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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

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:

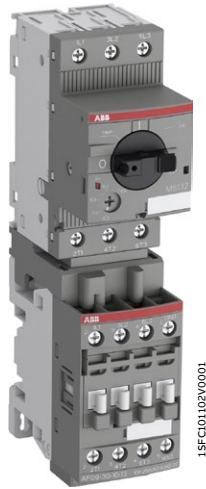
In order to confirm your starter combination ratings according to ABB's latest coordination test results, or to see other coordination of components please refer to the above mentioned SOC tool. SOC tool get constant updates and additions

General remarks applicable to all tables

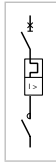
- Each table is defined for a maximum ambient temperature of 40 °C. For higher temperatures, apply a derating factor according to the following rules:
- Fuses: factor of 0.8 applied to In for an ambient temperature of 70 °C
- MCCBs and MCBs: factor of 0.8 applied to In for an ambient temperature of 60 °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 $10 \text{ s} < t_s < 30 \text{ s}$
- 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 $> 12.3 I_e$ AC-3 so that the transient current peak occurring during starting does not lead to tripping.

DOL and reversing starters protected by manual motor starters

With AF contactors - open type version in kit form

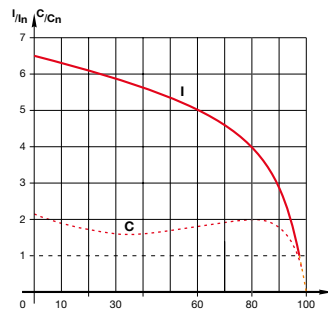


DOL starter
MS132-10 + BEA16-4 + AF09-30-10



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

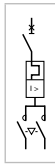
The contactor and the manual motor starter control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

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.



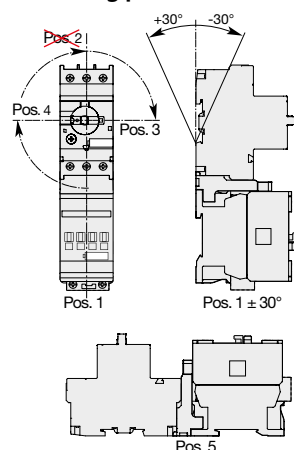
Reversing starter
MS132-10 + BEA16-4 + BER16-4
+ VEM4 + AF09-30-10



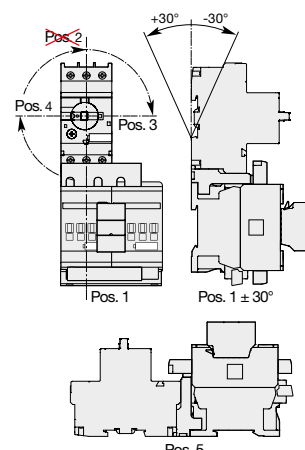
Main Technical Data

Standards	IEC 60947-4-1 / EN 60947-4-1	
Rated operational voltage U_e max.	690 V - 50/60 Hz	
Rated insulation voltage U_i		
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



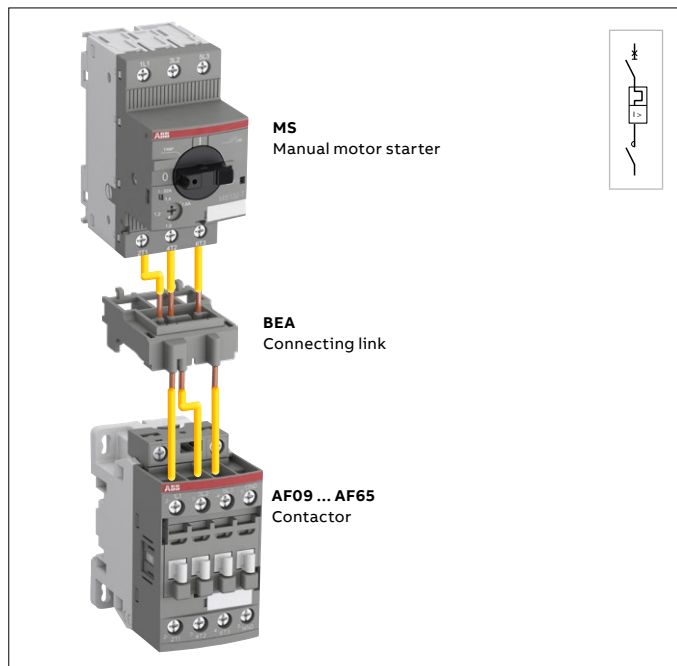
DOL starters



Reversing starters

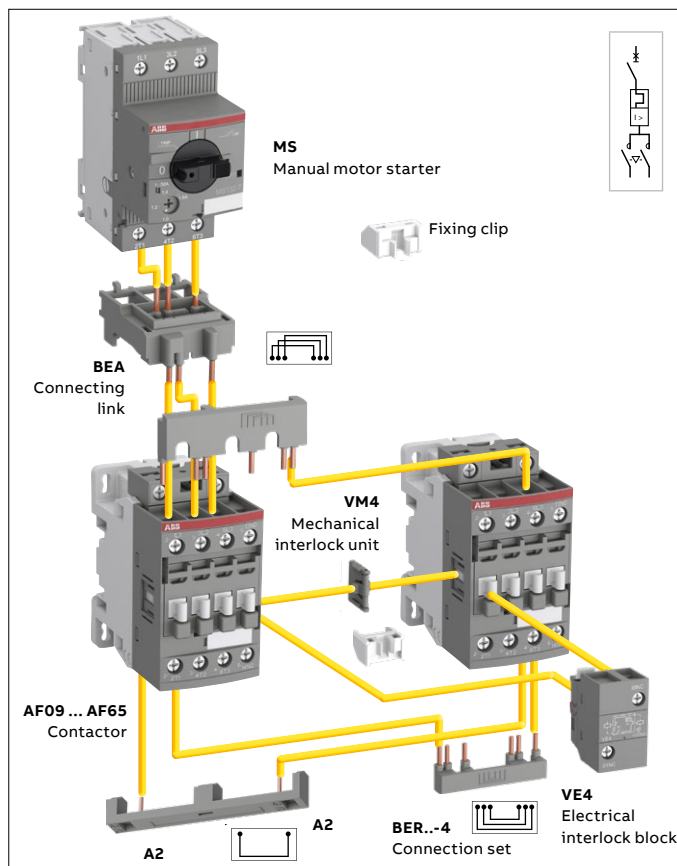
DOL and reversing starters protected by manual motor starters

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).

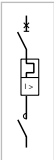
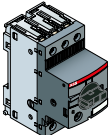
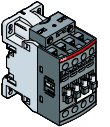
Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50/60 Hz, $I_q = 16$ kA up to 18.5 kW and $I_q = 50$ kA up to 45 kW.

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

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	Setting range A	Rated instantaneous short-circuit current setting li	Rated control circuit voltage Uc min. ... Uc max. V 50/60 Hz VDC		Type (3)	Order code	Allowed setting current A	Type	Order code
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	3.13	24...60 100...250	20...60 (5) 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.25	BEA16-4	1SBN081306T1000
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	5	24...60 100...250	20...60 (5) 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.4		
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.63		
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.63		
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	12.5	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1		
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	20	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1.6		
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	20	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1.6		
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	31.25	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	2.5		
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	4		
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	4		
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	6.3		
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	9		
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	9		
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60 100...250	20...60 100...250	AF12Z-30-10-11 AF12-30-10-13	1SBL156001R1110 1SBL157001R1310	12		
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60 100...250	20...60 100...250	AF16Z-30-10-11 AF16-30-10-13	1SBL176001R1110 1SBL177001R1310	16		
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	25	BEA38-4 + CA4-10	1SBN082306T2000 1SBN010110R1010
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60 100...250	20...60 100...250	AF30Z-30-00-11 AF30-30-00-13	1SBL276001R1100 1SBL277001R1300	32		
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60 100...250	20...60 100...250	AF40-30-00-11 AF40-30-00-13	1SBL347001R1100 1SBL347001R1300	40		
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60 100...250	20...60 100...250	AF52-30-00-11 AF52-30-00-13	1SBL367001R1100 1SBL367001R1300	53	BEA65-4 BPR65-4 (4) CA4-10	1SBN083406R1000 1SBN113405R1000 1SBN010110R1010
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60 100...250	20...60 100...250	AF65-30-00-11 AF65-30-00-13	1SBL387001R1100 1SBL387001R1300	65		
37	66	MS497-75	1SAM580000R1008	57.0...75.0	975	24...60 100...250	20...60 100...250	AF80-30-00-11 AF80-30-00-13	1SBL397001R1100 1SBL397001R1300	75		
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60 100...250	20...60 100...250	AF96-30-00-11 AF96-30-00-13	1SBL407001R1100 1SBL407001R1300	90		

(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).

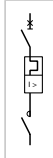
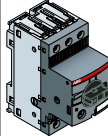
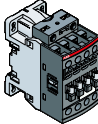
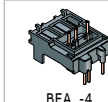
(4) For direct mounting on 2 rails 35 mm of MS165 with AF40 ... AF65: BEA65-4 must be associated with BPR65-4 fixed on contactor base. Applicable for MS165 manufactured after week 31, 2016 (date code > 16114).

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

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		
										 		
IEC		Type (1)	Order code	Setting range	Rated instantaneous short-circuit current setting I _i	Rated control circuit voltage U _c min. ... U _c max. (2)		Type (3)	Order code	Allowed setting current	Type	Order code
AC-3, 400 V Rated operational power current												
kW	A					A	A					
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	3.13	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.25	BEA16-4	1SBN081306T1000
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	5	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.4		
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.63		
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	0.63		
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	12.5	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1		
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	20	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1.6		
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	20	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	1.6		
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	31.25	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110 1SBL137001R1310	2.5		
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	4	BEA26-4 + CA4-10	1SBN082306T1000 1SBN010110R1010
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	4		
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	6.3		
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	10		
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	10		
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	24...60 100...250	20...60 100...250	AF26Z-30-00-11 AF26-30-00-13	1SBL236001R1100 1SBL237001R1300	12		
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60 100...250	20...60 100...250	AF30Z-30-00-11 AF30-30-00-13	1SBL276001R1100 1SBL277001R1300	16		
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	24...60 100...250	20...60 100...250	AF30Z-30-00-11 AF30-30-00-13	1SBL276001R1100 1SBL277001R1300	25		
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60 100...250	20...60 100...250	AF30Z-30-00-11 AF30-30-00-13	1SBL276001R1100 1SBL277001R1300	32		
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	24...60 100...250	20...60 100...250	AF40-30-00-11 AF40-30-00-13	1SBL347001R1100 1SBL347001R1300	40		
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60 100...250	20...60 100...250	AF52-30-00-11 AF52-30-00-13	1SBL367001R1100 1SBL367001R1300	53		
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	24...60 100...250	20...60 100...250	AF65-30-00-11 AF65-30-00-13	1SBL387001R1100 1SBL387001R1300	65		
37	66	MS497-75	1SAM580000R1008	57.0...75.0	975	24...60 100...250	20...60 100...250	AF80-30-00-11 AF80-30-00-13	1SBL397001R1100 1SBL397001R1300	75		
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	24...60 100...250	20...60 100...250	AF96-30-00-11 AF96-30-00-13	1SBL407001R1100 1SBL407001R1300	90		

- (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.

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	
										BEA65-4 BER65-4 VEM4 CA4-10	
IEC AC-3, 400 V Rated operational power kW	current A	Type (1)	Order code	Setting range A	Rated instantaneous short-circuit current setting I _n A	Rated control circuit voltage U _c min. ... U _c max. (2)	Type (3)	Order code	Allowed setting current A	Type	Order code
0.06	0.2	MS132-0.25	1SAM350000R1002	0.16...0.25	3.13	24...60	AF09Z-30-10-11	ISBL136001R1110	0.25	+ + VEM4	1SBN081306T1000 1SBN081311R1000 1SBN030111R1000
0.09	0.3	MS132-0.4	1SAM350000R1003	0.25...0.40	5	100...250	AF09-30-10-13	ISBL137001R1310	0.4		
0.12	0.44	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	24...60	AF09Z-30-10-11	ISBL136001R1110	0.63		
0.18	0.6	MS132-0.63	1SAM350000R1004	0.40...0.63	7.88	100...250	AF09-30-10-13	ISBL137001R1310	0.63		
0.25	0.85	MS132-1.0	1SAM350000R1005	0.63...1.00	12.5	24...60	AF09Z-30-10-11	ISBL136001R1110	1		
0.37	1.1	MS132-1.6	1SAM350000R1006	1.00...1.60	20	100...250	AF09-30-10-13	ISBL137001R1310	1.6		
0.55	1.5	MS132-1.6	1SAM350000R1006	1.00...1.60	20	24...60	AF09Z-30-10-11	ISBL136001R1110	1.6		
0.75	1.9	MS132-2.5	1SAM350000R1007	1.60...2.50	31.25	100...250	AF09-30-10-13	ISBL137001R1310	2.5		
1.1	2.7	MS132-4.0	1SAM350000R1008	2.50...4.00	50	24...60	AF09Z-30-10-11	ISBL136001R1110	4		
1.5	3.6	MS132-4.0	1SAM350000R1008	2.50...4.00	50	100...250	AF09-30-10-13	ISBL137001R1310	4		
2.2	4.9	MS132-6.3	1SAM350000R1009	4.00...6.30	78.75	24...60	AF09Z-30-10-11	ISBL136001R1110	6.3		
3	6.5	MS132-10	1SAM350000R1010	6.30...10.0	150	100...250	AF09-30-10-13	ISBL137001R1310	9		
4	8.5	MS132-10	1SAM350000R1010	6.30...10.0	150	24...60	AF09Z-30-10-11	ISBL136001R1110	9		
5.5	11.5	MS132-12	1SAM350000R1012	8.00...12.0	180	100...250	AF09-30-10-13	ISBL137001R1310	12		
7.5	15.5	MS132-16	1SAM350000R1011	10.0...16.0	240	24...60	AF12Z-30-10-11	ISBL156001R1110	16		
11	22	MS132-25	1SAM350000R1014	20.0...25.0	375	100...250	AF16Z-30-10-11	ISBL176001R1110	16		
15	29	MS132-32	1SAM350000R1015	25.0...32.0	480	24...60	AF26Z-30-00-11	ISBL236001R1100	25	+ + + 2x	BEA38-4 BER38-4 VEM4 CA4-10
18.5	35	MS165-42	1SAM451000R1015	30.0...42.0	630	100...250	AF26-30-00-13	ISBL237001R1300	32		
22	41	MS165-54	1SAM451000R1016	40.0...54.0	810	24...60	AF30Z-30-00-11	ISBL276001R1100	40		
30	55	MS165-65	1SAM451000R1017	52.0...65.0	975	100...250	AF30-30-00-13	ISBL277001R1300	40		
37	66	MS497-75	1SAM580000R1008	57.0...75.0	975	24...60	AF40-30-00-11	ISBL347001R1100	53	+ + + 2x	BEA65-4 BER65-4 VEM4 CA4-10
45	80	MS495-90	1SAM550000R1009	70.0...90.0	1170	100...250	AF52-30-00-13	ISBL367001R1300	65		
						24...60	AF65-30-00-11	ISBL387001R1100	75		
						100...250	AF65-30-00-13	ISBL387001R1300	90		
						24...60	AF80-30-00-11	ISBL397001R1100	90	+ + + 2x	BER96-4 VM96-4 CA4-10 CA4-01
						100...250	AF80-30-00-13	ISBL397001R1300	90		
						24...60	AF96-30-00-11	ISBL407001R1100	90		
						100...250	AF96-30-00-13	ISBL407001R1300	90		

(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.

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	Type (1)	Order code	Setting range	Rated instantaneous short-circuit current setting li	Rated control circuit voltage Uc min. Uc max. (2)		Type (3)	Order code	Allowed setting current	Type (4)	Order code		
AC-3, 400 V Rated operational power kW A			A		V 50/60 Hz	V DC			A				
0.06	0.2	MS132-0.25 1SAM350000R1002	0.16...0.25	313	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	0.25	+ BEA16-4 + BER16-4 + VEM4	1SBN081306T1000 1SBN081311R1000 1SBN030111R1000		
					100...250	100...250	AF09-30-10-13	1SBL137001R1310					
0.09	0.3	MS132-0.4 1SAM350000R1003	0.25...0.40	5	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	7.88	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	7.88	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	12.5	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	20	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	20	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	31.25	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 + BER38-4 + VEM4 + 2x CA4-10	1SBN082306T1000 1SBN082311R1000 1SBN030111R1000 1SBN010110R1010		
					100...250	100...250	AF26-30-00-13	1SBL237001R1300					
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 + BER38-4 + VEM4 + 2x CA4-10	1SBN082306T2000 1SBN082311R1000 1SBN030111R1000 1SBN010110R1010		
					100...250	100...250	AF26-30-00-13	1SBL237001R1300					
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 + 2x BPR65-4 (5) + BER65-4 + VM96-4 + 2x CA4-10 + 2x CA4-01	1SBN083406R1000 1SBN113405R1000 1SBN083411R1000 1SBN033405T1000 1SBN010110R1010 1SBN010110R1001		
					100...250	100...250	AF40-30-00-13	1SBL347001R1300					
22	41	MS165-54 1SAM451000R1016	40.0...54.0	810	24...60	20...60	AF52-30-00-11	1SBL367001R1100	53				
					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	MS497-75 1SAM580000R1008	57.0...75.0	975	24...60	20...60	AF80-30-00-11	1SBL397001R1100	75	+ BER96-4 + VM96-4 + 2x CA4-10 + 2x CA4-01	1SBN083911R1000 1SBN033405T1000 1SBN010110R1010 1SBN010110R1001		
					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 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.

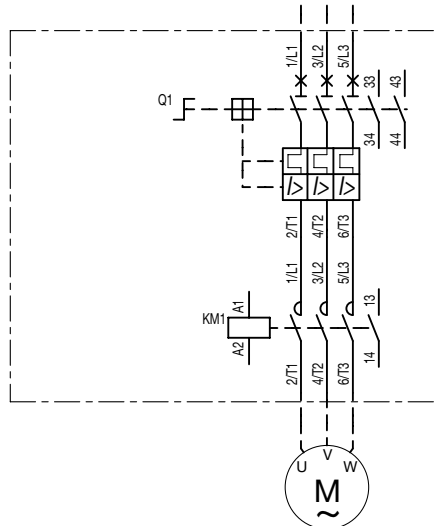
DOL and reversing starters protected by manual motor starters

With AF contactors - open type version in kit form

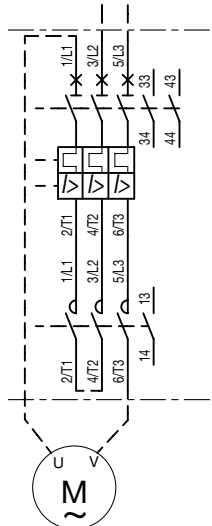
Wiring diagrams

Direct-on-line starters

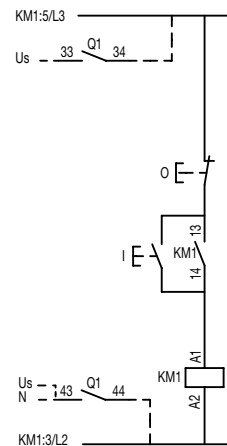
Power circuit



1-phase

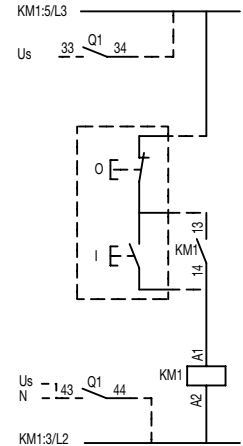


AC or DC local control



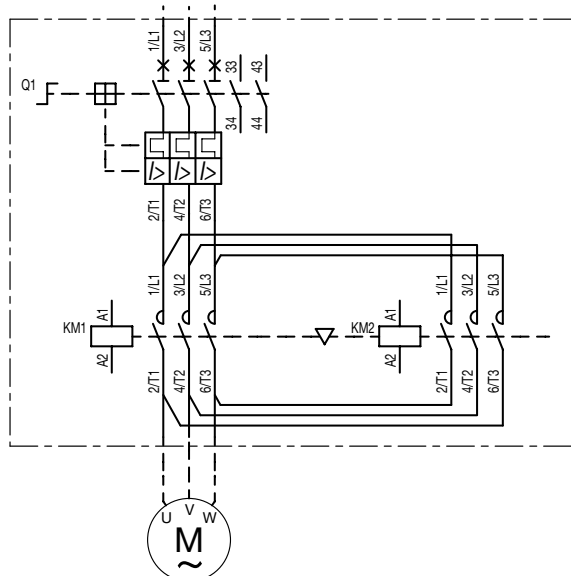
Note: coil Uc 12-20 V DC : A1+, A2-

AC or DC remote control

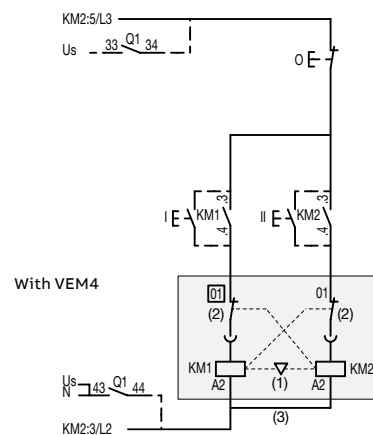


Reversing starters

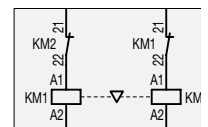
Power circuit



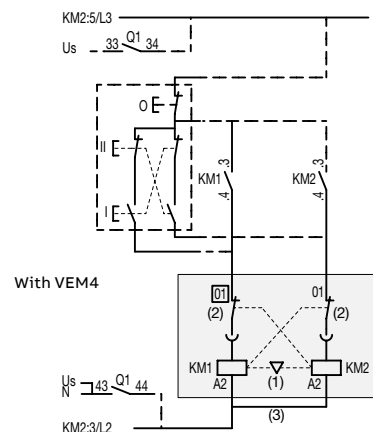
AC or DC local control



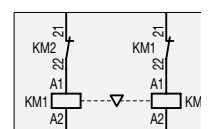
With VM



AC or DC remote control



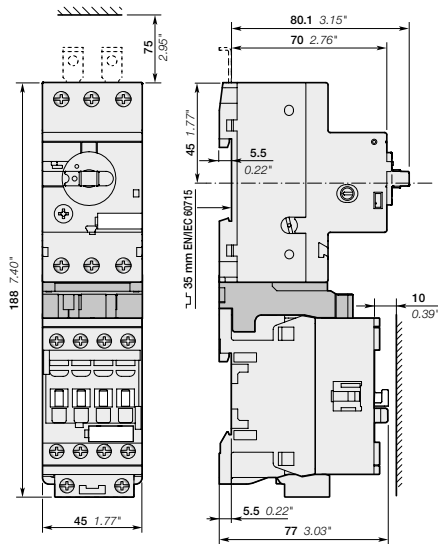
With VM



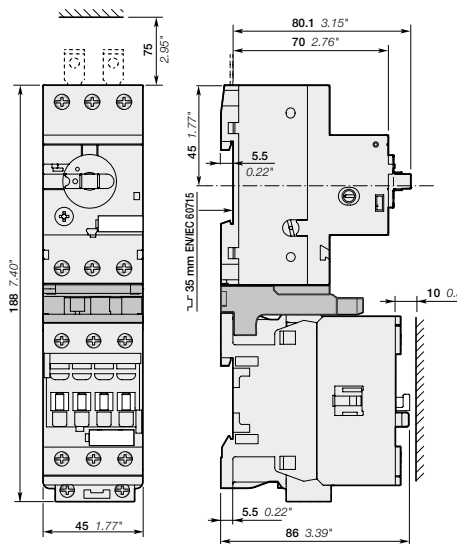
Note: - VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection
(Except for coil Uc 12-20 V DC : use VM4 with CA4).
- coil Uc 12-20 V DC : A1+, A2-

DOL starters protected by MS116 manual motor starters

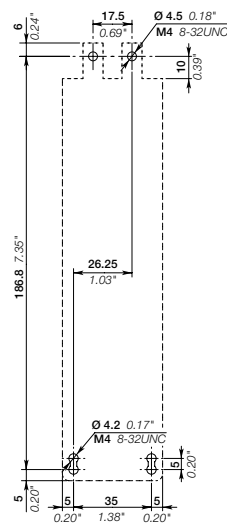
With AF contactors - open type version in kit form



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



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



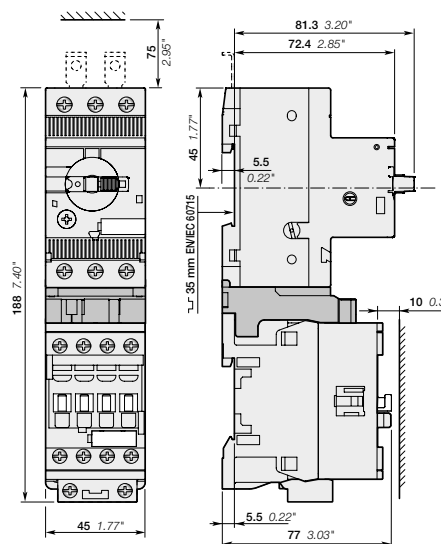
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Coordination tables for MS166 available in our SOC tool :

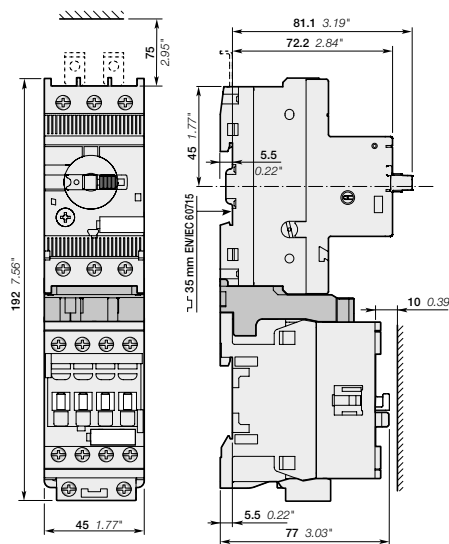
<https://applications.it.abb.com/SOC/Selectivity>

DOL starters protected by MS132 manual motor starters

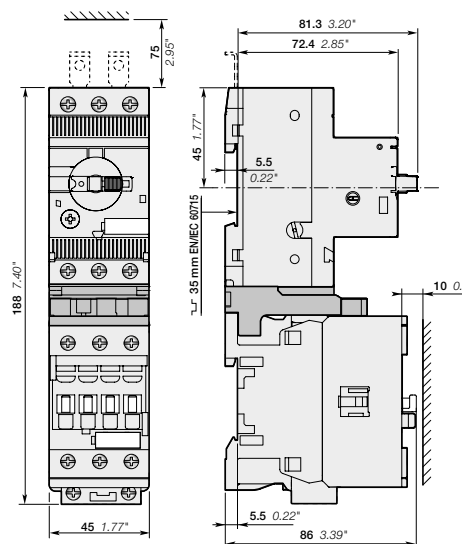
With AF contactors - open type version in kit form



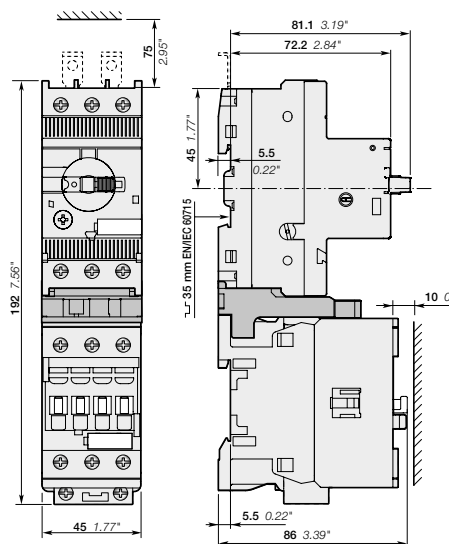
MS132-0.16 ... MS132-10
+ BEA16-4
+ AF09, AF12, AF16



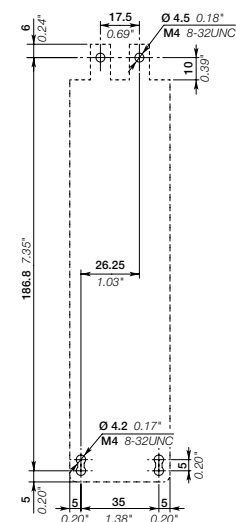
MS132-12 ... MS132-25
+ BEA16-4
+ AF09, AF12, AF16



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



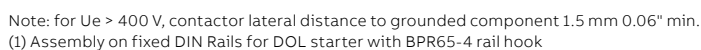
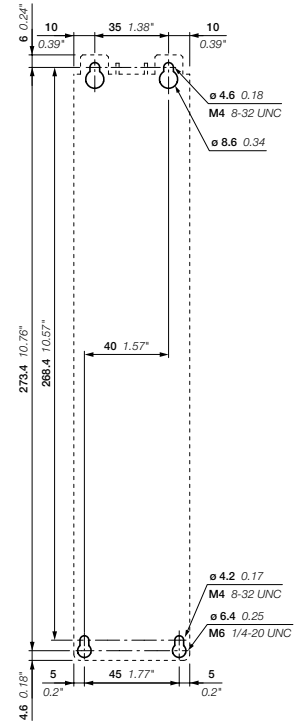
MS132-12 ... MS132-32
+ BEA38-4
+ AF26, AF30, AF38



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

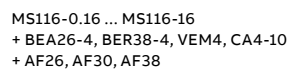
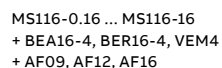
Main dimensions mm, inches

With AF contactors - open type version in kit form



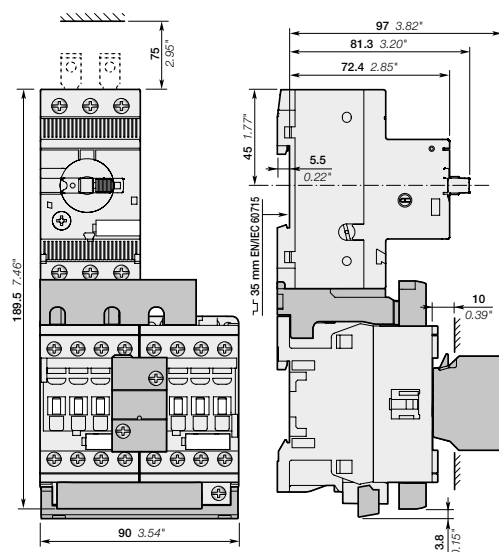
12

With AF contactors - open type version in kit form

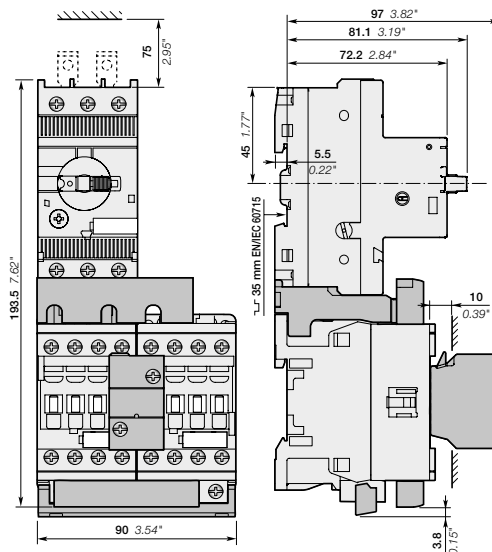


Reversing starters protected by MS132 manual motor starters

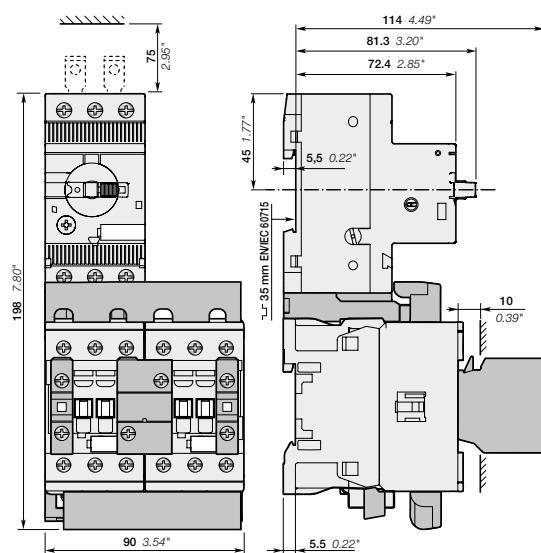
With AF contactors - open type in kit form



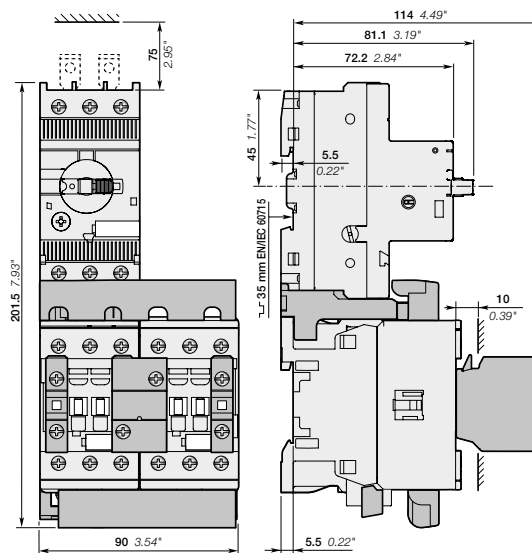
MS132-0.16 ... MS132-10
+ BEA16-4, BER16-4, VEM4
+ AF09, AF12, AF16



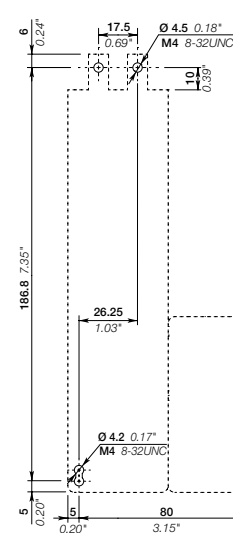
MS132-12 ... MS132-25
+ BEA16-4, BER16-4, VEM4
+ AF09, AF12, AF16



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

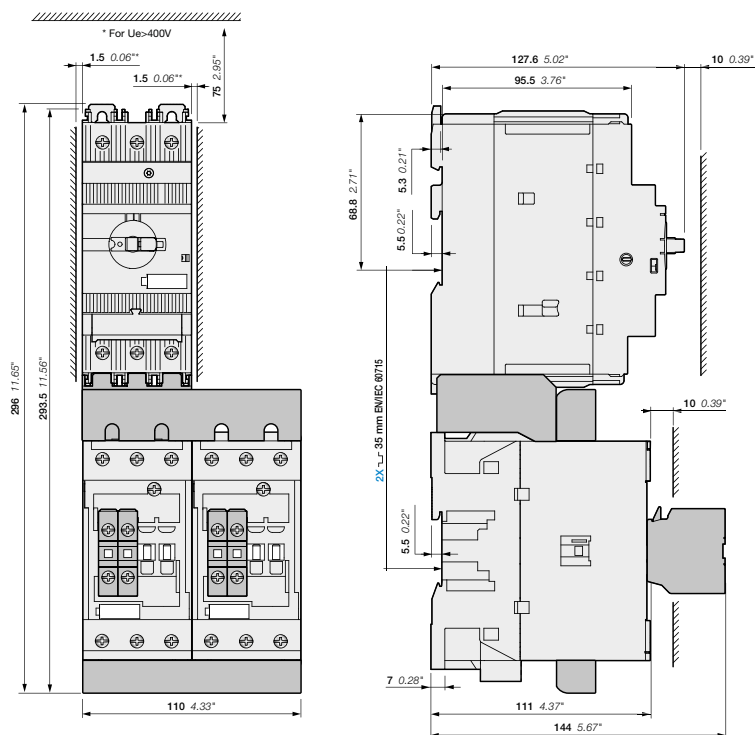


Note: contactor lateral distance to grounded component 2 mm 0.08\" min.

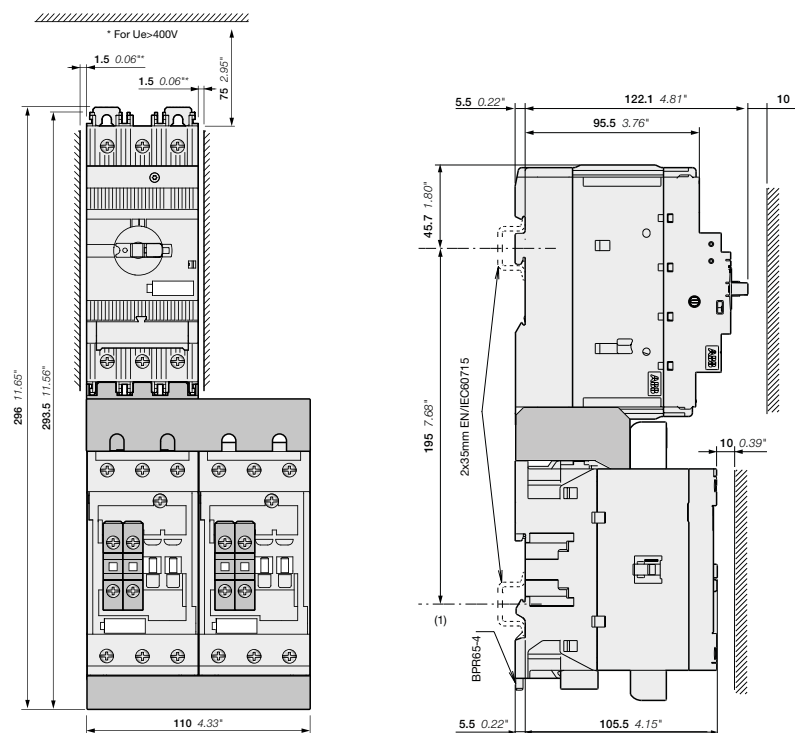
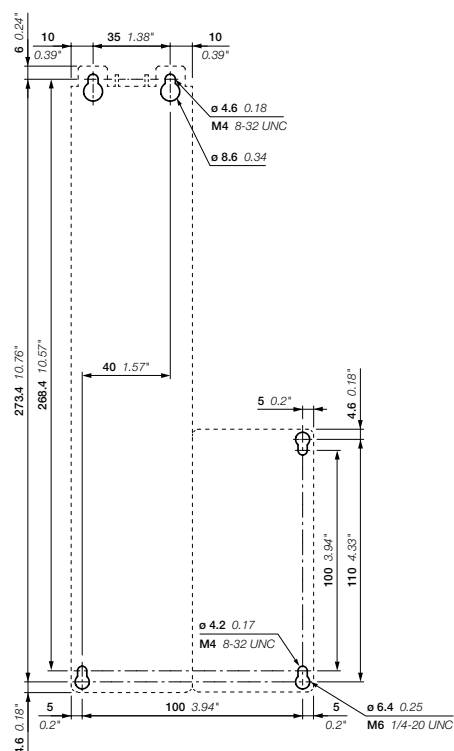
Main dimensions mm, inches

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 $U_e > 400 V$, 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

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

With AF contactors - open type version in kit form



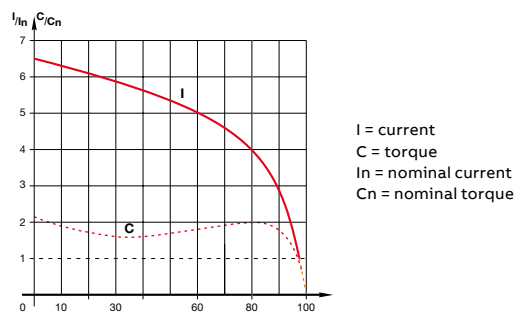
XT2S 160 + BEA140/XT2 +
AF140-30-11



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.



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:

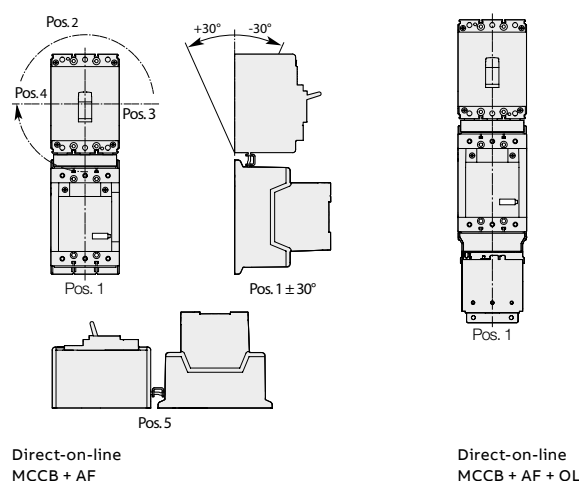
Type 1: In short-circuit conditions, the contactor or starter does not endanger persons or installations and will not be able to then operate without being repaired or having parts replaced.

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

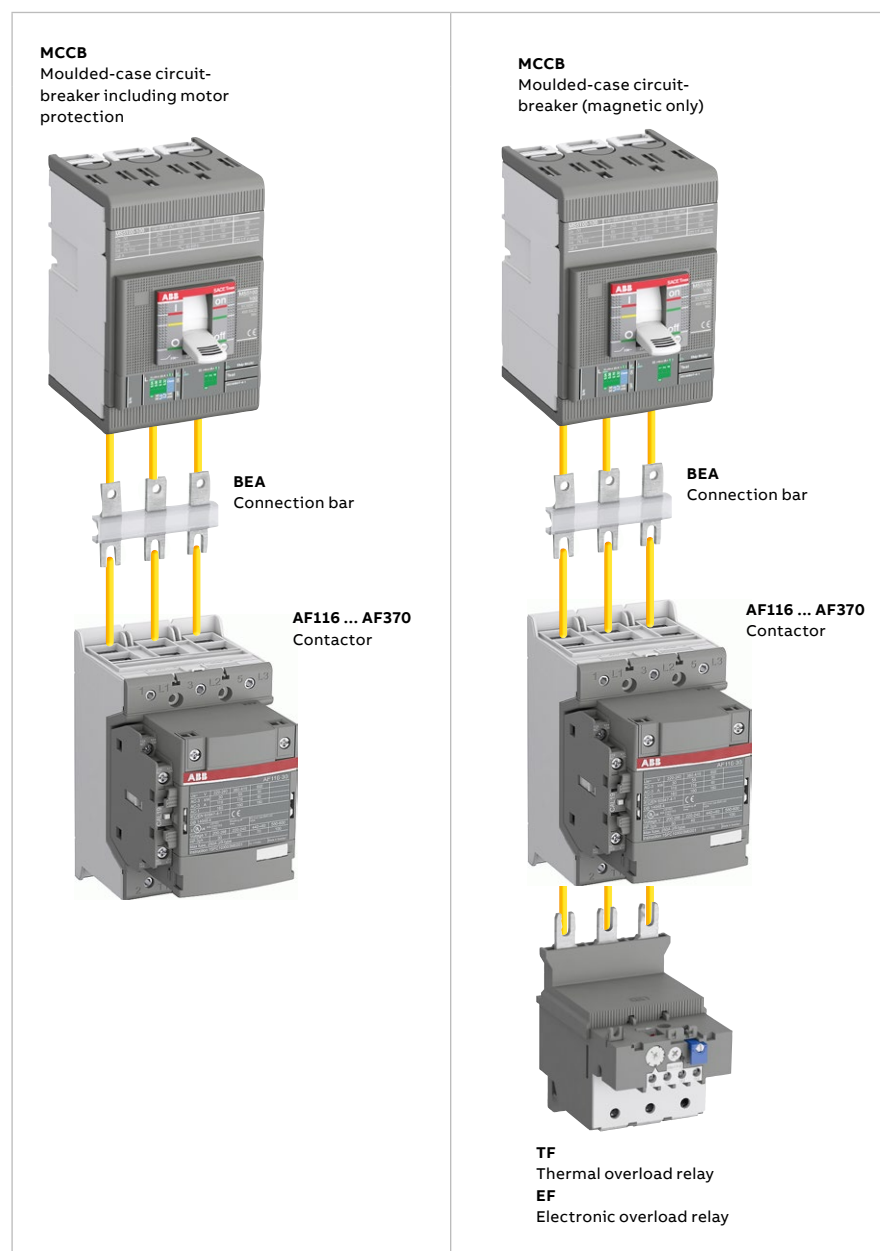
Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage U_e max.	400 V - 50/60 Hz
Rated insulation voltage U_i	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Switching frequency	≤ 15 starts/hour - 80 % max. load factor - with max. 1.5 s starting time ≤ 30 starts/hour - 50 % max. load factor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

Mounting positions



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

With AF contactors - open type version in kit form



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.

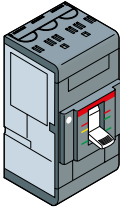
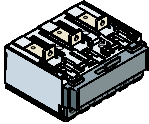
Select now easily and quickly your starter in the following pages for coordination type 1 or 2 at 400 V, 50/60 Hz, I_q = 50 kA up to 200 kW.

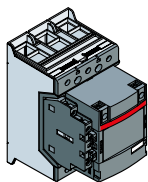
For the full coordination tables, please visit our SOC tool : <https://applications.it.abb.com/SOC/Selectivity>

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 tripping current setting A	Max. allowed thermal setting	Base		+	Trip unit		
AC-3, 400 V				Type	Order code		Type	Order code	
Rated power kW	Rated current 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	-	

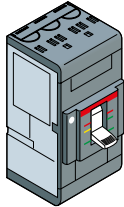
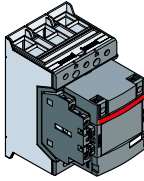
Contactors**Connection bars**

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	BEA205/T4	1SFN084806R1001	
100...250	100...250	AF140-30-11-13	1SFL447001R1311			
24...60	20...60	AF190-30-11-11	1SFL487002R1111			
100...250	100...250	AF190-30-11-13	1SFL487002R1311			
24...60	20...60	AF205-30-11-11	1SFL527002R1111	BEA370/T5	1SFN085406R1000	
100...250	100...250	AF205-30-11-13	1SFL527002R1311			
24...60	20...60	AF265-30-11-11	1SFL547002R1111			
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			

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

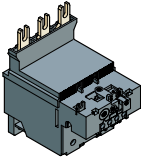
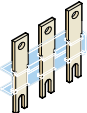
MCCB	Contactors
	

Thermal overload relays

IEC AC-3, 400 V Rated power kW	Rated current A	Magnetic tripping current A	Type	Order code	Control voltage Uc min. ... Uc max.		Type	Order code
					V 50/60 Hz	V DC		
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 
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	Setting ranges	Max. allowed setting current	Type	Order code	Type	Order code
	A	A				
	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

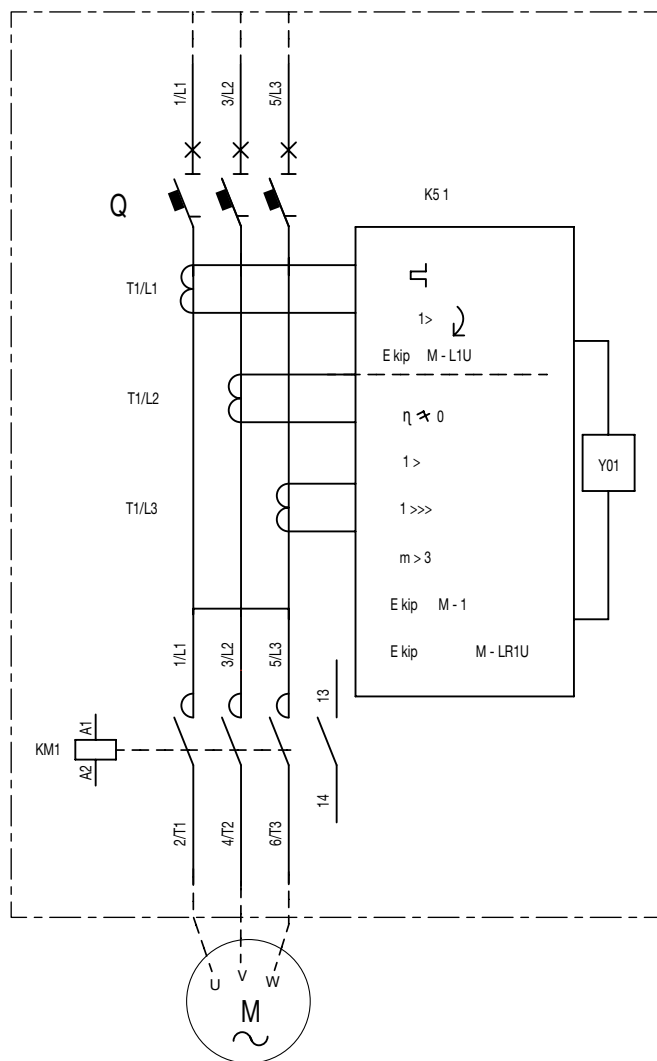
	54...150	116	EF146-150	1SAX351001R1101	BEA140/XT2	1SFN084206R1000
	54...150	140	EF146-150	1SAX351001R1101		
	63...210	190	EF205-210	1SAX531001R1101	BEA205/XT4	1SFN084806R1000
	63...210	205	EF205-210	1SAX531001R1101	BEA205/T4	1SFN084806R1001
	115...380	265	EF370-380	1SAX611001R1101	BEA370/T5	1SFN085406R1000
	115...380	305	EF370-380	1SAX611001R1101		
	115...380	350	EF370-380	1SAX611001R1101		

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

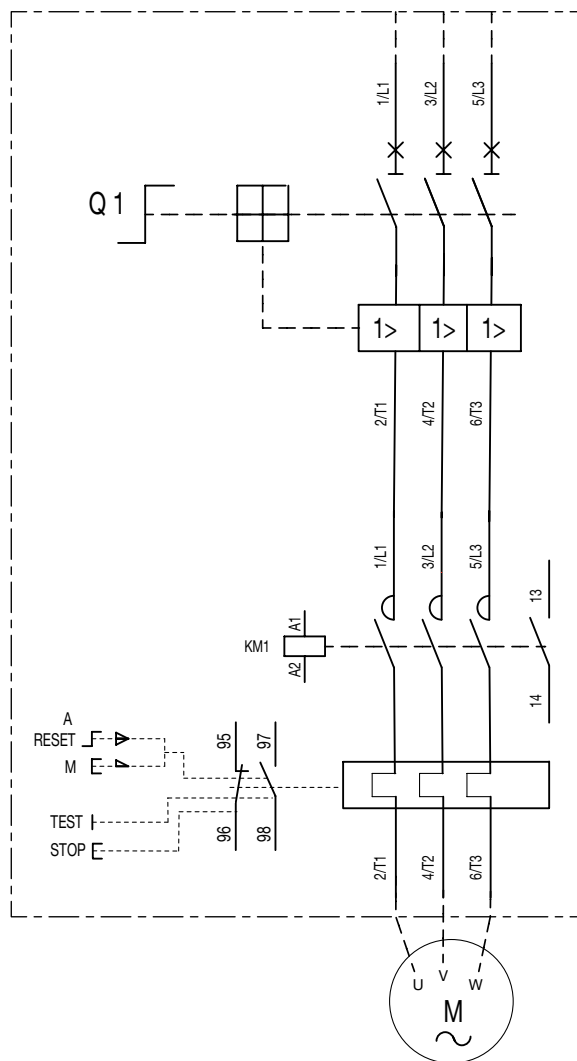
With AF contactors - Open type version in kit form

Direct-on-line starters

Protected by MCCB including motor protection

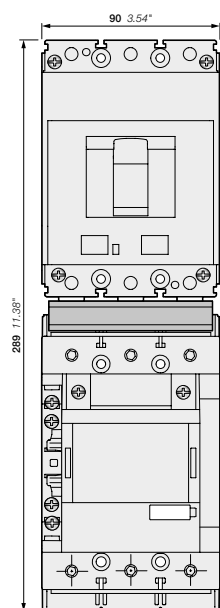


Protected by MCCB (magnetic only) and overload relays

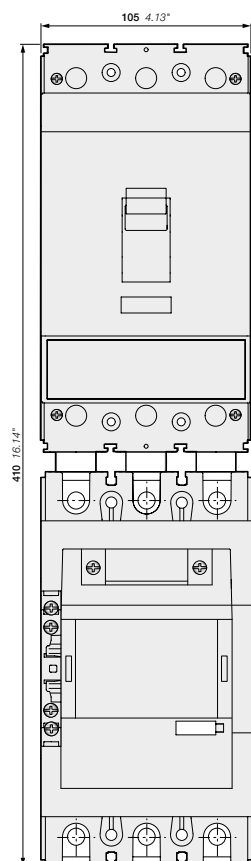
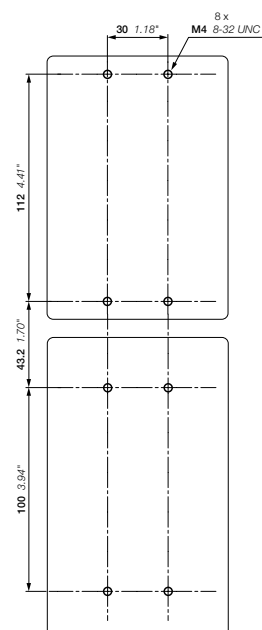
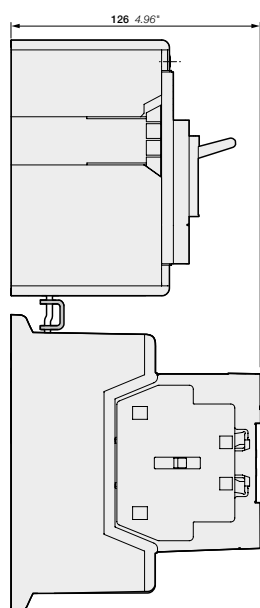


DOL starters protected by MCCB, including motor protection

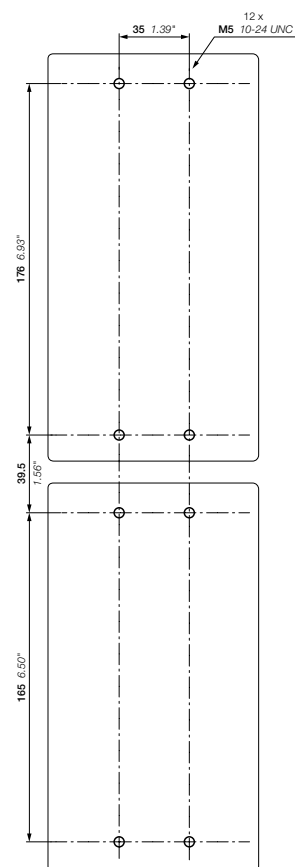
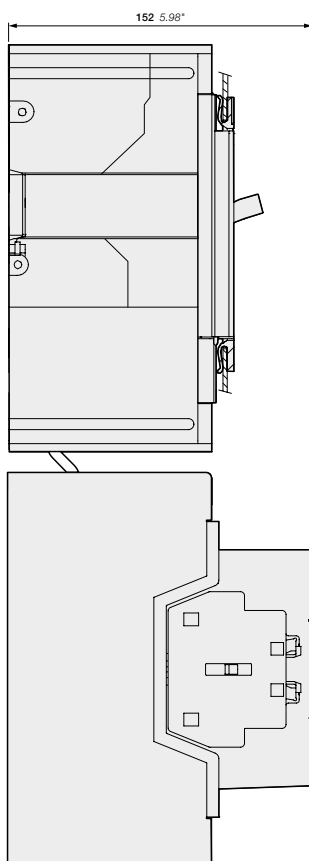
With AF contactors - Open type version in kit form



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



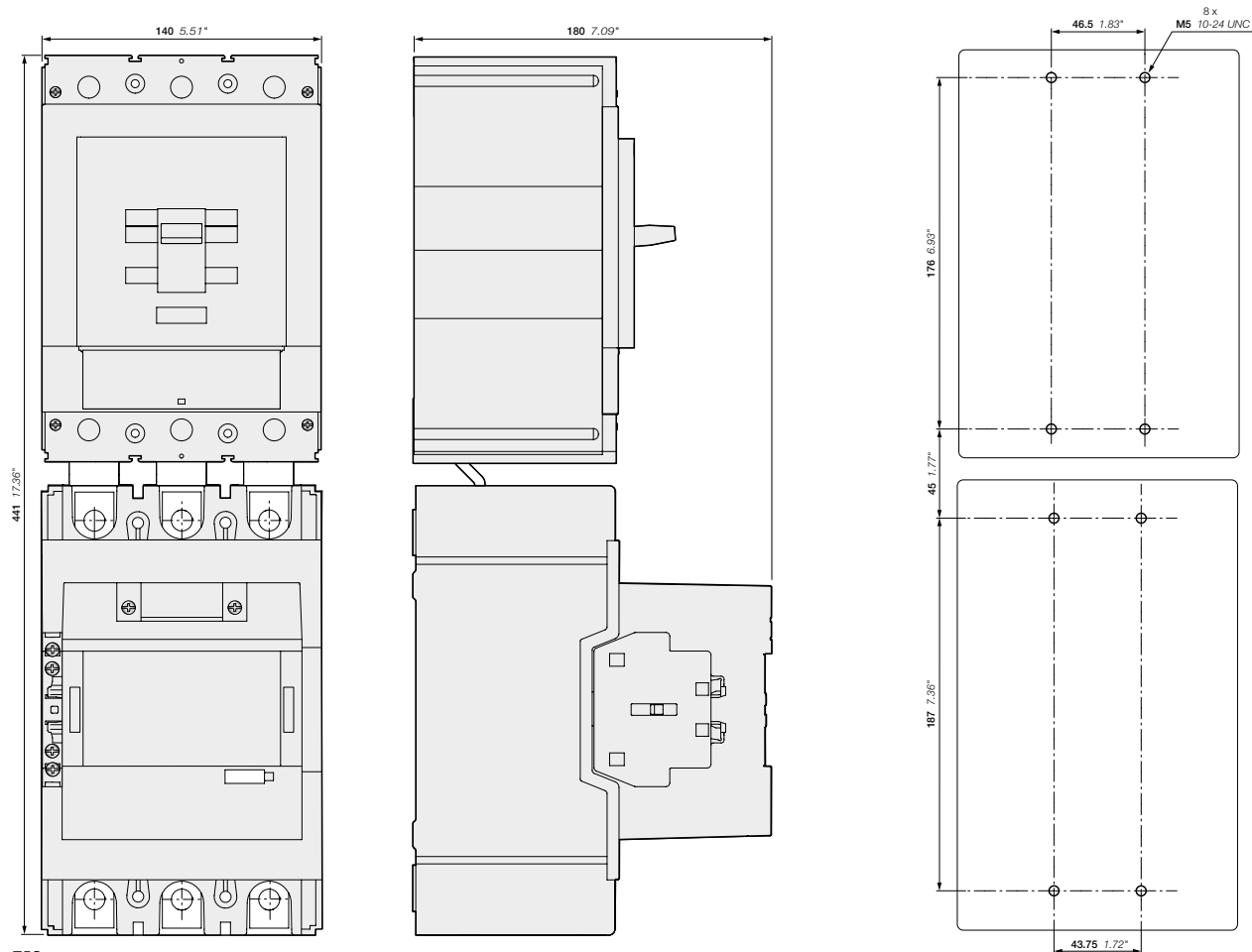
T4S
+ BEA205/T4
+ AF190, AF205



Main dimensions mm, inches

DOL starters protected by MCCB, including motor protection

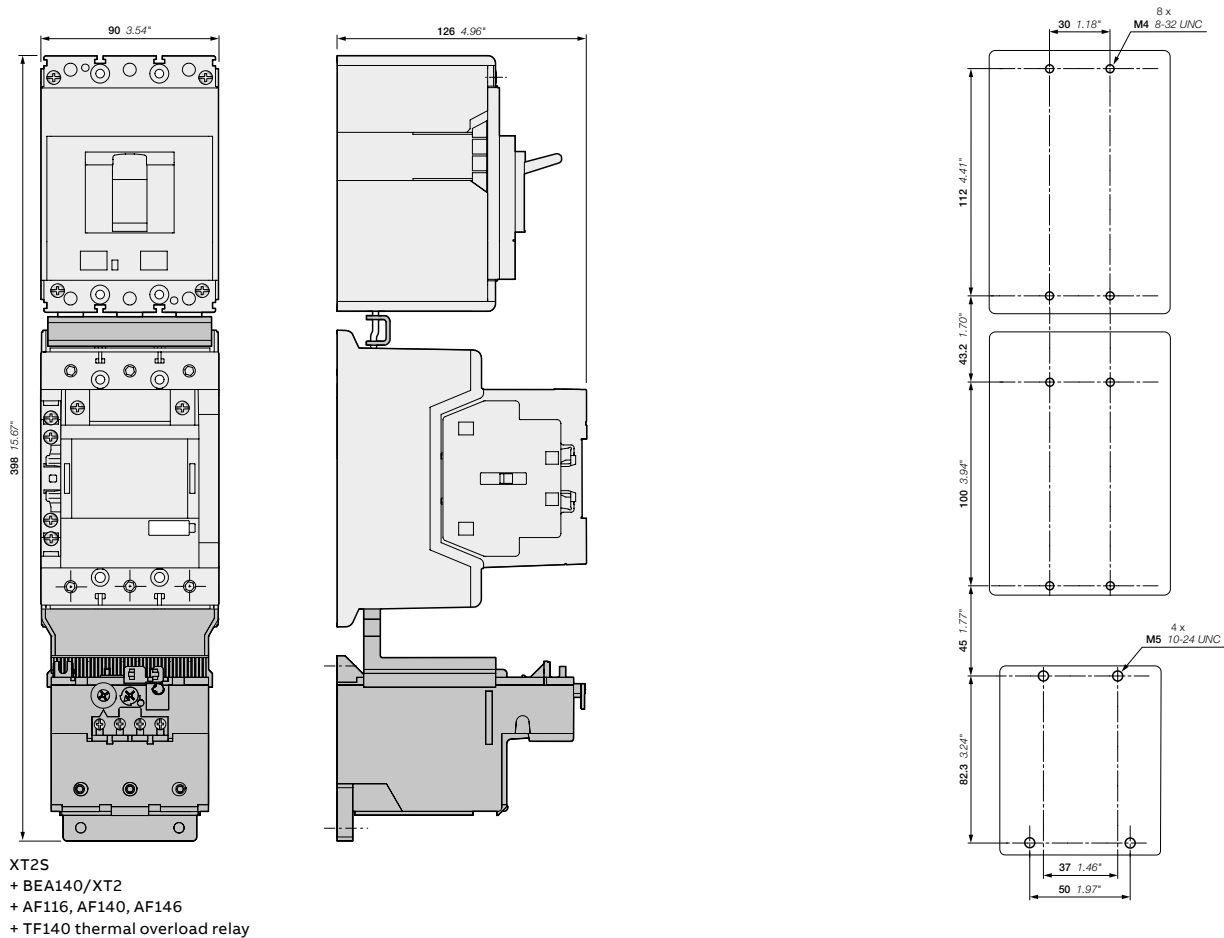
With AF contactors - Open type version in kit form



T5S
+ BEA370/T5
+ AF265, AF305, AF370

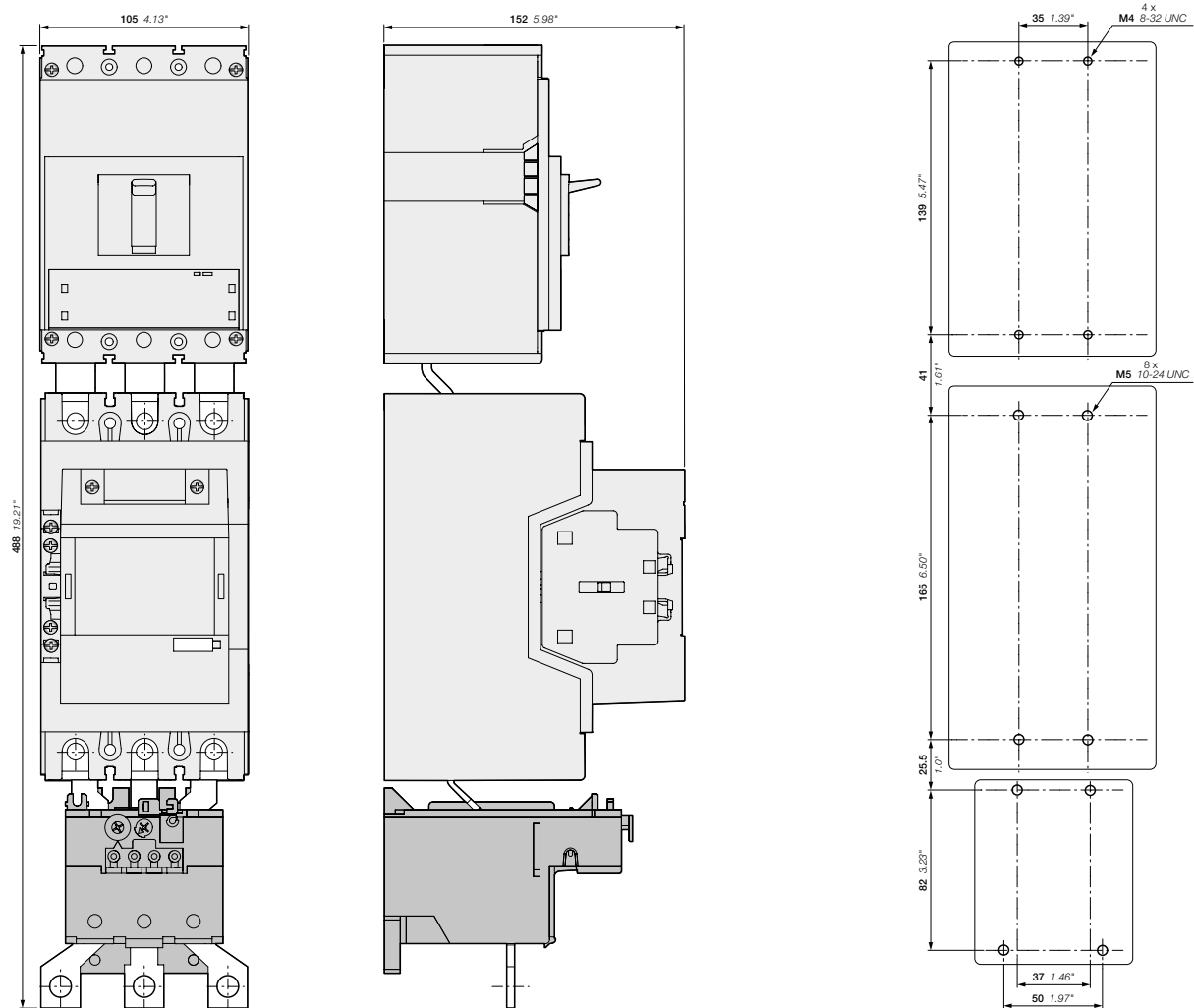
DOL starters protected by MCCB (magnetic only) and thermal overload relays

With AF contactors - Open type version in kit form



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

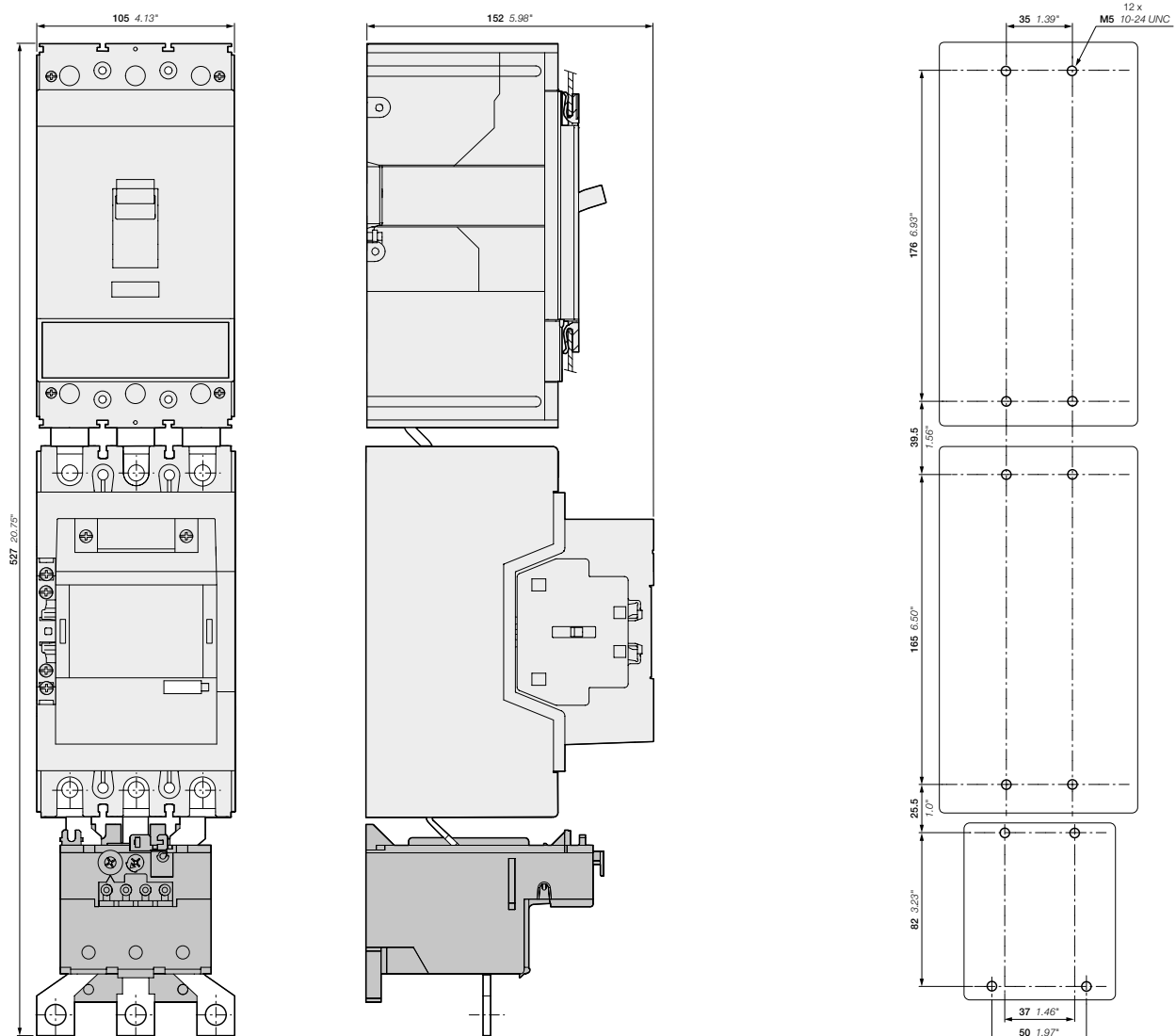
With AF contactors - Open type version in kit form



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

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

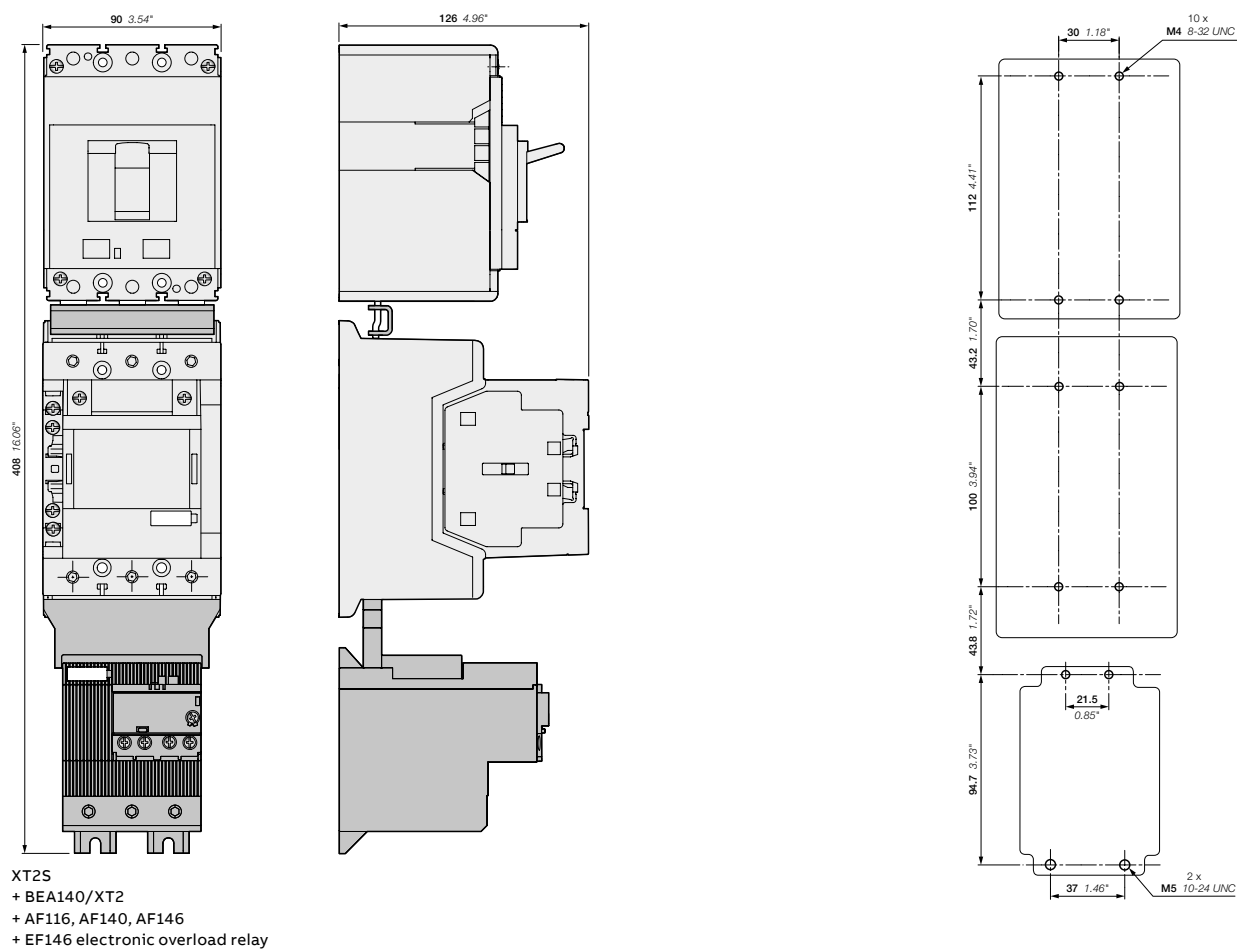
With AF contactors - Open type version in kit form



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

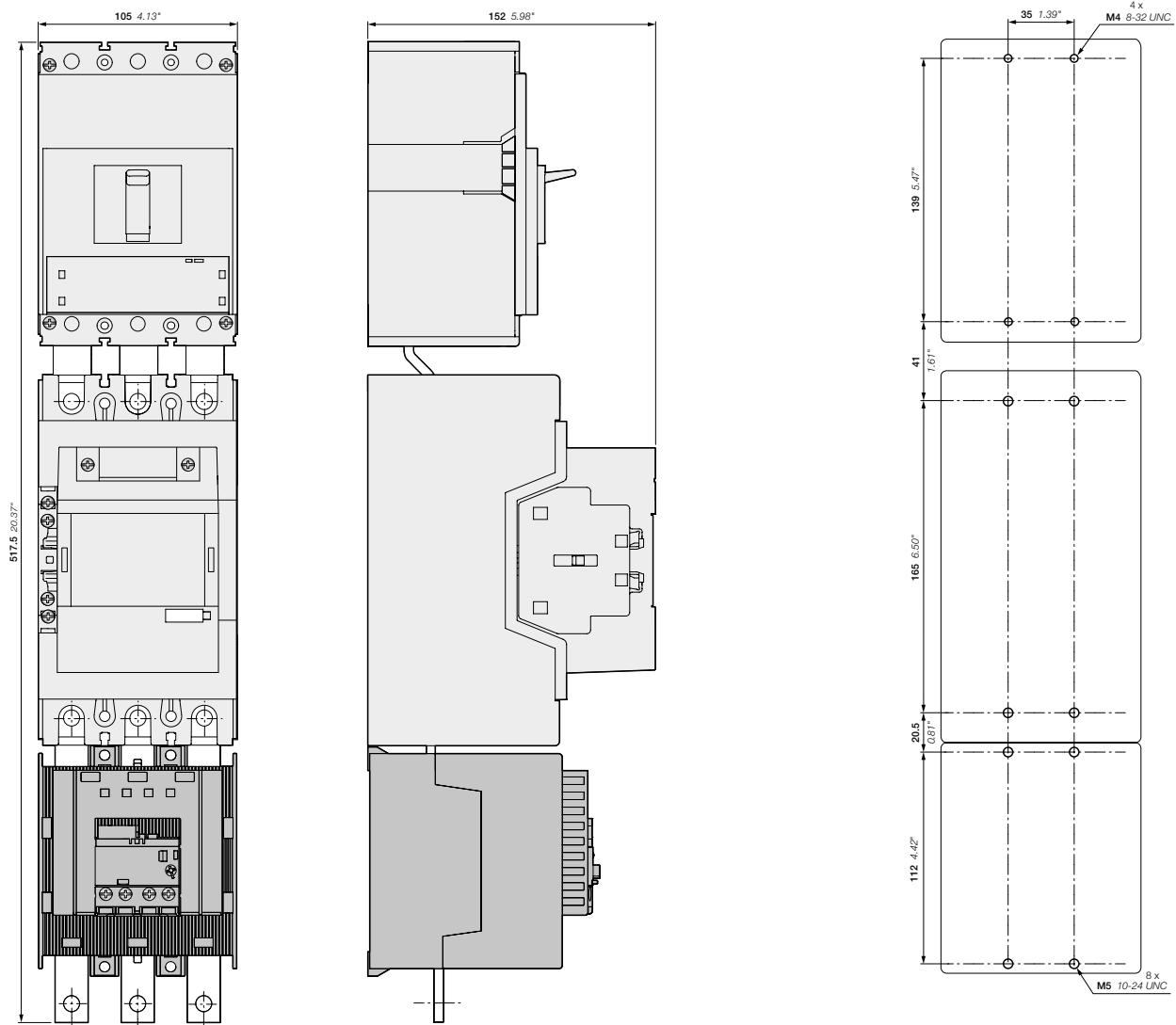
DOL starters protected by MCCB (magnetic only) and electronic overload relays

With AF contactors - Open type version in kit form



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

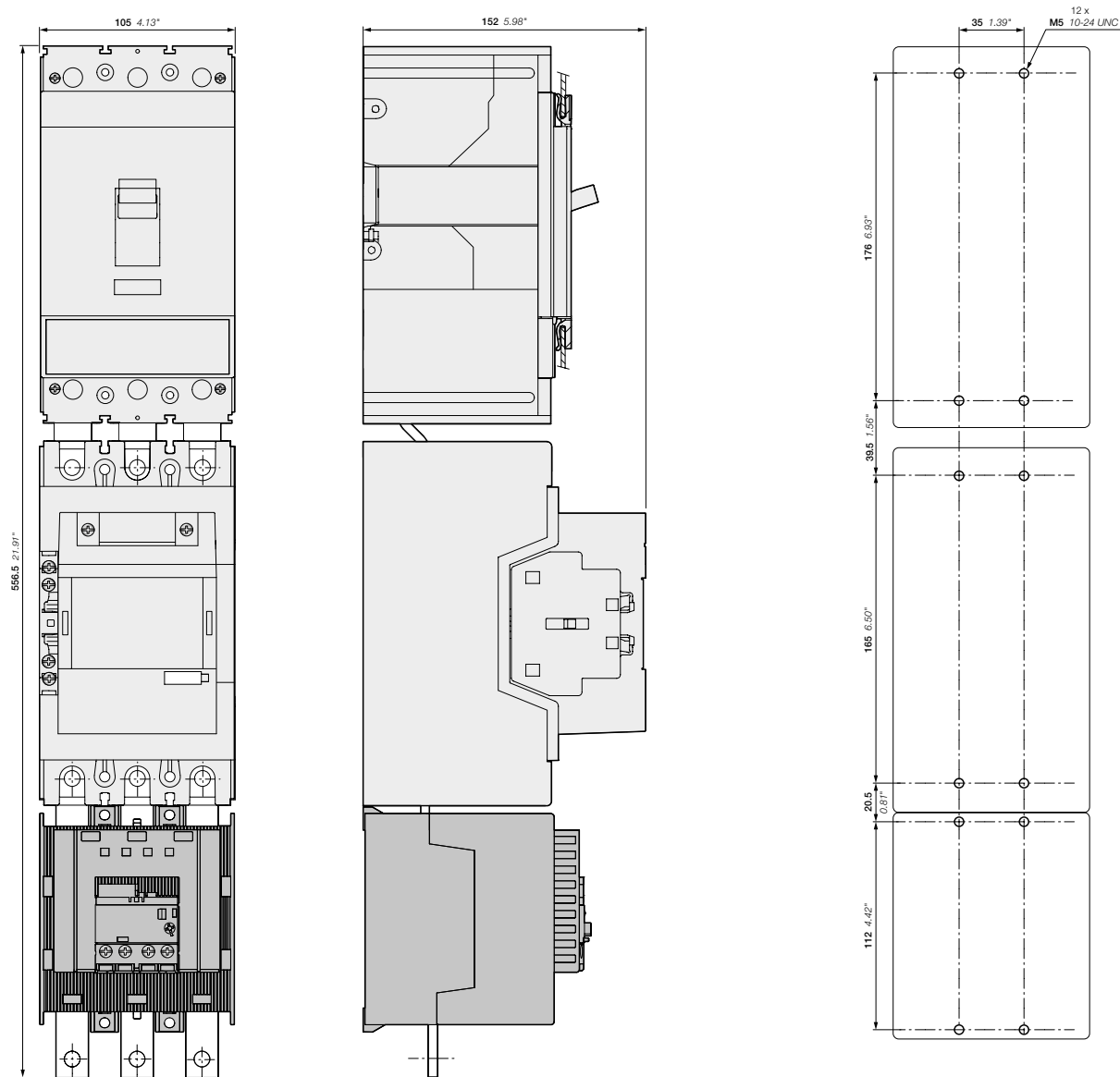
With AF contactors - Open type version in kit form



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

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

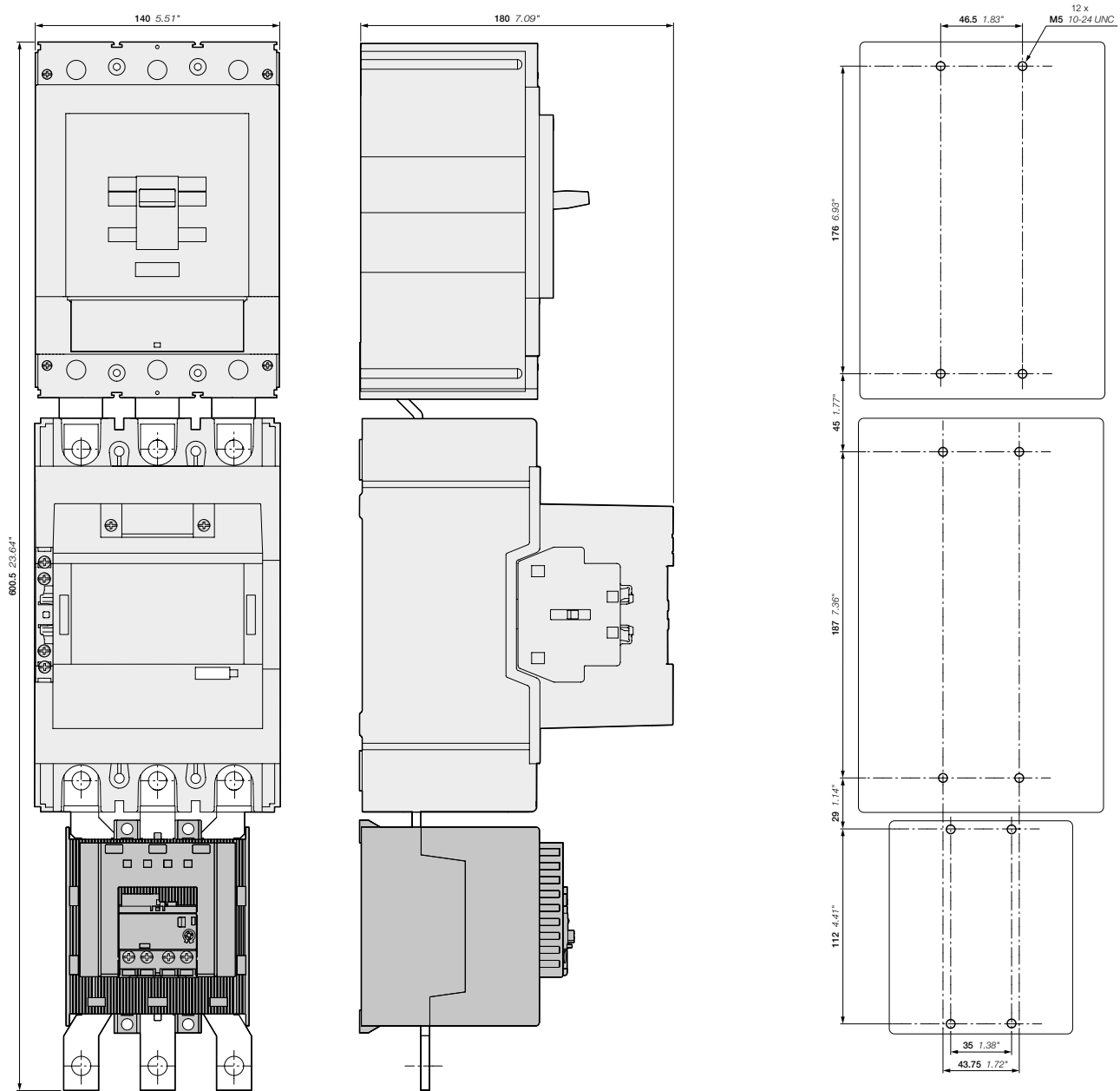
With AF contactors - Open type version in kit form



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

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

With AF contactors - Open type version in kit form



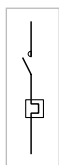
T55
 + BEA370/T5
 + AF265, AF305, AF370
 + EF370 electronic overload relay

DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form

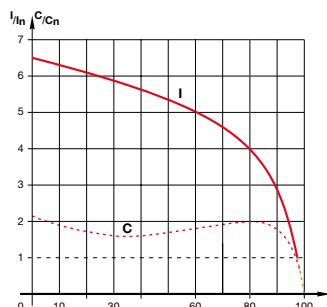


AF09-30-10 + TF42



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



AF140-30-11 + TF140DU

Coordination Types

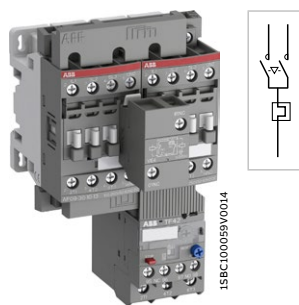
The contactor, the short-circuit protection device and the thermal overload relay control and protect motors against overload and short-circuits according to coordination types 1 and 2 (IEC 60947-4-1 / EN 60947-4-1) defining the anticipated level of service continuity as follow:

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 U_e max.	690 V - 50/60 Hz
Rated insulation voltage U_i	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Ambient air temperature	
Close to the device	$\leq 60^\circ\text{C}$ (TF42: 38 A above $\leq 50^\circ\text{C}$)
Degree of protection	IP20
Switching frequency	Refer to "Switching frequency diagrams" page

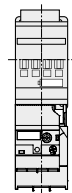


AF09-30-10 + BER16-4 + VEM4
+ TF42

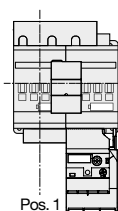


AF140-30-11 + BER140-4 + VM19 +
TF140DU

Mounting positions



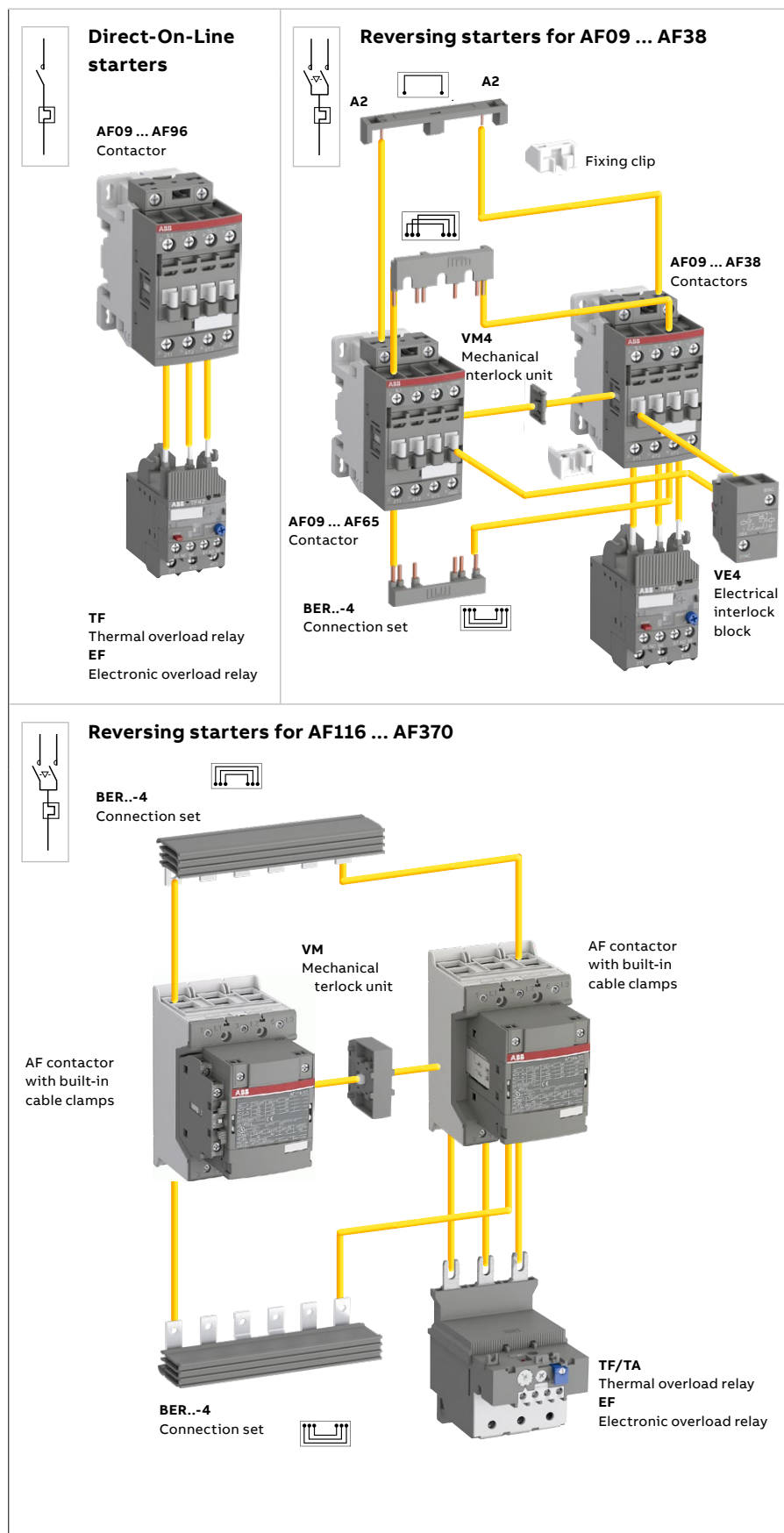
Pos. 1
Direct-on-line



Pos. 1
Reversing

DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form



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:

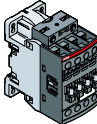
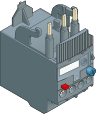
- For AF09 ... AF38, use VEM4 mechanical and electrical interlock set for reversing starter in 90 mm width.
- It includes:
 - VM4 mechanical interlock unit including 2 fixing clips
 - VE4 electrical interlock block with A2-A2 connection.
- For AF40 ... AF370, use VM mechanical interlock unit and additional 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>

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		Control voltage Uc min. ... Uc max. (1) V 50/60 Hz V DC (2)		Type	Order code	Setting ranges A	Type	Order code	
Rated current A									
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.

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 + VEM4	1SBN081311R1000 1SBN030111R1000
		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				+ BER38-4 + VEM4 + 2x CA4-10	1SBN082311R1000 1SBN030111R1000 1SBN010110R1010
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				+ BER65-4 + VM96-4 + 2x CA4-10 + 2x CA4-01	1SBN083411R1000 1SBN033405T1000 1SBN010110R1010 1SBN010110R1001
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				+ BER96-4 + VM96-4 + 2x CA4-10 + 2x CA4-01	1SBN083911R1000 1SBN033405T1000 1SBN010110R1010 1SBN010110R1001
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	+ BER140-4 + VM19	1SFN084111R1000 1SFN030300R1000
		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				+ BER205-4 + VM19	1SFN084811R1000 1SFN030300R1000
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					

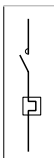
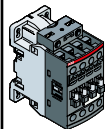
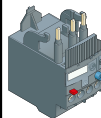
(1) For other control voltages, see "Voltage code table".

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.

Direct-on-line starters protected by electronic overload relays

With AF contactors - Open type version in kit form

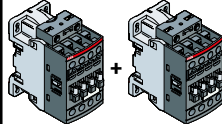
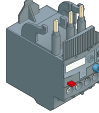
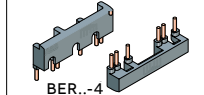
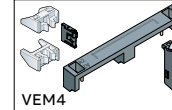
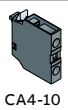
		Contactors					Electronic overload relays			Accessories	
											
IEC AC-3, 400 V Rated power kW Rated current A		Control voltage Uc min. ... Uc max. (1) V 50/60 Hz V DC		Type	Order code		Setting ranges A	Type	Order code		
4	8.5	24...60 100...250	20...60 100...250	AF09Z-30-10-11 AF09-30-10-13	1SBL136001R1110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

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

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

Reversing starters protected by electronic overload relays

With AF contactors - Open type version in kit form

		Contactors 				Electronic overload relays 			Accessories  BER..-4  VEM4  CA4-10	
IEC		Control voltage Uc min. ... Uc max. (1)		Type	Order code	Setting ranges	Type	Order code	Type	Order code
AC-3, 400 V	Rated power kW	Rated current A	V 50/60 Hz	V DC		A				
4	8.5	24...60	20...60	AF09Z-30-10-11	1SBL136001R1110	5.70...18.9	EF19-18.9	1SAX111001R1105	BER16-4 + VEM4	1SBN081311R1000 1SBN030111R1000
		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	BER38-4 + VEM4 + 2x CA4-10	1SBN082311R1000 1SBN030111R1000 1SBN010110R1010
		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	BER65-4 + VM96-4 + 2x CA4-10 + 2x CA4-01	1SBN083411R1000 1SBN033405T1000 1SBN010110R1010 1SBN010110R1001
		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	BER140-4 + VM19	1SFN084111R1000 1SFN030300R1000
		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	BER205-4 + VM19	1SFN084811R1000 1SFN030300R1000
		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	BER370-4 + VM19	1SFN085411R1000 1SFN030300R1000
		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	BER370-4 + VM19	1SFN085411R1000 1SFN030300R1000
		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	BER370-4 + VM19	1SFN085411R1000 1SFN030300R1000
		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	BER370-4 + VM19	1SFN085411R1000 1SFN030300R1000
		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.

DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form

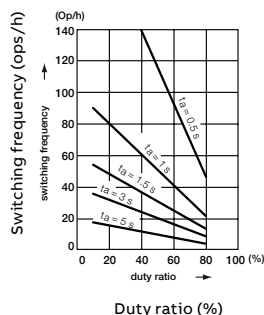
Switching frequency diagrams

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



t_a : motor starting time

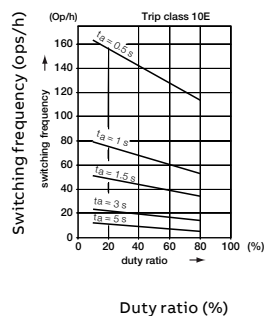
Example:

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

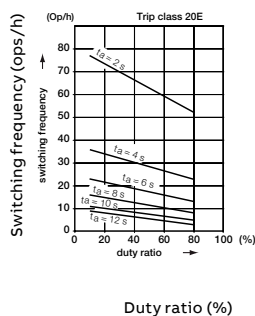
Intermittent periodic duty

Trip class 10E



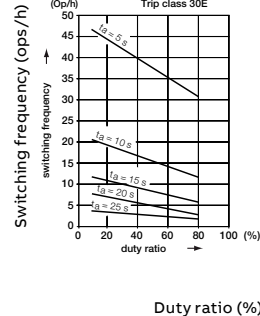
t_a : motor starting time

Trip class 20E



Duty ratio (%)

Trip class 30E



Duty ratio (%)

Example 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 $6 \times I_n$.

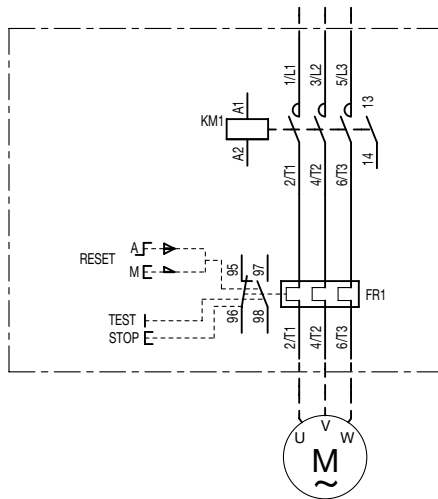
DOL and reversing starters protected by overload relays

With AF contactors - Open type version in kit form

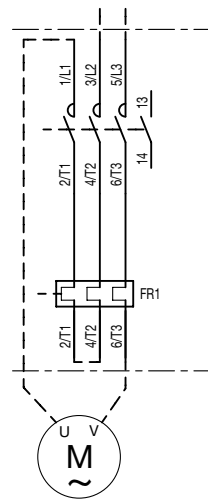
Wiring diagrams

Direct-on-line starters

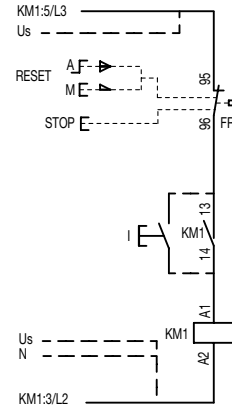
Power circuit



1-phase

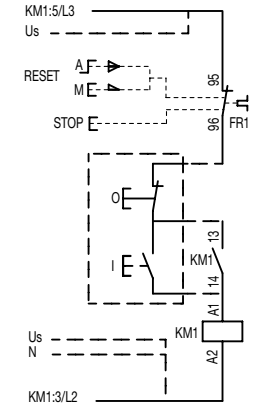


AC or DC local control



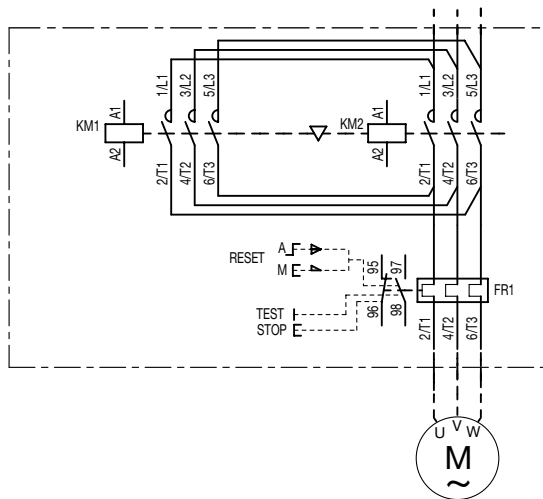
Note: coil Uc 12-20 V DC : A1+, A2-

AC or DC remote control

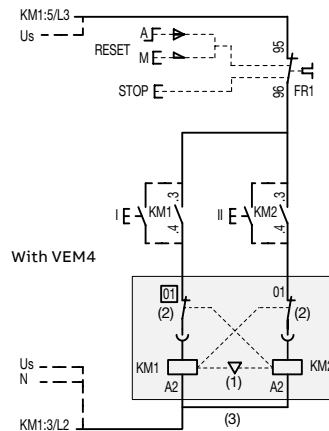


Reversing starters

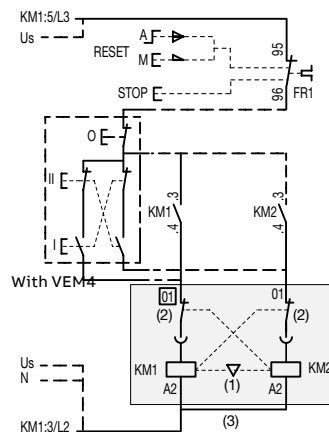
Power circuit



AC or DC local control

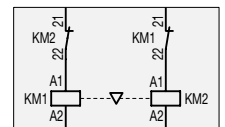


AC or DC remote control

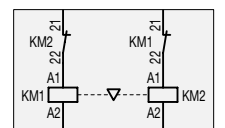


Note: - VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection
(Except for coil Uc 12-20 V DC : use VM4 with CA4).
- coil Uc 12-20 V DC : A1+, A2-

With VM

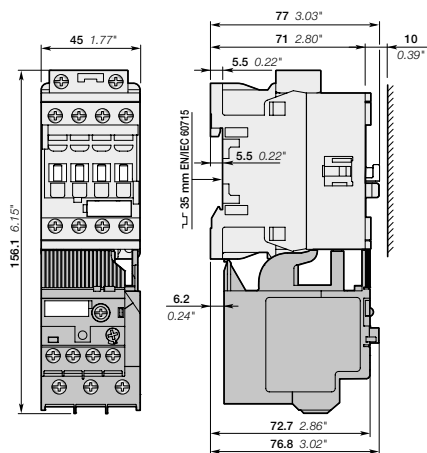


With VM

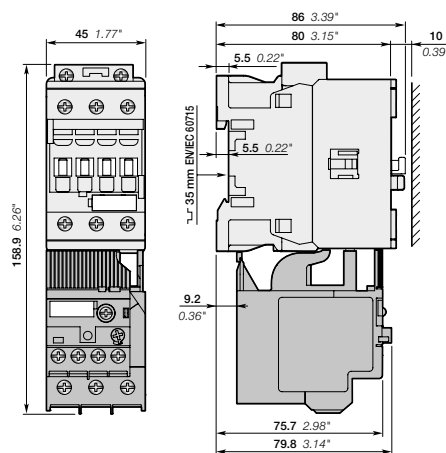


DOL starters protected by thermal overload relays

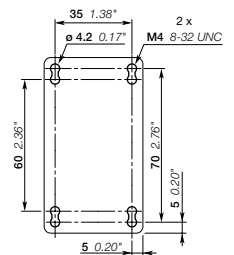
With AF contactors - open type version in kit form



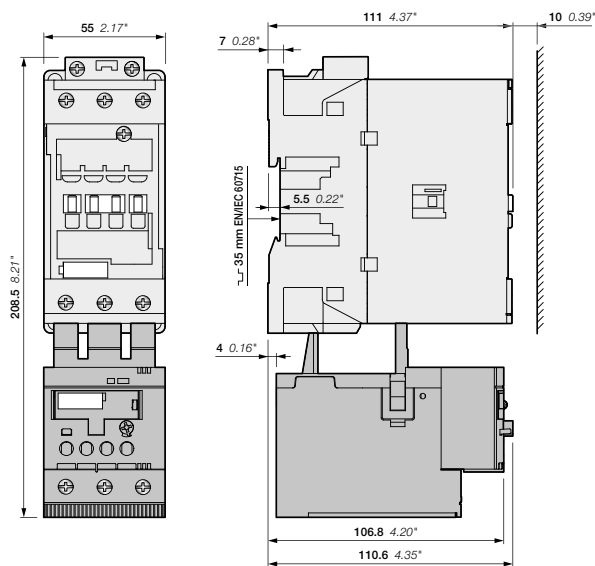
AF09, AF12, AF16
+ TF42 thermal overload relay



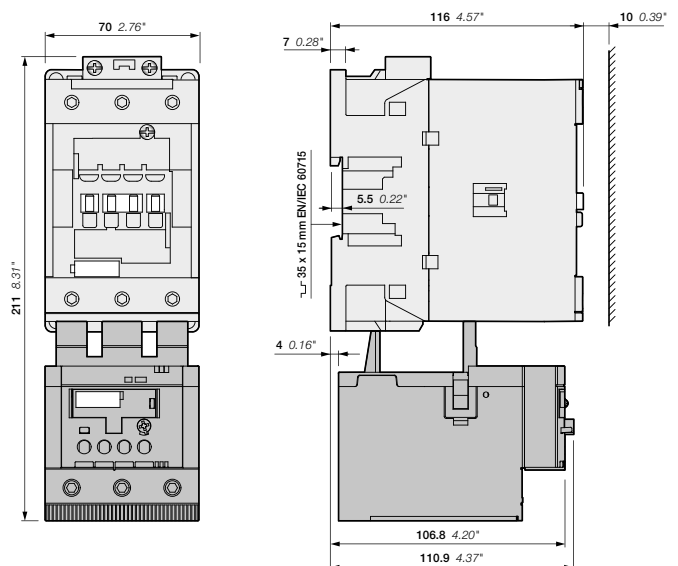
AF26, AF30, AF38
+ TF42 thermal overload relay



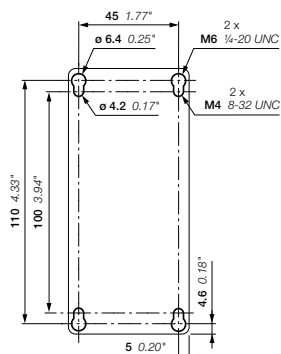
Note: contactor lateral distance to grounded component 2 mm 0.08" min.



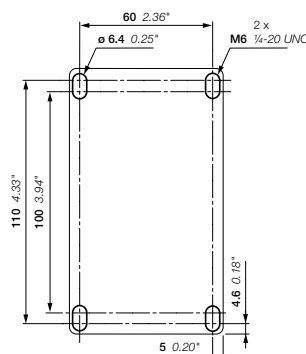
AF40, AF52, AF65
+ TF65 thermal overload relay



AF80, AF96
+ TF96 thermal overload relay



AF40, AF52, AF65
+ TF65 thermal overload relay

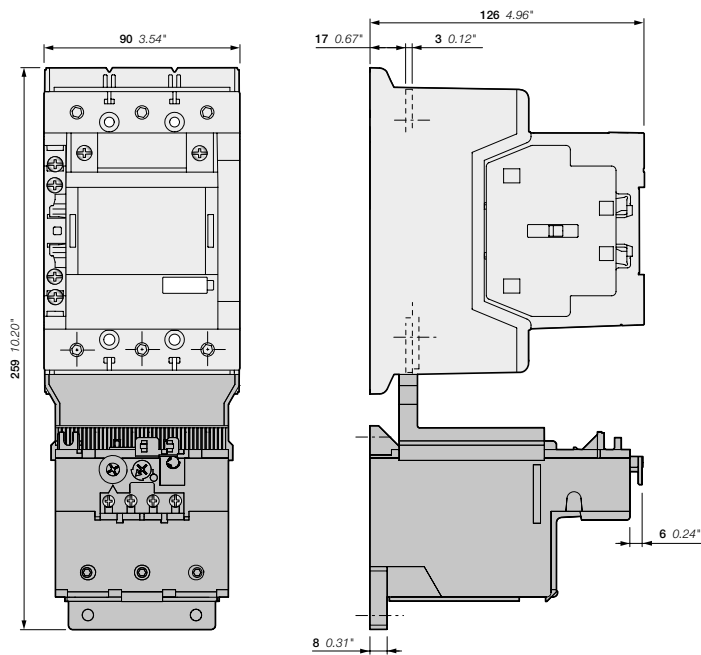


AF80, AF96
+ TF96 thermal overload relay

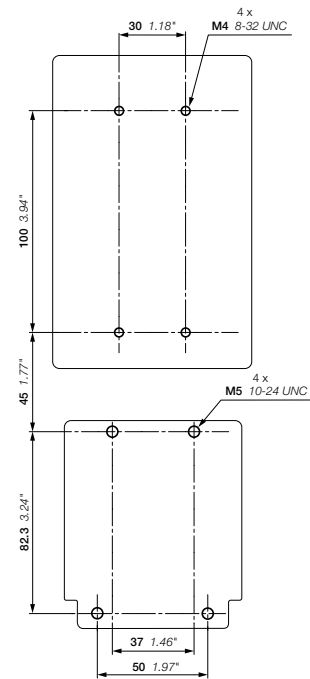
Main dimensions mm, inches

DOL starters protected by thermal overload relays

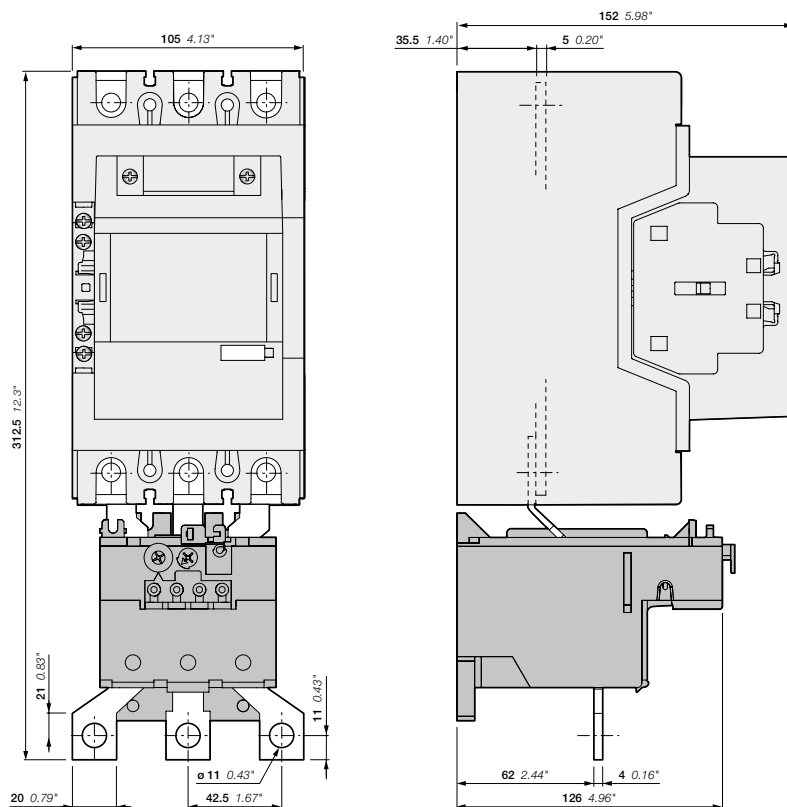
With AF contactors - open type version in kit form



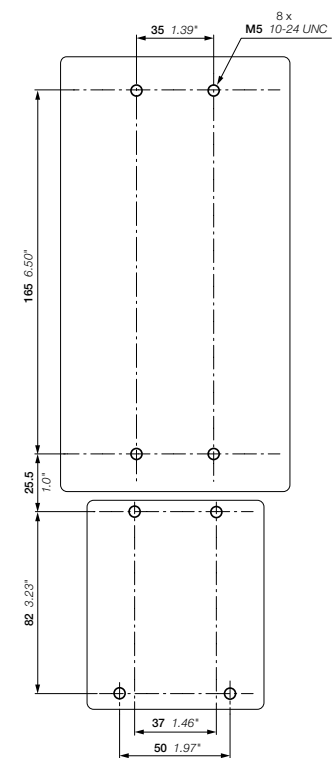
AF116, AF140-30-11(B)
+ TF140 thermal overload relay



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



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

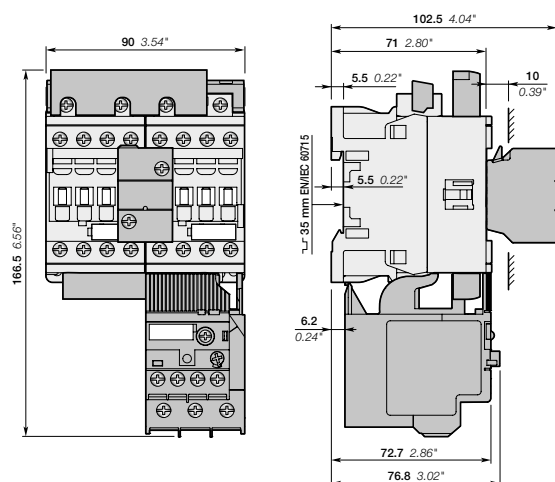


AF190, AF205
+ TA200DU thermal overload relay

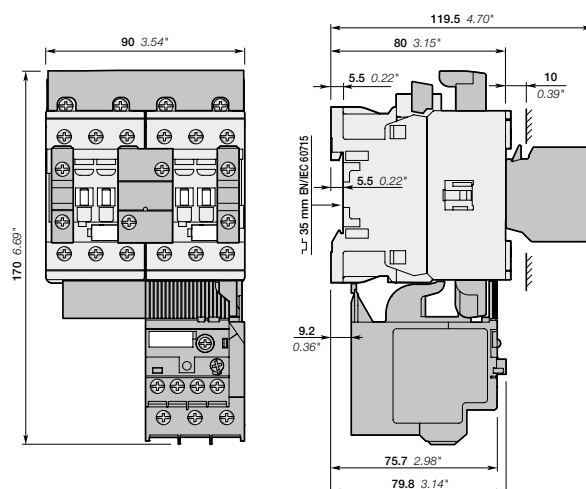
Main dimensions mm, inches

Reversing starters protected by thermal overload relays

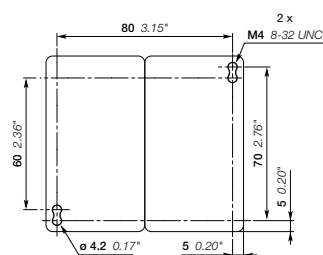
With AF contactors - open type version in kit form



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



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

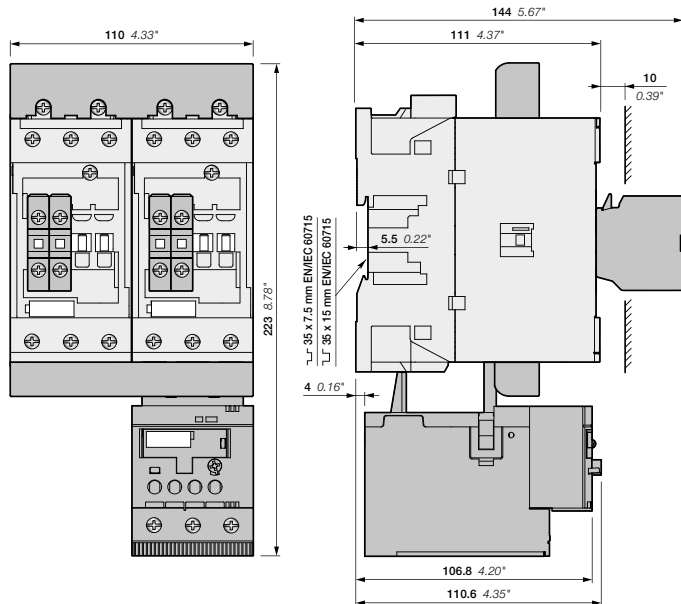


AF09, AF12, AF16, AF26, AF30, AF38

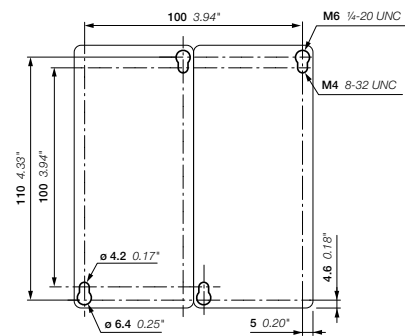
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Reversing starters protected by thermal overload relays

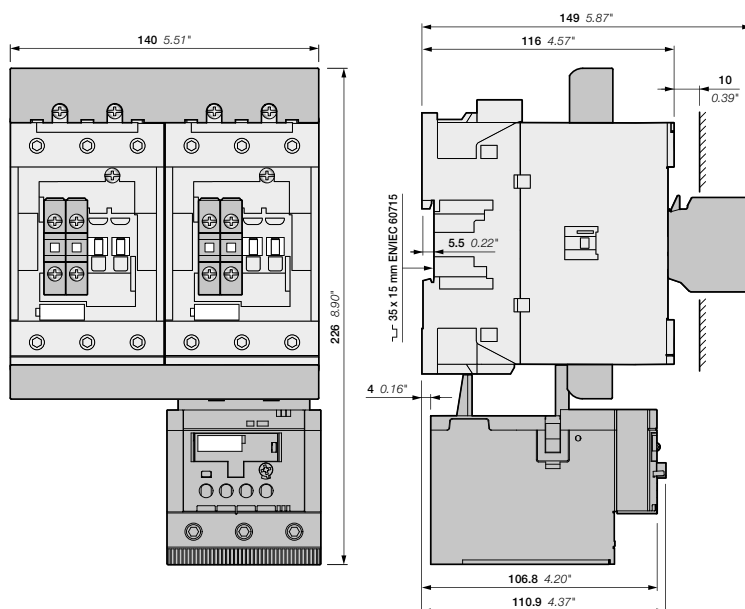
With AF contactors - open type version in kit form



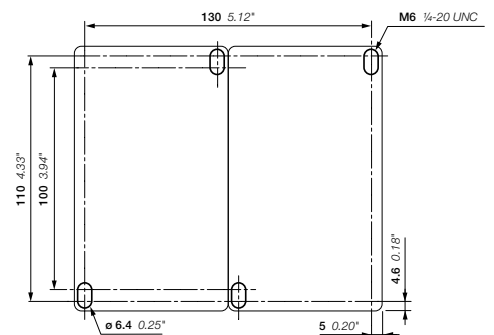
AF40, AF52, AF65
+ BER65-4, VM96-4
+ TF65 thermal overload relay



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



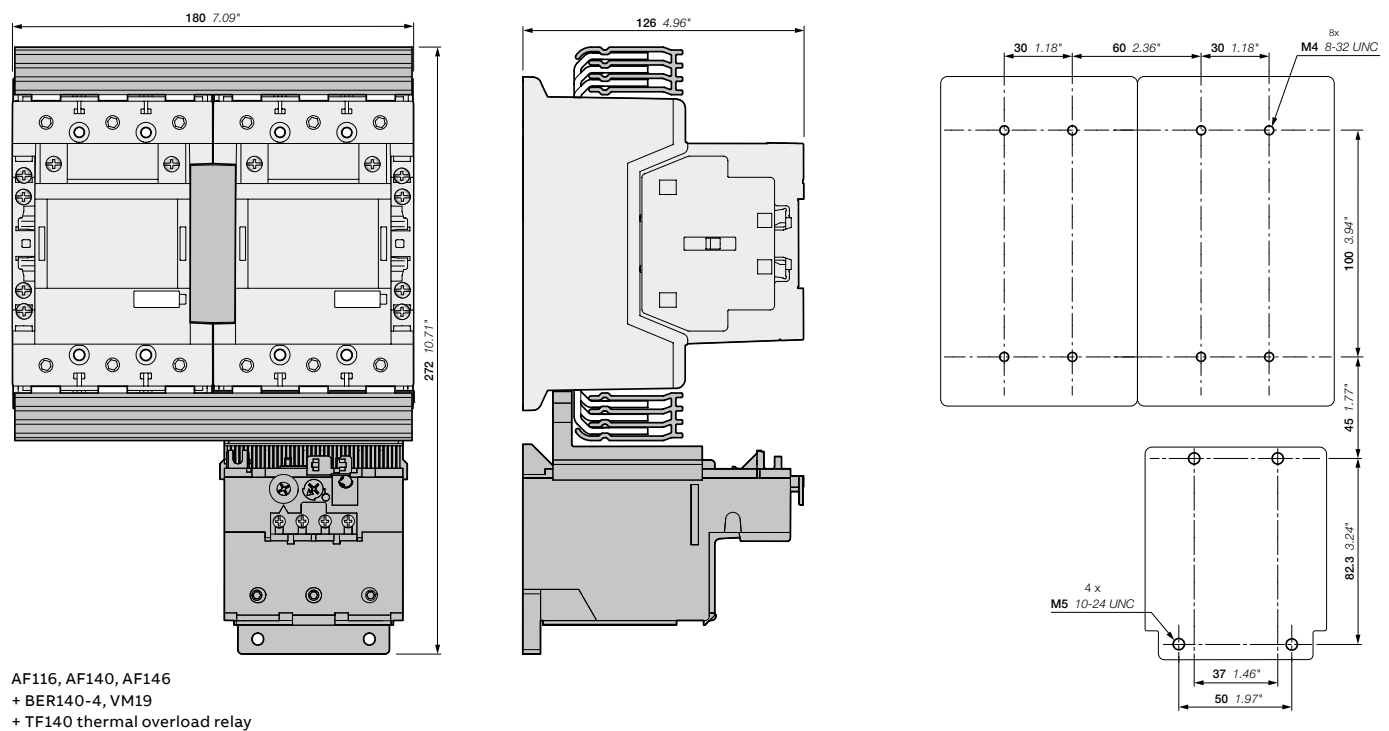
AF80, AF96
+ BER96-4, VM96-4
+ TF96 thermal overload relay



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

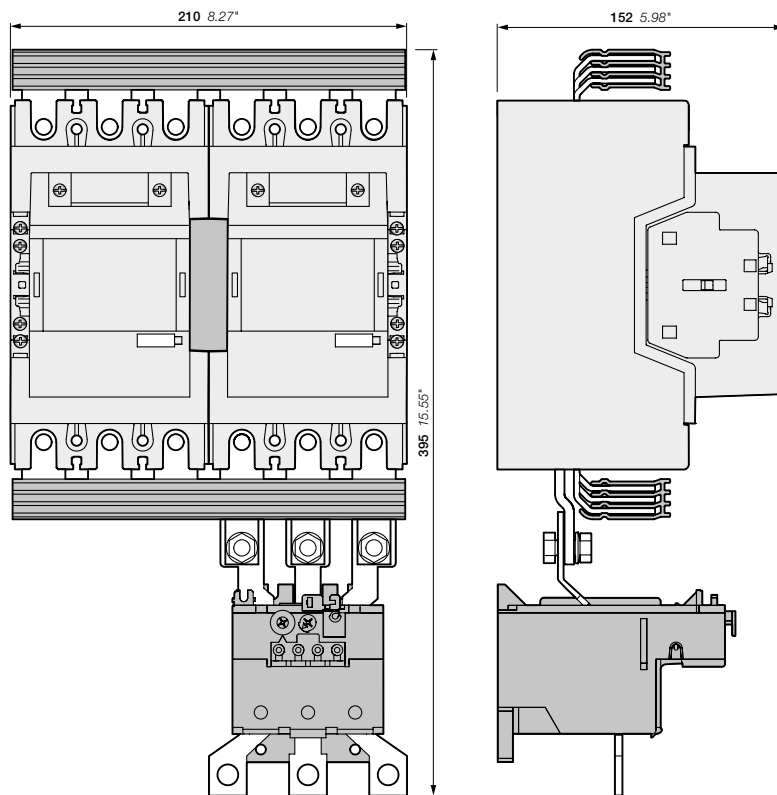
Reversing starters protected by thermal overload relays

With AF contactors - open type version in kit form



Reversing starters protected by thermal overload relays

With AF contactors - open type version in kit form

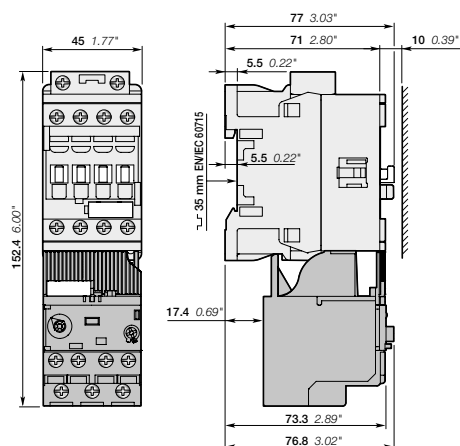


AF190, AF205
+ BER205-4, VM19
+ TA200DU thermal overload relay

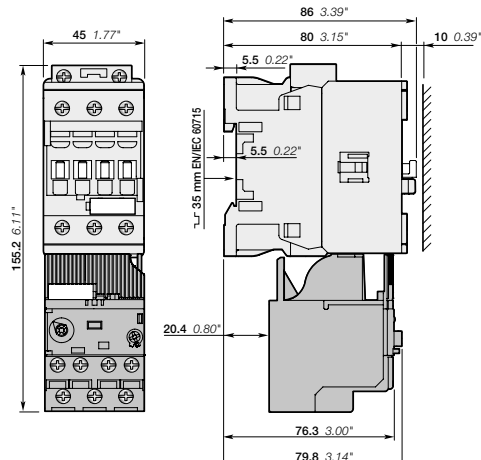
Main dimensions mm, inches

DOL starters protected by electronic overload relays

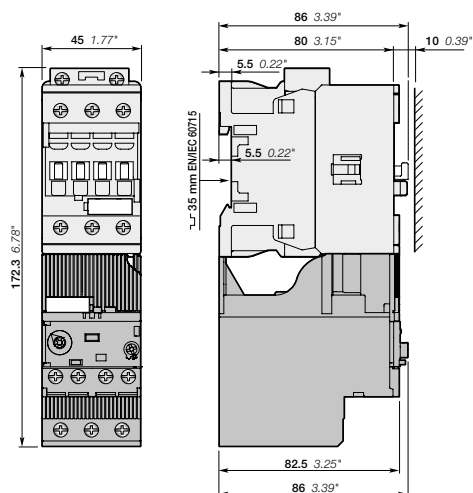
With AF contactors - open type version in kit form



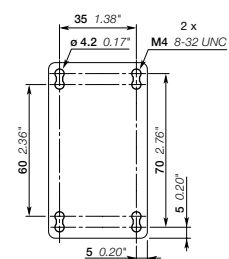
AF09, AF12, AF16
+ EF19 electronic overload relay



AF26, AF30, AF38
+ EF19 electronic overload relay



AF26, AF30, AF38
+ EF45 electronic overload relay

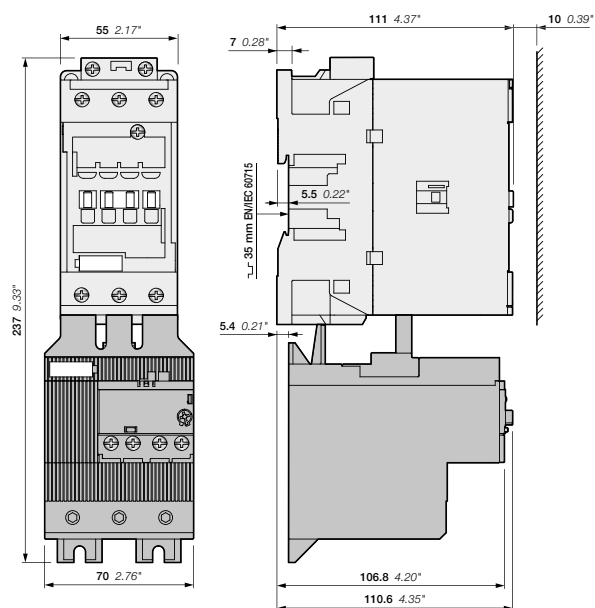


AF09, AF12, AF16, AF26, AF30, AF38
+ EF electronic overload relay

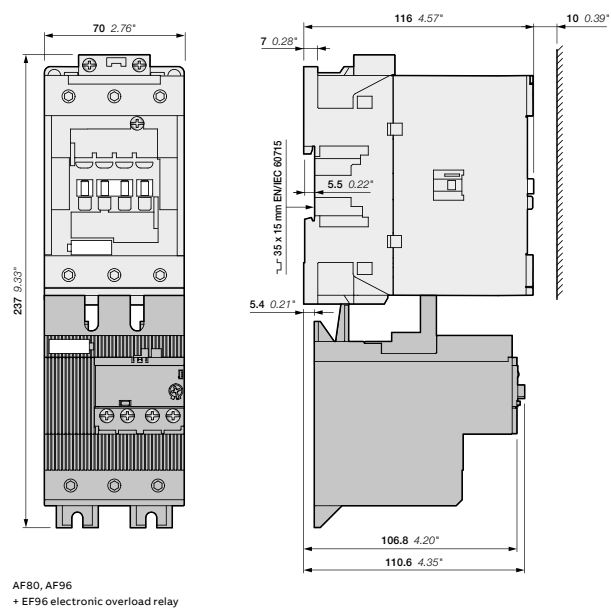
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

DOL starters protected by electronic overload relays

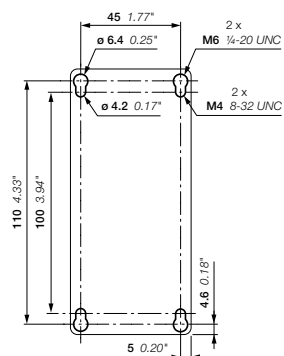
With AF contactors - open type version in kit form



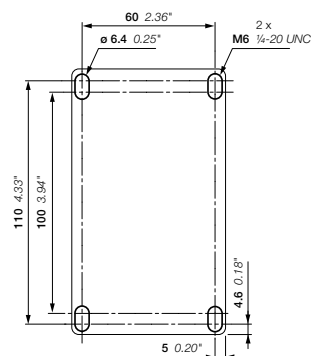
AF40, AF52, AF65
+ EF65 electronic overload relay



AF80, AF96
+ EF96 electronic overload relay



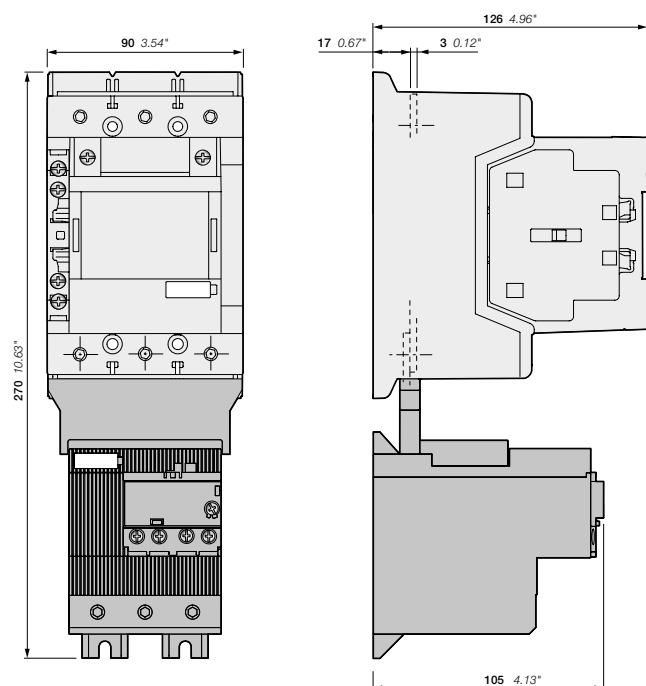
AF40, AF52, AF65
+ EF65 electronic overload relay



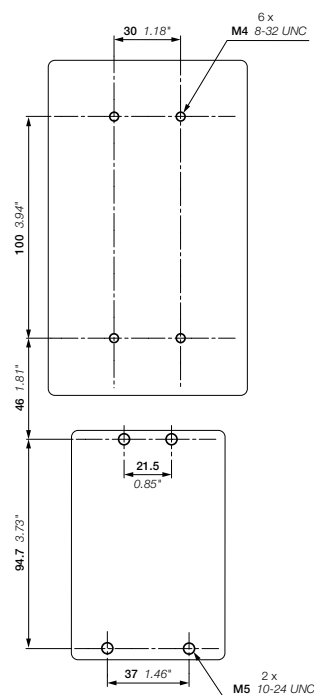
AF80, AF96
+ EF96 electronic overload relay

DOL starters protected by electronic overload relays

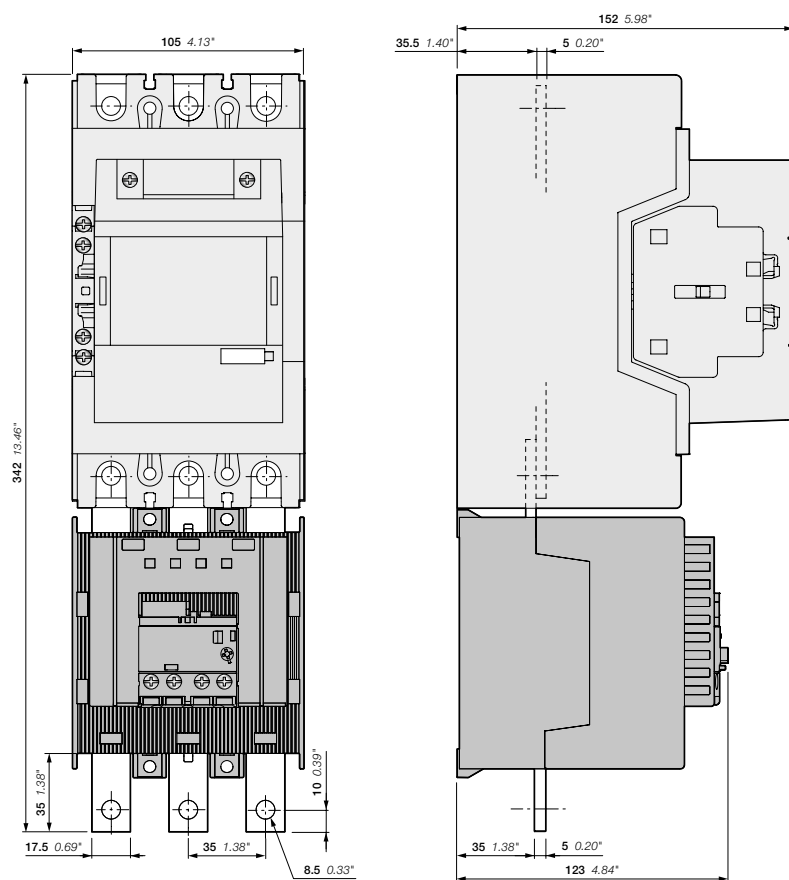
With AF contactors - open type version in kit form



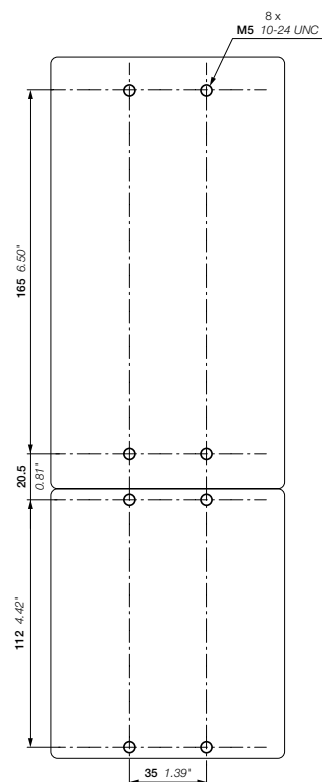
AF116, AF140, AF146-30-11(B)
+ EF146 electronic overload relay



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



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

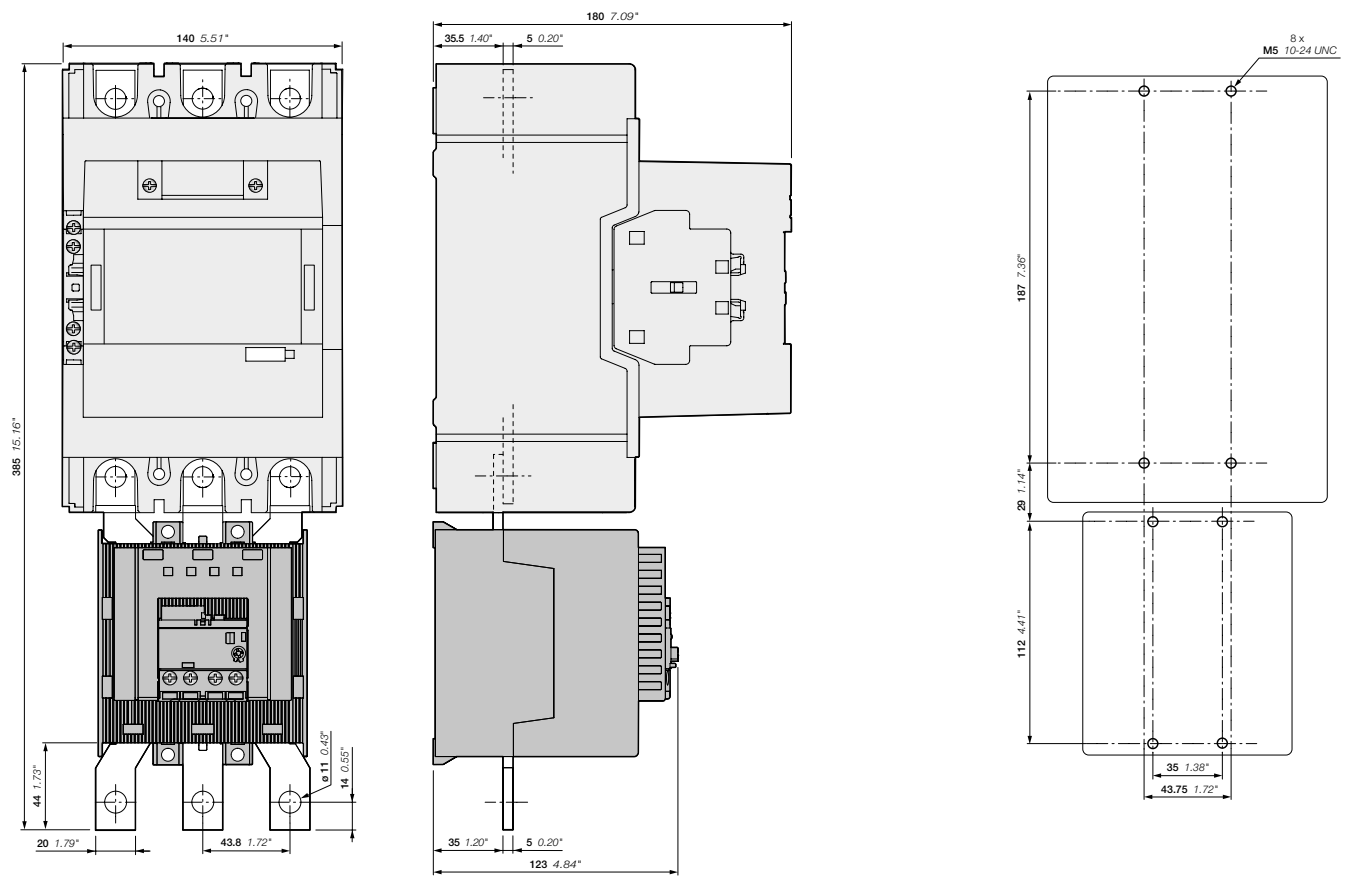


AF190, AF205
+ EF205 electronic overload relay

Main dimensions mm, inches

DOL starters protected by electronic overload relays

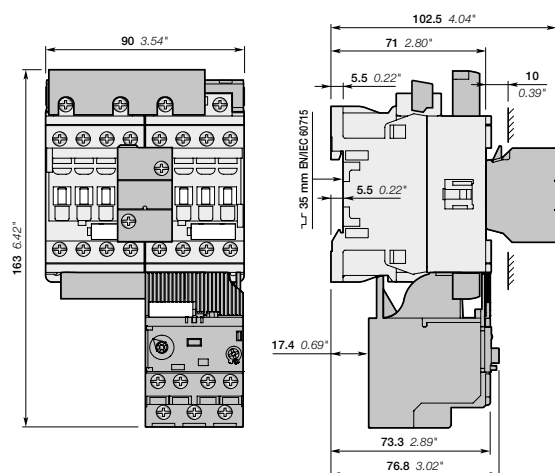
With AF contactors - open type version in kit form



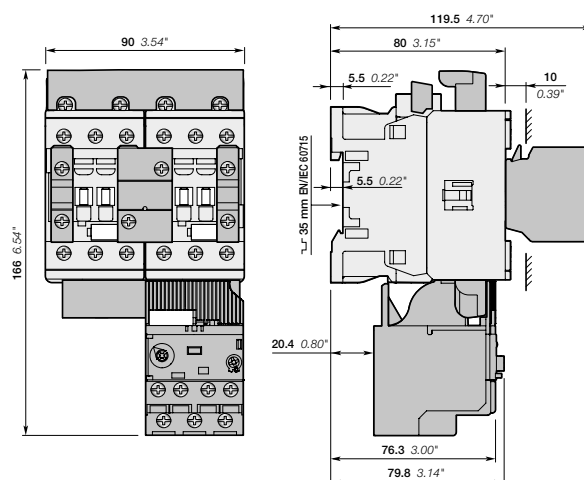
AF265, AF305, AF370-30-11
+ EF370 electronic overload relay

Reversing starters protected by electronic overload relays

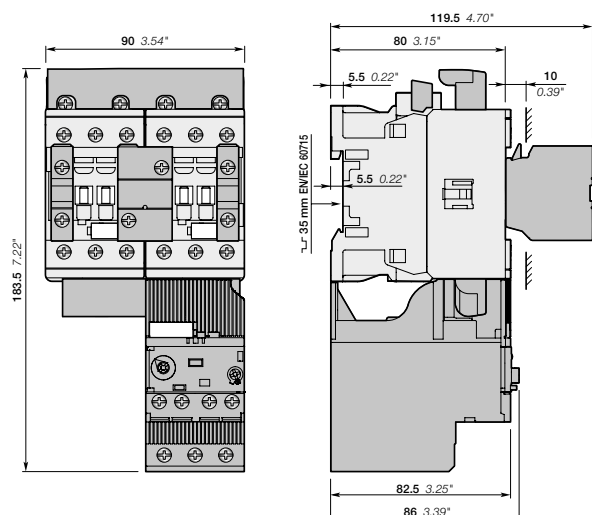
With AF contactors - open type version in kit form



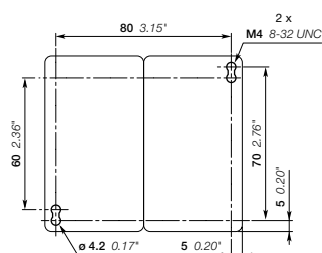
AF09, AF12, AF16
+ BER16-4, VEM4
+ EF19 electronic overload relay



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



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

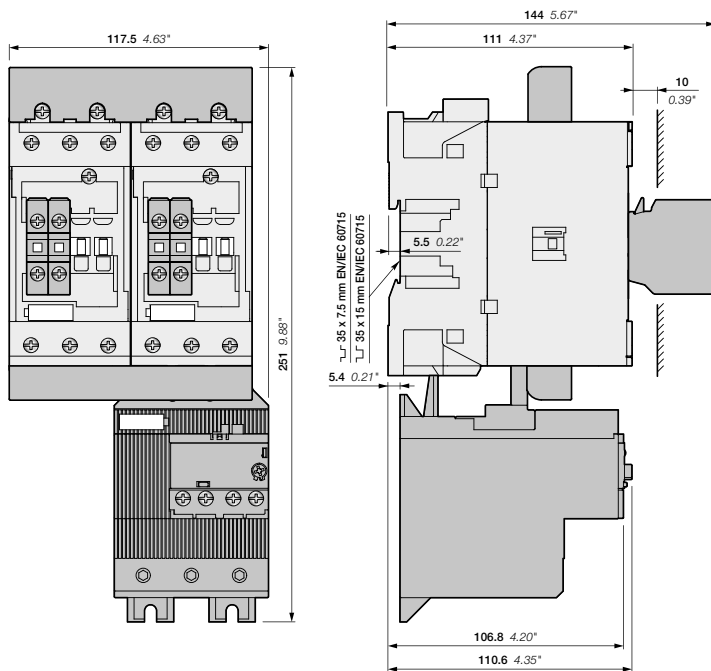


AF09, AF12, AF16, AF26, AF30, AF38

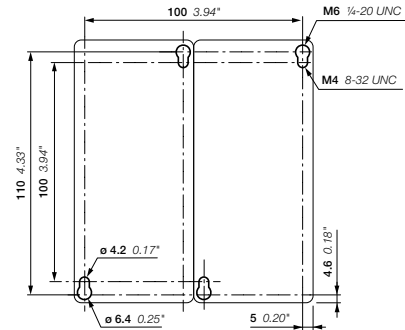
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

Reversing starters protected by electronic overload relays

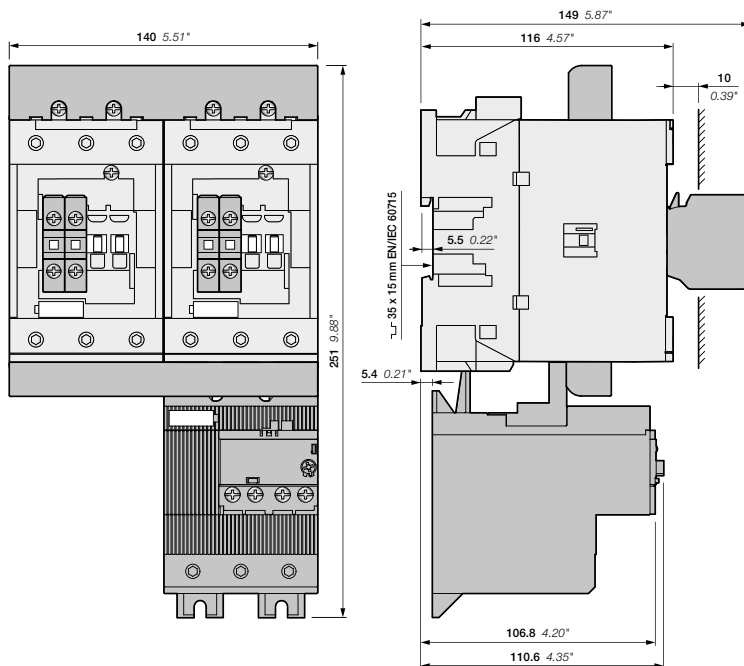
With AF contactors - open type version in kit form



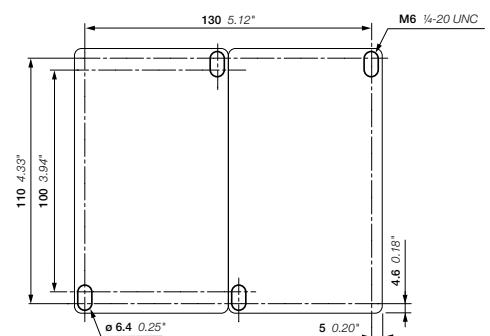
AF40, AF52, AF65
+ BER65-4, VM96-4
+ EF65 electronic overload relay



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



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

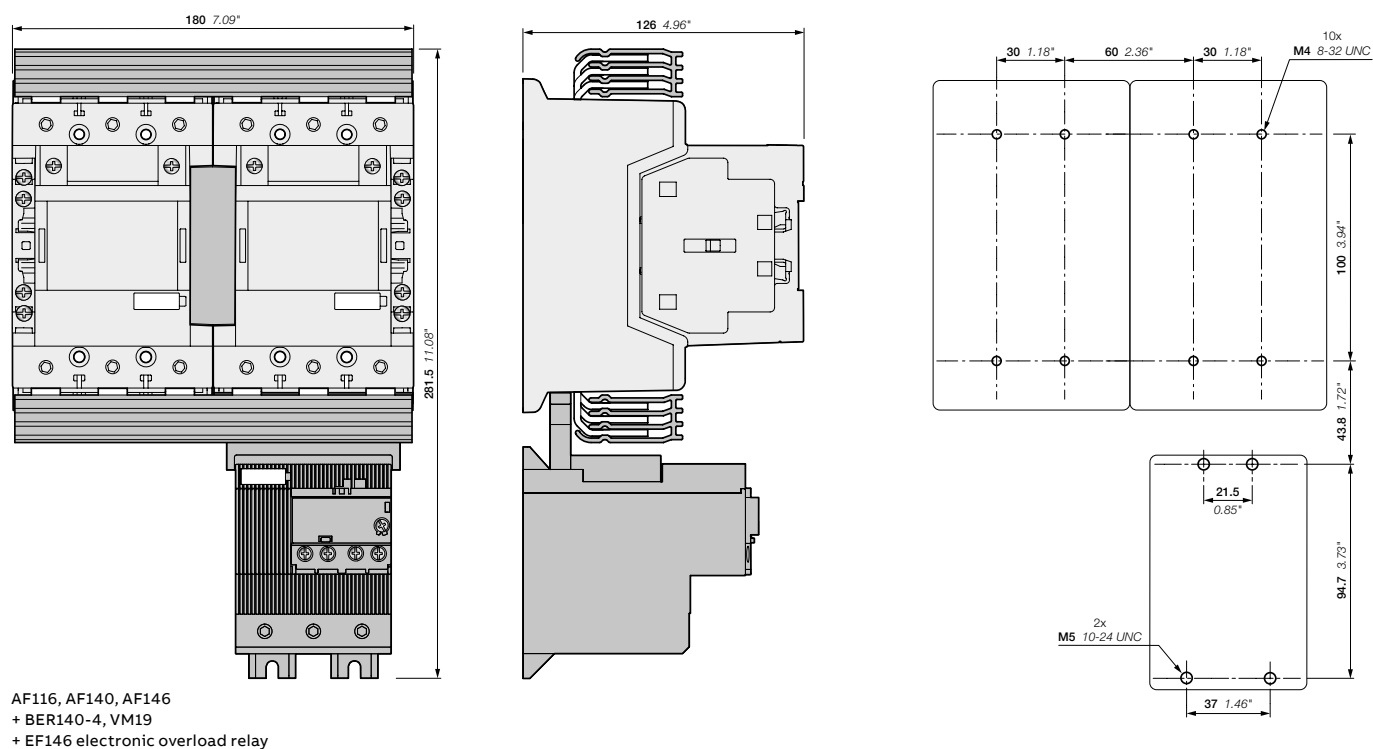


AF80, AF96
+ BER96-4, VM96-4
+ EF96 electronic overload relay

Main dimensions mm, inches

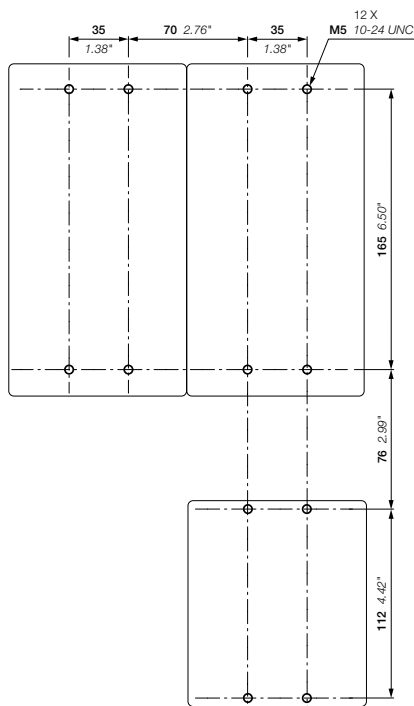
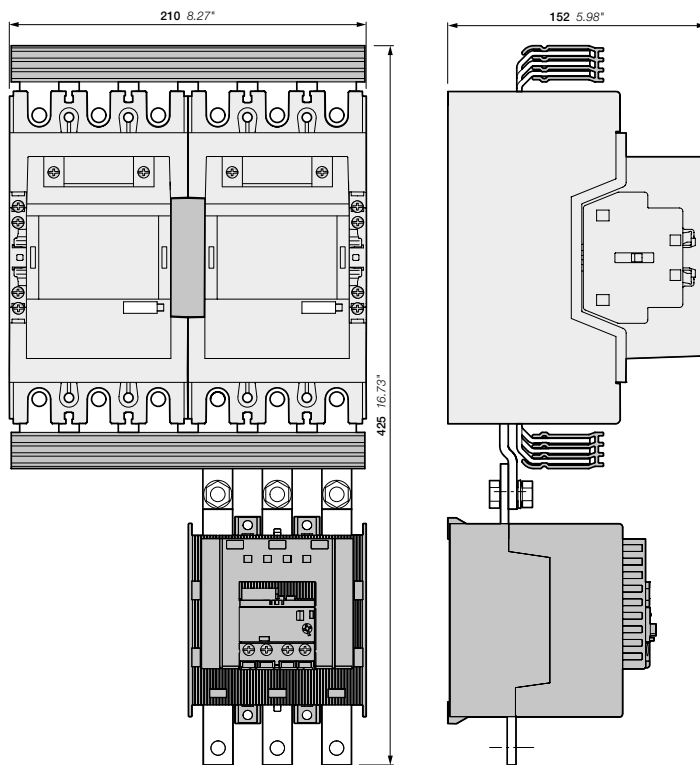
Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form



Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form

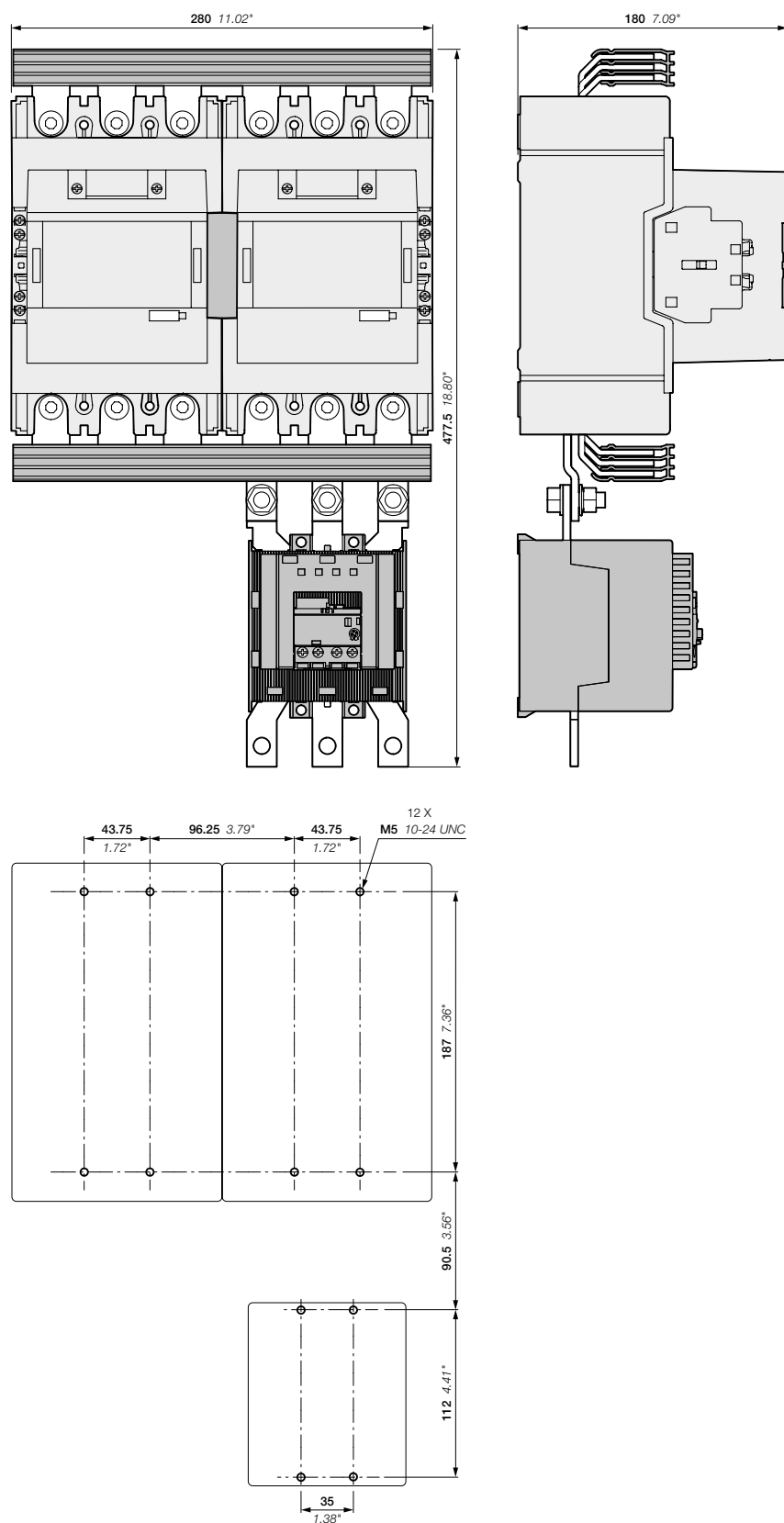


AF190, AF205
+ BER205-4, VM19
+ EF205 electronic overload relay

Main dimensions mm, inches

Reversing starters protected by electronic overload relays

With AF contactors - open type version in kit form

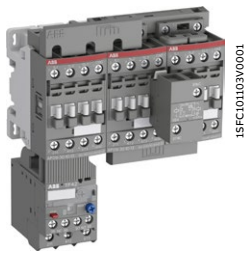
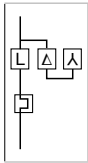


AF265, AF305, AF370
+ BER370-4, VM19
+ EF370 electronic overload relay

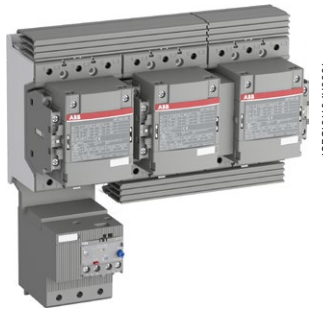
Main dimensions mm, inches

Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form



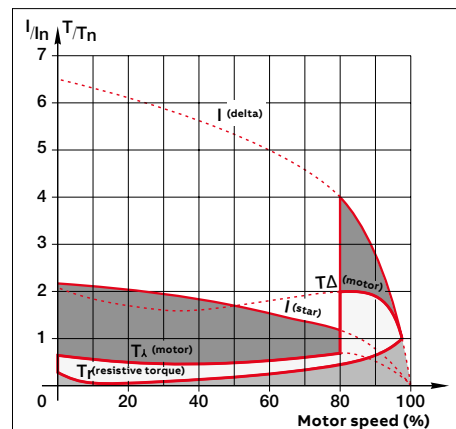
AF16-30-10 + AF16-30-10 +
AF09-30-10 + BEY16-4 + VEM4 + TF42



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

I_n = nominal current
 T_n = 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.

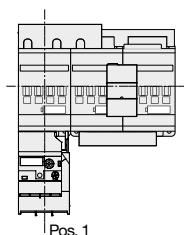
3rd stage: "Delta" connection - Thanks to AF contactors, a transition time (or dwelling time) of 50 ms is already integrated between the opening of the "star" contactor and closing of the "delta" contactor.

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

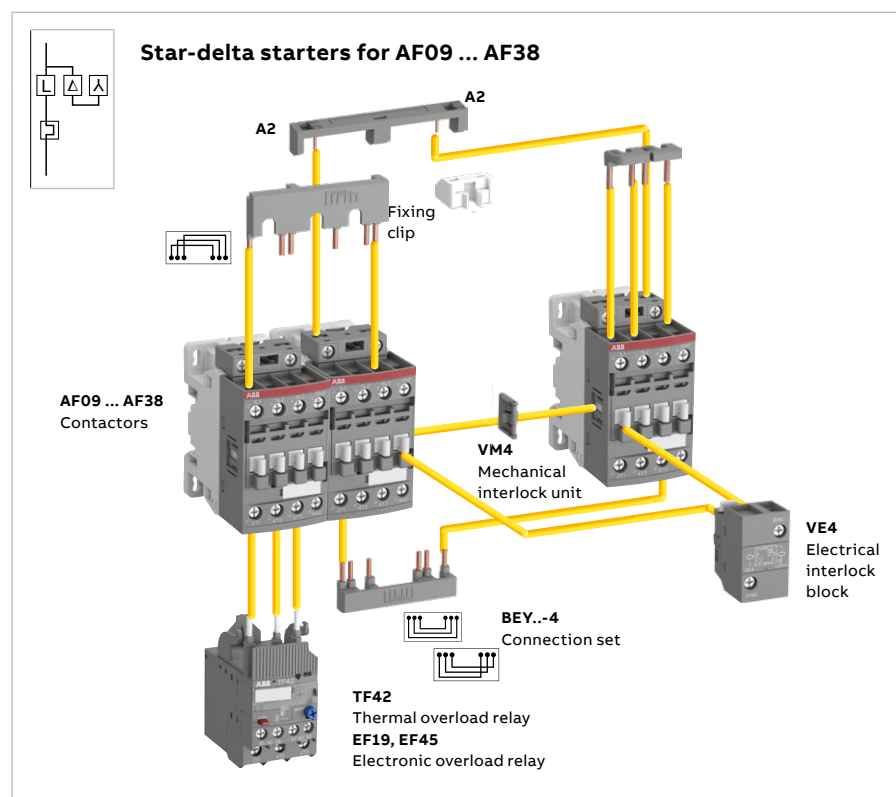
Standards	IEC 60947-4-1 / EN 60947-4-1
Rated operational voltage U_e max.	690 V - 50/60 Hz
Rated insulation voltage U_i	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Ambient air temperature	
Close to the device	$\leq 60^\circ\text{C}$ (TF42: 38 A above $\leq 50^\circ\text{C}$)
Degree of protection	IP20
Switching frequency	Refer to "Switching frequency diagrams" page

Mounting positions



Star-delta starters protected by overload relays

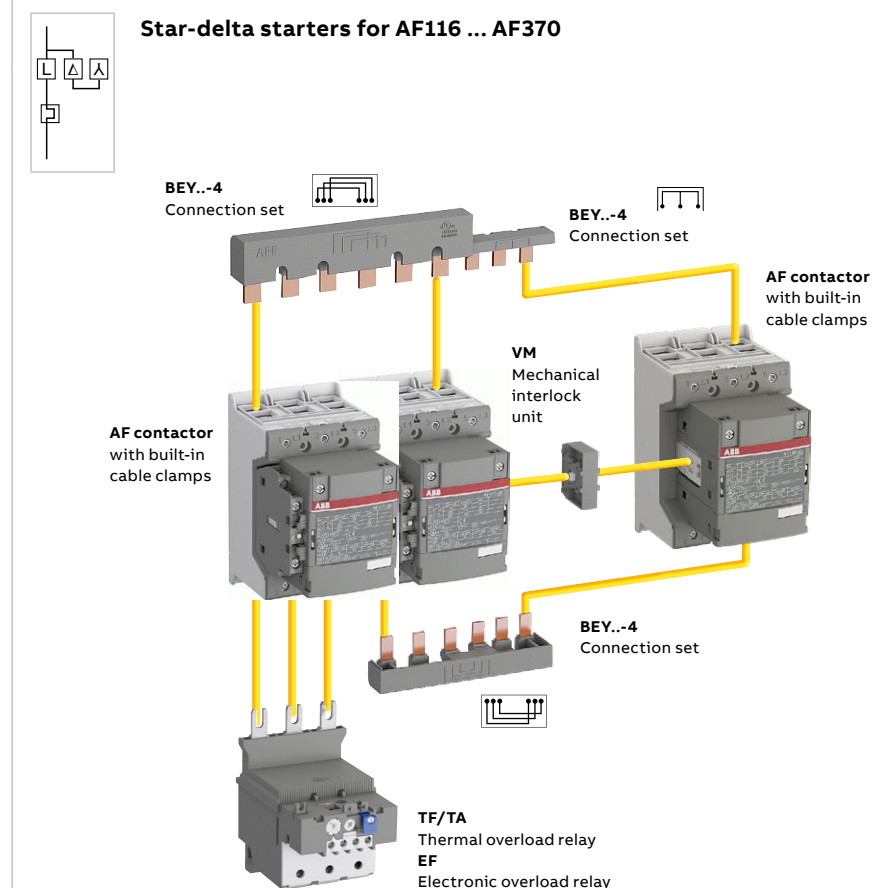
With AF contactors - Open type version in kit form



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.

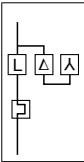
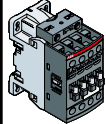
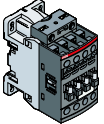
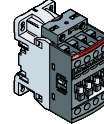
Select now easily and quickly your starter in the following pages at 400 V, up to 200 kW.

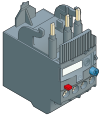
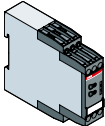
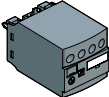
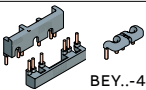
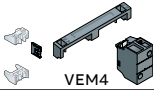


For the full coordination tables: www.abb.com/lowvoltage then go to the right menu: "Support", select: "Online Product Selection Tools" then select "Coordination Tables for motor protection"

Star-delta starters protected by thermal overload relays

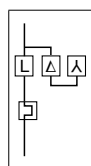
With AF contactors - Open type version in kit form

				Line contactor KM1		Delta contactor KM3		Star contactor KM2		
										
IEC		Control voltage Uc min. ... Uc max. (1)		Type	Order code	Type	Order code	Type	Order code	
AC-3	Rated power 400 V kW	Rated current 400 V 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	

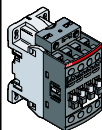
Thermal overload relays (2)			Electronic timers (3)		Accessories		Auxiliary contact blocks	
			  CT-ERS TEF4-ON U _c = 24...240 V 50/60 Hz or DC		Connection sets  BEY..-4 Mechanical and electrical interlock sets  VEM4		 CA4	
Setting ranges	Type	Order code	Type	Order code	Type	Order code	Type	Order code
A								
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	-	-

Star-delta starters protected by electronic overload relays

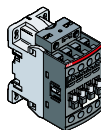
With AF contactors - Open type version in kit form



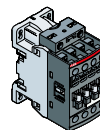
Line contactor KM1



Delta contactor KM3



Star contactor KM2



IEC		Control voltage Uc min. ... Uc max. (1)		Type	Order code	Type	Order code	Type	Order code
Rated power 400 V kW	Rated current 400 V 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
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

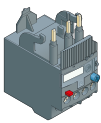
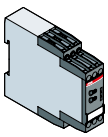
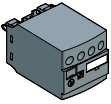
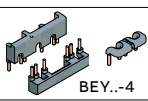
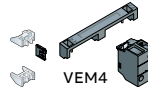
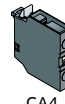
(1) AF09 ... AF370: ambient temperature ≤ 60 °C.

(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)		Accessories		Auxiliary contact blocks	
			  CT-ERS TEF4-ON Uc = 24...240 V 50/60 Hz or DC		  Connection sets BEY..-4 Mechanical and electrical interlock sets VEM4		 CA4	
Setting ranges	Type	Order code	Type	Order code	Type	Order code	Type	Order code
A								
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	1SBN084413R1000 1SBN030300R1000	-	-
54...150	EF146-150	1SAX351001R1101	CT-ERS.21S	1SVR730100R0300	BEY140-4 + VM19	1SBN084413R1000 1SBN030300R1000	-	-
63...210	EF205-210	1SAX531001R1101	CT-ERS.21S	1SVR730100R0300	BEY190-4 + VM140/190	1SBN084813R1000 1SBN034403R1000	-	-
63...210	EF205-210	1SAX531001R1101	CT-ERS.21S	1SVR730100R0300	BEY205-4 + VM19	1SBN085213R1000 1SBN030300R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY265-4 + VM205/265	1SBN085413R1000 1SBN035203R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY370-4 + VM19	1SBN085813R1000 1SBN030300R1000	-	-
115...380	EF370-380	1SAX611001R1101	CT-ERS.21S	1SVR730100R0300	BEY370-4 + VM19	1SBN085813R1000 1SBN030300R1000	-	-

Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form

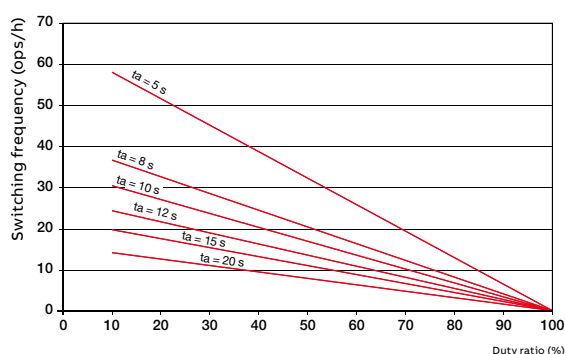
Switching frequency diagrams

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

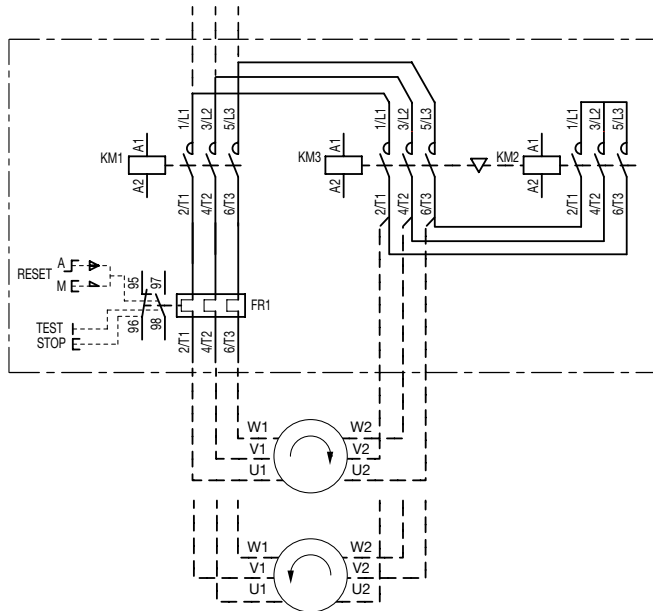
Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form

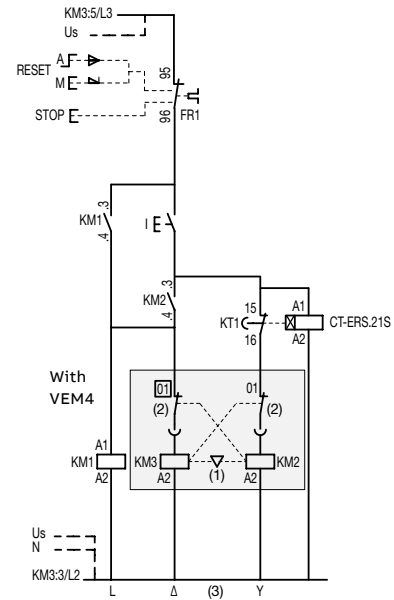
Wiring diagrams with CT-ERS.21S timer

Star-delta starters

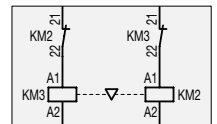
Power circuit



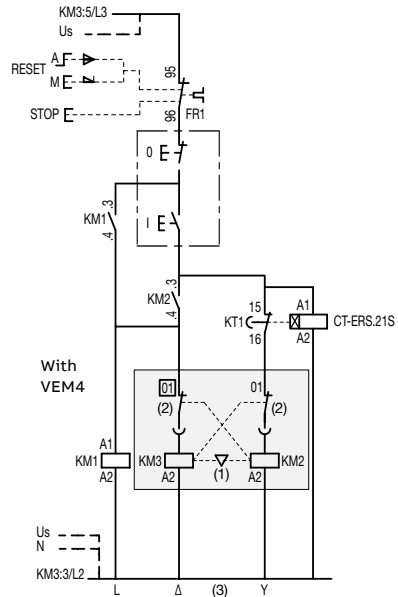
AC or DC local control with CT-ERS.21S timer



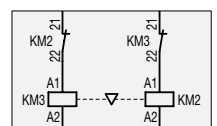
With VM



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-

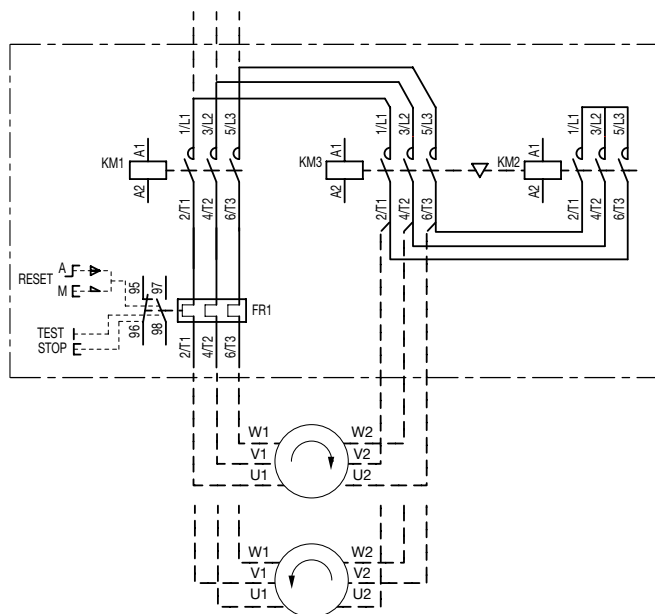
Star-delta starters protected by overload relays

With AF contactors - Open type version in kit form

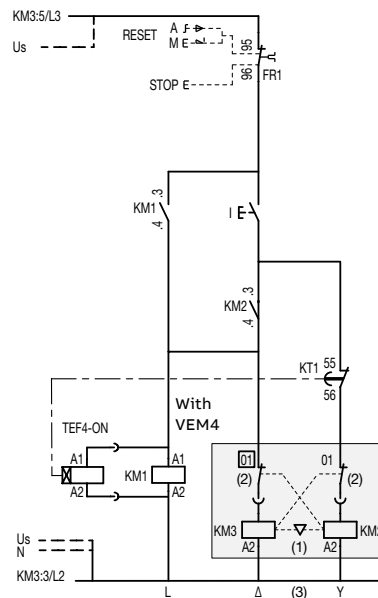
Wiring diagrams with TEF4-ON timer

Star-delta starters

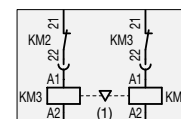
Power circuit



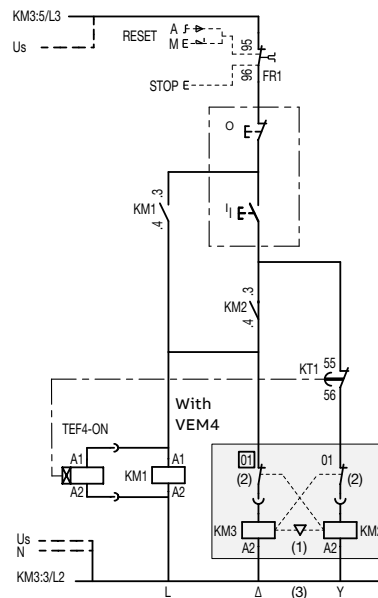
AC or DC local control with TEF4-ON timer
Uc = 24...240 V 50/60 Hz or DC



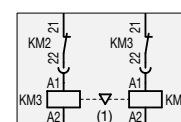
With VM



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



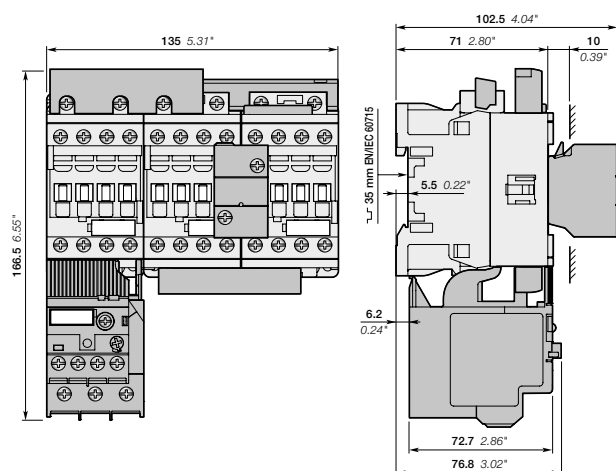
With VM



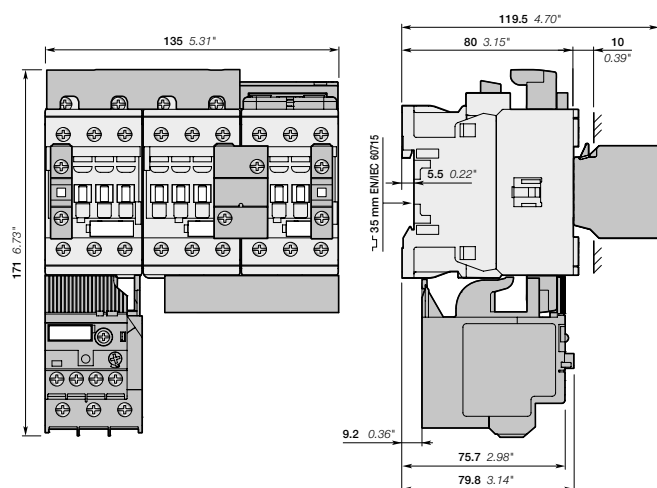
Note: VEM4 = VM4 (1) + VE4 (2) with A2-A2 (3) connection

Star-delta starters protected by thermal overload relays

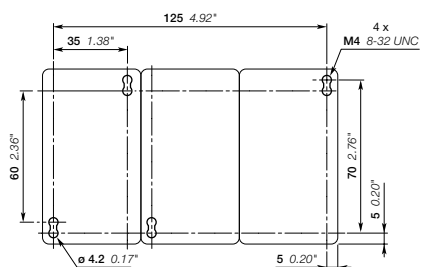
With AF contactors - Open type version in kit form



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



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

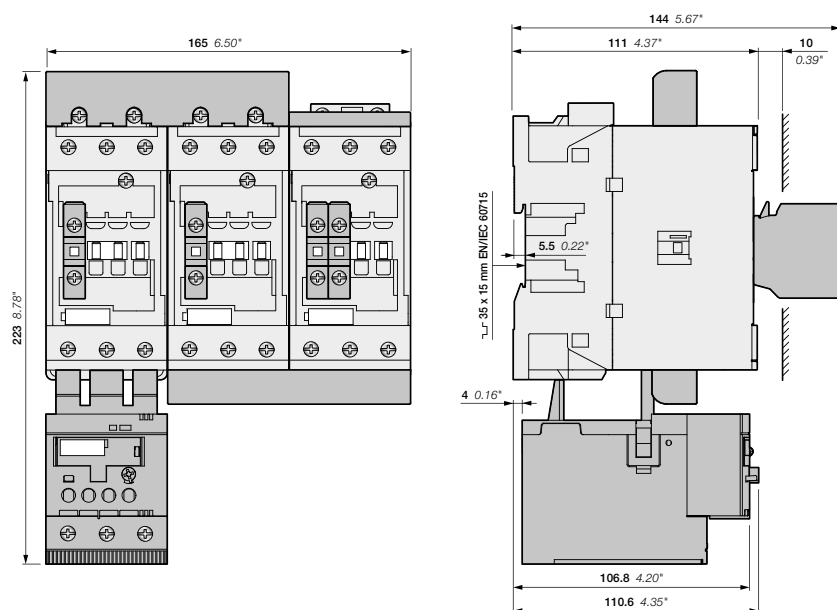


Note: contactor lateral distance to grounded component 2 mm 0.08" min.

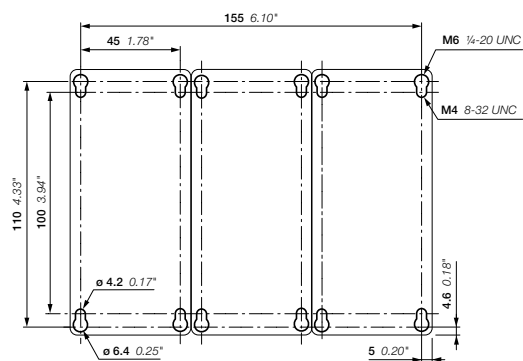
Main dimensions mm, inches

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form

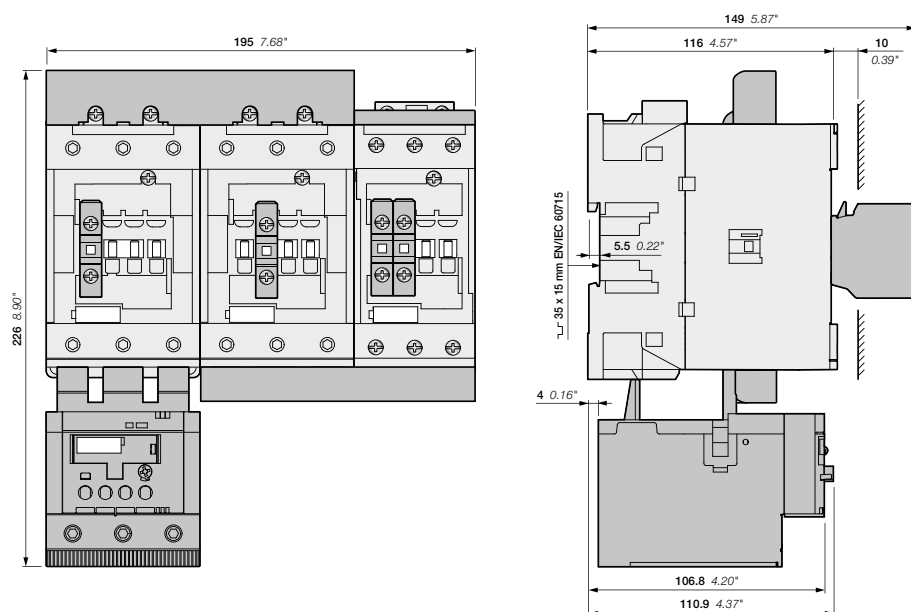


AF40, AF52, AF65
+ BEY65-4, VM96-4, CA4-10, CA4-01
+ TF65 thermal overload relay

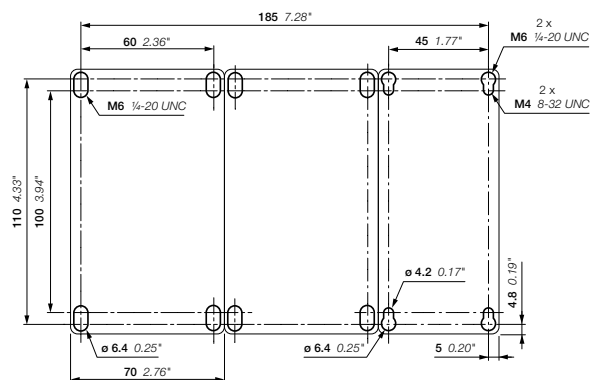


Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



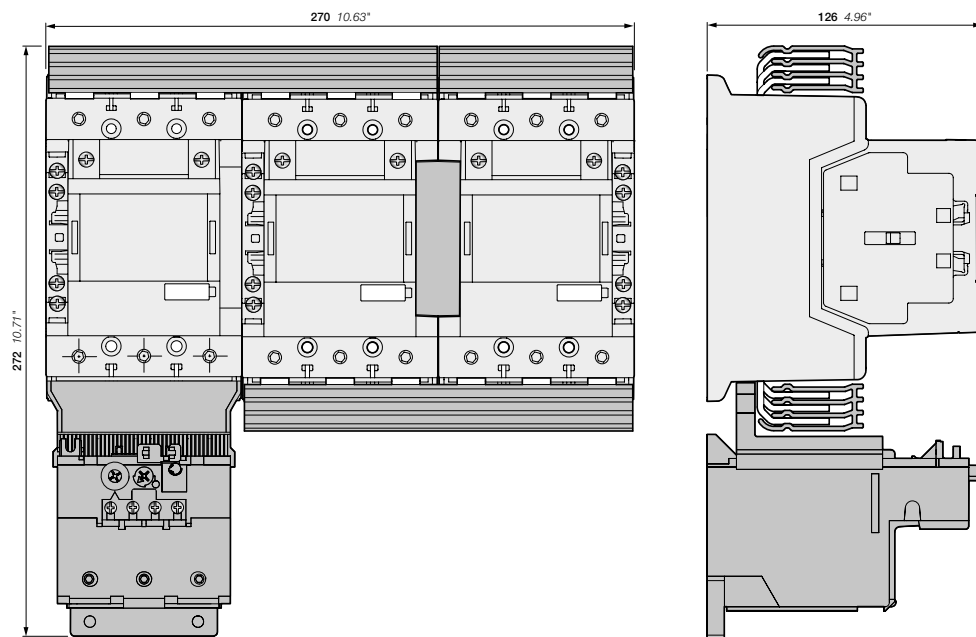
Line, Delta: AF80, AF96
 + Star: AF52, AF65
 + BEY96-4, VM96-4, CA4-10, CA4-01
 + TF96 thermal overload relay



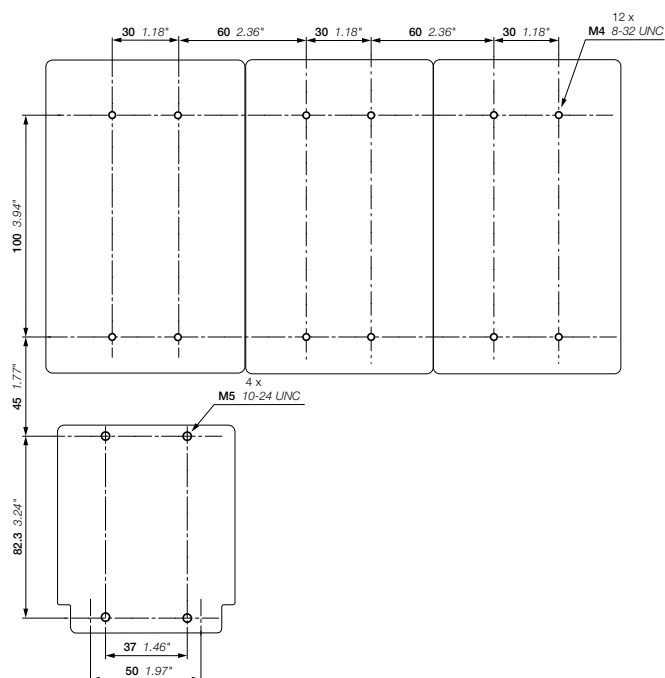
Main dimensions mm, inches

Star-delta starters protected by thermal overload relays

With AF contactors - Open type version in kit form



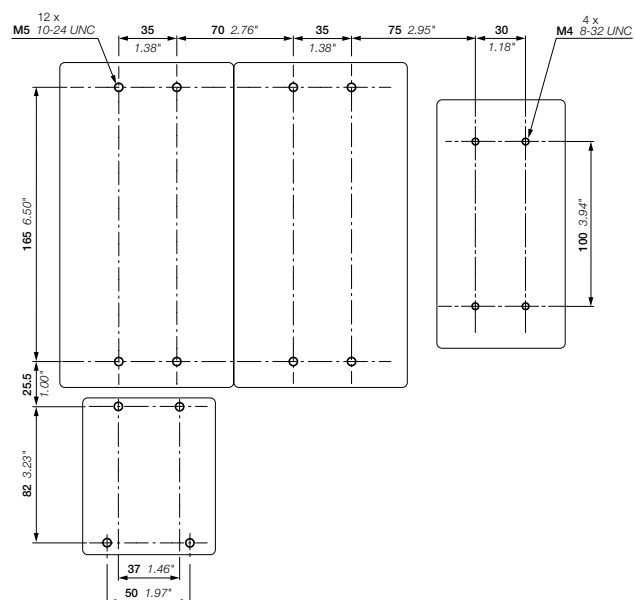
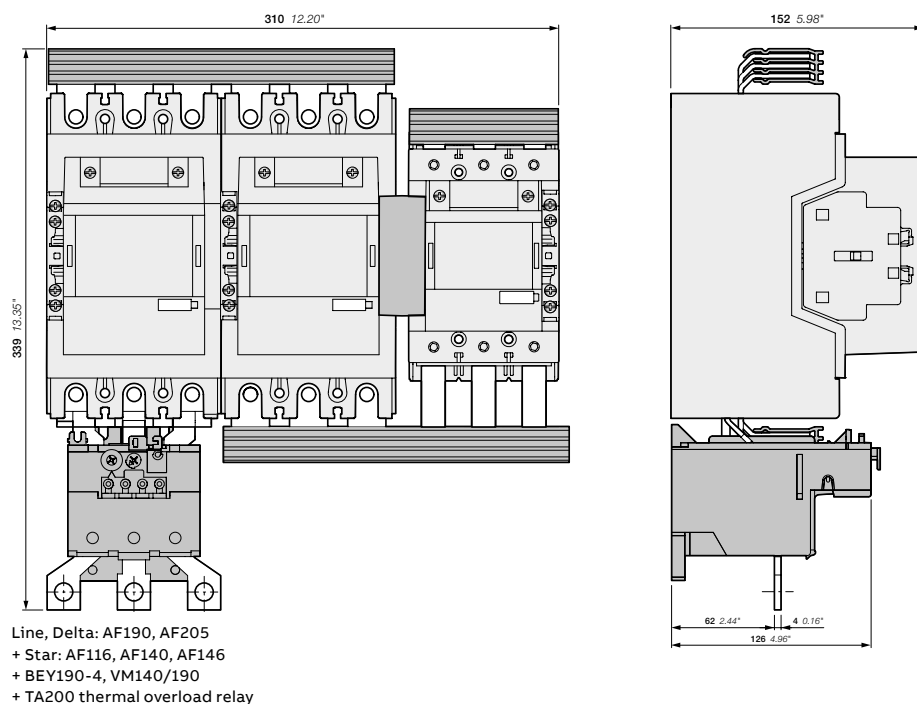
AF116, AF140, AF146
+ BEY140-4, VM19
+ TF140 thermal overload relay



Main dimensions mm, inches

Star-delta starters protected by thermal overload relays

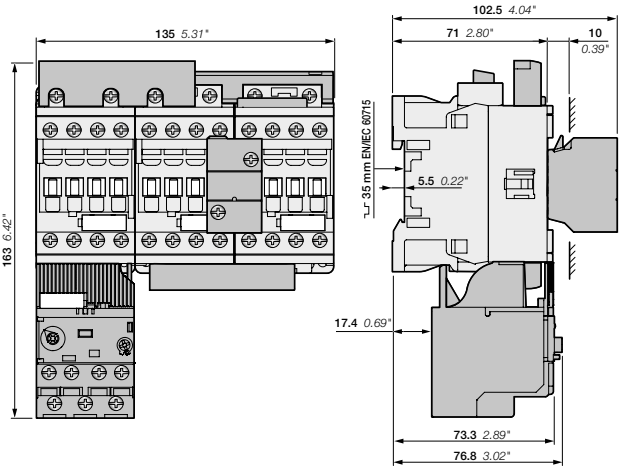
With AF contactors - Open type version in kit form



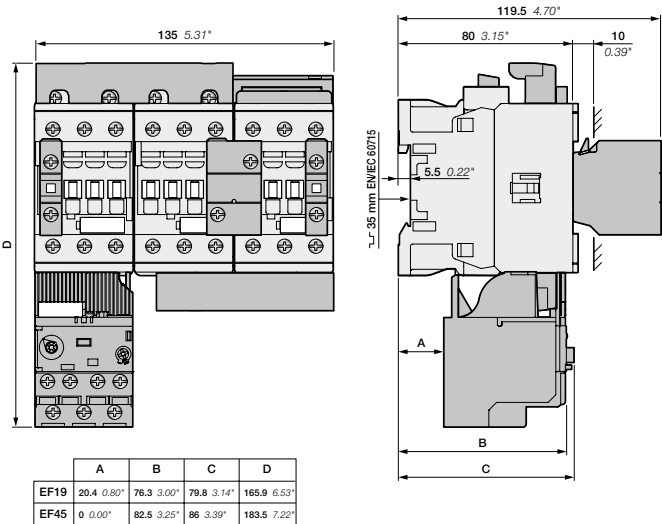
Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

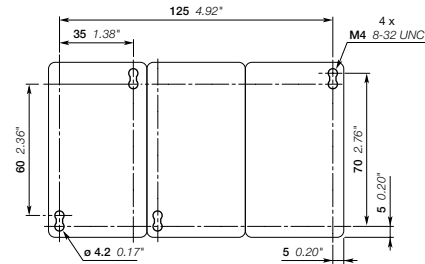
With AF contactors - Open type version in kit form



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



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

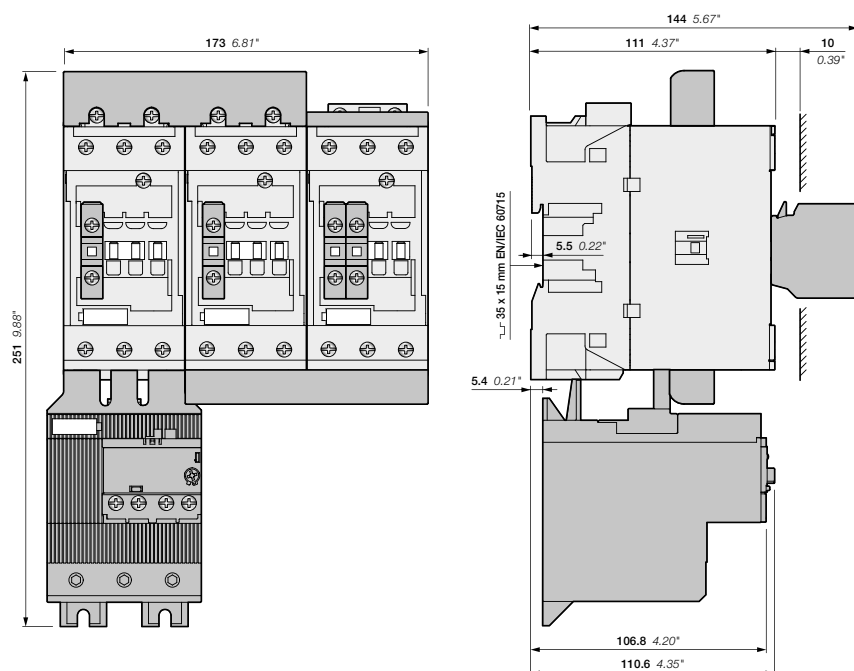


Note: contactor lateral distance to grounded component 2 mm 0.08" min.

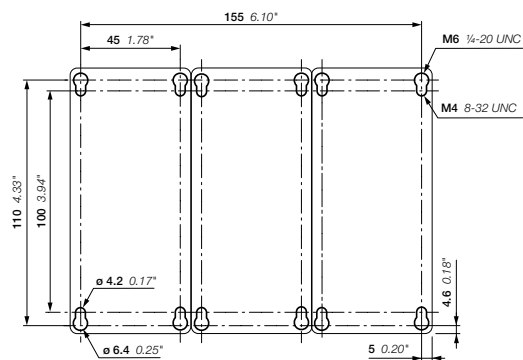
Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



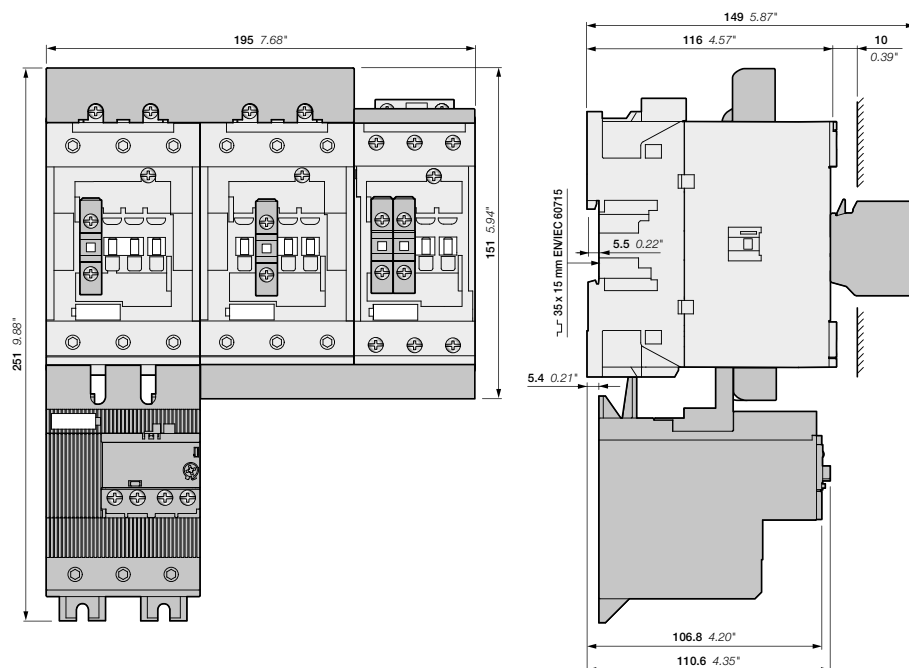
AF40, AF52, AF65
+ BEY65-4, VM96-4, CA4-10, CA4-01
+ EF65 electronic overload relay



Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form

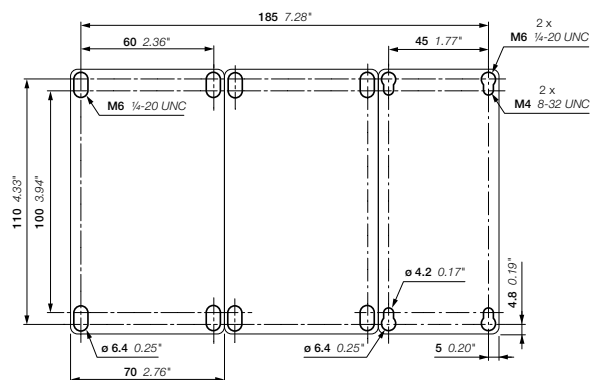


Line, Delta: AF80, AF96

+ Star: AF52, AF65

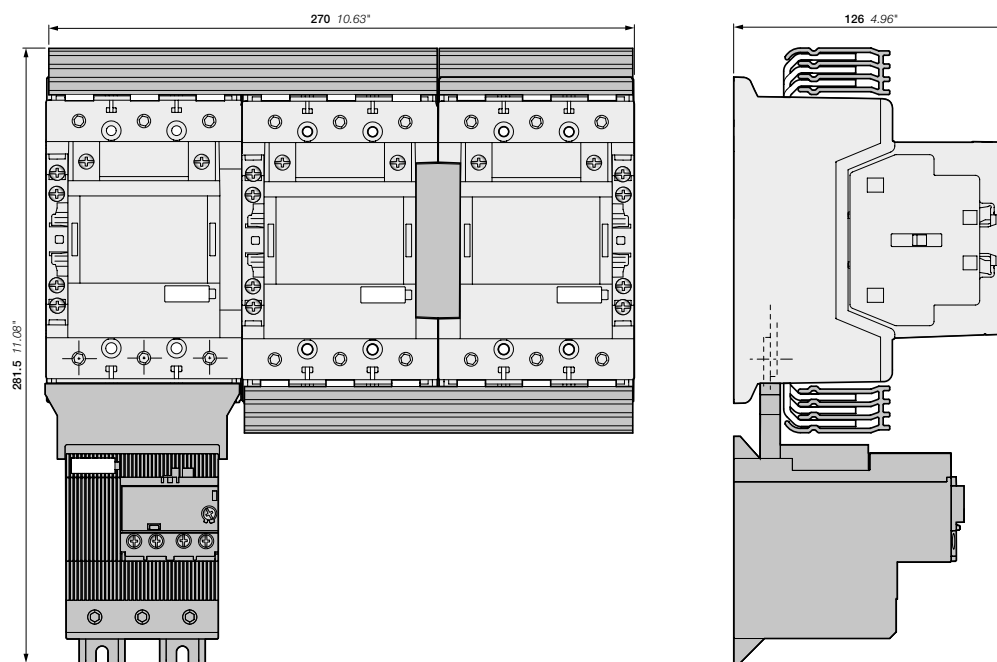
+ BEY96-4, VM96-4, CA4-10, CA4-01

+ EF96 electronic overload relay

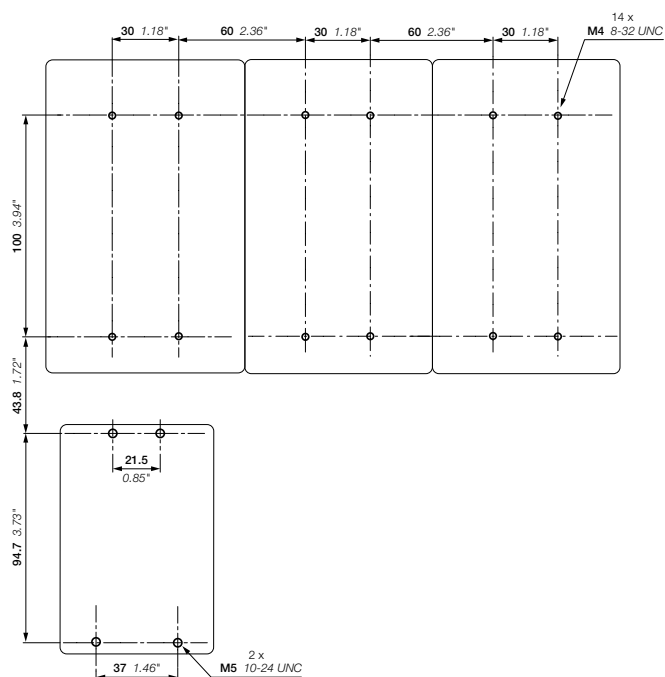


Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



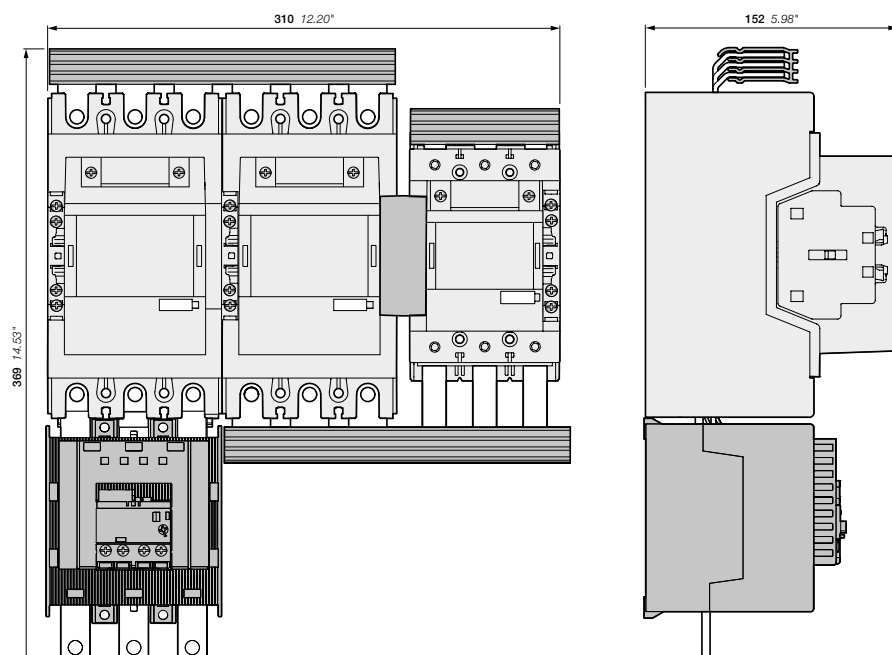
AF116, AF140, AF146
+ BEY140-4, VM19
+ EF146 electronic overload relay



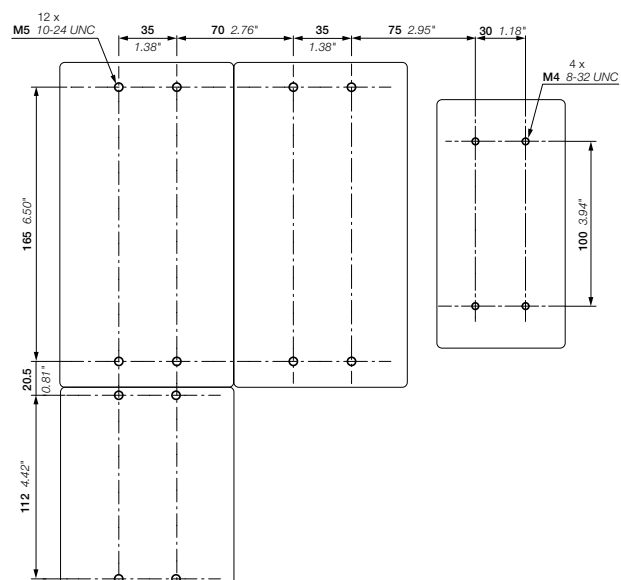
Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



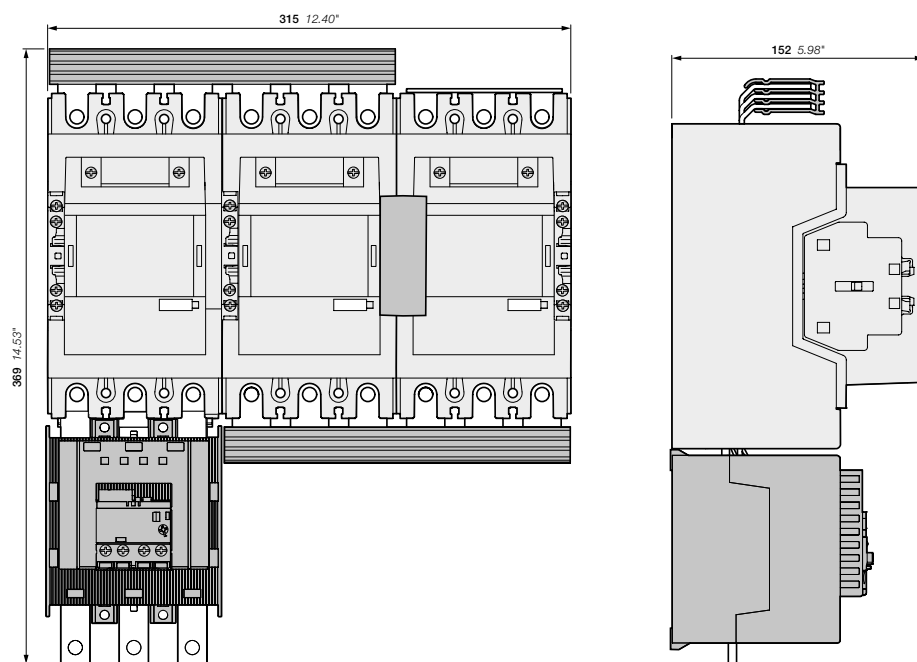
Line, Delta: AF190, AF205
 + Star: AF116, AF140, AF146
 + BEY190-4, VM140/190
 + EF205 electronic overload relay



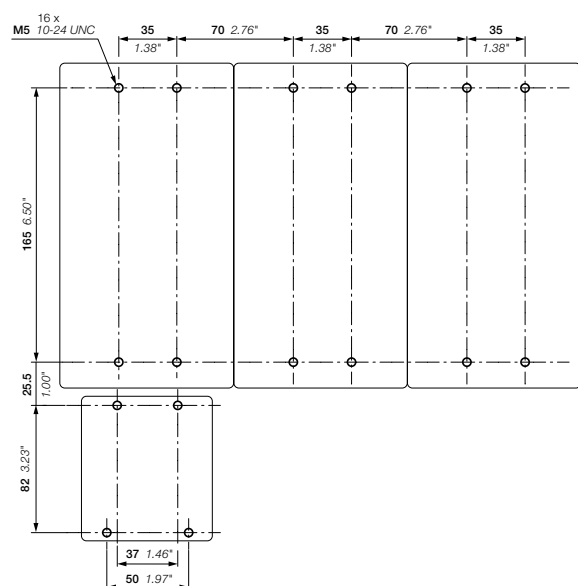
Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



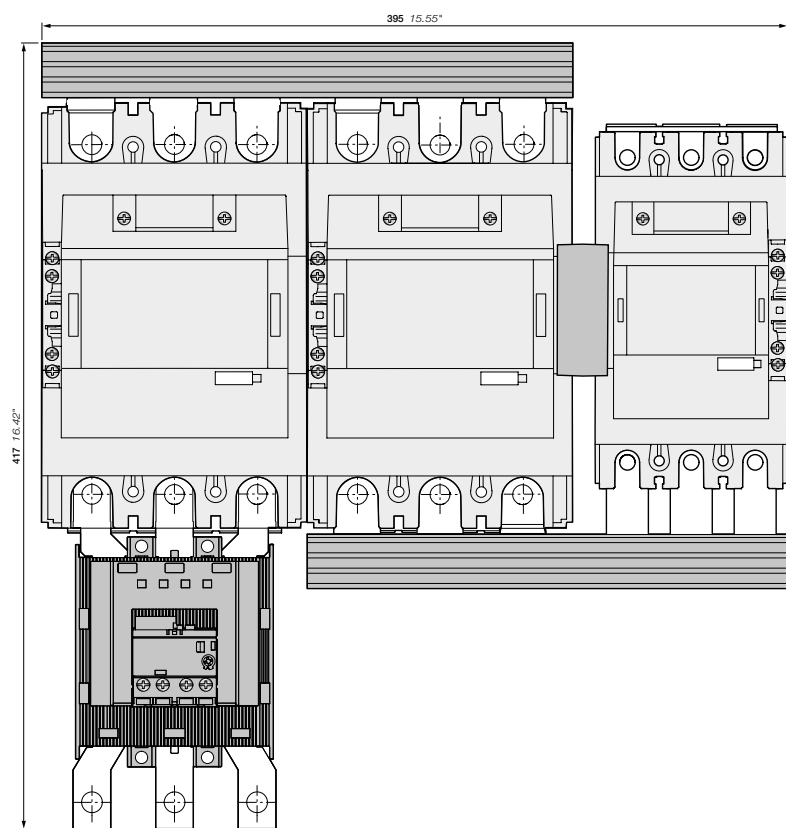
AF190, AF205
+ BEY205-4, VM19
+ EF205 electronic overload relay



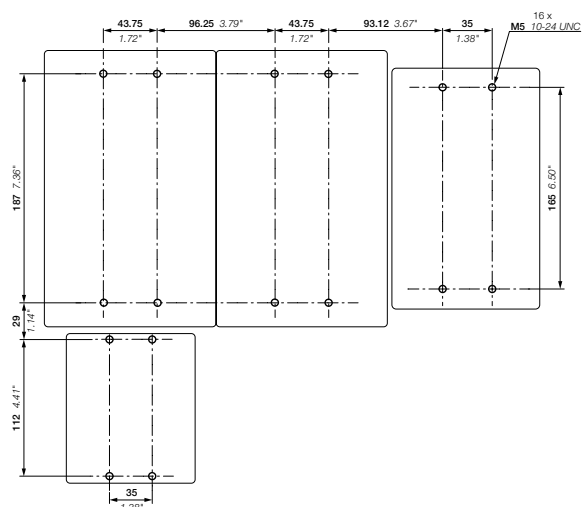
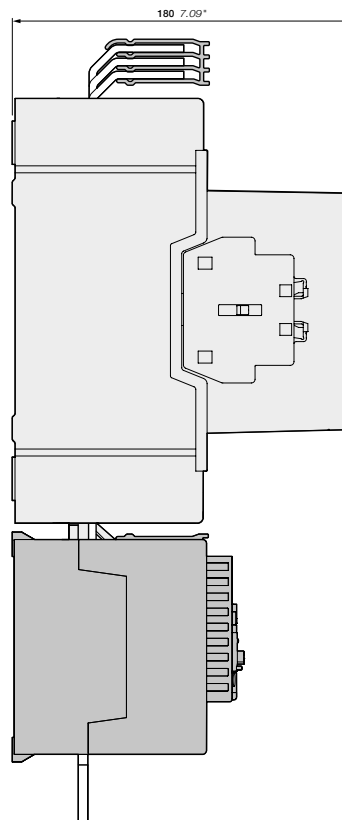
Main dimensions mm, inches

Star-delta starters protected by electronic overload relays

With AF contactors - Open type version in kit form



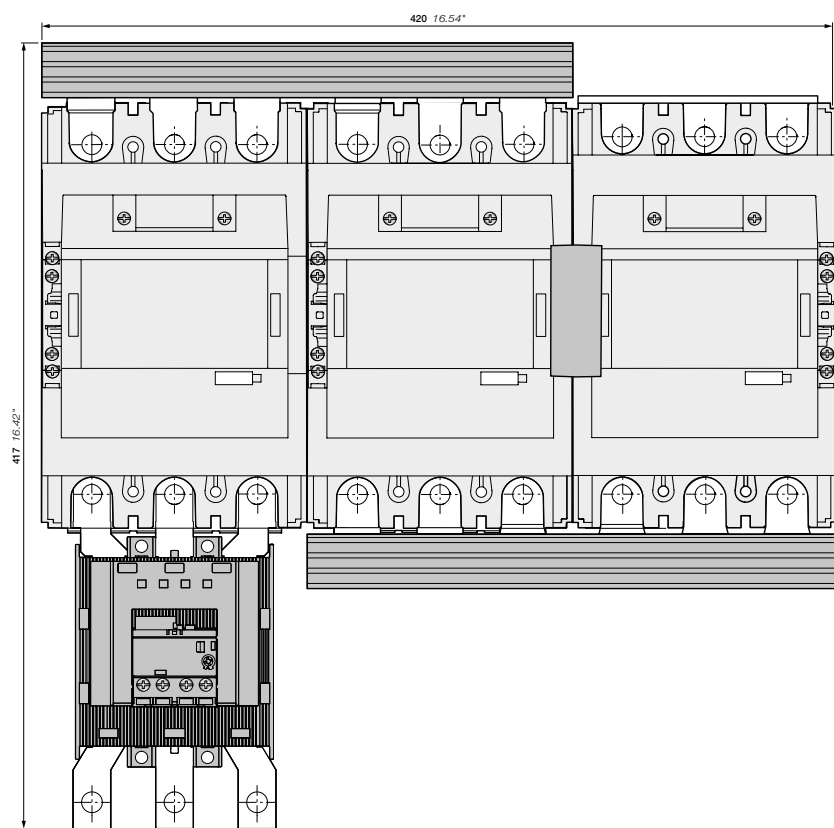
Line, Delta: AF265, AF305, AF370
 + Star: AF190, AF205
 + BEY265-4, VM205/265
 + EF370 electronic overload relay



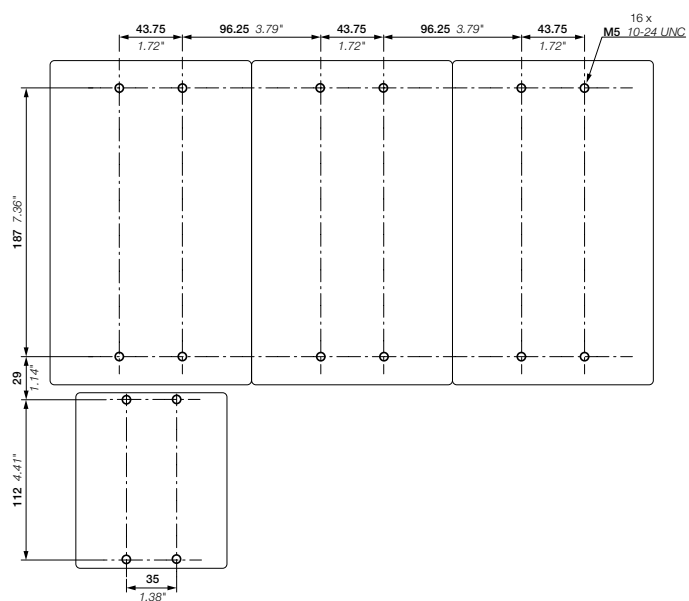
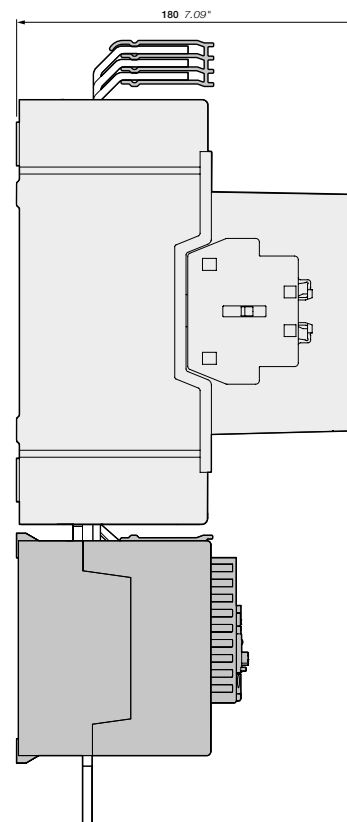
Main dimensions mm, inches

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