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<http://new.abb.com/low-voltage/products/motor-protection>



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Motor rated operational powers and currents

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

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

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

AF..(Z)B..S 3-pole contactors and NF(Z)B..S contactor relays

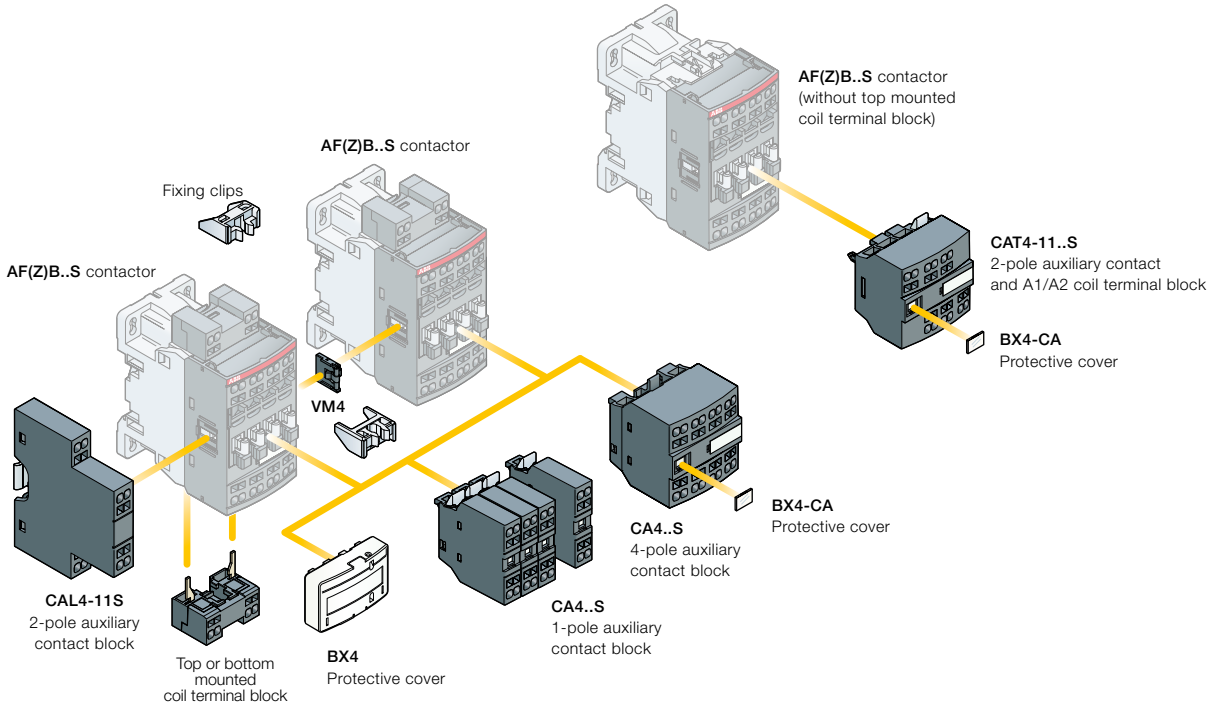
Spring terminals for connection with standard ferrules

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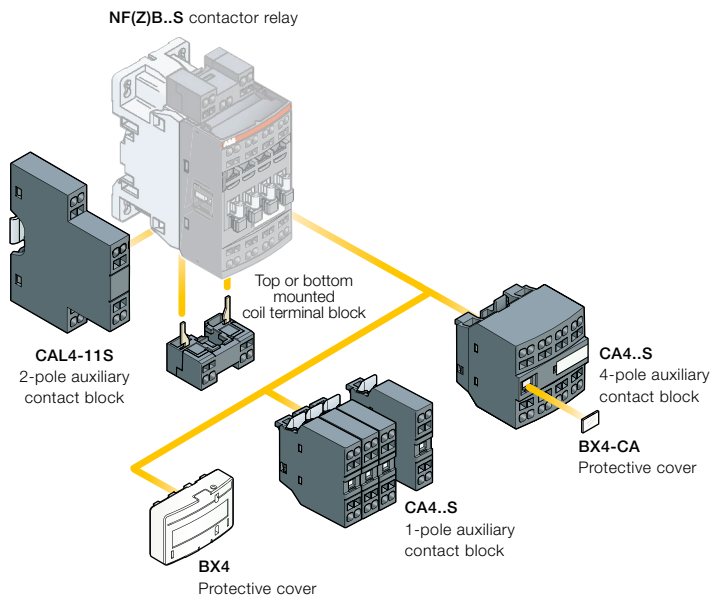
AF..(Z)B..S 3-pole contactors and NF(Z)B..S contactor relays

Spring terminals for connection with standard ferrules

Main accessories for AF..(Z)B..S 3-pole contactors



Main accessories for NF(Z)B..S contactor relays





AF..(Z)B..S 3-pole contactors

IEC	AC-3 Rated operational power	$\theta \leq 60\text{ }^{\circ}\text{C}$, 400 V	kW	4	5.5	7.5	11
UL/CSA	3-phase motor rating	480 V	hp	5	7.5	10	–
DC Control supply			Type	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
IEC	AC-3 Rated operational current	$\theta \leq 60\text{ }^{\circ}\text{C}$, 400 V	A	9	12	18	26
	AC-1 Rated operational current Ue max. $\leq 690\text{ V}$, 50/60 Hz	$\theta \leq 40\text{ }^{\circ}\text{C}$	A	22	24	24	35
		$\theta \leq 60\text{ }^{\circ}\text{C}$	A	18	20	20	30
		$\theta \leq 70\text{ }^{\circ}\text{C}$	A	15	16	16	25
	With conductor cross sectional area		mm ²	2.5	2.5	2.5	4
UL/CSA	General use rating	600 V	A	20	20	20	–
NEMA	NEMA Size			00	0	–	–



NF(Z)B..S contactor relays

Number of contacts										
DC Control supply 				Type	NF(Z)B22ES	NF(Z)B31ES	NF(Z)B40ES	NF(Z)B44ES	NF(Z)B62ES	NF(Z)B80ES
IEC	AC-15 Rated operational current	240 V	A	4	4	4	4	4	4	
		400 V	A	3	3	3	3	3	3	
		690 V	A	2	2	2	2	2	2	
	DC-13 Rated operational current	24 V	A	6	6	6	6	6	6	
		250 V	A	0.27	0.27	0.27	0.27	0.27	0.27	
UL/CSA Pilot Duty				A600, Q600			A600, Q600			



AF..(Z)B..S 3-pole and NF(Z)B..S contactor relays

Spring terminals for connection with standard ferrules

Ordering details

4 to 11 kW

AF09ZB..S ... AF26ZB..S	DC operated	6
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AF09ZB..S ... AF26ZB..S 3-pole contactors

4 to 11 kW

DC operated - spring terminals for connection with standard ferrules



AF09ZB-30-10S



AF26ZB-30-00S

Description

AF09ZB..S ... AF26ZB..S 3-pole contactors comply with the latest railway rolling stock standards to allow the use of AC voltages and allow installation in passengers or driver cabins for trains frequently operating tunnels or undergrounds. They are mainly used for controlling 3-phase motors and power circuits up to 690 V AC and 220 V DC. These contactors are of the block type design with 3 main poles.

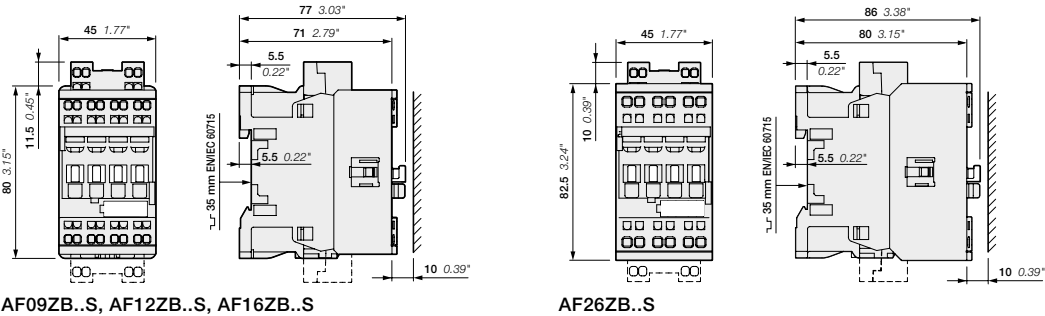
- designed in accordance to the applicable parts of IEC 60077 and EN 50155 standard
- shocks and vibration withstand conforming to IEC 61373 (category 1, class B)
- fire and smoke safety compliance to european standard EN 45545 (HL2 hazard level)
- electronic coil interface accepting a wide AC control voltage range (0.85 Uc min. ... 1.1 Uc max. according to IEC 60947-4-1) including several Uc control voltages (0.7 ... 1.25 Uc according to IEC 60077) used for battery supply
- low coil consumption
- built-in surge suppression
- side by side mounting without restriction from -40 °C up to +70 °C
- add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

IEC		UL / CSA		Supply	Rated	Auxiliary	Type	Order code	Weight
Rated operational power	current $\theta \leq 40\text{ }^{\circ}\text{C}$	3-phase motor rating 480 V	General use rating 600 V AC	control voltage Uc (IEC 60077) (1)	control circuit voltage Uc min. ... Uc max. (IEC 60947-4-1)	contacts fitted			
400 V AC-3	AC-1			V DC	V DC				Pkg (1 pce)
kW	A	hp	A						kg
4	22	5	20	24, 33, 48	20 ... 60	1 0	AF09ZB-30-10S-21	1SBL136059R2110	0.31
						0 1	AF09ZB-30-01S-21	1SBL136059R2101	0.31
					72, 96, 110	1 0	AF09ZB-30-10S-22	1SBL136059R2210	0.31
						0 1	AF09ZB-30-01S-22	1SBL136059R2201	0.31
					220	1 0	AF09ZB-30-10S-23	1SBL136059R2310	0.31
5.5	24	7-1/2	20	24, 33, 48	20 ... 60	1 0	AF12ZB-30-10S-21	1SBL156059R2110	0.31
						0 1	AF12ZB-30-01S-21	1SBL156059R2101	0.31
					72, 96, 110	1 0	AF12ZB-30-10S-22	1SBL156059R2210	0.31
						0 1	AF12ZB-30-01S-22	1SBL156059R2201	0.31
					220	1 0	AF12ZB-30-10S-23	1SBL156059R2310	0.31
7.5	24	10	20	24, 33, 48	20 ... 60	1 0	AF16ZB-30-10S-21	1SBL176059R2110	0.31
						0 1	AF16ZB-30-01S-21	1SBL176059R2101	0.31
					72, 96, 110	1 0	AF16ZB-30-10S-22	1SBL176059R2210	0.31
						0 1	AF16ZB-30-01S-22	1SBL176059R2201	0.31
					220	1 0	AF16ZB-30-10S-23	1SBL176059R2310	0.31
11	35	-	-	24, 33, 48	20 ... 60	0 0	AF26ZB-30-00S-21	1SBL236059R2100	0.36
					72, 96, 110	0 0	AF26ZB-30-00S-22	1SBL236059R2200	0.36
					220	0 0	AF26ZB-30-00S-23	1SBL236059R2300	0.36

(1) Other control voltages, see voltage code table.

Main dimensions mm, inches



AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

4 to 11 kW

AC operated - spring terminals for connection with standard ferrules



AF09ZB-30-10S



AF26ZB-30-00S

Description

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors comply with the latest railway rolling stock standards and allow installation in passengers or driver cabins for trains frequently operating tunnels or undergrounds. They are mainly used for controlling 3-phase motors and power circuits up to 690 V AC and 220 V DC. These contactors are of the block type design with 3 main poles.

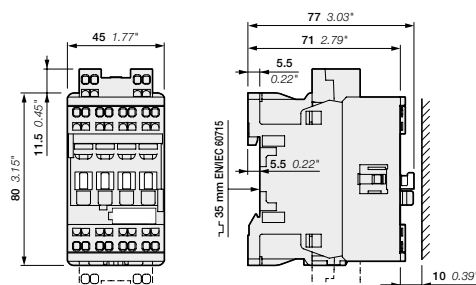
- designed in accordance to the applicable parts of IEC 60077 and EN 50155 standard
- shocks and vibration withstand conforming to IEC 61373 (category 1, class B)
- fire and smoke safety compliance to european standard EN 45545 (HL2 hazard level)
- electronic coil interface accepting sinusoidal AC 50/60 Hz control supplies included inside the wide control voltage range $U_c \text{ min.} \dots U_c \text{ max.}$ of the contactor. Max. permitted control voltage must not be exceeded during voltage fluctuation defined according to IEC 60077 or EN 50155 (see technical data)
- built-in surge suppression
- side by side mounting without restriction from -40 °C up to +70 °C
- add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

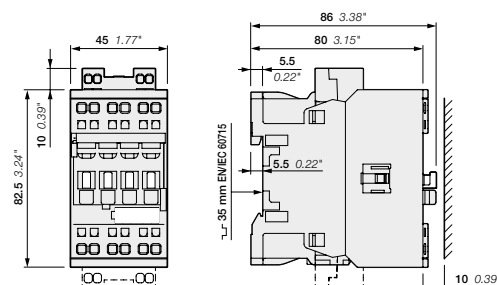
IEC		UL / CSA		Rated control circuit voltage Uc min. ... Uc max. (IEC 60947-4-1) (1)	Auxiliary contacts fitted 	Type	Order code	Weight
Rated operational power	current θ ≤ 40 °C	3-phase motor rating 480 V	General use rating 600 V AC					
400 V AC-3	AC-1			V AC 50/60 Hz				kg
4	22	5	20	24 ... 60	1 0	AF09ZB-30-10S-21	1SBL136059R2110	0.31
					0 1	AF09ZB-30-01S-21	1SBL136059R2101	0.31
				48 ... 130	1 0	AF09ZB-30-10S-22	1SBL136059R2210	0.31
					0 1	AF09ZB-30-01S-22	1SBL136059R2201	0.31
				100 ... 250	1 0	AF09ZB-30-10S-23	1SBL136059R2310	0.31
					0 1	AF09ZB-30-01S-23	1SBL136059R2301	0.31
5.5	24	7-1/2	20	250 ... 500	1 0	AF09B-30-10S-14	1SBL137059R1410	0.31
					0 1	AF09B-30-01S-14	1SBL137059R1401	0.31
				24 ... 60	1 0	AF12ZB-30-10S-21	1SBL156059R2110	0.31
					0 1	AF12ZB-30-01S-21	1SBL156059R2101	0.31
				48 ... 130	1 0	AF12ZB-30-10S-22	1SBL156059R2210	0.31
					0 1	AF12ZB-30-01S-22	1SBL156059R2201	0.31
7.5	24	10	20	100 ... 250	1 0	AF12ZB-30-10S-23	1SBL156059R2310	0.31
					0 1	AF12ZB-30-01S-23	1SBL156059R2301	0.31
				250 ... 500	1 0	AF12B-30-10S-14	1SBL157059R1410	0.31
					0 1	AF12B-30-01S-14	1SBL157059R1401	0.31
				24 ... 60	1 0	AF16ZB-30-10S-21	1SBL176059R2110	0.31
					0 1	AF16ZB-30-01S-21	1SBL176059R2101	0.31
11	35	-	-	48 ... 130	1 0	AF16ZB-30-10S-22	1SBL176059R2210	0.31
					0 1	AF16ZB-30-01S-22	1SBL176059R2201	0.31
				100 ... 250	1 0	AF16ZB-30-10S-23	1SBL176059R2310	0.31
					0 1	AF16ZB-30-01S-23	1SBL176059R2301	0.31
				250 ... 500	1 0	AF16B-30-10S-14	1SBL177059R1410	0.31
					0 1	AF16B-30-01S-14	1SBL177059R1401	0.31
11	35	-	-	24 ... 60	0 0	AF26ZB-30-00S-21	1SBL236059R2100	0.36
				48 ... 130	0 0	AF26ZB-30-00S-22	1SBL236059R2200	0.36
				100 ... 250	0 0	AF26ZB-30-00S-23	1SBL236059R2300	0.36
				250 ... 500	0 0	AF26B-30-00S-14	1SBL237059R1400	0.36

(1) Other control voltages, see voltage code table.

Main dimensions mm, inches



AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S

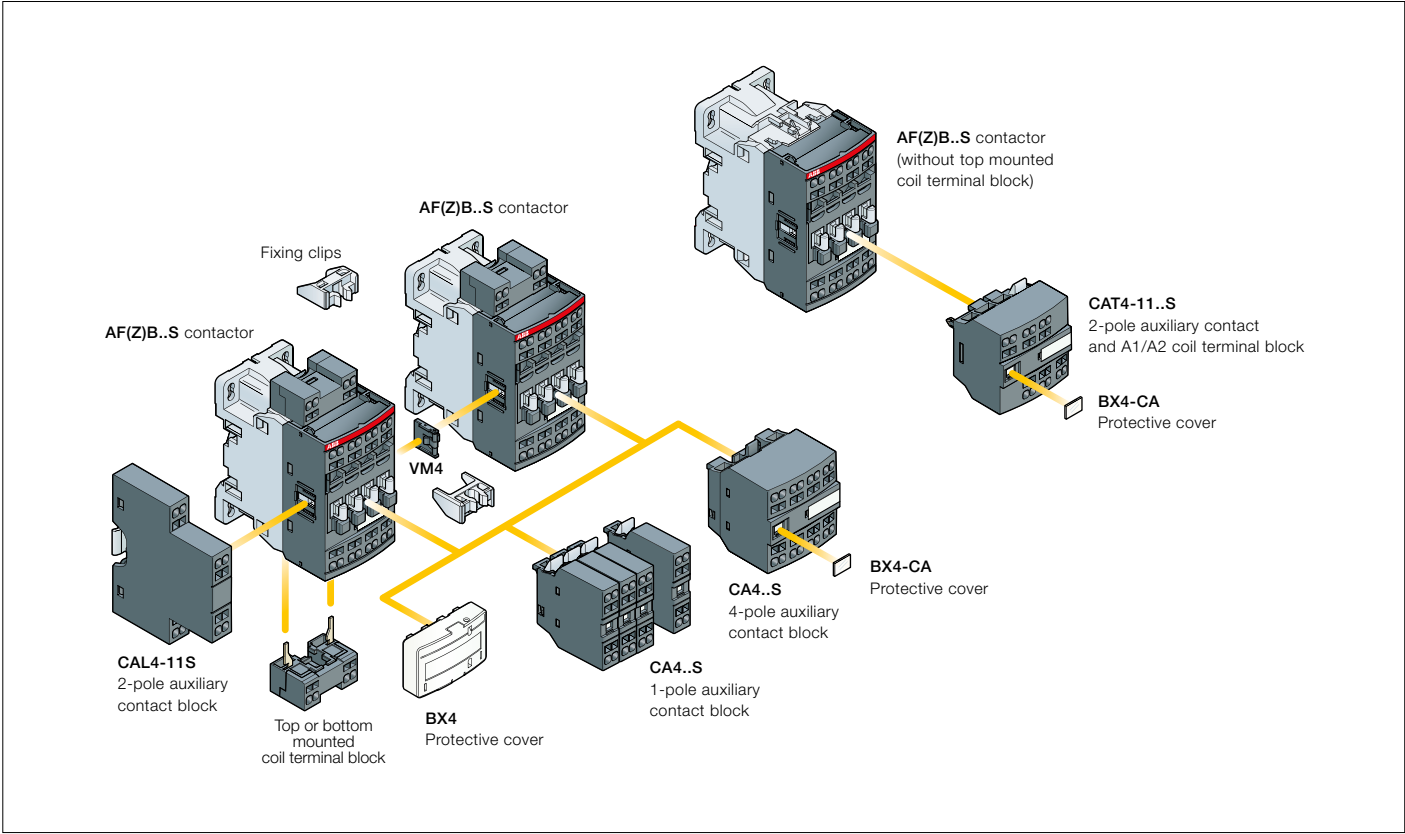


AF26(Z)B..S

AF09(Z)B..S ... AF26(Z)B..S 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				Side-mounted accessories				
			Auxiliary contact blocks			Mechanical interlock unit (between 2 contactors)	Auxiliary contact blocks				
							Left side	Right side			
				1-pole CA4..S	2-pole CAT4-11..S	4-pole CA4..S	VM4	2-pole CAL4-11S			
			Max. N.C. built-in and add-on N.C. auxiliary contacts: 4 N.C. max. on positions 1, 2, 3, 4 and 3 N.C. max. on positions 1 ±30°, 5								
AF09(Z)B..S ... AF16(Z)B..S	3 0	0 1	4 max.	or 1	or 1	–	+	1	–		
			2 max.	–	–	–	+	1	+	1	
			4 max.	or 1	or 1	+	1	+	1	or 1	
AF09(Z)B..S ... AF16(Z)B..S AF26(Z)B..S	3 0	1 0 0 0	4 max.	or 1	or 1	–	–	+	1	–	
			2 max.	or 1	–	–	–	+	1	+	1
			4 max.	or 1	or 1	+	1	+	1	or 1	

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Spring terminals for connection with standard ferrules

Main accessories



CA4-10S



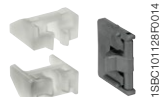
CAL4-11S



CA4-22MS



CAT4-11ES



VM4



LDC4S



BX4



BX4-CA



BP38-4

Ordering details (1)

For contactors

Auxiliary
contacts

Type

Order code

Pkg
qty

Weight
(1 pce)

kg

Front-mounted instantaneous auxiliary contact blocks

AF09(Z)B ... AF26(Z)B..S	1	0	CA4-10S-T	1SBN010119T1010	10	0.016
	0	1	CA4-01S-T	1SBN010119T1001	10	0.016
AF09(Z)B ... AF16(Z)B-30-10S	2	2	CA4-22MS	1SBN010145R1122	1	0.06
	3	1	CA4-31MS	1SBN010145R1131	1	0.06
AF26(Z)B-30-00S	2	2	CA4-22ES	1SBN010145R1022	1	0.06
	3	1	CA4-31ES	1SBN010145R1031	1	0.06
	4	0	CA4-40ES	1SBN010145R1040	1	0.06

Side-mounted instantaneous auxiliary contact blocks

AF09(Z)B ... AF26(Z)B..S	1	1	CAL4-11S	1SBN010130R1011	1	0.045
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Front-mounted instantaneous auxiliary contact and A1/A2 coil terminal blocks

AF09(Z)B ... AF16(Z)B-30-10S	1	1	CAT4-11MS	1SBN010153R1111	1	0.045
AF26(Z)B-30-00S	1	1	CAT4-11ES	1SBN010153R1011	1	0.045
AF09(Z)B ... AF16(Z)B-30-01S	1	1	CAT4-11US	1SBN010153R1311	1	0.045

Mechanical interlock unit

AF09(Z)B ... AF26(Z)B..S	VM4	1SBN030105T1000	10	0.005
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Note: VM4 includes 2 fixing clips (BB4) to maintain together both contactors.

Additional coil terminal block

AF09(Z)B ... AF26(Z)B..S	LDC4S	1SBN070157T1000	10	0.01
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Protective covers

All 1-stack contactors	BX4	1SBN110108T1000	10	0.006
For 4-pole CA4..S and 2-pole CAT4..S auxiliary contact blocks	BX4-CA	1SBN110109W1000	50	0.001

Mounting piece

AF09(Z)B ... AF26(Z)B..S	BP38-4	1SBN112303T1000	10	0.003
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(1) See "Main accessory fitting details" table.

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Technical data

Main pole - Utilization characteristics according to IEC

Contactor types		AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S	
Standards		IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1				
Fire and smoke		IEC 60077-1, IEC 60077-2, EN 50155 (applicable parts)				
Rated operational voltage U_e max.		690 V				
Rated frequency (without derating)		50 / 60 Hz				
Conventional free-air thermal current I_{th}						
acc. to IEC 60947-4-1, open contactors, $\theta \leq 40\text{ }^{\circ}\text{C}$		24 A	24 A	24 A	35 A	
With conductor cross-sectional area		2.5 mm ²	2.5 mm ²	2.5 mm ²	4 mm ²	
AC-1 Utilization category						
For air temperature close to contactor						
I_e / Rated operational current AC-1	$\theta \leq 40\text{ }^{\circ}\text{C}$	22 A	24 A	24 A	35 A	
	$\theta \leq 60\text{ }^{\circ}\text{C}$	18 A	20 A	20 A	30 A	
	$\theta \leq 70\text{ }^{\circ}\text{C}$	15 A	16 A	16 A	25 A	
U_e max. $\leq 690\text{ V}$, 50/60 Hz						
With conductor cross-sectional area		2.5 mm ²	2.5 mm ²	2.5 mm ²	4 mm ²	
AC-3 Utilization category						
For air temperature close to contactor $\theta \leq 60\text{ }^{\circ}\text{C}$						
I_e / Max. rated operational current AC-3 (1)						
	3-phase motors	220-230-240 V	9 A	12 A	18 A	26 A
		380-400 V	9 A	12 A	18 A	26 A
		415 V	9 A	12 A	18 A	26 A
		440 V	9 A	12 A	18 A	26 A
		500 V	9.5 A	12.5 A	15 A	23 A
		690 V	7 A	9 A	10.5 A	17 A
Rated operational power AC-3 (1)						
	1500 r.p.m. 50 Hz	220-230-240 V	2.2 kW	3 kW	4 kW	6.5 kW
	1800 r.p.m. 60 Hz	380-400 V	4 kW	5.5 kW	7.5 kW	11 kW
	3-phase motors	415 V	4 kW	5.5 kW	9 kW	11 kW
		440 V	4 kW	5.5 kW	9 kW	15 kW
		500 V	5.5 kW	7.5 kW	9 kW	15 kW
		690 V	5.5 kW	7.5 kW	9 kW	15 kW
Rated making capacity AC-3		10 x I_e AC-3 acc. to IEC 60947-4-1				
Rated breaking capacity AC-3		8 x I_e AC-3 acc. to IEC 60947-4-1				
Short-circuit protection device for contactors						
without thermal overload relay - Motor protection excluded (2)						
$U_e \leq 500\text{ V AC}$ - gG type fuse		25 A	25 A	25 A	40 A	
Rated short-time withstand current I_{cw}		1 s	300 A	300 A	300 A	700 A
at $40\text{ }^{\circ}\text{C}$ ambient temperature,		10 s	150 A	150 A	150 A	350 A
in free air from a cold state		30 s	80 A	80 A	80 A	225 A
		1 min	60 A	60 A	60 A	150 A
		15 min	24 A	24 A	24 A	35 A
Maximum breaking capacity						
$\cos \varphi = 0.45$		at 440 V	250 A	250 A	250 A	500 A
		at 690 V	106 A	106 A	106 A	200 A
Power dissipation per pole		I_e / AC-1	0.9 W	1.1 W	1.1 W	1.8 W
		I_e / AC-3	0.15 W	0.3 W	0.6 W	1 W
Max. electrical switching frequency		AC-1	600 cycles/h			
		AC-3	1200 cycles/h			
		AC-2, AC-4	300 cycles/h			150 cycles/h

(1) For the corresponding kW/A or hp/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".

AF09(Z)B..S ... AF16(Z)B..S 3-pole contactors

Technical data

Main pole - Utilization characteristics according to UL / NEMA / CSA

Contactor types		AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S
Standards		UL 508, CSA C22.2 N°14		
Maximum operational voltage		600 V		
NEMA size		00	0	–
NEMA continuous amp rating		9	18	–
NEMA maximum horse power ratings				
1-phase, 60 Hz				
	115 V AC	1/3 hp	1 hp	–
	230 V AC	1 hp	2 hp	–
NEMA maximum horse power ratings				
3-phase, 60 Hz				
	200 V AC	1-1/2 hp	3 hp	–
	230 V AC	1-1/2 hp	3 hp	–
	460 V AC	2 hp	5 hp	–
	575 V AC	2 hp	5 hp	–
UL / CSA general use rating				
600 V AC		20 A	20 A	20 A
With conductor cross-sectional area		AWG 12	AWG 12	AWG 12
UL / CSA maximum 1-phase motor rating				
Full load current				
	120 V AC	13.8 A	16 A	16 A
	240 V AC	10 A	12 A	12 A
Horse power rating				
	120 V AC	3/4 hp	1 hp	1 hp
	240 V AC	1-1/2 hp	2 hp	2 hp
UL / CSA maximum 3-phase motor rating				
Full load current				
	200-208 V AC	7.8 A	11 A	11 A
	220-240 V AC	6.8 A	9.6 A	15.2 A
	440-480 V AC	7.6 A	11 A	14 A
	550-600 V AC	9 A	11 A	11 A
Horse power rating				
	200-208 V AC	2 hp	3 hp	3 hp
	220-240 V AC	2 hp	3 hp	5 hp
	440-480 V AC	5 hp	7-1/2 hp	10 hp
	550-600 V AC	7-1/2 hp	10 hp	10 hp
Short-circuit protection device for contactors				
without thermal overload relay - Motor protection excluded				
Fuse rating		30 A	30 A	60 A
Fuse type, 600 V		J		
Maximum electrical switching frequency				
For general use		600 cycles/h		
For motor use		1200 cycles/h		

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Technical data

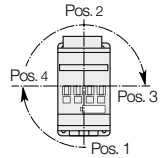
General technical data

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
Rated insulation voltage Ui				
acc. to IEC 60947-4-1	690 V			
acc. to UL / CSA	600 V			-
Rated impulse withstand voltage Uimp.	6 kV			
Electromagnetic compatibility	Devices complying with IEC 60947-1 / EN 60947-1 - Environments A EN 50121-3-2			
Ambient air temperature close to contactor				
Operation	-25 ... +60 °C			
Fitted with thermal overload relay	-40 ... +70 °C			
Without thermal overload relay	-60 ... +80 °C			
Storage				
Climatic withstand	Category B according to IEC 60947-1 Annex Q			
Maximum operating altitude (without derating)	3000 m			
Mechanical durability				
Number of operating cycles	10 millions operating cycles			
Maximum switching frequency	3600 cycles/h			
Shock and vibration withstand				
acc. to IEC 61373	Category 1, class B			

Magnet system characteristics

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
Coil operating limits				
acc. to IEC 60947-4-1				
DC supply	(AF..ZB) at $\theta \leq 70^\circ\text{C}$ $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ (AF..B) at $\theta \leq 60^\circ\text{C}$ $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$; at $\theta \leq 70^\circ\text{C}$ $0.85 \times U_c \text{ min} \dots U_c \text{ max}$			
AC supply	at $\theta \leq 60^\circ\text{C}$ $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ at $\theta \leq 70^\circ\text{C}$ $0.85 \times U_c \text{ min} \dots U_c \text{ max}$			
DC control voltage				
Rated control circuit voltage Uc	(AF..ZB) 20 ... 250 V DC - (AF..B) 250 ... 500 V DC			
Coil consumption				
Average pull-in value	(AF..ZB) 12 ... 16 W - (AF..B) 50 W			
Average holding value	(AF..ZB) 1.7 W - (AF..B) 2 W			
PLC-output control	(AFZB) $\geq 500 \text{ mA}$ 24 V DC			
AC control voltage 50/60 Hz				
Rated control circuit voltage Uc	(AF..ZB) 24 ... 250 V AC - (AF..B) 250 ... 500 V AC			
Coil consumption				
Average pull-in value	(AF..ZB) 16 VA - (AF..B) 50 VA			
Average holding value	(AF..ZB) 1.7 VA / 1.5 W - (AF..B) 2.2 VA / 2 W			
Max. permitted control voltage during voltage fluctuation defined acc. to IEC 60077 / EN 50155	Rated control circuit voltage / Max. permitted control voltage 24 ... 60 V AC 50/60 Hz / 75 V AC 50/60 Hz 48 ... 130 V AC 50/60 Hz / 150 V AC 50/60 Hz 100 ... 250 V AC 50/60 Hz / 275 V AC 50/60 Hz 250 ... 500 V AC 50/60 Hz / 550 V AC 50/60 Hz			
Drop-out voltage	$\leq 60\%$ of $U_c \text{ min.}$			
Operating time				
Between coil energization and:				
N.O. contact closing	40 ... 95 ms			
N.C. contact opening	38 ... 90 ms			
Between coil de-energization and:				
N.O. contact opening	11 ... 95 ms			
N.C. contact closing	13 ... 98 ms			

Mounting characteristics and conditions for use

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
Mounting positions				
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			

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Technical data

Connecting characteristics

Contactor types		AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
Main terminals		 Spring terminals			
Connection capacity (min. ... max.)					
Main conductors (poles)					
	Rigid Solid ($\leq 4 \text{ mm}^2$)	1 x	1 ... 2.5 mm ²		1.5 ... 4 mm ²
		2 x	1 ... 2.5 mm ²		1.5 ... 4 mm ²
	Flexible with non insulated ferrule	1 x	0.75 ... 2.5 mm ²		1.5 ... 4 mm ²
		2 x	0.75 ... 2.5 mm ²		1.5 ... 4 mm ²
	Flexible with insulated ferrule	1 x	0.75 ... 1.5 mm ²		1.5 ... 4 mm ²
		2 x	0.75 ... 1.5 mm ²		1.5 ... 4 mm ²
Connection capacity acc. to UL/CSA		1 or 2 x	AWG 18 ... 12		—
Stripping length			10 mm		14 mm
Auxiliary conductors (built-in auxiliary terminals + coil terminals)					
	Rigid solid	1 x	1 ... 2.5 mm ²		
		2 x	1 ... 2.5 mm ²		
	Flexible with non insulated ferrule	1 x	0.75 ... 2.5 mm ²		
		2 x	0.75 ... 2.5 mm ²		
	Flexible with insulated ferrule	1 x	0.75 ... 1.5 mm ²		
		2 x	0.75 ... 1.5 mm ²		
Connection capacity acc. to UL/CSA		1 or 2 x	AWG 18 ... 14		
Stripping length			10 mm		
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529					
Main terminals		IP20			
Coil terminals		IP20			
Built-in auxiliary terminals		IP20			—
Screw terminals		Flat Ø 3.5			

AF09(Z)B..S ... AF16(Z)B..S 3-pole contactors

Technical data

Built-in auxiliary contacts according to IEC

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S
Rated operational voltage U_e max.	690 V		
Rated frequency (without derating)	50 / 60 Hz		
Conventional free air thermal current I_{th} - $\theta \leq 40^\circ\text{C}$	16 A		
I_e / 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 400-440 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 I_e AC-15 acc. to IEC 60947-5-1		
Breaking capacity AC-15	10 x I_e AC-15 acc. to IEC 60947-5-1		
I_e / 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 0.27 A / 60 W 250 V DC 0.27 A / 68 W 400 V DC 0.15 A / 60 W 500 V DC 0.13 A / 65 W 600 V DC 0.1 A / 60 W		
Short-circuit protection device gG type fuse	10 A		
Rated short-time withstand current I_{cw}	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	10^{-7}		
Power dissipation per pole at 6 A	≥ 2 ms		
Maximum electrical switching frequency	0.1 W		
	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 (CA4..S, CAL4..S, CAT4..S aux. contact blocks) 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 (CA4..S, CAL4..S, CAT4..S aux. contact blocks) are mirror contacts.		

Built-in auxiliary contacts according to UL / CSA

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S
Maximum operational voltage	600 V AC, 600 V DC		
Pilot duty	A600, Q600		
AC thermal rated current	10 A		
AC maximum volt-ampere making	7200 VA		
AC maximum volt-ampere breaking	720 VA		
DC thermal rated current	2.5 A		
DC maximum volt-ampere making-breaking	69 VA		

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

DC circuit switching

General

The arc switching on DC is more difficult than on AC.

- For selecting a contactor it is essential to determine the current, the voltage and the L/R time constant of the controlled load
- For information, typical time constant values are quoted hereafter: non inductive loads such as resistance furnaces ($L/R \approx 1$ ms), inductive loads such as shunt motors ($L/R \approx 2$ ms) or series motors ($L/R \approx 7.5$ ms)
- The addition of a resistor in parallel with an inductive winding helps in the elimination of the arcs
- All the poles required for breaking must be connected in series between the load and the source polarity not linked to earth (or chassis).

Technical data

- The tables indicate for the standard contactors the I_e max. operating currents depending on: the utilization category (i.e. L/R) DC-1, DC-3, DC-5 as defined in the IEC 60947-4-1 publication, the operating voltage U_e and the pole coupling details.
Ampere values quoted in these tables are valid for a $-25 \dots +70$ °C temperature close to the contactors, as long as these values do not exceed the AC-1. Ampere values for the corresponding ambient temperature
- Max. switching frequency: 300 cycles/h.

Selection table

Contactor types	AF09(Z)B..S	AF12(Z)B..S	AF16(Z)B..S	AF26(Z)B..S
	3-pole			

Utilization category DC-1, $L/R \leq 1$ ms

	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	10 A	15 A	20 A	-
	220 V	-	-	-	-
	440 V	-	-	-	-
	600 V	-	-	-	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	22 A	24 A	24 A	35 A
	220 V	10 A	15 A	20 A	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	22 A	24 A	24 A	35 A
	220 V	22 A	24 A	24 A	35 A

Utilization category DC-3, $L/R \leq 2$ ms

	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	6 A	7 A	8 A	-
	220 V	-	-	-	-
	440 V	-	-	-	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	22 A	24 A	24 A	35 A
	220 V	6 A	7 A	8 A	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	22 A	24 A	24 A	35 A
	220 V	22 A	24 A	24 A	35 A

Utilization category DC-5, $L/R \leq 7.5$ ms

	≤ 72 V	9 A	12 A	16 A	20 A
	110 V	4 A	4 A	4 A	-
	220 V	-	-	-	-
	440 V	-	-	-	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	10 A	15 A	20 A	35 A
	220 V	4 A	4 A	4 A	-
	≤ 72 V	22 A	24 A	24 A	35 A
	110 V	22 A	24 A	24 A	35 A
	220 V	9 A	12 A	16 A	20 A

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Electrical durability and utilization categories

General

Utilization categories determine the current making and breaking conditions relating to the characteristics of the loads to be controlled by the contactors. International standard IEC 60947-4-1 and European standard EN 60947-4-1 are the standards to be referred to.

If I_c is the current to be broken by the contactor and I_e the rated operational current normally drawn by the load, then:

- Categories AC-1 and AC-3: $I_c = I_e$
- Category AC-2: $I_c = 2.5 \times I_e$
- Category AC-4: $I_c = 6 \times I_e$

Generally speaking $I_c = m \times I_e$ where m is a multiple of the load operational current.

On next pages, the curves corresponding to categories AC-1, AC-3 and AC-4 represent the electrical durability variation of standard contactors in relation to the breaking current I_c .

Electrical durability is expressed in millions of operating cycles.

Curve utilization mode

Electrical durability forecast and contactor selection for categories AC-1, AC-2, AC-3 or AC-4

- Note the characteristics of the load to be controlled:
 - Operational voltage U_e
 - Current normally drawn I_e (U_e / I_e / kW relation for motors, see "Motor rated operational powers and currents").
 - Utilization category AC-1, AC-2, AC-3 or AC-4
 - Breaking current $I_c = I_e$ for AC-1 and for AC-3 ; $I_c = 2.5 \times I_e$ for AC-2 ; $I_c = 6 \times I_e$ for AC-4
- Define the number of operating cycles N required.
- On the diagram corresponding to the operational category, select the contactor with the curve immediately above the intersection point (I_c ; N).

Electrical durability forecast and contactor selection for mixed duty motor control: AC-3 ($I_c = I_e$) type switching off while "motor running" and, occasionally, AC-4 ($I_c = 6 \times I_e$) type switching off while "motor accelerating"

- Note the characteristics of the motor to be controlled:
 - Operational voltage U_e
 - Current normally drawn while "motor running" I_e (U_e / I_e / kW relation for motors, see "Motor rated operational powers and currents")
 - Breaking current for AC-3 $I_c = I_e$
 - Breaking current for AC-4 while "motor accelerating" $I_c = 6 \times I_e$
 - Percentage of AC-4 operating cycles K (on the basis of the total number of operating cycles)
- Define the total number of operating cycles N required.
- Note the smallest contactor rating compatible for AC-3 (U_e / I_e) on Main pole utilization characteristic table (see "Technical data").
- For the selected contactor make a note of the following in relation to the voltage using diagram AC-3 in next pages:
 - The number of operating cycles A for $I_c = I_e$ (AC-3)
 - The number of operating cycles B for $I_c = 6 \times I_e$ (AC-4)
- Calculate the estimated number of cycles N' (N' is always below A)

$$N' = \frac{A}{1 + 0.01 K (A/B - 1)}$$

- If N' is too low in relation to the target N , calculate the estimated number of cycles for a higher contactor rating.

Case of uninterrupted duty

For uninterrupted duty, some verifications of preventing maintenance are necessary to check the functionality of the concerned product (consult us).

The combined effect of environmental conditions and the proper temperature of the product may require some disposals. As a matter of fact, for this duty, the use duration prevails over the number of operating cycles.

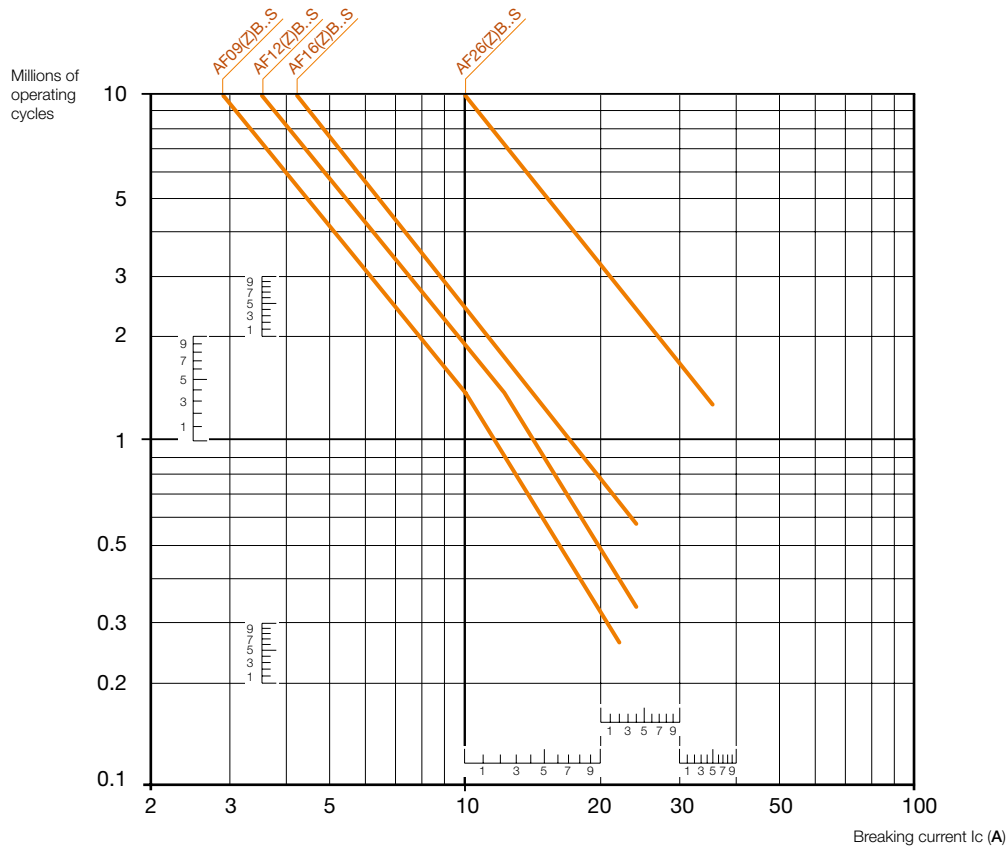
AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Electrical durability

Electrical durability for AC-1 utilization category - $U_e \leq 690$ V. Ambient temperature ≤ 60 °C

Switching non-inductive or slightly inductive loads. The breaking current I_c for AC-1 is equal to the rated operational current of the load.

Maximum electrical switching frequency: see "Technical data".



AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors AC-1 electrical durability

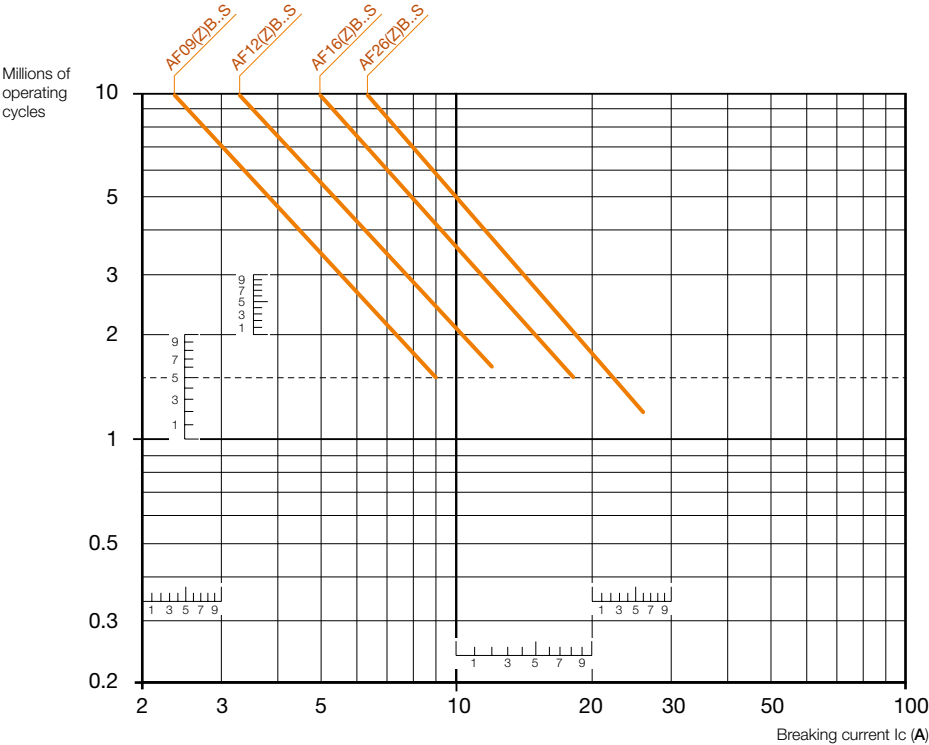
AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

Electrical durability

Electrical durability for AC-3 utilization category

Switching cage motors: starting and switching off running motors. The breaking current I_c for AC-3 is equal to the rated operational current I_e (I_e = motor full load current). Maximum electrical switching frequency: see "Technical data".

AC-3 - $U_e \leq 440\text{ V}$ - Ambient temperature $\leq 60\text{ }^\circ\text{C}$



AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors AC-3 electrical durability for $U_e \leq 440\text{ V}$

AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors

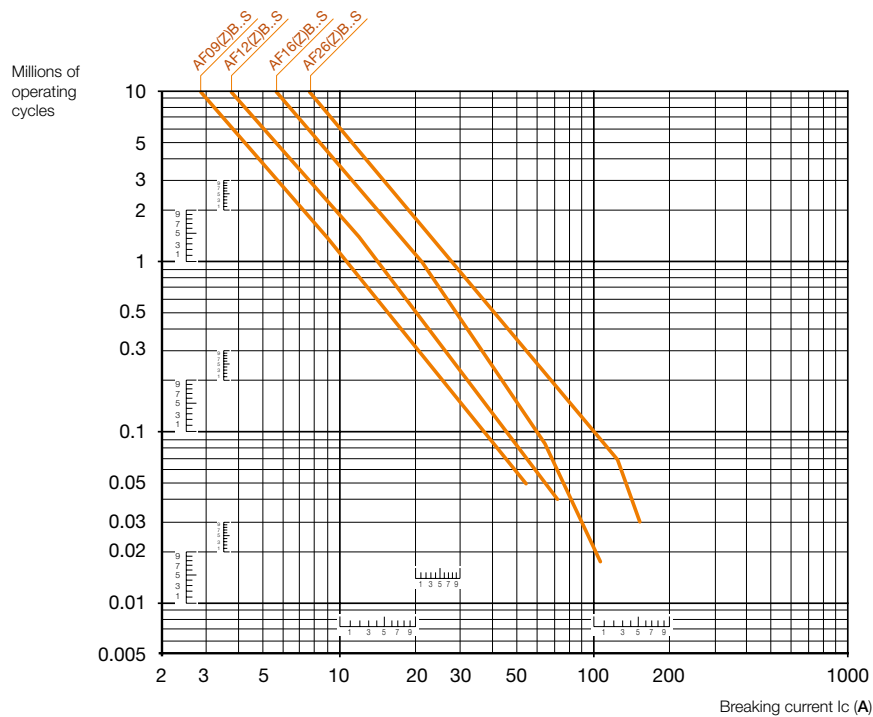
Electrical durability

Electrical durability for AC-4 utilization category

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current I_c is equal to $6 \times I_e$ for AC-4, keeping in mind that I_e is the motor rated operational current (I_e = motor full-load current).

Maximum electrical switching frequency: see "Technical data".

AC-4 - $U_e \leq 440 \text{ V}$ - Ambient temperature $\leq 60^\circ \text{C}$

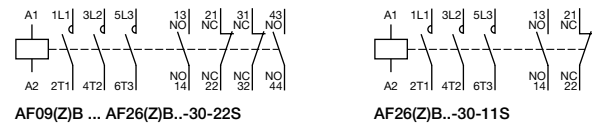
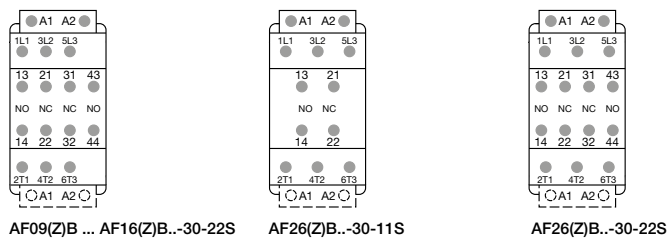
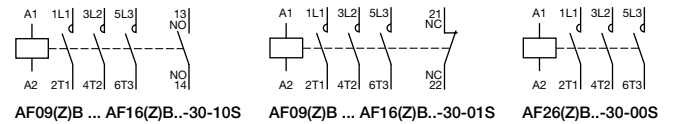
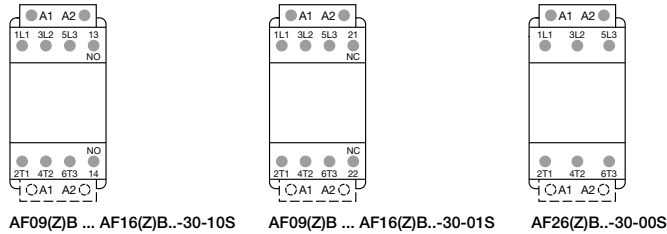


AF09(Z)B..S ... AF26(Z)B..S 3-pole contactors - with spring terminals

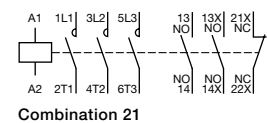
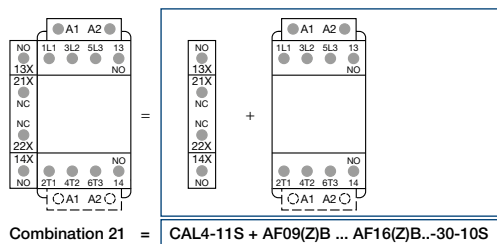
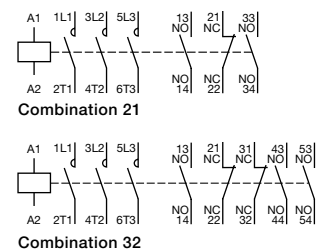
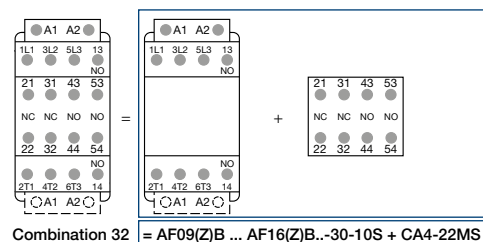
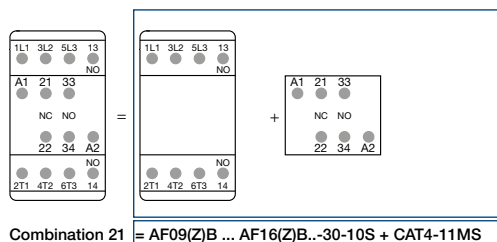
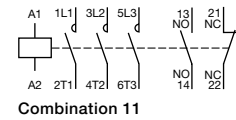
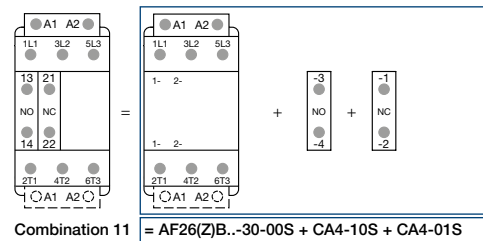
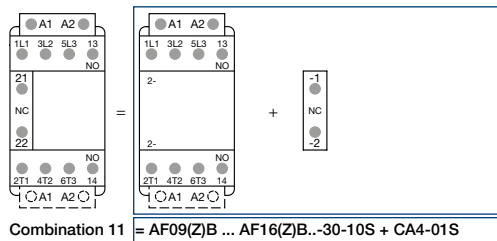
Terminal marking and positioning

AF09(Z)B..S ... AF26(Z)B..S contactors - AC / DC operated

Standard devices without addition of auxiliary contacts



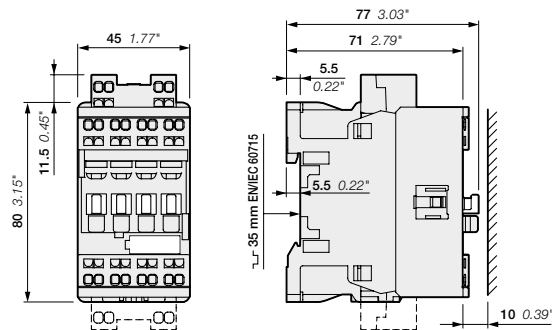
Other possible contact combinations with auxiliary contacts added by the user



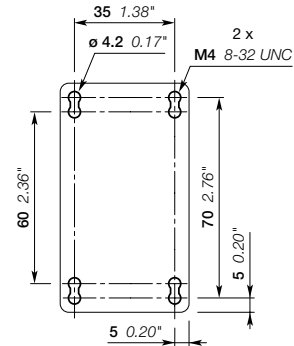
Note: Only AF..(Z)B contactor with DC control voltage 12...20 V DC need to respect the connection polarities indicated close to the coil terminals: A1+ for the positive pole and A2- for the negative pole.

AF09(Z)B..S ... AF16(Z)B..S 3-pole contactors - with spring terminals

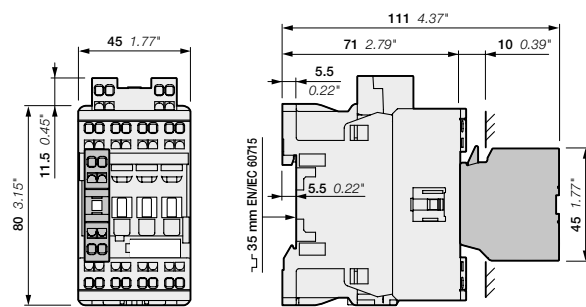
Main dimensions mm, inches



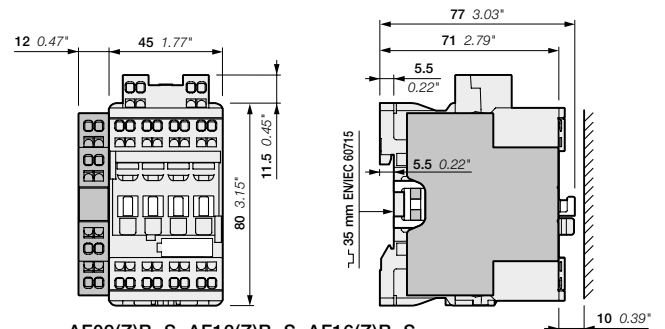
AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S



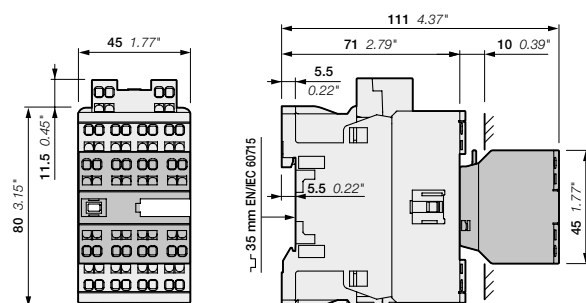
AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S



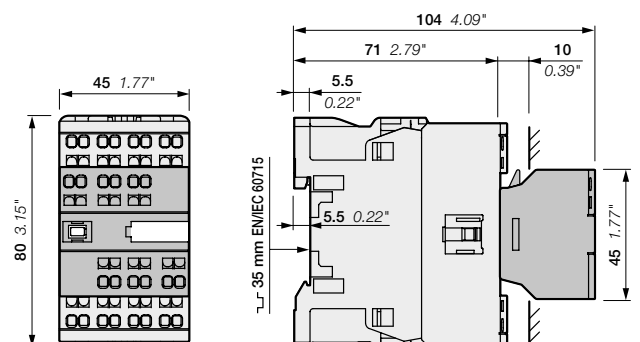
AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S
+ CA4..S 1-pole auxiliary contact block



AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S
+ CAL4-11S 2-pole auxiliary contact block



AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S
+ CA4..S 4-pole auxiliary contact block

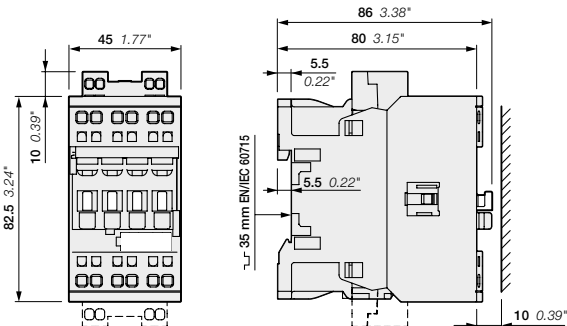


AF09(Z)B..S, AF12(Z)B..S, AF16(Z)B..S
+ CAT4..S 2-pole auxiliary contact and coil terminal block

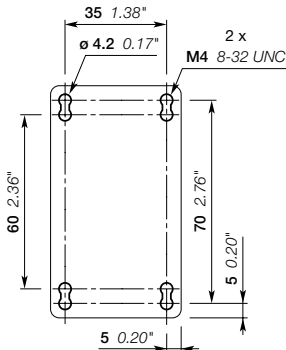
Note: contactor lateral distance to grounded component 2 mm 0.08" min.

AF26(Z)B..S 3-pole contactors - with spring terminals

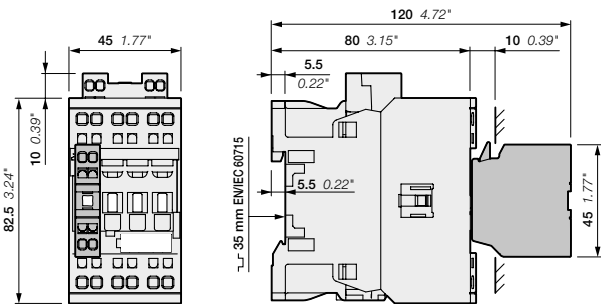
Main dimensions mm, inches



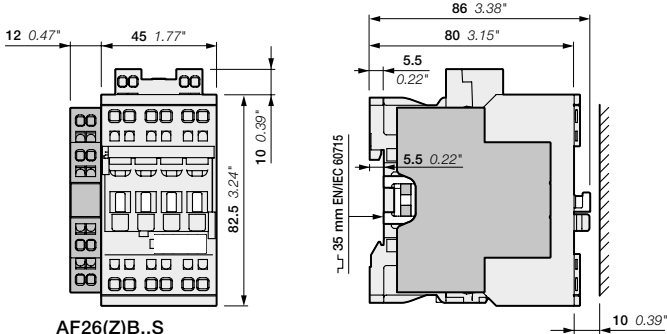
AF26(Z)B..S



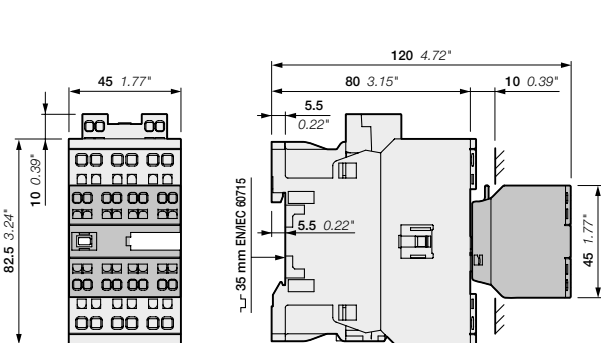
AF26(Z)B..S



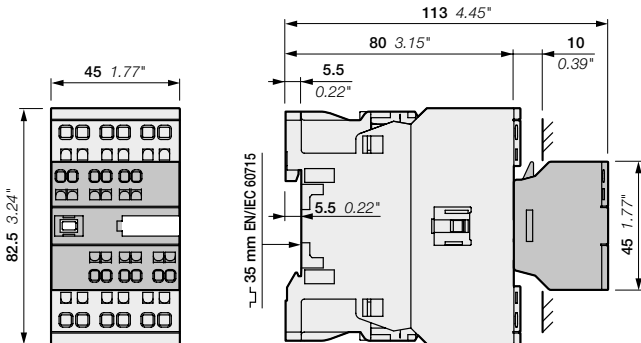
AF26(Z)B..S
+ CA4..S 1-pole auxiliary contact block



AF26(Z)B..S
+ CAL4-11S 2-pole auxiliary contact block



AF26(Z)B..S
+ CA4..S 4-pole auxiliary contact block



AF26(Z)B..S
+ CAT4..S 2-pole auxiliary contact and coil terminal block

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

NF(Z)B 4 and 8 pole contactor relays

Ordering details 4 and 8-pole contactor relays

NFZB..S	DC operated	24
NF(Z)B..S	AC operated	25
Main accessories		26

Technical data

Main pole - Utilization characteristics according to IEC	28
Main pole - Utilization characteristics according to UL / CSA	28
General technical data	29
Magnet system and mounting characteristics	29
Connecting characteristics	30

Terminal positioning and marking 31

Main dimensions 32

Voltage code table 40

NFZB..S 4 and 8-pole contactor relays

DC operated - spring terminals for connection with standard ferrules



NFZB22ES



NFZB44ES

Description

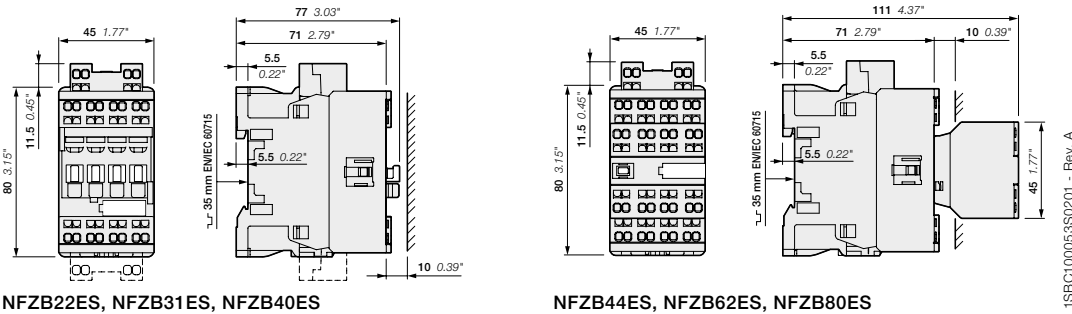
- NFZB..S contactor relays comply with the latest railway rolling stock standards and allow installation in passengers or driver cabins for trains frequently operating tunnels or undergrounds. They are used for switching auxiliary and control circuits. These contactor relays are of the block type design with 4 or 8 main poles.
- designed in accordance to the applicable parts of IEC 60077 and EN 50155 standard
 - shocks and vibration withstand conforming to IEC 61373 (category 1, class B)
 - fire and smoke safety compliance to european standard EN 45545 (HL2 hazard level)
 - electronic coil interface accepting a wide DC control voltage range (0.85 U_c min. ... 1.1 U_c max. according to IEC 60947-4-1) including several U_c control voltages (0.7 ... 1.25 U_c according to IEC 60077) used for battery supply
 - low coil consumption
 - built-in surge suppression
 - side by side mounting without restriction from -40 °C up to +70 °C
 - add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

Ordering details

Number of contacts	Supply control voltage U_c (1) (IEC 60077) V DC	Rated control circuit voltage U_c min. ... U_c max. (IEC 60947-4-1) V DC	Type	Order code	Weight Pkg (1 pce) kg
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB22ES-21 NFZB22ES-22 NFZB22ES-23	1SBH136059R2122 1SBH136059R2222 1SBH136059R2322	0.31 0.31 0.31
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB31ES-21 NFZB31ES-22 NFZB31ES-23	1SBH136059R2131 1SBH136059R2231 1SBH136059R2331	0.31 0.31 0.31
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB40ES-21 NFZB40ES-22 NFZB40ES-23	1SBH136059R2140 1SBH136059R2240 1SBH136059R2340	0.31 0.31 0.31
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB44ES-21 NFZB44ES-22 NFZB44ES-23	1SBH136059R2144 1SBH136059R2244 1SBH136059R2344	0.36 0.36 0.36
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB62ES-21 NFZB62ES-22 NFZB62ES-23	1SBH136059R2162 1SBH136059R2262 1SBH136059R2362	0.36 0.36 0.36
	24, 33, 48 72, 96, 110 220	20 ... 60 48 ... 130 100 ... 250	NFZB80ES-21 NFZB80ES-22 NFZB80ES-23	1SBH136059R2180 1SBH136059R2280 1SBH136059R2380	0.36 0.36 0.36

(1) Other control voltages, see voltage code table.

Main dimensions mm, inches

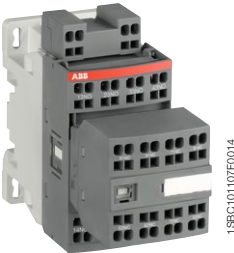


NF(Z)B..S 4 and 8-pole contactor relays

AC operated - spring terminals for connection with standard ferrules



NFZB22ES



NFZB44ES

Description

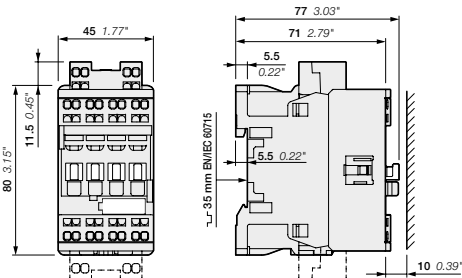
NF(Z)B..S contactor relays comply with the latest railway rolling stock standards and allow installation in passengers or driver cabins for trains frequently operating tunnels or undergrounds. They are used for switching auxiliary and control circuits. These contactor relays are of the block type design with 4 or 8 main poles.

- designed in accordance to the applicable parts of IEC 60077 and EN 50155 standard
- shocks and vibration withstand conforming to IEC 61373 (category 1, class B)
- fire and smoke safety compliance to european standard EN 45545 (HL2 hazard level)
- electronic coil interface accepting sinusoidal AC 50/60 Hz control supplies included inside the wide control voltage range $U_c \text{ min. } \dots U_c \text{ max.}$ of the contactor. Max. permitted control voltage must not be exceeded during voltage fluctuation defined according to IEC 60077 or EN 50155 (see technical data).
- built-in surge suppression
- side by side mounting without restriction from -40 °C up to +70 °C
- add-on auxiliary contact blocks for front or side mounting and a wide range of accessories.

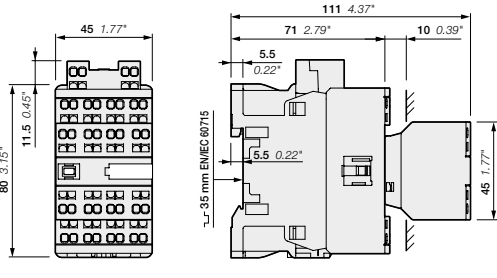
Ordering details

Number of contacts	Rated control circuit voltage $U_c \text{ min. } \dots U_c \text{ max.}$ (IEC 60947-4-1) V AC 50/60 Hz	Type	Order code	Weight Pkg (1 pce) kg
	24 ... 60	NFZB22ES-21	1SBH136059R2122	0.31
	48 ... 130	NFZB22ES-22	1SBH136059R2222	0.31
	100 ... 250	NFZB22ES-23	1SBH136059R2322	0.31
	250 ... 500	NFZB22ES-14	1SBH137059R1422	0.31
	24 ... 60	NFZB31ES-21	1SBH136059R2131	0.31
	48 ... 130	NFZB31ES-22	1SBH136059R2231	0.31
	100 ... 250	NFZB31ES-23	1SBH136059R2331	0.31
	250 ... 500	NFZB31ES-14	1SBH137059R1431	0.31
	24 ... 60	NFZB40ES-21	1SBH136059R2140	0.31
	48 ... 130	NFZB40ES-22	1SBH136059R2240	0.31
	100 ... 250	NFZB40ES-23	1SBH136059R2340	0.31
	250 ... 500	NFZB40ES-14	1SBH137059R1440	0.31
	24 ... 60	NFZB44ES-21	1SBH136059R2144	0.36
	48 ... 130	NFZB44ES-22	1SBH136059R2244	0.36
	100 ... 250	NFZB44ES-23	1SBH136059R2344	0.36
	250 ... 500	NFZB44ES-14	1SBH137059R1444	0.36
	24 ... 60	NFZB62ES-21	1SBH136059R2162	0.36
	48 ... 130	NFZB62ES-22	1SBH136059R2262	0.36
	100 ... 250	NFZB62ES-23	1SBH136059R2362	0.36
	250 ... 500	NFZB62ES-14	1SBH137059R1462	0.36
	24 ... 60	NFZB80ES-21	1SBH136059R2180	0.36
	48 ... 130	NFZB80ES-22	1SBH136059R2280	0.36
	100 ... 250	NFZB80ES-23	1SBH136059R2380	0.36
	250 ... 500	NFZB80ES-14	1SBH137059R1480	0.36

Main dimensions mm, inches



NF(Z)B22ES, NF(Z)B31ES, NF(Z)B40ES

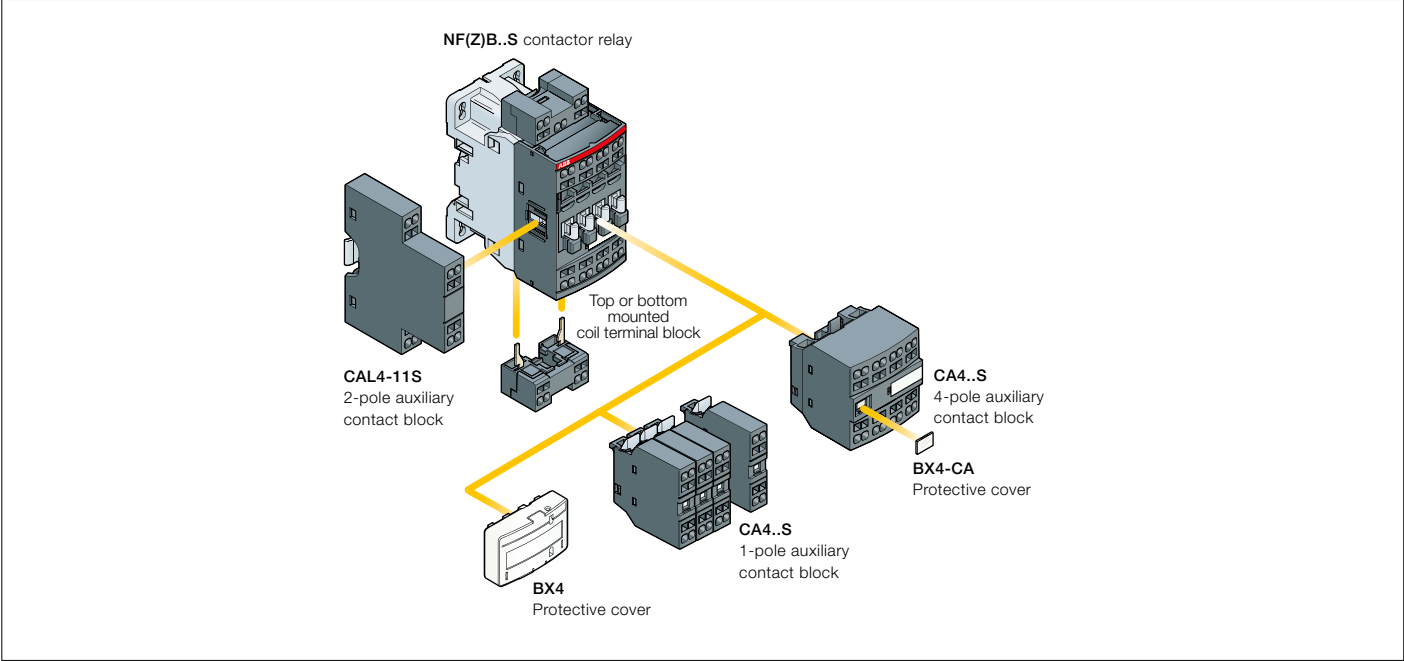


NF(Z)B44ES, NF(Z)B62ES, NF(Z)B80ES

NF(Z)B..S 4 and 8-pole contactor relays

Main accessories

Contactor relays 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 relay types	Main poles	Front-mounted accessories		Side-mounted accessories	
		Auxiliary contact blocks		Auxiliary contact blocks	
		1-pole CA4..S	4-pole CA4..S	Left side 2-pole CAL4-11S	Right side
Max. add-on N.C. auxiliary contacts: 3 N.C. max. on positions 1, 2, 3, 4 and 2 N.C. max. on positions 5					
NF(Z)B..	2 2 ES	4 max.	or 1	+	1
	3 1 ES	2 max.	–	+	1
Max. add-on N.C. auxiliary contacts: 4 N.C. max. on positions 1, 2, 3, 4 and 3 N.C. max. on positions 5					
NF(Z)B..	4 0 ES	4 max.	or 1	+	1
		2 max.	–	+	1
NF(Z)B..	4 4 ES	–	–	1	–
	6 2 ES				
	8 0 ES				

NF(Z)B..S 4 and 8-pole contactor relays

Spring terminals for connection with standard ferrules

Main accessories



1SBC101110F0014

CA4-10S



1SBC101113F0014

CAL4-11S



1SBC101129F0014

CA4-22NS



1SBC101135F0014

LDC4S



1SBC101136F0014

BX4



1SBC101138F0014

BX4-CA

Ordering details (1)

For contactors	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce)
	 				kg

Front-mounted instantaneous auxiliary contact blocks

NF(Z)B..S	1 0	CA4-10S-T	1SBN010119T1010	10	0.016
	0 1	CA4-01S-T	1SBN010119T1001	10	0.016
NF(Z)B..S	2 2	CA4-22NS	1SBN010145R1222	1	0.060
	3 1	CA4-31NS	1SBN010145R1231	1	0.060
	4 0	CA4-40NS	1SBN010145R1240	1	0.060

Side-mounted instantaneous auxiliary contact blocks

NF(Z)B..S	1 1	CAL4-11S	1SBN010130R1011	1	0.045
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Additional coil terminal block

NF(Z)B..S		LDC4S	1SBN070157T1000	10	0.010
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Protective covers

All 1-stack contactor relays		BX4	1SBN110108T1000	10	0.006
For 4-pole CA4..S auxiliary contact blocks		BX4-CA	1SBN110109W1000	50	0.001

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

NF(Z)B..S 4 and 8-pole contactor relays

Technical data

Contact utilization characteristics according to IEC

Contactor relay types	NF(Z)B..S	
Standards	IEC 60947-1 / 60947-5-1 and EN 60947-1 / 60947-5-1 IEC 60077-1, IEC 60077-2, EN 50155 (applicable parts)	
Fire and smoke	EN45545 (Hazard level HL2)	
Rated operational voltage U_e max.	690 V	
Conventional free-air thermal current I_{th} $\theta \leq 40^\circ\text{C}$	16 A	
Rated frequency (without derating)	50 / 60 Hz	
I_e / 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
	400-440 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 I_e AC-15 acc. to IEC 60947-5-1	
Breaking capacity AC-15	10 x I_e AC-15 acc. to IEC 60947-5-1	
I_e / 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	0.27 A / 60 W
	250 V DC	0.27 A / 68 W
	400 V DC	0.15 A / 60 W
	500 V DC	0.13 A / 65 W
	600 V DC	0.1 A / 60 W
Short-circuit protection device gG type fuse	10 A	
Rated short-time withstand current I_{cw}	for 1.0 s	100 A
	for 0.1 s	140 A
Minimum switching capacity	12 V / 3 mA	
with failure rate acc. to IEC 60947-5-4	10^{-7}	
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 (according 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 (CA4..S, CAL4..S aux. contact blocks) are mechanically linked contacts	

Contact utilization characteristics according to UL / CSA

Contactor relay types	NF(Z)B..S	
Standards	UL 508, CSA C22.2 N°14	
Max. operational voltage	600 V AC, 600 V DC	
Pilot duty	A600, Q600	
AC thermal rated current	10 A	
AC maximum volt-ampere making	7200 VA	
AC maximum volt-ampere breaking	720 VA	
DC thermal rated current	2.5 A	
DC maximum volt-ampere making-breaking	69 VA	

NF(Z)B..S 4 and 8-pole contactor relays

Technical data

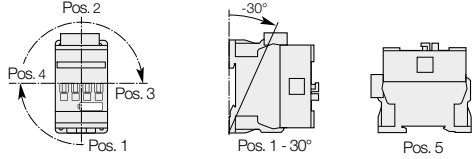
General technical data

Contactor types	NF(Z)B..S
Rated insulation voltage U_i	
acc. to IEC 60947-4-1	690 V
acc. to UL / CSA	600 V
Rated impulse withstand voltage U_{imp}	6 kV
Electromagnetic compatibility	Devices complying with IEC 60947-1 / EN 60947-1 - Environments A EN 50121-3-2
Ambient air temperature close to contactor	
Operation in free air	-40 ... +70 °C
Storage	-60 ... +80 °C
Climatic withstand	Category B according to IEC 60947-1 Annex Q
Maximum operating altitude (without derating)	3000 m
Mechanical durability	
Number of operating cycles	20 millions operating cycles
Maximum switching frequency	6000 cycles/h
Shock and vibration withstand acc. to IEC 61373	Category 1, class B

Magnet system characteristics

Contactor types	NF(Z)B..S
Coil operating limits acc. to IEC 60947-4-1	DC supply (NFZB) at $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ (NFB) at $\theta \leq 60$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$; at $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots U_c \text{ max}$ AC supply at $\theta \leq 60$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ at $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots U_c \text{ max}$
DC control voltage	
Rated control circuit voltage U_c	(NFZB) 20 ... 250 V DC - (NFB) 250 ... 500 V DC
Coil consumption	Average pull-in value (NFZB) 12 ... 16 W - (NFB) 50 W Average holding value (NFZB) 1.7 W - (NFB) 2 W
PLC-output control	(NFZB) ≥ 500 mA 24 V DC
AC control voltage 50/60 Hz	
Rated control circuit voltage U_c	(NFZB) 24 ... 250 V AC - (NFB) 250 ... 500 V AC
Coil consumption	Average pull-in value (NFZB) 16 VA - (NFB) 50 VA Average holding value (NFZB) 1.7 VA / 1.5 W - (NFB) 2.2 VA / 2 W
Max. permitted control voltage during voltage fluctuation defined acc. to IEC 60077 / EN 50155	Rated control circuit voltage / Max. permitted control voltage 24 ... 60 V AC 50/60 Hz / 75 V AC 50/60 Hz 48 ... 130 V AC 50/60 Hz / 150 V AC 50/60 Hz 100 ... 250 V AC 50/60 Hz / 275 V AC 50/60 Hz 250 ... 500 V AC 50/60 Hz / 550 V AC 50/60 Hz
Drop-out voltage	≤ 60 % of $U_c \text{ min}$.
Operating time	
Between coil energization and:	N.O. contact closing 40 ... 95 ms N.C. contact opening 38 ... 90 ms
Between coil de-energization and:	N.O. contact opening 11 ... 95 ms N.C. contact closing 13 ... 98 ms

Mounting characteristics and conditions for use

Contactor types	NF(Z)B..S
Mounting positions	
Mounting distances	Max. N.C. built-in and add-on N.C. auxiliary contacts: see accessory fitting details for a 3-pole contactor NF(Z)B..S. The contactor relays 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

NF(Z)B..S 4 and 8-pole contactor relays

Technical data

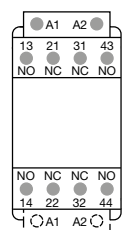
Connecting characteristics

Contact types		NF(Z)B..S	
Main terminals			
Connection capacity (min. ... max.)		Spring terminals	
Pole and coil terminals			
	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 ... 1.5 mm²
		2 x	0.75 ... 1.5 mm²
Connection capacity acc. to UL/CSA		1 or 2 x	AWG 18 ... 12
Stripping length		10 mm	
Degree of protection			
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529			
All terminals		IP20	
Screw terminals		Flat Ø 3.5	

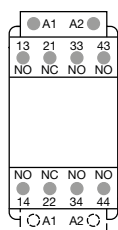
NF(Z)B..S contactor relays

Terminal marking and positioning

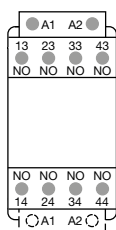
Standard devices without addition of auxiliary contacts



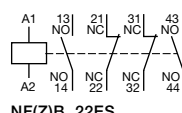
NF(Z)B..22ES



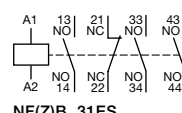
NF(Z)B..31ES



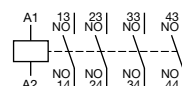
NF(Z)B..40ES



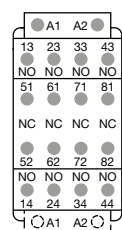
NF(Z)B..22ES



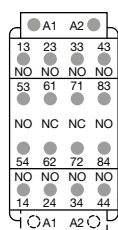
NF(Z)B..31ES



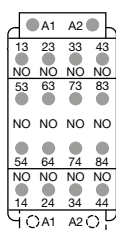
NF(Z)B..40ES



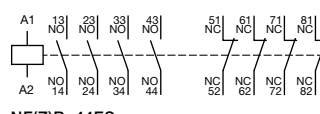
NF(Z)B..44ES



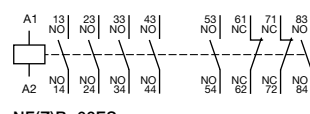
NF(Z)B..62ES



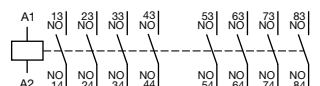
NF(Z)B..80ES



NF(Z)B..44ES

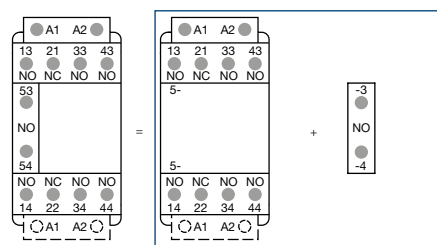


NF(Z)B..62ES

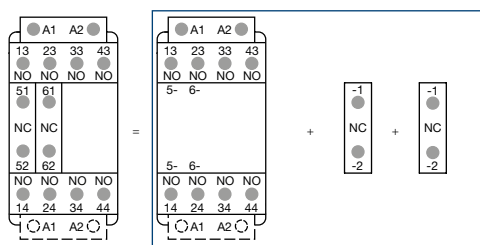


NF(Z)B..80ES

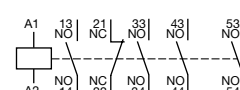
Other possible contact combinations with auxiliary contacts added by the user



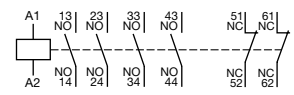
Combination 41 = NF(Z)B..31ES + CA4-10S



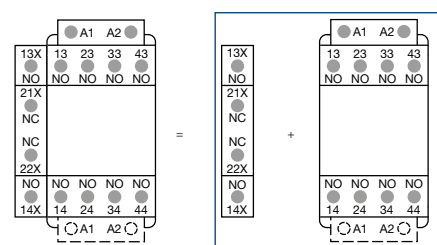
Combination 42 = NF(Z)B..40ES + CA4-01S + CA4-01S



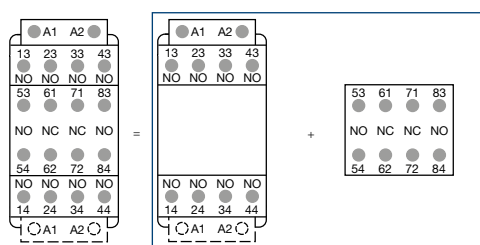
Combination 41E



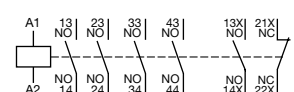
Combination 42E



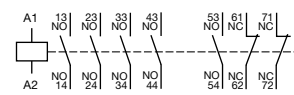
Combination 51 = CAL4-11S + NF(Z)B..40ES



Combination 62 = NF(Z)B..40ES + CA4-22NS



Combination 51E

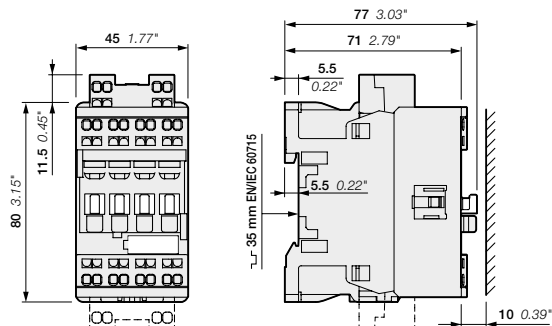


Combination 62E

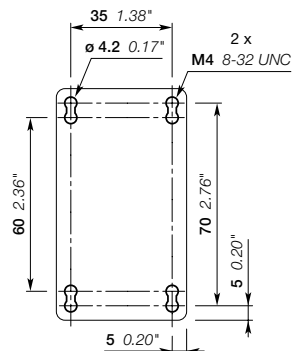
Note: Only NFZ contactor relays with DC control voltage 12...20 V DC need to respect the connection polarities indicated close to the coil terminals: A1+ for the positive pole and A2- for the negative pole.

NF(Z)B..S contactor relays

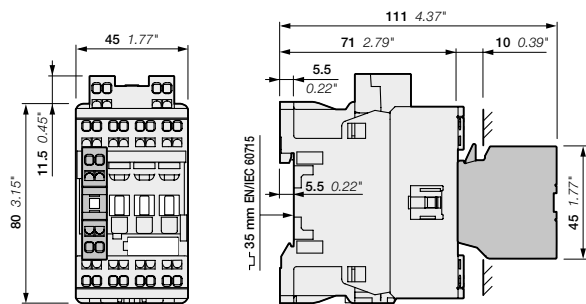
Main dimensions mm, inches



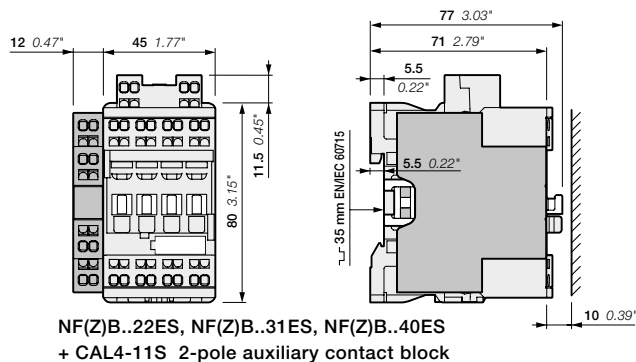
NF(Z)B..22ES, NF(Z)B..31ES, NF(Z)B..40ES



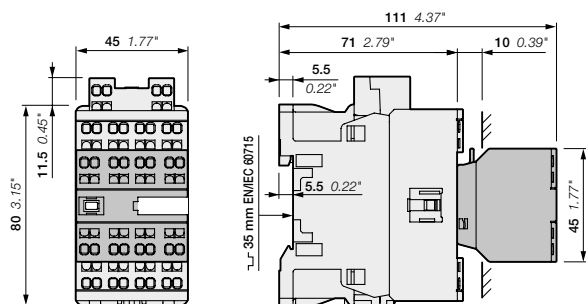
NF(Z)B..22ES, NF(Z)B..31ES, NF(Z)B..40ES



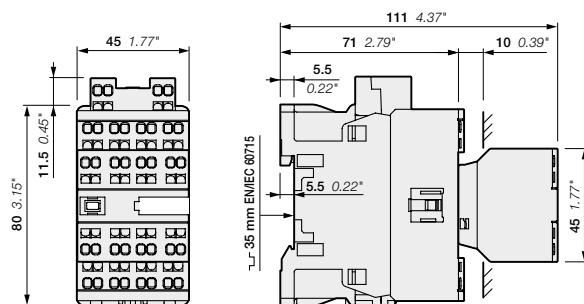
NF(Z)B..22ES, NF(Z)B..31ES, NF(Z)B..40ES
+ CA4..S 1-pole auxiliary contact block



NF(Z)B..22ES, NF(Z)B..31ES, NF(Z)B..40ES
+ CAL4-11S 2-pole auxiliary contact block



NF(Z)B..22ES, NF(Z)B..31ES, NF(Z)B..40ES
+ CA4..S 4-pole auxiliary contact block



NF(Z)B..44ES, NF(Z)B..62ES, NF(Z)B..80ES

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

Accessories for AF09(Z)B..S ... AF26(Z)B..S

Auxiliary contact blocks	34
Electrical durability	36
Terminal positioning and marking	37
Other accessories	38
Voltage code table	40

Auxiliary contact blocks

Spring terminals for connection with standard ferrules



CA4-10S



CAL4-11S



CA4-22MS



CAT4-11ES

Description

The auxiliary contact blocks are used for the operation of auxiliary and control circuits for standard industrial environments.

Types of auxiliary contact blocks for front mounting:

- CA4..S 1 or 4-pole block, with instantaneous N.O., N.C. contacts
- CAT4..S 2-pole block, front-mounted, instantaneous N.O. + N.C. contacts with A1 / A2 coil terminal connection on front face
- CAL4..S 2-pole block, with instantaneous N.O. + N.C. contacts clipped onto the right and/or left side of the contactors.

Select the type of 2 or 4-pole auxiliary contact blocks CAT4 or CA4 (-..ES, -..MS, -..US or -..NS) according to the device type for compliance with the standard requirements (see terminal and marking positioning).

The auxiliary contact blocks are equipped with spring terminals protected against accidental direct contact and bear the corresponding function marking.

Ordering details (1)

For contactors	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce)
	 				kg

Front-mounted instantaneous auxiliary contact blocks

AF09(Z)B..S ... AF26(Z)B..S	1 0 - -	CA4-10S-T	1SBN010119T1010	10	0.016
4-pole NF(Z)B..S	0 1 - -	CA4-01S-T	1SBN010119T1001	10	0.016
AF09(Z)B..S ... AF16(Z)B..-30-10S	2 2 - -	CA4-22MS	1SBN010145R1122	1	0.06
	3 1 - -	CA4-31MS	1SBN010145R1131	1	0.06
AF26(Z)B..S	2 2 - -	CA4-22ES	1SBN010145R1022	1	0.06
	3 1 - -	CA4-31ES	1SBN010145R1031	1	0.06
	4 0 - -	CA4-40ES	1SBN010145R1040	1	0.06
4-pole NF(Z)B..S	2 2 - -	CA4-22NS	1SBN010145R1222	1	0.06
	3 1 - -	CA4-31NS	1SBN010145R1231	1	0.06
	4 0 - -	CA4-40NS	1SBN010145R1240	1	0.06

Side-mounted instantaneous auxiliary contact blocks

AF09(Z)B..S ... AF26(Z)B..S	1 1 - -	CAL4-11S	1SBN010130R1011	1	0.045
NF(Z)B..S					

Front-mounted instantaneous auxiliary contact and A1/A2 coil terminal blocks

AF09(Z)B ... AF16(Z)B..-30-10S	1 1 - -	CAT4-11MS	1SBN010153R1111	1	0.045
AF26(Z)B..S	1 1 - -	CAT4-11ES	1SBN010153R1011	1	0.045
AF09(Z)B ... AF16(Z)B..-30-01S	1 1 - -	CAT4-11US	1SBN010153R1311	1	0.045

(1) For each contactor or contactor relay type, refer to "Accessory fitting details" table.

Auxiliary contact blocks - with spring terminals

Technical data

Types	1-pole CA4..S, 4-pole CA4..S, 2-pole CAT4..S, 2-pole CAL4..S	
Contact utilization characteristics according to IEC		
Standards	IEC 60947-5-1 and EN 60947-5-1	
Rated insulation voltage U_i acc. to IEC 60947-5-1	690 V	
Rated impulse withstand voltage U_{imp} .	6 kV	
Rated operational voltage U_e max.	24 ... 690 V	
Conventional thermal current I_{th} - $\theta \leq 40\text{ }^{\circ}\text{C}$	16 A	
Rated frequency (without derating)	50/60 Hz	
I_e / 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
	400-440 V 50/60 Hz	3 A
	500 V 50/60 Hz	2 A
	690 V 50/60 Hz	2 A
Making capacity	10 x I_e AC-15 acc. to IEC 60947-5-1	
Breaking capacity	10 x I_e AC-15 acc. to IEC 60947-5-1	
I_e / 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	0.27 A / 60 W
	250 V DC	0.27 A / 68 W
	400 V DC	0.15 A / 60 W
	500 V DC	0.13 A / 65 W
	600 V DC	0.1 A / 60 W
Short-circuit protection device gG type fuse	10 A	
Rated short-time withstand current I_{cw} $\theta = 40\text{ }^{\circ}\text{C}$	for 1.0 s	100 A
	for 0.1 s	140 A
Minimum switching capacity	12 V / 3 mA	
with failure rate acc. to IEC 60947-5-4	10^{-7}	
Power dissipation per pole at 6 A	0.1 W	
Mechanical durability	Number of operating cycles	10 millions operating cycles
	Max. switching frequency	3600 cycles/h
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	Additional N.O. or N.C. auxiliary contacts (CA4..S, CAL4..S, CAT4..S) are mechanically linked contacts	
Mirror contacts acc. to annex F of IEC 60947-4-1	Additional N.C. auxiliary contacts (CA4..S, CAL4..S, CAT4..S) are mirror contacts	

Contact utilization characteristics according to UL / CSA

Standards	UL 508, CSA C22.2 N°14
Max. operational voltage	600 V AC, 600 V DC
Pilot duty	A600, Q600
AC thermal rated current	10 A
AC maximum volt-ampere making	7200 VA
AC maximum volt-ampere breaking	720 VA
DC thermal rated current	2.5 A
DC maximum volt-ampere making-breaking	69 VA

Connecting characteristics

Connection capacity (min. ... max.)		
 Rigid solid	1 x	1 ... 2.5 mm ²
	2 x	1 ... 2.5 mm ²
 Flexible with ferrule	1 x	0.75 ... 2.5 mm ²
	2 x	0.75 ... 2.5 mm ²
 Flexible with insulated ferrule	1 x	0.75 ... 2.5 mm ²
	2 x	0.75 ... 1.5 mm ²
Connection capacity acc. to UL/CSA	1 or 2 x	AWG 18 ... 14
Stripping length	10 mm	
Degree of protection	IP20	
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529		
Screwdriver type	Flat Ø 3.5	

Auxiliary contact blocks for AF09(Z)B..S ... AF26(Z)B..S contactors and NF(Z)B..S contactor relays - with spring terminals

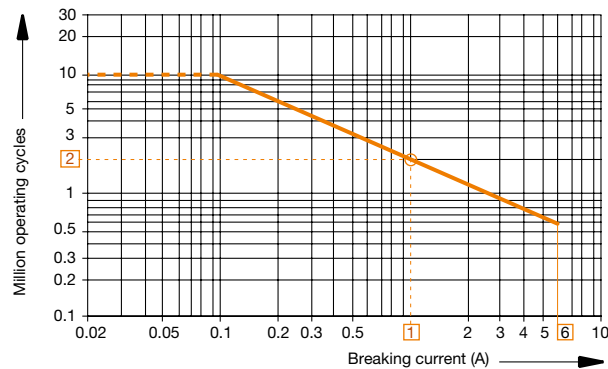
Electrical durability

Electrical durability for AC-15 utilization category

AC-15 utilization category according to IEC 60947-5-1 / EN 60947-5-1:

- making current: $10 \times I_e$ with $\cos \phi = 0.7$ and U_e
- breaking current: I_e with $\cos \phi = 0.4$ and U_e .

These curves represent the electrical durability of the built-in or add-on auxiliary contacts in relation to the breaking current. The curves have been drawn for resistive and inductive loads up to 690 V, 40...60 Hz.

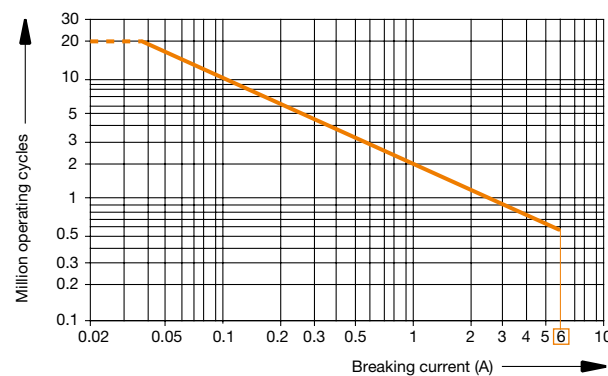


- AF09(Z)B..S ... AF26(Z)B..S contactor built-in auxiliary contacts
- 1-pole and 4-pole CA4..S, 2-pole CAT4..S, 2-pole CAL4..S add-on auxiliary contacts.

Example:

Breaking current = 1 A

On the opposite curve at intersection "O" 1 A the corresponding value for the electrical durability is approximately 2 millions operating cycles.

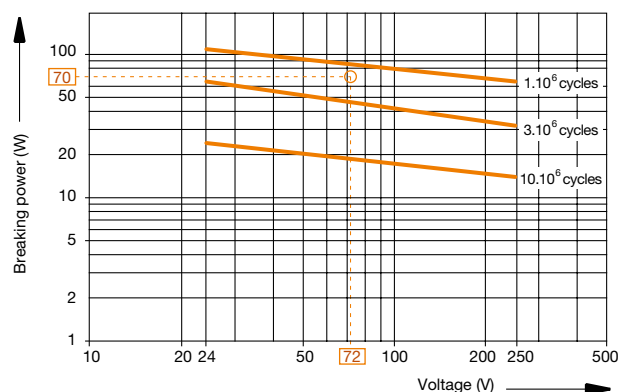


NF(Z)B..S contactor relays.

(For add on auxiliary contacts see curve above).

Electrical durability for DC-13 utilization category

DC-13 utilization category according to IEC 60947-5-1 / EN 60947-5-1: making and breaking current I_e and U_e .



- AF09(Z)B..S ... AF26(Z)B..S contactor built-in auxiliary contacts
- 1-pole and 4-pole CA4..S, 2-pole CAT4..S, 2-pole CAL4..S add-on auxiliary contacts,
- NF(Z)B..S contactor relays.

Example:

Control of DC electro-magnet:

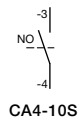
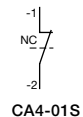
U_e voltage = 72 V DC and breaking power = 70 W.

On the opposite curve at intersection "O" 72 V / 70 W the corresponding value for the electrical durability is approximately 2 millions operating cycles.

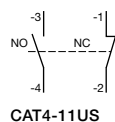
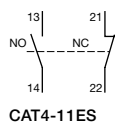
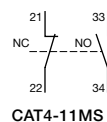
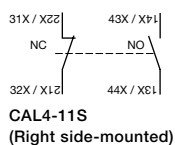
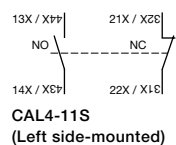
Add-on auxiliary contacts - with spring terminals

Terminal marking and positioning

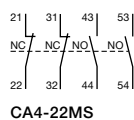
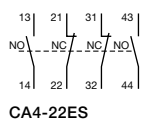
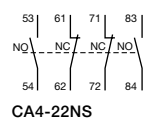
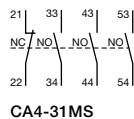
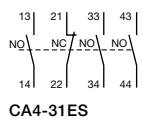
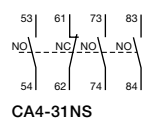
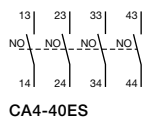
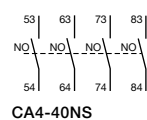
1-pole auxiliary contacts



2-pole auxiliary contacts



4-pole auxiliary contacts



Other accessories



Ordering details

For contactors	Type	Order code	Pkg qty	Weight (1 pce) kg
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Mechanical interlock unit

VM4 mechanical interlock unit for the interlocking of two AF contactors. When mounted between two contactors without additional width, the VM4 mechanical interlock unit prevents one of the contactors from closing as long as the other contactor is closed. The mechanical interlock unit includes 2 fixing clips (BB4).

AF09(Z)B..S ... AF26(Z)B..S	VM4	1SBN030105T1000	10	0.005
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Fixing clips

AF09(Z)B..S ... AF26(Z)B..S	BB4	1SBN110120W1000	50	0.002
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Additional coil terminal block - with spring terminals

Additional coil terminal block for a bottom access to the coil terminals of contactors or contactor relays.

AF09(Z)B..S ... AF26(Z)B..S and NF(Z)B..S	LDC4S	1SBN070157T1000	10	0.01
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Protective covers

Sealable and transparent protective covers BX4 and non-removable BX4-CA to protect the devices against accidental contact.

All 1-stack contactors and contactor relays	BX4	1SBN110108T1000	10	0.006
For 4-pole CA4 and 2-pole CAT4 auxiliary contact blocks	BX4-CA	1SBN110109W1000	50	0.001

Mounting piece

Mounting piece for replacement of A / AL26 ... A / AL40 contactors fixed by screws by AF contactors in 45 mm width.

AF09(Z)B..S ... AF26(Z)B..S	BP38-4	1SBN112303T1000	10	0.003
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Function markers

Box of 16 blank cards (16 markers by card) printable on HTP500 thermal transfer printer and AMS 500 marking table to identify your contactors, overload relays or manual motor starters. Marker dimensions: 7 x 20 mm (.276" x .787").

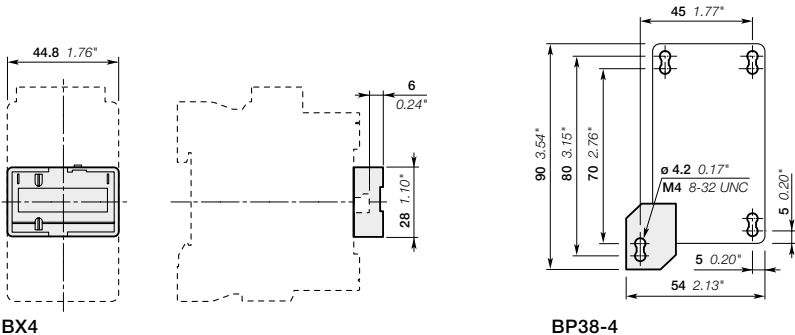
Box of 16 blank cards	BA4	1SNA235156R2700	16	0.011
AMS 500 support plate for 8 BA4	SPRC 1	1SNA360010R1500	1	0.22
HTP500 support plate	HTP500-BA4	1SNA235712R2400	1	0.29

Test block

BDT4 test block is suitable for switching on contactor off-load. Marking on the block indicates the contactor type to fit with.

AF(Z)B..S, NF(Z)B..S	BDT4	1SBN110122T1000	10	0.007
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Main dimensions mm, inches



Notes

Voltage code table

The below tables indicate the available voltage ranges U_c min. ... U_c max. usually used in rolling stock application according to IEC 60077 standard. When placing an order, please check the required control supply and select the corresponding AF.(Z)B..S / NF(Z)B..S control voltage range. 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 AF09ZB-30-10S and coil 48...130 V DC, type is AF09ZB-30-10S-22 and order code is 1SBL136059R2210.

DC operated

Control supply

U_c min. ... U_c max.
acc. to IEC 60077

Rated control circuit voltage

U_c min. ... U_c max.
acc. to IEC 60947-4-1
0.85 U_c min. ... 1.1 U_c max.

Coil code

V DC

17...32
23...42.5
23...44.5
25...45
33...60
36...65
42...78
50...90
55...96
63...113
67...120
77...143
87.5...162.5
90...150
105...183
120...167
152...264
187...253

V DC

20...60
48...130
100...250

21
22
23

AC operated

Rated control circuit voltage

U_c min. ... U_c max.
acc. to IEC 60947-4-1
0.85 U_c min. ... 1.1 U_c max.

Coil code

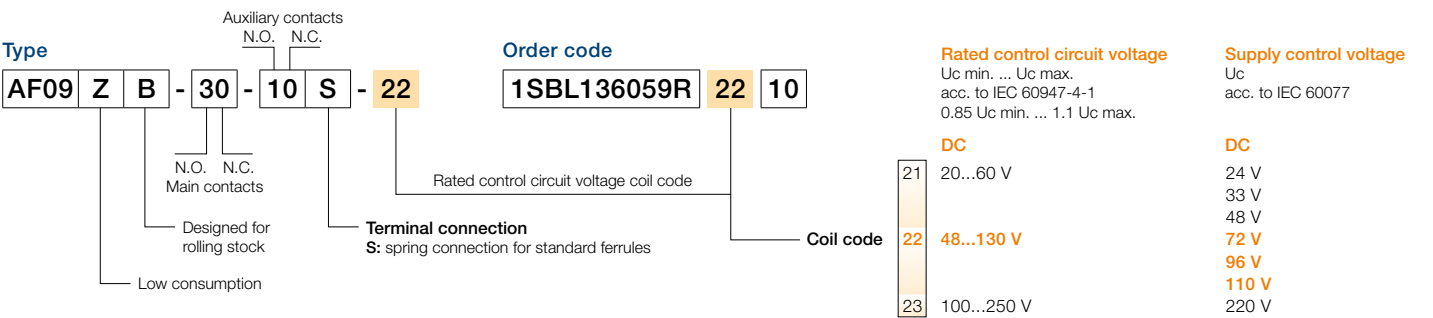
V AC 50/60 Hz

24...60
48...130
100...250
250...500

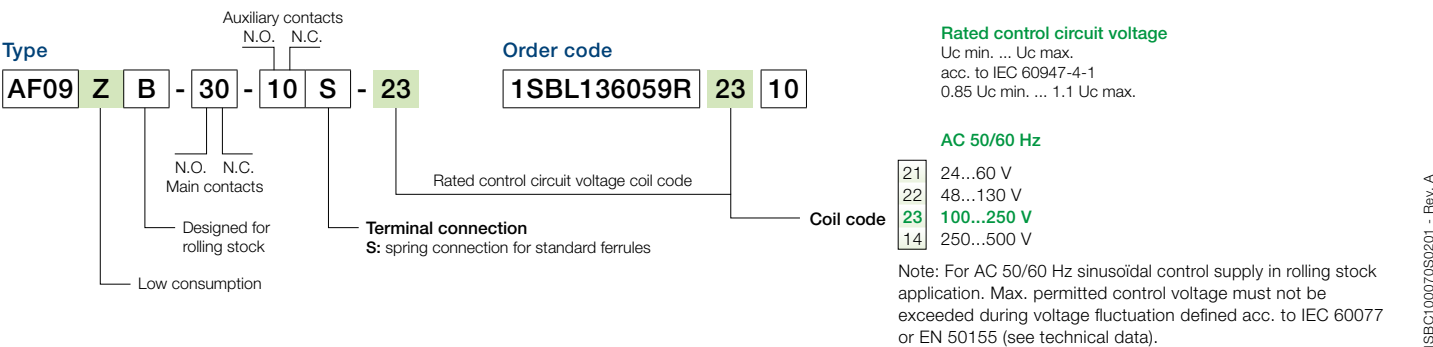
21
22
23
14

AF.(Z)B..S 3-pole contactors

DC operated



AC operated



NF(Z)B..S contactor relays

DC operated

Type

NF Z B - 22 - E S - 22

N.O. N.C.
Auxiliary contacts

Designed for
rolling stock

Low consumption

Order code

1SBH136059R 22 22

Rated control circuit voltage coil code

Terminal connection
S: spring connection for standard ferrules

Rated control circuit voltage

Uc min. ... Uc max.
acc. to IEC 60947-4-1
0.85 Uc min. ... 1.1 Uc max.

DC

21

20...60 V

22

48...130 V

23

100...250 V

Supply control voltage

Uc
acc. to IEC 60077

DC

24 V

33 V

48 V

72 V

96 V

110 V

220 V

AC operated

Type

NF Z B - 22 - E S - 22

N.O. N.C.
Auxiliary contacts

Designed for
rolling stock

Low consumption

Order code

1SBH136059R 22 22

Rated control circuit voltage coil code

Terminal connection
S: spring connection for standard ferrules

Rated control circuit voltage

Uc min. ... Uc max.
acc. to IEC 60947-4-1
0.85 Uc min. ... 1.1 Uc max.

AC 50/60 Hz

21

24...60 V

22

48...130 V

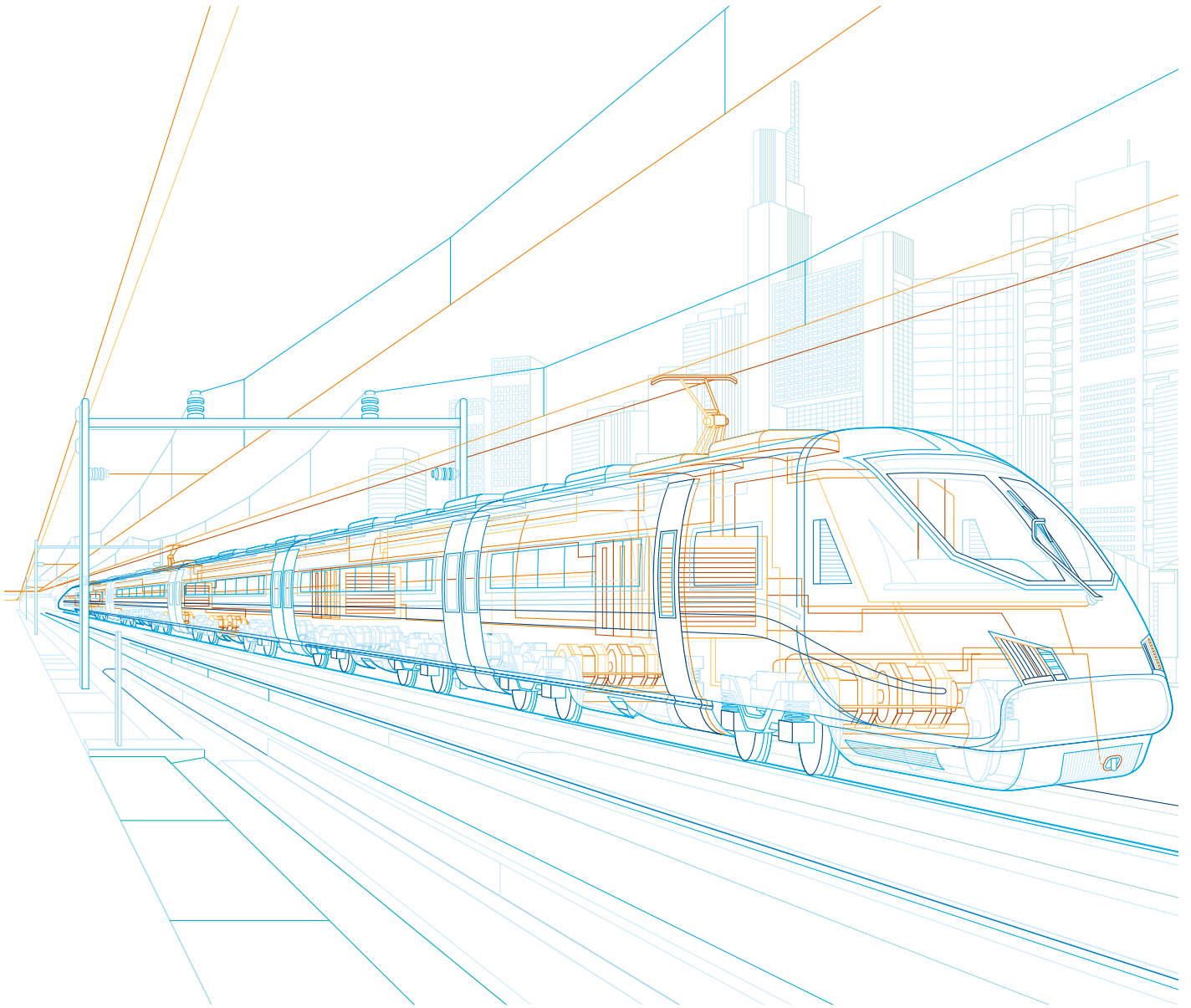
23

100...250 V

14

250...500 V

Note: For AC 50/60 Hz sinusoidal control supply in rolling stock application. Max. permitted control voltage must not be exceeded during voltage fluctuation defined acc. to IEC 60077 or EN 50155 (see technical data).



Standards description

Main particularities of the railway applications

- Control network in DC, with a wide variation in voltage due to battery use, typically 0.7 Uc ... 1.25 Uc (Uc as control voltage).
- In accordance with the train design and the national running rules, the control network can be supplied in AC 50/60 Hz.
- Wide variation of temperature: range of -40 °C to +70 °C to cover all cases all over the world.
- Continuous vibration stress
- Shocks, when trains are formed
- Fire and smoke withstand. Special care being taken for plastic materials for which specific tests are required.

Standards for rolling stock applications

Rolling stock applications need low voltage international standard compliance and dedicated standards - national and international ones - focused on railway environment.

General standards

IEC 60947-4-1	Contactors and motor-starters
IEC 60947-5-1	Control circuit devices and switching elements
UL 508 & UL60947-4-1	Underwriters Laboratories Standard for Safety for Industrial Control Equipment
CSA 22.2 & CSA 60947-4-1	Canadian Standard Association Industrial control Equipment
EAC	Certification in Russia
CCC	Certification in China: Compulsory China Certification

Rolling stock standards

IEC 60077-1 & IEC 60077-2	General service conditions and general rules Electro-technical components – General rules
EN 50155	Electronic equipment used on rolling stock for the relevant parts
IEC 61373	Shock and vibration tests
EN 50121-3-2	Electromagnetic Compatibility
GOST 9219	Electrical apparatus. General requirements

Rolling stock - Fire and smoke standards

European standard

EN 45545-2	Fire protection on railway vehicles – Part 2 Requirements for fire behavior of materials and components
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Note: North american standards, please consult your ABB sales representative.

Standards description

Fire and smoke protection standards

The design of rolling stock and control products used such as contactors, shall incorporate the aim of limiting fire development and minimizing the smoke toxicity in case an ignition event occurs so that an acceptable level of safety is achieved. In the event of a fire, passengers and staff will be able to escape from the fire and smoke unaided and be able to reach a place of safety.

In this regard, the key standards are the fire and smoke protection european standard EN 45545-2.

European standard EN 45545-2 classification

EN 45545 has been developed from existing fire safety regulations for railway vehicles from the International Union of Railways (UIC) and different European countries and specifies the reaction to fire and smoke performance requirements for materials and products used on railway vehicles.

EN 45545-1 defines the combination of the both criteria below, decisive for the classification of the Hazard Level HL1 up to HL3:

- the operating categories of a train and how the train itself is conceived
 - the types of environments depending on the length of tunnels.
- EN 45545 classifies control products as contactors according to listed products.

Listed products used in below masses and area as defined below, are treated as non-listed products and can guarantee an ample protection fire and smoke performance thanks to comprehensive measurements of oxygen index, density and opacity of smoke.

Non-listed products as contactors are classified with the highest hazard levels HL2 or HL3 for one product or in group mounting defined for:

- an exposed area of each product < 0.2 m²
- grouped plastic materials compliant to criteria R22/R24 for interior grouped products and R23/R24 for exterior grouped products.

All contactors, contactor relays and accessories have been tested according to the above standards.

Plastic material tables and certificates are available on request.

Train types	Tunnel length	Operating conceptions			
		N Standard vehicles	A Automatic vehicles without staff on board	D 2 level vehicles	S Sleeping cars 2 levels or 1 level
1	< 1 km	HL1	HL1	HL1	HL2
2	< 5 km	HL2	HL2	HL2	HL2
3	> 5 km	HL2	HL2	HL2	HL3
4	> 5 km no side evacuation	HL3	HL3	HL3	HL3

For interior

Types of mass for grouped plastic material defined in an exposed surface < 0.2 m²

Global mass				HL1	HL2	HL3
R22	EN ISO 4589-2 OI	Oxygen content	≥ 28 %	≥ 28 %	≥ 32 %	
	EN ISO 5659-2: 25 kWm²	D _s max.	≤ 600	≤ 300	≤ 150	
	NF X 70-100-1 and -2: 600 °C	CIT _{NLP}	≤ 1.2	≤ 0.9	≤ 0.75	
Remaining mass not R22 classified				HL1	HL2	HL3
R24	≤ 500 g	EN ISO 4589-2 OI	Oxygen content	≥ 28 %	≥ 28 %	≥ 32 %
Remaining mass unclassified				HL1	HL2	HL3
< 100 g				No requirements apply to the materials of this group.		

For exterior

Types of mass for grouped plastic material defined in an exposed surface < 0.2 m²

Global mass			HL1	HL2	HL3	
R23	EN ISO 4589-2 OI	Oxygen content	≥ 28 %	≥ 28 %	≥ 32 %	
	EN ISO 5659-2: 25 kWm²	D _s max.	-	≤ 600	≤ 300	
	NF X 70-100-1 and -2: 600 °C	CIT _{NLP}	-	≤ 1.8	≤ 1.5	
Remaining mass not R23 classified			HL1	HL2	HL3	
R24	< 2000 g	EN ISO 4589-2 OI	Oxygen content	≥ 28 %	≥ 28 %	≥ 32 %
Remaining mass unclassified			HL1	HL2	HL3	
< 400 g	No requirements apply to the materials of this group.					

Standards description

Shock and vibration tests IEC 61373

This international standard specifies the requirements for testing items of equipment intended for use on railway vehicles which are subsequently subjected to vibrations and shock owing to the nature of railway operational environment.

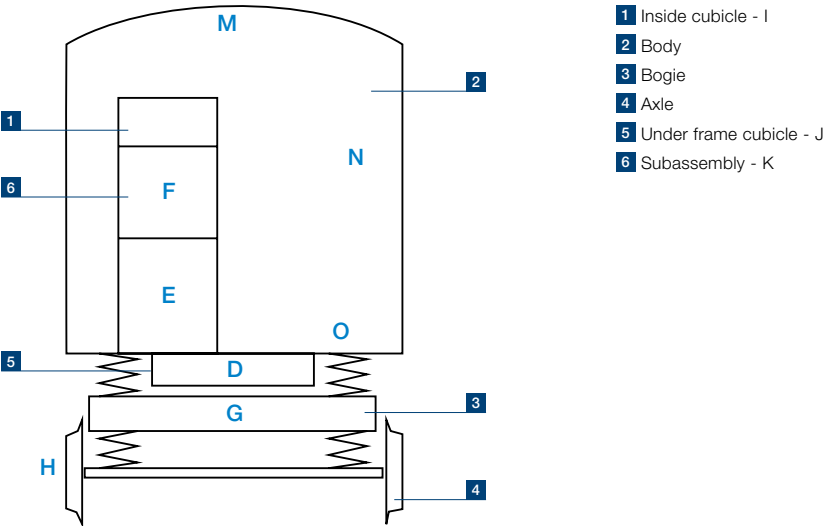
To gain assurance that the quality of the equipment is acceptable, it has to withstand tests of reasonable duration that simulate the service conditions seen throughout its expected life.

All control products inside this catalogue for rolling stock application are compliant to category 1 class B.

Note: the figure identifies general location of equipment on railway vehicles.
Equipment's location within the vehicle: category 1 (body mounted), category 2 (bogie mounted C) and category 3 (axle mounted) divided into 2 subgroups, according to the location of the components:

- class A: cubicles, subassemblies, equipment and components mounted directly on or under the car body.
- class B: anything mounted inside an equipment case which is in turn mounted directly on or under the car body.

Category	Class	Location	Description of equipment location
Category 1	Class A	M N O I and J	Components mounted directly on to or under the car body
	Class B	D	Components mounted into an underframe internal cubicle which is in turn fixed to the car body
		K and E	Components mounted into a large internal cubicle which is in turn fixed to the car body
		F	Components mounted into subassemblies which are mounted into a cubicle which is in turn fixed to the car body
Category 2		G	Cubicles, subassemblies, equipment and components, which are mounted on to the bogie of a railway vehicle
Category 3		H	Subassemblies, equipment and components or assemblies, which are mounted on to the axle assembly of a railway vehicle



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<http://new.abb.com/low-voltage/products/motor-protection>



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