Catalog

The new AX contactor range
Control made simple
The performance you need

Power and productivity
for a better world™

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 blue colour (according to IEC 60947-4-1 Annex G)									
Motor power kW	220 V A	230 V A	240 V A	380 V A	400 V A	415 V A	440 V A	500 V A	660 V A	690 V 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

Motor protection and control
Contactors, manual motor starters and overload relays

1SYN829571C201

The new AX contactor range
Product overview

Complete motor starting solution
ABB has one of the biggest product portfolios on the market, and the AX contactor comes with a complete set of accessories, including thermal and electronic overload relays, manual motor starters, timers, auxiliary relays etc.

Longer service life
ABB always aims to make the use of its products as trouble-free as possible. The long electrical and mechanical life of the AX contactor range plays a big part in this since it will keep service and repair work at a minimum.

Space and time saving
The compact design of the AX contactor allows for many more motor starting combinations to fit into the same enclosure, and with the complete set of accessories, installation could not be any easier.

Reliable and safe
Coordination tables for type-1 and type-2 coordination are available with MMS, MCCB and fuses. This makes selection of protection devices easy, and ensures safe and reliable installations.

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The new AX contactor range
Product overview

The new contactor range is designed to provide the performance and features that are required, in a compact and modern design. Control made simple – The performance you need.

Common applications
- HVAC
- Pumps
- Compressors
- Paper industry
- Packaging machines
- Mining
- General Machinery
- Switchgear panels
- Elevator and escalators
- Building
- Lighting control
- Moulding machines
- Power supply solutions

Standards
- IEC 60947-1
- IEC 60947-4-1
- IEC 60947-5-1

Technical data
- Rated current (Ie): 9 … 370 A
- Motor rated power (Pe): 4 … 200 kW (400V AC-3)
- 3 poles
- AC control
- Width from 44mm (9 A) to 145mm (370 A)
- Ambient temperature up to 70°C

Accessories
- Auxiliary contacts front and side mounted
- Mechanical and electrical interlocks
- Timers
- Surge suppressors
- Terminal shrouds, enlargements and extensions
- Connection kits

Overload relays
- Thermal overload relays
- Electronic overload relays (class 10, 20 and 30)

Manual motor starters
- With thermal and magnetic protection
- With magnetic protection only

1SYN829571C201

3-pole contactors, for motor control and power switching

IEC	**AC-3 Rated operational power**	θ ≤ 55 °C, 400 V	kW	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**
AC Control supply			Type	**AX09**	**AX12**	**AX18**	**AX25**	**AX32**	**AX40**
IEC	**AC-3 Rated operational current**	θ ≤ 55 °C, 400 V	**A**	**09**	**12**	**18**	**25**	**32**	**40**
	AC-1 Rated operational current	θ ≤ 40 °C, 690 V	**A**	**22**	**25**	**27**	**32**	**55**	**60**

Main accessories

Auxiliary contact blocks	Front mounting	**CA5X-10** (1 x N.O.) **CA5X-01** (1 x N.C.) **CA5X-4 pole** (add on block with 4 contacts NO or NC combination)
	Side mounting	**CAL5X-11** (1 x N.O. + 1 x N.C.)
Timers	Electronic	**TEF5-ON** **TEF5-OFF**
Interlocking units	Mechanical	**VM5-1**
	Mechanical / Electrical	**VE5-1**
Surge suppressors	Varistor (AC / DC)	**RV5** (24...440 V)
	RC type (AC)	**RC5-1** (24...440 V)

Overload relays

Thermal relays		Class 10A	**TA25DU-M** (0.10…32 A) (1)	**TA42DU-M** (18...42 A)
Electronic relays		Class 10E,20E,30E	**E16DU** (0.10…18.9A)	**E45DU**(9…45A)

(1) The max AC3 operational current is 23A for AX25 with TA25DU-25M
(2) The max AC3 operational current is 74A for AX80 with TA75DU-80M
(3) The max AC3 operational current is 182A for AX205 with TA200DU-200

Manual motor starters

Thermal / magnetic protection Class 10	**MS116** (0.10...32 A) Ics up to 50 kA for class 10 A	
	MS132 (0.10...32 A) Ics up to 100 kA	
Magnetic types only	**MO132** (0.16...32 A) Ics up to 100 kA	

1SYN829571C201




22	30	37	45	55	75	90	110	132	160	200
AX50	AX65	AX80	AX95	AX115	AX150	AX185	AX205	AX260	AX300	AX370
50	65	80	96	115	150	185	205	265	305	370
100	115	125	145	160	190	250	275	400	500	600

	CAL18X-11(1 x N.O. + 1 x N.C.)		**CAL19-11**(1 x N.O. + 1 x N.C.)
		VM300H	**VM19**
VE5-2			
RC5-2 (24...440 V)		**RC5-3** (250...440 V)	

TA75DU-M (18...80 A) [2]	**TA80DU** (29...80 A)	**TA200DU** (66...200 A) [3]	
	TA110DU (66...110 A)		
E80DU(27...80A)	**E140DU**(50...140A)	**EF205**(63...210A)	**EF370** (115...380 A)

Short-circuit protection devices

MS450 (28...50 A) Ics up to 50 kA		Tmax / XT Circuit breaker and accessories
MS495 (45...100 A) Ics up to 50 kA		
MS497 (22...100 A) Ics up to 100 kA		
MO496 (32...100 A) Ics up to 100 kA		
MO450 (40...50 A) Ics up to 50 kA	**MO495** (63...100 A) Ics up to 50 kA	

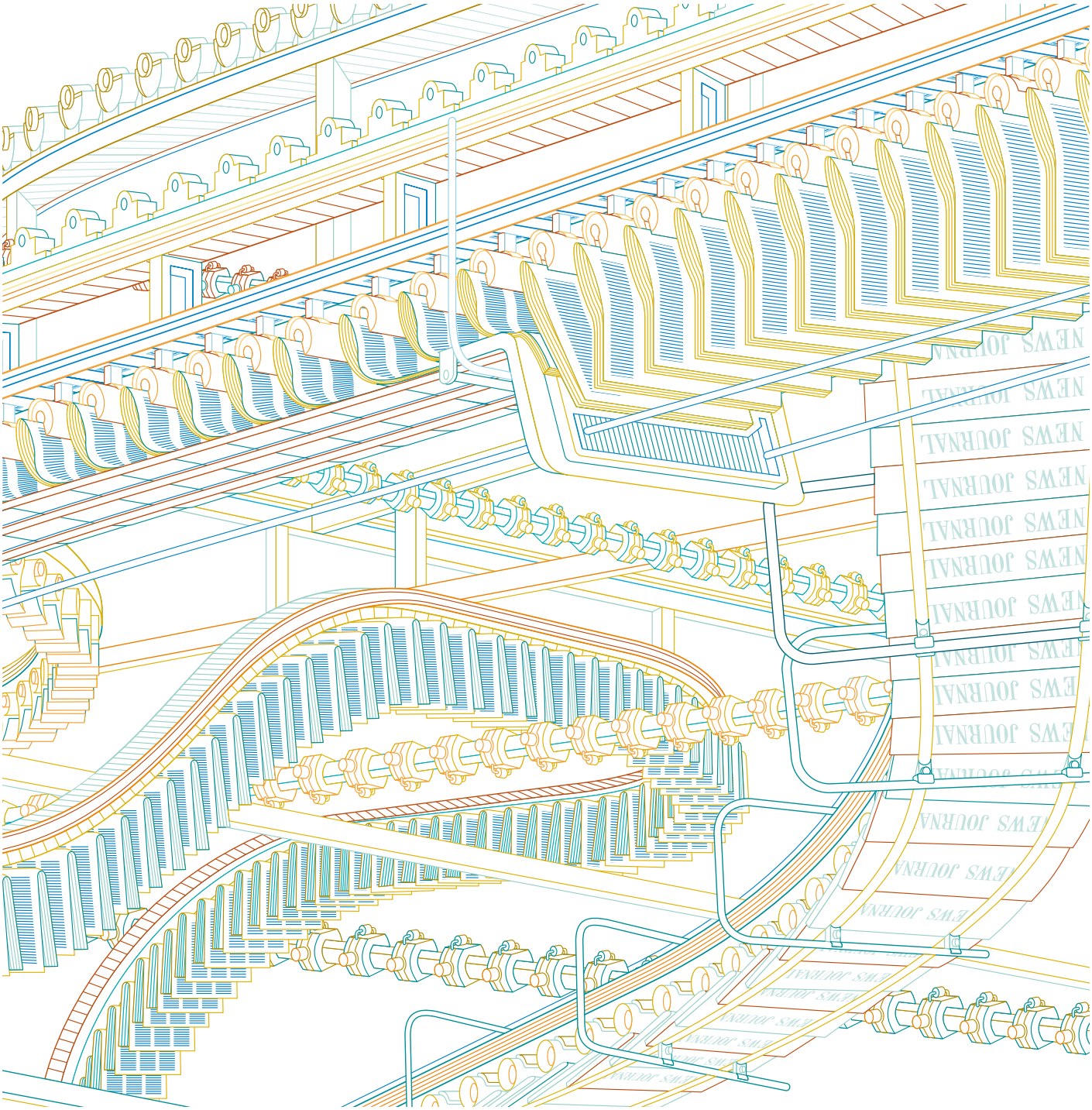


1SYN829571C201

1SYN829571C201

AX contactors and NX contactor relays

1SYN829571C201



1SYN829571C201

AX09 ... AX25 3-pole contactors
4 to 11 kW
AC operated

AX09 ... AX25

Description

AX09 … AX25 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and 1 built-in auxiliary contact

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

IEC Rated operational power 400 V AC-3 kW	current θ ≤ 40 °C AC-1 A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Auxiliary contacts fitted		Type	Order code	Weight Pkg (1 pce) kg
4	22	24	24	1	0	AX09-30-10-81	1SBL901074R8110	0.340
				0	1	AX09-30-01-81	1SBL901074R8101	0.340
		110	110…120	1	0	AX09-30-10-84	1SBL901074R8410	0.340
				0	1	AX09-30-01-84	1SBL901074R8401	0.340
		220…230	230…240	1	0	AX09-30-10-80	1SBL901074R8010	0.340
				0	1	AX09-30-01-80	1SBL901074R8001	0.340
		230…240	240…260	1	0	AX09-30-10-88	1SBL901074R8810	0.340
				0	1	AX09-30-01-88	1SBL901074R8801	0.340
		400…415	415…440	1	0	AX09-30-10-86	1SBL901074R8610	0.340
				0	1	AX09-30-01-86	1SBL901074R8601	0.340
5.5	25	24	24	1	0	AX12-30-10-81	1SBL911074R8110	0.340
				0	1	AX12-30-01-81	1SBL911074R8101	0.340
		110	110…120	1	0	AX12-30-10-84	1SBL911074R8410	0.340
				0	1	AX12-30-01-84	1SBL911074R8401	0.340
		220…230	230…240	1	0	AX12-30-10-80	1SBL911074R8010	0.340
				0	1	AX12-30-01-80	1SBL911074R8001	0.340
		230…240	240…260	1	0	AX12-30-10-88	1SBL911074R8810	0.340
				0	1	AX12-30-01-88	1SBL911074R8801	0.340
		400…415	415…440	1	0	AX12-30-10-86	1SBL911074R8610	0.340
				0	1	AX12-30-01-86	1SBL911074R8601	0.340
7.5	27	24	24	1	0	AX18-30-10-81	1SBL921074R8110	0.340
				0	1	AX18-30-01-81	1SBL921074R8101	0.340
		110	110…120	1	0	AX18-30-10-84	1SBL921074R8410	0.340
				0	1	AX18-30-01-84	1SBL921074R8401	0.340
		220…230	230…240	1	0	AX18-30-10-80	1SBL921074R8010	0.340
				0	1	AX18-30-01-80	1SBL921074R8001	0.340
		230…240	240…260	1	0	AX18-30-10-88	1SBL921074R8810	0.340
				0	1	AX18-30-01-88	1SBL921074R8801	0.340
		400…415	415…440	1	0	AX18-30-10-86	1SBL921074R8610	0.340
				0	1	AX18-30-01-86	1SBL921074R8601	0.340
11	32	24	24	1	0	AX25-30-10-81	1SBL931074R8110	0.340
				0	1	AX25-30-01-81	1SBL931074R8101	0.340
		110	110…120	1	0	AX25-30-10-84	1SBL931074R8410	0.340
				0	1	AX25-30-01-84	1SBL931074R8401	0.340
		220…230	230…240	1	0	AX25-30-10-80	1SBL931074R8010	0.340
				0	1	AX25-30-01-80	1SBL931074R8001	0.340
		230…240	240…260	1	0	AX25-30-10-88	1SBL931074R8810	0.340
				0	1	AX25-30-01-88	1SBL931074R8801	0.340
		400…415	415…440	1	0	AX25-30-10-86	1SBL931074R8610	0.340
				0	1	AX25-30-01-86	1SBL931074R8601	0.340

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX32, AX40 3-pole contactors
15 to 18.5 kW
AC operated

AX32, AX40

Description

AX32, AX40 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and 1 built-in auxiliary contact

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

IEC Rated operational power 400 V AC-3 kW	current θ ≤ 40 °C AC-1 A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Auxiliary contacts fitted		Type	Order code	Weight Pkg (1 pce) kg
15	55	24	24	1	0	AX32-30-10-81	1SBL281074R8110	0.71
				0	1	AX32-30-01-81	1SBL281074R8101	0.71
		110	110…120	1	0	AX32-30-10-84	1SBL281074R8410	0.71
				0	1	AX32-30-01-84	1SBL281074R8401	0.71
		220…230	230…240	1	0	AX32-30-10-80	1SBL281074R8010	0.71
				0	1	AX32-30-01-80	1SBL281074R8001	0.71
		230…240	240…260	1	0	AX32-30-10-88	1SBL281074R8810	0.71
				0	1	AX32-30-01-88	1SBL281074R8801	0.71
		400…415	415…440	1	0	AX32-30-10-86	1SBL281074R8610	0.71
				0	1	AX32-30-01-86	1SBL281074R8601	0.71
18.5	60	24	24	1	0	AX40-30-10-81	1SBL321074R8110	0.71
				0	1	AX40-30-01-81	1SBL321074R8101	0.71
		110	110…120	1	0	AX40-30-10-84	1SBL321074R8410	0.71
				0	1	AX40-30-01-84	1SBL321074R8401	0.71
		220…230	230…240	1	0	AX40-30-10-80	1SBL321074R8010	0.71
				0	1	AX40-30-01-80	1SBL321074R8001	0.71
		230…240	240…260	1	0	AX40-30-10-88	1SBL321074R8810	0.71
				0	1	AX40-30-01-88	1SBL321074R8801	0.71
		400…415	415…440	1	0	AX40-30-10-86	1SBL321074R8610	0.71
				0	1	AX40-30-01-86	1SBL321074R8601	0.71

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX50 ... AX80 3-pole contactors
22 to 37 kW
AC operated

AX50 ... AX80

Description

AX50 … AX80 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details (without auxillary blcok)

IEC		Rated control circuit voltage Uc (1)		Auxiliary contacts fitted		Type	Order code	Weight
Rated operational power 400 V AC-3	current θ ≤ 40 °C AC-1							Pkg (1 pce)
kW	A	V 50 Hz	V 60 Hz					kg
22	100	24	24	0	0	AX50-30-00-81	1SBL351074R8100	1.12
		110	110…120	0	0	AX50-30-00-84	1SBL351074R8400	1.12
		220…230	230…240	0	0	AX50-30-00-80	1SBL351074R8000	1.12
		230…240	240…260	0	0	AX50-30-00-88	1SBL351074R8800	1.12
		400…415	415…440	0	0	AX50-30-00-86	1SBL351074R8600	1.12
30	115	24	24	0	0	AX65-30-00-81	1SBL371074R8100	1.12
		110	110…120	0	0	AX65-30-00-84	1SBL371074R8400	1.12
		220…230	230…240	0	0	AX65-30-00-80	1SBL371074R8000	1.12
		230…240	240…260	0	0	AX65-30-00-88	1SBL371074R8800	1.12
		400…415	415…440	0	0	AX65-30-00-86	1SBL371074R8600	1.12
37	125	24	24	0	0	AX80-30-00-81	1SBL411074R8100	1.12
		110	110…120	0	0	AX80-30-00-84	1SBL411074R8400	1.12
		220…230	230…240	0	0	AX80-30-00-80	1SBL411074R8000	1.12
		230…240	240…260	0	0	AX80-30-00-88	1SBL411074R8800	1.12
		400…415	415…440	0	0	AX80-30-00-86	1SBL411074R8600	1.12

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX50 ... AX80 3-pole contactors
22 to 37 kW
AC operated

AX50 ... AX80

Description

AX50 … AX80 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and side mounted auxiliary contact block

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

IEC Rated operational power 400 V AC-3 kW	current θ ≤ 40 °C AC-1 A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Auxiliary contacts fitted		Type	Order code	Weight Pkg (1 pce) kg
22	100	24	24	1	1	AX50-30-11-81	1SBL351074R8111	1.16
		110	110…120	1	1	AX50-30-11-84	1SBL351074R8411	1.16
		220…230	230…240	1	1	AX50-30-11-80	1SBL351074R8011	1.16
		230…240	240…260	1	1	AX50-30-11-88	1SBL351074R8811	1.16
		400…415	415…440	1	1	AX50-30-11-86	1SBL351074R8611	1.16
30	115	24	24	1	1	AX65-30-11-81	1SBL371074R8111	1.16
		110	110…120	1	1	AX65-30-11-84	1SBL371074R8411	1.16
		220…230	230…240	1	1	AX65-30-11-80	1SBL371074R8011	1.16
		230…240	240…260	1	1	AX65-30-11-88	1SBL371074R8811	1.16
		400…415	415…440	1	1	AX65-30-11-86	1SBL371074R8611	1.16
37	125	24	24	1	1	AX80-30-11-81	1SBL411074R8111	1.16
		110	110…120	1	1	AX80-30-11-84	1SBL411074R8411	1.16
		220…230	230…240	1	1	AX80-30-11-80	1SBL411074R8011	1.16
		230…240	240…260	1	1	AX80-30-11-88	1SBL411074R8811	1.16
		400…415	415…440	1	1	AX80-30-11-86	1SBL411074R8611	1.16

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX95 ... AX150 3-pole contactors
45 to 75 kW
AC operated

AX95 ... AX150

Description

AX95 … AX150 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and side mounted auxiliary contact block

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

IEC		Rated control circuit voltage Uc (1)		Auxiliary contacts fitted		Type	Order code	Weight
Rated operational power 400 V AC-3	current θ ≤ 40 °C AC-1							Pkg (1 pce)
kW	A	V 50 Hz	V 60 Hz					kg
45	145	24	24	1	1	AX95-30-11-81	1SFL431074R8111	2.08
		110	110…120	1	1	AX95-30-11-84	1SFL431074R8411	2.08
		220…230	230…240	1	1	AX95-30-11-80	1SFL431074R8011	2.08
		230…240	240…260	1	1	AX95-30-11-88	1SFL431074R8811	2.08
		400…415	415…440	1	1	AX95-30-11-86	1SFL431074R8611	2.08
55	160	24	24	1	1	AX115-30-11-81	1SFL981074R8111	2.08
		110	110…120	1	1	AX115-30-11-84	1SFL981074R8411	2.08
		220…230	230…240	1	1	AX115-30-11-80	1SFL981074R8011	2.08
		230…240	240…260	1	1	AX115-30-11-88	1SFL981074R8811	2.08
		400…415	415…440	1	1	AX115-30-11-86	1SFL981074R8611	2.08
75	190	24	24	1	1	AX150-30-11-81	1SFL991074R8111	2.08
		110	110…120	1	1	AX150-30-11-84	1SFL991074R8411	2.08
		220…230	230…240	1	1	AX150-30-11-80	1SFL991074R8011	2.08
		230…240	240…260	1	1	AX150-30-11-88	1SFL991074R8811	2.08
		400…415	415…440	1	1	AX150-30-11-86	1SFL991074R8611	2.08

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX185, AX205 3-pole contactors
90 to 110 kW
AC operated

AX185, AX205

Description

AX185, AX205 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and side mounted auxiliary contact block

– control circuit: AC operated

– add-on auxiliary contact blocks for side mounting and a wide range of accessories.

Ordering details

IEC Rated operational power 400 V AC-3 kW	current θ ≤ 40 °C AC-1 A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Auxiliary contacts fitted		Type	Order code	Weight Pkg (1 pce) kg
90	250	24	24	1	1	AX185-30-11-81	1SFL491074R8111	3.80
		110	110…120	1	1	AX185-30-11-84	1SFL491074R8411	3.80
		220…230	230…240	1	1	AX185-30-11-80	1SFL491074R8011	3.80
		230…240	240…260	1	1	AX185-30-11-88	1SFL491074R8811	3.80
		400…415	415…440	1	1	AX185-30-11-86	1SFL491074R8611	3.80
110	275	24	24	1	1	AX205-30-11-81	1SFL501074R8111	3.80
		110	110…120	1	1	AX205-30-11-84	1SFL501074R8411	3.80
		220…230	230…240	1	1	AX205-30-11-80	1SFL501074R8011	3.80
		230…240	240…260	1	1	AX205-30-11-88	1SFL501074R8811	3.80
		400…415	415…440	1	1	AX205-30-11-86	1SFL501074R8611	3.80

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX260 ... AX370 3-pole contactors
132 to 200 kW
AC operated

AX260 ... AX370

Description

AX260 … AX370 contactors are mainly used for controlling 3-phase motors and power circuits up to 690 V AC.

These contactors are of the block type design with:

– 3 main poles and side mounted auxiliary contact block

– control circuit: AC operated

– add-on auxiliary contact blocks for side mounting and a wide range of accessories.

Ordering details

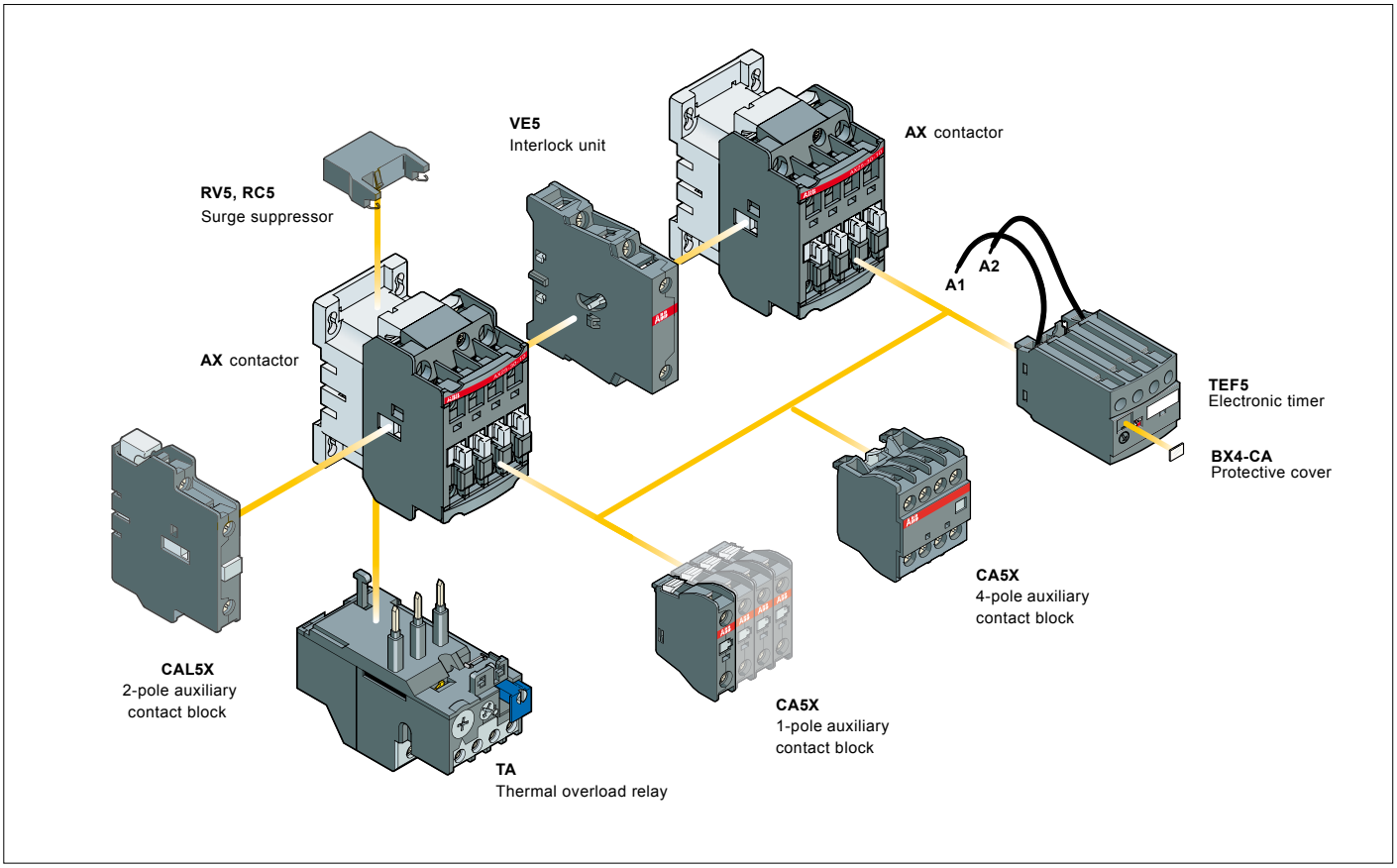
IEC Rated operational power 400 V AC-3 kW	current θ ≤ 40 °C AC-1 A	Rated control circuit voltage Uc (1) V 50 Hz	V 60 Hz	Auxiliary contacts fitted		Type	Order code	Weight Pkg (1 pce) kg
132	400	24	24	1	1	AX260-30-11-81	1SFL547074R8111	5.4
		110	110…120	1	1	AX260-30-11-84	1SFL547074R8411	5.4
		220…230	230…240	1	1	AX260-30-11-80	1SFL547074R8011	5.4
		230…240	240…260	1	1	AX260-30-11-88	1SFL547074R8811	5.4
		400…415	415…440	1	1	AX260-30-11-86	1SFL547074R8611	5.4
160	500	24	24	1	1	AX300-30-11-81	1SFL587074R8111	5.4
		110	110…120	1	1	AX300-30-11-84	1SFL587074R8411	5.4
		220…230	230…240	1	1	AX300-30-11-80	1SFL587074R8011	5.4
		230…240	240…260	1	1	AX300-30-11-88	1SFL587074R8811	5.4
		400…415	415…440	1	1	AX300-30-11-86	1SFL587074R8611	5.4
200	600	24	24	1	1	AX370-30-11-81	1SFL607074R8111	5.4
		110	110…120	1	1	AX370-30-11-84	1SFL607074R8411	5.4
		220…230	230…240	1	1	AX370-30-11-80	1SFL607074R8011	5.4
		230…240	240…260	1	1	AX370-30-11-88	1SFL607074R8811	5.4
		400…415	415…440	1	1	AX370-30-11-86	1SFL607074R8611	5.4

(1) for other voltage version see page no. 2/51

1SYN829571C201

AX09 ... AX150 3-pole contactors
Main accessories

Contactor and main accessories (other accessories available)



Main accessory fitting details

Many configurations of accessories are possible depending on whether these are front-mounted or side-mounted.

Contactor types	Main poles	Built-in auxiliary contacts	Front-mounted accessories: Auxiliary contact blocks				Front-mounted accessories: Electronic timer		Side-mounted accessories: Auxiliary contact blocks		Side-mounted accessories: Interlock unit
			1-pole CA5X		4-pole CA5X		TEF5		2-pole CALX		VM5 or VE5
AX09 ... AX25	3 0 3 0	1 0 0 1 (1)	1 to 4 x CA5X	or	1 x CA5X (4-pole)	or	1 x TEF5	+	1 to 2 x CALX5-11	or	1 x VM5-1 or VE5-1 +1 x CALX5-11
AX32, AX40	3 0 3 0	1 0 0 1 (1)	1 to 5 x CA5X	or	1 x CA5X (4-pole) + 1 x 1-pole CA5X	or	1 x TEF5 + 1 x CA5X (1-pole)	+	1 to 2 x CALX5-11	or	1 x VM5-1 or VE5-1 +1 x CALX5-11
AX50 ... AX80	3 0	1 1	1 to 6 x CA5X	or	1 x CA5X (4-pole) + 2 x 1-pole CA5X	or	1 x TEF5 + 2 x CA5X (1-pole)	+	1 x CALX5-11	or	1 x VE5-2
AX95 ... AX150	3 0	1 1	1 to 6 x CA5X	or	1 x CA5X (4-pole) + 2 x 1-pole CA5X		–	+	1 x CALX18-11	or	1 x VE5-2

(1) 2 N.C. CA5X auxiliary contacts maximum in mounting position 5. for mounting position refer technical data page.

Overload relays fitting details (1)

Contactor types	Thermal overload relays	Electronic overload relays
AX09 ... AX18	TA25DU-M (0.1...0.32 A)	E16DU(0.10 ... 18.9A)
AX25	TA25DU-M (0.1...0.32 A)	
AX32, AX40	TA25DU-M (0.1...0.32 A) or TA42DU-M (18...42 A)	E45DU (9 ... 45A)
AX50 ... AX80	TA75DU-M (18...80 A) or TA85DU-M (65 ... 85 A)	E80DU(27 ... 80A)
AX95, AX115	TA80DU (29...80 A) or TA110DU (66...110 A)	E140DU(50 ... 140A)

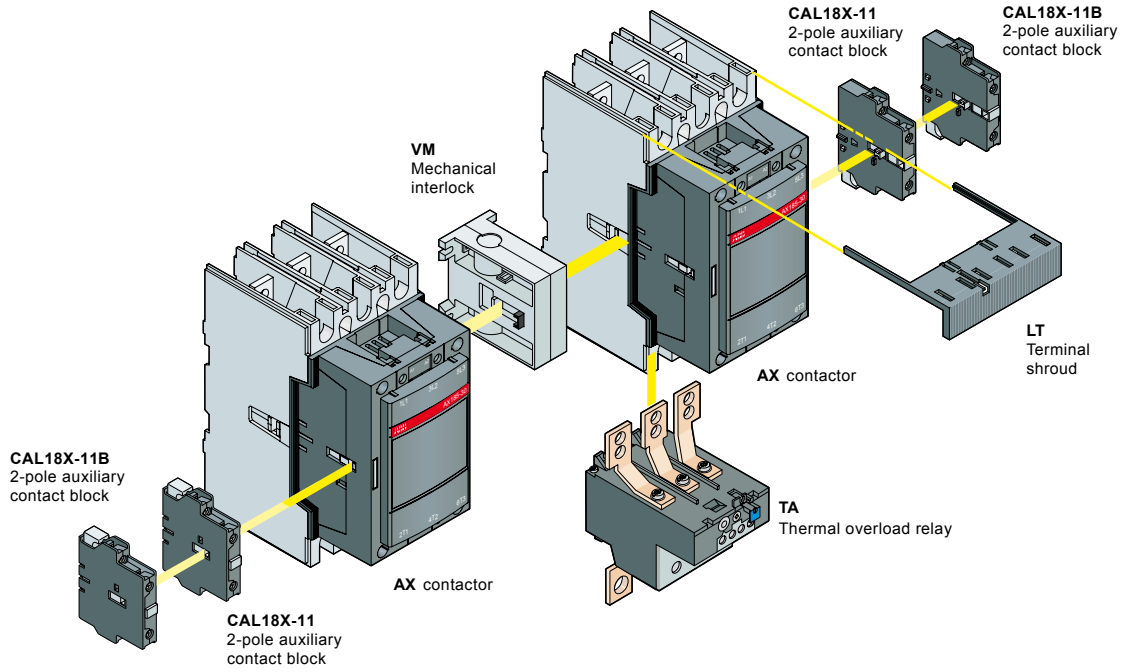
The addition of a thermal overload relay on the contactor does not prevent fitting of many other accessories as shown above.
(1) Direct mounting - No kit required.

1SYN829571C201

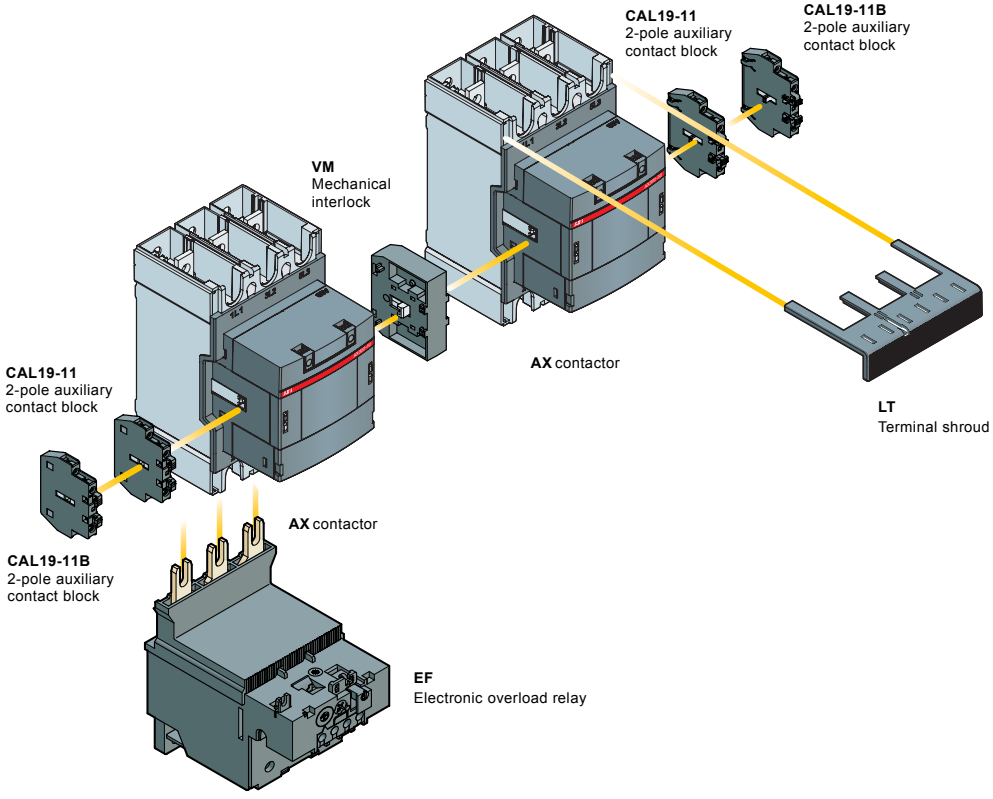
AX185 ... AX370 3-pole contactors
Main accessories

Main accessories (other accessories available)

AX185, AX205



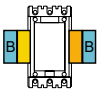
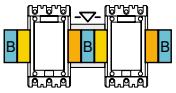
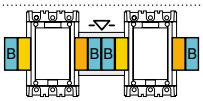
AX260 ... AX370



1SYN829571C201

AX185 ... AX370 3-pole contactors
Main accessories

Main accessory fitting details

Contactor types	Main poles	Available auxiliary contacts	Side-mounted accessories Add-on auxiliary contact blocks CAL18X-11, CAL18X-11B, CAL19-11, CAL19-11B				Mechanical interlock units	Mounting and positioning Factory mounted auxiliary contacts Add-on CAL18-11 auxiliary contacts Add-on CAL18-11B auxiliary contacts
Contactors + auxiliary contact blocks								
AX185 ... AX205	3 0	1 1	1 x CAL18X-11	+	2 x CAL18X-11B		–	
AX260 ... AX370	3 0	1 1	1 x CAL19-11	+	2 x CAL19-11B		–	
AX260 ... AX370	3 0	2 2	-	+	2 x CAL19-11B		–	
(1) Total number of auxiliary contact blocks for the two contactors.								
Contactors with mechanical interlocking + auxiliary contact blocks								
AX185 ... AX205	3 0	1 1	2 x CAL18-11 (1)	+	2 x CAL18-11B (1)	+	VM...H (2)	
AX260 ... AX370	3 0	1 1	2 x CAL19-11	+	2 x CAL19-11B	+	VM... (2)	

(1) Total number of auxiliary contact blocks for the two contactors
(2) Interlock type, according to the contactor ratings (see "Accessories")

Overload relays fitting details (1)

Contactor types	Thermal overload relays	Electronic overload relays
AX185, AX205	TA200DU (66 ... 200 A)	EF205 (63 ... 210 A)
AX260 ... AX370	-	EF370 (115 ... 380 A)

The addition of a thermal overload relay on the contactor does not prevent fitting of many other accessories as shown above.
(1) Direct mounting - No kit required.

1SYN829571C201

AX09 ... AX150 3-pole contactors
Main accessories

CA5X-10

CA5X-4P

CAL5X-11

VE5-1

Ordering details (1)

For contactors	Auxiliary contacts		Type	Order code	Pkg qty	Weight (1 pce) kg
Front-mounted instantaneous auxiliary contact blocks						
AX09 ... AX150 and	1	–	CA5X-10	1SBN019010R1010	10	0.014
NX 4-pole	–	1	CA5X-01	1SBN019010R1001	10	0.014
AX50...AX150	2	2	CA5X-22E	1SBN019040R1022	2	0.060
	3	1	CA5X-31E	1SBN019040R1031	2	0.060
	4	0	CA5X-40E	1SBN019040R1040	2	0.060
	0	4	CA5X-04E	1SBN019040R1004	2	0.060
AX09...AX40-30-10	2	2	CA5X-22M	1SBN019040R1122	2	0.060
	3	1	CA5X-31M	1SBN019040R1131	2	0.060
	4	0	CA5X-40M	1SBN019040R1140	2	0.060
	0	4	CA5X-04M	1SBN019040R1104	2	0.060
AX09...AX40-30-01	2	2	CA5X-22U	1SBN019040R1322	2	0.060
	3	1	CA5X-31U	1SBN019040R1331	2	0.060
	4	0	CA5X-40U	1SBN019040R1340	2	0.060
	0	4	CA5X-04U	1SBN019040R1304	2	0.060
NX 4-pole	2	2	CA5X-22N	1SBN019040R1222	2	0.060
	3	1	CA5X-31N	1SBN019040R1231	2	0.060
	0	4	CA5X-04N	1SBN019040R1204	2	0.060
	4	0	CA5X-40N	1SBN019040R1240	2	0.060

Side-mounted instantaneous auxiliary contact block, 2 pole

AX09 ... AX80 and NX - 4 pole	1	1	CAL5X-11	1SBN019020R1011	2	0.050
AX95 ... AX205 (1)	1	1	CAL18X-11	1SFN019820R1011	2	0.050

Mechanical interlock units for two horizontal mounted contactors(2)

Left side contactor	Right side contactor	Mounting						
AX09 ... AX40	AX09 ... AX40	Mech.	–	–	VM5-1	1SBN030100R1000	1	0.066
AX95 ... AX205	AX185 ... AX205	Mech.	–	–	VM300H	1SFN034700R1000	1	0.150

Mechanical and electrical interlock units for two horizontal mounted contactors

Left side contactor	Right side contactor	Mounting						
AX09...AX40	AX09...AX40	Mech. + Elect.	–	2	VE5-1	1SBN030110R1000	1	0.076
AX32...AX80	AX50...AX80	Mech. + Elect.	–	2	VE5-2	1SBN030210R1000	1	0.146
AX50...AX80	AX32...AX80	Mech. + Elect.	–	2	VE5-2	1SBN030210R1000	1	0.146
AX50...AX80	AX95...AX150	Mech. + Elect.	–	2	VE5-2(3)	1SBN030210R1000	1	0.146
AX95...AX150	AX50...AX80	Mech. + Elect.	–	2	VE5-2(3)	1SBN030210R1000	1	0.146
AX95...AX150	AX95...AX150	Mech. + Elect.	–	2	VE5-2	1SBN030210R1000	1	0.146

(1) For each contactor type, refer to "Accessory fitting details".
(2) Mechanical durability: VM5-1 = 5 millions cycles, VM300H = 1 million cycles.
(3) The combination of AX50 ... AX80 contactors interlocked with AX95...AX150 contactors cannot be mounted on symmetrical rail (75 mm, IEC/EN 60715).

1SYN829571C201

AX09 ... AX150 3-pole contactors
Main accessories

TEF5-OFF

For contactors	Time delay range selected by switch	Delay type	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce) kg
Electronic timers							
AX09 ... AX80	0.1...1 s	ON-delay	1 1	TEF5-ON	1SBN020312R1000	1	0.065
NX 4 pole	1...10 s	OFF-delay	1 1	TEF5-OFF	1SBN020314R1000	1	0.065
	10...100 s						

Note: Rated control circuit voltage Uc 24...240 V 50/60 Hz or DC.

Connecting links with manual motor starters

BEA

For contactors	MMS type	Type	Order code	Pkg qty	Weight (1 pce) kg
AX09...AX18	MS116 / MS132	BEA16/116	1SBN081406R1000	10	0.020
AX25	MS116 / MS 132	BEA25/116	1SBN089306T1000	10	0.020
AX25	MS116 / MS 132	BEA25/132	1SBN089306T1001	10	0.020
AX32 ... AX40	MS450	BEA40/450	1SBN083206R1000	1	0.061
AX50	MS450	BEA50/450	1SBN083506R1000	1	0.062
AX50 ... AX80	MS495	BEA75/495	1SBN084106R1000	1	0.120
AX95 ... AX150	MS495	BEA100/495	1SBN084506R1000	1	0.124

RV5/50

For contactors	Rated control circuit voltage Uc V AC		Type	Order code	Pkg qty	Weight (1 pce) kg
Surge suppressors						
AX09 ... AX150	24...50	•	RV5/50	1SBN050010R1000	2	0.015
	50...133	•	RV5/133	1SBN050010R1001	2	0.015
	110...250	•	RV5/250	1SBN050010R1002	2	0.015
	250...440	•	RV5/440	1SBN050010R1003	2	0.015
AX09 ... AX40	24...50	•	RC5-1/50	1SBN050100R1000	2	0.012
	50...133	•	RC5-1/133	1SBN050100R1001	2	0.012
	110...250	•	RC5-1/250	1SBN050100R1002	2	0.012
	250...440	•	RC5-1/440	1SBN050100R1003	2	0.012
AX50 ... AX150	24...50	•	RC5-2/50	1SBN050200R1000	2	0.015
	50...133	•	RC5-2/133	1SBN050200R1001	2	0.015
	110...250	•	RC5-2/250	1SBN050200R1002	2	0.015
	250...440	•	RC5-2/440	1SBN050200R1003	2	0.015

(1) See "Main accessory fitting details" table.

WB75-A

Mechanical latching units

For contactors	Rated control circuit voltage Uc		Type	Order code	Pkg qty	Weight (1 pce) kg
	50Hz	60 Hz				
AX09...AX80	24	24...28	WB75-A	FPTN372726R1001	1	0.120
	220...230	220...255	WB75-A	FPTN372726R1006	1	0.120

AX185 ... AX370 3-pole contactors
Main accessories


1SFC101033F0201

CAL18X-11


1SBC580411F0301

VM300H


1SFT98099-019C3

LT...AC


1SFT9099-125

LT...AL

Ordering details (1)

For contactors	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce) kg
Side-mounted instantaneous auxiliary contact blocks					
AX185 ... AX205 (1)	1 1	CAL18X-11	1SFN019820R1011	2	0.050
	1 1	CAL18X-11B	1SFN019820R3311	2	0.050
AX260 ... AX370	1 1	CAL19-11	1SFN010820R1011	2	0.040
	1 1	CAL19-11B	1SFN010820R3311	2	0.040

Left side contactor	Right side contactor	Mounting			Type	Order code	Pkg qty	Weight (1 pce) kg
Mechanical interlock unit for two horizontal mounted contactors								
AX95 ... AX205	AX185 ... AX205	Mech.	-	-	VM300H	1SFN034700R1000	1	0.150
AX260 ... AX370	AX260 ... AX370	Mech.	-	-	VM19	1SFN030300R1000	1	0.054

Terminal shrouds					
AX185 ... AX205 with connectors	LT185-AC	1SFN124701R1000	2	0.050	
AX185 ... AX205 with lugs	LT185-AL	1SFN124703R1000	2	0.220	
AX260 ... AX370 with connectors	LT370-30C	1SFN125401R1000	2	0.035	
AX260 ... AX370 with lugs	LT370-30L	1SFN125403R1000	2	0.280	


1SFT98000-011C3

LW


1SFT98000-012C3

LX

For contactors	Dimensions hole Ø mm	bar mm	Type	Order code	Pkg qty	Weight (1 pce) kg
Terminal extension						
AX185	10.5	20 x 5	LX185	1SFN074707R1000	1	0.250
AX205 ... AX300	10.5	25 x 5	LX300	1SFN075107R1000	1	0.450
Terminal enlargements						
AX185	8.5	20 x 5	LW185	1SFN074710R1000	1	0.250
AX205 ... AX300	10.5	20 x 5	LW300	1SFN075110R1000	1	0.350

Surge suppressor


1SBC574001F0301

RV5/50

For contactors	Rated control circuit voltage Uc V AC	Type	Order code	Pkg qty	Weight (1 pce) kg
AX185 ... AX205	250...440	RC5-3/440	1SFN050300R1003	2	0.028

AX09 ... AX40 3-pole contactors
Technical data

Main pole - Utilization characteristics according to IEC

Contactor types	AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Standards		IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1					
Rated operational voltage Ue max.		690 V					
Rated frequency limits		25 ... 400 Hz					
Rated frequency (without derating)		50 / 60 Hz					
Conventional free-air thermal current Ith							
acc. to IEC 60947-4-1, open contactors, θ ≤ 40 °C		24 A	26 A	28 A	32 A	65 A	65 A
With conductor cross-sectional area		4 mm²	4 mm²	4 mm²	6 mm²	16 mm²	16 mm²
AC-1 Utilization category							
For air temperature close to contactor							
Ie / Rated operational current AC-1	**θ ≤ 40 °C**	22 A	25 A	27 A	32 A	55 A	60 A
Ue max. ≤ 690 V, 50/60 Hz	**θ ≤ 55 °C**	22 A	22 A	25 A	27 A	55 A	60 A
	θ ≤ 70 °C	18 A	18 A	20 A	23 A	39 A	42 A
With conductor cross-sectional area		2.5 mm²	2.5 mm²	4 mm²	6 mm²	10 mm²	16 mm²
AC-3 Utilization category							
For air temperature close to contactor θ ≤ 55 °C							
Ie / Max. rated operational current AC-3 (1)							
M 3~ 3-phase motors	**220-230-240 V**	9 A	12 A	18 A	25 A	32 A	40 A
	380-400 V	9 A	12 A	18 A	25 A	32 A	40 A
	415 V	9 A	12 A	18 A	25 A	32 A	40 A
	440 V	9 A	9 A	12 A	16 A	32 A	37 A
	500 V	9 A	9 A	12 A	14 A	28 A	33 A
	690 V	7 A	7 A	9 A	10 A	21 A	25 A
Rated operational power	**AC-3** (1)						
M 3~ 1500 r.p.m. 50 Hz, 1800 r.p.m. 60 Hz, 3-phase motors	**220-230-240 V**	2.2 kW	3 kW	4 kW	6.5 kW	9 kW	11 kW
	380-400 V	4 kW	5.5 kW	7.5 kW	11 kW	15 kW	18.5 kW
	415 V	4 kW	5.5 kW	9 kW	11 kW	15 kW	18.5 kW
	440 V	4 kW	4 kW	5.5 kW	9 kW	18.5 kW	22 kW
	500 V	5.5 kW	5.5 kW	7.5 kW	9 kW	18.5 kW	22 kW
	690 V	5.5 kW	5.5 kW	7.5 kW	9 kW	18.5 kW	22 kW
Rated making capacity AC-3		10 x Ie AC-3 acc. to IEC 60947-4-1					
Rated breaking capacity AC-3		8 x Ie AC-3 acc. to IEC 60947-4-1					
AC-8a Utilization category							
(without thermal overload relay - Ue 400 V 50/60 Hz - θ ≤ 40 °C)							
Ie / Rated operational current AC-8a		12 A	16 A	22 A	30 A	40 A	50 A
Rated operational power AC-8a		5.5 kW	5.5 kW	7.5 kW	11 kW	20 kW	22 kW
Short-circuit protection device for contactors							
without thermal overload relay - Motor protection excluded (2)							
Ue ≤ 500 V AC - gG type fuse		25 A	25 A	32 A	32 A	63 A	63 A
Rated short-time withstand current Icw	**1 s**	250 A	250 A	280 A	300 A	600 A	600 A
at 40 °C ambient temperature,	**10 s**	100 A	100 A	120 A	140 A	400 A	400 A
in free air from a cold state	**30 s**	60 A	60 A	70 A	80 A	225 A	225 A
	1 min	50 A	50 A	55 A	60 A	150 A	150 A
	15 min	26 A	26 A	28 A	30 A	65 A	65 A
Maximum breaking capacity							
cos Ø = 0.45	**at 440 V**	250 A	250 A	250 A	250 A	820 A	820 A
	at 690 V	90 A	90 A	90 A	90 A	340 A	340 A
Power dissipation per pole	**Ie / AC-1**	0.8 W	0.8 W	1 W	1.2 W	2.5 W	3 W
	Ie / AC-3	0.1 W	0.1 W	0.2 W	0.35 W	0.9 W	1.3 W
Electrical durability (1x10⁶)	**400/415V, AC-3**	1.5	1.5	1.5	1.3	1.5	1.5
Max. electrical switching frequency	**AC-1**	600 cycle/h					
	AC-3	1200 cycle/h					
Mechanical durability							
Number of operating cycles		10 millions operating cycles					
Max. switching frequency		3600 cycles/h					

(1) For the corresponding kW/A values of 1500 r.p.m, 50 Hz or 1800 r.p.m, 60 Hz, 3-phase motors, see "Motor rated operational powers and currents".
(2) For the protection of motor starters against short circuits, see "Coordination with short-circuit protection devices".

1SYN829571C201

AX50 ... AX150 3-pole contactors
Technical data

Main pole - Utilization characteristics according to IEC

Contactor types	AC operated	AX50	AX65	AX80	AX95	AX115	AX150
Standards		IEC 60947-1 / 60947-4-1					
Rated operational voltage Ue max.		690 V			1000 V		
Rated frequency limits		25 ... 400 Hz					
Rated frequency (without derating)		50 / 60 Hz					
Conventional free-air thermal current Ith							
acc. to IEC 60947-4-1, open contactors, θ ≤ 40 °C		100 A	125 A	125 A	145 A	160 A	190 A
With conductor cross-sectional area		35 mm²	50 mm²	50 mm²	50 mm²	70 mm²	95 mm²
AC-1 Utilization category							
For air temperature close to contactor							
Ie / Rated operational current AC-1	**θ ≤ 40 °C**	100 A	115 A	125 A	145 A	160 A	190 A
Ue max. ≤ 690 V, 50/60 Hz	**θ ≤ 55 °C**	85 A	95 A	105 A	135 A	145 A	145 A
	θ ≤ 70 °C	70 A	80 A	85 A	115 A	130 A	130 A
With conductor cross-sectional area		35 mm²	50 mm²	50 mm²	50 mm²	70 mm²	95 mm²
AC-3 Utilization category							
For air temperature close to contactor θ ≤ 55 °C							
Ie / Max. rated operational current AC-3 (1)							
	220-230-240 V	53 A	65 A	80 A	96 A	115 A	150 A
	380-400 V	50 A	65 A	80 A	96 A	115 A	150 A
3-phase motors	**415 V**	50 A	65 A	80 A	96 A	115 A	150 A
	440 V	45 A	65 A	70 A	93 A	100 A	100 A
	500 V	45 A	55 A	65 A	80 A	100 A	100 A
	690 V	35 A	43 A	46 A	65 A	82 A	82 A
Rated operational power	**AC-3** (1)						
	220-230-240 V	15 kW	18.5 kW	22 kW	25 kW	30 kW	45 kW
1500 r.p.m. 50 Hz	**380-400 V**	22 kW	30 kW	37 kW	45 kW	55 kW	75 kW
1800 r.p.m. 60 Hz	**415 V**	25 kW	37 kW	40 kW	55 kW	59 kW	75 kW
3-phase motors	**440 V**	25 kW	37 kW	40 kW	55 kW	59 kW	59 kW
	500 V	30 kW	37 kW	45 kW	55 kW	59 kW	59 kW
	690 V	30 kW	37 kW	40 kW	55 kW	75 kW	75 kW
Rated making capacity AC-3		10 x Ie AC-3 acc. to IEC 60947-4-1					
Rated breaking capacity AC-3		8 x Ie AC-3 acc. to IEC 60947-4-1					
AC-8a Utilization category							
(without thermal overload relay - Ue 400 V 50/60 Hz - θ ≤ 40 °C)							
Ie / Rated operational current AC-8a		63 A	85 A	95 A	120 A	140 A	-
Rated operational power AC-8a		30 kW	45 kW	45 kW	55 kW	55 kW	-
Short-circuit protection device for contactors							
without thermal overload relay - Motor protection excluded (2)							
Ue ≤ 500 V AC - gG type fuse		100 A	125 A	160 A	160 A	200 A	315 A
Rated short-time withstand current Icw	**1 s**	1000 A	1000 A	1000 A	1320 A	1320 A	1320 A
at 40 °C ambient temperature,	**10 s**	650 A	650 A	650 A	800 A	800 A	800 A
in free air from a cold state	**30 s**	370 A	370 A	370 A	500 A	500 A	500 A
	1 min	250 A	250 A	250 A	350 A	350 A	350 A
	15 min	110 A	135 A	135 A	160 A	160 A	160 A
Maximum breaking capacity							
cos Ø = 0.45	**at 440 V**	1300 A	1300 A	1300 A	1160 A	1160 A	1160 A
	at 690 V	630 A	630 A	630 A	800 A	800 A	800 A
Power dissipation per pole	**Ie / AC-1**	5 W	6.5 W	7 W	6.5 W	6.5 W	6.5 W
	Ie / AC-3	1.3 W	1.5 W	2 W	2.7 W	2.7 W	2.7 W
Electrical durability (1x10⁶)	**400/415V, AC-3**	1.2	1.2	1.1	0.8	0.6	0.6
Max. electrical switching frequency	**AC-1**	600 cycle/h			300 cycles/h		
	AC-3	600 cycle/h			300 cycles/h		
Mechanical durability							
Number of operating cycles		10 millions operating cycles					
Max. switching frequency		3600 cycles/h					

1SYN829571C201

AX185 ... AX370 3-pole contactors
Technical data

Main pole - Utilization characteristics according to IEC

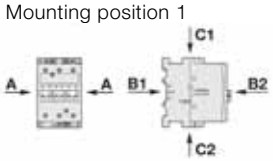
Contactor types	AC operated	AX185	AX205	AX260	AX300	AX370
Standards		IEC 60947-1 / 60947-4-1 / EN 60947-1 / 60947-4-1				
Rated operational voltage Ue max.		1000 V				
Rated frequency limits		25 ... 400 Hz				
Rated frequency (without derating)		50 / 60 Hz				
Conventional free-air thermal current Ith						
acc. to IEC 60947-4-1, open contactors, θ ≤ 40 °C		250 A	275 A	400 A	500 A	600 A
With conductor cross-sectional area		120 mm²	150 mm²	240 mm² (1)	300 mm²	2X185 mm² (2)
AC-1 Utilization category						
For air temperature close to contactor						
Ie / Rated operational current AC-1	**θ ≤ 40 °C**	250 A	275 A	400 A	500 A	600 A
Ue max. ≤ 690 V, 50/60 Hz	**θ ≤ 55 °C**	230 A	250 A	350 A	400 A	500 A
	θ ≤ 70 °C	180 A	180 A	290 A	325 A	400 A
With conductor cross-sectional area		120 mm²	150 mm²	240 mm² (1)	300 mm²	2X185 mm² (2)
AC-3 Utilization category						
For air temperature close to contactor θ ≤ 55 °C						
Ie / Max. rated operational current AC-3 (1)						
	220-230-240 V	185 A	205 A	265 A	305 A	370 A
M 3~ 3-phase motors	**380-400 V**	185 A	205 A	265 A	305 A	370 A
	415 V	185 A	205 A	265 A	305 A	370 A
	440 V	145 A	185 A	265 A	305 A	370 A
	500 V	145 A	170 A	250 A	290 A	315 A
	690 V	120 A	170 A	250 A	290 A	315 A
Rated operational power	**AC-3** (1)					
	220-230-240 V	55 kW	59 kW	75 kW	90 kW	110 kW
M 3~ 1500 r.p.m. 50 Hz, 1800 r.p.m. 60 Hz, 3-phase motors	**380-400 V**	90 kW	110 kW	132 kW	160 kW	200 kW
	415 V	90 kW	110 kW	132 kW	160 kW	200 kW
	440 V	75 kW	90 kW	160 kW	160 kW	200 kW
	500 V	90 kW	110 kW	160 kW	200 kW	250 kW
	690 V	110 kW	132 kW	200 kW	250 kW	315 kW
Rated making capacity AC-3		10 x Ie AC-3 acc. to IEC 60947-4-1				
Rated breaking capacity AC-3		8 x Ie AC-3 acc. to IEC 60947-4-1				
AC-8a Utilization category						
(without thermal overload relay - Ue 400 V 50/60 Hz - θ ≤ 40 °C)						
Ie / Rated operational current AC-8a		-	-	-	-	-
Rated operational power AC-8a		-	-	-	-	-
Short-circuit protection device for contactors						
without thermal overload relay - Motor protection excluded (2)						
Ue ≤ 500 V AC - gG type fuse		355 A	355 A	500 A	500 A	630 A
Rated short-time withstand current Icw	**1 s**	1800 A	1800 A	2650 A	3050 A	3700 A
at 40 °C ambient temperature,	**10 s**	1200 A	1200 A	2120 A	2440 A	2960 A
in free air from a cold state	**30 s**	800 A	800 A	1224 A	1409 A	1709 A
	1 min	600 A	600 A	865 A	996 A	1208 A
	15 min	280 A	280 A	400 A	500 A	600 A
Maximum breaking capacity						
cos Ø = 0.45	**at 440 V**	1500 A	1500 A	3800 A	4600 A	5000 A
	at 690 V	1200 A	1200 A	3300 A	3800 A	4000 A
Power dissipation per pole	**Ie / AC-1**	13 W	13 W	32 W	50 W	72 W
	Ie / AC-3	5 W	5 W	14 W	19 W	27 W
Electrical durability (1x10⁶)	**400/415V, AC-3**	0.8	0.7	0.5	0.5	0.5
Max. electrical switching frequency	**AC-1**	300 cycles/h				
	AC-3	300 cycles/h				
Mechanical durability						
Number of operating cycles		5 millions operating cycles				
Max. switching frequency		3600 cycles/h		300 cycles/h		

(1) For currents above 275 A use terminal enlargements or terminal extensions
(2) For currents above 450 A use terminal enlargements or terminal extensions

1SYN829571C201

AX09 ... AX40 3-pole contactors
Technical data

General technical data

Contactor types	AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Rated insulation voltage Ui							
acc. to IS / IEC 60947-4-1		690 V					
Rated impulse withstand voltage Uimp.		6 kV					
Ambient air temperature close to contactor							
Operation Fitted with thermal overload relay		-25...+55 °C (1)					
Without thermal overload relay		-40...+70 °C					
Storage		-60...+80 °C					
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II					
Maximum operating altitude (without derating)		3000 m					
Shock withstand							
acc. to IEC 60068-2-27 and EN 60068-2-27							
Mounting position 1							
	Shock direction	1/2 sinusoidal shock for 11 ms: no change in contact position, closed or open position(2)					
	A	20 g					
	B1	10 g closed position / 5 g open position					
	B2	15 g					
	C1	20 g					
	C2	20 g					

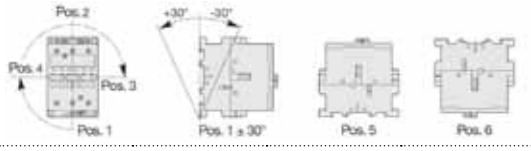
(1) The max. operational current is 23A for AX25 with TA25DU-25M; the max. operational current is 74A for AX80 with TA75DU-80M;
the max. operational current is 182A for AX205 with TA200DU-200
(2) These values are not valid for rail mounting with contactors AX95 ... AX150.

Magnet system characteristics

Contactor types		AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Coil operating limits		**AC supply**	at θ ≤ 55 °C 0.85...1.1 x Uc					
acc. to IS / IEC 60947-4-1			Please also refer to "Mounting characteristics and conditions for use"					
AC control voltage 50/60 Hz								
Rated control circuit voltage Uc		**at 50 Hz**	24...440 V					
		at 60 Hz	24...440 V					
Coil consumption	**Average pull-in value**	**50 Hz**	70 VA				120 VA	
		60 Hz	80 VA				140 VA	
		50/60 Hz (1)	74 VA / 70 VA				125 VA / 120 VA	
	Average holding value	**50 Hz**	8 VA / 2 W				12 VA / 3 W	
		60 Hz	8 VA / 2 W				12 VA / 3 W	
		50/60 Hz (1)	8 VA / 2 W				12 VA / 3 W	
Drop-out voltage			approx. 40...65 % of Uc					
Operating time								
Between coil energization and:		**N.O. contact closing**	10...26 ms				8...21 ms	
		N.C. contact opening	7...21 ms				6...18 ms	
Between coil de-energization and:		**N.O. contact opening**	4...11 ms				4...11 ms	
		N.C. contact closing	9...16 ms				7...14 ms	

(1) 50/60 Hz coils: see "Coil voltage code table".

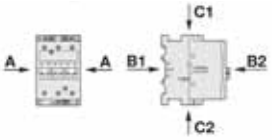
Mounting characteristics and conditions for use

Contactor types		AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Mounting positions								
			Max. N.O. or N.C. built-in and add-on N.O. or N.C. auxiliary contacts: see accessory fitting details for 3-pole contactor AX9 ... AX150					
Control voltage / Ambient temperature								
Mounting positions	1, 1±30°, 2, 3, 4, 5	**at θ ≤ 55 °C**	0.85...1.1 x Uc					
		at 55 °C≤ θ ≤ 70 °C	Uc					
	6	**at θ ≤ 55 °C**	0.95...1.1 x Uc					
		at θ ≤ 55 °C	Unauthorized					
Mounting distances			The contactors can be assembled side by side					
Fixing								
On rail according to IEC 60715, EN 60715			35 x 7.5 mm or 35 x 15 mm					
By screws (not supplied)			2 x M4 screws placed diagonally					

1SYN829571C201

AX50 ... AX150 3-pole contactors
Technical data

General technical data

Contactor types	AC operated	AX50	AX65	AX80	AX95	AX115	AX150
Rated insulation voltage Ui							
acc. to IEC 60947-4-1		690 V			1000 V		
Rated impulse withstand voltage Uimp.		6 kV			8 kV		
Ambient air temperature close to contactor							
Operation Fitted with thermal overload relay		-25...+55 °C(1)					
Without thermal overload relay		-40...+70 °C					
Storage		-60...+80 °C			-40 to +70 °C		
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II			acc. to IEC 60068-2-30		
Maximum operating altitude (without derating)		3000 m					
Shock withstand							
acc. to IEC 60068-2-27 and EN 60068-2-27							
Mounting position 1							
	Shock direction	1/2 sinusoidal shock for 11 ms: no change in contact position, closed or open position(2)					
	A	20 g					
	B1	10 g closed position / 5 g open position					
	B2	15 g					
	C1	20 g					
	C2	20 g					

(1) The max. operational current is 23A for AX25 with TA25DU-25M; the max. operational current is 74A for AX80 with TA75DU-80M; the max. operational current is 182A for AX205 with TA200DU-200
(2) These values are not valid for rail mounting with contactors AX95 ... AX150.

Magnet system characteristics

Contactor types		AC operated	AX50	AX65	AX80	AX95	AX115	AX150
Coil operating limits		**AC supply**	at θ ≤ 55 °C 0.85...1.1 x Uc			At θ ≤ 70 °C 0.85 ... 1.1 x Uc		
acc. to IEC 60947-4-1			Please also refer to "Mounting characteristics and conditions for use"					
AC control voltage 50/60 Hz								
Rated control circuit voltage Uc		**at 50 Hz**	24...440 V					
		at 60 Hz	24...440 V					
Coil consumption	**Average pull-in value**	**50 Hz**	180 VA			350 VA		
		60 Hz	210 VA			450 VA		
		50/60 Hz (1)	190 VA / 180 VA			410 VA / 365 VA		
	Average holding value	**50 Hz**	18 VA / 5.5 W			22 VA / 6.5 W		
		60 Hz	18 VA / 5.5 W			26 VA / 8 W		
		50/60 Hz (1)	18 VA / 5.5 W			27 VA / 7.5 W		
Drop-out voltage			approx. 40...65 % of Uc					
Operating time								
Between coil energization and:		**N.O. contact closing**	8...27 ms			10...25 ms		
		N.C. contact opening	7...22 ms			7...22 ms		
Between coil de-energization and:		**N.O. contact opening**	4...11 ms			7...15 ms		
		N.C. contact closing	7...14 ms			10...18 ms		

(1) 50/60 Hz coils: see "Coil voltage code table".

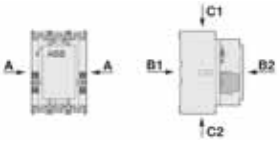
Mounting characteristics and conditions for use

Contactor types		AC operated	AX50	AX65	AX80	AX95	AX115	AX150
Mounting positions								
			Add on max. N.O. or N.C. auxiliary contacts: see accessory fitting details for 3-pole contactor AX9 ... AX150					
Control voltage / Ambient temperature								
Mounting positions	1, 1±30°, 2, 3, 4, 5	**at θ ≤ 55 °C**	0.85...1.1 x Uc					
		at 55 °C≤ θ ≤ 70 °C	Uc			0.85...1.1 x Uc		
	6	**at θ ≤ 55 °C**	0.95...1.1 x Uc					
		at θ ≤ 55 °C	Unauthorized					
Mounting distances			The contactors can be assembled side by side					
Fixing								
On rail according to IEC 60715, EN 60715			35 x 15 mm or 75 x 25 mm			-		
By screws (not supplied)			2 x M6 screws placed diagonally			2 x M6 screws placed diagonally		

1SYN829571C201

AX185 ... AX370 3-pole contactors
Technical data

General technical data

Contactor types	AC operated	AX185	AX205	AX260	AX300	AX370
Rated insulation voltage Ui						
acc. to IEC 60947-4-1		1000 V				
Rated impulse withstand voltage Uimp.		8 kV				
Ambient air temperature close to contactor						
Operation Fitted with thermal overload relay		-25...+55 °C (1)				
Without thermal overload relay		-40...+70 °C				
Storage		-40 to +70 °C				
Climatic withstand		acc. to IEC 60068-2-30				
Maximum operating altitude (without derating)		3000 m				
Shock withstand		1/2 sinusoidal shock for 11 ms: no change in contact position, closed or open position (2)				
acc. to IEC 60068-2-27 and EN 60068-2-27						
Mounting position 1						
	Shock direction					
	A	5 g				
	B1	5 g				
	B2	5 g				
	C1	5 g				
	C2	5 g				

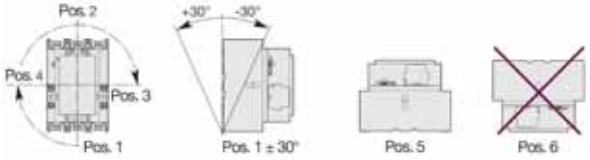
(1) The max. operational current is 182A for AX205 with TA200DU-200
(2) These values are not valid for rail mounting with contactors AX95 ... AX150.

Magnet system characteristics

Contactor types	AC operated	AX185	AX205	AX260	AX300	AX370
Coil operating limits	**AC supply**	at θ ≤ 55 °C 0.85...1.1 x Uc		At θ ≤ 70 °C 0.85 ... 1.1 x Uc max		
acc. to IEC 60947-4-1		Please also refer to "Mounting characteristics and conditions for use"				
AC control voltage 50/60 Hz						
Rated control circuit voltage Uc	**at 50 Hz**	24...440 V				
	at 60 Hz	24...440 V				
Coil consumption **Average pull-in value**	**50 Hz**	550 VA		-		
	60 Hz	600 VA		-		
	50/60 Hz (1)	700 VA / 650 VA		475 VA		
Average holding value	**50 Hz**	35 VA / 11 W		-		
	60 Hz	40 VA / 12 W		-		
	50/60 Hz (1)	44 VA / 13 W		17.5 VA		
Drop-out voltage		approx. 40...65 % of Uc		55% of Uc min.		
Operating time						
Between coil energization and:	**N.O. contact closing**	13...27 ms		30...60 ms		
	N.C. contact opening	8...22 ms		-		
Between coil de-energization and:	**N.O. contact opening**	5...10 ms		45...80 ms		
	N.C. contact closing	9...13 ms		-		

(1) 50/60 Hz coils: see "Coil voltage code table".

Mounting characteristics and conditions for use

Contactor types	AC operated	AX185	AX205	AX260	AX300	AX370
Mounting positions						
		Max. add-on N.O. or N.C. auxiliary contacts: see accessory fitting details for 3-pole contactor AX185 ... AX370				
Control voltage / Ambient temperature						
Mounting positions 1, 1±30°, 2, 3, 4, 5	**at θ ≤ 55 °C**	0.85...1.1 x Uc				
	at 55 °C≤ θ ≤ 70 °C	0.85...1.1 x Uc				
6	**at θ ≤ 55 °C**	Unauthorized				
	at θ ≤ 55 °C	Unauthorized				
Mounting distances		The contactors can be assembled side by side				
Fixing						
On rail according to IEC 60715, EN 60715		-				
By screws (not supplied)		4 x M5				

1SYN829571C201

AX09 ... AX40 3-pole contactors
Technical data

Connecting characteristics

Contactor types			AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Main terminals				 Screw terminals with cable clamp				 Screw terminals with double connector 2 x (5.6 x 6.5 mm)	
Connection capacity (min. ... max.)									
Main conductors (poles)									
 Rigid	Solid (≤ 4 mm²)		1 x	1...4 mm²			1...6 mm²	2.5...16 mm²	
	Stranded (≥ 6 mm²)		2 x	1...4 mm²			1...6 mm²	2.5...16 mm²	
 Flexible with ferrule			1 x	0.75...2.5 mm²			0.75...6 mm²	2.5...10 mm²	
			2 x	0.75...2.5 mm²			0.75...6 mm²	2.5...10 mm²	
Flexible with insulated ferrule			1 x	-			0.75...4 mm²	2.5...10 mm²	
			2 x	-			0.75...2.5 mm²	2.5...10 mm²	
 Bars or lugs			L <	7.7 mm			9.6 mm	-	
			I >	3.7 mm			3.7 mm	-	
Tightening torque	Recommended			1 Nm / 9 lb.in			1.2 Nm / 11 lb.in	2.3 Nm / 20 lb.in	
	Max.			1.2 Nm			1.5Nm	2.60 Nm	
Auxiliary conductors									
(built-in auxiliary terminals + coil terminals)									
 Rigid solid			1 x	1...4 mm²					
			2 x	1...4 mm²					
 Flexible with ferrule			1 x	0.75...2.5 mm²					
			2 x	0.75...2.5 mm²					
 Lugs			L <	7.7 mm				8 mm	
			I >	3.7 mm				3.7 mm	
Tightening torque									
Coil terminals	Recommended			1 Nm / 9 lb.in					
	Max.			1.20 Nm					
Built-in auxiliary terminals	Recommended			1 Nm / 9 lb.in				1 Nm / 9 lb.in	
	Max.			1.20 Nm				1.20 Nm	
Degree of protection									
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529									
Main terminals				IP20 (only front side)					
Coil terminals				IP20				IP20	
Built-in auxiliary terminals				IP20 (only front side)				IP20	
Screw terminals				Delivered in open position, screws of unused terminals must be tightened					
Main terminals				M3.5				M5	
		Screwdriver type		Flat Ø 5.5 / Pozidriv 2				Flat Ø 6.5 / Pozidriv 2	
Coil terminals				M3.5					
		Screwdriver type		Flat Ø 5.5 / Pozidriv 2					
Built-in auxiliary terminals				M3.5					
		Screwdriver type		Flat Ø 5.5 / Pozidriv 2					

1SYN829571C201

AX50 ... AX150 3-pole contactors
Technical data

Connecting characteristics

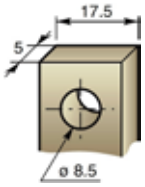
Contactor types		AC operated	AX50	AX65	AX80	AX95	AX115	AX150
Main terminals			 "Screw terminals with single connector (13 x 10 mm)"			 "Screw terminals with single connector (14 x 14 mm)"		
Connection capacity (min. ... max.)								
Main conductors (poles)								
Rigid	Solid (≤ 4 mm²)	1 x	6…50 mm²			10…95 mm²		
	Stranded (≥ 6 mm²)	2 x	6…25 mm²			6…35 mm²		
Flexible with ferrule		1 x	6…35 mm²			10…70 mm² (1)		
		2 x	6…16 mm²			6…35 mm² (1)		
Flexible with insulated ferrule		1 x	6…35 mm²			10…70 mm² (1)		
		2 x	6…16 mm²			6…35 mm² (1)		
Bars or lugs		L <	-			30 mm (2)		
		l >	-			6 mm		
Tightening torque	Recommended		4.00 Nm / 35 lb.in			8 Nm / 71 lb.in		
	Max.		4.50 Nm			9 Nm		
Auxiliary conductors								
(built-in auxiliary terminals + coil terminals)								
Rigid solid		1 x	1….4 mm²			0.75…2.5 mm²		
		2 x	1….4 mm²			0.75…2.5 mm²		
Flexible with ferrule		1 x	1…2.5 mm²			0.75…2.5 mm²		
		2 x	0.75…2.5 mm²					
Lugs		L <	8 mm²					
		l >	3.7 mm²					
Tightening torque								
Coil terminals	Recommended		1 Nm / 9 lb.in					
	Max.		1.2 Nm					
Built-in auxiliary terminals	Recommended		-					
	Max.		-					
Degree of protection								
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529								
Main terminals			IP 10					
Coil terminals			IP20					
Built-in auxiliary terminals			-					
Screw terminals			Delivered in open position, screws of unused terminals must be tightened					
Main terminals			M6			M8		
		Screwdriver type	Flat Ø 6.5 / Pozidriv 2			Hexagon socket (s = 4 mm)		
Coil terminals			M3.5					
		Screwdriver type	Flat Ø 5.5 / Pozidriv 2					
Built-in auxiliary terminals			-					
		Screwdriver type	-					

(1) AX95 -AX150: use flexible without ferrule.
(2) With LW110 enlargement piece, see "Accessories".

1SYN829571C201

AX185 ... AX205 3-pole contactors
Technical data

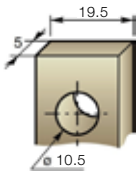
Connecting characteristics

Contactor types	AC operated	AX185	AX205
Main terminals			
Flat type			
Connection capacity (min. ... max.)			
Main conductors (poles)			
Rigid with connector	Single for Cu cable	6...185 mm²	
	Single for Al/Cu cable	25...150 mm²	
	Double for Al/Cu cable	-	
Bars or lugs	L <	24 mm	
	Ø >	8 mm	
Tightening torque	Recommended	18 Nm / 160 lb.in	
	Max.	20 Nm	
Auxiliary conductors			
(built-in auxiliary terminals + coil terminals)			
Rigid solid	1 x	1....4 mm²	
	2 x	1....4 mm²	
Flexible with ferrule	1 x	0.75...2.5 mm²	
	2 x	0.75...2.5 mm²	
Lugs	L <	8 mm²	
	I >	3.7 mm²	
Tightening torque			
Coil terminals	Recommended	1 Nm / 9 lb.in	
	Max.	1.2 Nm	
Degree of protection			
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529			
Main terminals		IP00	
Coil terminals		IP20	
Screw terminals			
Main terminals		M8	
		Screw and bolts	
Coil terminals (delivered in open position)		M3.5	
	Screwdriver type	Flat Ø 5.5 / Pozidriv 2	

1SYN829571C201

AX260 ... AX370 3-pole contactors
Technical data

Connecting characteristics

Contactor types			AC operated	AX260	AX300	AX370
Main terminals						
Flat type						
Connection capacity (min. ... max.)						
Main conductors (poles)						
	Rigid with connector	Cu cable Stranded	1x		16...300 mm²	
		Clamp type			1SDA055016R1	
		Tightening torque			25 Nm	
		Cu cable Stranded	2x		70...185 mm²	
		Clamp type			1SCA022194R0890 (OZXB4)	
		Tightening torque			22 Nm	
		Al cable Stranded	1x		185...240 mm²	
		Clamp type			1SDA055020R1	
		Tightening torque			43 Nm	
		Cu cable Flexible	1x		16...240 mm²	
		Clamp type			1SDA055016R1	
		Tightening torque			25 Nm	
		Cu cable Flexible	2x		70...185 mm²	
		Clamp type			1SCA022194R0890 (OZXB4)	
		Tightening torque			22 Nm	
	Bars or lugs	Double for Al/Cu cable			70...185 mm²	
		W <			32mm (1.260 in)	
		Ø >			10mm (.394 in)	
		Socket type			LL...included	
		Tightening torque			28Nm / 248 lb.in	
Auxiliary conductors						
(Coil terminals)						
	Rigid /Stranded		1 x		1...4 mm²	
			2 x		1...4 mm²	
	Flexible		1 x		0.75...2.5 mm²	
			2 x		0.75...2.5 mm²	
	Flexible with non insulated		1 x		0.75...2.5 mm²	
			2 x		0.75...2.5 mm²	
	Flexible with insulated ferrule		1 x		0.75...2.5 mm²	
			2 x		0.75...2.5 mm²	
	Lugs		L <		8 mm	
			l >		3.5 mm	
	Stripping length				9 mm	
	Tightening torque				1.00 Nm / 9 lb.in	
Degree of protection						
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529						
Main terminals					IP00	
Coil terminals					IP20	
Screw terminals						
Main terminals					M10	
			Screwdriver type		Screws and bolts	
Coil terminals (delivered in open position)					M3.5	
			Screwdriver type		Flat Ø 5.5 mm / Pozidriv 2	

1SYN829571C201

AX09 ... AX40 3-pole contactors
Technical data

Built-in auxiliary contacts according to IEC - Other auxiliary contacts see "Accessories"

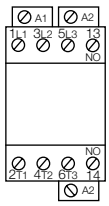
Contactor types	AC operated	AX09	AX12	AX18	AX25	AX32	AX40
Rated operational voltage Ue max.		690 V					
Rated frequency (without derating)		50/60 Hz					
Conventional free air thermal current Ith $\theta \leq 40$ °C		16 A					
Ie / Rated operational current AC-15							
acc. to IEC 60947-5-1	24-127 V 50/60 Hz	6 A					
	220-240 V 50/60 Hz	4 A					
	380-440 V 50/60 Hz	3 A					
	500 V 50/60 Hz	2 A					
	690 V 50/60 Hz	2 A					
Making capacity AC-15		10 x Ie AC-15 acc. to IEC 60947-5-1					
Breaking capacity AC-15		10 x Ie AC-15 acc. to IEC 60947-5-1					
Ie / Rated operational current DC-13							
acc. to IEC 60947-5-1	24 V DC	6 A / 144 W					
	48 V DC	2.8 A / 134 W					
	72 V DC	2 A / 144 W					
	110 V DC	1.1 A / 121 W					
	125 V DC	1.1 A / 138 W					
	220 V DC	0.55 A / 121 W					
	250 V DC	0.55 A / 138 W					
Short-circuit protection device gG type fuse		10 A					
Rated short-time withstand current Icw	for 1.0 s	100 A					
	for 0.1 s	140 A					
Minimum switching capacity with failure rate acc. to IEC 60947-5-4		12 V / 3 mA					
Non-overlapping time between N.O. and N.C. contacts		≥ 2 ms					
Power dissipation per pole at 6 A		0.1 W					
Max. electrical switching frequency	AC-15	1200 cycles/h					
	DC-13	900 cycles/h					
Mechanically linked contacts acc. to annex L of IEC 60947-5-1		Built-in N.O. or N.C. auxiliary contacts and additional N.O. or N.C. auxiliary contacts of 4-pole CA5X are mechanically linked contacts.					
Mirror contacts acc. to annex F of IEC 60947-4-1		Built-in N.C. auxiliary contacts or additional N.C. auxiliary contacts (CA5X, CAL5X-11) are mirror contacts.					

1SYN829571C201

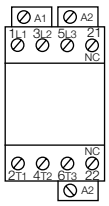
AX09 ... AX370 3-pole contactors
Terminal marking and positioning

AX09 ... AX150 contactors - AC operated

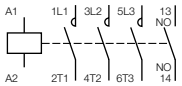
Standard devices without addition of auxiliary contacts



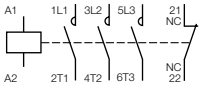
AX09 ... AX40-30-10



AX09 ... AX40-30-01

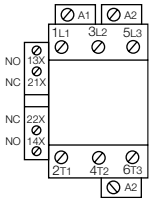


AX09 ... AX40-30-10

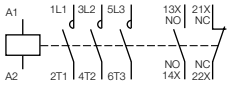


AX09 ... AX40-30-01

Standard devices with factory mounted auxiliary contacts

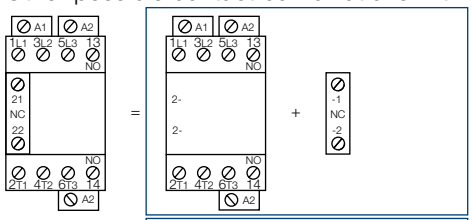


AX50 ... AX150-30-11

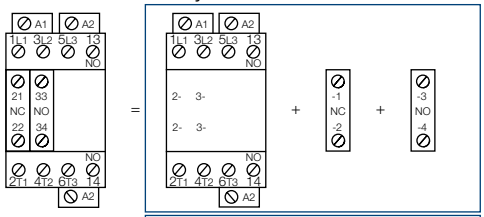


AX50 ... AX150-30-11

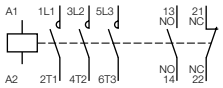
Other possible contact combinations with auxiliary contacts added by the user



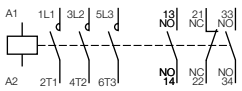
Combination 11 = AX09 ... AX40-30-10 + CA5X-01



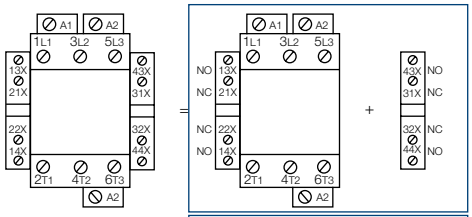
Combination 21 = AX09 ... AX40-30-10 + CA5X-01 + CA5X-10



Combination 11



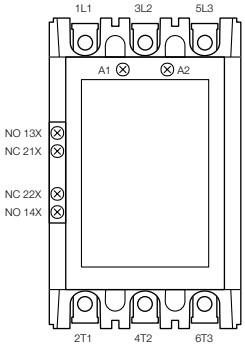
Combination 21



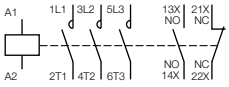
Combination 22 = AX50 ... AX80-30-11 + CAL5X-11

AX185 ... AX370 contactors - AC operated

Standard devices with factory mounted auxiliary contacts



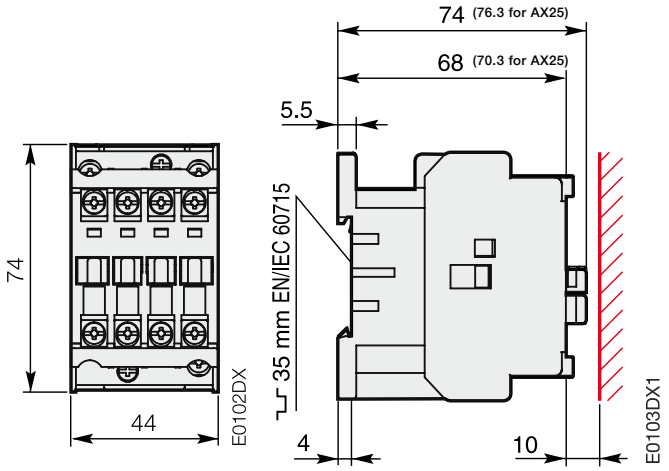
AX185 ... AX370-30-11



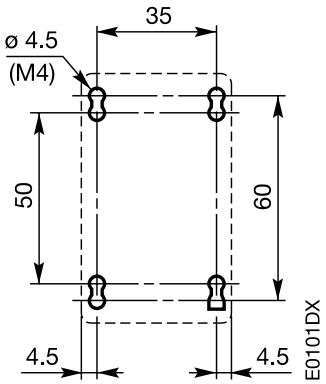
AX185 ... AX370-30-11

AX contactor
Dimensions

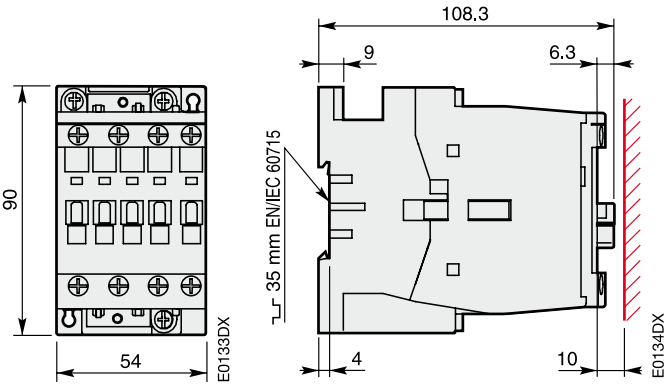
Main dimensions mm



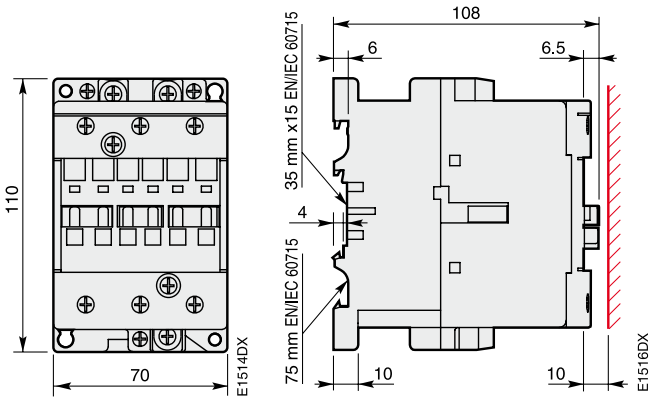
AX09, AX12, AX18, AX25, NX..E



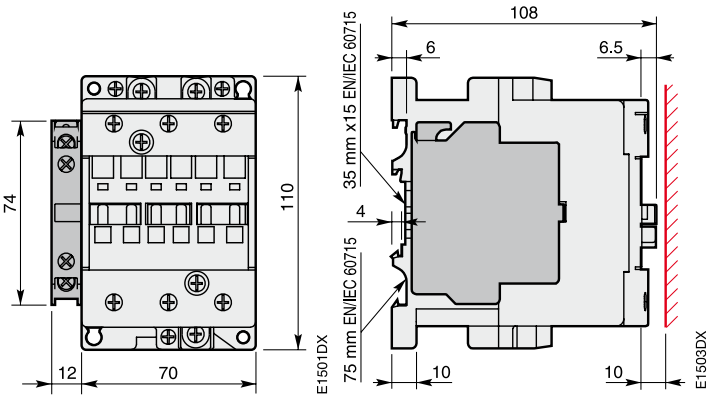
Drilling plan AX09, AX12, AX18, AX25, NX..E



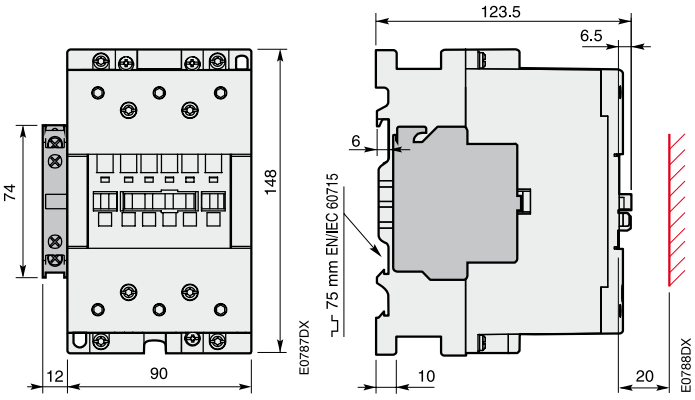
AX32, AX40



AX50, AX65, AX80



AX50, AX65, AX80 + CAL5X - 11

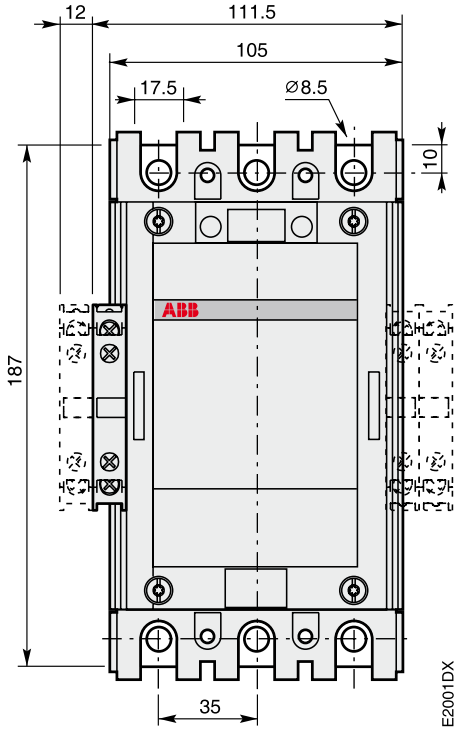


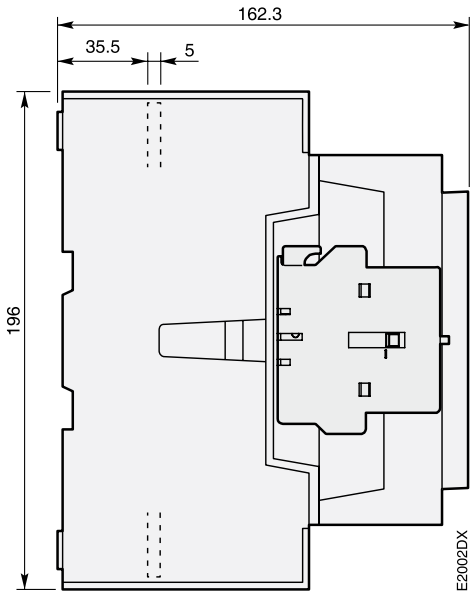
AX95, AX115, AX150 + CAL18X-11

1SYN829571C201

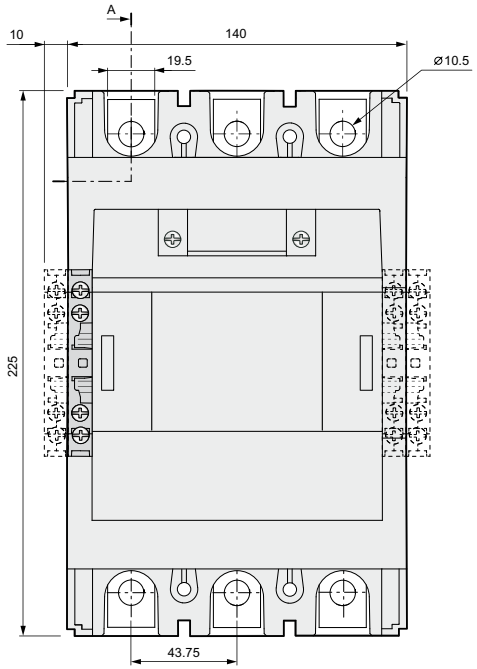
AX contactor
Dimensions

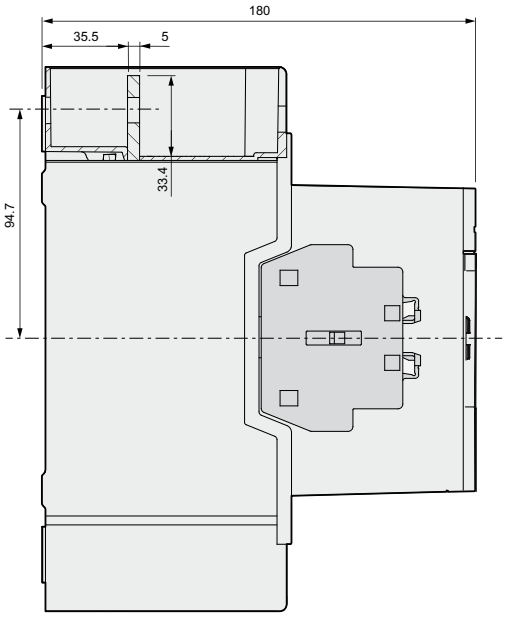
Main dimensions mm





AX185, AX205 + CAL18X-11





AX260, AX300,AX370-30-00 + CAL19 2-pole contact block
AX260, AX300,AX370-30-11

AX260, AX300, AX370

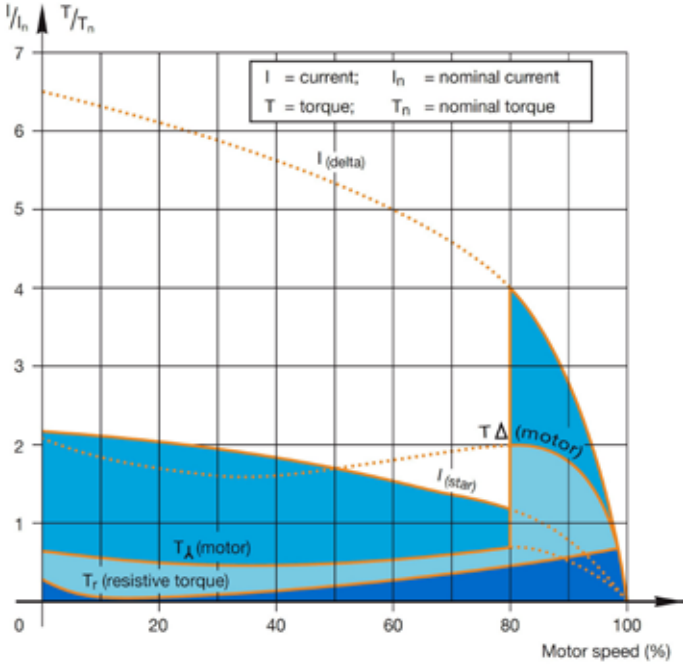
1SYN829571C201

Star-delta starting of three-phase asynchronous motors
Contactor selection

General

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.

Star-delta starting



Technical Data

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.

Utilization

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, etc.

In order to prevent a high current peak, at least 85 % of nominal speed must be reached before switching from star to delta.

Precautions

Motor nominal voltage in delta connection must be equal to that of the mains.
Example:
A motor for 415 V star-delta starting must be designed for 415 V in "delta" connection. Its usual designation is "415 V / 690 V motor". The motor must be constructed with 6 terminal windings.

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 (normally 6 to 16 s) then begins.
2nd stage - "Star" to "Delta" switching
When the programmed starting time is over, the KM2 "star" contactor opens.
3rd stage - "Delta" connection
A transition time (or dwelling time) of 50 ms is fixed between opening of the "star" contactor and closing of the "delta" contactor by the use of TE5S timer. This prevents short circuit between "star" and "delta".

Note: An electrical interlock between star and delta is mandatory such as VE 5 or through auxiliary contacts.
Furthermore, in open transition, the current interruption may reach up to 95 ms: it shall be checked that this duration is compatible with the application i.e. mainly if the decreasing in rotation speed is acceptable during the starting phase.

1SYN829571C201

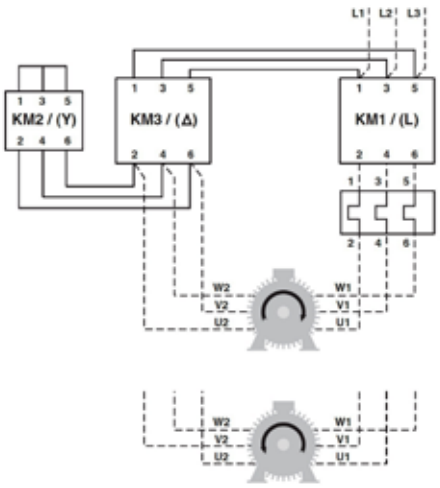
Star-delta starting of three-phase asynchronous motors
Contactor selection

Rated operational power [4]						Max. Starting time from cold state[2] seconds	Line contacor type	Delta contacor type	Star contacor type	Overload relay[3] type	Timer
220-230 V AC-3 kW	240 V AC-3 kW	380-400 V AC-3 kW	415 V AC-3 kW	500 V AC-3 kW	660-690 V AC-3 kW						
4	4	7.5	5.5	5.5	7.5	15	AX09	AX09	AX09	TA25DU...M	TE5S
5.5	5.5	7.5	11	7.5	7.5	15	AX12	AX12	AX09	TA25DU...M	TE5S
7.5	7.5	15	15	11	11	15	AX18	AX18	AX12	TA25DU...M	TE5S
11	11	22(1)	22	15	15	15	AX25	AX25	AX18	TA25DU...M	TE5S
15	15	30	30	30	30	15	AX32	AX32	AX25	TA25DU...M	TE5S
18.5	22	37	37	37	37	30	AX40	AX40	AX32	TA42DU...M	TE5S
22	30	45	45	55	55	30	AX50	AX50	AX32	TA75DU...M	TE5S
30	37	55	55	55	55	30	AX65	AX65	AX40	TA75DU...M	TE5S
37	45	55	75	75	75	30	AX80	AX80	AX50	TA75DU...M	TE5S
45	55	75/90[2]	90	90	90	20	AX95	AX95	AX65	TA110DU	TE5S
55	55	90/110[2]	110	110	132	20	AX115	AX115	AX80	TA110DU	TE5S
75	75	132	132	110	132	20	AX150	AX150	AX95	TA200DU	TE5S
90	90	160	160	160	160/200[2]	20	AX185	AX185	AX115	TA200DU	TE5S
110	110	160	160	200	250	20	AX205	AX205	AX150	TA200DU	TE5S
132	132	250	250	315	400	20	AX260	AX260	AX185	EF370	CT-ERS.21
160	160	250	315	355	400/500[2]	20	AX300	AX300	AX205	EF370	CT-ERS.21
200	200	315/355[2]	355	355	500	20	AX370	AX370	AX260	EF370	CT-ERS.21

Notes:
(1) To combine with TA25DU-32M
(2) Due to different voltage to select different motor
(3) Usual time value = 6...16 s.
(4) The setting current value is : nominal motor current x 0.58

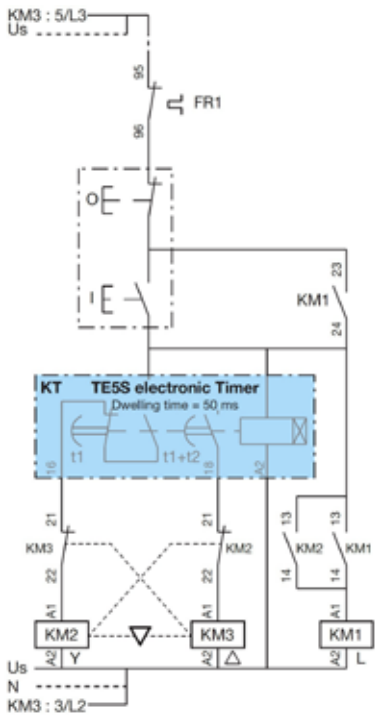
Power circuit diagram

AX09 ... AX370 contactors



Control circuit diagrams - Remote control

AX09 ... AX370 contactors



Notes

NX contactor relays

1SYN829571C201

NX contactor relays
AC operated

NX40E

Description

NX contactor relays are used for switching auxiliary circuits and control circuits.

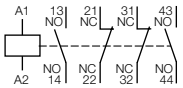
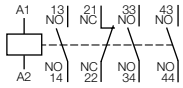
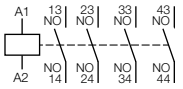
These contactor relays are of the block type design with:

– 4 poles. Contactor relays have mechanically linked auxiliary contact elements

– control circuit: AC operated

– add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

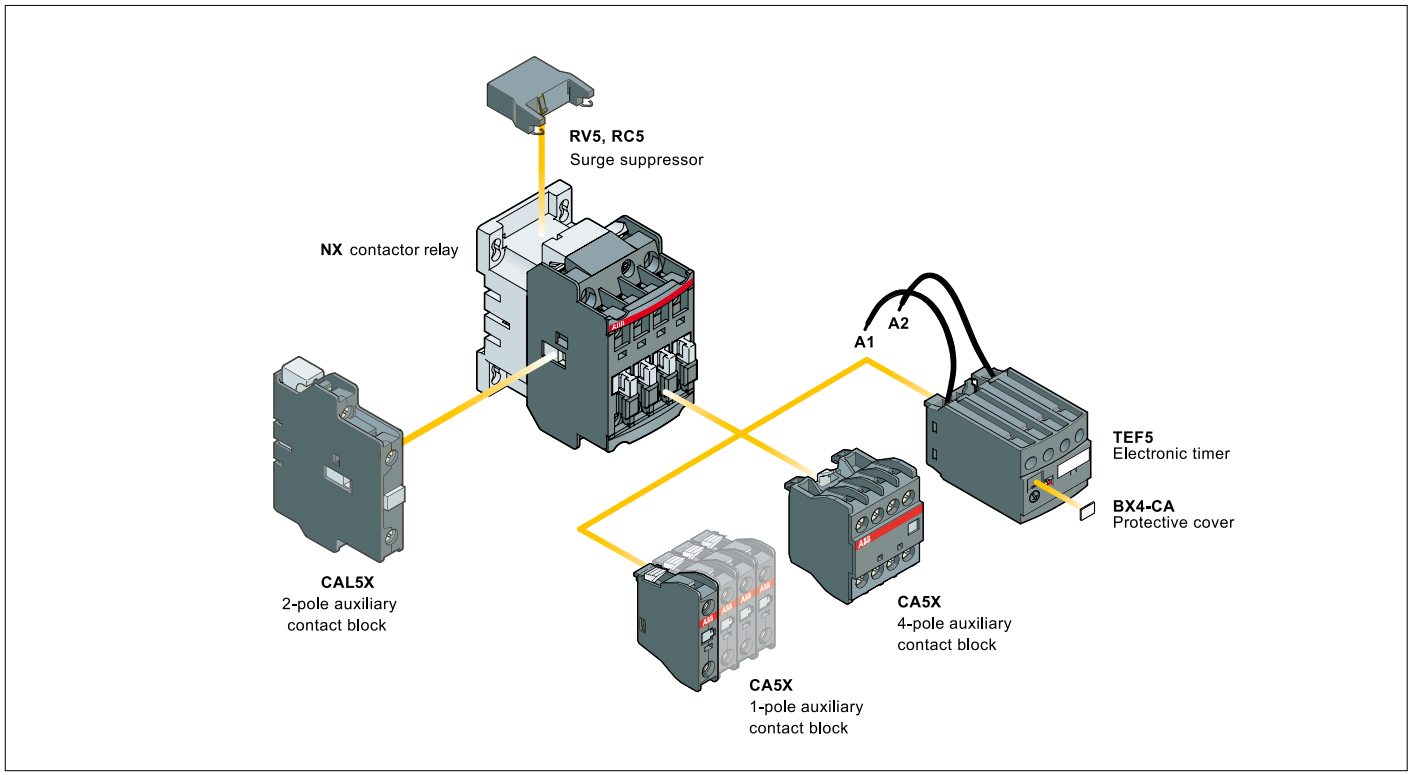
Ordering details

Number of contacts	Rated control circuit voltage Uc (1)		Type	Order code	Weight Pkg (1 pce)
	V 50 Hz	V 60 Hz			kg
 NX22E	24	24	NX22E-81	1SBH901074R8122	0.340
	110	110…120	NX22E-84	1SBH901074R8422	0.340
	220…230	230…240	NX22E-80	1SBH901074R8022	0.340
	230…240	240…260	NX22E-88	1SBH901074R8822	0.340
	400…415	415…440	NX22E-86	1SBH901074R8622	0.340
 NX31E	24	24	NX31E-81	1SBH901074R8131	0.340
	110	110…120	NX31E-84	1SBH901074R8431	0.340
	220…230	230…240	NX31E-80	1SBH901074R8031	0.340
	230…240	240…260	NX31E-88	1SBH901074R8831	0.340
	400…415	415…440	NX31E-86	1SBH901074R8631	0.340
 NX40E	24	24	NX40E-81	1SBH901074R8140	0.340
	110	110…120	NX40E-84	1SBH901074R8440	0.340
	220…230	230…240	NX40E-80	1SBH901074R8040	0.340
	230…240	240…260	NX40E-88	1SBH901074R8840	0.340
	400…415	415…440	NX40E-86	1SBH901074R8640	0.340

(1) for other voltage version see page no. 2/51

NX contactor relays
Main accessories

Contactor and main accessories (other accessories available)



Main accessory fitting details

Many configurations of accessories are possible depending on whether these are front-mounted or side-mounted.

Contactor types	Main poles	Front-mounted accessories: Auxiliary contact blocks 1-pole CA5X		4-pole CA5X		Electronic timer TEF5		Side-mounted accessories: Auxiliary contact blocks 2-pole CAL5X-11
NX	2 2 E (1) 3 1 E (1) 4 0 E	1 to 4 x CA5X	or	1 x CA5X (4-pole)	or	1 x TEF5	+	1 to 2 x CAL5X-11

(1) 2 N.C. front mounted auxiliary contacts maximum in mounting position 5.

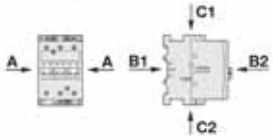
1SYN829571C201

NX contactor relays
Technical data

Contact utilization characteristics according to IEC

Contactor relay types	AC operated	NX
Standards		IEC 60947-1 / 60947-5-1 / EN 60947-1 / 60947-5-1
Rated operational voltage Ue max.		690 V
Rated frequency (without derating)		50 / 60 Hz
Conventional free-air thermal current Ith θ ≤ 40 °C		16 A
Ie / Rated operational current AC-15		
acc. to IEC 60947-5-1	**24-127 V 50/60 Hz**	6 A
	220-230 V 50/60 Hz	4 A
	380-415 V 50/60 Hz	3 A
	500 V 50/60 Hz	2 A
	690 V 50/60 Hz	2 A
Rated making capacity AC-15		10 x Ie AC-15 acc. to IEC 60947-5-1
Rated breaking capacity AC-15		10 x Ie AC-15 acc. to IEC 60947-5-1
Ie / Rated operational current DC-13		
acc. to IEC 60947-5-1	**24 V DC**	6 A / 144 W
	48 V DC	2.8 A / 134 W
	72 V DC	1 A / 72 W
	110 V DC	0.55 A / 60 W
	125 V DC	0.55 A / 69 W
	220 V DC	0.30 A / 66 W
	250 V DC	0.30 A / 75 W
Short-circuit protection device for contactors		
Ue ≤ 500 V AC - gG type fuse		10 A
Rated short-time withstand current Icw		
at 40 °C ambient temperature,	**for 1.0 s**	100 A
in free air from a cold state	**for 0.1 s**	140 A
Minimum switching capacity		17 V / 5 mA
with failure rate acc. to IEC 60947-5-4		10^{-6}
Non-overlapping time between N.O. and N.C. contacts		≥ 2 ms
Power dissipation per pole at 6 A		0.1 W
Max. electrical switching frequency	**AC-15**	1200 cycles/h

General technical data

Contactor relay types	AC operated	NX
Rated insulation voltage Ui		
acc. to IEC 60947-5-1		690 V
Rated impulse withstand voltage Uimp.		6 kV
Ambient air temperature		
Operation in free air		-40...+70 °C
Storage		-60...+80 °C
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II
Maximum operating altitude (without derating)		3000 m
Mechanical durability		
Number of operating cycles		≥ 20 millions operating cycles
Max. switching frequency		6000 cycles/h
Shock withstand		
acc. to IEC 60068-2-27 and EN 60068-2-27		
Mounting position 1		
	**Shock direction**	1/2 sinusoidal shock for 11 ms: no change in contact position, closed or open position
	A	20 g
	B1	5 g
	B2	15 g
	C1	20 g
	C2	20 g

1SYN829571C201

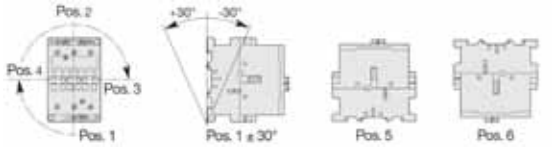
NX contactor relays
Technical data

Magnet system characteristics

Contactor relay types		**AC operated**	**NX**
Coil operating limits acc. to IEC 60947-4-1		**AC supply**	at θ ≤ 55 °C 0.85...1.1 x Uc Please also refer to "Mounting characteristics and conditions for use"
AC control voltage 50/60 Hz			
Rated control circuit voltage Uc		**at 50 Hz**	24...440 V
		at 60 Hz	24...440 V
Coil consumption	**Average pull-in value**	**50 Hz**	70 VA
		60 Hz	80 VA
		50/60 Hz (1)	74 VA / 70 VA
	Average holding value	**50 Hz**	8 VA / 2 W
		60 Hz	8 VA / 2 W
		50/60 Hz (1)	8 VA / 2 W
Drop-out voltage in % of Uc			approx. 40...65 % of Uc
Operating time			
Between coil energization and:		**N.O. contact closing**	10...26 ms
		N.C. contact opening	7...21 ms
Between coil de-energization and:		**N.O. contact opening**	4...11 ms
		N.C. contact closing	9...16 ms

(1) 50/60 Hz coils, see "voltage code table"

Mounting characteristics and conditions for use

Contactor relay types		**AC operated**	**NX**
Mounting positions			
			Add-on N.O. or N.C. auxiliary contacts: see accessory fitting details for contactor relays
Control voltage / Ambient temperature			
Mounting positions	1, 1±30°, 2, 3, 4, 5	**at θ ≤ 55 °C**	0.85...1.1 x Uc
		at θ ≤ 70 °C	Uc
	6	**at θ ≤ 55 °C**	0.95...1.1 x Uc
		at θ ≤ 70 °C	unauthorized
Mounting distances			The contactors can be assembled side by side
Fixing			
On rail according to IEC 60715, EN 60715			35 x 7.5 mm or 35 x 15 mm
By screws (not supplied)			2 x M4 screws placed diagonally

Connecting characteristics

Contactor relay types		**AC operated**	**NX**
Main terminals			 Screw terminals with cable clamp
Connection capacity (min. ... max.)			
Main conductors (poles)			
 Rigid		**1 x**	1...4 mm²
		2 x	1...4 mm²
 Flexible with ferrule		**1 x**	0.75...2.5 mm²
		**2 x**	0.75...2.5 mm²
Bars or lugs	Pole terminals	**L <**	7.7 mm
		I >	3.7 mm
	Coil terminals	**L <**	8 mm
		I >	3.7 mm
Tightening torque	Recommended		1 Nm / 9 lb.in
	Max.		1.20 Nm
Degree of protection acc. to IEC 60947-1 and IEC 60529			
All terminals			IP20 (only front side)
Screw terminals			Delivered in open position, screws of unused terminals must be tightened
All terminals			M3.5
		Screwdriver type	Flat Ø 5.5 / Pozidriv 2

1SYN829571C201

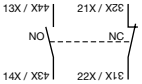
Add-on auxiliary contacts
Terminal marking and positioning

1-pole auxiliary contacts

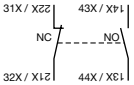
CA5X-01

CA5X-10

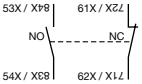
2-pole auxiliary contacts



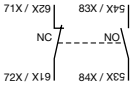
CAL5X-11, CAL18X-11, CAL19-11
(L. h. s. mounted)



CAL5X-11, CAL18X-11, CAL19-11
(R. h. s. mounted)

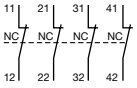


CAL18X-11B, CAL19-11B
(L. h. s. mounted)

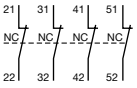


CAL18X-11B, CAL19-11B
(R. h. s. mounted)

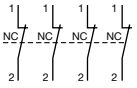
4-pole auxiliary contacts



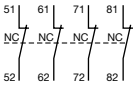
CA5X-04E



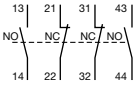
CA5X-04M



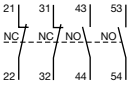
CA5X-04U



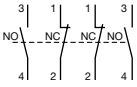
CA5X-04N



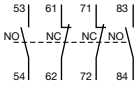
CA5X-22E



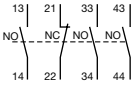
CA5X-22M



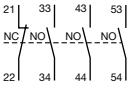
CA5X-22U



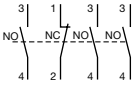
CA5X-22N



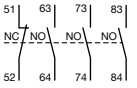
CA5X-31E



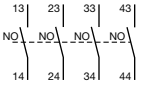
CA5X-31M



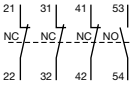
CA5X-31U



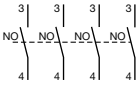
CA5X-31N



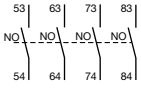
CA5X-40E



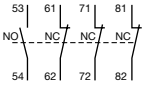
CA5X-13M



CA5X-40U



CA5X-40N



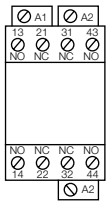
CA5X-13N

1SYN829571C201

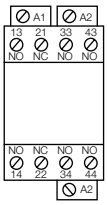
NX contactor relays
Terminal marking and positioning

NX contactor relays - AC operated

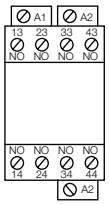
Standard devices without addition of auxiliary contacts



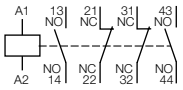
NX22E



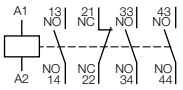
NX31E



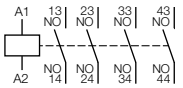
NX40E



NX22E

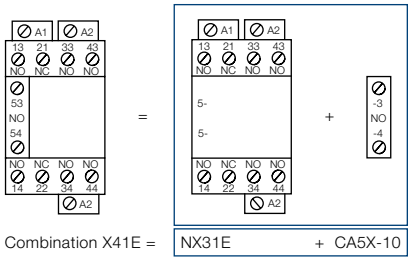


NX31E

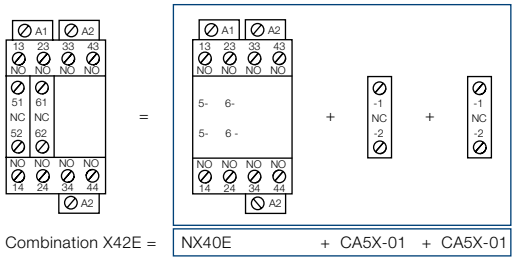


NX40E

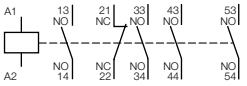
Other possible contact combinations with auxiliary contacts added by the user



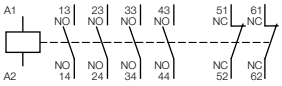
Combination X41E = NX31E + CA5X-10



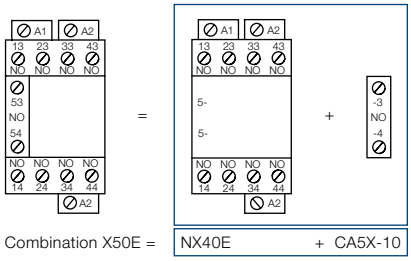
Combination X42E = NX40E + CA5X-01 + CA5X-01



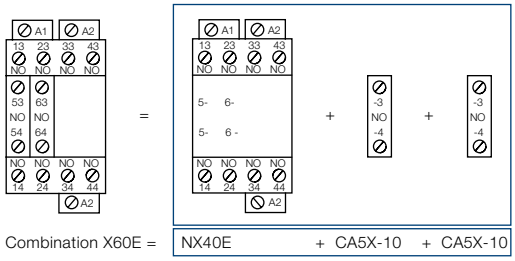
Combination X41E



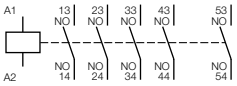
Combination X42E



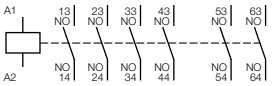
Combination X50E = NX40E + CA5X-10



Combination X60E = NX40E + CA5X-10 + CA5X-10



Combination X50E



Combination X60E

1SYN829571C201

Add-on auxiliary contacts

Technical data

Contact utilization characteristics according to IEC

Types		Front mounted 1-pole CA5X, 4-pole CA5X	CAL5X-11	Side mounted CAL18X-11, CAL18X-11B,	CAL19-11, CAL19-11B
Standards		IEC 60947-5-1 and EN 60947-5-1			
Rated insulation voltage Ui					
acc. to IEC 60947-5-1		690 V			
Rated operational voltage Ue max.		24...690 V AC			
Conventional thermal current Ith - θ ≤ 40 °C		16 A			
Ie / Rated operational current AC-15					
acc. to IEC 60947-5-1	**24-127 V 50/60 Hz**	6 A			
	220-240 V 50/60 Hz	4 A			
	380-440 V 50/60 Hz	3 A			
	500-690 V 50/60 Hz	2 A			
Making capacity		10 x Ie AC-15 acc. to IEC 60947-5-1			
Breaking capacity		10 x Ie AC-15 acc. to IEC 60947-5-1			
Ie / Rated operational current DC-13					
acc. to IEC 60947-5-1	**24 V DC**	6 A / 144 W			
	48 V DC	2.8 A / 134 W			
	72 V DC	1 A / 72 W			
	110 V DC	0.55 A / 60 W			
	125 V DC	0.55 A / 69 W			
	220 V DC	0.3 A / 66 W			
	250 V DC	0.3 A / 75 W			
Short-circuit protection device gG type fuse		10 A			
Rated short-time withstand current Icw	**for 1.0 s**	100 A			
θ = 40 °C	**for 0.1 s**	140 A			
Minimum switching capacity					
AX09 ... AX80 contactors		12 V / 3 mA		–	–
with failure rate acc. to IEC 60947-5-4		≤ 10^{-6}		–	–
AX95 ... AX150 contactors		24 V / 50 mA	–	24 V / 50 mA (0.5 million of operating cycles)	–
with failure rate acc. to IEC 60947-5-4		–	–	≤ 10^{-6}	-
AX185 ... AX205 contactors		–	–	24 V / 50 mA (0.5 million of operating cycles)	–
with failure rate acc. to IEC 60947-5-4		–	–	≤ 10^{-6}	-
AX260 ... AX370 contactors		–	–	-	24 V / 50 mA
with failure rate acc. to IEC 60947-5-4		–	–	–	≤ 10^{-6}
Power dissipation per pole at 6 A		0.1 W		0.15 W	
Mechanical durability					
Number of operating cycles		10 millions (AX09 ... AX80) 3 millions (AX95 ... AX150)	10 millions	5 millions (AX95 ... AX205)	
Max. switching frequency		3600 cycles/h			
Electrical durability					
Number of operating cycles					
Max. switching frequency	**AC-15**	1200 cycles/h			
	DC-13	900 cycles/h			

Connecting characteristics

Connection capacity (min. ... max.)					
Rigid solid	**1 x**	1...4 mm²			
	2 x	1...4 mm²			
Flexible with ferrule	**1 x**	0.75...2.5 mm²			
	2 x	0.75...2.5 mm²			
Lugs	**L ≤**	7.7 mm	8 mm		
	I >	3.7 mm	3.7 mm		
Tightening torque		1 Nm / 9 lb.in			
Degree of protection	**Terminals**	IP20			
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529					
Screw terminals		Delivered in open position, screws of unused terminals must be tightened			
All terminals		M3.5			
Screwdriver type		Flat Ø 5.5 / Pozidriv 2			

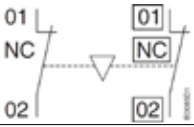
1SYN829571C201

Technical data

Contact utilization characteristics according to IEC

Types		VE5-1	VE5-2
Standards		IEC 60947-5-1 and EN 60947-5-1	
Rated insulation voltage Ui			
acc. to IEC 60947-5-1		690 V	
Rated operational voltage Ue max.		24...690 V	
Conventional thermal current Ith - Ø ≤ 40 °C		16 A	
Ie / Rated operational current AC-15			
acc. to IEC 60947-5-1	**24-127 V 50/60 Hz**	6 A	
	220-240 V 50/60 Hz	4 A	
	380-440 V 50/60 Hz	3 A	
	500-690 V 50/60 Hz	2 A	
Making capacity		10 x Ie AC-15 acc. to IEC 60947-5-1	
Breaking capacity		10 x Ie AC-15 acc. to IEC 60947-5-1	
Ie / Rated operational current DC-13			
acc. to IEC 60947-5-1	**24 V DC**	6 A	
	48 V DC	2.8 A	
	72 V DC	1 A	
	125 V DC	0.55 A	
	250 V DC	0.3 A	
Short-circuit protection device - gG type fuse		10 A	
Rated short-time withstand current Icw	**for 1.0 s**	100 A	
Ø = 40 °C	**for 0.1 s**	140 A	
Power dissipation per pole at 6 A		0.15 W	
Mechanical durability			
Number of operating cycles		5 millions operating cycles	
Max. switching frequency		600 cycles/h	

Connecting characteristics

Connection capacity (min. ... max.)			
Rigid solid		**1 x**	1...4 mm²
		2 x	1...4 mm²
Flexible with ferrule		**1 x**	0.75...2.5 mm²
		2 x	0.75...2.5 mm²
Lugs		**L <**	8 mm
		l >	3.5 mm
Tightening torque	Recommended		1 Nm
	Max.		1.2 Nm
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529			IP20
Screw terminals			Delivered in open position, screws of unused terminals must be tightened
All terminals			M3.5
Screwdriver type			Flat Ø 5.5 / Pozidriv 2
Terminal marking			

Technical note: when, during switching, the arc time is estimated to more than 40 ms, the closing signal of one of the two contactors must be delayed with respect to the opening signal of the other contactor in order to prevent a short-circuit.
Use a TEF5 or TE5S electronic timer according to application use with time lapse for A contators.

1SYN829571C201

Electronic timers

TEF5-OFF

Description

TEF5 frontal electronic timers are used for realizing timing function and are available in ON-delay and OFF-delay versions.

Compact solution in cabinet compared to separate timers

TEF5 electronic timers are front-mounted and locked on A contactors or N contactor relays. A mechanical indicator allows to show the state of the contactor.

TEF5 electronic timers are supplied by direct wiring to the coil terminals A1 - A2 of the contactor or contactor relay. A varistor is integrated on the timer to offer a built-in protection against surges in the contactor coil.

Available for a wide control voltage range 24…240 V AC / DC

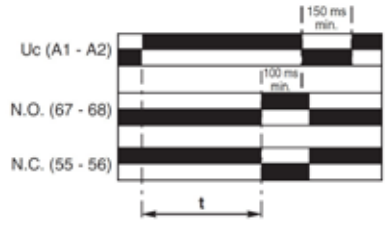
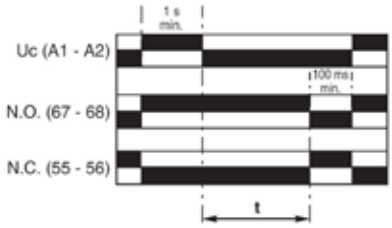
TEF5-ON or TEF5-OFF allow time-delayed functions up to 100 s in 3 distinct time ranges, independently of the control system. The time delay ranges are selected by a switch and the time delay can be adjusted by means of a rotary switch. The timing function is activated by closing or opening the device on which the timer is mounted. The OFF-delay version operates without additional control supply.

Ordering details

For contactors, contactor relays	Time delay range selected by switch	Delay type	Rated control circuit voltage Uc **V 50/60 Hz or DC**	Auxiliary contacts	Type	Order code	Weight **Pkg (1 pce) kg**
AX09 ... AX80 NX 4 pole	0.1...1 s	ON-delay	24...240	1 1	TEF5-ON	1SBN020312R1000	0.065
	1...10 s 10...100 s	OFF-delay	24...240	1 1	TEF5-OFF	1SBN020314R1000	0.065

Technical data

Contact utilization characteristics according to IEC

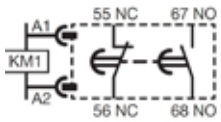
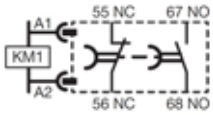
Types			TEF5-ON	TEF5-OFF
Standards			IEC 60947-5-1 and EN 60947-5-1	
Rated insulation voltage Ui				
acc. to IEC 60947-5-1			400 V	
Rated impulse withstand voltage Uimp			4 kV	
Rated operational voltage Ue max.			240 V	
Rated frequency (without derating)			50 / 60 Hz	
Conventional thermal current Ith - Ø ≤ 40 °C			5 A	
Ie / Rated operational current AC-15				
acc. to IEC 60947-5-1		**24-127 V 50/60 Hz**	3 A	
		220-240 V 50/60 Hz	1.5 A	
Making capacity			10 x Ie AC-15 acc. to IEC 60947-5-1	
Breaking capacity			10 x Ie AC-15 acc. to IEC 60947-5-1	
Ie / Rated operational current DC-13				
acc. to IEC 60947-5-1		**24 V DC**	1 A / 24 W	
Short-circuit protection device gG type fuse			6 A	
Rated short-time withstand current Icw		**for 1.0 s**	8 A	
Ø = 40 °C		**for 0.1 s**	8 A	
Minimum switching capacity			12 V / 3 mA	
with failure rate acc. to IEC 60947-5-4		**24 V DC**	10^{-7}	
Power dissipation per pole at 3 A			0.1 W	
Function diagram			ON-delay	OFF-delay
				
			Bistable relay inside. Before use, once apply Uc then switch it off in order to initialize position of the contacts.	
Control circuit voltage				
AC control voltage	Rated control circuit voltage Uc		24...240 V AC	
50/60 Hz	Average consumption		1.5 mA RMS	1 mA RMS
DC control voltage	Rated control circuit voltage Uc		24...240 V DC	
	Average consumption		1.5 mA	1 mA
Rated frequency limits			50 / 60 Hz	
Supply voltage range			0.85...1.1 x Uc (at Ø ≤ 70 °C)	
Overvoltage protection			Varistor included	
Time delay range (t) selected by switch		**0.1...1 s**	■■	
		1...10 s	■■	
		10...100 s	■■	
On-load reiteration accuracy under constant conditions			≤ 1 %	
Minimum ON period			0.1 s	1 s
Recovery time			0.15 s	0.1 s
Ambient air temperature	Operation		-25 °C ... +70 °C	
	Storage		-40 °C ... +80 °C	
Climatic withstand			Category B according to IEC 60947-1 Annex Q	
Maximum operating altitude			2000 m	
Mounting positions			Acc. to mounting positions permitted on contactors or contactor relays	
Shock withstand			1/2 sinusoidal shock for 11 ms: no change in contact position	
acc. to IEC 60068-2-27 and EN 60068-2-27			Same as contactor or contactor relay	
(Mounting position 1)				
Mechanical durability				
	Number of operating cycles		5 millions operating cycles	
	Max. switching frequency		3600 cycles/h	1800 cycles/h
Max. electrical switching frequency				
		AC-15	1200 cycles/h	
		DC-13	900 cycles/h	

1SYN829571C201

Technical data

Connecting characteristics

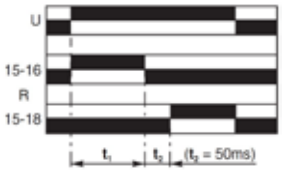
2

Connection capacity (min. ... max.)			
	Rigid solid	**1 x**	1...2.5 mm²
		2 x	1...2.5 mm²
	Flexible with non insulated ferrule	**1 x**	0.75...2.5 mm²
		2 x	0.75...2.5 mm²
	Flexible with insulated ferrule	**1 x**	0.75...2.5 mm²
		2 x	0.75...1.5 mm²
	Lugs	**L** ≤	8 mm
		l >	3.7 mm
	Connection capacity acc. to UL / CSA	**1 or 2 x**	AWG 18...14
	Stripping length		10 mm
	Tightening torque		1 N.m / 9 lb.in
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529			IP20
Screw terminals			Delivered in open position, screws of unused terminals should be tightened
All terminals			M3.5
Screwdriver type			Flat Ø 5.5 / Pozidriv 2
Terminal Marking			 

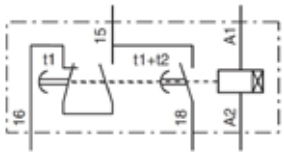
1SYN829571C201

Electronic timer for star-delta starters

TE5S...



Chart



Equivalent diagram

Front face

Description

When used in star-delta starters, the TE5S lags the star connection and provides a lapse of 50 ms before the switch over to delta connection.

According to the type of device chosen, the electronic circuit has a 24 V AC / DC, 110 to 120 V AC, 220 to 240 V AC or 380 to 440 V AC supply. An output relay with reversing contact ensures high current switching. A two-position switch allows selection of one of the two time delay ranges: 0.8 to 8 s or 6 to 60 s. The 0.1 to 1.0 graduated button allows an initial setting without steps within the previously selected range which can then be adjusted using a chronometer.

Note: We recommend that you allow for temperature drift for the final adjustment of the time delay setting. Drift: -0.2 % per °C.

For example, a setting made at 20 °C will yield a time delay shorter by 7 % at 55 °C in a cubicle (-0.2 % per °C i.e. -0.2 x 35 = -7 %).

Regardless of these settings the TE5S provides a fixed “lapse” of 50 ms between the opening of contact 15-16 and the closing of contact 15-18. This time delay prevents from arc short-circuit during star to delta switching.

Operation

On energization, the green U indicator light (voltage applied) comes on. Contact 15-16 then immediately moves to the closed position.

Count-down of the programmed time immediately commences. When the time delay has elapsed, contact 15-16 opens and at the same time the 50 ms lapse, t2, begins after which contact 15-18 moves to the closed position. The yellow R indicator light comes on.

On de-energization, the U and R indicator lights go out and, after the 250 ms resetting time, the device is ready for a new cycle.

Mounting

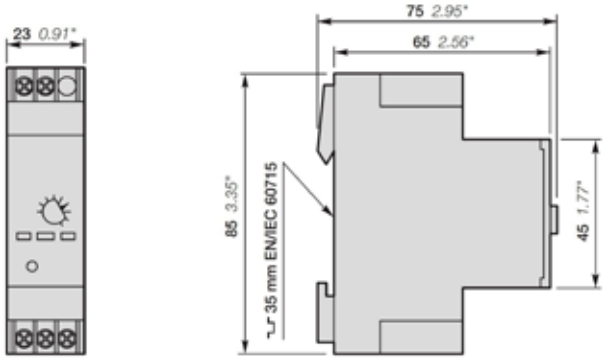
On 35 x 7.5 mm or 35 x 15 mm mounting rail according to IEC/EN 60715.

Ordering details

For contactors	Rated control circuit voltage Uc		Type	Order code	Pkg qty	Weight (1 pce)
	V 50/60 Hz	V DC				kg
AX09 ... AX205	24	24	TE5S-24	1SBN020010R1001	1	0.080
	110...120	–	TE5S-120	1SBN020010R1002	1	0.080
	220...240	–	TE5S-240	1SBN020010R1003	1	0.080
	380...440	–	TE5S-440	1SBN020010R1004	1	0.080
AX260 ... AX370	24...240	24...240	CT-ERS.21 (1)	1SVR630100R0300	1	0.121

(1) Please refer EPR catalog for CT-ERS.21 timer

Main dimensions mm, inches

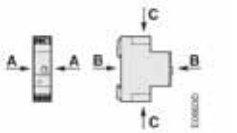


Electronic timer for star-delta starters

Technical data

Utilization characteristics according to IEC

2

Types			TE5S-24	TE5S-120	TE5S-240	TE5S-440
Standards			IEC 60947-5-1 and EN 60947-5-1			
Rated insulation voltage Ui						
acc. to IEC 60947-5-1			440 V			
Rated operational voltage Ue max.			24 V DC			–
			24…240 V AC			440 V AC
Conventional free air thermal current Ith			10 A			
Ie / Rated operational current AC-15						
acc. to IEC 60947-5-1		**24-120 V 50/60 Hz**	5 A			–
		220-240 V 50/60 Hz	4 A			–
		380-440 V 50/60 Hz	–			3 A
Ie / Rated operational current DC-13						
acc. to IEC 60947-5-1		**24 V DC**	4 A			–
Short-circuit protection device - gG type fuse			10 A			
Control circuit voltage						
AC control voltage	Rated supply voltage Uc		24 V AC	110…120 V AC	220…240 V AC	380…440 V AC
50/60 Hz	Average consumption		1.5 VA	3.5 VA	6.5 VA	12.5 VA
DC control voltage	Rated supply voltage Uc		24 V DC	–	–	–
	Average consumption		0.7 W	–	–	–
Rated frequency limits			48…63 Hz			
Supply voltage range			0.85…1.1 x Uc			
Overvoltage protection			Built-in varistor			
Load factor			100 %			
Time delay range (t1) selected by switch			0.8…8 s and 6…60 s			
Temperature drift			-0.2 % per °C			
Mechanical setting accuracy			±15 % of the setting range			
On-load reiteration accuracy under constant conditions			±2 % after 1 million operating cycles			
Minimum time lapse (t2)			50 ms			
Minimum time lapse after 1 million of operating cycles			40 ms			
Resetting time (max.)			250 ms			
Front panel display		**green indicator light**	Energization			
		yellow indicator light	Output relay activated			
Ambient air temperature						
Operation			-25…+60 °C			
Storage			-40…+85 °C			
Shock withstand						
acc. to IEC 60068-2-27 and EN 6006-2-27						
		**Shock direction**				
		A	20 g / 11 ms			
		B	15 g / 11 ms			
		C	20 g / 11 ms			
Vibration withstand			10 to 300 Hz in the 3 directions			
acc. to IEC 60068-2-6 and EN 60068-2-6			3 g			
Mechanical durability			5 millions operating cycles			
Electrical durability			1 million operating cycles			
On-load maximum switching frequency			720 cycles/h			600 cycles/h
Fixing						
On rail according to IEC 60715, EN 60715			35 x 7.5 mm or 35 x 15 mm			

Connecting characteristics

Connection capacity (min. … max.)			
Rigid solid		**1 x**	1…2.5 mm²
		2 x	1…2.5 mm²
Flexible with ferrule		**1 x**	0.75…2.5 mm²
		2 x	0.75…2.5 mm²
Tightening torque	Recommended		0.6 Nm
	Max.		0.8 Nm
Degree of protection			
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529			IP20
Screw terminals			Delivered in open position, screws of unused terminals must be tightened
All terminals			M2.5
Screwdriver type			Flat Ø 4 / Pozidriv 1

1SYN829571C201

Surge suppressors for contactor coils

RV5/50

Ordering details

For contactors	Rated control circuit voltage Uc V AC		Type	Order code	Pkg qty	Weight (1 pce) kg
Surge suppressors						
AX09 ... AX150	24...50	•	RV5/50	1SBN050010R1000	2	0.015
	50...133	•	RV5/133	1SBN050010R1001	2	0.015
	110...250	•	RV5/250	1SBN050010R1002	2	0.015
	250...440	•	RV5/440	1SBN050010R1003	2	0.015
AX09 ... AX40	24...50	•	RC5-1/50	1SBN050100R1000	2	0.012
	50...133	•	RC5-1/133	1SBN050100R1001	2	0.012
	110...250	•	RC5-1/250	1SBN050100R1002	2	0.012
	250...440	•	RC5-1/440	1SBN050100R1003	2	0.012
AX50 ... AX150	24...50	•	RC5-2/50	1SBN050200R1000	2	0.015
	50...133	•	RC5-2/133	1SBN050200R1001	2	0.015
	110...250	•	RC5-2/250	1SBN050200R1002	2	0.015
	250...440	•	RC5-2/440	1SBN050200R1003	2	0.015
AX185 ... AX205	250...440		RC5-3/440	1SFN050300R1003	2	0.028

(1) See "Main accessory fitting details" table.

Surge suppressors for contactor coils

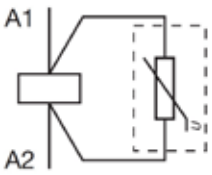
Technical data

Varistor	RV5/50	RV5/133	RV5/250	RV5/440
Rated control circuit voltage Uc	24...50 V AC	50...133 V AC	110...250 V AC	250...440 V AC
	24...50 V DC	50...133 V DC	110...250 V DC	250...440 V DC
Residual overvoltage (clipping voltage)	132 V AC	270 V AC	480 V AC	825 V AC
	132 V DC	270 V DC	480 V DC	825 V DC
Opening time growth factor	1.1...1.5			
Operating temperature	-20...+70 °C			
Connection to the coil terminals (parallel mounting)	Clip-on for both fixing and connection.			
Fixing	Clipped onto the top part of the contactor base without change in contactor overall dimensions.			
Advantages	High energy absorption: good damping - Unpolarized system.			
Drawback	Clipping as from Uvdr (1), thus voltage front up to this point.			

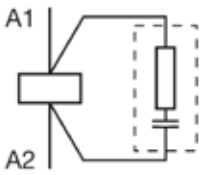
(1) Uvdr = Varistor operating voltage (voltage dependent resistor), tolerance ±10 %.

RC type	RC5-1/50	RC5-1/133	RC5-1/250	RC5-1/440
	RC5-2/50	RC5-2/133	RC5-2/250	RC5-2/440
	–	–	–	RC5-3/440
Rated control circuit voltage Uc	24...50 V AC	50...133 V AC	110...250 V AC	250...440 V AC
Residual overvoltage (clipping voltage)	2 to 3 x Uc max.			
Opening time growth factor	1.2...1.3			
Operating temperature	-20...+70 °C			
Connection to the coil terminals (parallel mounting)	Clip-on for both fixing and connection.			
Fixing	Clipped onto the top part of the contactor base without change in contactor overall dimensions.			
Advantages	Very fast clipping - Attenuation of steep fronts and thus of high frequencies. No operating delays.			

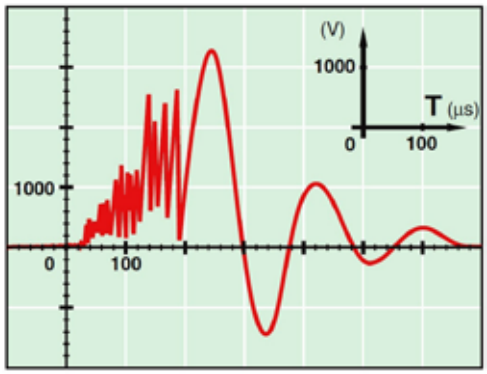
Wiring diagrams



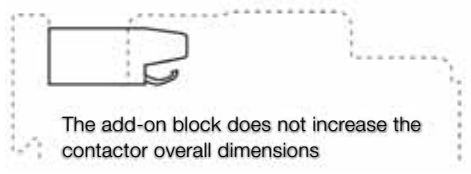
Varistor



RC type



Dimensions

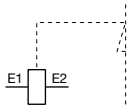


RV5, RC5

1SYN829571C201

Mechanical latching units

WB75-A



Terminal marking

Description

For converting standard contactors into latched contactors.

The WB75-A block contains a mechanical latching device with electromagnetic impulse unlatching (AC or DC) or manual unlatching.

Captive screw type connecting terminals, built-in cable clamps, M3.5 (+,-) pozidriv 2 screw with screwdriver guidance; delivered untightened and protected against accidental direct contact.

Operation

After closing, the contactor continues to be held in the closed position by the latching mechanism should the supply voltage fail at the contactor coil terminals.

Contactor opening can be controlled:

electrically by an impulse (AC or DC) on the WB75-A block coil.
(the coil is not designed to be permanently energized)

manually by pressing the pushbutton on the front face of the WB75-A block.

Mounting

The WB75-A block is clipped onto the front face of the 1-stack contactor where it takes up two slots. The two other slots may accept CA5X... single pole auxiliary contacts (1 block on each side of the mechanical latch).

Ordering details

For contactors	Rated control circuit voltage Uc		Type	Order code	Pkg qty	Weight (1 pce)
	V 50 Hz or DC	V 60 Hz				kg
AX09 ... AX80	24	24...28	WB75-A	FPTN372726R1001	1	0.120
	42	42...48	WB75-A	FPTN372726R1002	1	0.120
	48	48...55	WB75-A	FPTN372726R1003	1	0.120
	110	110...127	WB75-A	FPTN372726R1004	1	0.120
	220...230	220...255	WB75-A	FPTN372726R1006	1	0.120
	230...240	230...277	WB75-A	FPTN372726R1005	1	0.120
	380...415	380...440	WB75-A	FPTN372726R1007	1	0.120
	415...440	440...480	WB75-A	FPTN372726R1008	1	0.120

1SYN829571C201

Technical data

Utilization characteristics according to IEC

Type			WB75-A
Rated insulation voltage Ui acc. to IEC 60947-1			690 V
Max. electrical impulse time			
On AC coil (with load factor 5 %)			20 s
On DC coil (with load factor 3 %)			8 s
Min. electrical impulse time			
For latching (energizing of the contactor coil)		AC	50 ms
For pull-out (energizing of the WB block coil)		AC	30 ms
Coil operating limits		AC or DC supply	0.85…1.1 x Uc
AC control voltage 50/60 Hz			
Rated control circuit voltage Uc			24…480 V AC
Coil consumption		Average pull-in value	90 VA
		Average holding value	60 VA
DC control voltage			
Rated control circuit voltage Uc			24…440 V DC
Coil consumption		Average pull-in value	110 W
		Average holding value	110 W
Operating time			
On contactor closing (latching) Between coil energization and:			
		N.O. contact closing	No difference with the operation of a contactor without mechanical latching unit
		N.C. contact opening	No difference with the operation of a contactor without mechanical latching unit
On contactor opening (unlatching) Between WB coil energization and:		N.O. contact opening	5…25 ms
		N.C. contact closing	7…28 ms
Mechanical durability			
		Number of operating cycles	1 million operating cycles
Max. switching frequency			3600 cycles/h with on-load factor of 8 %

Connecting characteristics

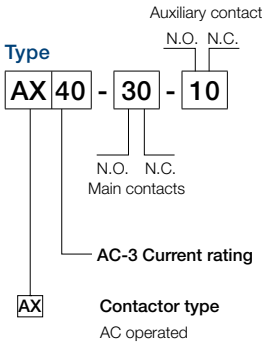
Connection capacity (min. ... max.)			
Rigid solid		1 x	1...4 mm²
		2 x	1...4 mm²
Flexible with ferrule		1 x	0.75...2.5 mm²
		2 x	0.75...2.5 mm²
Lugs		L <	8 mm
		l >	3.5 mm
Tightening torque	Recommended		1 Nm
	Max.		1.2 Nm
Screw terminals			Delivered in open position, screws of unused terminals must be tightened
All terminals			M3.5
Screwdriver type			Flat Ø 5.5 / Pozidriv 2

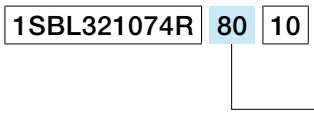
1SYN829571C201

Voltage code table

The below tables indicate the available coil voltages and corresponding digits for order codes. When placing an order, please give the order code. Select a standard contactor from ordering detail pages. Change the coil voltage code in the order code according to the table below. Example: for contactor AX40-30-10 and coil 80 V 50/60 Hz, the order code is 1SBL321074R8010.

AX contactors



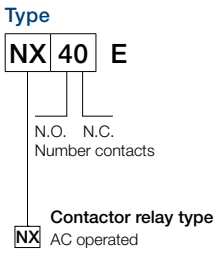


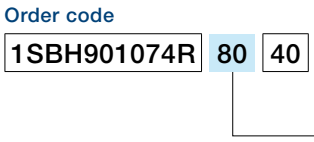
AC coil code
Contactors: AX

	50 Hz	60 Hz
81	24 V	24 V
83	48 V	48 V
84	110 V	110...120 V
36	190 V	220 V
80	220...230 V	230...240 V
88	230...240 V	240...260 V
85	380...400 V	400...415 V
86	400...415 V	415...440 V

Codes in bold for dual frequency coils.

NX contactor relays





AC coil code
Contactors: NX

	50 Hz	60 Hz
81	24 V	24 V
83	48 V	48 V
84	110 V	110...120 V
36	190 V	220 V
80	220...230 V	230...240 V
88	230...240 V	240...260 V
85	380...400 V	400...415 V
86	400...415 V	415...440 V

Codes in bold for dual frequency coils.

1SYN829571C201

1SYN829571C201

Manual motor starters

1SYN829571C201

Manual motor starters

3

Thermal and electromagnetic protection	Type	MS116	MS132	
Electromagnetic protection	Type	-		MO132
Phase loss sensitivity		Yes	Yes	No
Switch position		ON/OFF	ON/OFF/TRIP	
Magnetic trip indication		-	Yes	
Lockable handle without accessories		-	Yes	
Disconnecting feature		Yes	Yes	
Width		45 mm	45 mm	
Rated operational current Ie		0.16...32 A	0.16....32 A	0.16....32 A
Setting range for thermal release		0.10...32 A	0.10....32 A	-
Rated operational voltage Ue		690 V AC	690 V AC / 250 V DC	
Rated frequency		50/60 Hz	DC, 50/60 Hz	
Trip class		10A	10	
Short-circuit breaking capacity Ics	400 V AC	Up to 50 kA	Up to 100 kA	
Ambient air temperature open compensated		-25...+55 °C	-25...+60 °C	

Main accessories

Auxiliary contacts			
Front mounting		HKF1	
Side mounting		HK1	
Signalling contacts			
Tripped alarm		SK1	
Short-circuit alarm		-	CK1
Auxiliary trip units			
Shunt trip		AA1	
Undervoltage release		UA1	
Busbar systems			
3-phase busbar		PS1	
Feeder terminals		S1	

1SYN829571C201

MS450		MS495		MS497	
	MO450		MO495		MO496
Yes	No	Yes	No	Yes	No
ON/OFF/TRIP		ON/OFF/TRIP		ON/OFF/TRIP	
-		-		-	
Yes		Yes		Yes	
Yes		Yes		Yes	
55 mm		70 mm		70 mm	
40...50 A	40...50 A	63...100 A	63...100 A	32...100 A	32...100 A
28...50 A	-	45...100 A	-	22...100 A	-
690 V AC / 440 V DC		690 V AC / 440 V DC		690 V AC / 440 V DC	
DC, 50/60 Hz		DC, 50/60 Hz		DC, 50/60 Hz	
10		10		10	
Up to 50 kA		Up to 50 kA		Up to 100 kA	
-20...+60 °C		-20...+60 °C		-20...+60 °C	

HK4	
HKS4	
SK4	
SK4	
AA4	
UA4	
PS4	-
S4	-

1SYN829571C201

MS116 manual motor starters
0.10 to 32 A – with thermal and electromagnetic protection


2CDC241010F0011

MS116-16


2CDC241001F0011

MS116-25


2CDC241013F0011

MS116-0.16-HKF1-11


2CDC241012F0011

MS116-32-HKF1-11

Description

Manual motor starters (MMS) are protection devices for the main circuit. They combine motor control and protection in a single device. MMS are used mainly to switch motors manually ON/OFF and protect them and the installation fuse less against short-circuit, overload and phase failures. Fuse less protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds.

MS116 is a compact and economic range for motor protection up to 15.5 kW (400 V) / 32 A in width of 45 mm. Further features are the build-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter is suitable for three- and single-phase applications. Auxiliary contacts, signalling contacts, undervoltage releases, shunt trips, three-phase bus bars, power in-feed blocks and locking devices for protection against unauthorized changes are available as accessory.

Ordering details

Rated operational power 400 V AC-3	Setting range	Short-circuit breaking capacity Ics at 400 V AC	Rated instantaneous short-circuit current setting Ii	Type	Order code	Weight (1 pce)
kW	A	kA	A			kg
0.03	0.10...0.16	50	1.56	MS116-0.16	1SAM250000R1001	0.225
0.06	0.16...0.25	50	2.44	MS116-0.25	1SAM250000R1002	0.225
0.09	0.25...0.40	50	3.90	MS116-0.4	1SAM250000R1003	0.225
0.12	0.40...0.63	50	6.14	MS116-0.63	1SAM250000R1004	0.225
0.25	0.63...1.00	50	11.50	MS116-1.0	1SAM250000R1005	0.225
0.55	1.00...1.60	50	18.40	MS116-1.6	1SAM250000R1006	0.265
0.75	1.60...2.50	50	28.75	MS116-2.5	1SAM250000R1007	0.265
1.5	2.50...4.00	50	50.00	MS116-4.0	1SAM250000R1008	0.265
2.2	4.00...6.30	50	78.75	MS116-6.3	1SAM250000R1009	0.265
4.0	6.30...10.0	50	150	MS116-10	1SAM250000R1010	0.265
5.5	8.00...12.0	25	180	MS116-12	1SAM250000R1012	0.265
7.5	10.0...16.0	16	240	MS116-16	1SAM250000R1011	0.265
9.0	16.0...20.0	10	300	MS116-20	1SAM250000R1013	0.310
12.5	20.0...25.0	10	375	MS116-25	1SAM250000R1014	0.310
15.5	25.0...32.0	10	480	MS116-32	1SAM250000R1015	0.310
Auxiliary contacts mounted on the front (1 N.O. + 1 N.C.)						
0.03	0.10...0.16	50	1.56	MS116-0.16-HKF1-11	1SAM250005R1001	0.240
0.06	0.16...0.25	50	2.44	MS116-0.25-HKF1-11	1SAM250005R1002	0.240
0.09	0.25...0.40	50	3.90	MS116-0.4-HKF1-11	1SAM250005R1003	0.240
0.12	0.40...0.63	50	6.14	MS116-0.63-HKF1-11	1SAM250005R1004	0.240
0.25	0.63...1.00	50	11.50	MS116-1.0-HKF1-11	1SAM250005R1005	0.240
0.55	1.00...1.60	50	18.40	MS116-1.6-HKF1-11	1SAM250005R1006	0.280
0.75	1.60...2.50	50	28.75	MS116-2.5-HKF1-11	1SAM250005R1007	0.280
1.5	2.50...4.00	50	50.00	MS116-4.0-HKF1-11	1SAM250005R1008	0.280
2.2	4.00...6.30	50	78.75	MS116-6.3-HKF1-11	1SAM250005R1009	0.280
4.0	6.30...10.0	50	150	MS116-10.0-HKF1-11	1SAM250005R1010	0.280
5.5	8.00...12.0	25	180	MS116-12.0-HKF1-11	1SAM250005R1012	0.280
7.5	10.0...16.0	16	240	MS116-16.0-HKF1-11	1SAM250005R1011	0.280
9.0	16.0...20.0	10	300	MS116-20-HKF1-11	1SAM250005R1013	0.326
12.5	20.0...25.0	10	375	MS116-25-HKF1-11	1SAM250005R1014	0.326
15.5	25.0...32.0	10	480	MS116-32-HKF1-11	1SAM250005R1015	0.326

1SYN829571C201

MS116 manual motor starters
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type		MS116
Standards		IEC/EN 60947–2, IEC/EN 60947-4-1, IEC/EN 60947-1
Rated operational voltage U_e		690 V AC
Rated frequency		50/60 Hz
Trip class		10A
Number of poles		3
Duty time		100 %
Mechanical durability		100000 cycles
Electrical durability	up to 16 A	100000 cycles
	20 ... 32 A	50000 cycles
Rated impulse withstand voltage U_{imp}		6 kV
Rated insulation voltage U_i		690 V AC
Rated operational current I_e		See ordering details
Rated instantaneous short-circuit current setting I_i		See ordering details
Rated service short-circuit breaking capacity I_{cs}		See table "Short-circuit breaking capacity and back-up fuses"
Rated ultimate short-circuit breaking capacity I_{cu}		See table "Short-circuit breaking capacity and back-up fuses"

Short-circuit breaking capacity and back-up fuses

I_{CS} Rated service short-circuit breaking capacity

I_{CU} Rated ultimate short-circuit breaking capacity

I_{CC} Prospective short-circuit current at installation location

Note: Maximum rated current of the back-up fuses if $I_{CC} > I_{CS}$

Type	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM
	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
MS116-0.16	No back-up fuse required up to I_{CC} = 50 kA									No back-up fuse required up to I_{CC} = 30 kA					
MS116-0.25															
MS116-0.4															
MS116-0.63															
MS116-1.0															
MS116-1.6															
MS116-2.5							10	10	25	10	10	25	5	5	25
MS116-4.0							6	6	25	6	6	25	2	2	25
MS116-6.3							6	6	63	6	6	63	2	2	40
MS116-10							6	6	63	6	6	63	2	2	50
MS116-12	25	25	80	25	25	80	6	6	63	6	6	63	2	2	50
MS116-16	16	16	80	16	16	80	6	6	63	4	4	63	2	2	63
MS116-20	10	15	-	10	15	-	3	6	-	3	4	-	2	2	-
MS116-25	10	15	-	10	15	-	3	6	-	3	4	-	2	2	-
MS116-32	10	10	-	10	10	-	3	6	-	3	4	-	2	2	-

MS116-10: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
MS116-16: No need for back-up fuse in networks with a prospective current of up to 16 kA at 400 V.
With an approbiate 80 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.
MS116-32: No need for back-up fuse in networks with a prospective current of up to 10 kA at 400 V.

1SYN829571C201

MS116 manual motor starters
Technical data

General technical data

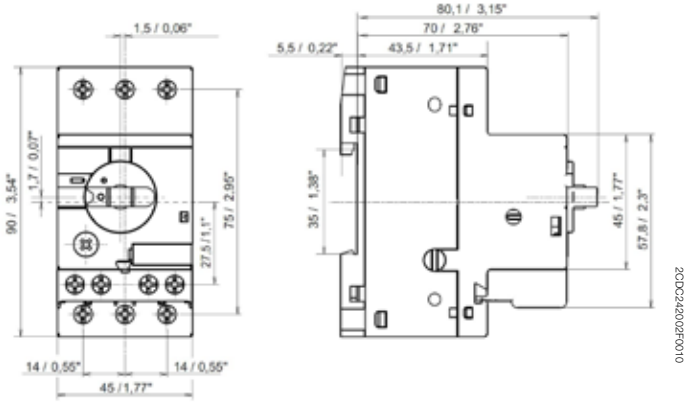
Type		**MS116**
Pollution degree		3
Phase loss sensitivity		Yes
Disconnect function acc. to IEC/EN 60947-2		Yes
Ambient air temperature		
Operation	Open - compensated	-25 ... +55 °C
	Open	-25 ... +70 °C
	Enclosed (IB132)	0 ... +40 °C
Storage		-50 ... +80 °C
Ambient air temperature compensation		Acc. to IEC/EN60947-4-1
Maximum operating altitude permissible		2000 m
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6		5g / 3 ... 150 Hz
Mounting position		Position 1-6 (optional for single mounting)
Mounting		DIN-rail (EN 60715)
Group mounting		On request
Minimum distance to other units same type	Horizontal	0 mm
	Vertical	150 mm
Minimum distance to electrical conductive board	Horizontal, up to 400 V	0 mm
	Horizontal, up to 690 V	> 1.5 mm
	Vertical	75 mm
Degree of protection	Housing	IP20
	Main circuit terminals	IP20

Connecting characteristics

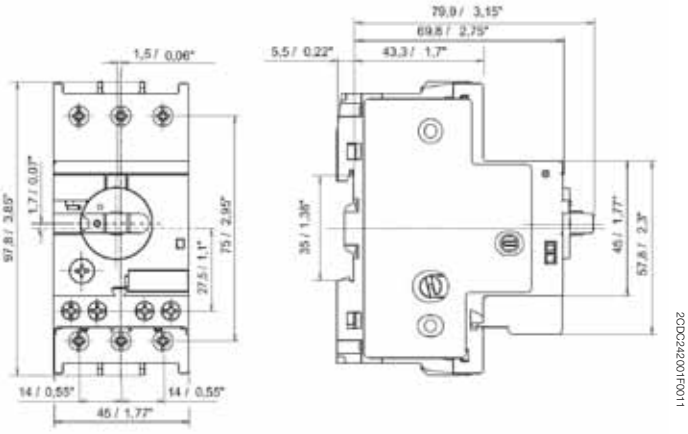
Main circuit

Type			**MS116 ≤ 16 A**	**MS116 ≥ 20 A**
Connecting capacity				
	Rigid	1 or 2 x	1 ... 4 mm²	2.5 ... 6 mm²
	Flexible with ferrule	1 or 2 x	0.75 ... 2.5 mm²	1 ... 6 mm²
	Flexible with insulated ferrule	1 or 2 x	0.75 ... 2.5 mm²	1 ... 6 mm²
	Flexible	1 or 2 x	0.75 ... 2.5 mm²	1 ... 6 mm²
Stripping length			9 mm	10 mm
Tightening torques			0.8 ... 1.2 Nm / 10 ... 12 lb.in	2.0 Nm / 18 lb.in
Connection screw			M3.5 (Pozidriv 2 / 5.5 mm)	M4 (Pozidriv 2 / 6.5 mm)

Main dimensions mm, inches



MS116 ≤ 16 A & MS116-HKF1-11 ≤ 16 A



MS116 ≥ 20 A & MS116-HKF1-11 ≥ 20 A

1SYN829571C201

MS132 manual motor starters
0.10 to 32 A – with thermal and electromagnetic protection


1SBC101232F0010

MS132-10


2CDC241001F0011

MS132-32


2CDC241014F0011

MS132-0.16-HKF1-11


2CDC241015F0011

MS132-32-HKF1-11

Description

Manual motor starters (MMS) are protection devices for the main circuit. They combine motor control and protection in a single device. MMS are used mainly to switch motors manually ON/OFF and protect them and the installation fuse less against short-circuit, overload and phase failures. Fuse less protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds.

MS132 is a compact and powerful range for motor protection up 15.5 kW (400 V) / 32 A in width of 45 mm. Further features are the build-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter is suitable for three- and single-phase applications. The handle is lockable to protect against unauthorized changes. Auxiliary contacts, signalling contacts, undervoltage releases, shunt trips, three-phase bus bars, power in-feed blocks.

Ordering details

Rated operational power 400 V AC-3	Setting range	Short-circuit breaking capacity Ics at 400 V AC	Rated instantaneous short-circuit current setting Ii	Type	Order code	Weight (1 pce)
kW	A	kA	A			kg
0.03	0.10...0.16	100	1.56	MS132-0.16	1SAM350000R1001	0.215
0.06	0.16...0.25	100	2.44	MS132-0.25	1SAM350000R1002	0.215
0.09	0.25...0.40	100	3.90	MS132-0.4	1SAM350000R1003	0.215
0.12	0.40...0.63	100	6.14	MS132-0.63	1SAM350000R1004	0.215
0.25	0.63...1.00	100	11.50	MS132-1.0	1SAM350000R1005	0.215
0.55	1.00...1.60	100	18.40	MS132-1.6	1SAM350000R1006	0.265
0.75	1.60...2.50	100	28.75	MS132-2.5	1SAM350000R1007	0.265
1.5	2.50...4.00	100	50.00	MS132-4.0	1SAM350000R1008	0.265
2.2	4.00...6.30	100	78.75	MS132-6.3	1SAM350000R1009	0.265
4.0	6.30...10.0	100	150	MS132-10	1SAM350000R1010	0.265
5.5	8.00...12.0	100	180	MS132-12	1SAM350000R1012	0.310
7.5	10.0...16.0	100	240	MS132-16	1SAM350000R1011	0.310
9.0	16.0...20.0	100	300	MS132-20	1SAM350000R1013	0.310
12.5	20.0...25.0	50	375	MS132-25	1SAM350000R1014	0.310
15.5	25.0...32.0	25	480	MS132-32	1SAM350000R1015	0.310
Auxiliary contacts mounted on the front (1 N.O. + 1 N.C.)						
0.03	0.10...0.16	100	1.56	MS132-0.16-HKF1-11	1SAM350005R1001	0.231
0.06	0.16...0.25	100	2.44	MS132-0.25-HKF1-11	1SAM350005R1002	0.231
0.09	0.25...0.40	100	3.90	MS132-0.4-HKF1-11	1SAM350005R1003	0.231
0.12	0.40...0.63	100	6.14	MS132-0.63-HKF1-11	1SAM350005R1004	0.231
0.25	0.63...1.00	100	11.50	MS132-1.0-HKF1-11	1SAM350005R1005	0.231
0.55	1.00...1.60	100	18.40	MS132-1.6-HKF1-11	1SAM350005R1006	0.281
0.75	1.60...2.50	100	28.75	MS132-2.5-HKF1-11	1SAM350005R1007	0.281
1.5	2.50...4.00	100	50.00	MS132-4.0-HKF1-11	1SAM350005R1008	0.281
2.2	4.00...6.30	100	78.75	MS132-6.3-HKF1-11	1SAM350005R1009	0.281
4.0	6.30...10.0	100	150	MS132-10.0-HKF1-11	1SAM350005R1010	0.281
5.5	8.00...12.0	100	180	MS132-12.0-HKF1-11	1SAM350005R1012	0.326
7.5	10.0...16.0	100	240	MS132-16.0-HKF1-11	1SAM350005R1011	0.326
9.0	16.0...20.0	100	300	MS132-20-HKF1-11	1SAM350005R1013	0.326
12.5	20.0...25.0	50	375	MS132-25-HKF1-11	1SAM350005R1014	0.326
15.5	25.0...32.0	25	480	MS132-32-HKF1-11	1SAM350005R1015	0.326

1SYN829571C201

MS132 manual motor starters
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	MS132
Standards	IEC/EN 60947–2, IEC/EN 60947-4-1, IEC/EN 60947-1
Rated operational voltage U_e	690 V AC / 250 V DC
Rated frequency	DC, 50/60 Hz
Trip class	10 (10A for 1SAM350000R1001)
Number of poles	3
Duty time	100 %
Mechanical durability	100000 cycles
Electrical durability	50000 cycles
Rated impulse withstand voltage U_{imp}	6 kV
Rated insulation voltage U_i	690 V AC
Rated operational current I_e	See ordering details
Rated oprational current DC-5 I_e 3 conducting paths in series up to 250 V	See "Rated operational current I_e"
Rated instantaneous short-circuit current setting I_i	See ordering details
Rated service short-circuit breaking capacity I_{cs}	See table "Short-circuit breaking capacity and back-up fuses"
Rated ultimate short-circuit breaking capacity I_{cu}	See table "Short-circuit breaking capacity and back-up fuses"
Rated service short-circuit breaking capacity DC I_{cs} 3 conducting paths in series up to 250 V	10 kA

Short-circuit breaking capacity and back-up fuses

I_{CS} Rated service short-circuit breaking capacity

I_{CU} Rated ultimate short-circuit breaking capacity

I_{CC} Prospective short-circuit current at installation location

Note: Maximum rated current of the back-up fuses if $I_{CC} > I_{CS}$

Type	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM
	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
MS132-0.16	No back-up fuse required up to I_{CC} = 100 kA														
MS132-0.25															
MS132-0.4															
MS132-0.63															
MS132-1.0															
MS132-1.6															
MS132-2.5															
MS132-4.0							20	20	35	20	20	35	3	3	32
MS132-6.3							20	20	63	20	20	63	3	3	50
MS132-10							20	20	100	20	20	100	3	3	50
MS132-12							20	20	100	20	20	100	3	3	63
MS132-16							20	20	125	20	20	125	3	3	63
MS132-20							20	20	125	20	20	125	3	3	80
MS132-25	50	50	125	50	50	125	20	20	125	10	10	125	3	3	100
MS132-32	25	50	125	25	50	125	20	20	125	10	10	125	3	3	100

MS132-16: No need for back-up fuse in networks with a prospective current of up to 100 kA at 400 V.
MS132-32: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 125 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

1SYN829571C201

MS132 manual motor starters
Technical data

General technical data

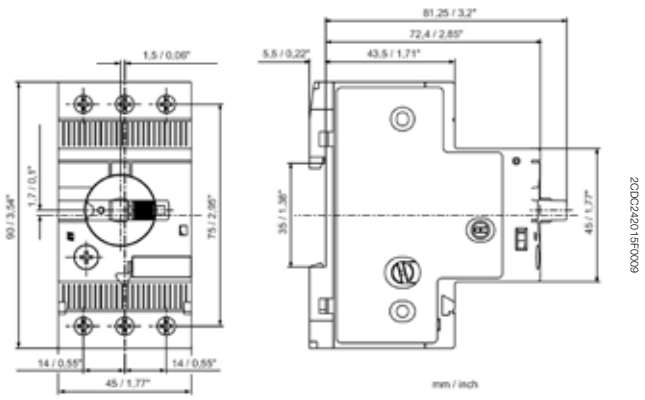
Type		MS132
Pollution degree		3
Phase loss sensitivity		Yes
Disconnect function acc. to IEC/EN 60947-2		Yes
Ambient air temperature		
Operation	Open - compensated	-25 ... +60 °C
	Open	-25 ... +70 °C
	Enclosed (IB132)	0 ... +40 °C
Storage		-50 ... +70 °C
Ambient air temperature compensation		Acc. to IEC/EN60947-4-1
Maximum operating altitude permissible		2000 m
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6		5g / 3 ... 150 Hz
Mounting position		Position 1-6 (optional for single mounting)
Mounting		DIN-rail (EN 60715)
Group mounting		On request
Minimum distance to other units same type	Horizontal	0 mm
	Vertical	150 mm
Minimum distance to electrical conductive board	Horizontal, up to 400 V	0 mm
	Horizontal, up to 690 V	> 1.5 mm
	Vertical	75 mm
Degree of protection	Housing	IP20
	Main circuit terminals	IP20

Connecting characteristics

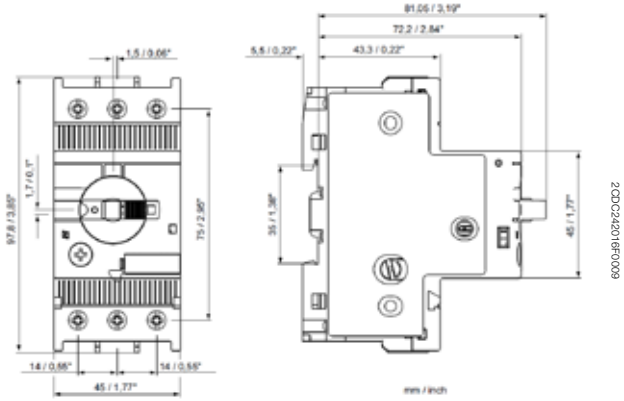
Main circuit

Type			MS132-0.16 ... MS132-10	MS132-12 ... MS132-16	MS132-20 ... MS132-32
Connecting capacity					
Rigid		1 or 2 x	1 ... 4 mm²	1 ... 4 mm²	2.5 ... 6 mm²
Flexible with ferrule		1 or 2 x	1 ... 4 mm²	1 ... 4 mm²	2.5 ... 6 mm²
Flexible with insulated ferrule		1 or 2 x	1 ... 4 mm²	1 ... 4 mm²	2.5 ... 6 mm²
Flexible		1 or 2 x	1 ... 4 mm²	1 ... 4 mm²	2.5 ... 6 mm²
Stripping length			9 mm	10 mm	10 mm
Tightening torques			0.8 ... 1.2 Nm / 10 ... 12 lb.in	1.5 Nm / 14 lb.in	2.0 Nm / 18 lb.in
Connection screw			M3.5 (Pozidriv 2)	M4 (Pozidriv 2)	M4 (Pozidriv 2)

Main dimensions mm, inches



MS132 ≤ 10 A



MS132 ≥ 12 A

MO132 manual motor starters magnetic only
0.16 to 32 A – with electromagnetic protection

MO132-6.3

MO132-32

Description

Manual motor starters magnetic only are electromechanical protection devices for the main circuit. They are used mainly to switch motors manually ON/OFF and protect them fuse less against short-circuit.

Fuse less protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds. Fuse less starter combinations are setup together with contactors and overload relays.

Ordering details

Rated operational power 400 V AC-3 (1)	Rated operational current	Short-circuit breaking capacity Ics at 400 V AC	Rated instantaneous short-circuit current setting Ii	Type	Order code	Weight (1 pce)
kW	A	kA	A			kg
0.03	0.16	100	1.56	MO132-0.16	1SAM360000R1001	0.215
0.06	0.25	100	2.44	MO132-0.25	1SAM360000R1002	0.215
0.09	0.40	100	3.90	MO132-0.4	1SAM360000R1003	0.215
0.12	0.63	100	6.14	MO132-0.63	1SAM360000R1004	0.215
0.25	1.0	100	11.50	MO132-1.0	1SAM360000R1005	0.215
0.55	1.6	100	18.40	MO132-1.6	1SAM360000R1006	0.265
0.75	2.5	100	28.75	MO132-2.5	1SAM360000R1007	0.265
1.5	4.0	50	50.00	MO132-4.0	1SAM360000R1008	0.265
2.2	6.3	50	78.75	MO132-6.3	1SAM360000R1009	0.265
4.0	10	50	125.00	MO132-10	1SAM360000R1010	0.265
5.5	12	50	150.00	MO132-12	1SAM360000R1012	0.310
7.5	16	50	200.00	MO132-16	1SAM360000R1011	0.310
9.0	20	50	250.00	MO132-20	1SAM360000R1013	0.310
12.5	25	50	312.50	MO132-25	1SAM360000R1014	0.310
15.5	32	25	400.00	MO132-32	1SAM360000R1015	0.310

(1) For overload protection of motors, an appropriate thermal or electronic overload relay must be used.

1SYN829571C201

MO132 manual motor starters magnetic only
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	MO132
Standards	IEC/EN 60947–2, IEC/EN 60947-4-1, IEC/EN 60947-1
Rated operational voltage U_e	690 V AC
Rated frequency	50/60 Hz
Number of poles	3
Duty time	100 %
Mechanical durability	100000 cycles
Electrical durability	50000 cycles
Rated impulse withstand voltage U_{imp}	6 kV
Rated insulation voltage U_i	690 V AC
Rated operational current I_e	See ordering details
Rated instantaneous short-circuit current setting I_i	See ordering details
Rated service short-circuit breaking capacity I_{cs}	See table "Short-circuit breaking capacity and back-up fuses"
Rated ultimate short-circuit breaking capacity I_{cu}	See table "Short-circuit breaking capacity and back-up fuses"

Short-circuit breaking capacity and back-up fuses

I_{CS} Rated service short-circuit breaking capacity

I_{CU} Rated ultimate short-circuit breaking capacity

I_{CC} Prospective short-circuit current at installation location

Note: Maximum rated current of the back-up fuses if $I_{CC} > I_{CS}$

Type	230 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM	I_{CS}	I_{CU}	gG, aM
	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A	kA	kA	A
MO132-0.16	No back-up fuse required up to I_{CC} = 100 kA														
MO132-0.25															
MO132-0.4															
MO132-0.63															
MO132-1.0															
MO132-1.6															
MO132-2.5															
MO132-4.0							20	20	35	20	20	35	3	3	32
MO132-6.3							20	20	63	20	20	63	3	3	50
MO132-10							20	20	100	20	20	100	3	3	50
MO132-12							20	20	100	20	20	100	3	3	63
MO132-16							20	20	125	20	20	125	3	3	63
MO132-20							20	20	125	20	20	125	3	3	80
MO132-25	50	50	125	50	50	125	10	10	125	10	10	125	3	3	100
MO132-32	25	50	125	25	50	125	10	10	125	10	10	125	3	3	100

MO132-20: No need for back-up fuse in networks with a prospective current of up to 100 kA at 400 V.

MO132-32: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 125 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

1SYN829571C201

MO132 manual motor starters magnetic only
Technical data

General technical data

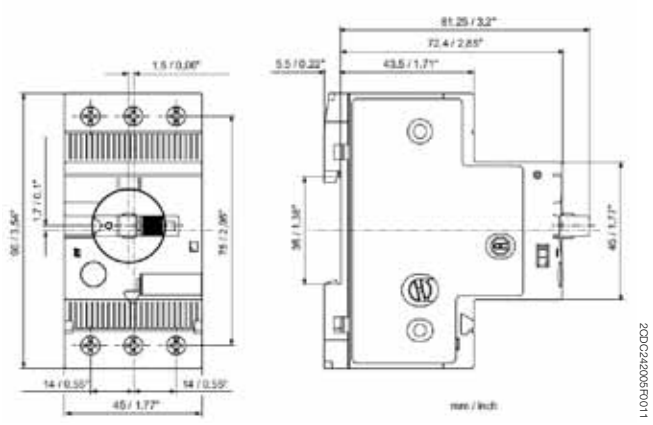
Type		MO132
Pollution degree		3
Phase loss sensitivity		No
Disconnect function acc. to IEC/EN 60947-2		Yes
Ambient air temperature		
Operation	Open	-25 ... +60 °C
	Enclosed (IB132)	0 ... +40 °C
Storage		-50 ... +80 °C
Ambient air temperature compensation		-
Maximum operating altitude permissible		2000 m
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6		5g / 3 ... 150 Hz
Mounting position		Position 1-6 (optional for single mounting)
Mounting		DIN-rail (EN 60715)
Group mounting		On request
Minimum distance to other units same type	Horizontal	0 mm
	Vertical	150 mm
Minimum distance to electrical conductive board	Horizontal, up to 400 V	0 mm
	Horizontal, up to 690 V	> 1.5 mm
	Vertical	75 mm
Degree of protection	Housing	IP20
	Main circuit terminals	IP20

Connecting characteristics

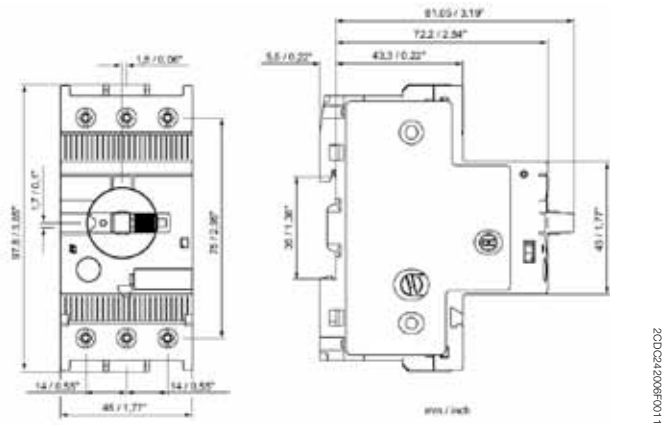
Main circuit

Type			MO132-0.16 ... MO132-10	MO132-12 ... MO132-16	MO132-20 ... MO132-32
Connecting capacity					
Rigid		1 or 2 x	1 ... 4 mm²	1 ... 4 mm²	2.5 ... 6 mm²
Flexible with ferrule		1 or 2 x	0.75 ... 2.5 mm²	0.75 ... 2.5 mm²	1 ... 6 mm²
Flexible with insulated ferrule		1 or 2 x	0.75 ... 2.5 mm²	0.75 ... 2.5 mm²	1 ... 6 mm²
Flexible		1 or 2 x	0.75 ... 2.5 mm²	0.75 ... 2.5 mm²	1 ... 6 mm²
Stripping length			9 mm	10 mm	10 mm
Tightening torques			0.8 ... 1.2 Nm / 10 ... 12 lb.in	1.5 Nm / 14 lb.in	2.0 Nm / 18 lb.in
Connection screw			M3.5 (Pozidriv 2)	M4 (Pozidriv 2)	M4 (Pozidriv 2)

Main dimensions mm, inches



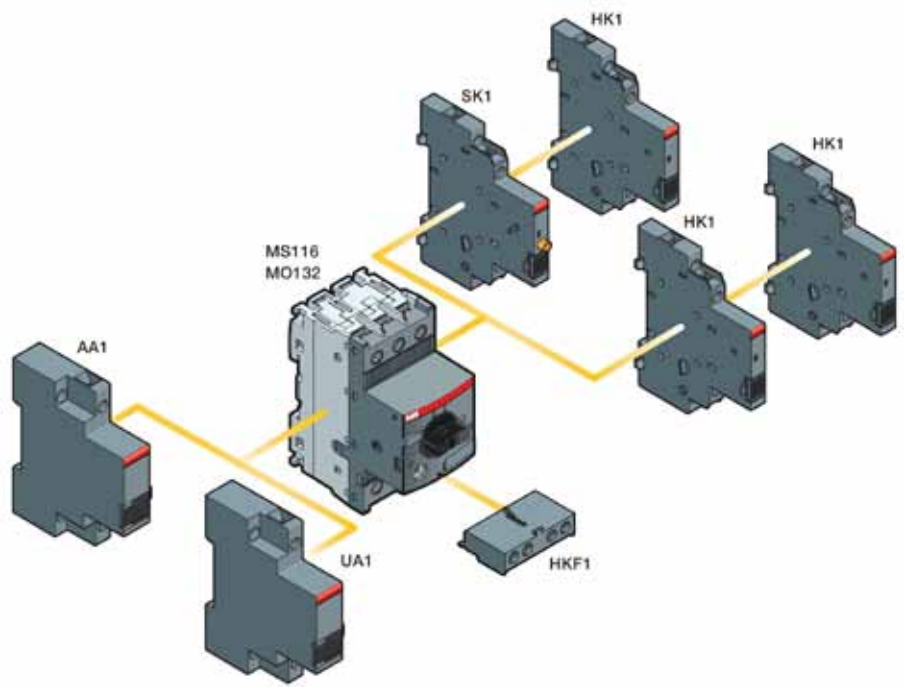
MO132 ≤ 10 A



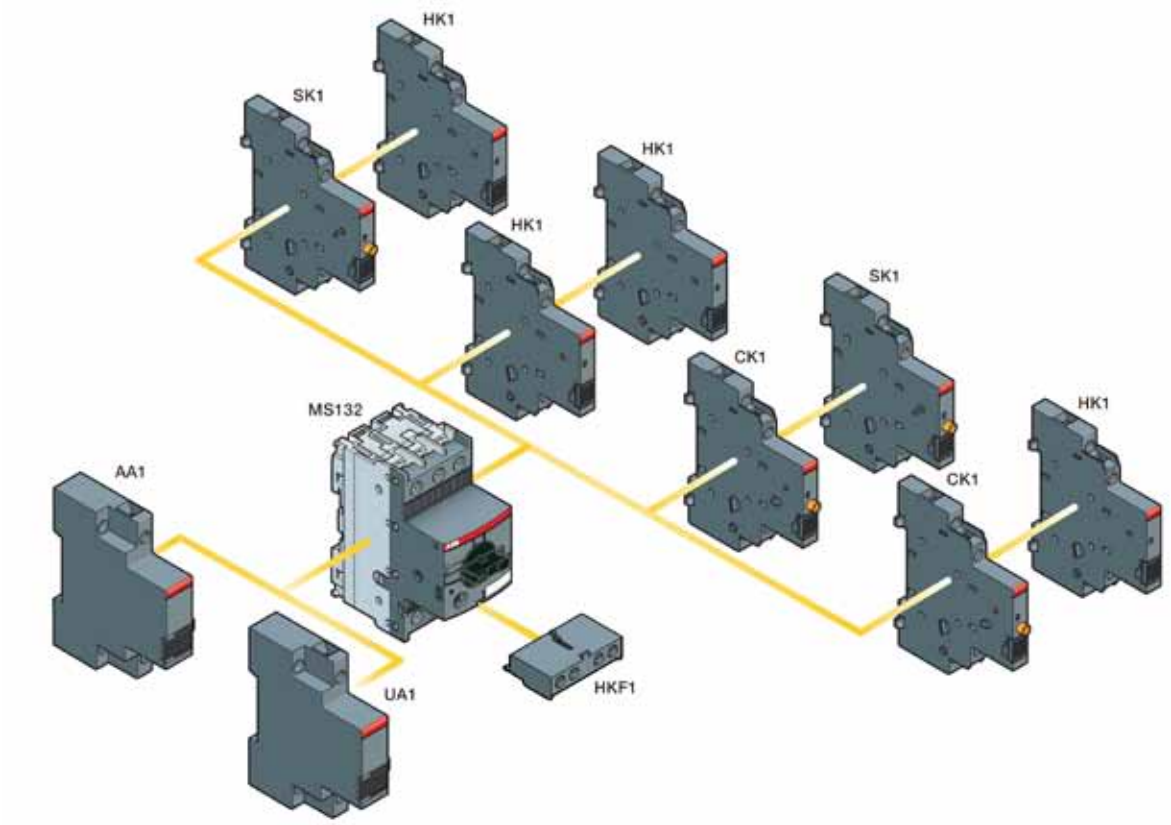
MO132 ≥ 12 A

MS116, MS132, MO132 manual motor starters
Main accessories

MS116, MO132 manual motor starters with accessories



MS132 manual motor starters with accessories



MS116, MS132, MO132 manual motor starters
Main accessories


1SBC101208F0014

HKF1-11


1SBC101209F0014

HK1-11


1SBC101210F0014

SK1-11


1SBC101286F0014

CK1-11

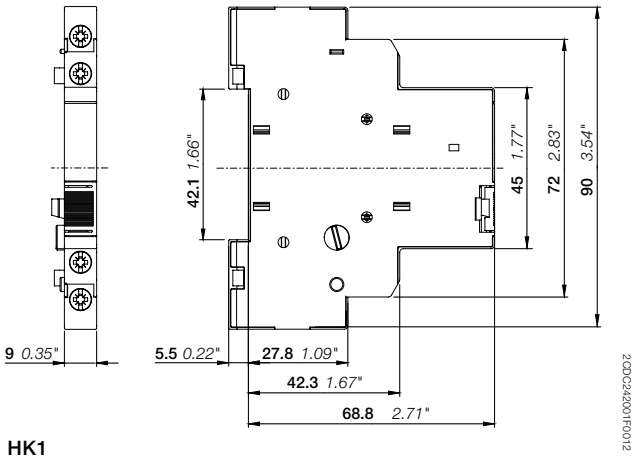
Description

Manual motor starters can be equipped with auxiliary contacts for lateral/front mounting, signalling contact for lateral mounting, undervoltage release and shunt trips. Two different signalling contacts are available. The accessories can be fitted wiring free and without tools. A variety of combinations is possible as required for the application. The auxiliary contacts change position with the main contacts. The signalling contact SK signals tripping regardless if it was caused by short-circuit or overload. The signalling contact CK signals tripping in case it was caused by short-circuit. Undervoltage release are used for remote tripping of the manual motor starter especially for emergency stop circuits. Shunt trips release the MMS used for remote tripping.

Ordering details

Suitable for	Auxiliary contacts N.O.	Auxiliary contacts N.C.	Description	Type	Order code	Pkg qty	Weight (1 pce) kg
Auxiliary contacts – mountable on the front							
MS116, MS132, MO132	1	1		HKF1-11	1SAM201901R1001	10	0.015
	2	0		HKF1-20	1SAM201901R1002	10	0.015
Auxiliary contacts – mountable on the right							
MS116, MS132, MO132	1	1	max. 2 pieces	HK1-11	1SAM201902R1001	2	0.035
	2	0	max. 2 pieces	HK1-20	1SAM201902R1002	2	0.035
	0	2	max. 2 pieces	HK1-02	1SAM201902R1003	2	0.035
	2	0	with lead contacts	HK1-20L	1SAM201902R1004	2	0.035
Signalling contacts – mountable on the right							
MS116, MS132, MO132	1	1	for tripped alarm, max. 2 pieces	SK1-11	1SAM201903R1001	2	0.035
	2	0	for tripped alarm, max. 2 pieces	SK1-20	1SAM201903R1002	2	0.035
	0	2	for tripped alarm, max. 2 pieces	SK1-02	1SAM201903R1003	2	0.035
MS132	1	1	for short-circuit alarm, max. 2 pieces	CK1-11	1SAM301901R1001	2	0.035
	2	0	for short-circuit alarm, max. 2 pieces	CK1-20	1SAM301901R1002	2	0.035
	0	2	for short-circuit alarm, max. 2 pieces	CK1-02	1SAM301901R1003	2	0.035

Main dimensions mm, inches



HK1

MS116, MS132, MO132 manual motor starters
Main accessories


1SBC101211F0014

AA1-24

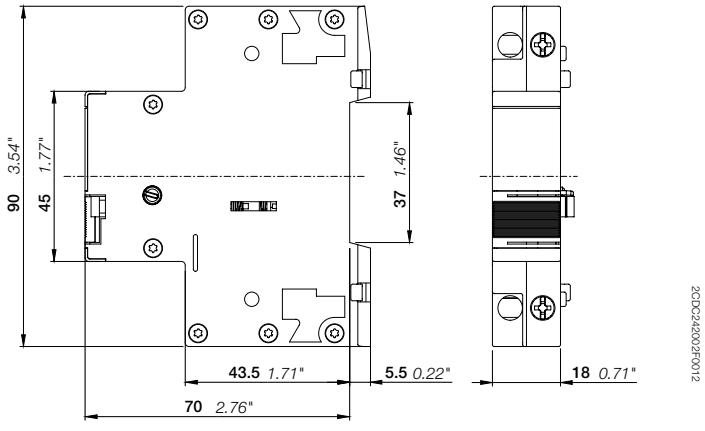

1SBC101212F0014

UA1-24

Ordering details

Suitable for	Rated control supply voltage V	Frequency Hz	Type	Order code	Pkg qty	Weight (1 pce) kg
Shunt trips – mountable on the left						
MS116, MS132, MO132	20...24	50/60	AA1-24	1SAM201910R1001	1	0.100
	110	50/60	AA1-110	1SAM201910R1002	1	0.100
	200...240	50/60	AA1-230	1SAM201910R1003	1	0.100
	350...415	50/60	AA1-400	1SAM201910R1004	1	0.100
Undervoltage releases – mountable on the left						
MS116, MS132, MO132	24	50	UA1-24	1SAM201904R1001	1	0.100
	48	50	UA1-48	1SAM201904R1002	1	0.100
	60	50	UA1-60	1SAM201904R1003	1	0.100
	110...120	50/60	UA1-110	1SAM201904R1004	1	0.100
	208	60	UA1-208	1SAM201904R1008	1	0.100
	230...240	50/60	UA1-230	1SAM201904R1005	1	0.100
	400	50	UA1-400	1SAM201904R1006	1	0.100
	415...480	50/60	UA1-415	1SAM201904R1007	1	0.100

Main dimensions mm, inches



AA1, UA1

General technical data

Type		HK1	SK1	HKF1
Standards		IEC/EN 60947-2, IEC/EN 60947-4-1, IEC/EN 60947-1		
Rated operational voltage U_e		690 V AC / 600 DC		250 V AC / 250 V DC
Conventional free-air thermal current I_{th}		6 A		5 A
Rated frequency		50/60 Hz		
Rated impulse withstand voltage U_{imp}		6 kV		
Rated insulation voltage U_i		690 V AC		250 V AC
Pollution degree		3		
Ambient air temperature	Operation	-25 ... +70 °C		
	Storage	-50 ... +80 °C		
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms		
Resistance to vibrations acc. to IEC 60068-2-6		5g / 3 ... 150 Hz		
I_e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category				
	24 V, 120 V	6 A		3 A
	240 V	4 A		1.5 A
	400 V	3 A		-
	440 V, 690 V	1 A		-
I_e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category				
	24 V	2 A		1 A
	125 V	0.55 A		0.27 A
	250 V	0.27 A		0.11 A
	440 V, 600 V	0.15 A		-
Minimum switching capacity		17 V / 5 mA		
Short-circuit protective device	N.C., 95-96	10 A Type gG		
	N.O., 97-98	10 A Type gG		
Duty time		100 %		
Mounting		Right side of MMS		Front of MMS
Mounting positions		1-6		
Mechanical durability		50000 cycles		-
Electrical durability		50000 cycles		-

Connecting charateristics

Auxiliary circuit

Type		HK1	SK1	HKF1
Connecting capacity				
Rigid	1 or 2 x	1 ... 1.5 mm²		1 ... 2.5 mm²
Flexible with ferrule	1 or 2 x	0.75 ... 1.5 mm²		
Flexible with insulated ferrule	1 or 2 x	0.75 ... 1.5 mm²		
Flexible	1 or 2 x	0.75 ... 1.5 mm²		
Stripping length		8 mm		
Tightening torques		0.8 ... 1.2 Nm / 7 lb.in		
Connection screw		M3 (Pozidriv 2)		

1SYN829571C201

MS450, MS495, MS497 manual motor starters
22 to 100 A – with thermal and electromagnetic protection


2CDC241004F0009

MS450-40


1SBC101184F0014

MS495-40


2CDC241020F0011

MS497-100

Description

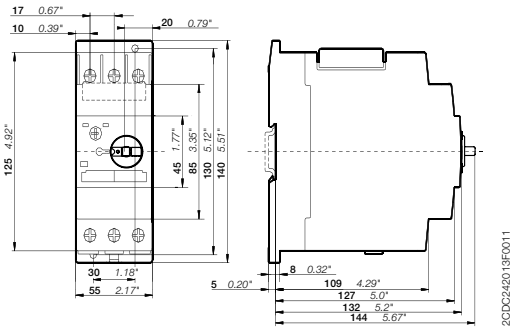
Manual motor starters (MMS) are protection devices for the main circuit. They combine motor control and protection in a single device. MMS are used mainly to switch motors manually ON/OFF and protect them and the installation fuse less against short-circuit, overload and phase failures. Fuse less protection with a manual motor starter saves costs, space and ensures a quick reaction under short-circuit condition, by switching off the motor within milliseconds.

Further features are the build-in disconnect function, temperature compensation, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter is suitable for three- and single-phase applications. The handle is lockable to protect against unauthorized changes. Auxiliary contacts, signalling contacts, undervoltage releases, shunt trips, three-phase busbars, power in-feed blocks are available as accessory.

Ordering details

Rated operational power 400 V AC-3	Setting range	Short-circuit breaking capacity Ics at 400 V AC	Rated instantaneous short-circuit current setting Ii	Type	Order code	Weight (1 pce)
kW	A	kA	A			kg
MS450 manual motor starters						
15.8	28.0…40.0	25	520.00	MS450-40	1SAM450000R1005	1.047
22	36.0…45.0	25	585.00	MS450-45	1SAM450000R1006	1.039
22	40.0…50.0	25	650.00	MS450-50	1SAM450000R1007	1.027
MS495 manual motor starters						
30	45.0…63.0	25	819.00	MS495-63	1SAM550000R1007	2.247
37	57.0…75.0	25	975.00	MS495-75	1SAM550000R1008	2.253
45	70.0…90.0	25	1170.00	MS495-90	1SAM550000R1009	2.280
55	80.0…100.0	25	1235.00	MS495-100	1SAM550000R1010	2.295
MS497 manual motor starters						
15	22.0…32.0	50	416.00	MS497-32	1SAM580000R1004	2.222
18.5	28.0…40.0	50	520.00	MS497-40	1SAM580000R1005	2.203
22	36.0…50.0	50	650.00	MS497-50	1SAM580000R1006	2.230
30	45.0…63.0	50	819.00	MS497-63	1SAM580000R1007	2.255
37	57.0…75.0	50	975.00	MS497-75	1SAM580000R1008	2.266
45	70.0…90.0	50	1170.00	MS497-90	1SAM580000R1009	2.268
55	80.0…100.0	50	1235.00	MS497-100	1SAM580000R1010	2.275

Main dimensions mm, inches



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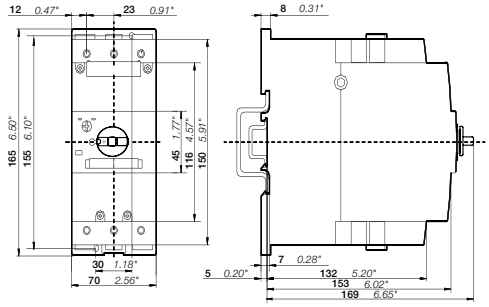
MS450



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MS495, MS497

1SYN829571C201

MS450, MS495, MS497 manual motor starters
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	MS450, MS495, MS497
Standards	IEC/EN 60947–2, IEC/EN 60947-4-1, IEC/EN 60947-1
Rated operational voltage U_e	690 V AC / 450 V DC
Rated frequency	50/60 Hz
Trip class	10
Number of poles	3
Duty time	100 %
Mechanical durability	50000 cycles
Electrical durability	25000 cycles
Rated impulse withstand voltage U_{imp}	6 kV
Rated insulation voltage U_i	690 V AC
Rated operational current I_e	See ordering details
Rated instantaneous short-circuit current setting I_i	See ordering details
Rated service short-circuit breaking capacity I_{cs}	See table "Short-circuit breaking capacity and back-up fuses"
Rated ultimate short-circuit breaking capacity I_{cu}	See table "Short-circuit breaking capacity and back-up fuses"

Short-circuit breaking capacity and back-up fuses

I_{CS} Rated service short-circuit breaking capacity

I_{CU} Rated ultimate short-circuit breaking capacity

I_{CC} Prospective short-circuit current at installation location

Note: Maximum rated current of the back-up fuses if $I_{CC} > I_{CS}$

Type	240 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A
Short-circuit protection MS450															
MS450-40	No back-up fuse required up to I_{CC} = 100 kA			25	50	160	15	50	125	5	10	100	2	4	63
MS450-45				25	50	160	15	50	125	5	10	100	2	4	63
MS450-50				25	50	160	15	50	125	5	10	100	2	4	80
Short-circuit protection MS495															
MS495-40	No back-up fuse required up to I_{CC} = 100 kA			25	50	125	20	50	125	6	12	125	3	6	63
MS495-50				25	50	125	20	50	125	6	12	125	3	6	80
MS495-63				25	50	160	20	50	160	6	12	160	3	6	80
MS495-75				25	50	160	20	50	160	6	8	160	3	5	100
MS495-90				25	50	160	20	50	160	6	8	160	3	5	125
MS495-100				25	50	160	20	50	160	6	8	160	3	5	125
Short-circuit protection MS497															
MS497-32	No back-up fuse required up to I_{CC} = 100 kA			50	100	No back-up fuse required up to I_{CC} = 100 kA	50	100	No back-up fuse required up to I_{CC} = 100 kA	11	22	100	7	12	63
MS497-40				50	100		50	100		9	18	160	6	12	80
MS497-50				50	100		50	100		7.5	15	160	5	10	100
MS497-63				50	100		50	70	200	7.5	15	160	4	7.5	100
MS497-75				50	100		50	70	200	5	10	160	3	6	125
MS497-90				50	100		50	70	200	5	10	160	3	6	160
MS497-100				50	100		50	70	200	5	10	160	3	6	160

MS450: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 160 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

MS495-40: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 125 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

MS495-100: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 160 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

MS497-32: No need for back-up fuse in networks with a prospective current of up to 100 kA at 440 V.

MS497-90: No need for back-up fuse in networks with a prospective current of up to 70 kA at 440 V.
With an approbiate 200 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

1SYN829571C201

MS450, MS495, MS497 manual motor starters
Technical data

General technical data

Type		MS450	MS495	MS497
Pollution degree		3		
Phase loss sensitivity		Yes		
Disconnect function acc. to IEC/EN 60947-2		Yes		
Ambient air temperature				
Operation	Open - compensated	-20 ... +60 °C		
	Open	-20 ... +70 °C		
	Enclosed	-20 ... +35 °C		
Storage		-50 ... +80 °C		
Ambient air temperature compensation		Acc. to IEC/EN60947-4-1		
Maximum operating altitude permissible		2000 m		
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms	-	
Resistance to vibrations acc. to IEC 60068-2-6		2g / 5-150 Hz		
Mounting position		Position 1-6 (optional for single mounting)		
Mounting		DIN-rail 35 mm (EN 60715)	DIN-rail 15 mm / 75 mm (EN 60715)	
Minimum distance to other units same type	Horizontal	0 mm	0 mm	
	Vertical - up to 240 V	-	50 mm	
	Vertical - up to 440 V	-	70 mm	
	Vertical - up to 500 V	-	110 mm	
	Vertical - up to 690 V	-	150 mm	
	Vertical	50 mm	-	
Minimum distance to electrical conductive board	Horizontal	10 mm	-	
	Horizontal - up to 500 V	-	10 mm	
	Horizontal - up to 690 V	-	30 mm	
	Vertical - up to 240 V	-	50 mm	
	Vertical - up to 440 V	-	70 mm	
	Vertical - up to 500 V	-	110 mm	
	Vertical - up to 690 V	-	150 mm	
	Vertical	50 mm	-	
Degree of protection	Housing	IP20		
	Main circuit terminals	IP00		

Connecting characteristics

Main circuit

Type			**MS450**	**MS495**	**MS497**
Connecting capacity					
Rigid		1 or 2 x	0.75 ... 16 mm²	2.5 ... 16 mm²	2.5 ... 16 mm²
Flexible with ferrule		1 x	0.75 ... 35 mm²	10 ... 70 mm²	10 ... 70 mm²
		2 x	0.75 ... 25 mm²	10 ... 50 mm²	10 ... 50 mm²
Flexible		1 x	0.75 ... 35 mm²	10 ... 70 mm²	10 ... 70 mm²
		2 x	0.75 ... 25 mm²	10 ... 50 mm²	10 ... 50 mm²
Stripping length			13 mm	17 mm	17 mm
Tightening torques			3 - 4.5 Nm / 27 ... 40 lb.in	4 - 6 Nm / 35 - 53 lb.in	4 - 6 Nm / 35 - 53 lb.in
Connection screw			Pozidriv 2	Hexagon 4	Hexagon 4

1SYN829571C201

MO450, MO495, MO496 manual motor starters magnetic only
32 to 100 A – with electromagnetic protection

MS450-40

Description

The manual motor starter magnetic only is used to manually switch on and off motors and to protect them reliably and without the need for a fuse from short-circuits.

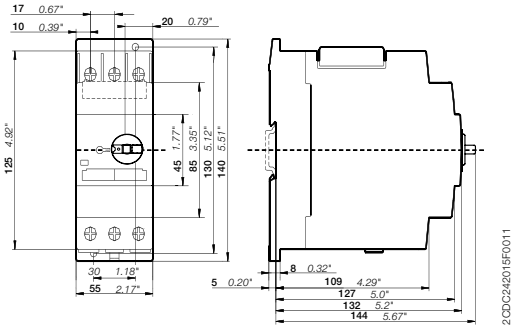
Further features are the build-in disconnect function, trip-free mechanism and a rotary handle with a clear switch position indication. The manual motor starter magnetic only is suitable for three- and single-phase applications. The handle is lockable to protect against unauthorized changes. Auxiliary contacts, signalling contacts, undervoltage releases, shunt trips, three-phase busbars, power in-feed blocks are available as accessory.

Ordering details

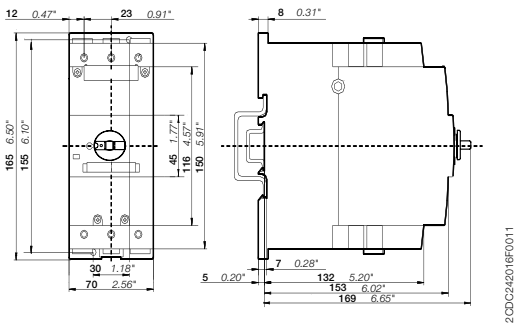
Rated operational power 400 V AC-3 (1) kW	Rated operational current A	Short-circuit breaking capacity Ics at 400 V AC kA	Rated instantaneous short-circuit current setting Ii A	Type	Order code	Weight (1 pce) kg
MO450 manual motor starter magnetic only						
15.8	40	25	520.00	MO450-40	1SAM460000R1005	1.033
22	45	25	585.00	MO450-45	1SAM460000R1006	1.040
22	50	25	650.00	MO450-50	1SAM460000R1007	1.019
MO495 manual motor starter magnetic only						
30	63	25	819.00	MO495-63	1SAM560000R1007	2.244
37	75	25	975.00	MO495-75	1SAM560000R1008	2.247
45	90	25	1170.00	MO495-90	1SAM560000R1009	2.269
55	100	25	1235.00	MO495-100	1SAM560000R1010	2.292
MO496 manual motor starter magnetic only						
15	32	50	416.00	MO496-32	1SAM590000R1004	2.208
18.5	40	50	520.00	MO496-40	1SAM590000R1005	2.218
22	50	50	650.00	MO496-50	1SAM590000R1006	2.218
30	63	50	819.00	MO496-63	1SAM590000R1007	2.248
37	75	50	975.00	MO496-75	1SAM590000R1008	2.278
45	90	50	1170.00	MO496-90	1SAM590000R1009	2.266
55	100	50	1235.00	MO496-100	1SAM590000R1010	2.293

(1) For overload protection of motors, an appropriate thermal or electronic overload relay must be used.

Main dimensions mm, inches



MO450



MO495, MO496

MO450, MO495, MO496 manual motor starters magnetic only
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	MO450, MO495, MO496
Standards	IEC/EN 60947–2, IEC/EN 60947-4-1, IEC/EN 60947-1
Rated operational voltage U_e	690 V AC / 450 V DC
Rated frequency	50/60 Hz
Number of poles	3
Duty time	100 %
Mechanical durability	50000 cycles
Electrical durability	25000 cycles
Rated impulse withstand voltage U_{imp}	6 kV
Rated insulation voltage U_i	690 V AC
Rated operational current I_e	See ordering details
Rated instantaneous short-circuit current setting I_i	See ordering details
Rated service short-circuit breaking capacity I_{cs}	See table "Short-circuit breaking capacity and back-up fuses"
Rated ultimate short-circuit breaking capacity I_{cu}	See table "Short-circuit breaking capacity and back-up fuses"

Short-circuit breaking capacity and back-up fuses

I_{CS} Rated service short-circuit breaking capacity

I_{CU} Rated ultimate short-circuit breaking capacity

I_{CC} Prospective short-circuit current at installation location

Note: Maximum rated current of the back-up fuses if $I_{CC} > I_{CS}$

Type	240 V AC			400 V AC			440 V AC			500 V AC			690 V AC		
	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A	I_{CS} kA	I_{CU} kA	gG, aM A
Short-circuit protection MO450															
MO450-40	No back-up fuse required up to I_{CC} = 100 kA			25	50	160	15	50	125	5	10	100	2	4	63
MO450-45				25	50	160	15	50	125	5	10	100	2	4	63
MO450-50				25	50	160	15	50	125	5	10	100	2	4	80
Short-circuit protection MO495															
MO495-63	No back-up fuse required up to I_{CC} = 100 kA			25	50	160	20	50	160	6	12	160	3	6	80
MO495-75				25	50	160	20	50	160	6	8	160	3	5	100
MO495-90				25	50	160	20	50	160	6	8	160	3	5	125
MO495-100				25	50	160	20	50	160	6	8	160	3	5	125
Short-circuit protection MO496															
MO496-32	No back-up fuse required up to I_{CC} = 100 kA			50	100	No back-up fuse required up to I_{CC} = 100 kA	50	100	No back-up fuse required up to I_{CC} = 100 kA	11	22	100	7	12	63
MO496-40				50	100		50	100		9	18	160	6	12	80
MO496-50				50	100		50	100		7.5	15	160	5	10	100
MO496-63				50	100		50	70	200	7.5	15	160	4	7.5	100
MO496-75				50	100		50	70	200	5	10	160	3	6	125
MO496-90				50	100		50	70	200	5	10	160	3	6	160
MO496-100				50	100		50	70	200	5	10	160	3	6	160

MO450: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 160 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

MO495-100: No need for back-up fuse in networks with a prospective current of up to 50 kA at 400 V.
With an approbiate 160 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

MO496-32: No need for back-up fuse in networks with a prospective current of up to 100 kA at 440 V.
MO496-90: No need for back-up fuse in networks with a prospective current of up to 70 kA at 440 V.
With an approbiate 200 A type gG fuse the device can be used in a network with a prospective current of up to 100 kA.

1SYN829571C201

MO450, MO495, MO496 manual motor starters magnetic only
Technical data

General technical data

Type		MO450	MO495	MO496
Pollution degree		3		
Phase loss sensitivity		No		
Disconnect function acc. to IEC/EN 60947-2		Yes		
Ambient air temperature				
Operation	Open - compensated	-20 ... +60 °C		
	Open	-20 ... +70 °C (above 60° C, current derating)		
	Enclosed	-20 ... +35 °C		
Storage		-50 ... +80 °C		
Ambient air temperature compensation		-		
Maximum operating altitude permissible		2000 m		
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms		
Resistance to vibrations acc. to IEC 60068-2-6		2g / 5-150 Hz	-	
Mounting position		Position 1-6 (optional for single mounting)		
Mounting		DIN-rail 35 mm (EN 60715)	DIN-rail 15 mm / 75 mm (EN 60715)	
Minimum distance to other units same type	Horizontal	0 mm	0 mm	
	Vertical - up to 240 V	-	50 mm	
	Vertical - up to 440 V	-	70 mm	
	Vertical - up to 500 V	-	110 mm	
	Vertical - up to 690 V	-	150 mm	
	Vertical	50 mm	-	
Minimum distance to electrical conductive board	Horizontal	10 mm	-	
	Horizontal - up to 500 V	-	10 mm	
	Horizontal - up to 690 V	-	30 mm	
	Vertical - up to 240 V	-	50 mm	
	Vertical - up to 440 V	-	70 mm	
	Vertical - up to 500 V	-	110 mm	
	Vertical - up to 690 V	-	150 mm	
	Vertical	50 mm	-	
Degree of protection	Housing	IP20		
	Main circuit terminals	IP20		

Connecting characteristics

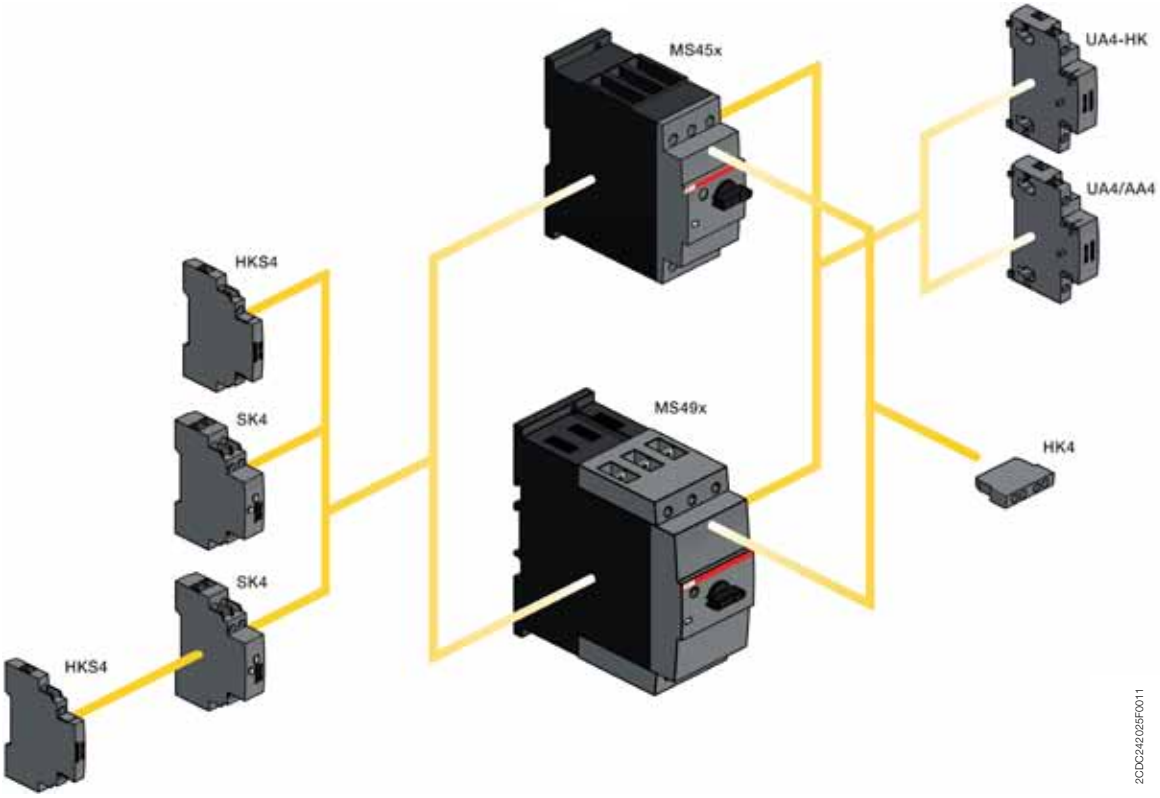
Main circuit

Type			MO450	MO495	MO496
Connecting capacity					
	Rigid	1 or 2 x	0.75 ... 16 mm²	2.5 ... 16 mm²	2.5 ... 16 mm²
	Flexible with ferrule	1 x	0.75 ... 35 mm²	10 ... 70 mm²	10 ... 70 mm²
		2 x	0.75 ... 25 mm²	10 ... 50 mm²	10 ... 50 mm²
	Flexible	1 x	0.75 ... 35 mm²	10 ... 70 mm²	10 ... 70 mm²
		2 x	0.75 ... 25 mm²	10 ... 50 mm²	10 ... 50 mm²
Stripping length			13 mm	17 mm	17 mm
Tightening torques			3 - 4.5 Nm / 27 ... 40 lb.in	4 - 6 Nm / 35 - 53 lb.in	4 - 6 Nm / 35 - 53 lb.in
Connection screw			Pozidriv 2	Hexagon 4	Hexagon 4

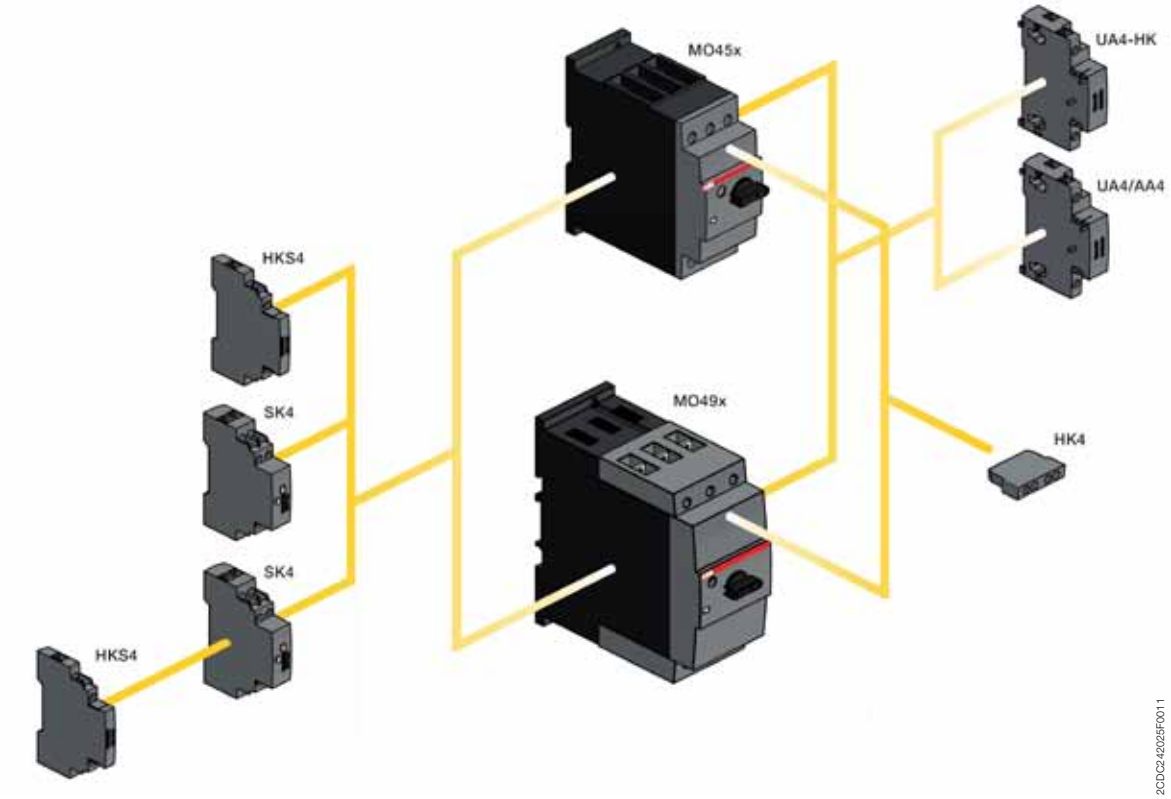
1SYN829571C201

MS45x, MS49x, MO45x, MO49x manual motor starters
Main accessories

MS45x and MS49x manual motor starters with accessories



MO45x and MO49x manual motor starters with accessories



MS45x, MS49x, MO45x, MO49x manual motor starters
Main accessories


2CDC241026F0011

HK4-11


2CDC241022F0011

HKS4-20


2CDC241024F0011

SK4-11


2CDC241023F0011

AA4-24


2CDC241025F0011

UA4-110

Description

Manual motor starters can be equipped with auxiliary contacts for lateral/front mounting, signalling contact for lateral mounting, undervoltage release and shunt trips. The accessories can be fitted wiring free and without tools. A variety of combinations is possible as required for the application. The auxiliary contacts change position with the main contacts. Undervoltage release are used for remote tripping of the manual motor starter especially for emergency stop circuits. Shunt trips release the MMS used for remote tripping.

Ordering details

Suitable for	Auxiliary contacts N.O.	Auxiliary contacts N.C.	Description	Type	Order code	Pkg qty	Weight (1 pce) kg
Auxiliary contacts – mountable on the front							
MS45x, MS49x, MO45x, MO49x	1	1		HK4-11	1SAM401901R1001	10	0.017
			Changeover	HK4-W	1SAM401901R1002	10	0.015
Auxiliary contacts – mountable on the left							
MS45x,	1	1	Max. 1 piece	HKS4-11	1SAM401902R1001	2	0.045
MS49x,	2	0	Max. 1 piece	HKS4-20	1SAM401902R1002	2	0.045
MO45x, MO49x	0	2	Max. 1 piece	HKS4-02	1SAM401902R1003	2	0.045
Signalling contacts – mountable on the left							
MS45x, MS49x, MO45x, MO49x	2	2	Separate signalling acc. UL508E 1 N.O. + 1 N.C. for short circuit alarm and 1 N.O. + 1 N.C. for tripped alarm, max. 1x SK4-11 + 1 x HKS4-xx	SK4-11	1SAM401904R1001	1	0.093

Suitable for	Rated control supply voltage V	Frequency Hz	Type	Order code	Pkg qty	Weight (1 pce) kg
Shunt trip units – mountable on the right						
MS45x,	20...24	50/60	AA4-24	1SAM401907R1001	1	0.135
MS49x,	90...110	50/60	AA4-110	1SAM401907R1002	1	0.135
MO45x,	200...240	50/60	AA4-230	1SAM401907R1003	1	0.128
MO49x	350...415	50/60	AA4-400	1SAM401907R1004	1	0.125
Undervoltage releases – mountable on the right						
MS45x,	24	50/60	UA4-24	1SAM401905R1004	1	0.134
MS49x,	110/120	50/60	UA4-110	1SAM401905R1001	1	0.134
MO45x,	230/240	50/60	UA4-230	1SAM401905R1002	1	0.131
MO49x	400/440	50/60	UA4-400	1SAM401905R1003	1	0.129
	230/240	50/60	UA4-HK-230	1SAM401906R1001	1	0.140
	400/440	50/60	UA4-HK-400	1SAM401906R1002	1	0.137

1SYN829571C201

MS45x, MS49x, MO45x, MO49x manual motor starters
Main accessories

General technical data

Type		HK4-11	HK4-W	HKS4	SK4
Standards		IEC/EN 60947–1, IEC/EN 60947-5-1, UL 508, CSA22.2 No. 14			
Rated operational voltage U_e		230 V AC / 220 V DC	690 V AC / 220 V DC	690 V AC	690 V AC
Conventional free-air thermal current I_{th}		2.5 A	5 A	10 A	10 A
Rated frequency		DC, 50/60 Hz			
Rated impulse withstand voltage U_{imp}		6 kV			
Rated insulation voltage U_i		300 V	300 V	690 V	690 V
Pollution degree		3			
Ambient air temperature	Operation	-20 ... +70 °C			
	Storage	-50 ... +80 °C			
Resistance to shock acc. to IEC 60068-2-27		25g / 11 ms			
Resistance to vibrations acc. to IEC 60068-2-6		2g / 5 ... 150 Hz			
Number of poles		1 N.C. + 1 N.O.	Changeover	1 N.C. + 1 N.O. / 2 N.O. / 2 N.C.	2 N.C. + 2 N.O.
I_e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category					
	24 V	2 A	4 A	6 A	6 A
	230 V	0.5 A	3 A	4 A	4 A
	400 V	-	1.5 A	3 A	3 A
	690 V	-	0.5 A	1 A	1 A
I_e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category					
	24 V	1 A	1 A	2 A	2 A
	48 V	0.3 A	-	-	-
	60 V	0.15 A	-	-	-
	110 V	-	0.22 A	0.5 A	0.5 A
	230 V	-	0.1 A	0.25 A	0.25 A
Minimum switching capacity		17 V / 1 mA		-	-
Short-circuit protective device		10 A Type gG			
Duty time		100 %			
Mounting		Front of MMS	Front of MMS	Left side of MMS	Left side of MMS
Mounting positions		1-6			
Mechanical durability		100000 cycles			
Electrical durability		100000 cycles			

Connecting characteristics

Auxiliary circuit

Type		HK4-11	HK4-W	HKS4	SK4
Connecting capacity					
Rigid	1 x	0.5... 2.5 mm²			
	2 x	0.5 ... 1.5 mm² or 0.75 ... 2.5 mm			
Flexible with ferrule	1 x	0.5 ... 2.5 mm²			
	2 x	0.5 ... 1.5 mm² or 0.75 ... 2.5 mm			
Stripping length		10 mm			
Tightening torques		0.8 ... 1.2 Nm / 7 ... 10.3 lb.in			
Connection screw		Pozidriv 2			

Type		UA4-xxx	AA4-xxx
Power consumption			
Pull-in	AC	20.2/13 VA/W	20.2/13 VA/W
	DC	20 W	13 ... 80 W
Holding	AC	7.2/2.4 VA/W	-
	DC	2.1 W	-
Operating voltage			
Tripping		0.35 ... 0.7 V x U_s	0.7 ... 1.1 V x U_s
Coil operating voltage		0.85 ... 1.1 V x U_s	-

1SYN829571C201

MSHD-LB

MSHD-LY

MSMN

MSH-AR

MSAH1

Description

With this solution of door coupling rotary mechanism it is possible to operate a Manual Motor Starter in the back of a switch cabinet from outside. The door coupling mechanism prevents opening of the door of a switch cabinet with the Manual Motor Starter in ON position.

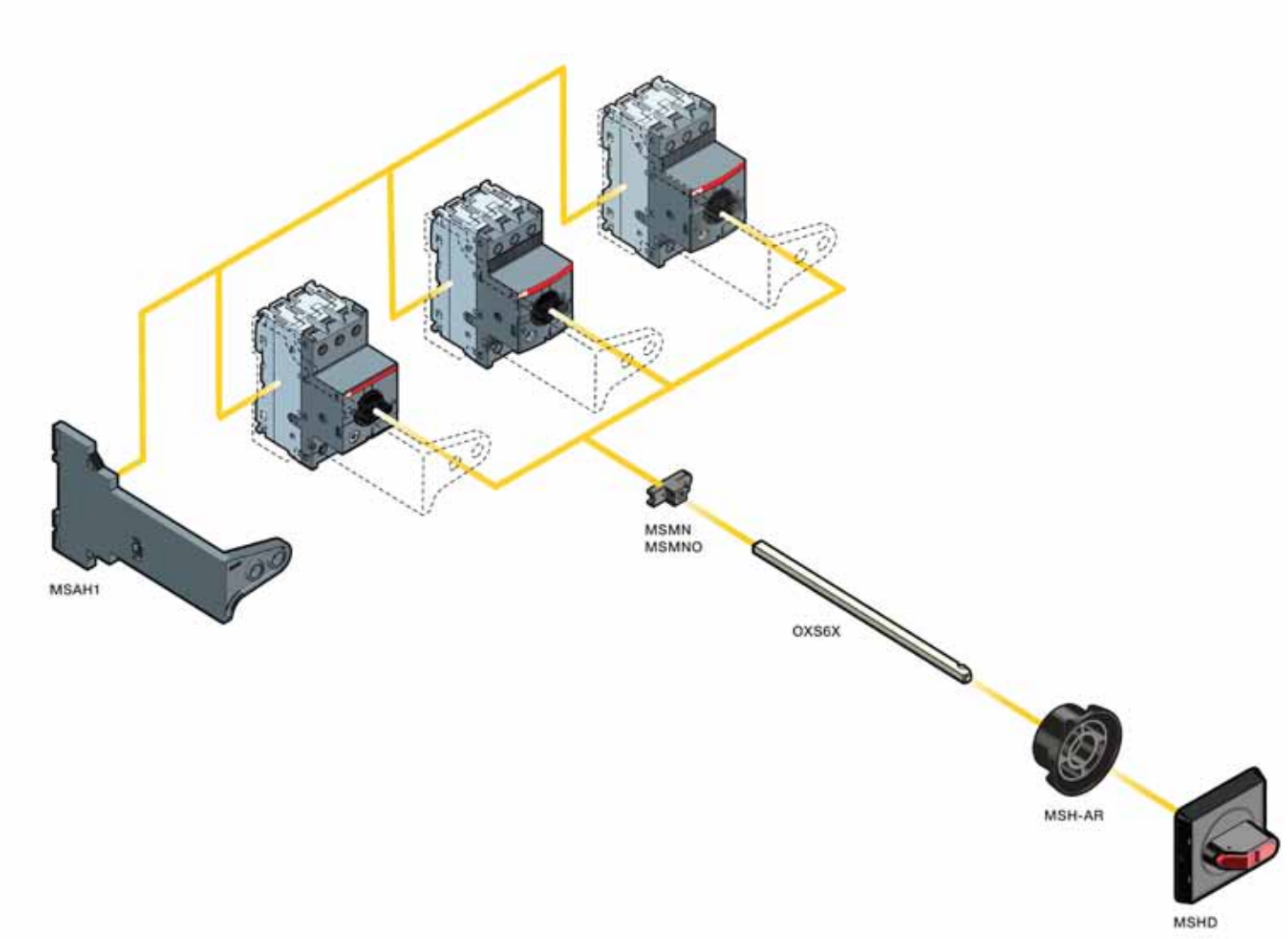
The complete mechanism includes handle, shaft, driver, shaft alignment ring and shaft supporter.

All accessories fit for 6 mm shafts with a maximum length of 180 mm. The degree of protection for handles MSHD is IP64.

Ordering details

Suitable for	Description	Shaft length mm	Color	Type	Order code	Pkg qty	Weight (1 pce) kg
Shafts							
MS116, MS132, MO132, MS4xx, MO4xx	For MSHD handles. Shaft diameter 6 mm. Shaft extension for door coupling driver.	85		OXS6X85	1SCA101647R1001	1	0.020
		105		OXS6X105	1SCA108043R1001	1	0.020
		130		OXS6X130	1SCA101655R1001	1	0.030
		180		OXS6X180	1SCA101659R1001	1	0.040
IP64 handles (UL: Type 1, 3R, 12)							
MS116, MS132, MO132, MS4xx, MO4xx	Padlockable max. 3 padlocks with bail diameter 5 … 8 mm, door interlock in ON position defeatable, for use with 6 mm OXS6…types up to 180 mm or driver shafts MSOX.		Black	MSHD-LB (1)	1SAM201920R1001	1	0.065
			Yellow	MSHD-LY (1)	1SAM201920R1002	1	0.065
			Black	MSHD-LTB (2)	1SAM201920R1011	1	0.065
			Yellow	MSHD-LTY (2)	1SAM201920R1012	1	0.065
Driver							
MS116, MS132, MO132, MS4xx, MO4xx	Coupling driver for use with 6 mm OXS6… types up to 180 mm.			MSMN (3)	1SAM101923R0002	1	0.002
				MSMNO (4)	1SAM101923R0012	1	0.002
Shaft alignment ring							
MS116, MS132, MO132, MS4xx, MO4xx	The MSH-AR supports the long shafts for alignment to the handle inlet. It makes closing panel doors more easy. Use for OXS6X > 105 mm.			MSH-AR	1SAM201920R1000	1	0.010
Shaft supporter							
MS116, MS132, MO132	With the MSAH it is possible to support the shaft in the extension of handle (MSHD). It is mandatory for the usage of shafts >130 mm.			MSAH1	1SAM201909R1021	1	0.035

(1) Indication I-O and ON-OFF (recommended for MS116, MS4xx, MO4xx).
(2) Indication I-O and ON-OFF + Trip indication.
(3) Coded - Positioning of ON indication dependent from mounting orientation of the MMS.
(4) Uncoded - Positioning of ON indication independent from mounting orientation of the MMS.


MSAH1
MSMN
MSMNO
OXS6X
MSH-AR
MSHD

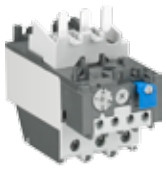
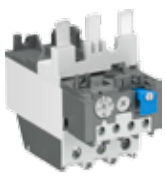
1SYN829571C201

Overload relays

1SYN829571C201

Overload relays

Thermal overload relay

Type	TA25DU-M	TA42DU-M	TA75DU-M	TA80DU	TA110DU	TA200DU
Current range	0.10 ... 32 A	18 ... 42 A	18 ... 80 A	29 ... 80 A	66 ... 110 A	66 ... 200 A
Trip class	10A	10A	10A	10A	10A	10A
Single mounting kit	DB25	DB80	DB80	DB80	DB200	DB200
For contactors	AX09 ... AX32	AX32 ... AX40	AX50 ... AX80	AX95 ... AX150	AX95 ... AX150	AX185 ... AX205

Electronic overload relay






Type	E16DU	E45DU	E80DU	E140DU	EF205	EF370
Current range	0.10 ... 18.9 A	9 ... 45 A	27 ... 80 A	50 ... 140 A	63 ... 210 A	115 ... 380 A
Trip class	10E, 20E, 30E selectable					
Single mounting kit	DB16E	DB45E	DB80E	DB140E	-	-
For contactors	AX09 ... AX18	AX32 ... AX40	AX50 ... AX115	AX150	AX185 ... AX205	AX205 ... AX370

1SYN829571C201

Thermal overload relays TA25DU-M / TA42DU-M / TA75DU-M
0.10 to 80 A


2CDC231019F0013

TA25DU-M

Description

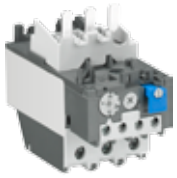
The TA25DU-M / TA42DU-M and TA75DU-M thermal overload relays are economic electromechanical protection devices for the main circuit. They offer reliable protection for motors in the event of overload or phase failure. The devices have trip class 10A.

The thermal overload relays are three pole relays with bimetal tripping elements. The motor current flows through the bimetal tripping elements and heats them directly and indirectly. In case of an overload (over current), the bimetal elements bent as a result of the heating. This leads to a release of the relay and a change of the contacts switching position (95-96 / 97-98).

– Manual or automatic reset selectable
– Phase loss sensitive acc. to IEC/EN 60947-4-1
– Two electrically isolated auxiliary contacts – 1 N.O. + 1 N.C.
– TEST and STOP function – Trip indication on the front
– Temperature compensation
– Suitable for three- and single-phase applications

Ordering details

Setting range A	Short-circuit protective device	Trip class	Type	Order code	Weight (1 pce) kg
TA25DU-M					
0.10 ... 0.16	0.50 A, Fuse type F	10A	TA25DU-0.16M	1SAZ211201R2005	0.150
0.16 ... 0.25	0.63 A, Fuse type F	10A	TA25DU-0.25M	1SAZ211201R2009	0.150
0.25 ... 0.40	1.25 A, Fuse type F	10A	TA25DU-0.4M	1SAZ211201R2013	0.150
0.40 ... 0.63	2 A, Fuse type gG / -	10A	TA25DU-0.63M	1SAZ211201R2017	0.150
0.63 ... 1.00	4 A, Fuse type gG / 2 A aM	10A	TA25DU-1.0M	1SAZ211201R2021	0.150
1.00 ... 1.40	6 A, Fuse type gG / 2 A aM	10A	TA25DU-1.4M	1SAZ211201R2023	0.150
1.30 ... 1.80	6 A, Fuse type gG / 4 A aM	10A	TA25DU-1.8M	1SAZ211201R2025	0.150
1.70 ... 2.40	6 A, Fuse type gG / 4 A aM	10A	TA25DU-2.4M	1SAZ211201R2028	0.150
2.20 ... 3.10	10 A, Fuse type gG / 6 A aM	10A	TA25DU-3.1M	1SAZ211201R2031	0.150
2.80 ... 4.00	10 A, Fuse type gG / 6 A aM	10A	TA25DU-4.0M	1SAZ211201R2033	0.150
3.50 ... 5.00	16 A, Fuse type gG / 10 A aM	10A	TA25DU-5.0M	1SAZ211201R2035	0.150
4.50 ... 6.50	20 A, Fuse type gG / 16 A aM	10A	TA25DU-6.5M	1SAZ211201R2038	0.150
6.00 ... 8.50	20 A, Fuse type gG / 20 A aM	10A	TA25DU-8.5M	1SAZ211201R2040	0.150
7.50 ... 11.00	35 A, Fuse type gG / 25 A aM	10A	TA25DU-11M	1SAZ211201R2043	0.150
10.00 ... 14.00	35 A, Fuse type gG / 25 A aM	10A	TA25DU-14M	1SAZ211201R2045	0.150
13.00 ... 19.00	50 A, Fuse type gG / 35 A aM	10A	TA25DU-19M	1SAZ211201R2047	0.170
18.00 ... 25.00	63 A, Fuse type gG / 50 A aM	10A	TA25DU-25M	1SAZ211201R2051	0.170
24.00 ... 32.00	80 A, Fuse type gG / 63 A aM	10A	TA25DU-32M	1SAZ211201R2053	0.200
TA42DU-M					
18 ... 25	63 A, Fuse type gG / 50 A aM	10A	TA42DU-25M	1SAZ311201R2001	0.335
22 ... 32	80 A, Fuse type gG / 63 A aM	10A	TA42DU-32M	1SAZ311201R2002	0.335
29 ... 42	100 A, Fuse type gG / 80 A aM	10A	TA42DU-42M	1SAZ311201R2003	0.335
TA75DU-M					
18 ... 25	63 A, Fuse type gG / 50 A aM	10A	TA75DU-25M	1SAZ321201R2001	0.335
22 ... 32	80 A, Fuse type gG / 63 A aM	10A	TA75DU-32M	1SAZ321201R2002	0.335
29 ... 42	100 A, Fuse type gG / 80 A aM	10A	TA75DU-42M	1SAZ321201R2003	0.335
36 ... 52	125 A, Fuse type gG / 100 A aM	10A	TA75DU-52M	1SAZ321201R2004	0.335
45 ... 63	160 A, Fuse type gG / 125 A aM	10A	TA75DU-63M	1SAZ321201R2005	0.335
60 ... 80	200 A, Fuse type gG / 160 A aM	10A	TA75DU-80M	1SAZ321201R2006	0.370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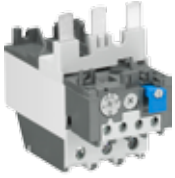
TA42DU-M


2CDC231022F0013

TA75DU-M

2CDC232015F0011
1SYN829571C201

Thermal overload relays TA25DU-M / TA42DU-M / TA75DU-M
Technical data

Main circuit – Utilization characteristics according to IEC/EN

Type	TA25DU-M	TA42DU-M	TA75DU-M
Standards	IEC/EN 60947–4–1, IEC/EN 60947-5-1, IEC/EN 60947-1		
Rated operational voltage U_e	690 V AC		
Rated frequency	DC, 50/60 Hz		
Frequency range	0 ... 400 Hz		
Trip class	10A		
Number of poles	3		
Duty time	100 %		
Operating frequency without early tripping	Up to 15 operations/h, see "Technical diagram – Intermittent periodic duty"		
Rated impulse withstand voltage U_{imp}	6 kV		
Rated insulation voltage U_i	690 V AC		

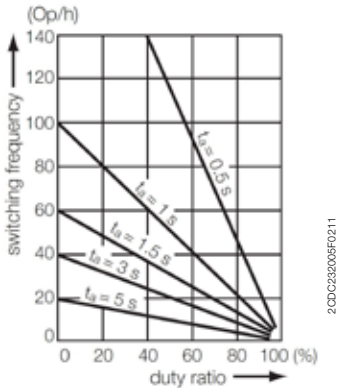
Auxiliary circuit according to IEC/EN

Type		TA25DU-M	TA42DU-M	TA75DU-M
Rated operational voltage U_e		500 V AC, 440 V DC		
Conventional free air thermal current I_{th}	N.C., 95-96	10 A		
	N.O., 97-98	6 A		
Rated frequency		DC, 50/60 Hz		
Number of poles		1 N.O. + 1 N.C.		

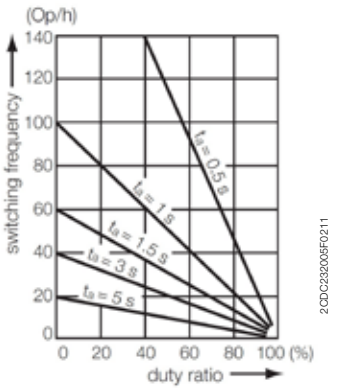
I_e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category			I_e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category		
110-120 V	N.C., 95-96	3.00 A	24 V	N.C., 95-96	1.25 A
	N.O., 97-98	1.50 A		N.O., 97-98	1.25 A
220-230-240 V	N.C., 95-96	3.00 A	60 V	N.C., 95-96	0.25 A
	N.O., 97-98	1.50 A		N.O., 97-98	0.25 A
440 V	N.C., 95-96	1.00 A	110-120-125 V	N.C., 95-96	0.25 A
	N.O., 97-98	1.00 A		N.O., 97-98	0.25 A
480-500 V	N.C., 95-96	1.00 A	250 V	N.C., 95-96	0.12 A
	N.O., 97-98	1.00 A		N.O., 97-98	0.04 A

Minimum switching capacity		17 V / 3 mA		
Short-circuit protective device	N.C., 95-96	10 A, Fuse type gG		
	N.O., 97-98	6 A, Fuse type gG		
Rated impulse withstand voltage U_{imp}		6 kV		
Rated insulation voltage U_i		690 V		

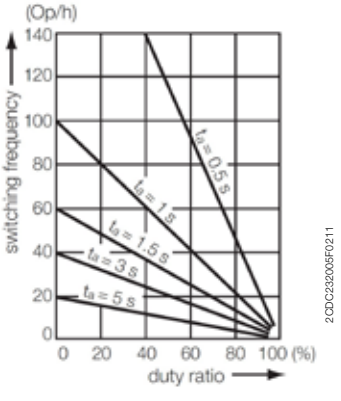
Technical diagram – Intermittent periodic duty



t_a: Motor starting time - TA25



t_a: Motor starting time - TA42



t_a: Motor starting time - TA75

Thermal overload relays TA25DU-M / TA42DU-M / TA75DU-M
Technical data

General technical data

Type			TA25DU-M	TA42DU-M	TA75DU-M
Pollution degree			3		
Phase loss sensitive			Yes		
Ambient air temperature					
Operation	Open - compensated		-25 ... +55 °C		
	Open		-25 ... +55 °C		
Storage			-40 ... +70 °C		
Ambient air temperature compensation			Acc. to IEC/EN60947-4-1		
Maximum operating altitude permissible			2000 m		
Resistance to shock acc. to IEC 60068-2-27			12g / 15 ms		
Mounting position			Position 1-6		
Mounting			Mount on the contactor and tighten the screws of the main circuit terminals or with single mounting kit on DIN rail (35 mm)		
Degree of protection	Housing		IP20		
	Main circuit terminals		IP10		

Electrical connection

Main circuit

Type			TA25DU-M (0.16-11 A)	TA25DU-M (14-25 A)	TA25DU-M (32 A)
Connecting capacity					
Rigid		1 x	0.75 ... 4 mm²	1.5 ... 6 mm²	1.5 ... 10 mm²
		2 x	0.75 ... 4 mm²	1.5 ... 6 mm²	-
Flexible with insulated ferrule		1 x or 2 x[1)]	0.75 ... 4 mm²	1.5 ... 4 mm²	1.5 ... 6 mm²
Stripping length			12 mm	12 mm	15 mm
Tightening torques			1.4 - 2.0 Nm	1.4 - 2.0 Nm	2.5 - 3.2 Nm
Connection screw			M4 (Pozidriv 2)	M4 (Pozidriv 2)	M5 (Pozidriv 2)

[1)] Combination of different wires not possible

Main circuit

Type			TA42DU-M	TA75DU-M
Connecting capacity				
Rigid		1 x	2.5 ... 25 mm²	
		2 x	2.5 ... 16 mm²	
Flexible with insulated ferrule		1 x	2.5 ... 25 mm²	
		2 x	2.5 ... 10 mm²	
Stripping length			14 mm	
Tightening torques			4.5 Nm	
Connection screw			M6 (Pozidriv 2)	

Auxiliary circuit

Type			TA25DU-M	TA42DU-M	TA75DU-M
Connecting capacity					
Rigid		1 x or 2 x	0.75 ... 4 mm²		
Flexible		1 x or 2 x	0.75 ... 2.5 mm²		
Stripping length			9 mm		
Tightening torques			0.8 ... 1.3 Nm		
Connection screw			M3.5 (Pozidriv 2)		

1SYN829571C201

Thermal overload relays TA25DU-M / TA42DU-M / TA75DU-M
Accessories


SST01494

DX25


2CDC231017F0006

DB25/25A


SST20591

DR25-A-220/380

1SFC151402F0001

KPR-101L


2CDC231007F0010

DB80

Description

The single mounting kits offer the possibility to mount the overload relays separately from the contactor.

The DS25-A allows electrically remote tripping of TA25DU-M. DR25-A coil for remote reset of TA25DU-M.

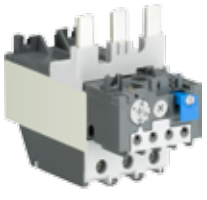
Ordering details

For thermal overload relays	Description	Type	Order code	Weight (1 pce) kg
Terminal block and mounting kits				
TA25DU-0.16M; ... 25M / DB25/25 A	Terminal block 10 mm²	DX25	1SAZ201307R0002	0.030
TA25DU-0.16M ... 25M	Single mounting kit	DB25/25A	1SAZ201108R0001	0.055
TA25DU-32M	Single mounting kit	DB25/32A	1SAZ201108R0002	0.080
TA42DU-M / TA75DU-M	Single mounting kit	DB80	1SAZ301110R0001	0.155
Remote reset coil				
TA25DU-M	24 V, 50/60 Hz	DR25-A-24	1SAZ201504R0001	0.050
TA25DU-M	48 V, 50/60 Hz	DR25-A-48	1SAZ201504R0002	0.050
TA25DU-M	110 V, 50/60 Hz	DR25-A-110	1SAZ201504R0003	0.050
TA25DU-M	220/380 V, 50/60 Hz	DR25-A-220/380	1SAZ201504R0005	0.050
TA25DU-M	500 V, 50/60 Hz	DR25-A-500	1SAZ201504R0006	0.050
Reset push button				
TA25DU-M / TA42DU -M / TA75DU -M	Reset push button*	KPR-101L	1SFA616162R1014	0.027

The remote reset coil is to be connected to auxiliary contact 97-98 of TA25DU-M.
The coil is not suitable for Continuous operation. Impulse duration: maximum 0.2 seconds.

1SYN829571C201

Thermal overload relays TA80DU / TA110DU / TA200DU
29 to 200 A



TA80DU

TA200DU

Description

The TA80DU thermal overload relays are economic electromechanical protection devices for the main circuit. They offer reliable protection for motors in the event of overload or phase failure. The devices have trip class 10A.

The thermal overload relays are three pole relays with bimetal tripping elements. The motor current flows through the bimetal tripping elements and heats them directly and indirectly. In case of an overload (over current), the bimetal elements bent as a result of the heating. This leads to a release of the relay and a change of the contacts switching position (95-96 / 97-98).

– Manual or automatic reset selectable
– Phase loss sensitive acc. to IEC/EN 60947-4-1
– Two electrically isolated auxiliary contacts – 1 N.O. + 1 N.C.
– TEST and STOP function – Trip indication on the front
– Temperature compensation
– Suitable for three- and single-phase applications

Ordering details

Setting range A	Short-circuit protective device	Trip class	Type	Order code	Weight (1 pce) kg
TA80DU					
29 ... 42	100 A, Fuse type gG / 80 A aM	10A	TA80DU-42	1SAZ331201R1003	0.360
36 ... 52	125 A, Fuse type gG / 100 A aM	10A	TA80DU-52	1SAZ331201R1004	0.365
45 ... 63	160 A, Fuse type gG / 125 A aM	10A	TA80DU-63	1SAZ331201R1005	0.365
60 ... 80	200 A, Fuse type gG / 160 A aM	10A	TA80DU-80	1SAZ331201R1006	0.375
TA110DU					
66 ... 90	200 A, Fuse type gG / 160 A aM	10A	TA110DU-90	1SAZ411201R1001	0.750
80 ... 110	224 A, Fuse type gG / 200 A aM	10A	TA110DU-110	1SAZ411201R1002	0.755
TA200DU					
66 ... 90	200 A, Fuse type gG / 125 A aM	10A	TA200DU-90	1SAZ421201R1001	0.755
80 ... 110	224 A, Fuse type gG / 160 A aM	10A	TA200DU-110	1SAZ421201R1002	0.760
100 ... 135	224 A, Fuse type gG / 200 A aM	10A	TA200DU-135	1SAZ421201R1003	0.760
110 ... 150	250 A, Fuse type gG / 200 A aM	10A	TA200DU-150	1SAZ421201R1004	0.760
130 ... 175	315 A, Fuse type gG / 250 A aM	10A	TA200DU-175	1SAZ421201R1005	0.770
150 ... 200	315 A, Fuse type gG / 250 A aM	10A	TA200DU-200	1SAZ421201R1006	0.785

DB80

KPR-101L

Ordering details accessories

For thermal overload relays A	Description	Type	Order code	Weight (1 pce) kg
TA80DU	Single mounting kit	DB80	1SAZ301110R0001	0.155
TA200DU	Terminal shroud	LT200/A	1SAZ401901R1001	0.090
TA110DU / TA200DU	Single mounting kit	DB200	1SAZ401110R0001	0.225
TA80DU / TA110DU / TA200DU	Reset push button*	KPR-101L	1SFA616162R1014	0.027

1SYN829571C201

Thermal overload relays TA80DU / TA110DU / TA200DU
Technical data

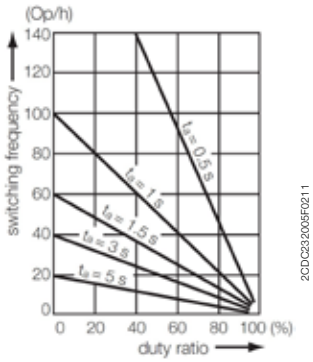
Main circuit – Utilization characteristics according to IEC/EN

Type	TA80DU	TA110DU	TA200DU
Standards	IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1		
Rated operational voltage U_e	690 V AC		
Rated frequency	DC, 50/60 Hz		
Frequency range	0 ... 400 Hz		
Trip class	10A		
Number of poles	3		
Duty time	100 %		
Operating frequency without early tripping	Up to 15 operations/h, see "Technical diagram – Intermittent periodic duty"		
Rated impulse withstand voltage U_{imp}	6 kV		
Rated insulation voltage U_i	690 V AC		

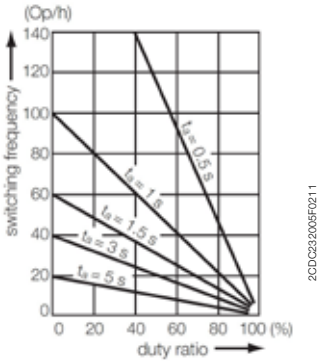
Auxiliary circuit according to IEC/EN

Type		TA80DU	TA110DU	TA200DU
Rated operational voltage U_e		500 V AC, 440 V DC		
Conventional free air thermal current I_{th}	N.C., 95-96	10 A		
	N.O., 97-98	6 A		
Rated frequency		DC, 50/60 Hz		
Number of poles		1 N.O. + 1 N.C.		
I_e / Rated operational current AC-15				
acc. to IEC/EN 60947-5-1 for utilization category				
110-120 V	N.C., 95-96	3.00 A		
	N.O., 97-98	1.50 A		
220-230-240 V	N.C., 95-96	3.00 A		
	N.O., 97-98	1.50 A		
440 V	N.C., 95-96	1.00 A		
	N.O., 97-98	1.00 A		
480-500 V	N.C., 95-96	1.00 A		
	N.O., 97-98	1.00 A		
I_e / Rated operational current DC-13				
acc. to IEC/EN 60947-5-1 for utilization category				
24 V	N.C., 95-96	1.25 A		
	N.O., 97-98	1.25 A		
60 V	N.C., 95-96	0.25 A		
	N.O., 97-98	0.25 A		
110-120-125 V	N.C., 95-96	0.25 A		
	N.O., 97-98	0.25 A		
250 V	N.C., 95-96	0.12 A		
	N.O., 97-98	0.04 A		
Minimum switching capacity		17 V / 3 mA		
Short-circuit protective device	N.C., 95-96	10 A, Fuse type gG		
	N.O., 97-98	6 A, Fuse type gG		
Rated impulse withstand voltage U_{imp}		6 kV		
Rated insulation voltage U_i		690 V		

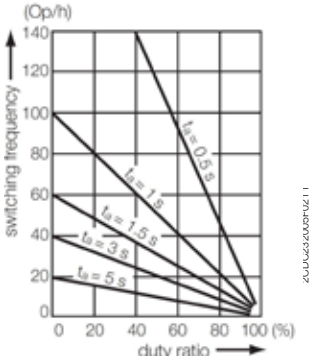
Technical diagram – Intermittent periodic duty



t_a: Motor starting time - TA80DU



t_a: Motor starting time - TA110DU



t_a: Motor starting time **- TA200DU**

Thermal overload relays TA80DU / TA110DU / TA200DU
Technical data

General technical data

			TA80DU	TA110DU	TA200DU
Type					
Pollution degree			3		
Phase loss sensitive			Yes		
Ambient air temperature					
	Operation	Open - compensated	-25 ... +55 °C		
		Open	-25 ... +55 °C		
	Storage		-40 ... +70 °C		
Ambient air temperature compensation			Acc. to IEC/EN60947-4-1		
Maximum operating altitude permissible			2000 m		
Resistance to shock acc. to IEC 60068-2-27			12g / 15 ms		
Mounting position			Position 1-6		
Mounting			Mount on the contactor and tighten the screws of the main circuit terminals or with single mounting kit		
Degree of protection	Housing		IP20		
	Main circuit terminals		IP10		

Electrical connection

Main circuit

Type			TA80DU	TA110DU	TA200DU
Connecting capacity					
	Rigid	1 x	2.5 ... 25 mm²	16 ... 35 mm²	25 ... 120 mm²
		2 x	2.5 ... 16 mm²	-	-
	Flexible	1 x	2.5 ... 25 mm²	16 ... 35 mm²	16 ... 35 mm²
		2 x	2.5 ... 10 mm²	-	-
	Lugs		-	-	L ≤ 12mm / I > 6mm
Stripping length			14 mm	25 mm	-
Tightening torques			4.5 Nm / 40 lb.in	7.2 ... 9.6 Nm / 40 lb.in	4 Nm
Connection screw			M6 (Pozidriv 2)	M8 (Hexagon)	M6

Auxiliary circuit

Type			TA80DU	TA110DU	TA200DU
Connecting capacity					
	Rigid	1 x or 2 x	0.75 ... 4 mm²		
	Flexible with ferrule	1 x or 2 x	0.75 ... 2.5 mm²		
	Flexible with insulated ferrule	1 x or 2 x	0.75 ... 2.5 mm²		
	Flexible	1 x or 2 x	0.75 ... 2.5 mm²		
Stripping length			9 mm		
Tightening torques			0.8 ... 1.3 Nm / 12 lb.in		
Connection screw			M3.5 (Pozidriv 2)		

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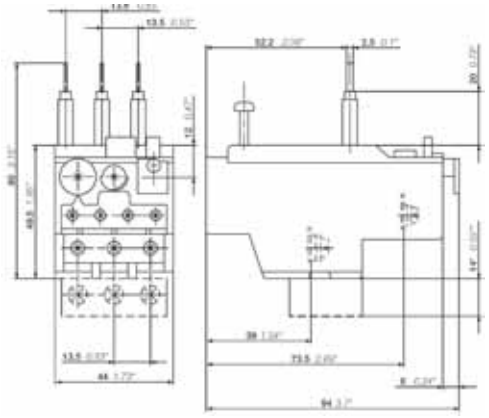
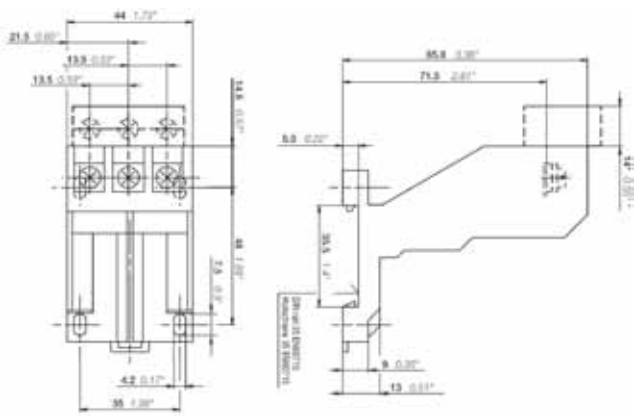
Thermal overload relays TA25DU-M / TA42DU -M / TA75DU -M
Dimensions

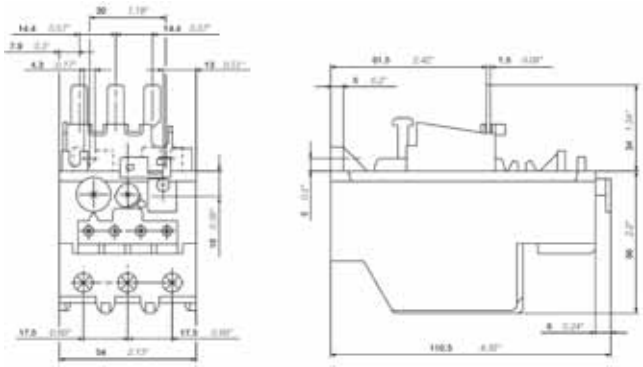
Main dimensions mm, inches



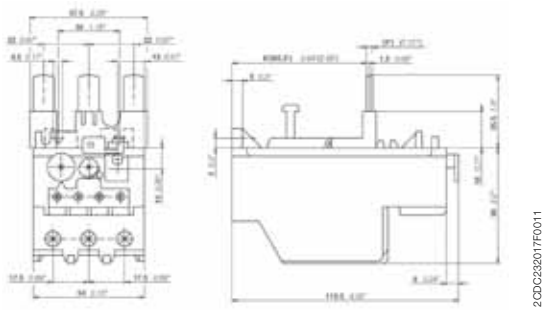
TA25DU-M



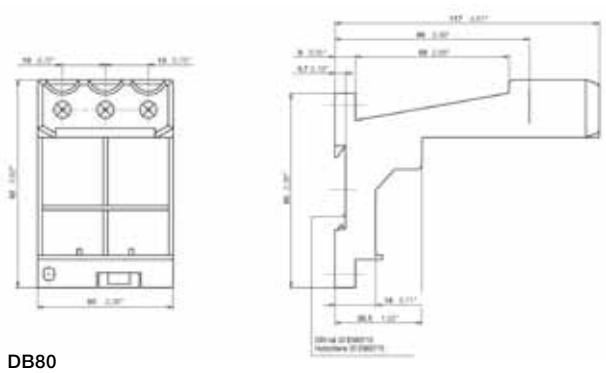
DB25



TA42DU-M



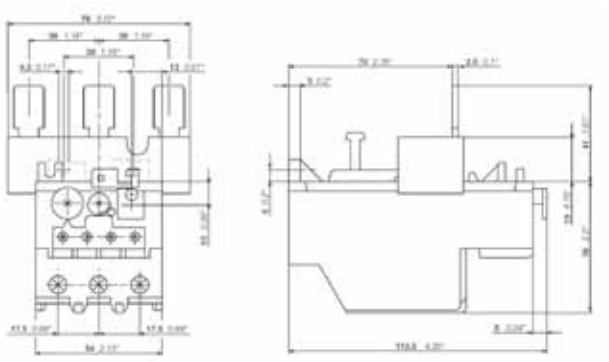
TA75DU-M



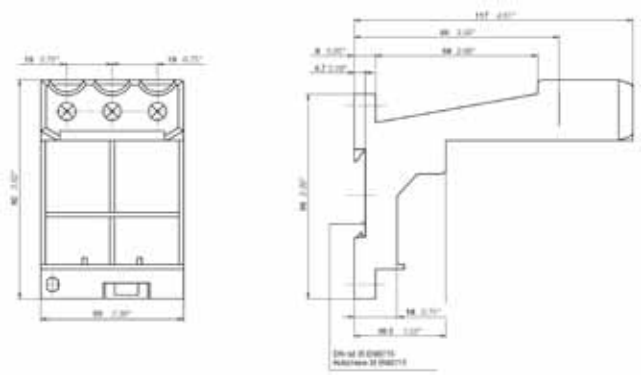
DB80

Thermal overload relays TA80DU / TA110DU / TA200DU
Dimensions

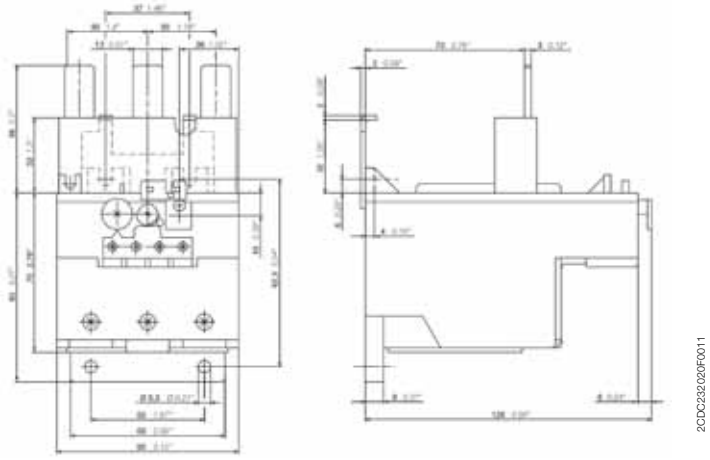
Main dimensions mm, inches



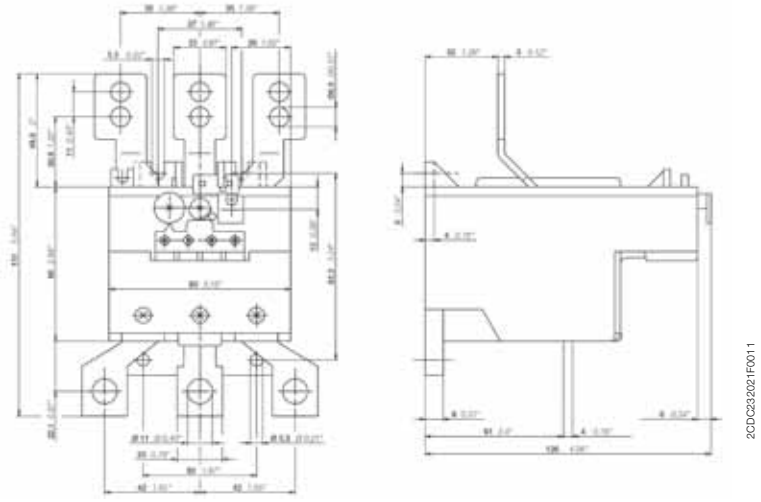
TA80DU



DB80



TA110DU



TA200DU

Electronic overload relays E16DU, E45DU, E80DU, E140DU
0.10 to 140 A

E16DU

E45DU

2CDC231003F0006

E80DU-80

E140DU

Description

The E16DU up to E140DU are self-supplied electronic overload relays, which means no extra external supply is needed. It offers reliable protection for motors in the event of overload or phase failure. Easy to use like a thermal overload relay and compatible with standard motor applications, the electronic overload relay is convincing, above all, due to its wide setting range, high accuracy, high operational temperature range and the possibility to select a trip class (10E, 20E, 30E). Further features are the temperature compensation, trip contact (N.C.), signal contact (N.O.), automatic or manual reset selectable, trip-free mechanism, STOP and TEST function and a trip indication. The overload relays are connected directly to the contactors. Single mounting kits are available as accessory.

Ordering details

Setting range A	Short-circuit protective device	Trip class	Type	Order code	Weight (1 pce) kg
E16DU electronic overload relays					
0.10 ... 0.32	1 A, Fuse type gG	10E, 20E, 30E	E16DU-0.32	1SAX111001R1101	0.150
0.30 ... 1.00	4 A, Fuse type gG	10E, 20E, 30E	E16DU-1.0	1SAX111001R1102	0.150
0.80 ... 2.70	10 A, Fuse type gG	10E, 20E, 30E	E16DU-2.7	1SAX111001R1103	0.150
1.90 ... 6.30	20 A, Fuse type gG	10E, 20E, 30E	E16DU-6.3	1SAX111001R1104	0.150
5.70 ... 18.9	50 A, Fuse type gG	10E, 20E, 30E	E16DU-18.9	1SAX111001R1105	0.150
E45DU electronic overload relays					
9.00 ... 30.0	160 A, Fuse type gG	10E, 20E, 30E	E45DU-30	1SAX211001R1101	0.350
15.0 ... 45.0	160 A, Fuse type gG	10E, 20E, 30E	E45DU-45	1SAX211001R1102	0.350
E80DU electronic overload relay					
27.0 ... 80.0 A	250 A	10E, 20E, 30E	E80DU-80	1SAX311001R1101	0.770
E140DU electronic overload relay					
50.0 ... 140.0 A	400 A	10E, 20E, 30E	E140DU-140	1SAX321001R1101	0.915

1SYN829571C201

Electronic overload relays E16DU, E45DU, E80DU, E140DU
Technical data

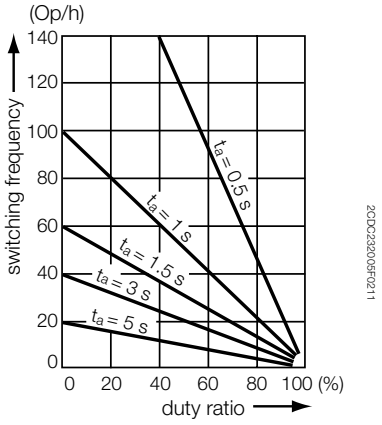
Main circuit – Utilization characteristics according to IEC/EN

Type	E16DU	E45DU	E80DU	E140DU
Standards	IEC 60947-1 / 60947-4-1 / 60947-5-1 and EN 60947-1 / 60947-4-1 / 60947-5-1			
Rated operational voltage U_e	690 V AC		1000 V AC	
Rated frequency	50/60 Hz			
Trip class	10E, 20E, 30E, selectable			
Number of poles	3			
Duty time	100 %			
Operating frequency without early tripping	Up to 15 operations/h, see "Technical diagram – Intermittent periodic duty"			
Rated impulse withstand voltage U_{imp}	6 kV			
Rated insulation voltage U_i	690 V AC		1000 V AC	

Auxiliary circuit according to IEC/EN

Type		E16DU	E45DU	E80DU	E140DU
Rated operational voltage U_e		600 V AC / DC			
Conventional free air thermal current I_{th}		6 A			
Rated frequency		DC, 50/60 Hz			
Number of poles		1 N.C. + 1 N.O.			
I_e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category					
110-120 V	50/60 Hz	3.00 A			
220-230-240 V	50/60 Hz	3.00 A			
440 V	50/60 Hz	1.10 A			
480-500 V	50/60 Hz	0.72 A			
I_e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category					
24 V		1.50 A			
60 V		0.55 A			
110-120-125 V		0.55 A			
250 V		0.27 A			
Minimum switching capacity		12 V / 3 mA			
Short-circuit protective device		6 A, Fuse type gG			
Rated impulse withstand voltage U_{imp}		6 kV			
Rated insulation voltage U_i		690 V			

Technical diagram – Intermittent periodic duty



t_a: Motor starting time

E16DU, E45DU, E80DU, E140DU electronic overload relays
Technical data

General technical data

Type	E16DU	E45DU	E80DU	E140DU
Pollution degree	3			
Phase loss sensitive	Yes			
Ambient air temperature				
Operation Open - compensated	-25 ... +70 °C			
Storage	-50 ... +85 °C			
Ambient air temperature compensation	Continuous			
Maximum operating altitude permissible	2000 m			
Resistance to shock acc. to IEC 60068-2-27	15 g / 11 ms			
Resistance to vibrations acc. to IEC 60068-2-6	5 g / 3 ... 150 Hz			
Mounting position	Position 1-6			
Mounting	Mount on the contactor and tighten the screws of the main circuit terminals or with single mounting kit			
Degree of protection	IP20			

Electrical connection

Main circuit

Type		E16DU	E45DU	E80DU	E140DU
Connecting capacity					
Rigid	1 x	1 ... 4 mm²	2.5 ... 16 mm²	6 ... 95 mm²	6 ... 95 mm²
	2 x	1 ... 4 mm²	2.5 ... 16 mm²	6 ... 35 mm²	6 ... 35 mm²
Flexible with insulated ferrule	1 x	0.75 ... 2.5 mm²	2.5 ... 10 mm²	6 ... 70 mm²	6 ... 70 mm²
	2 x	0.75 ... 2.5 mm²	2.5 ... 10 mm²	6 ... 35 mm²	6 ... 35 mm²
Stripping length		9 mm	13 mm	-	-
Tightening torques		0.8 - 1.5 Nm / 7 lb.in	2.3 - 2.6 Nm / 22 lb.in	6 - 6.5 Nm / 53 lb.in	6 - 6.5 Nm / 53 lb.in
Connection screw		M3.5 (Pozidriv 2)	M5 (Pozidriv 2)	M8 (inbus 4)	M8 (inbus 4)

Auxiliary circuit

Type		E16DU	E45DU	E80DU	E140DU
Connecting capacity					
Rigid	1 x or 2 x	1 ... 4 mm²			
Flexible with ferrule	1 x or 2 x	0.75 ... 2.5 mm²			
Flexible with insulated ferrule	1 x or 2 x	0.75 ... 2.5 mm²			
Flexible	1 x or 2 x	0.75 ... 2.5 mm²			
Stripping length		9 mm			
Tightening torques		0.8 ... 1.2 Nm / 7 lb.in			
Connection screw		M3.5 (Pozidriv 2)			

1SYN829571C201

E16DU, E45DU, E80DU, E140DU electronic overload relays
Accessories

DB16E

DB45E

DB80E

DB140E

Description

Single mounting kits are available as accessory for E16DU, E45DU, E80DU, and E140DU. The single mounting kits offer the possibility to mount the overload relay separately from the contactor.

Ordering details

For thermal overload relays **Single mounting kits**	Description	Type	Order code	Weight (1 pce) **kg**
E16DU	Single mounting kit	DB16E	1SAX101110R0001	0.035
E45DU	Single mounting kit	DB45E	1SAX201110R1001	0.090
E80DU	Single mounting kit	DB80E	1SAX301110R1001	0.145
E140DU	Single mounting kit	DB140E	1SAX301110R1002	0.145

1SYN829571C201

EF205, EF370 electronic overload relays
63 to 380 A

EF205-210

EF370-380

KPR-101L

Description

The EF205 and EF370 are self-supplied electronic overload relays, which means no extra external supply is needed. It offers reliable protection for motors in the event of overload or phase failure. Easy to use like a thermal overload relay and compatible with standard motor applications, the electronic overload relay is convincing, above all, due to its wide setting range, high accuracy, high operational temperature range and the possibility to select a trip class (10E, 20E, 30E). Further features are the temperature compensation, trip contact (N.C.), signal contact (N.O.), automatic or manual reset selectable, trip-free mechanism, STOP and TEST function and a trip indication. The overload relays are connected directly to the contactors.

Ordering details

Setting range A	Short-circuit protective device	Trip class	Type	Order code	Weight (1 pce) kg
63 ... 210	1250 A, Fuse type gG	10E, 20E, 30E	EF205-210	1SAX531001R1101	1.210
115 ... 380	1600 A, Fuse type gG	10E, 20E, 30E	EF370-380	1SAX611001R1101	1.430

Ordering details accessories

For thermal overload relays A	Description	Type	Order code	Weight (1 pce) kg
EF205, EF370	Reset push button*	KPR-101L	1SFA616162R1014	0.027

*Note: for more information see catalogue 1SFC151004C0201

EF205, EF370 electronic overload relays
Technical data

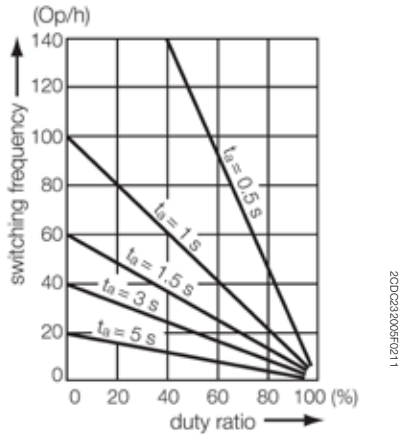
Main circuit – Utilization characteristics according to IEC/EN

Type	EF205, EF370
Standards	IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 60947-5-1
Rated operational voltage U_e	1000 V AC
Rated frequency	50/60 Hz – not suitable for DC applications
Trip class	10E, 20E, 30E, selectable
Number of poles	3
Duty time	100 %
Operating frequency without early tripping	Up to 15 operations/h, see "Technical diagram – Intermittent periodic duty"
Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	1000 V

Auxiliary circuit according to IEC/EN

Type		EF205, EF370
Rated operational voltage U_e		600 V AC / DC
Conventional free air thermal current I_{th}		6 A
Rated frequency		DC, 50/60 Hz
Number of poles		1 N.C. + 1 N.O.
I_e / Rated operational current AC-15 acc. to IEC/EN 60947-5-1 for utilization category		
110-120 V	50/60 Hz	3.00 A
220-230-240 V	50/60 Hz	3.00 A
400 V	50/60 Hz	1.10 A
480-500 V	50/60 Hz	0.75 A
I_e / Rated operational current DC-13 acc. to IEC/EN 60947-5-1 for utilization category		
24 V		1.50 A
60 V		0.55 A
110-120-125 V		0.55 A
250 V		0.27 A
Minimum switching capacity		12 V / 3 mA
Short-circuit protective device		6 A, Fuse type gG
Rated impulse withstand voltage U_{imp}		6 kV
Rated insulation voltage U_i		690 V

Technical diagram – Intermittent periodic duty



t_a: Motor starting time

EF205, EF370 electronic overload relays
Technical data

General data

Type			**EF205, EF370**
Pollution degree			3
Phase loss sensitive			Yes
Ambient air temperature			
Operation	Open - compensated		-25 ... +70 °C
Storage			-50 ... +85 °C
Ambient air temperature compensation			Acc. to IEC/EN 60947-4-1
Maximum operating altitude permissible			2000 m
Resistance to shock acc. to IEC 60068-2-27			25g / 11 ms
Resistance to vibrations acc. to IEC 60068-2-6			5g / 3 ... 150 Hz
Mounting position			Position 1-6
Mounting			Mount on the contactor and tighten the screws of the main circuit terminals
Degree of protection	Housing		IP20
	Main circuit terminals		IP20

Electrical connection

Main circuit

Type			**EF205**	**EF370**
Connecting capacity				
	Rigid	1 x	16 ... 185 mm²	50 ... 240 mm²
		2 x	16 ... 120 mm²	50 ... 150 mm²
	Flexible	1 x	16 ... 185 mm²	50 ... 240 mm²
		2 x	16 ... 120 mm²	50 ... 150 mm²
	Lugs	L ≤	24 mm	32 mm
	Bars	Ø >	8 mm	10 mm
Stripping length			-	-
Tightening torques			18 Nm / 160 lb.in	28 Nm / 247 lb.in
Connection screw			M8	M10

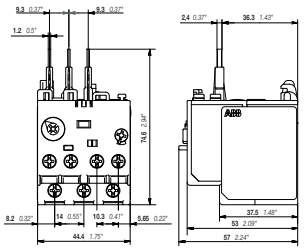
Auxiliary circuit

Type			**EF205, EF370**
Connecting capacity			
	Rigid	1 or 2 x	1 ... 4 mm²
	Flexible with ferrule	1 or 2 x	0.75 ... 2.5 mm²
	Flexible with insulated ferrule	1 or 2 x	0.75 ... 2.5 mm²
	Flexible	1 or 2 x	0.75 ... 2.5 mm²
Stripping length			9 mm
Tightening torques			0.8 ... 1.2 Nm / 7 ... 11 lb.in
Connection screw			M3.5 (Pozidriv 2)

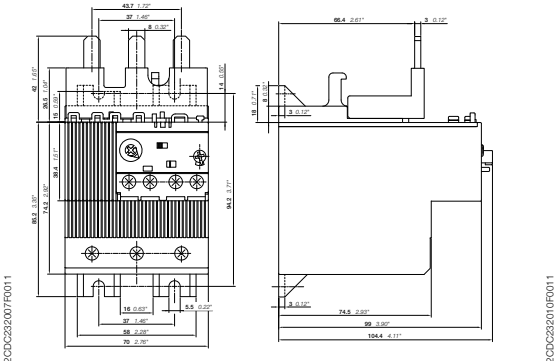
1SYN829571C201

Electronic overload relays E16DU, E45DU, E80DU, E140DU
Dimensions

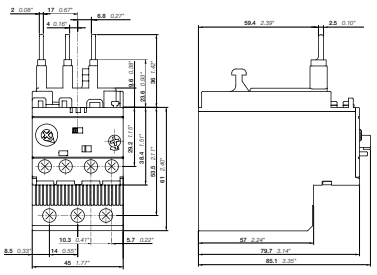
Main dimensions mm, inches



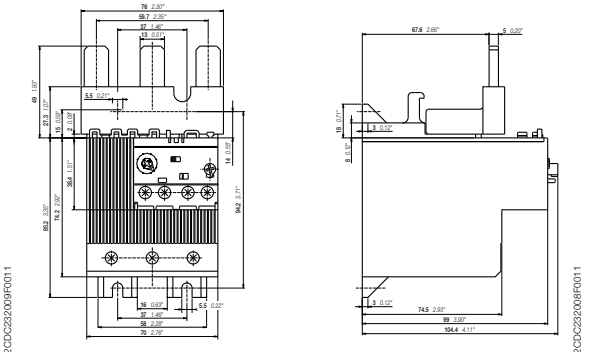
E16DU



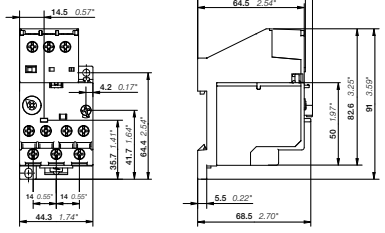
E80DU



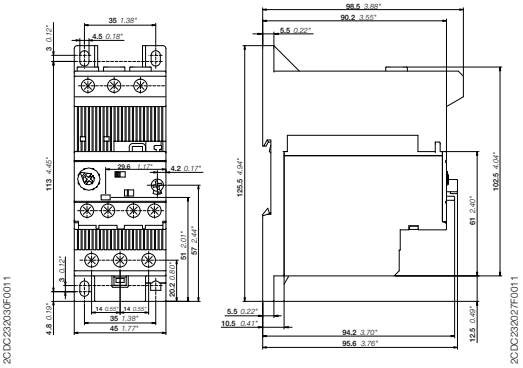
E45DU



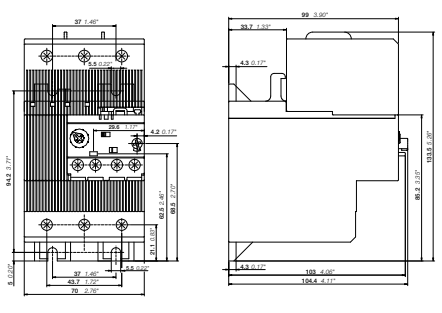
E140DU



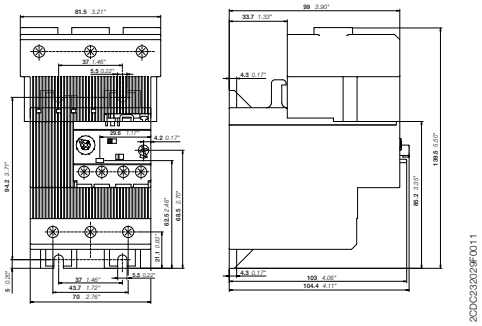
DB16E



DB45E



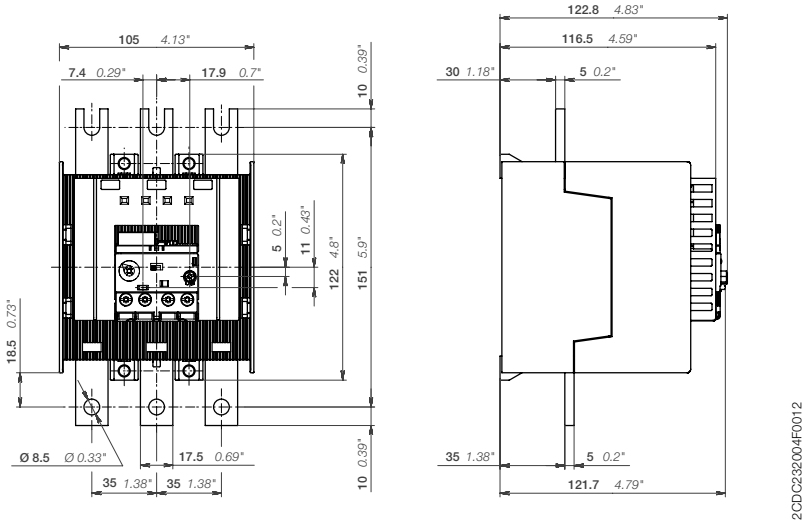
DB80E



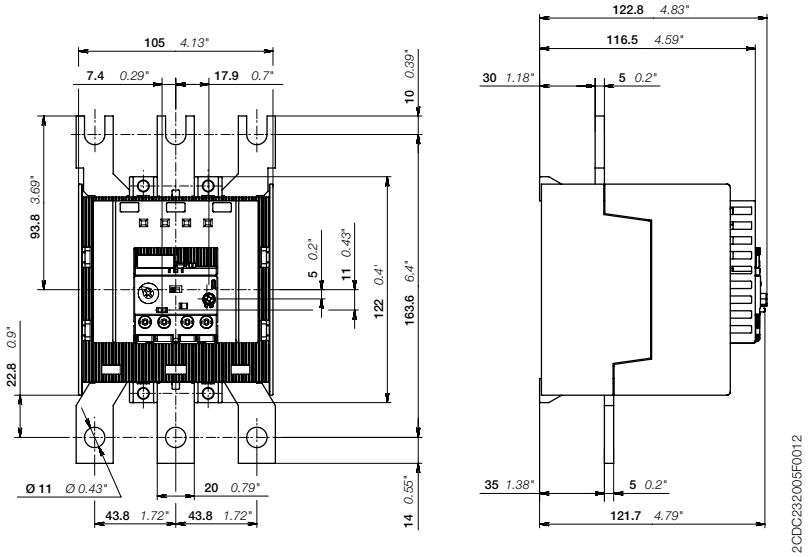
DB140E

Electronic overload relays EF205, EF370
Dimensions

Main dimensions mm, inches



EF205-210



EF370-380

General technical data

1SYN829571C201

Coordination with short-circuit protection devices

In compliance with standards IEC 60947-4-1, we define for the contactors and starters the type, rating and characteristics of the short-circuit protection devices SCPD which allow selective protection against overloads and ensure protection against short circuits.

Basic functions

Any starter is designed to:
– start motors,
– ensure continuous functioning of motors,
– disconnect motors from the supply line,
– guarantee protection of motors against overloads.

The starter is typically made up of a switching device (contactor) and an overload protection device (thermal overload relay or electronic overload relay).

These two devices MUST be coordinated with equipment capable of providing protection against short circuit (SCPD: short circuit protective device): typically a circuit breaker with magnetic release only or a switch fuse. These are not necessarily part of the starter.

Applicable standards

IEC 60947-4-1 (EN 60947-4-1) precisely defines the different points to be considered in order to carry out correct coordination.

Complete coordination for a combination includes the following points:
– Selectivity test between the overload relay and the short-circuit protection device SCPD.
– Short-circuit condition tests:
  - at prospective "r" currents - These currents depend on the rated operational current of the starter (Ie AC-3) and are given by the standard (Table 13). For example:
    r = 1kA for Ie AC-3 < 16 A
    r = 3 kA for 16 A < Ie AC-3 < 63 A
    r = 5 kA for 63 A < Ie AC-3 < 125 A etc.
  - at the rated conditional short-circuit current "Iq" - This is the maximum prospective current that the combination can withstand, for example 50 kA.

Types of coordination

IEC 60947-4-1 (EN 60947-4-1) defines two types of coordination according to the expected level of service continuity. Acceptable extreme damage for the switchgear is divided into two types.

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. In this case, the manufacturer must stipulate the measures to be taken with respect to maintenance of the equipment.

The complete ABB offer

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 includes 400 V, 500 V, 690 V networks.

A complete data base of coordination tables, according to IEC 60947-4-1 (EN 60947-4-1), is available on the ABB Website.

In the coordination tables the following short-circuit protection devices are recommended:
– Moulded case circuit-breakers (MCCBs)
– Miniature circuit-breakers (MCBs)
– Switch-disconnector-fuses (aM, gG and BS)
– Manual Motor Starters (MMS).

General remarks applicable to all tables

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

1SYN829571C201

Terms and technical definitions

Circuits
– auxiliary circuit: All the conductive parts of a contactor designed to be inserted in a different circuit from the main circuit and the contactor control circuits.
– control circuit: All the conductive parts of a contactor (other than the main circuit and the auxiliary circuit) used to control the contactor's closing operation or opening operation or both.
– main circuit: All the conductive parts of a contactor designed to be inserted in the circuit that it controls.

Thermal overload relay tripping classes
IEC 60947-4-1 defines tripping classes 10 A, 10, 20 and 30. Types 10 A, 10, etc. correspond to the maximum tripping time for a making current at 7.2 times the setting current.

Furthermore, for each class the standard specifies the tripping time for 1.5 times the setting current and sets the non tripping condition at 1.05 times the setting current.

All these data are summarized in the table below.

Extract from IEC 60947-4-1:

Tripping class		10 A	10	20	30
Max. tripping time for 1.5 times the setting current (warm state)	s	120	240	480	720
Tripping time for 7.2 times the setting current (cold state)	s	2 - 10	4 - 10	6 - 20	9 - 30
For 1.05 times the setting current		No tripping			

Electromagnetic compatibility
AF... contactors comply with IEC 60947-1, 60947-4-1 and EN 60947-1, 60947-4-1 standards.

Definitions:

Environment A: "Mainly relates to low-voltage non public or industrial networks/locations/installations (EN 50082-2 article 4) including highly disturbing sources".

Environment B: "Mainly relates to low-voltage public networks (EN 50082-1 article 5) such as residential, commercial and light industrial locations/installations. Highly disturbing sources such as arc welders are not covered by this environment".

Notice for AF09 ... AF38, AF116 ... AF2650 contactors and NF contactor relays: these products have been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in wich case the user may be required to take adequate mitigation measures.

AF40 ... AF96 have been designed for environment B.

Definitions according to SEMI F47-0706
SEMIF47-0706 defines the voltage sag immunity required for semiconductor processing, metrology and automated test equipment, and on subsystems and components which are used in the construction of semiconductor processing equipment including but not limited to:
– Power supplies
– Generators
– Robots and factory interface
– Chillers, pumps, blowers
– AC operated contactors and contactor relays
– voltage sag: an rms reduction in the AC voltage, at the power frequency, for durations from a half cycle to a few seconds.

The IEC terminology for this phenomenon is voltage dip.

voltage sag immunity: the ability of equipment to withstand momentary electrical power interruptions or sags

Coordination of protections against short circuit
The goal here is to protect electromechanical starters and softstarters.

Any starter is designed to:
– start motors,
– ensure continuous functioning of motors,
– disconnect motors from the supply line,
– guarantee protection of motors against overloads.

The starter is typically made up of a switching device (contactor) and an overload protection device (thermal overload relay or electronic overload relay). These two devices MUST be coordinated with equipment capable of providing protection against short circuit (SCPD: short circuit protective device): typically a circuit breaker with magnetic release only or a switch fuse. These are not necessarily part of the starter.

The characteristics of the starter must comply with the international standard IEC 60947-4-1 which defines the above items as follows:

contactor: a mechanical switching device having only one position of rest, operated otherwise than by hand, capable of making, carrying and breaking currents under normal circuit conditions including overload conditions.

overload release: overload relay or release which operates in the case of overload and also in case of loss of phase.

circuit-breaker: defined by IEC 60947-2 as a mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time and breaking currents under specified abnormal circuit conditions.

IEC publication 60947-4-1 defines coordination types "1" and "2":
– Type "1" coordination requires that, in the event of a short-circuit, the contactor or starter does not endanger persons or installations and will not then be able to operate without being repaired or parts being replaced.
– Type "2" coordination requires that, 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 being light welded is acceptable. In this case, the manufacturer must stipulate the measures to be taken with respect to maintenance of the equipment.

Rated operational current Ie.
Current rated by the manufacturer. It is mainly based on the rated operational voltage Ue, the rated frequency, the utilization category, the rated duty and the type of protective enclosure, if necessary.

Conventional free air thermal current Ith
Current that the contactor can withstand in free air for a duty time of 8 hours without the temperature rise of its various parts exceeding the maximum values given by the standard.

Operating cycle or cycle
Includes one making operation and one breaking operation.

Cycle time
This is the sum of the current flow time and the no-current time for given cycle.

Electrical durability
Number of on-load operating cycles that the contactor is able to carry out. It depends on the operational current, the operational voltage and the utilization category.

1SYN829571C201

Terms and technical definitions

Mechanical durability
Number of no-current operating cycles that a contactor is able to carry out.

Assessed failure rate
Defined according to IEC 60947-5-4. This rate is given in standard industrial environments for the contactor relays and for the built-in auxiliary contact of contactors.

Load factor
Ratio of the on-load operating time to the total cycle time x 100.

Switching frequency
Number of switching cycles per hour.

Plugging
Stopping or fast reversal in rotation direction of a motor by two supply leads being interchanged while the motor is running.

Inching
Energization of a motor's circuit repeatedly or for short periods with the aim of obtaining small movements of the driven mechanism.

Coil operating limits
Expressed in multiples of the nominal control circuit voltage Uc for the upper and lower limits.

Mounting position
Comply with the manufacturer's instructions. Restrictions are to be taken into account for certain mounting positions.

Rated breaking or making capacity
Root mean square (r.m.s.) value of the current that the contactor is able to break or make at a given voltage according to the conditions specified by standards and for a given utilization category.

Intermittent duty
Duty during which the contactor is successively closed or open for periods which are too short to enable the contactor to achieve thermal balance.

Ambient temperature
Air temperature close to the contactor.

Time
- Time constant: Ratio of the inductance to the resistance (L/R = mH/Ω = ms).
- Short-time withstand current: Current that the contactor is able to withstand in closed position for a short time interval and in specified conditions.
- Closing time: Time interval between the coil energization and the instant the contacts touch on all the poles.
- Opening time: Time interval between the coil de-energization and the instant the contacts separate on all the poles.

Rated control voltage Uc
Control voltage value for which the control circuit is sized.

Rated operational voltage Ue
Voltage to which the contactor's utilization characteristics refer. In three-phase it is the phase-to-phase voltage.

Rated insulation voltage Ui
Reference voltage for dielectric tests and creepage distances.

Rated impulse withstand voltage Uimp
Peak value of an impulse voltage, having a specified form and polarity, which does not cause breakdown in specific test conditions.

Shock withstand
Requirement for vehicles, crane drives, installations on board ships and plug-in equipment. For the acceptable "g" values, the contacts must not change position and the thermal overload relays must not trip.

Resistance to vibrations
Requirements for vehicles, boats and other means of transport. For the specified vibration amplitude and frequency values the device must remain able to operate.

1SYN829571C201

Standards and utilization categories

Utilization categories:

A contactor's duty is characterised by the utilization category together with the rated operational voltage and current indicated.

Utilization categories for contactors according to IEC 60947-4-1:

Alternating current:	AC-1	Non-inductive or slightly inductive loads, resistance furnaces.
	AC-2	Slip-ring motors: starting, switching off.
	AC-3	Cage motors: starting, switching off running motors.
	AC-4	Cage motors: starting, plugging, inching.
	AC-5a	Discharge lamp switching.
	AC-5b	Incandescent lamp switching.
	AC-6a	Transformer switching.
	AC-6b	Capacitor bank switching.
	AC-8a	Hermetic refrigeration compressor motor control with manual resetting of overload releases.
	AC-8b	Hermetic refrigeration compressor motor control with automatic resetting of overload releases.
Direct current:	DC-1	Non inductive or slightly inductive loads, resistance furnaces.
	DC-3	Shunt motors: starting, plugging, inching, dynamic breaking of DC motors.
	DC-5	Series motors: starting, plugging, inching, dynamic breaking of DC motors.
	DC-6	Incandescent lamp switching.

Utilization categories for contactor relays according to IEC 60947-5-1:

Alternating current:	AC-12	Control of resistive loads and static loads with opto-coupler isolation.
	AC-13	Control of static loads with transformer isolation.
	AC-14	Control of weak electromagnetic loads (≤ 72 VA).
	AC-15	Control of electromagnetic loads (> 72 VA).
Direct current:	DC-12	Control of resistive loads and static loads with opto-coupler isolation.
	DC-13	Control of DC electromagnets.
	DC-14	Control of DC electromagnets having economy resistors.

In fact some applications, and the specific criteria characterizing the various loads controlled by contactors, may modify the utilization characteristics of the contactors. The main applications concerned are:

Capacitor bank switching

Account must be taken of high peaks when the current is made and of harmonic currents during continuous duty. For this application, IEC publication 60947-4-1 stipulates utilization category AC-6b. The operational currents or powers acceptable for the contactors are determined by our electrical tests; IEC publication 60947-4-1 gives the calculating formula for determining the operational current (Table 9).

Transformer switching

Account must be taken of the peaks due to magnetization phenomena when the current is made.

For this application, IEC publication 60947-4-1 stipulates utilization category AC-6a. The operational currents or powers acceptable for the contactors are determined using the values obtained for AC-3 or AC-4 category tests and the calculating formula given in IEC 60947-4-1 (Table 9).

Lighting circuit switching

The current peaks occurring on energization of the circuit and the power factor depend on the type of lamps, the connection mode and whether or not there is compensation.

For this application, IEC publication 60947-4-1 stipulates two standard utilization categories:

– AC-5a for discharge lamp switching.
– AC-5b for incandescent lamp switching.

Slip-ring motor switching

The contactors used for short-circuiting rotor resistors can be used for rotor voltages up to 2 times the rated operational voltage.

The conditions of use of rotor contactors depend on the connection mode of the main poles. IEC 60947-4-1 stipulates AC-2 utilization category for startor contactor.

1SYN829571C201

Utilization categories (cont.)

DC power circuit switching
Arc suppression is more difficult in direct current than in alternating current. Higher the time constant and voltage, heavier the breaking conditions: consequently several poles have to be connected in series.

AC high current circuit switching
Possibility of increasing performances by connecting poles in parallel.

Circuit switching during temporary and intermittent duty
In these cases higher operational currents are acceptable.

Influence of the length of the conductors used in the contactor control circuit
According to the operational voltages, the cross-sectional areas, the coil consumption and the control layout, difficulties due to line resistances and capacitances may appear during contactor closing and opening orders.

Making and breaking conditions for utilization categories

Utilization category		Durability test conditions						Occasional operation Making and breaking capacities - 50 operating cycles					
		Making conditions			Breaking conditions			Making conditions			Breaking conditions		
		I/Ie	U/Ue	Cos. ϕ or L/R (ms)	I/Ie	U/Ue	Cos. ϕ or L/R (ms)	Ic/Ie	Ur/Ue	Cos. ϕ or L/R (ms)	Ic/Ie	Ur/Ue	Cos. ϕ or L/R (ms)
Contactors for AC circuit switching													
AC-1		1	1	0.95	1	1	0.95	1.5	1.05	0.8	1.5	1.05	0.8
AC-2		2.5	1	0.65	2.5	1	0.65	4	1.05	0.65	4	1.05	0.65
AC-3	Ie < 17 A	6	1	0.65	1	0.17	0.65	10	1.05	0.45	8	1.05	0.45
	17 < Ie <100 A	6	1	0.35	1	0.17	0.35	10	1.05	0.45	8	1.05	0.45
	Ie >100 A	6	1	0.35	1	0.17	0.35	10	1.05	0.35	8	1.05	0.35
AC-4	Ie < 17 A	6	1	0.65	6	1	0.65	12	1.05	0.45	10	1.05	0.45
	17 < Ie <100 A	6	1	0.35	6	1	0.35	12	1.05	0.45	10	1.05	0.45
	Ie >100 A	6	1	0.35	6	1	0.35	12	1.05	0.35	10	1.05	0.35
Contactors for DC circuit switching													
DC-1		1	1	1	1	1	1	1.5	1.05	1	1.5	1.05	1
DC-3		2.5	1	2	2.5	1	2	4	1.05	2.5	4	1.05	2.5
DC-5		2.5	1	7.5	2.5	1	7.5	4	1.05	15	4	1.05	15
Contactor relays for AC circuit switching													
AC-14	(≤ 72 VA)	–	–	–	–	–	–	6	1.1	0.7	6	1.1	0.7
AC-15	(> 72 VA)	10	1	0.7	1	1	0.4	10	1.1	0.3	10	1.1	0.3

Contactor relays for AC circuit switching

Utilization category	Standard operation						Occasional operation Making and breaking capacities - 50 operating cycles					
	Making conditions			Breaking conditions			Making conditions			Breaking conditions		
	I/Ie	U/Ue	$T_{0.95}$	I/Ie	U/Ue	$T_{0.95}$	Ic/Ie	Ur/Ue	$T_{0.95}$	Ic/Ie	Ur/Ue	$T_{0.95}$
DC-13	1	1	6 P(1)	1	1	6 P(1)	1.1	1.1	6 P(1)	1.1	1.1	6 P(1)
DC-14	–	–	–	–	–	–	10	1.1	15 ms	10	1.1	15 ms

(1) The value "6 x P" is the result of an empirical relation which is estimated to represent most DC magnetic loads up to the highest limit of P = 50 W (6 x P = 300 ms). It is accepted that loads having drawn energy above 50 W are made up of weaker loads in parallel. As a consequence, the 300 ms value must form the highest limit whatever the value of the power drawn.

Key:
U (I) = applied voltage (current)
Ur = recovery voltage
L/R = test circuit time constant
Ue (Ie) = rated operational voltage (current)
Ic = making and breaking current expressed in DC or in AC like the r.m.s. value of the symmetrical components
$T_{0.95}$ = time required to reach 95% of the current in steady-state conditions, expressed in milliseconds

1SYN829571C201

Degrees of protection

General

In an installation, the degree of protection required for electrical equipment depends on the environmental characteristics. The degree of protection, ensured by the enclosure of equipment or by the cubicle containing the equipment is expressed by the IP code which gives the level of protection against access to hazardous parts, the ingress of foreign bodies and/or the ingress of water, in compliance with IEC 60529, IEC 60947-1.

Besides the IP symbol, the complete code has two figures followed (optionally) by two additional letters. A short description of the elements used in IP coding is given below.

IP... code	Figures or letters	Specifications for installation protection	Protection of persons
First figure		Against ingress of foreign bodies	Against access to hazardous parts with:
	0	No protection	No protection
	1	Diameter > 50 mm	Back of hand
	2	Diameter > 12.5 mm	Finger
	3	Diameter > 2.5 mm	Tool
	4	Diameter > 1 mm	Wire
	5	Limited protection against dust	Wire
	6	Total protection against dust	Wire
Second figure		Against entrance of water having a harmful effect	
	0	No protection	
	1	Vertical dripping	
	2	Dripping at a vertical angle of < 15°	
	3	Rain at a vertical angle of < 60°	
	4	Splashing	
	5	Low pressure water jet	
	6	Powerful water jets	
	7	Temporary immersion	
	8	Permanent immersion	
Additional letter (optional) for use with:		Against ingress of foreign bodies	Against access to hazardous parts with:
First figure 0	A	Stopped by a barrier with a 50 mm Ø sphere	Back of hand
First figure 0 or 1	B	Entrance of test finger limited to 80 mm	Finger
First figure 1 or 2	C	Wire with 2.5 mm Ø and length of 100 mm	Tool
First figure 2 or 3	D	Wire with 1 mm Ø and length of 100 mm	Wire
Additional letter (optional)		Specific additional information	
	H	High voltage apparatus	–
	M	Moving parts which are moving during water test	
	S	Moving parts which are stationary during water test	
	W	Specified atmospheric conditions	

Note: The type of enclosure or cubicle in which the equipment must be installed prevails with respect to the degree of protection.

1SYN829571C201

Notes

1SYN829571C201

Notes

1SYN829571C201

Index
Order code classification

Type	Order Code	Page
AX09-30-10-81	1SBL901074R8110	**2**/3
AX09-30-01-81	1SBL901074R8101	**2**/3
AX09-30-10-88	1SBL901074R8810	**2**/3
AX09-30-01-88	1SBL901074R8801	**2**/3
AX09-30-10-84	1SBL901074R8410	**2**/3
AX09-30-01-84	1SBL901074R8401	**2**/3
AX09-30-10-80	1SBL901074R8010	**2**/3
AX09-30-01-80	1SBL901074R8001	**2**/3
AX09-30-10-86	1SBL901074R8610	**2**/3
AX09-30-01-86	1SBL901074R8601	**2**/3
AX12-30-10-81	1SBL911074R8110	**2**/3
AX12-30-01-81	1SBL911074R8101	**2**/3
AX12-30-10-88	1SBL911074R8810	**2**/3
AX12-30-01-88	1SBL911074R8801	**2**/3
AX12-30-10-84	1SBL911074R8410	**2**/3
AX12-30-01-84	1SBL911074R8401	**2**/3
AX12-30-10-80	1SBL911074R8010	**2**/3
AX12-30-01-80	1SBL911074R8001	**2**/3
AX12-30-10-86	1SBL911074R8610	**2**/3
AX12-30-01-86	1SBL911074R8601	**2**/3
AX18-30-10-81	1SBL921074R8110	**2**/3
AX18-30-01-81	1SBL921074R8101	**2**/3
AX18-30-10-88	1SBL921074R8810	**2**/3
AX18-30-01-88	1SBL921074R8801	**2**/3
AX18-30-10-84	1SBL921074R8410	**2**/3
AX18-30-01-84	1SBL921074R8401	**2**/3
AX18-30-10-80	1SBL921074R8010	**2**/3
AX18-30-01-80	1SBL921074R8001	**2**/3
AX18-30-10-86	1SBL921074R8610	**2**/3
AX18-30-01-86	1SBL921074R8601	**2**/3
AX25-30-10-81	1SBL931074R8110	**2**/3
AX25-30-01-81	1SBL931074R8101	**2**/3
AX25-30-10-88	1SBL931074R8810	**2**/3
AX25-30-01-88	1SBL931074R8801	**2**/3
AX25-30-10-84	1SBL931074R8410	**2**/3
AX25-30-01-84	1SBL931074R8401	**2**/3
AX25-30-10-80	1SBL931074R8010	**2**/3
AX25-30-01-80	1SBL931074R8001	**2**/3
AX25-30-10-86	1SBL931074R8610	**2**/3
AX25-30-01-86	1SBL931074R8601	**2**/3
AX32-30-10-81	1SBL281074R8110	**2**/4
AX32-30-01-81	1SBL281074R8101	**2**/4
AX32-30-10-88	1SBL281074R8810	**2**/4
AX32-30-01-88	1SBL281074R8801	**2**/4
AX32-30-10-84	1SBL281074R8410	**2**/4
AX32-30-01-84	1SBL281074R8401	**2**/4
AX32-30-10-80	1SBL281074R8010	**2**/4
AX32-30-01-80	1SBL281074R8001	**2**/4
AX32-30-10-86	1SBL281074R8610	**2**/4
AX32-30-01-86	1SBL281074R8601	**2**/4
AX40-30-10-81	1SBL321074R8110	**2**/4
AX40-30-01-81	1SBL321074R8101	**2**/4
AX40-30-10-88	1SBL321074R8810	**2**/4
AX40-30-01-88	1SBL321074R8801	**2**/4
AX40-30-10-84	1SBL321074R8410	**2**/4
AX40-30-01-84	1SBL321074R8401	**2**/4
AX40-30-10-80	1SBL321074R8010	**2**/4
AX40-30-01-80	1SBL321074R8001	**2**/4
AX40-30-10-86	1SBL321074R8610	**2**/4
AX40-30-01-86	1SBL321074R8601	**2**/4
AX50-30-00-81	1SBL351074R8100	**2**/5
AX50-30-00-88	1SBL351074R8800	**2**/5
AX50-30-00-84	1SBL351074R8400	**2**/5
AX50-30-00-80	1SBL351074R8000	**2**/5
AX50-30-00-86	1SBL351074R8600	**2**/5
AX65-30-00-81	1SBL371074R8100	**2**/5
AX65-30-00-88	1SBL371074R8800	**2**/5
AX65-30-00-84	1SBL371074R8400	**2**/5
AX65-30-00-80	1SBL371074R8000	**2**/5
AX65-30-00-86	1SBL371074R8600	**2**/5
AX80-30-00-81	1SBL411074R8100	**2**/5
AX80-30-00-88	1SBL411074R8800	**2**/5
AX80-30-00-84	1SBL411074R8400	**2**/5
AX80-30-00-80	1SBL411074R8000	**2**/5
AX80-30-00-86	1SBL411074R8600	**2**/5
AX50-30-11-81	1SBL351074R8111	**2**/6
AX50-30-11-88	1SBL351074R8811	**2**/6
AX50-30-11-84	1SBL351074R8411	**2**/6

Type	Order Code	Page
AX50-30-11-80	1SBL351074R8011	**2**/6
AX50-30-11-86	1SBL351074R8611	**2**/6
AX65-30-11-81	1SBL371074R8111	**2**/6
AX65-30-11-88	1SBL371074R8811	**2**/6
AX65-30-11-84	1SBL371074R8411	**2**/6
AX65-30-11-80	1SBL371074R8011	**2**/6
AX65-30-11-86	1SBL371074R8611	**2**/6
AX80-30-11-81	1SBL411074R8111	**2**/6
AX80-30-11-88	1SBL411074R8811	**2**/6
AX80-30-11-84	1SBL411074R8411	**2**/6
AX80-30-11-80	1SBL411074R8011	**2**/6
AX80-30-11-86	1SBL411074R8611	**2**/6
AX95-30-11-81	1SFL431074R8111	**2**/7
AX95-30-11-88	1SFL431074R8811	**2**/7
AX95-30-11-84	1SFL431074R8411	**2**/7
AX95-30-11-80	1SFL431074R8011	**2**/7
AX95-30-11-86	1SFL431074R8611	**2**/7
AX115-30-11-81	1SFL981074R8111	**2**/7
AX115-30-11-88	1SFL981074R8811	**2**/7
AX115-30-11-84	1SFL981074R8411	**2**/7
AX115-30-11-80	1SFL981074R8011	**2**/7
AX115-30-11-86	1SFL981074R8611	**2**/7
AX150-30-11-81	1SFL991074R8111	**2**/7
AX150-30-11-88	1SFL991074R8811	**2**/7
AX150-30-11-84	1SFL991074R8411	**2**/7
AX150-30-11-80	1SFL991074R8011	**2**/7
AX150-30-11-86	1SFL991074R8611	**2**/7
AX185-30-11-81	1SFL491074R8111	**2**/8
AX185-30-11-88	1SFL491074R8811	**2**/8
AX185-30-11-84	1SFL491074R8411	**2**/8
AX185-30-11-80	1SFL491074R8011	**2**/8
AX185-30-11-86	1SFL491074R8611	**2**/8
AX205-30-11-81	1SFL501074R8111	**2**/8
AX205-30-11-88	1SFL501074R8811	**2**/8
AX205-30-11-84	1SFL501074R8411	**2**/8
AX205-30-11-80	1SFL501074R8011	**2**/8
AX205-30-11-86	1SFL501074R8611	**2**/8
AX260-30-11-81	1SFL547074R8111	**2**/9
AX260-30-11-88	1SFL547074R8811	**2**/9
AX260-30-11-84	1SFL547074R8411	**2**/9
AX260-30-11-80	1SFL547074R8011	**2**/9
AX260-30-11-86	1SFL547074R8611	**2**/9
AX300-30-11-81	1SFL587074R8111	**2**/9
AX300-30-11-88	1SFL587074R8811	**2**/9
AX300-30-11-84	1SFL587074R8411	**2**/9
AX300-30-11-80	1SFL587074R8011	**2**/9
AX300-30-11-86	1SFL587074R8611	**2**/9
AX370-30-11-81	1SFL607074R8111	**2**/9
AX370-30-11-88	1SFL607074R8811	**2**/9
AX370-30-11-84	1SFL607074R8411	**2**/9
AX370-30-11-80	1SFL607074R8011	**2**/9
AX370-30-11-86	1SFL607074R8611	**2**/9
CA5X-10	1SBN019010R1010	**2**/13
CA5X-01	1SBN019010R1001	**2**/13
CA5X-22E	1SBN019040R1022	**2**/13
CA5X-31E	1SBN019040R1031	**2**/13
CA5X-40E	1SBN019040R1040	**2**/13
CA5X-04E	1SBN019040R1004	**2**/13
CA5X-22M	1SBN019040R1122	**2**/13
CA5X-31M	1SBN019040R1131	**2**/13
CA5X-13M	1SBN019040R1113	**2**/13
CA5X-04M	1SBN019040R1104	**2**/13
CA5X-22U	1SBN019040R1322	**2**/13
CA5X-31U	1SBN019040R1331	**2**/13
CA5X-40U	1SBN019040R1340	**2**/13
CA5X-04U	1SBN019040R1304	**2**/13
CA5X-22N	1SBN019040R1222	**2**/13
CA5X-31N	1SBN019040R1231	**2**/13
CA5X-13N	1SBN019040R1213	**2**/13
CA5X-04N	1SBN019040R1204	**2**/13
CA5X-40N	1SBN019040R1240	**2**/13
CAL5X-11	1SBN019020R1011	**2**/13
CAL18X-11	1SFN019820R1011	**2**/13
CAL18X-11B	1SFN019820R3311	**2**/13
CAL19-11	1SFN010820R1011	**2**/13
CAL19-11B	1SFN010820R3311	**2**/13
VM5-1	1SBN030100R1000	**2**/13
VM300H	1SFN034700R1000	**2**/13

Type	Order Code	Page
VM19	1SFN030300R1000	**2**/13
VE5-1	1SBN030110R1000	**2**/13
VE5-2	1SBN030210R1000	**2**/13
TEF5-ON	1SBN020312R1000	**2**/14
TEF5-OFF	1SBN020314R1000	**2**/14
BEA16/116	1SBN081406R1000	**2**/14
BEA40/450	1SBN083206R1000	**2**/14
BEA50/450	1SBN083506R1000	**2**/14
BEA75/495	1SBN084106R1000	**2**/14
BEA100/495	1SBN084506R1000	**2**/14
RV5/50	1SBN050010R1000	**2**/14
RV5/133	1SBN050010R1001	**2**/14
RV5/250	1SBN050010R1002	**2**/14
RV5/440	1SBN050010R1003	**2**/14
RC5-1/50	1SBN050100R1000	**2**/14
RC5-1/133	1SBN050100R1001	**2**/14
RC5-1/250	1SBN050100R1002	**2**/14
RC5-1/440	1SBN050100R1003	**2**/14
RC5-2/50	1SBN050200R1000	**2**/14
RC5-2/133	1SBN050200R1001	**2**/14
RC5-2/250	1SBN050200R1002	**2**/14
RC5-2/440	1SBN050200R1003	**2**/14
RC5-3/440	1SFN050300R1003	**2**/14
RC5-3/440	1SFN050300R1003	**2**/15
WB75-A	FPTN372726R1001	**2**/14
WB75-A	FPTN372726R1006	**2**/14
LT185-AC	1SFN124701R1000	**2**/15
LT185-AL	1SFN124703R1000	**2**/15
LT370-30C	1SFN125401R1000	**2**/15
LT370-30L	1SFN125403R1000	**2**/15
LX185	1SFN074707R1000	**2**/15
LX300	1SFN075107R1000	**2**/15
LW185	1SFN074710R1000	**2**/15
LW300	1SFN075110R1000	**2**/15
NX22E-81	1SBH901074R8122	**2**/34
NX22E-88	1SBH901074R8822	**2**/34
NX22E-84	1SBH901074R8422	**2**/34
NX22E-80	1SBH901074R8022	**2**/34
NX22E-86	1SBH901074R8622	**2**/34
NX31E-81	1SBH901074R8131	**2**/34
NX31E-88	1SBH901074R8831	**2**/34
NX31E-84	1SBH901074R8431	**2**/34
NX31E-80	1SBH901074R8031	**2**/34
NX31E-86	1SBH901074R8631	**2**/34
NX40E-81	1SBH901074R8140	**2**/34
NX40E-88	1SBH901074R8840	**2**/34
NX40E-84	1SBH901074R8440	**2**/34
NX40E-80	1SBH901074R8040	**2**/34
NX40E-86	1SBH901074R8640	**2**/34
TE5S-24	1SBN020010R1001	**2**/45
TE5S-120	1SBN020010R1002	**2**/45
TE5S-240	1SBN020010R1003	**2**/45
TE5S-440	1SBN020010R1004	**2**/45
CT-ERS.21	1SVR630100R0300	2/45
WB75-A- 24V	FPTN372726R1001	**2**/49
WB75-A- 42V	FPTN372726R1002	**2**/49
WB75-A- 48V	FPTN372726R1003	**2**/49
WB75-A- 110V	FPTN372726R1004	**2**/49
WB75-A- 220V	FPTN372726R1005	**2**/49
WB75-A- 230V	FPTN372726R1006	**2**/49
WB75-A- 380V	FPTN372726R1007	**2**/49
WB75-A- 415V	FPTN372726R1008	**2**/49
MS116-0.16	1SAM250000R1001	**3**/4
MS116-0.25	1SAM250000R1002	**3**/4
MS116-0.4	1SAM250000R1003	**3**/4
MS116-0.63	1SAM250000R1004	**3**/4
MS116-1.0	1SAM250000R1005	**3**/4
MS116-1.6	1SAM250000R1006	**3**/4
MS116-2.5	1SAM250000R1007	**3**/4
MS116-4.0	1SAM250000R1008	**3**/4
MS116-6.3	1SAM250000R1009	**3**/4
MS116-10	1SAM250000R1010	**3**/4
MS116-12	1SAM250000R1011	**3**/4
MS116-16	1SAM250000R1012	**3**/4
MS116-20	1SAM250000R1013	**3**/4
MS116-25	1SAM250000R1014	**3**/4
MS116-32	1SAM250000R1015	**3**/4

1SYN829571C201

Index
Order code classification

1SYN829571C201

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