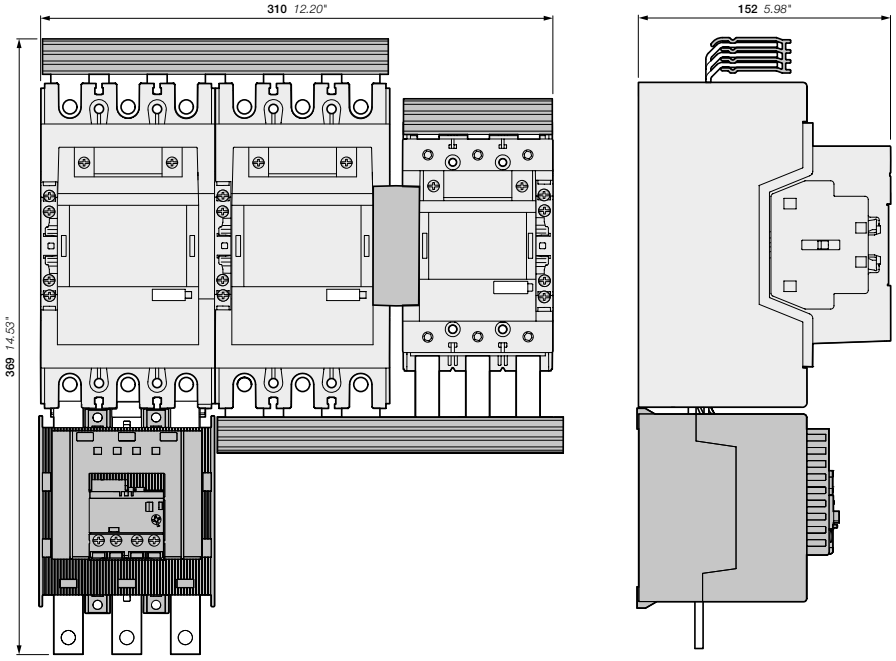


Main dimensions mm, inches

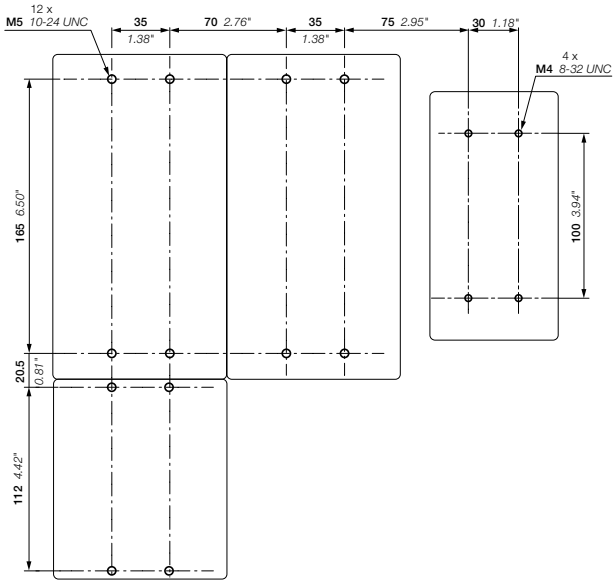
1SFC101172C0201

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



Line, Delta: AF190, AF205
+ Star: AF116, AF140, AF146
+ BEY190-4, VM140/190
+ EF205 electronic overload relay

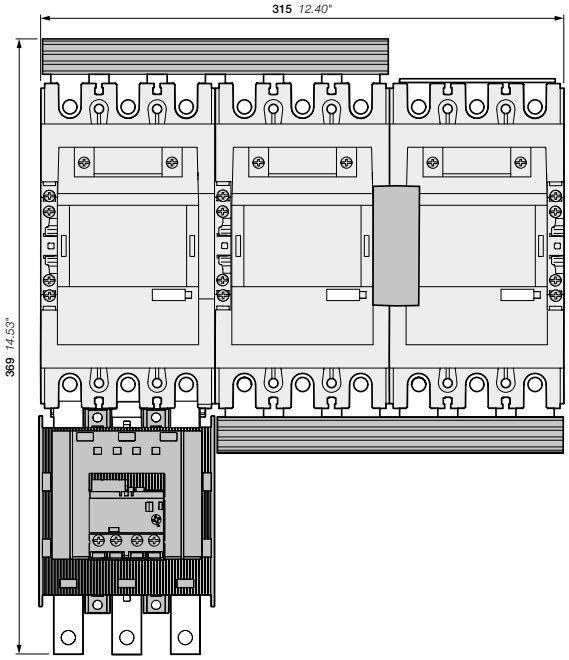


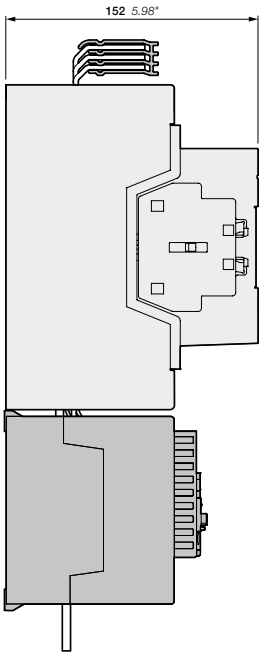
Main dimensions mm, inches

1SFC101173C0201

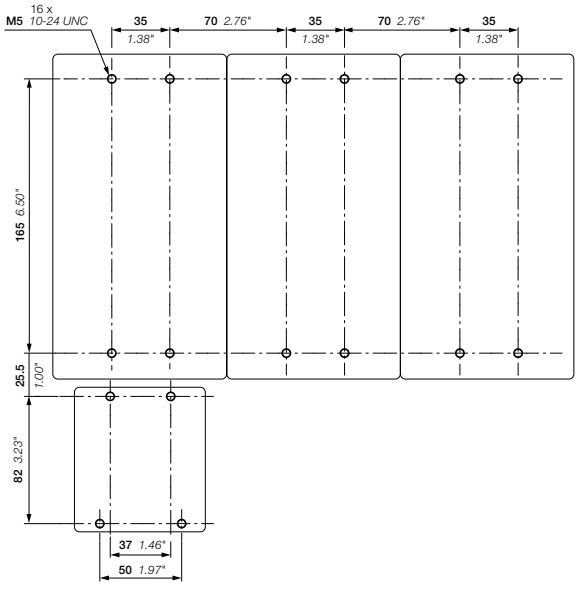
Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form





AF190, AF205
+ BEY205-4, VM19
+ EF205 electronic overload relay

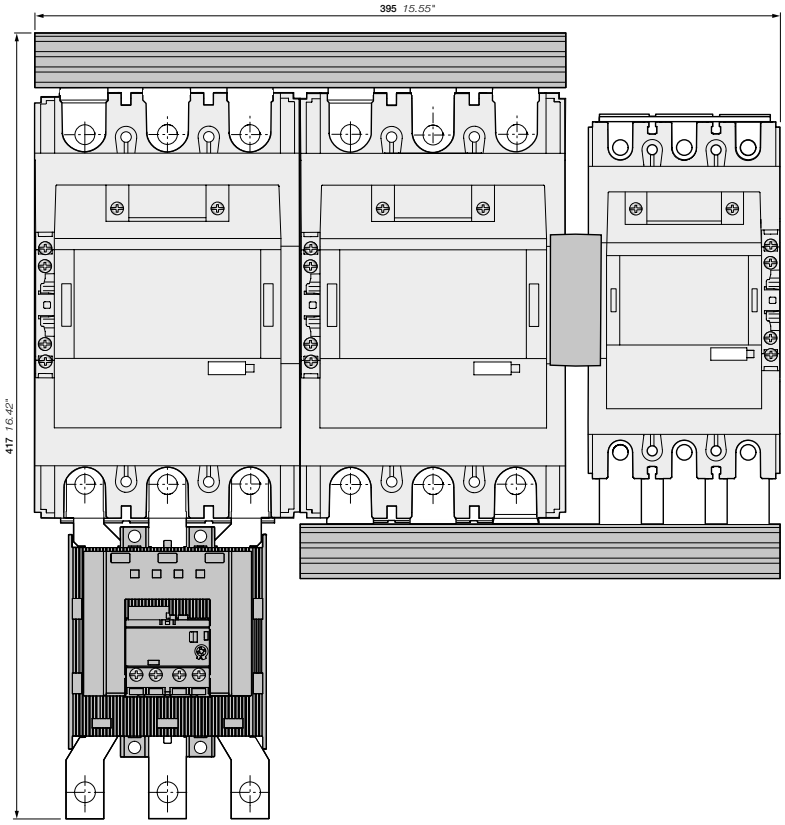


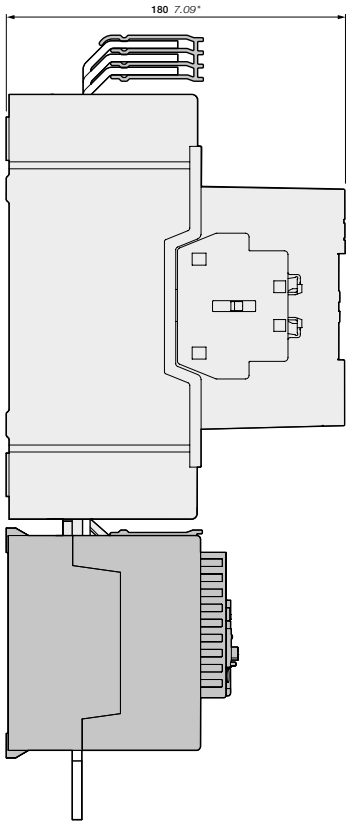
Main dimensions mm, inches

1SFC101174C0201

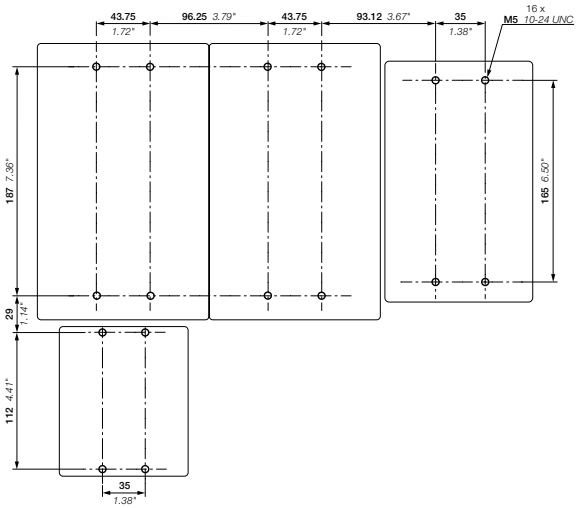
Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form





Line, Delta: AF265, AF305, AF370
+ Star: AF190, AF205
+ BEY265-4, VM205/265
+ EF370 electronic overload relay

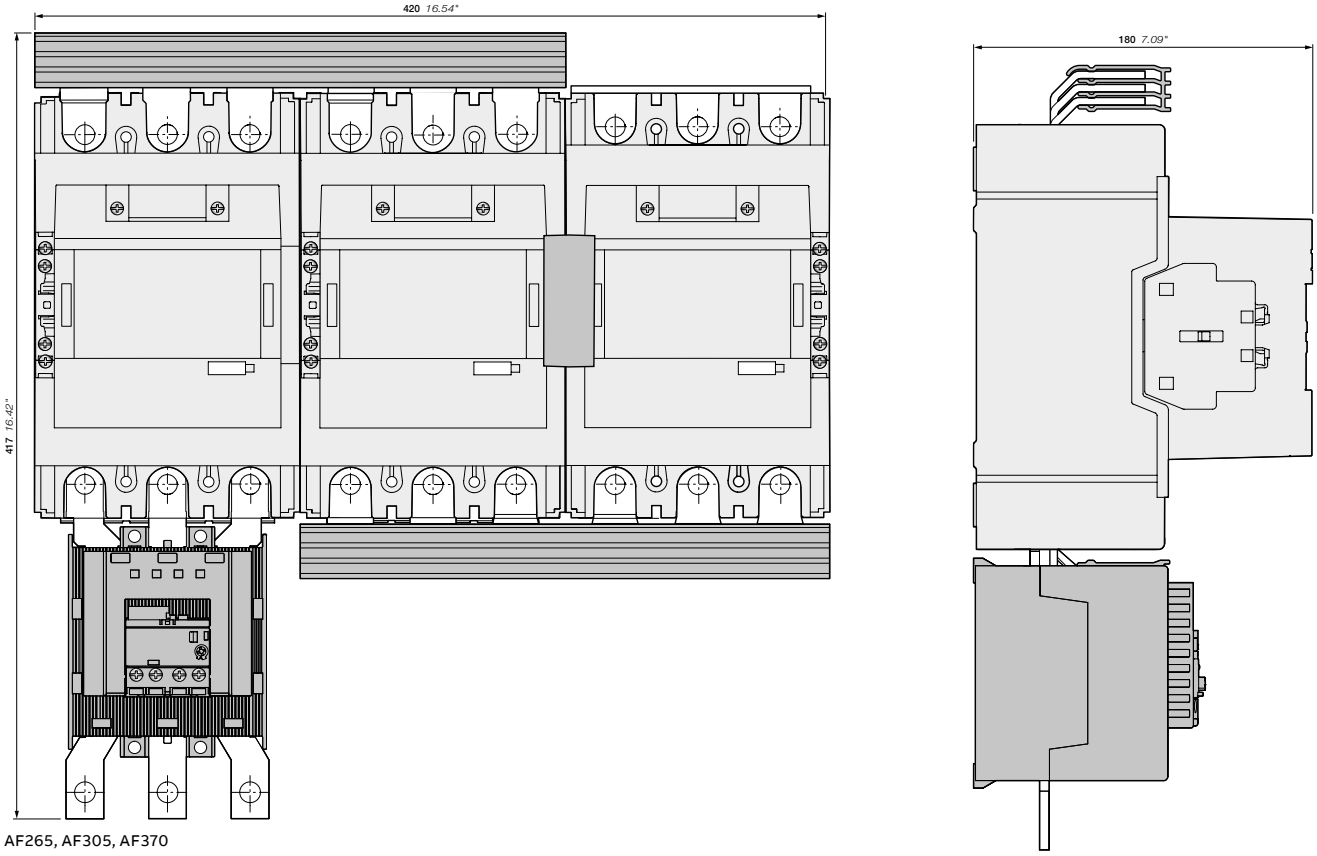


Main dimensions mm, inches

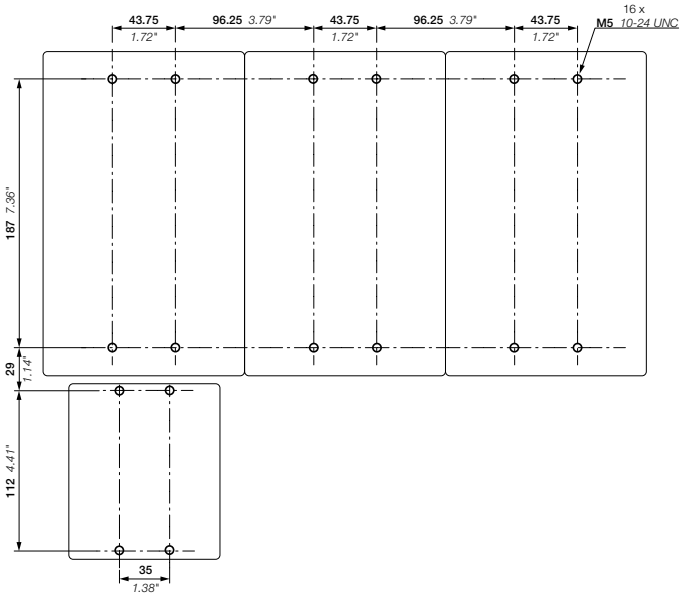
1SFC101175C0201

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



AF265, AF305, AF370
+ BEY370-4, VM19
+ EF370 electronic overload relay



Main dimensions mm, inches

1SFC101176C0201