



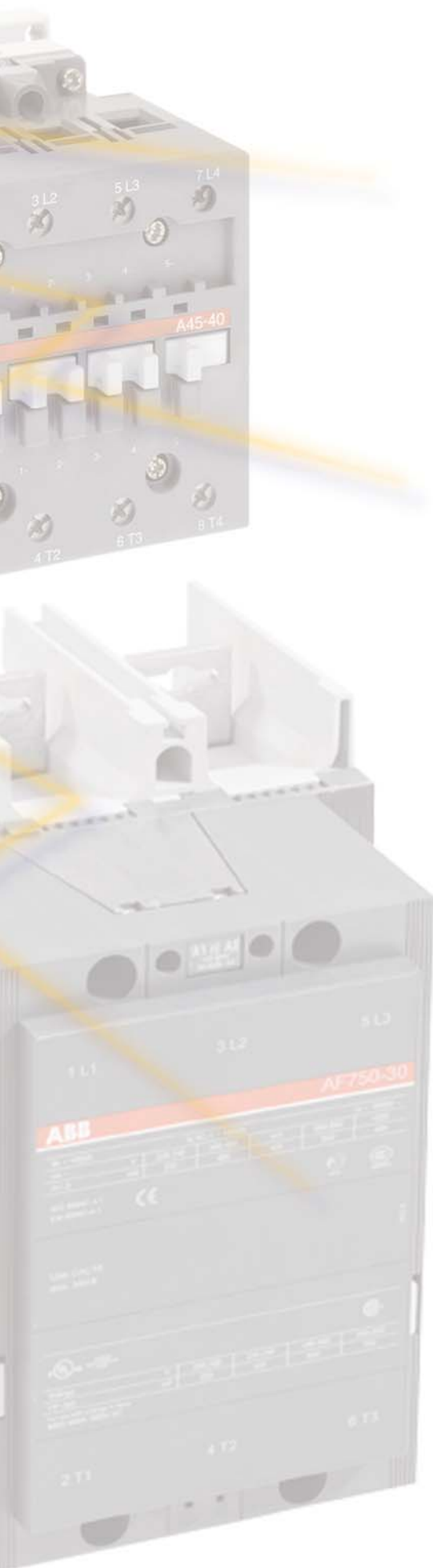
3-pole Contactors 4-pole Contactors Specific Contactors Applications Technical Data

a.c. Circuit Switching

d.c. Circuit Switching

Capacitor Switching

Lighting Circuits



Contents

Panorama

3-pole Contactors	2/2
4-pole Contactors	2/4

3-pole Contactors: Description and Ordering Details

A 9 ... A 110 Contactors (a.c. Operated)	2/6
A 145 ... AF 1650 Contactors (a.c. Operated)	2/10
AL 9 ... AE 110, AL..Z Contactors (d.c. Operated)	2/14
TAL 9 ... TAE 110 Contactors (d.c. Operated)	2/16
AF 50 ... AF 110 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/18
AF 145 ... AF 1650 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/20

4-pole Contactors: Ordering Details

A 9 ... A 75 Contactors (a.c. Operated)	2/22
EK 110 ... EK 1000 Contactors (a.c. Operated)	2/24
AL 9 ... AE 75 Contactors (d.c. Operated)	2/26
TAL 9 ... TAE 75 Contactors (d.c. Operated)	2/28
EK 110 ... EK 1000 Contactors (d.c. Operated)	2/30
AF 45 ... AF 75 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/31

Specific Contactors: Ordering Details

UA..RA Contactors for Capacitor Switching	2/34
UA... Contactors for Capacitor Switching	2/38
GA 75 and GAE 75 Contactors for d.c. Switching	2/44
AM... Magnetically Latched Contactors	2/46
EH 1200 Contactor for Non Inductive Loads	2/48

Applications and Contactor Selection

Capacitor Switching	2/32
Star-Delta Starting	2/50
Control of Three-Phase Slip-Ring Motors	2/52
Autotransformer Starting	2/54
LV/LV Three-Phase Transformer Switching	2/55
Lighting Circuit Switching	2/56
d.c. Circuit Switching	2/60
Auxiliary Contacts for Safety Circuits	2/63

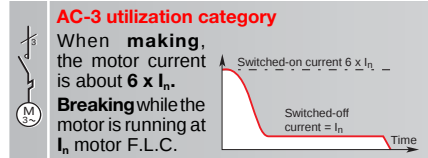
Technical Data

A..., AF..., AL..., AL..Z, TAL..., AE... and TAE Contactors	2/64
EK... Contactors	2/76
Contactor Electrical Durability and Utilization Categories	2/81
Influence of the Length of Conductors used in Contactor Control Circuit	2/88
Parallel Connection of Main Poles	2/90
Temporary or Intermittent Duty	2/91
Questionnaire for Product Specifications	2/92

A., AL., AE., AF.,

a.c. Circuit Switching

Switching of 3-phase Cage Motors

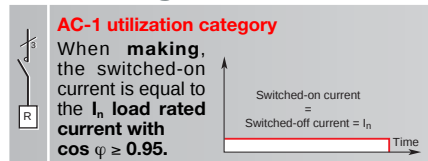


AC-3 Power rating	$\theta \leq 55^\circ\text{C}, 400\text{ V}$
AC-3 Rated operational current	$\theta \leq 55^\circ\text{C}, 400\text{ V}$ $\theta \leq 55^\circ\text{C}, 415\text{ V}$ $\theta \leq 55^\circ\text{C}, 690\text{ V}$

A 9	A 12	A 16	A 26	A 30	A 40
AL 9	AL 12	AL 16	AL 26	AL 30	AL 40
4	5.5	7.5	11	15	18.5
9	12	17	26	32	37
9	12	17	26	32	37
7	9	10	17*	21*	25*

* For AL 26 ... AL 40 see "Technical Data"

Switching of Resistive Circuits



AC-1 Rated operational current	$\theta \leq 40^\circ\text{C}, 690\text{ V}$ $\theta \leq 55^\circ\text{C}, 690\text{ V}$ $\theta \leq 70^\circ\text{C}, 690\text{ V}$
• With conductor cross-sectional area	
• Rated operational voltage	

A 25	A 27	A 30	A 45	A 55	A 60
AL 22	AL 25	AL 27	AL 40	AL 55	AL 60
A 18	A 20	A 23	A 32	A 39	A 42
2.5	4	4	6	10	16
V	690				

3-phase Motor-rating General Use Rating

Motor-rating	480 V
Amp-rating	600 V
Nema Size	

hp	5	7.5	10	20	25	30
A	21	25	30	40	50	60
	00	0	-	1	1P	-

3-pole Contactors

Selection & Ordering

- ▶ Select contactor type.
- ▶ Select contactor coil voltage on cover folding page 0/1, according to control circuit supply. (Please quote coil voltage in plain text).

Note: The AF contactor range, with a.c./d.c. Electronic Coil Interface, is available from AF 50 up to AF 1650.



a.c. Control supply range Types
A..., AF... Contactors



d.c. Control supply range Types
AL..., AE..., AF... Contactors

A 9-30-10	A 12-30-10	A 16-30-10	A 26-30-10	A 30-30-10	A 40-30-10
-----------	------------	------------	------------	------------	------------

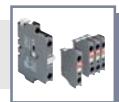
AL 9-30-10	AL 12-30-10	AL 16-30-10	AL 26-30-10	AL 30-30-10	AL 40-30-10
------------	-------------	-------------	-------------	-------------	-------------

Contactor Main Accessories

Selection & Ordering

- ▶ Select accessory type and quote required data in plain text.

Auxiliary contacts



CA 5-..., 1-pole,
CAL ...-..., 2-pole

CA 5-10, 1-pole, front mounting 1 x N.O.	CA 5-01, 1-pole, front mounting 1 x N.C.
---	---

Timers



TP..., Pneumatic (A..., AE..., AF... contactors only)
TE..., Electronic
Supply voltages: 24 V a.c./d.c., 110 ... 120; 220 ... 240; 380 ... 440 V a.c.

TP 40 DA, TP 180 DA Direct timing - Front mounting	TP 40 IA, TP 180 IA
TE5S Direct timing - Separate mounting	

Interlocks



VE 5-..., Mechanical / Electrical
VM..., Mechanical
mounting between 2 contactors

VE 5-1	VM 5-1
--------	--------

Surge suppressors



RV..., (Varistor) a.c./d.c.
RC..., (Capacitor) a.c.
RT..., (Transil diode) d.c.

RV 5	RC 5-1	RT 5
------	--------	------

Protection of 3-phase motors

Selection & Ordering

- ▶ Select O/L relay type and setting range according to motor F.L.C.

O/L relays



TA..DU..., Thermal O/L relay
E..DU..., Electronic O/L relay
Standard starting time 2 ... 10 s
tripping class 10 A

TA 25 DU ...	TA 42 DU ...
0.10...0.16	1.0...1.4
0.16...0.25	1.3...1.8
0.25...0.40	1.7...2.4
0.40...0.63	2.2...3.1
0.63...1.0	2.8...4.0
3.5...5.0	13...19
4.5...6.5	18...25
6.0...8.5	24...32
7.5...11	
10...14	
E16 DU ...-10	
0.1...0.32	0.9...2.7
0.3...1.0	2...6.3
5.7...18.9	

For further information:

- >> Description
- >> Ordering Details
- >> Technical Data

Types pages	A..	AF..	AL../TAL..	AE../TAE	UA../RA/UA..	GA../GAE..	AM..
pages	2/6, 2/10	2/18, 2/20	2/14	2/34, 2/38	2/44	2/46	
pages	2/7, 2/11	2/19, 2/21	2/15, 2/16	2/15, 2/16	2/35, 2/39	2/45	2/47
pages	2/64		2/75		2/37, 2/41	2/44	2/46

3-pole Contactors



	A 50	A 63	A 75	A 95	A 110	A 145	A 185	A 210	A 260	A 300	AF 400	AF 460	AF 580	AF 750	AF 1350	AF 1650
	AE 50	AE 63	AE 75	AE 95	AE 110	AF 145	AF 185	AF 210	AF 260	AF 300						
	22	30	37	45	55	75	90	110	140	160	200	250	315	400	475	560
	50	65	75	96	110	145	185	210	260	305	400	460	580	750	860	1050
	50	65	75	96	110	145	185	210	260	300	400	460	580	750	860	1050
	35	43	46	65	82	120	170	210	220	280	350	400	500	650	800	950
	100	115	125	145	160	250	275	350	400	500	600	700	800	1050	1350	1650
	85	95	105	135	145	230	250	300	350	400	500	600	700	875	1150	1450
	70	80	85	115	130	180	180	240	290	325	400	480	580	720	1000	1270
	35	50	50	50	70	120	150	185	240	300	2 x 185	2 x 240	2x240	bar / mm 2x50x8	bar / mm 2//100x5	bar / mm 3//100x5
	1000						690			1000						
	40	60	60	60	75	100	125	150	200	250	350	400	500	600	800	900
	80	90	105	125	140	230	250	300	350	400	550	650	750	900	1350	1650
	2	–	3	–	–	4	–	–	5	–	–	6	–	7	–	8

A 50-30-00 A 63-30-00 A 75-30-00	A 95-30-00 A 110-30-00	A 145-30-11 A 185-30-11	A 210-30-11 A 260-30-11 A 300-30-11	AF 400-30-11 AF 460-30-11	AF 580-30-11 AF 750-30-11	AF 1350-30-11 AF 1650-30-11
AE 50-30-00 AE 63-30-00 AE 75-30-00	AE 95-30-00 AE 110-30-00	AF 145-30-11 AF 185-30-11	AF 210-30-11 AF 260-30-11 AF 300-30-11	AF 400-30-11 AF 460-30-11	AF 580-30-11 AF 750-30-11	AF 1350-30-11 AF 1650-30-11

CAL 5-11 2-pole, side mounting 1 x N.O. + 1 x N.C.	CAL 18-11 2-pole, side mounting 1 x N.O. + 1 x N.C. (1 st block)	CAL 18-11 B 2-pole, side mounting 1 x N.O. + 1 x N.C. (2 nd block)
---	--	--

Inverse timing - Front mounting	TE5S Sep. mounting	TE5S Direct timing - Separate mounting
---------------------------------	--------------------	--

VE 5-2 –	VM 300H	VM 750H	VM 1650H
-------------	---------	---------	----------

RV 5 RC 5-2 RT 5	The AF 50 ... AF 1650 contactors are equipped with a built-in electronic coil interface which eliminates the need of extra surge suppressors - For A 145 ... A 300 use RC-EH 300
------------------------	--

TA 75 DU... 29...42 36...52 45...63 60...80	TA 80 DU... 60...80 TA 110 DU... 65...90 80...110	TA 200 DU... 130...175 150...200 E 200 DU 60...200	TA 450 DU... 165...235 220...310 E 320 DU 100...320	E 500 DU 150...500	E 800 DU 250...800	E 1250 DU 375...1250
---	---	--	---	-----------------------	-----------------------	-------------------------

Information
about:

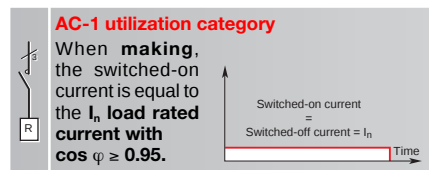
>> Accessories section 4
>> Motor Protection section 5
>> Approvals section 7

>> Terminal Marking section 8
>> Dimensions section 9

A., AL., AE., EK.,

a.c. Circuit Switching

Switching of Resistive Circuits



AC-1	Rated operational current	$\theta \leq 40^\circ \text{C}$ $\theta \leq 55^\circ \text{C}$ $\theta \leq 70^\circ \text{C}$
●	With conductor cross-sectional area	
●	Rated operational voltage	

	A 9	A 16	A 26	
	AL 9	AL 16	AL 26	
A	25	30	45	
A	22	27	40	
A	18	23	32	
mm²	2.5	4	6	
V	690			

General Use Rating

Amp-rating	600 V
Nema Size	

A	21	30	40	
	00	0	1	

4-pole Contactors

Selection & Ordering

- Select 4 N.O. or 2 N.O. + 2 N.C. main poles.
- Select contactor type.
- Select contactor coil voltage on cover folding page 0/1, according to control circuit supply. (Please quote coil voltage in plain text).

Note: The 4 N.O. or 2 N.O. + 2 N.C. **AF** contactor range with a.c./d.c. Electronic Coil Interface, is available from **AF 45** up to **AF 75**.

4 N.O. main poles

	a.c. Control supply range A..., EK... Contactors	Types	A 9-40-00 A 16-40-00	A 26-40-00	
	d.c. Control supply range AL..., AE..., EK... Contactors	Types	AL 9-40-00 AL 16-40-00	AL 26-40-00	

2 N.O. + 2 N.C. main poles

	a.c. Control supply range A... Contactors	Types	A 9-22-00 A 16-22-00	A 26-22-00	
	d.c. Control supply range AL..., AE... Contactors	Types	AL 9-22-00 AL 16-22-00	AL 26-22-00	

Contactor Main Accessories

Selection & Ordering

- Select accessory type and quote required data in plain text.

Auxiliary contacts		CA 5-.. , 1-pole CAL ..-.. , 2-pole	Types	CA 5-10 1-pole, front mounting 1 x N.O.	CA 5-01 1-pole, front mounting 1 x N.C.
Timers		TP.. , Pneumatic for A..., AE... contactors only TE.. , Electronic Supply voltages: 24 V a.c./d.c., 110 ... 120 ; 220 ... 240 ; 380 ... 440 V a.c.	Types	TP 40 DA, TP 180 DA Direct timing - Front mounting TE5S Direct timing - Separate	
Interlocks		VE 5-.. , Mechanical/ Electrical VM... , VH... Mechanical mounting between 2 contactors	Types	VE 5-1 VM 5-1	
Surge suppressors		RV.. , (Varistor) a.c./d.c. RC.. , (Capacitor) a.c. RT.. , (Transil diode) d.c.	Types	RV 5 RC 5-1 RT 5	

For further information:

	Types	A..	EK..	AF..	AL../AE..	TAL../TAE..	AM..
>> Ordering Details	pages	2/22	2/24, 2/30	2/31	2/26	2/28	2/47
>> Technical Data	pages	2/64 ... 2/74	2/76 ... 2/80	2/64	2/74		2/46

4-pole Contactors



	A 45	A 50	A 75	EK 110	EK 150	EK 175	EK 210	EK 370	EK 550	EK 1000
	AE 45	AE 50	AE 75							
	70	100	125	200	250	300	350	550	800	1000
	60	85	105	180	230	270	310	470	650	800
	50	70	85	155	200	215	250	400	575	720
	25	35	50	95	150	185	240	2 x 185	2 x 240	2 x 300
	690			1000						

80			80		105		170		200		250		300		420			540		–	
2			2		3		–		–		–		–		–			–		–	

A 45-40-00			A 50-40-00		A 75-40-00		EK 110-40-11		EK 150-40-11		EK 175-40-11		EK 210-40-11		EK 370-40-11			EK 550-40-11		EK 1000-40-11	
AE 45-40-00			AE 50-40-00		AE 75-40-00		EK 110-40- 21		EK 150-40-21		EK 175-40-21		EK 210-40-21		EK 370-40-21			EK 550-40-21		EK 1000-40-21	

A 45-22-00			A 75-22-00		–		–		–		–		–		–			–		–	
AE 45-22-00			AE 75-22-00		–		–		–		–		–		–			–		–	

CAL 5-11 2-pole, side mounting 1 x N.O. + 1 x N.C.			CAL 16-11 2-pole, side mounting 1 x N.O. + 1 x N.C.																		
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TP 40 IA, TP 180 IA Inverse timing - Front mounting mounting			–				TE5S Direct timing - Separate mounting (interpose an N.. contactor relay for EK 370 ... EK 1000)														
---	--	--	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

VE 5-2 –			VH 145 (Mechanical / Electrical)		VH 300 (Mechanical / Electrical)		– VH 800														
-------------	--	--	-------------------------------------	--	-------------------------------------	--	-------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

RV 5 RC 5-2 RT 5			– RC-EH 300 –				RC-EH 800 (Varistor + RC) –														
------------------------	--	--	---------------------	--	--	--	-----------------------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Information
about:

>> Accessories section 4
>> Approvals section 7

>> Terminal Marking section 8
>> Dimensions section 9

A 9 ... A 110 3-pole Contactors

a.c. Operated



Application

A 9 ... A 110 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 V a.c. / 1000 V a.c. or 220 V d.c. / 440 V d.c. The contactors can also be used for many other applications such as isolation, capacitor switching, lighting.

Description

The **A...** series 3-pole contactors are of the block type design.

- Main poles and auxiliary contact blocks

A 9 ... A 40 1-stack contactors:

- 3 main poles,
- 1 built-in auxiliary contact,
- front and side mounted add-on auxiliary contact blocks.

A 50 ... A 110 contactors:

- 3 main poles,
- front and side mounted add-on auxiliary contact blocks.

- Control circuit: a.c. operated with laminated magnet circuit.
- Accessories: a wide range of accessories is available

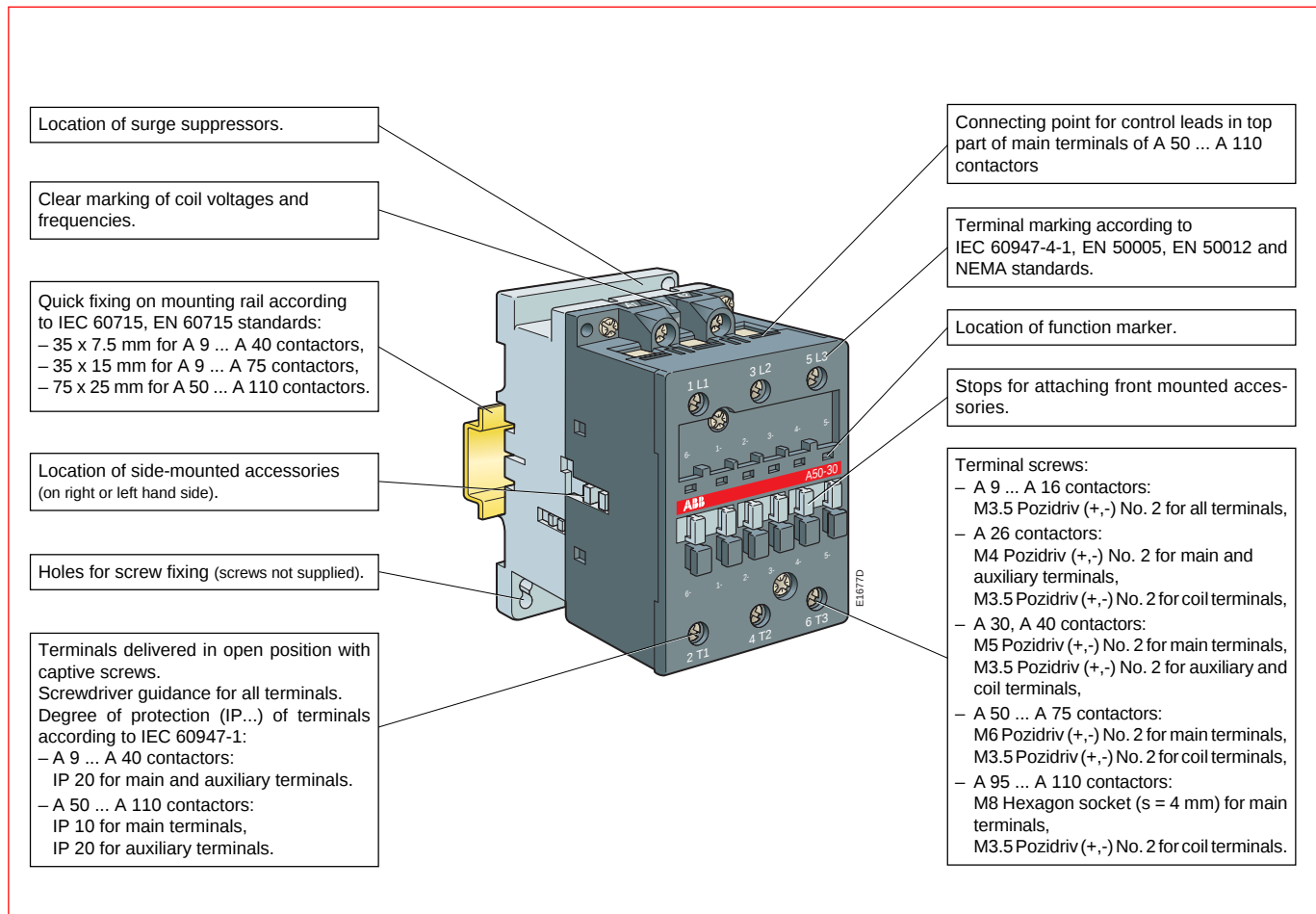
A 9 ... A 40 2-stack contactors:

- 1st stack with 3 main poles and 1 built-in auxiliary contact,
- 2nd stack with 4 built-in auxiliary contacts,
- side mounted add-on auxiliary contact blocks.

The built-in auxiliary contact elements are mechanically linked.

Variants

- 4-pole: A 9 ... A 75 contactors (with 4 N.O. or 2 N.O. + 2 N.C. main poles).
- d.c. operated: AL 9 ... AL 40, AL 9Z ... AL 16Z and AE 50 ... AE 110 contactors.
- d.c. operated with large coil voltage range: TAL 9 ... TAL 40 and TAE 50 ... TAE 110 contactors.
- electronic coil interface (a.c./d.c. operated): AF 50 ... AF 110 contactors.
- contactors for capacitor switching (UA..., UA...RA types).
- contactors for d.c. switching (GA..., GAE... types).
- magnetically latched contactors (AM... types).



A 9 ... A 110 3-pole Contactors

a.c. Operated



A 9-30-10



A 26-30-10



A 50-30-00



A 95-30-00

Ordering Details

IEC	UL/CSA		Auxiliary contacts fitted		Type	Order code	Weight kg
Rated power 400 V AC-3 kW	Rated current $\theta \leq 40^\circ\text{C}$ AC-1 A	3-Phase motor rating 480 V hp	General use rating 600 V A	1 st stack 2 nd stack	state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
4	25	5	21	1 – –	A 9-30-10	1SBL 141 001 R□□10	0.340
				– 1 –	A 9-30-01	1SBL 141 001 R□□01	0.340
				– – 2 2	A 9-30-22	1SBL 141 001 R□□22	0.400
				1 – 2 2	A 9-30-32	1SBL 141 001 R□□32	0.400
5.5	27	7.5	25	1 – –	A 12-30-10	1SBL 161 001 R□□10	0.340
				– 1 –	A 12-30-01	1SBL 161 001 R□□01	0.340
				– – 2 2	A 12-30-22	1SBL 161 001 R□□22	0.400
				1 – 2 2	A 12-30-32	1SBL 161 001 R□□32	0.400
7.5	30	10	30	1 – –	A 16-30-10	1SBL 181 001 R□□10	0.340
				– 1 –	A 16-30-01	1SBL 181 001 R□□01	0.340
				– – 2 2	A 16-30-22	1SBL 181 001 R□□22	0.400
				1 – 2 2	A 16-30-32	1SBL 181 001 R□□32	0.400
11	45	20	40	1 – –	A 26-30-10	1SBL 241 001 R□□10	0.600
				– 1 –	A 26-30-01	1SBL 241 001 R□□01	0.600
				1 – 2 2	A 26-30-32	1SBL 241 001 R□□32	0.660
15	55	25	50	1 – –	A 30-30-10	1SBL 281 001 R□□10	0.710
				– 1 –	A 30-30-01	1SBL 281 001 R□□01	0.710
				1 – 2 2	A 30-30-32	1SBL 281 001 R□□32	0.770
18.5	60	30	60	1 – –	A 40-30-10	1SBL 321 001 R□□10	0.710
				– 1 –	A 40-30-01	1SBL 321 001 R□□01	0.710
				1 – 2 2	A 40-30-32	1SBL 321 001 R□□32	0.770
22	100	40	80	– – –	A 50-30-00	1SBL 351 001 R□□00	1.160
				1 1 –	A 50-30-11	1SBL 351 001 R□□11	1.200
				– – 2 2	A 50-30-22	1SBL 351 001 R□□22	1.230
30	115	60	90	– – –	A 63-30-00	1SBL 371 001 R□□00	1.160
				1 1 –	A 63-30-11	1SBL 371 001 R□□11	1.200
				– – 2 2	A 63-30-22	1SBL 371 001 R□□22	1.230
37	125	60	105	– – –	A 75-30-00	1SBL 411 001 R□□00	1.160
				1 1 –	A 75-30-11	1SBL 411 001 R□□11	1.200
				– – 2 2	A 75-30-22	1SBL 411 001 R□□22	1.230
45	145	60	125	– – –	A 95-30-00	1SFL 431 001 R□□00	2.000
				1 1 –	A 95-30-11	1SFL 431 001 R□□11	2.040
				– – 2 2	A 95-30-22	1SFL 431 001 R□□22	2.070
55	160	75	140	– – –	A 110-30-00	1SFL 451 001 R□□00	2.000
				1 1 –	A 110-30-11	1SFL 451 001 R□□11	2.040
				– – 2 2	A 110-30-22	1SFL 451 001 R□□22	2.070

Coil voltages and codes

Voltage □□ V - 50Hz	Voltage □□ V - 60Hz	Code □□
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

>> Accessory Fitting Details	page 2/8	>> General - Approvals	section 7
>> Thermal O/L Relays	page 2/9	>> Terminal Marking and Positioning	section 8
>> Auxiliary Contacts for Safety Circuits	page 2/63	>> Dimensions	section 9
>> Technical Data	page 2/64		

A 9 ... A 110 3-pole Contactors

Main Accessories

Fitting Details - For Ordering Details, see "Accessories"

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

Contactor types	Main poles	Available auxiliary contacts	Front mounted accessories			Side mounted accessories	
			Auxiliary contact 1-pole CA 5-.. (or 1-pole CE 5-..)	Auxiliary contact 4-pole CA 5-..	Pneumatic timer TP .. A	Auxiliary contact 2-pole CAL.. (or 1-pole CEL 18-..)	Interlock unit VM 5-.. or VE 5-..
A 9 ... A 26 A 9 ... A 26	3 0	1 0 0 1 (5)	1 to 4 x CA 5-.. (1 to 2 x CE 5-.. max.) (1)	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A (6)	+ 1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 9 ... A 16 A 9 ... A 26	3 0	2 2 3 2	—	—	—	1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 30, A 40 A 30, A 40	3 0	1 0 0 1 (5)	1 to 5 x CA 5-.. (1 to 3 x CE 5-.. max.) (2)	or 1 x CA 5-.. (4-pole) + 1 x 1-pole CA 5-.. or CE 5-.. (2)	or 1 x TP .. A + 1 x CA 5-.. (1-pole)	+ 1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 30, A 40	3 0	3 2 (5)	1 x CA 5-.. (or 1 x CE 5-..) (4)	—	—	+ 1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 50 ... A 75	3 0	0 0	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (3)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (3)	or 1 x TP .. A + 2 x CA 5-.. (1-pole)	+ 1 to 2 x CAL 5-11	or 1 x VE 5-2 + 1 x CAL 5-11
A 50 ... A 75	3 0	1 1	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (3)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (3)	or 1 x TP .. A + 2 x CA 5-.. (1-pole)	+ 1 x CAL 5-11	or 1 x VE 5-2
A 50 ... A 75	3 0	2 2	1 to 2 x CA 5-.. (1 to 2 x CE 5-.. max.)	—	—	+ 1 to 2 x CAL 5-11	or 1 x VE 5-2 + 1 x CAL 5-11
A 95, A 110	3 0	0 0	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (3)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (3)	—	+ 1 to 2 x CAL 18-11 (or 1 to 2 x CEL 18-..)	or 1 x VE 5-2 + 1 x CAL 18-11
A 95, A 110	3 0	1 1	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (3)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (3)	—	+ 1 x CAL 18-11 (or 1 x CEL 18-..)	or 1 x VE 5-2
A 95, A 110	3 0	2 2	1 to 2 x CA 5-.. (1 to 2 x CE 5-.. max.)	—	—	+ 1 to 2 x CAL 18-11 (or 1 to 2 x CEL 18-..)	or 1 x VE 5-2 + 1 x CAL 18-11

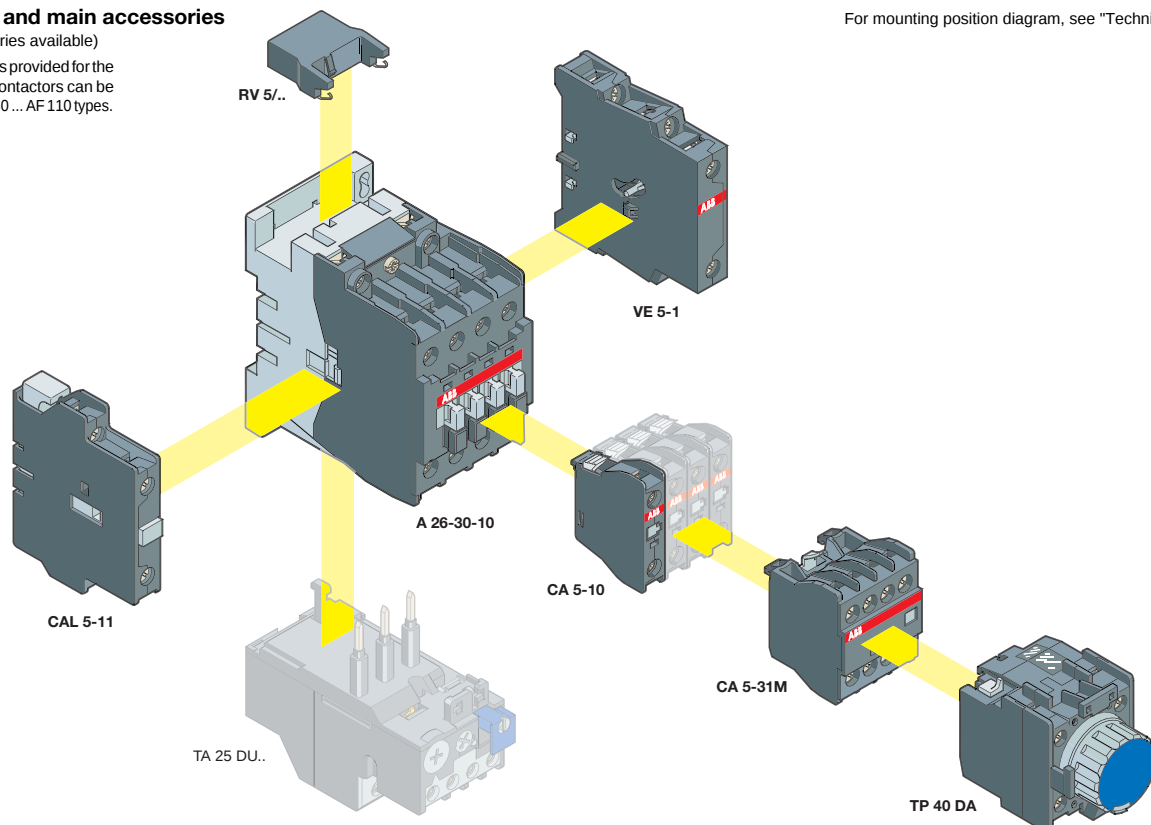
- (1) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is limited to 2.
 (2) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is limited to 3.
 (3) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is limited to 5.
 (4) CE 5-.. auxiliary contacts not allowed in mounting position 5.
 (5) 2 N.C. CA 5-.. auxiliary contacts maximum in mounting position 5.
 (6) A 9, A 12, A 16-30-01 in mounting position 5, TP..DA not allowed.

CE 5-.. auxiliary contacts not allowed in mounting position 5.
 CE 5-.. auxiliary contacts not allowed in mounting position 5.

Contactor and main accessories

(other accessories available)

The accessories provided for the A 50 ... A 110 contactors can be used for the AF 50 ... AF 110 types.



For mounting position diagram, see "Technical Data"

A 9 ... A 110 3-pole Contactors

Thermal O/L Relays

Fitting Details - For Ordering Details, see "Motor Protection"

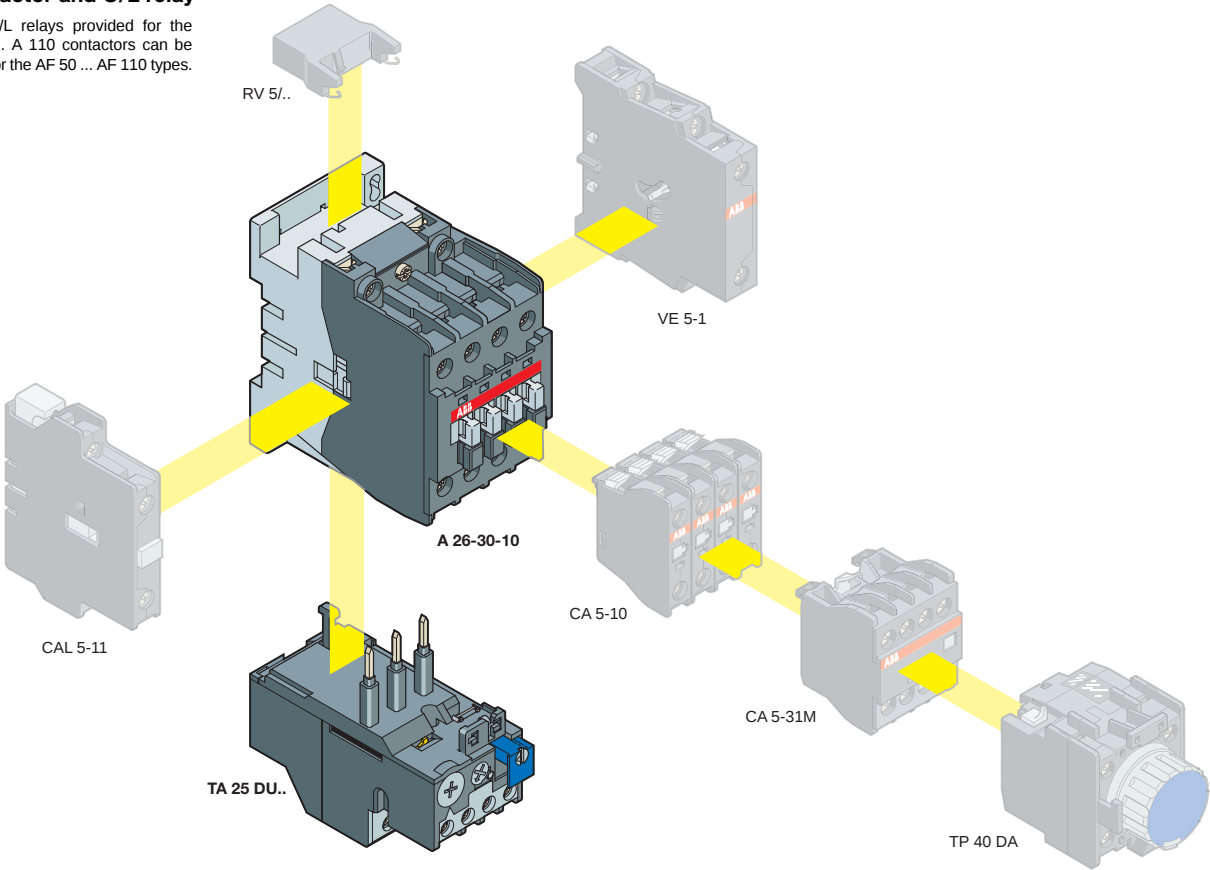
The addition of a thermal O/L relay on the contactor does not prevent fitting of many other accessories as shown below.

Contactor types	Thermal O/L relays - No mounting kit required, direct mounting				
	TA 25 DU.. 0.1 ... 0.16 to 24 ... 32 A	TA 42 DU 18 ... 25 to 29 ... 42 A	TA 75 DU 18 ... 25 to 60 ... 80 A	TA 80 DU 29 ... 42 to 60 ... 80 A	TA 110 DU 65 ... 90 to 80 ... 110 A
A 9 ... A 26	TA 25 DU..	—	—	—	—
A 30, A 40	TA 25 DU.. (1)	or TA 42 DU.. (1)	—	—	—
A 50 ... A 75	—	—	TA 75 DU..	—	—
A 95, A 110	—	—	—	TA 80 DU.. (1)	or TA 110 DU.. (1)

(1) According to the current value.

Contactor and O/L relay

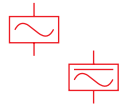
The O/L relays provided for the A 50 ... A 110 contactors can be used for the AF 50 ... AF 110 types.



A 145 ... AF 1650 3-pole Contactors

a.c. Operated - A 145 ... A 300 Contactors

a.c. / d.c. Operated - AF 400 ... AF 1650 Contactors



Application

A 145 ... AF 1650 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 V a.c. / 1000 V a.c. or 220 V d.c. / 600 V d.c. The contactors can also be used for many other applications such as isolation, bypass, capacitor switching, lighting...

Description

The **A 145 ... AF 1650** 3-pole contactors are of the block type design.

- Main poles and auxiliary contact blocks
 - 3 main poles,
 - 1 N.O. and 1 N.C. auxiliary contact block (fitted on the left side).A maximum of 4 auxiliary contact blocks can be fitted on each contactor.

- Control circuit:

A 145 ... A 300 contactors: a.c. operated with laminated magnet circuit,

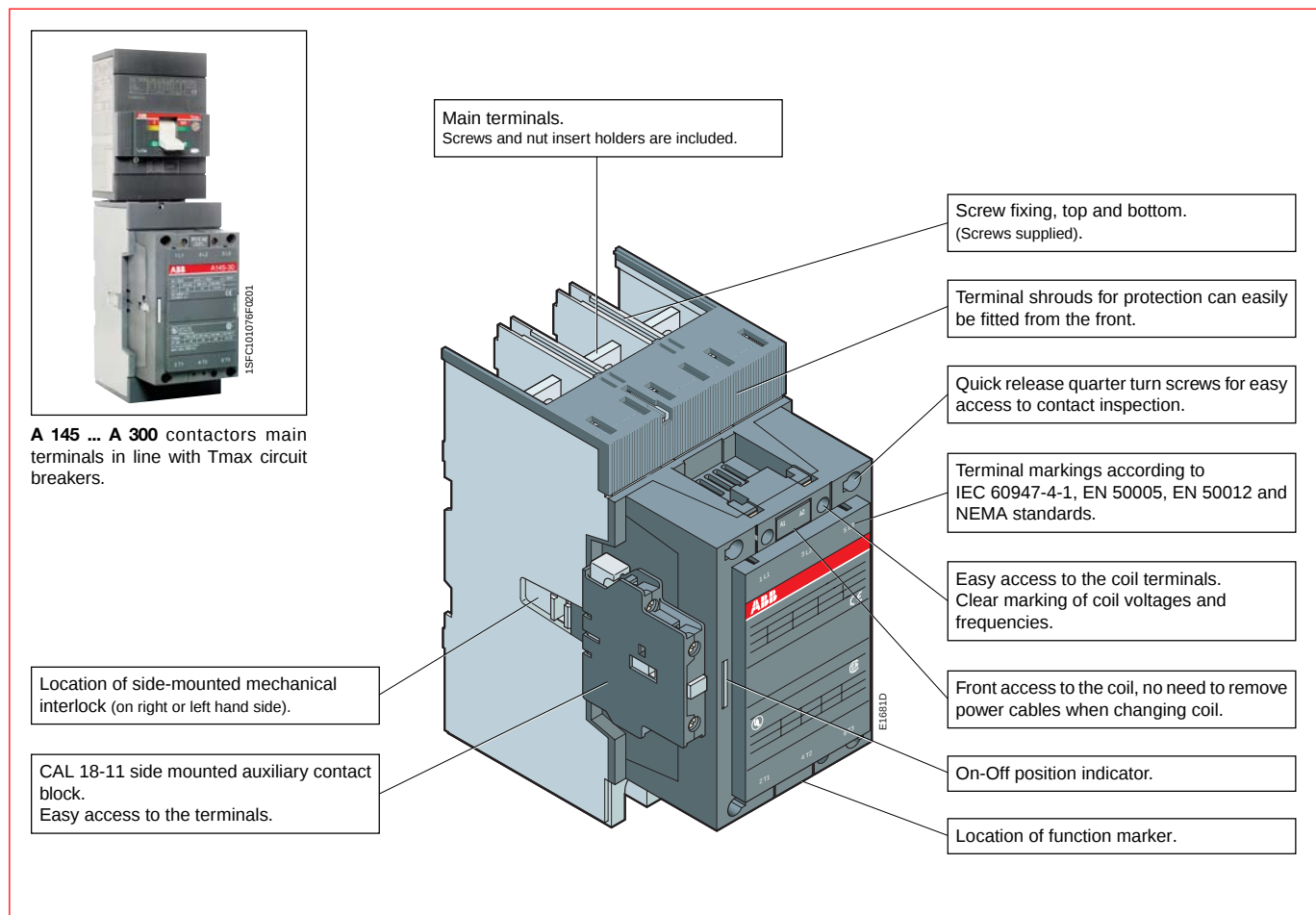
AF 400 ... AF 1650 contactors: a.c. operated, wide voltage range, with electronic coil interface, with laminated magnet circuit.

Contactors AF 400 ... AF 1650 are fitted as standard with an electronic coil interface which accepts a wide control voltage range for a.c. 50/60 Hz supply or d.c. supply.

- Accessories: a wide range of accessories is available.

Variants

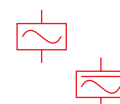
- electronic coil interface (a.c./d.c. operated) with wide voltage range: AF 145 ... AF 300 contactors.



A 145 ... AF 1650 3-pole Contactors

a.c. Operated - A 145 ... A 300 Contactors

a.c. / d.c. Operated - AF 400 ... AF 1650 Contactors



Ordering Details

IEC	UL/CSA		Auxiliary contacts fitted		Type	Order code	Weight kg
Rated power 400 V	Rated current $\theta \leq 40^\circ\text{C}$	3-Phase motor rating	General use rating		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
AC-3	AC-1	480 V	600 V				
kW	A	hp	A				
75	250	100	230	1 1 2 2	A 145-30-11 A 145-30-22	1SFL 471 001 R□□11 1SFL 471 001 R□□22	3.500 3.500
90	275	125	250	1 1 2 2	A 185-30-11 A 185-30-22	1SFL 491 001 R□□11 1SFL 491 001 R□□22	3.500 3.500
110	350	150	300	1 1 2 2	A 210-30-11 A 210-30-22	1SFL 511 001 R□□11 1SFL 511 001 R□□22	6.100 6.100
140	400	200	350	1 1 2 2	A 260-30-11 A 260-30-22	1SFL 531 001 R□□11 1SFL 531 001 R□□22	6.100 6.100
160	500	250	400	1 1 2 2	A 300-30-11 A 300-30-22	1SFL 551 001 R□□11 1SFL 551 001 R□□22	6.100 6.100
200	600	350	550	1 1 2 2	AF 400-30-11 AF 400-30-22	1SFL 577 001 R□□11 1SFL 577 001 R□□22	12.00 12.00
250	700	400	650	1 1 2 2	AF 460-30-11 AF 460-30-22	1SFL 597 001 R□□11 1SFL 597 001 R□□22	12.00 12.00
315	800	500	750	1 1 2 2	AF 580-30-11 AF 580-30-22	1SFL 617 001 R□□11 1SFL 617 001 R□□22	15.00 15.00
400	1050	600	900	1 1 2 2	AF 750-30-11 AF 750-30-22	1SFL 637 001 R□□11 1SFL 637 001 R□□22	15.00 15.00
475	1350	800	1350	1 1 2 2	AF 1350-30-11 AF 1350-30-22	1SFL 657 001 R□□11 1SFL 657 001 R□□22	34.00 34.00
560	1650	900	1650	1 1 2 2	AF 1650-30-11 AF 1650-30-22	1SFL 677 001 R□□11 1SFL 677 001 R□□22	35.00 35.00

Coil voltages and codes: A 145 ... A 300

Voltage □□ V - 50Hz	Voltage □□ V - 60Hz	Code □□
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

Coil voltages and codes: AF 400 ... AF 750

Voltage □□ V - 50/60Hz	Voltage □□ V d.c.	Code □□
—	24 ... 60	6 8 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0
250 ... 500	250 ... 500	7 1

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

Coil voltages and codes: AF 1350, AF 1650

Voltage □□ V - 50/60Hz	Voltage □□ V d.c.	Code □□
100 ... 250	100 ... 250	7 0

>> AF... contactors with electronic coil interface: electromagnetic compatibility	page 2/21	>> General - Approvals	section 7
>> Accessory Fitting Details	page 2/12	>> Terminal Marking and Positioning	section 8
>> Thermal & Electronic O/L Relays	page 2/13	>> Dimensions	section 9
>> Technical Data	page 2/65		

2

3-pole Contactors



A 185-30-11



A 300-30-11



AF 460-30-11



AF 750-30-11



AF 1650-30-11

A 145 ... AF 1650 3-pole Contactors

Main Accessories

Fitting Details - For Ordering Details, see "Accessories"

Contactor types	Main poles	Available auxiliary contacts	Side mounted accessories	Mechanical interlock units	Mounting and positioning
			(Front mounted accessories are not available on large A..., AF... contactors)	(for two horizontal mounted contactors)	
			Add-on auxiliary contact blocks CAL 18-11, CAL 18-11B (3)		Factory mounted auxiliary contacts Add-on CAL 18-11 auxiliary contacts Add-on CAL 18-11B auxiliary contacts
Contactor types + auxiliary contact blocks					
A 145 ... A 300	3 0	1 1	1 x CAL 18-11	+ 2 x CAL 18-11B	—
AF 145 ... AF 1650	3 0	1 1			
A 145 ... A 300	3 0	2 2	—	2 x CAL 18-11B	—
AF 145 ... AF 1650	3 0	2 2			
Contactor types with mechanical interlocking + auxiliary contact blocks					
A 145 ... A 185	3 0	1 1	2 x CAL 18-11 (1)	+ 3 x CAL 18-11B (1) + VM ...H (2)	
AF 145 ... AF 185	3 0	1 1			
A 145 ... A 185	3 0	2 2	—	3 x CAL 18-11B (1) + VM ...H (2)	
AF 145 ... AF 185	3 0	2 2			
A 210 ... A 300	3 0	1 1	2 x CAL 18-11 (1)	+ 4 x CAL 18-11B (1) + VM ...H (2)	
AF 210 ... AF 1650	3 0	1 1			
A 210 ... A 300	3 0	2 2	—	4 x CAL 18-11B (1) + VM ...H (2)	
AF 210 ... AF 1650	3 0	2 2			

(1) Total number of auxiliary contact blocks for the two contactors.

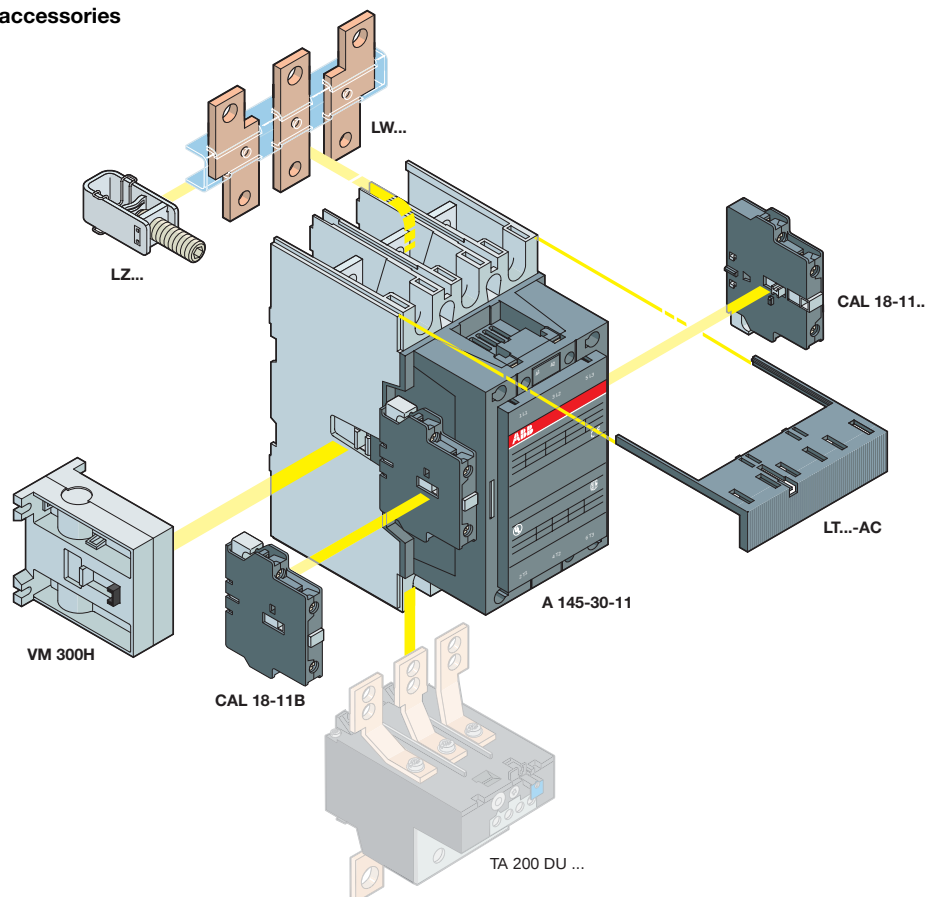
(2) Interlock type, according to the contactor ratings (see "Accessories").

(3) The CEL 18-... auxiliary contact blocks can replace the CAL 18-11 and CAL 18-11B. Though, no auxiliary contact block can be mounted outside the CEL 18-...

- (1) Total number of auxiliary contact blocks for the two contactors. (2) Interlock type, according to the contactor ratings (see "Accessories").
(3) The CEL 18... auxiliary contact blocks can replace the CAL 18-11 and CAL 18-11B. Though, no auxiliary contact block can be mounted outside the CEL 18-...

Contactor and main accessories

(other accessories available)



EL686D

A 145 ... AF 1650 3-pole Contactors

Thermal & Electronic O/L Relays

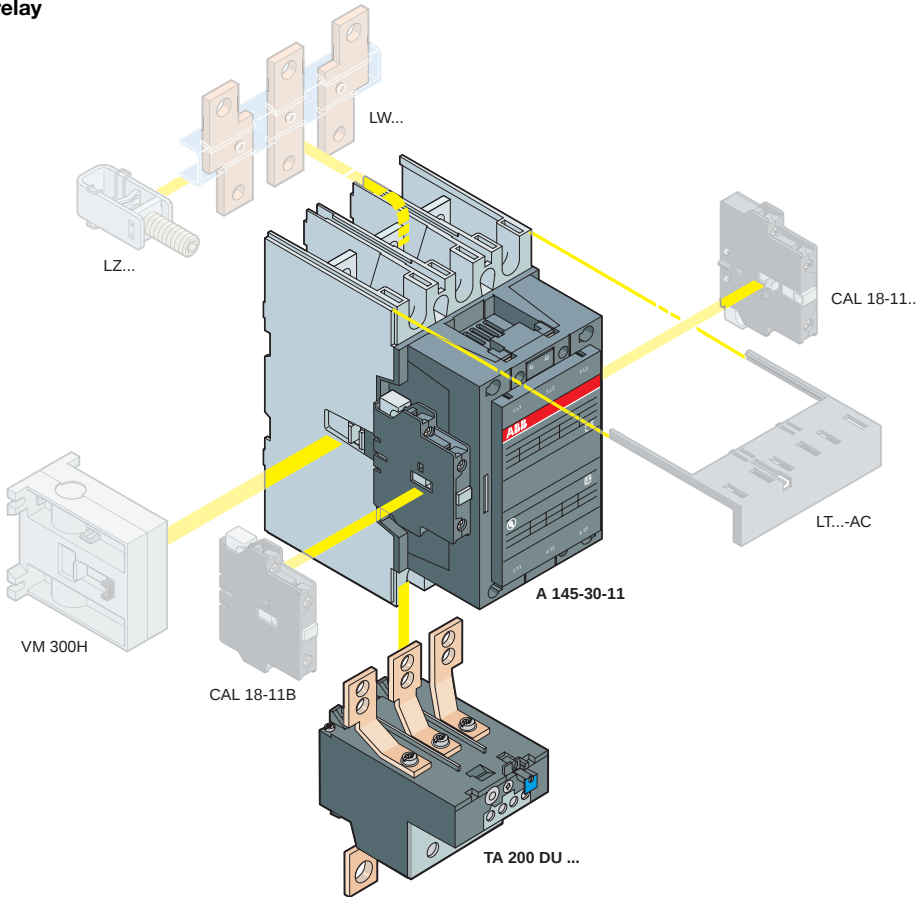
Fitting Details - For Ordering Details, see "Motor Protection"

The addition of a thermal or electronic O/L relay on the contactor does not prevent fitting of many other accessories as shown below.

Contactor types	Thermal O/L relays				
	TA 200 DU.. (1) 80 ... 110 to 150 ... 200 A	TA 450 DU (2) 130 ... 185 to 220 ... 310 A			
	Electronic O/L relays				
	E 200 DU.. (1) 60 ... 200 A	E 320 DU.. (1) 100 ... 320 A	E 500 DU.. (2) 150 ... 500 A	E 800 DU.. (2) 250 ... 800 A	E 1250 DU.. (1) 375 ... 1250 A
A 145, A 185	TA 200 DU.. or E 200 DU..	—	—	—	—
A 210 ... A 300	—	TA 450 DU.. or E 320 DU..	—	—	—
AF 400, AF 460	—	—	E 500 DU..	—	—
AF 580, AF 750	—	—	—	E 800 DU	—
AF 1350, AF 1650	—	—	—	—	E 1250 DU

(1) No mounting kit required, direct mounting
(2) Mounting kit required (see "Motor Protection")

Contactor and O/L relay



AL 9 ... AE 110, AL..Z... and TAL 9 ... TAE 110 3-pole Contactors



d.c. Operated

Application

AL... and **AE...** contactors, as well as **TAL...** and **TAE...** versions, are mainly used for controlling 3-phase motors and more generally for controlling power circuits up to 690 V a.c. (1000 V a.c. for AE... and TAE... contactors) or 220 / 440 V d.c.

Description

3-pole contactors of the block type design.

The **AL...** contactors are fitted with low consumption d.c. coils:

- **AL 9 ... AL 16** contactors: **3 W** (pull-in and holding)
- **AL 26 ... AL 40** contactors: **3.5 W** (pull-in and holding)
- **AL 9Z ... AL 16Z** contactors: with very low consumption d.c. coil **2.4 W** (pull-in and holding)

Contactors are thus suitable for a direct control by PLC transistor outputs, without the use of an interface relay.

The **TAL...** version offers a large coil voltage range.

The **AE...** contactors are fitted with standard double-winding d.c. coils.

The **TAE...** version offers a large coil voltage range.

- Main poles and auxiliary contact blocks

AL 9 ... AL 40 and TAL 9 ... TAL 40 1-stack contactors:

- 3 main poles,
- 1 built-in auxiliary contact,
- front or side mounted add-on auxiliary contact blocks (only front mounted for AL..Z... version).

AE 50 ... AE 110 and TAE 50 ... TAE 110 contactors:

- 3 main poles,
- front or side mounted add-on auxiliary contact blocks.

- Control circuit: d.c. operated.

The polarity on the coil terminals (A1+ and A2-) must be respected for AL..., AL..Z... and TAL... contactors.

- Accessories: a wide range of accessories is available.

AL 9 ... AL 40 2-stack contactors:

- 1st stack with 3 main poles
- 2nd stack with 4 built-in auxiliary contacts.

The built-in auxiliary contact elements are mechanically linked

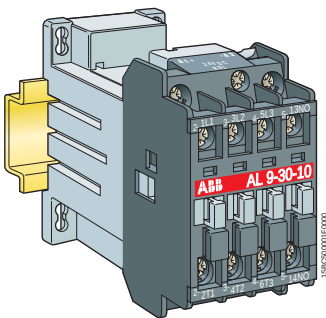
Larger d.c. operated contactors:

use AF 145 ... AF 1650 types.

Variants

- electronic coil interface (a.c./d.c. operated): AF 50 ... AF 110 contactors.
- 4-pole: **AL 9 ... AL 26** contactors and **TAL 9 ... TAL 26** contactors (with 4 N.O. or 2 N.O. + 2 N.C. main poles)
AE 45 ... AE 75 contactors (with 4 N.O. or 2 N.O. + 2 N.C. main poles) and **TAE 45 ... TAE 75** contactors (with 4 N.O. main poles).

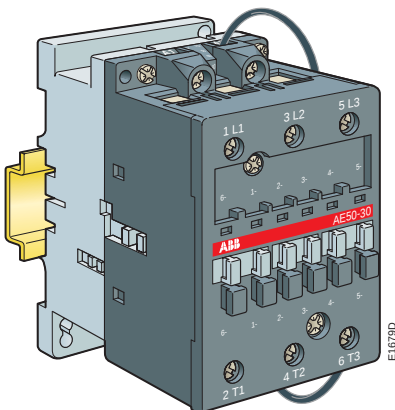
AL 9 ... AE 110 and TAL 9 ... TAE 110 contactors specific design (see A 9 ... A 110 contactors for general design)



- **AL9 ... AL 40, TAL 9 ... TAL 40**

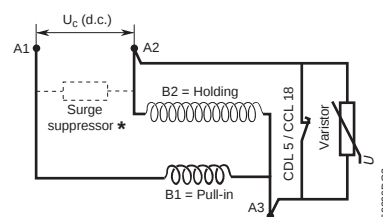


The general design is identical to that of A 9 ... A 40 contactors, only the depth is increased.



- **AE 50 ... AE 110, TAE 50 ... TAE 110**

Add-on lagging contact (factory mounted) for insertion of the "holding" winding.



AE 50 ... AE 110, TAE 50 ... TAE 110

N.C. lagging auxiliary contact block with built-in varistor:

- CDL 5-01 type fitted on AE 50 ... AE 75 and TAE 50, TAE 75 contactors
- CCL 18-01 type fitted on AE 95, AE 110 and TAE 95, TAE 110 contactors

* Extra RV 5 (or RT 5) surge suppressor can be added on to the "Pull-in" winding, if required.

Please order separately (see "Accessories").

AL 9 ... AE 110 and AL..Z... 3-pole Contactors

d.c. Operated



AL 16-30-10



AL 40-30-10



AE 50-30-00



AE 95-30-00

Ordering Details

AL 9 ... AE 110 contactors

IEC	UL/CSA	Auxiliary contacts fitted	Type	Order code	Weight kg
Rated power 400 V	Rated current $\theta \leq 40^\circ\text{C}$	3-Phase motor rating General use rating	1 st stack 2 nd stack	state coil voltage (see table below)	Pack ^{ing} 1 piece
AC-3	AC-1	480 V 600 V		state coil voltage code (see table below)	
kW	A	hp	A		
4	25	5	21	AL 9-30-10 111 1SBL 143 001 R 111 10	0.520
				AL 9-30-01 111 1SBL 143 001 R 111 01	0.520
				AL 9-30-22 111 1SBL 143 001 R 111 22	0.580
5.5	27	7.5	25	AL 12-30-10 111 1SBL 163 001 R 111 10	0.520
				AL 12-30-01 111 1SBL 163 001 R 111 01	0.520
				AL 12-30-22 111 1SBL 163 001 R 111 22	0.580
7.5	30	10	30	AL 16-30-10 111 1SBL 183 001 R 111 10	0.520
				AL 16-30-01 111 1SBL 183 001 R 111 01	0.520
				AL 16-30-22 111 1SBL 183 001 R 111 22	0.580
11	45	20	40	AL 26-30-10 111 1SBL 243 001 R 111 10	0.750
				AL 26-30-01 111 1SBL 243 001 R 111 01	0.750
				AL 26-30-22 111 1SBL 243 001 R 111 22	0.810
15	55	25	50	AL 30-30-10 111 1SBL 283 001 R 111 10	0.850
				AL 30-30-01 111 1SBL 283 001 R 111 01	0.850
				AL 30-30-22 111 1SBL 283 001 R 111 22	0.910
18.5	60	30	60	AL 40-30-10 111 1SBL 323 001 R 111 10	0.850
				AL 40-30-01 111 1SBL 323 001 R 111 01	0.850
				AL 40-30-22 111 1SBL 323 001 R 111 22	0.910
22	100	40	80	AE 50-30-00 111 1SBL 359 001 R 111 00	1.200
				AE 50-30-11 111 1SBL 359 001 R 111 11	1.240
30	115	60	90	AE 63-30-00 111 1SBL 379 001 R 111 00	1.200
				AE 63-30-11 111 1SBL 379 001 R 111 11	1.240
37	125	60	105	AE 75-30-00 111 1SBL 419 001 R 111 00	1.200
				AE 75-30-11 111 1SBL 419 001 R 111 11	1.240
45	145	60	125	AE 95-30-00 111 1SFL 439 001 R 111 00	2.040
				AE 95-30-11 111 1SFL 439 001 R 111 11	2.070
55	160	75	140	AE 110-30-00 111 1SFL 459 001 R 111 00	2.040
				AE 110-30-11 111 1SFL 459 001 R 111 11	2.070

AL 9Z ... AL 16Z contactors

4	25	5	21	AL 9Z-30-10 111 1SBL 144 001 R 111 10	0.520
				AL 9Z-30-01 111 1SBL 144 001 R 111 01	0.520
5.5	27	7.5	25	AL 12Z-30-10 111 1SBL 164 001 R 111 10	0.520
				AL 12Z-30-01 111 1SBL 164 001 R 111 01	0.520
7.5	30	10	30	AL 16Z-30-10 111 1SBL 184 001 R 111 10	0.520
				AL 16Z-30-01 111 1SBL 184 001 R 111 01	0.520

Coil voltages and codes:

Voltage V - d.c.	AL.../AE... Code	AL..Z... Code
12	8 0	--
24	8 1	1 5
42	8 2	--
48	8 3	2 0
50	2 1	--
60	8 4	--
75	8 5	--
110	8 6	--
125	8 7	--
220	8 8	--
240	8 9	--
250	3 8	--

>> Accessory Fitting Details page 2/17
 >> Thermal O/L Relays page 2/9
 >> Technical Data page 2/64

>> General - Approvals section 7
 >> Terminal Marking and Positioning section 8
 >> Dimensions section 9

2

3-pole Contactors

TAL 9 ... TAE 110 3-pole Contactors

d.c. Operated with Large Coil Voltage Range



TAL 16-30-10



TAL 40-30-10



TAE 50-30-00



TAE 95-30-00

Ordering Details

IEC		UL/CSA		Auxiliary contacts fitted		Type	Order code	Weight kg
Rated power 400 V AC-3 kW	Rated current θ ≤ 40°C AC-1 A	3-Phase motor rating 480 V hp	General use rating 600 V A	1 st stack	2 nd stack			
						state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
4	25	5	21	1 – – 1	– – – –	TAL 9-30-10 TAL 9-30-01	1SBL 143 061 R 1SBL 143 061 R	0.520 0.520
5.5	27	7.5	25	1 – – 1	– – – –	TAL 12-30-10 TAL 12-30-01	1SBL 163 061 R 1SBL 163 061 R	0.520 0.520
7.5	30	10	30	1 – – 1	– – – –	TAL 16-30-10 TAL 16-30-01	1SBL 183 061 R 1SBL 183 061 R	0.520 0.520
11	45	20	40	1 – – 1	– – – –	TAL 26-30-10 TAL 26-30-01	1SBL 243 061 R 1SBL 243 061 R	0.750 0.750
15	55	25	50	1 – – 1	– – – –	TAL 30-30-10 TAL 30-30-01	1SBL 283 061 R 1SBL 283 061 R	0.850 0.850
18.5	60	30	60	1 – – 1	– – – –	TAL 40-30-10 TAL 40-30-01	1SBL 323 061 R 1SBL 323 061 R	0.850 0.850
22	100	40	80	– – 1 1	– – – –	TAE 50-30-00 TAE 50-30-11	1SBL 359 061 R 1SBL 359 061 R	1.200 1.240
37	125	60	105	– – 1 1	– – – –	TAE 75-30-00 TAE 75-30-11	1SBL 419 061 R 1SBL 419 061 R	1.200 1.240
45	145	60	125	– – 1 1	– – – –	TAE 95-30-00 TAE 95-30-11	1SFL 439 061 R 1SFL 439 061 R	2.040 2.070
55	160	75	140	– – 1 1	– – – –	TAE 110-30-00 TAE 110-30-11	1SFL 459 061 R 1SFL 459 061 R	2.040 2.070

Coil voltages and codes: TAL... and TAE...

Voltage V - d.c.	Code
17 ... 32	5 1
25 ... 45	5 2
36 ... 65	5 4
42 ... 78	5 8
50 ... 90	5 5
77 ... 143	6 2
90 ... 150	6 6
152 ... 264	6 8

Other voltages: please consult us.



Voltage tolerances (-15 % and +10 %) included in the U_c min. and U_c max. values.

>> Accessory Fitting Details page 2/17
>> Thermal O/L Relays page 2/9
>> Technical Data page 2/64

>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

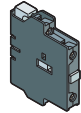
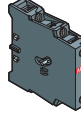
AL 9 ... AE 110, AL..Z... and TAL 9 ... TAE 110 3-pole Contactors



Main Accessories

Accessory Fitting Details for AL 9 ... AL 40, AL..Z... and TAL 9 ... TAL 40 Contactors

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

Contactor configuration			Front mounted accessories			Side mounted accessories (7)	
Contactor types	Main poles	Available auxiliary contacts					
AL 9 ... AL 16	3 0	1 0	1 to 4 x CA 5-..(1)	or 1 x CA 5-.. (4-pole) (1)	or 1 to 2 x CE 5-.. (2)	or 1 x CAL 5-11	+ 1 x VM 5-1(3) or VE 5-1(3)(4)
AL 9 ... AL 16	3 0	0 1	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 9 ... AL 16	3 0	2 2	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 26	3 0	1 0	1 to 4 x CA 5-..(5)	or 1 x CA 5-.. (4-pole) (5)	or 1 to 2 x CE 5-..	or 1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1
AL 26	3 0	0 1	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 26	3 0	2 2	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 30, AL 40	3 0	1 0	1 to 5 x CA 5-..(5)	or 1 x CA 5-.. (4-pole) (5)	or 1 to 2 x CE 5-..	or 1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1(4)
AL 30, AL 40	3 0	0 1	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 30, AL 40	3 0	2 2	—	—	—	—	1 x VM 5-1 or VE 5-1
AL 9Z ... AL 16Z (7)	3 0	1 0	1 to 2 x CA 5-..(1)	—	or 1 to 2 x CE 5-.. (2)	—	—
AL 9Z ... AL 16Z (7)	3 0	0 1	1 to 2 x CA 5-..(1)	—	or 1 to 2 x CE 5-.. (2)	—	or 1 x VM 5-1
TAL 9 ... TAL 16	3 0	1 0	1 to 4 x CA 5-..(1)	or 1 x CA 5-.. (4-pole) (1)	or 1 to 2 x CE 5-.. (2)	or 1 x CAL 5-11	+ 1 x VM 5-1(6) or VE 5-1(6)(4)
TAL 9 ... TAL 16	3 0	0 1	—	—	—	—	—
TAL 26	3 0	1 0	1 to 4 x CA 5-..(5)	or 1 x CA 5-.. (4-pole) (5)	or 1 to 2 x CE 5-..	or 1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1
TAL 26	3 0	0 1	—	—	—	—	—
TAL 30, TAL 40	3 0	1 0	1 to 5 x CA 5-..(5)	or 1 x CA 5-.. (4-pole) (5)	or 1 to 2 x CE 5-..	or 1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1(4)
TAL 30, TAL 40	3 0	0 1	—	—	—	—	—

(1) 2 N.C. auxiliary contacts maximum in all mounting positions except 5. In position 5 no N.C. auxiliary contact allowed.

(2) CE 5-.. auxiliary contacts **not allowed in position 5**.

(3) When **VM5-1** or **VE5-1** interlock unit is used with auxiliary contact CAL 5-11 the control voltage is limited to 0.9 U_c ... 1.1 U_c.

(4) With **VE5-1** interlock unit, a maximum of 3 N.O. auxiliary contacts are permitted.

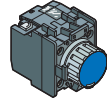
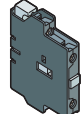
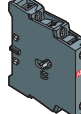
(5) 2 N.C. auxiliary contacts maximum in mounting position 5.

(6) When **VM5-1** or **VE5-1** interlock unit is used, CAL 5-11 auxiliary contact is not permitted in any position.

(7) Not allowed in mounting position 1±30°.

Accessory Fitting Details for AE 50 ... AE 110 and TAE 50 ... TAE 110 Contactors

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

Contactor configuration			Front mounted accessories			Side mounted accessories	
Contactor types	Main poles	Available auxiliary contacts					
AE 50 ... AE 75	3 0	0 0	1 to 6 x CA 5-..	1 x CA 5-.. (4-pole)	1 x TP .. A	+ 1 x CAL 5-11	or 1 x VE 5-2
TAE 50, 75	3 0	0 0	(1 to 5 x CE 5-.. max.) (1)	+ 2 x 1-pole CA 5-.. or CE 5-.. (1)	+ 2 x CA 5-.. (1-pole)	—	—
AE 50 ... AE 75	3 0	1 1	1 to 6 x CA 5-..	1 x CA 5-.. (4-pole)	1 x TP .. A	—	—
TAE 50, 75	3 0	1 1	(1 to 5 x CE 5-.. max.) (1)	+ 2 x 1-pole CA 5-.. or CE 5-.. (1)	+ 2 x CA 5-.. (1-pole)	—	—
AE 95, 110	3 0	0 0	1 to 6 x CA 5-..	1 x CA 5-.. (4-pole)	—	+ 1 x CAL 18-11	or 1 x VE 5-2
TAE 95, 110	3 0	0 0	(1 to 5 x CE 5-.. max.) (1)	+ 2 x 1-pole CA 5-.. or CE 5-.. (1)	—	(or 1 x CEL 18-..)	—
AE 95, 110	3 0	1 1	1 to 6 x CA 5-..	1 x CA 5-.. (4-pole)	—	—	—
TAE 95, 110	3 0	1 1	(1 to 5 x CE 5-.. max.) (1)	+ 2 x 1-pole CA 5-.. or CE 5-.. (1)	—	—	—

(1) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is limited to 5.

AF 50 ... AF 110 3-pole Contactors



Electronic Coil Interface

a.c. / d.c. Operated - Wide Voltage Range

Application

AF 50 ... AF 110 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 V a.c. and 220 V d.c. The contactors can also be used for many other applications such as bypass, capacitor switching, lighting, d.c. power circuits...

The **AF...** contactors are fitted with an electronic coil interface which accepts a wide control voltage range, on a.c. 50/60 Hz or d.c. supplies. The same contactor can accept various supply voltages according to the different countries where the electrical equipment will be installed, or some fluctuation in the control voltage due to the local supply or network.

The **AF...** contactors are also fully suitable for operation in a.c. or d.c. control circuit liable to voltage interruptions or voltage dip risks.

Description

The **AF 50 ... AF 110** 3-pole contactors are of the block type design.

- Main poles and auxiliary contact blocks
 - 3 main poles,
 - front and side mounted add-on auxiliary contact blocks.

- Electronic control:

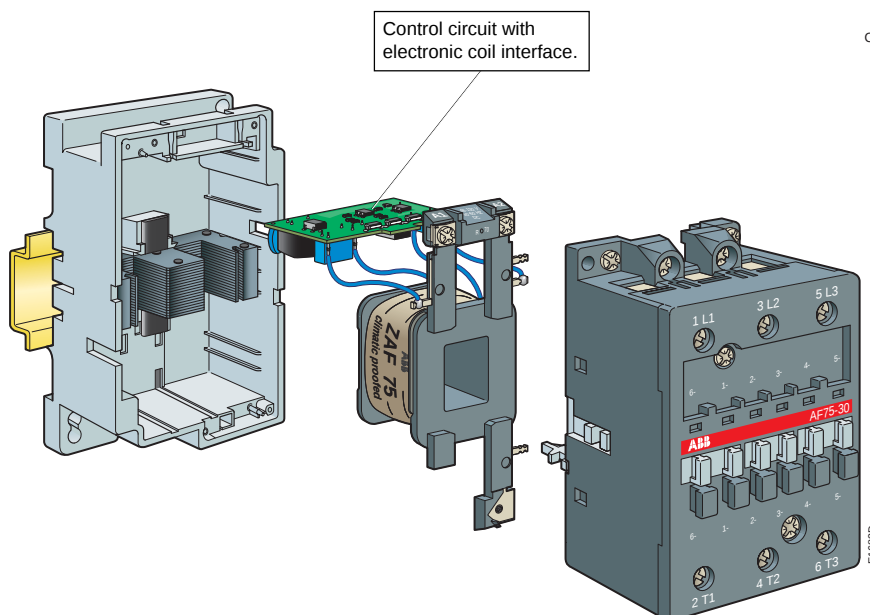
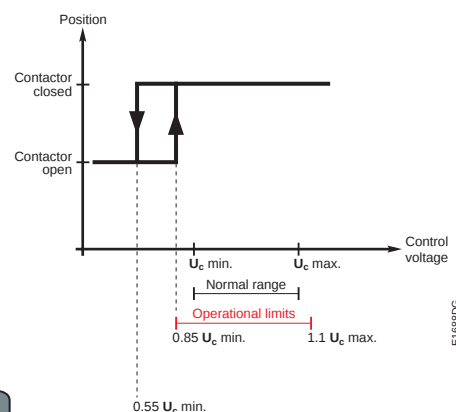
The contactors are fitted with an electronic interface that very precisely controls the voltage to the coil. The electronic control circuit always works using d.c. current through the coil and in a.c. operation the current is rectified before being applied to the coil. To achieve the levels of the currents required for making and holding respectively, the voltage is pulsed across the coil with the aid of a transistor. The pulsing also implies that the current in the coil can be optimally regulated all the time relatively independently of the voltage level. The function is controlled by a specific integrated circuit developed by **ABB**.

Advantages

- Wide voltage range, e.g. 100 ... 250 V a.c. and d.c.,
 - Can manage large voltage variations,
 - Reduced power consumption,
 - Very distinct closing and opening,
 - Noise free,
 - Can withstand voltage interruptions or voltage dips in the control supply (≤ 20 ms).
- Accessories: a wide range of accessories is available.
The accessories provided for the A 50 ... A 110 contactors can be used for the AF 50 ... AF 110 types.

AF... contactors specific design (see A... contactors for general design).

Operating diagram



AF 50 ... AF 110 3-pole Contactors



Electronic Coil Interface

a.c. / d.c. Operated - Wide Voltage Range



AF 50-30-00



AF 110-30-11

Ordering Details

IEC		UL/CSA		Auxiliary contacts fitted		Type	Order code	Weight kg
Rated power 400 V	Rated current $\theta \leq 40^\circ\text{C}$	3-Phase motor rating	General use rating	1 st stack	2 nd stack			
AC-3	AC-1	480 V	600 V			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
kW	A	hp	A					
22	100	40	80	--	--	AF 50-30-00	1SBL 357 001 R 00	1.180
				1 1	--	AF 50-30-11	1SBL 357 001 R 11	1.220
30	115	60	90	--	--	AF 63-30-00	1SBL 377 001 R 00	1.180
				1 1	--	AF 63-30-11	1SBL 377 001 R 11	1.220
37	125	60	105	--	--	AF 75-30-00	1SBL 417 001 R 00	1.180
				1 1	--	AF 75-30-11	1SBL 417 001 R 11	1.220
45	145	60	125	--	--	AF 95-30-00	1SFL 437 001 R 00	2.030
				1 1	--	AF 95-30-11	1SFL 437 001 R 11	2.070
55	160	75	140	--	--	AF 110-30-00	1SFL 457 001 R 00	2.030
				1 1	--	AF 110-30-11	1SFL 457 001 R 11	2.070

Coil voltages and codes

Voltage V - 50/60Hz	Voltage V d.c.	Code
—	20 ... 60	7 2 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

Electromagnetic compatibility

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

Notice: This product has been designed for **environment A**. Use of this product in **environment B** may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

Definitions:

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

Environment B: "Mainly relates to low-voltage public networks (see 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".

>> Accessory Fitting Details page 2/8
>> Thermal O/L Relays page 2/9
>> Technical Data page 2/64

>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

2

3-pole Contactors

AF 145 ... AF 1650 3-pole Contactors



Electronic Coil Interface

a.c. / d.c. Operated - Wide Voltage Range

Application

AF 145 ... AF 1650 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 V a.c. / 1000 V a.c. or 220 V d.c. / 600 V d.c. The contactors can also be used for many other applications such as bypass, capacitor switching, lighting, d.c. power circuits... The **AF...** contactors are fitted with an electronic coil interface which accepts a wide control voltage range, on a.c. 50/60 Hz or d.c. supplies. The same contactor can accept various supply voltages according to the different countries where the electrical equipment will be installed, or some fluctuation in the control voltage due to the local supply or network.

The **AF...** contactors are also fully suitable for operation in a.c. or d.c. control circuit liable to voltage interruptions or voltage dip risks.

Description

The **AF 145 ... AF 1650** 3-pole contactors are of the block type design.

- Main poles and auxiliary contact blocks

- 3 main poles,
- 1 N.O. and 1 N.C. auxiliary contact block (fitted on the left side).

A maximum of 4 auxiliary contact blocks can be fitted on each contactor.

- Electronic control:

The contactors are fitted with an electronic interface that very precisely controls the voltage to the coil. The electronic control circuit always works using d.c. current through the coil and in a.c. operation the current is rectified before being applied to the coil. To achieve the levels of the currents required for making and holding respectively, the voltage is pulsed across the coil with the aid of a transistor. The pulsing also implies that the current in the coil can be optimally regulated all the time relatively independently of the voltage level. The function is controlled by a specific integrated circuit developed by **ABB**.

Advantages

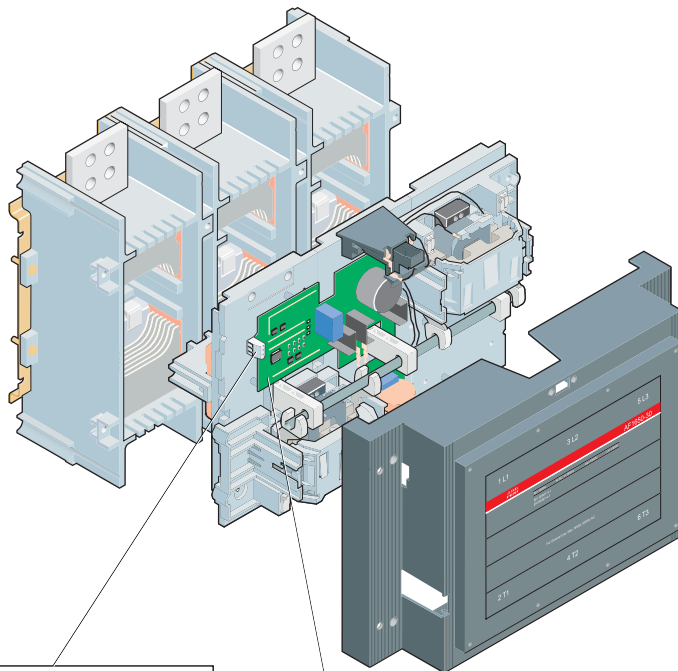
- Wide voltage range, e.g. 100 ... 250 V a.c. and d.c.,
- Can manage large voltage variations,
- Reduced power consumption,
- Very distinct closing and opening,
- Noise free,
- Can withstand voltage interruptions or voltage dips in the control supply (≤ 20 ms).

- Control inputs

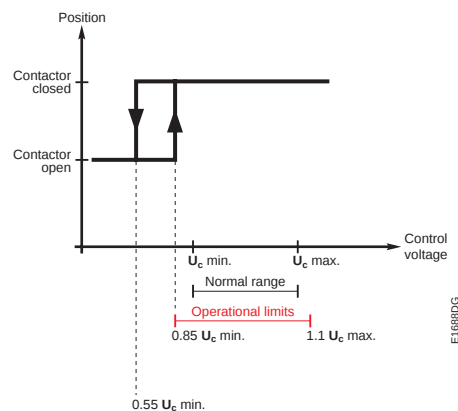
The large sizes **AF 400 ... AF 1650** are equipped with low voltage inputs for control, for example by a PLC.

- Accessories: a wide range of accessories is available.

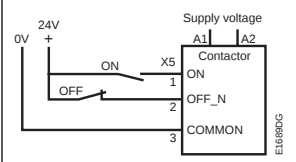
AF... contactors specific design (see A... contactors for general design)



Operating diagram



Control inputs (AF 400 ... AF 1650)



Control circuit with electronic coil interface.

AF 145 ... AF 1650 3-pole Contactors



Electronic Coil Interface

a.c. / d.c. Operated - Wide Voltage Range



AF 300-30-11



AF 460-30-11



AF 750-30-11



AF 1650-30-11

Ordering Details

IEC		UL/CSA		Auxiliary contacts fitted	Type	Order code	Weight kg
Rated power 400 V AC-3 kW	Rated current θ ≤ 40°C AC-1 A	3-Phase motor rating 480 V hp	General use rating 600 V A				
					state coil voltage  (see table below)	state coil voltage code  (see table below)	Pack ^{ing} 1 piece
75	250	100	230	1 1 2 2	AF 145-30-11  AF 145-30-22 	1SFL 477 001 R  11 1SFL 477 001 R  22	3.600 3.600
90	275	125	250	1 1 2 2	AF 185-30-11  AF 185-30-22 	1SFL 497 001 R  11 1SFL 497 001 R  22	3.600 3.600
110	350	150	300	1 1 2 2	AF 210-30-11  AF 210-30-22 	1SFL 517 001 R  11 1SFL 517 001 R  22	6.200 6.200
140	400	200	350	1 1 2 2	AF 260-30-11  AF 260-30-22 	1SFL 537 001 R  11 1SFL 537 001 R  22	6.200 6.200
160	500	250	400	1 1 2 2	AF 300-30-11  AF 300-30-22 	1SFL 557 001 R  11 1SFL 557 001 R  22	6.200 6.200
200	600	350	550	1 1 2 2	AF 400-30-11  AF 400-30-22 	1SFL 577 001 R  11 1SFL 577 001 R  22	12.00 12.00
250	700	400	650	1 1 2 2	AF 460-30-11  AF 460-30-22 	1SFL 597 001 R  11 1SFL 597 001 R  22	12.00 12.00
315	800	500	750	1 1 2 2	AF 580-30-11  AF 580-30-22 	1SFL 617 001 R  11 1SFL 617 001 R  22	15.00 15.00
400	1050	600	900	1 1 2 2	AF 750-30-11  AF 750-30-22 	1SFL 637 001 R  11 1SFL 637 001 R  22	15.00 15.00
475	1350	800	1350	1 1 2 2	AF 1350-30-11  AF 1350-30-22 	1SFL 657 001 R  11 1SFL 657 001 R  22	34.00 34.00
560	1650	900	1650	1 1 2 2	AF 1650-30-11  AF 1650-30-22 	1SFL 677 001 R  11 1SFL 677 001 R  22	35.00 35.00

Coil voltages and codes: AF 145 ... AF 300

Voltage □□ V - 50/60Hz	Voltage □□ V d.c.	Code □□
—	20 ... 60	7 2 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

Coil voltages and codes: AF 400 ... AF 750

Voltage □□ V - 50/60Hz	Voltage □□ V d.c.	Code □□
—	24 ... 60	6 8 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0
250 ... 500	250 ... 500	7 1

Coil voltages and codes: AF 1350, AF 1650

Voltage □□ V - 50/60Hz	Voltage □□ V d.c.	Code □□
100 ... 250	100 ... 250	7 0

Electromagnetic compatibility

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

Notice: This product has been designed for **environment A**. Use of this product in **environment B** may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

Definitions:

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

Environment B: "Mainly relates to low-voltage public networks (see 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".

>> Accessory Fitting Details	page 2/12	>> General - Approvals	section 7
>> Thermal & Electronic O/L Relays	page 2/13	>> Terminal Marking and Positioning	section 8
>> Technical Data	page 2/65	>> Dimensions	section 9

A 9 ... A 75 4-pole Contactors

a.c. Operated



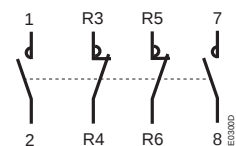
A 9-40-00



A 45-40-00



A 9-22-00



Ordering Details

IEC	UL/CSA	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$ A	General use rating 600 V A		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece

4 N.O. main poles

25	21	—	—	A 9-40-00	1SBL 141 201 R	0.340
30	30	—	—	A 16-40-00	1SBL 181 201 R	0.340
45	40	—	—	A 26-40-00	1SBL 241 201 R	0.610
70	80	—	—	A 45-40-00	1SBL 331 201 R	1.390
100	80	—	—	A 50-40-00	1SBL 351 201 R	1.390
125	105	—	—	A 75-40-00	1SBL 411 201 R	1.390

2 N.O. + 2 N.C. main poles

25	21	—	—	A 9-22-00	1SBL 141 501 R	0.340
30	30	—	—	A 16-22-00	1SBL 181 501 R	0.340
45	40	—	—	A 26-22-00	1SBL 241 501 R	0.610
70	80	—	—	A 45-22-00	1SBL 331 501 R	1.400
125	105	—	—	A 75-22-00	1SBL 411 501 R	1.400

Coil voltages and codes

Voltage V - 50Hz	Voltage V - 60Hz	Code
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

Remark for A 9 ... A 75 4-pole contactors fitted with 2 N.O. + 2 N.C. main poles

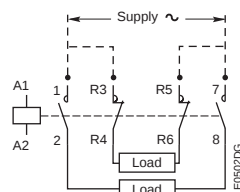
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK before MAKE.



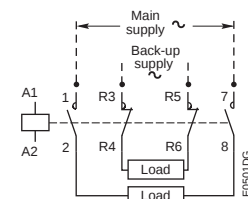
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



>> Accessory Fitting Details page 2/23
>> Accessory Ordering Details section 4
>> Technical Data page 2/64

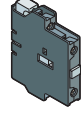
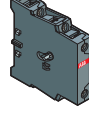
>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

A 9 ... A 75 4-pole Contactors

Main Accessories

Accessory Fitting Details

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

Contactor configuration			Front mounted accessories			Side mounted accessories	
Contactor types	Main poles	Available auxiliary contacts	 Auxiliary contact 1-pole CA 5-.. (or 1-pole CE 5-..)	 Auxiliary contact 4-pole CA 5-..	 Pneumatic Timer TP .. A	 Auxiliary contact 2-pole CAL 5-11	 Interlock unit VM 5-.. or VE 5-..
A 9, A 16	4 0	0 0	1 to 4 x CA 5-.. (1 to 2 x CE 5-.. max.) (1)	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A	+ 1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 9, A 16	2 2	0 0 (4)	1 to 4 x CA 5-.. (or 1 x CE 5-.. (7))	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A (6)	+ 1 to 2 x CAL 5-11	—
A 26	4 0	0 0	1 to 4 x CA 5-.. (1 to 3 x CE 5-.. max.) (2)	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A	+ 1 to 2 x CAL 5-11	or 1 x VM 5-1 or VE 5-1 + 1 x CAL 5-11
A 26	2 2	0 0 (4)	1 to 4 x CA 5-.. (or 1 x CE 5-.. (7))	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A	+ 1 to 2 x CAL 5-11	—
A 45 ... A 75	4 0	0 0	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (3)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (3)	or 1 x TP .. A + 2 x 1-pole CA 5-..	+ 1 to 2 x CAL 5-11	or 1 x VE 5-2 + 1 x CAL 5-11
A 45 ... A 75	2 2	0 0 (5)	1 to 6 x CA 5-.. (no CE 5-..)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-..	or 1 x TP .. A + 2 x 1-pole CA 5-..	+ 1 to 2 x CAL 5-11	—

- (1) The total number of **N.O.** or **N.C. CE 5-..** and other **additional N.C. CA 5-..** auxiliary contacts is **limited to 2**.
CE 5-.. auxiliary contacts **not allowed in mounting position 5**.
- (2) The total number of **N.O.** or **N.C. CE 5-..** and other **additional N.C. CA 5-..** auxiliary contacts is **limited to 3**.
CE 5-.. auxiliary contacts **not allowed in mounting position 5**.
- (3) The total number of **N.O.** or **N.C. CE 5-..** and other **additional N.C. CA 5-..** auxiliary contacts is **limited to 5**.
- (4) **2 x N.C. CA 5-..** auxiliary contacts maximum in mounting position 5.
- (5) **2 x N.C. CA 5-..** auxiliary contacts maximum.
- (6) **A 9-22-00** and **A 16-22-00** in mounting position 5: **TP..DA not allowed**.
- (7) **CE 5-..** auxiliary contacts **not allowed in mounting position 5**.

The accessories provided for the A 45 ... A 75 contactors can be used for the AF 45 ... AF 75 types.

2

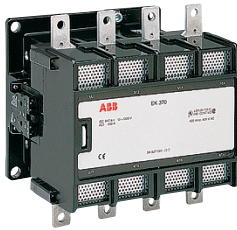
4-pole Contactors

EK 110 ... EK 1000 4-pole Contactors

a.c. Operated



EK 175-40-11



EK 370-40-11



EK 1000-40-11

Ordering Details

IEC	UL/CSA	Auxiliary contacts	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$ A	General use rating 600 V A		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
200	170	1 1 2 2 2 1	EK 110-40-11 EK 110-40-22 EK 110-40-21	SK 824 440- SK 824 450- SK 824 440-E	4.300 4.350 4.350
250	200	1 1 2 2 2 1	EK 150-40-11 EK 150-40-22 EK 150-40-21	SK 824 441- SK 824 451- SK 824 441-E	4.350 4.400 4.400
300	250	1 1 2 2 2 1	EK 175-40-11 EK 175-40-22 EK 175-40-21	SK 825 440- SK 825 448- SK 825 440-E	6.600 6.650 6.650
350	300	1 1 2 2 2 1	EK 210-40-11 EK 210-40-22 EK 210-40-21	SK 825 441- SK 825 451- SK 825 441-E	6.600 6.650 6.650
550	420	1 1 2 2	EK 370-40-11 EK 370-40-22	SK 827 040- SK 827 042-	17.20 17.20
800	540	1 1 2 2	EK 550-40-11 EK 550-40-22	SK 827 041- SK 827 043-	17.20 17.20
1000	—	1 1 2 2	EK 1000-40-11 EK 1000-40-22	SK 827 044- SK 827 045-	17.50 17.50

- E = 40 ... 400 Hz coil with built-in rectifier.

Coil voltages and codes: EK 110 ... EK 1000

Voltage V - 50Hz	Voltage V - 60Hz	Code
48	—	AD
—	110	AE
110	120	AF
220 ... 230	*	AL
230 ... 240	—	AM
—	380	AN
380 ... 400	440	AP
400 ... 415	—	AR

* Read 240V 60Hz for
EK 370 ... EK 1000.

Other voltages: page 0/1.

Multi-frequency coils: EK 110 ... EK 210

Voltage V - 40 ... 400Hz	Code
110 ... 120	EF
115 ... 127	EG
220 ... 230	EL
230 ... 240	EM
380 ... 400	EP
400 ... 415	ER

Dual frequency coils (1): EK 370 ... EK 1000

Voltage V - 50Hz	Voltage V - 60Hz	Code
110	110 ... 120	EF
110 ... 115	115 ... 127	EG
220	220 ... 240	EL
220 ... 230	230 ... 255	EM
380	380 ... 415	EP
380 ... 400	400 ... 440	ER

(1) Two auxiliary contact blocks maximum per contactor, ambient temperature $\leq 55^\circ\text{C}$ and mounting positions 2 and 6 excluded.

>> Accessory Fitting Details page 2/25
>> Accessory Ordering Details section 4
>> Technical Data page 2/76

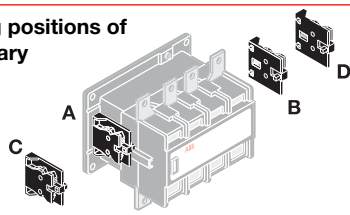
>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

EK 110 ... EK 1000 4-pole Contactors

Main Accessories

Accessory Fitting Details

Mounting positions of the auxiliary contacts



Auxiliary contact types and connecting diagrams



CAL16-11 A



CAL16-11 B



CAL16-11 C



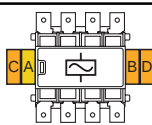
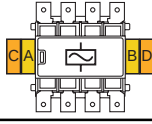
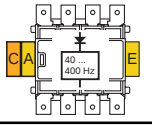
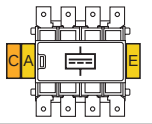
CAL16-11 D



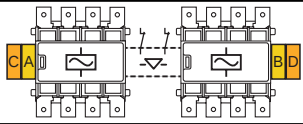
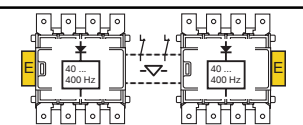
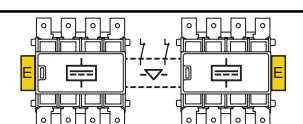
CCL16-11 E(1)

(1) Contact 35-36 used for some types of EK... contactors

EK... 4-pole contactors

Contactor types	Main poles	Available auxiliary contacts	Add-on auxiliary contact blocks 2-pole CAL 16-11...	Mounting positions
				 Factory mounted auxiliary contacts  Add-on CAL 16-11 auxiliary contacts
a.c. operated, 50 Hz, 60 Hz or 50/60 Hz				
EK 110 ... EK 1000	4 0	1 1	+ 1 x CAL 16-11 B + 1 x CAL 16-11 C + 1 x CAL 16-11 D	
EK 110 ... EK 1000	4 0	2 2	+ 1 x CAL 16-11 C + 1 x CAL 16-11 D	
a.c. operated, 40 ... 400 Hz				
EK 110 ... EK 1000	4 0	2 1	1 x CAL 16-11 C	
d.c. operated				
EK 110 ... EK 1000	4 0	2 1	1 x CAL 16-11 C	

EK... 4-pole reversing contactors with VH 145 / VH 300 mechanical and electrical interlock units

"Lefthand" contactors	Interlocking	"Righthand" contactors	Add-on auxiliary contact blocks 2-pole CAL 16-11...	Mounting positions
				 Factory mounted auxiliary contacts  Add-on CAL 16-11 auxiliary contacts
a.c. operated, 50 Hz, 60 Hz or 50/60 Hz				
EK 110 ... 150 EK 175, 210	VH 145 VH 300	EK 110 ... 150 EK 175, 210	+ 1 x CAL 16-11 C + 1 x CAL 16-11 D	
a.c. operated, 40 ... 400 Hz				
EK 110 ... 150 EK 175, 210	VH 145 VH 300	EK 110 ... 150 EK 175, 210	—	
d.c. operated				
EK 110 ... 150 EK 175, 210	VH 145 VH 300	EK 110 ... 150 EK 175, 210	—	

AL 9 ... AE 75 4-pole Contactors

d.c. Operated



AL 9-40-00



AL 9-22-00



AE 50-40-00

Ordering Details

IEC	UL/CSA	Aux. contacts fitted	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$	General use rating 600V		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
A	A				

4 N.O. Main Poles

25	21	--	AL 9-40-00	1SBL 143 201 R	0.520
30	30	--	AL 16-40-00	1SBL 183 201 R	0.520
45	40	--	AL 26-40-00	1SBL 243 201 R	0.750
70	80	--	AE 45-40-00	1SBL 339 201 R	1.430
100	80	--	AE 50-40-00	1SBL 359 201 R	1.430
125	105	--	AE 75-40-00	1SBL 419 201 R	1.430

2 N.O. + 2 N.C. Main Poles

25	21	--	AL 9-22-00	1SBL 143 501 R	0.520
30	30	--	AL 16-22-00	1SBL 183 501 R	0.520
45	40	--	AL 26-22-00	1SBL 243 501 R	0.750
70	80	--	AE 45-22-00	1SBL 339 501 R	1.440
125	105	--	AE 75-22-00	1SBL 419 501 R	1.440

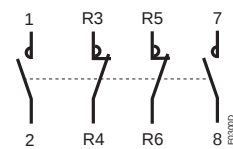
Note: The polarity on the coil terminals (A1+ and A2-) must be respected for AL... contactors.



Coil voltages and codes: AL... and AE...

Voltage - U_c V d.c.	Code
12	8 0
24	8 1
42	8 2
48	8 3
50	2 1
60	8 4
75	8 5
110	8 6
125	8 7
220	8 8
240	8 9
250	3 8

Remark for 4-pole contactors fitted with 2 N.O. + 2 N.C. main poles



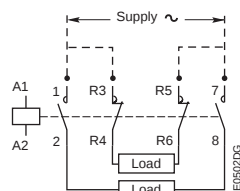
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK before MAKE.



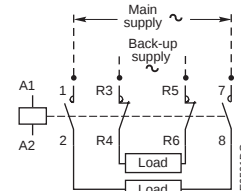
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



>> Accessory Fitting Details page 2/27
>> Accessory Ordering Details section 4
>> Technical Data page 2/64

>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

AL 9 ... AE 75 4-pole Contactors

Main Accessories



2

4-pole Contactors

Accessory Fitting Details for AL 9 ... AL 26 Contactors

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

Contactor configuration		Front mounted accessories			Side mounted accessories ⁽⁸⁾	
Contactor types		 Auxiliary contact 1-pole CA 5-..	 Auxiliary contact 4-pole CA 5-..	 Auxiliary contact 1-pole CE 5-..	 Auxiliary contact 2-pole CAL 5-11	 Interlock unit VM 5-.. or VE 5-..
AL 9, AL 16	4 0 0 0	1 to 4 x CA 5-..(1)	or 1 x CA 5-.. (4-pole) (1)	or 1 to 2 x CE 5-.. (2)	or 1 x CAL 5-11	+ 1 x VM 5-1(3) or VE 5-1(3)(4)
AL 9, AL 16	2 2 0 0	1 to 4 x CA 5-..(5)	or 1 x CA 5-.. (4-pole) (5)	—	or 1 x CAL 5-11	—
AL 26	4 0 0 0	1 to 4 x CA 5-..(6)	or 1 x CA 5-.. (4-pole) (6)	or 1 to 2 x CE 5-..	or 1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1
AL 26	2 2 0 0	1 to 4 x CA 5-..(7)	or 1 x CA 5-.. (4-pole) (7)	—	or 1 x CAL 5-11	—

- (1) 2 N.C. auxiliary contacts maximum in all mounting positions except 5. In position 5 no N.C. auxiliary contact allowed.
 (2) CE 5-.. auxiliary contact **not allowed in position 5**.
 (3) When VMS-1 or VE5-1 interlock unit is used with auxiliary contact CAL 5-11 the control voltage is limited to 0.9 U_c ... 1.1 U_c.
 (4) With VE5-1 interlock unit, a maximum of 3 N.O. auxiliary contacts are permitted.
 (5) 2 N.C. auxiliary contacts maximum.
 (6) 2 N.C. auxiliary contacts maximum in mounting position 5.
 (7) N.C. auxiliary contacts are not allowed.
 (8) Mounting position 1±30° not allowed.

Accessory Fitting Details for AE 45 ... AE 75 Contactors

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

Contactor configuration		Front mounted accessories			Side mounted accessories	
Contactor types		 Auxiliary contact 1-pole CA 5-.. (or 1-pole CE 5-..)	 Auxiliary contact 4-pole CA 5-..	 Pneumatic Timer TP .. A	 Auxiliary contact 2-pole CAL 5-11	 Interlock unit VE 5-2
AE 45 ... AE 75	4 0 0 0	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (1)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (1)	or 1 x TP .. A + 2 x 1-pole CA 5-..	+ 1 x CAL 5-11	or 1 x VE 5-2
AE 45 ... AE 75	2 2 0 0 (2)	1 to 6 x CA 5-.. (no CE 5-..)	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-..	or 1 x TP .. A + 2 x 1-pole CA 5-..	+ 1 x CAL 5-11	—

- (1) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is **limited to 5**.
 (2) 2 N.C. auxiliary contacts maximum.

TAL 9 ... TAE 75 4-pole Contactors

d.c. Operated with Large Coil Voltage Range



TAL 9-40-00



TAE 50-40-00

Ordering Details

IEC	UL/CSA	Aux. contacts fitted	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$	General use rating 600V		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
A	A				

4 N.O. Main Poles

25	21	--	TAL 9-40-00	1SBL 143 261 R	0.520
30	30	--	TAL 16-40-00	1SBL 183 261 R	0.520
45	40	--	TAL 26-40-00	1SBL 243 261 R	0.750
70	80	--	TAE 45-40-00	1SBL 339 261 R	1.430
100	80	--	TAE 50-40-00	1SBL 359 261 R	1.430
125	105	--	TAE 75-40-00	1SBL 419 261 R	1.430

2 N.O. + 2 N.C. Main Poles

25	21	--	TAL 9-22-00	1SBL 143 561 R	0.520
30	30	--	TAL 16-22-00	1SBL 183 561 R	0.520
45	40	--	TAL 26-22-00	1SBL 243 561 R	0.750

Note: The polarity on the coil terminals (A1+ and A2-) must be respected for TAL... contactors.



Coil voltages and codes: TAL... and TAE...

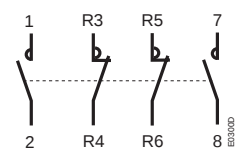
Voltage V - d.c.	Code
17 ... 32	5 1
25 ... 45	5 2
36 ... 65	5 4
42 ... 78	5 8
50 ... 90	5 5
77 ... 143	6 2
90 ... 150	6 6
152 ... 264	6 8

Other voltages: please consult us.



Voltage tolerances (-15 % and +10 %) included in the U_c min. and U_c max. values.

Remark for 4-pole contactors fitted with 2 N.O. + 2 N.C. main poles



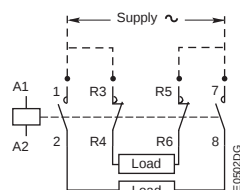
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK before MAKE.



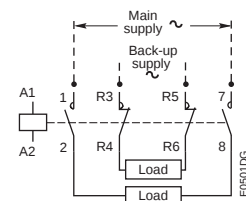
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



>> Accessory Fitting Details page 2/29
>> Accessory Ordering Details section 4
>> Technical Data page 2/64

>> General - Approvals section 7
>> Terminal Markings and Positioning section 8
>> Dimensions section 9

TAL 9 ... TAE 75 4-pole Contactors

Main Accessories

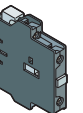
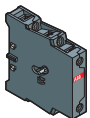


2

4-pole Contactors

Accessory Fitting Details for TAL 9 ... TAL 26 Contactors

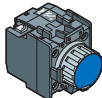
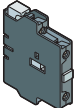
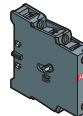
Many configurations of accessories are possible depending on whether these are front mounted or side mounted.

Contactor configuration			Front mounted accessories			Side mounted accessories ⁽⁸⁾		
Contactor types	Main poles	Available auxiliary contacts						
			Auxiliary contact 1-pole CA 5-..	Auxiliary contact 4-pole CA 5-..	Auxiliary contact 1-pole CE 5-..	Auxiliary contact 2-pole CAL 5-11	Interlock unit VM 5-.. or VE 5-..	
TAL 9, TAL 16	4 0	0 0	1 to 4 x CA 5-..(1) or	1 x CA 5-.. (4-pole) (1) or	1 to 2 x CE 5-.. (2) or	1 x CAL 5-11	+ 1 x VM 5-1(3) or VE 5-1(3)(4)	
TAL 9, TAL 16	2 2	0 0	1 to 4 x CA 5-..(5) or	1 x CA 5-.. (4-pole) (5) or	—	or 1 x CAL 5-11	—	
TAL 26	4 0	0 0	1 to 4 x CA 5-..(6) or	1 x CA 5-.. (4-pole) (6) or	1 to 2 x CE 5-.. or	1 x CAL 5-11	+ 1 x VM 5-1 or VE 5-1	
TAL 26	2 2	0 0	1 to 4 x CA 5-..(7) or	1 x CA 5-.. (4-pole) (7) or	—	or 1 x CAL 5-11	—	

- (1) 2 N.C. auxiliary contacts maximum in all mounting positions except 5. In position 5 no N.C. auxiliary contact allowed.
(2) CE 5-.. auxiliary contact **not allowed in position 5**.
(3) When **VM5-1** or **VE5-1** interlock unit is used, CAL 5-11 auxiliary contact is not permitted in any position.
(4) With **VE5-1** interlock unit, a maximum of 3 N.O. auxiliary contacts are permitted.
(5) 2 N.C. auxiliary contacts maximum.
(6) 2 N.C. auxiliary contacts maximum in mounting position 5.
(7) N.C. auxiliary contacts are not allowed.
(8) Mounting position 1±30° not allowed.

Accessory Fitting Details for TAE 45 ... TAE 75 Contactors

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

Contactor configuration			Front mounted accessories			Side mounted accessories		
Contactor types	 Main poles	 Available auxiliary contacts						
			Auxiliary contact 1-pole CA 5-.. (or 1-pole CE 5-..)	Auxiliary contact 4-pole CA 5-..	Pneumatic Timer TP .. A	Auxiliary contact 2-pole CAL 5-11	Interlock unit VE 5-2	
TAE 45 ... TAE 75	4 0	0 0	1 to 6 x CA 5-.. (1 to 5 x CE 5-.. max.) (1) or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-.. or CE 5-.. (1) or 1 x TP .. A + 2 x 1-pole CA 5-..			+	1 x CAL 5-11 or 1 x VE 5-2	

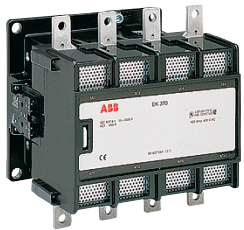
- (1) The total number of N.O. or N.C. CE 5-.. and other additional N.C. CA 5-.. auxiliary contacts is **limited to 5**.

EK 110 ... EK 1000 4-pole Contactors

d.c. Operated



EK 175-40



EK 370-40



EK 1000-40

Ordering Details

IEC	UL/CSA	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$ A	General use rating 600 V A		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
200	170	2 1	EK 110-40-21	SK 824 440-D	4.350
250	200	2 1	EK 150-40-21	SK 824 441-D	4.400
300	250	2 1	EK 175-40-21	SK 825 440-D	6.650
350	300	2 1	EK 210-40-21	SK 825 441-D	6.650
550	420	2 1	EK 370-40-21	SK 827 040-D	17.20
800	540	2 1	EK 550-40-21	SK 827 041-D	17.20
1000	—	2 1	EK 1000-40-21	SK 827 044-D	17.50

Coil voltages and codes

Voltage V d.c.	Code
12 (1)	DA
24	DB
36	DC
48	DD
60	DT
75	DG
110	DE
125	DU
220	DF

(1) Not for EK 370 ... EK 1000 contactors.

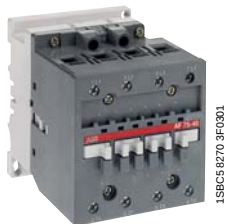
>> Accessory Fitting Details page 2/25
>> Accessory Ordering Details section 4
>> Technical Data page 2/76

>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

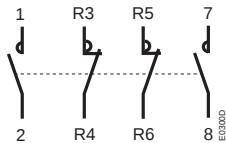
AF 45 ... AF 75 4-pole Contactors

Electronic Coil Interface

a.c. / d.c. Operated - Wide Voltage Range



AF 75-40-00



Ordering Details

IEC	UL/CSA	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40\text{ }^{\circ}\text{C}$ A	General use rating 600 V A		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece

4 N.O. main poles

70	80	-	-	AF 45-40-00	1SBL 337 201 R	1.420
100	80	-	-	AF 50-40-00	1SBL 357 201 R	1.420
125	105	-	-	AF 75-40-00	1SBL 417 201 R	1.420

2 N.O. + 2 N.C. main poles

70	80	-	-	AF 45-22-00	1SBL 337 501 R	1.420
125	105	-	-	AF 75-22-00	1SBL 417 501 R	1.420

Coil voltages and codes

Voltage V - 50/60Hz	Voltage V d.c.	Code
-	20 ... 60	7 2 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

Remark for AF 45 ... AF 75 4-pole contactors built with 2 N.O. + 2 N.C. main poles

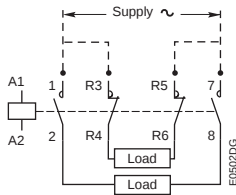
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK before MAKE.



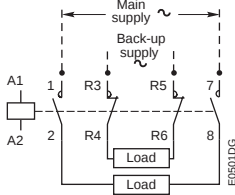
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block Diagrams

- Single supply and 2 separate loads



- 2 separate supplies and 2 separate loads



Electromagnetic compatibility

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

Notice: This product has been designed for **environment A**. Use of this product in **environment B** may cause unwanted electromagnetic disturbances in which case the user may be required to take adequate mitigation measures.

Definitions:

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

Environment B: "Mainly relates to low-voltage public networks (see 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".

>> Accessory Fitting Details page 2/23
>> Accessory Ordering Details section 4
>> Technical Data page 2/64

>> General - Approvals section 7
>> Terminal Markings and Positioning section 8
>> Dimensions section 9

Contactors for Capacitor Switching

AC-6b Utilization Category according to IEC 60947-4-1

Capacitor Transient Conditions

In Low Voltage industrial installations, capacitors are mainly used for reactive energy correction (raising the power factor). When these capacitors are energized, overcurrents of high amplitude and high frequencies (3 to 15 kHz) occur during the transient period (1 to 2 ms).

The amplitude of these current peaks, also known as "inrush current peaks", depends on the following factors:

- The network inductances.
- The transformer power and short-circuit voltage.
- The type of power factor correction.

There are 2 types of power factor correction: fixed or automatic.

Fixed power factor correction consists of inserting, in parallel on the network, a capacitor bank whose total power is provided by the assembly of capacitors of identical or different ratings.

The bank is energized by a contactor that simultaneously supplies all the capacitors (a single step).

The inrush current peak, in the case of fixed correction, can reach 30 times the nominal current of the capacitor bank.

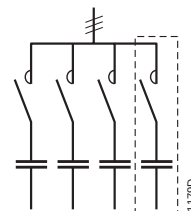


Single-step capacitor bank scheme
Use the A/AF... contactor ranges.

An automatic power factor correction system, on the other hand, consists of several capacitor banks of identical or different ratings (several steps), energized separately according to the value of the power factor to be corrected.

An electronic device automatically determines the power of the steps to be energized and activates the relevant contactors.

The inrush current peak, in the case of automatic correction, depends on the power of the steps already on duty, and can reach 100 times the nominal current of the step to be energized.



Multi-step capacitor bank scheme
Use the UA... or UA...RA contactor ranges.

Steady State Condition Data

The presence of harmonics and the network's voltage tolerance lead to a current, estimated to be 1.3 times the nominal current I_n of the capacitor, permanently circulating in the circuit.

Taking into account the manufacturing tolerances, the exact power of a capacitor can reach 1.15 times its nominal power.

Standard IEC 60831-1 Edition 2002 specifies that the capacitor must therefore have a maximum thermal current I_T of:

$$I_T = 1.3 \times 1.15 \times I_n = 1.5 \times I_n$$

Consequences for the Contactors

To avoid malfunctions (welding of main poles, abnormal temperature rise, etc.), contactors for capacitor bank switching must be sized to withstand:

- A permanent current that can reach 1.5 times the nominal current of the capacitor bank.
- The short but high peak current on pole closing (maximum permissible peak current $\hat{I}$).

Contactor Selection Tool for Capacitor Switching

In a given application, if the user does not know the value of the inrush current peak, this value can be approximately calculated using the formulas given on the **Application Guide "Contactors for Capacitor Switching"**.

Alternatively by the **CAPCAL Selection Tool**, available on the ABB Website:

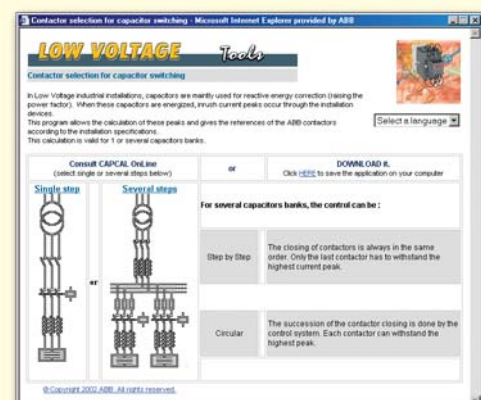
www.abb.com/lowvoltage

right menu: "Support"

search: "Online Product Selection Tools"

select: "Contactors: AC-6b Capacitor Switching"

This program allows the calculation of these peaks and gives the references of the ABB contactors according to the installation specifications. This calculation is valid for one or several capacitor banks.



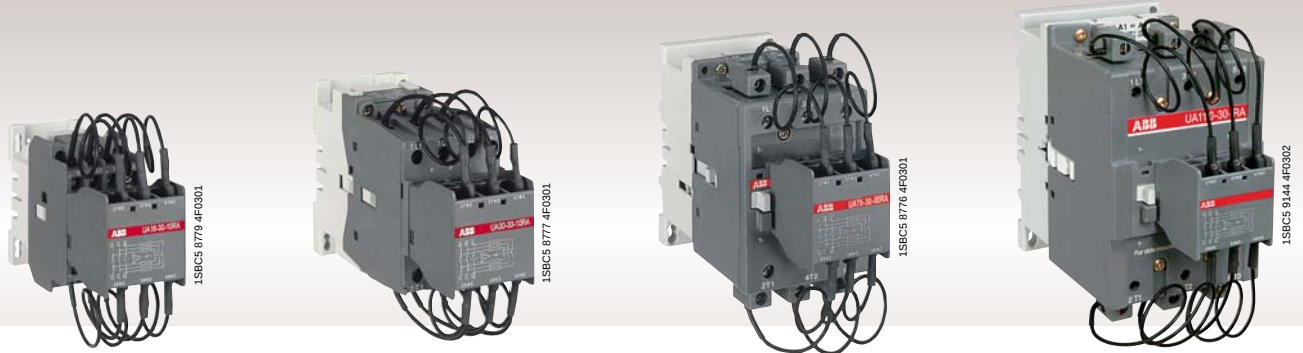
Contactors for Capacitor Switching

The ABB Solutions

ABB offers 3 contactor versions according to the value of the inrush current peak and the power of the capacitor bank.

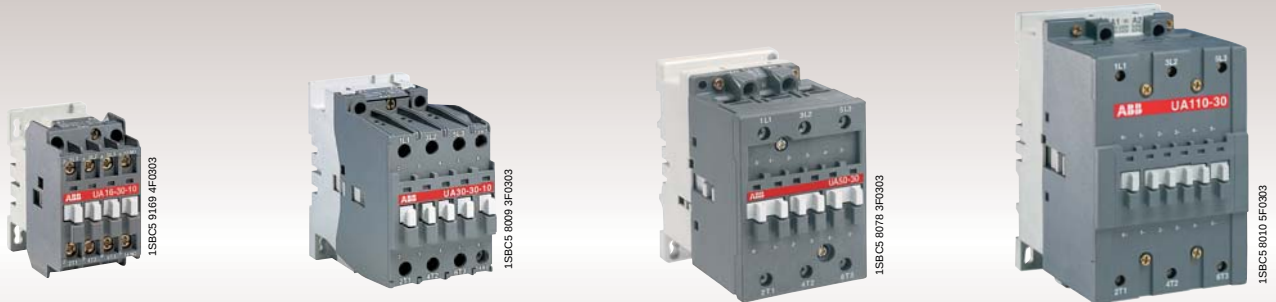
UA..RA Contactors for Capacitor Switching (UA 16..RA to UA 110..RA) with insertion of damping resistors.

The insertion of damping resistors protects the contactor and the capacitor from the highest inrush currents.



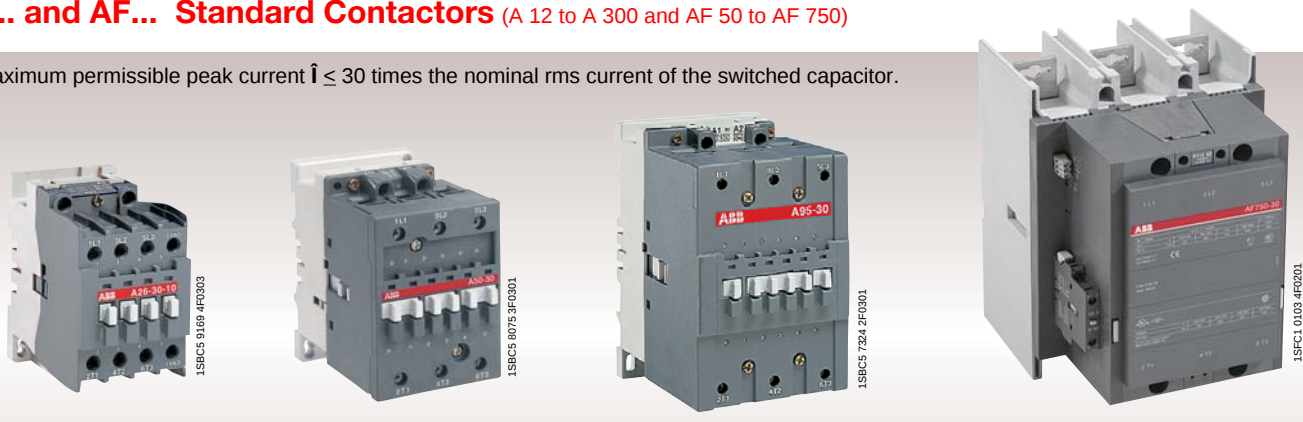
UA... Contactors for Capacitor Switching (UA 16 to UA 110)

Maximum permissible peak current $\hat{I} \leq 100$ times the nominal rms current of the switched capacitor.



A... and AF... Standard Contactors (A 12 to A 300 and AF 50 to AF 750)

Maximum permissible peak current $\hat{I} \leq 30$ times the nominal rms current of the switched capacitor.



2

Specific Contactors

UA..RA 3-pole Contactors for Capacitor Switching

Unlimited Peak Current $\hat{I}$



Application

The **UA..RA** contactors can be used in installations in which the peak current far exceeds 100 times nominal rms current. The contactors are delivered complete with their damping resistors and must be used without additional inductances (see table below).

The capacitors must be discharged (maximum residual voltage at terminals ≤ 50 V) before being re-energized when the contactors are making.

Their electrical durability is 250 000 operating cycles for $U_e < 500$ V and 100 000 operating cycles for $500 \text{ V} \leq U_e \leq 690$ V.

Description

The **UA..RA** contactors are fitted with a special front mounted block, which ensures the serial insertion of 3 damping resistors into the circuit to limit the current peak on energization of the capacitor bank. Their connection also ensures capacitor precharging in order to limit the second current peak occurring upon making of the main poles.

Operating principle

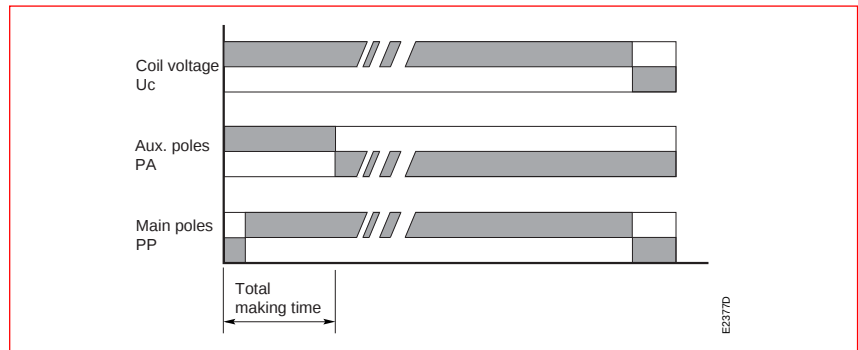
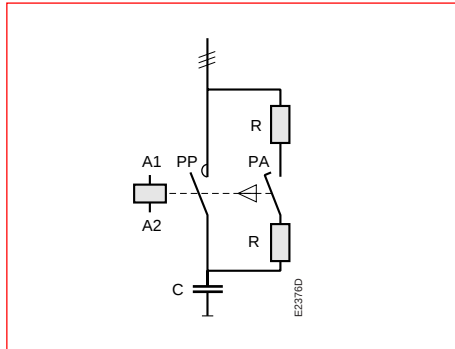
The front-mounted block mechanism of the **UA..RA** contactors ensures:

- early making of the auxiliary "PA" poles with respect to the main "PP" poles
- automatic return to the open position of the auxiliary "PA" poles after the main poles are closed.

When the coil is energized, the early making auxiliary poles connect the capacitor to the network via the set of 3 resistors. The damping resistors attenuate the first current peak and the second inrush current when the main contacts begin to make. Once the main poles are in the closed position, the auxiliary poles automatically break.

When the coil is de-energized, the main poles break ensuring the breaking of the capacitor bank.

The contactor can then begin a new cycle.



The insertion of resistors allows to damp the highest current peak of the capacitor when switching on, whatever its level.

Selection Table according to IEC

Type	Power in kvar – 50/60 Hz (AC-6b)															Max. permissible peak current $\hat{I}$	gG type fuses A max (*)
	230/240 V			400/415 V			440 V			500/550 V			690 V				
	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C		
UA 16-30-10 RA	8	7.5	6	12.5	12.5	10	15	13	11	18	16	12.5	22	21	17	Unlimited	80
UA 26-30-10 RA	12.5	11.5	9	22	20	15.5	24	20	17	30	25	20	35	31	26		125
UA 30-30-10 RA	16	16	11	30	27.5	19.5	32	30	20.5	34	34	25	45	45	32		200
UA 50-30-00 RA	25	24	20	40	40	35	50	43	37	55	50	46	72	65	60		200
UA 63-30-00 RA	30	27	23	50	45	39	55	48	42.5	65	60	50	80	75	65		200
UA 75-30-00 RA	35	30	25	60	50	41	65	53	45	75	65	55	100	80	70		200
UA 95-30-00 RA	40	35	30	70	60	53	75	65	58	85	75	70	120	105	85	Unlimited	250
UA 110-30-00 RA	45	40	35	80	70	60	85	75	70	95	82	78	130	110	100		250

(*) The fuse ratings given in the column represent the maximum ratings ensuring type 1 coordination according to the definition of standard IEC 60947-4-1.

Selection Table according to UL/CSA

Type	Power in kvar – 60 Hz			Max permissible peak current $\hat{I}$
	240 V 40 °C	480 V 40 °C	600 V 40 °C	
UA 16-30-10 RA	8	16	20	Unlimited
UA 26-30-10 RA	11	22	27	
UA 30-30-10 RA	14	28	35	
UA 50-30-00 RA	25	50	62	
UA 63-30-00 RA	27.5	55	70	
UA 75-30-00 RA	32	64	80	

UA..RA 3-pole Contactors for Capacitor Switching

Unlimited Peak Current $\hat{I}$



UA 16-30-10 RA



UA 30-30-10 RA



UA 75-30-00 RA



UA 110-30-00 RA

Ordering Details

IEC Rated power 400 V 40 °C kvar	UL/CSA Rated power 480 V 40 °C kvar	Auxiliary contacts fitted	Type	Order code	Weight kg
			state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
12.5	16	1 –	UA 16-30-10 RA	1SBL 181 024 R 10	0.460
22	22	1 –	UA 26-30-10 RA	1SBL 241 024 R 10	0.710
30	28	1 –	UA 30-30-10 RA	1SBL 281 024 R 10	0.810
40	50	– –	UA 50-30-00 RA	1SBL 351 024 R 00	1.350
50	55	– –	UA 63-30-00 RA	1SBL 371 024 R 00	1.350
60	64	– –	UA 75-30-00 RA	1SBL 411 024 R 00	1.350
70	–	– –	UA 95-30-00 RA	1SFL 431 024 R 00	2.000
80	–	– –	UA 110-30-00 RA	1SFL 451 024 R 00	2.000

Coil voltages and codes

Voltage V - 50Hz	Voltage V - 60Hz	Code
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

>> Accessory Fitting Details page 2/36
>> Accessory Ordering Details section 4
>> Technical Data page 2/37

>> General - Approvals section 7
>> Terminal Marking and Positioning section 8
>> Dimensions section 9

2

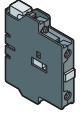
Specific Contactors

UA..RA 3-pole Contactors for Capacitor Switching

Unlimited Peak Current $\hat{I}$



Accessory Fitting Details

Contactor configuration			Front mounted accessories	Side mounted accessories
Contactor types	Main poles	Available auxiliary contacts	 Auxiliary contact 1-pole CA 5-...	 Auxiliary contact 2-pole CAL...
UA 16-30-10 RA	3 0	1 0	—	1 x CAL 5-11
UA 26-30-10 RA	3 0	1 0	—	1 to 2 x CAL 5-11
UA 30-30-10 RA	3 0	1 0	1 x CA5-...	+ 1 to 2 x CAL 5-11
UA 50-30-00 RA	3 0	0 0		
UA 63-30-00 RA	3 0	0 0	1 to 2 x CA5-...	+ 1 to 2 x CAL 5-11
UA 75-30-00 RA	3 0	0 0		
UA 95-30-00 RA	3 0	0 0		
UA 110-30-00 RA	3 0	0 0	1 to 2 x CA5-...	+ 1 to 2 x CAL 18-11

UA..RA 3-pole Contactors for Capacitor Switching

Unlimited Peak Current $\hat{I}$



Technical Data

Types	UA 16..RA	UA 26..RA	UA 30..RA	UA 50..RA UA 63..RA UA 75..RA	UA 95..RA UA 110..RA
Short-circuit protection gG type fuses	sized 1.5 ... 1.8 I_n of the capacitor				
Max. electrical switching frequency Operating cycles/h	240				
Electrical durability AC-6b					
– operating cycles at $U_e \leq 440$ V	250 000				
– operating cycles at 500 V $\leq U_e \leq 690$ V	100 000				
Connecting capacity (min. ... max.) Main conductors (poles)					
Rigid: solid (≤ 4 mm ²) } 1 x mm ²	1 ... 4	1.5 ... 6	2.5 ... 16	6 ... 50	10 ... 95
} 2 x mm ²	–	–	2.5 ... 16 + 2.5 ... 6	6 ... 25 + 6 ... 16	6 ... 35
Flexible with cable end 1 x mm ²	0.75 ... 2.5	1.5 ... 4	2.5 ... 10	6 ... 35	10 ... 70
2 x mm ²	–	–	2.5 ... 10 + 2.5 ... 4	6 ... 16 + 6 ... 10	6 ... 35
Lugs L mm $\leq$	7.7	10	–	–	–
I mm $>$	3.7	4.2	–	–	–
Auxiliary conductors (built-in auxiliary terminals + coil terminals)					
Rigid solid 1 x mm ²	1 ... 4				0.75 ... 2.5
2 x mm ²	1 ... 4				0.75 ... 2.5
Flexible with cable end 1 x mm ²	0.75 ... 2.5			1 ... 2.5	0.75 ... 2.5
2 x mm ²	0.75 ... 2.5				
Lugs					
Built-in aux. terminals L mm $\leq$	7.7	10	8	–	–
I mm $>$	3.7	4.2	3.7	–	–
Coil terminals L mm $\leq$	8				
I mm $>$	3.7				
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact in acc. with EN 50274				
– Main terminals	IP 20		IP 10		
– Coil terminals	IP 20				
– Built-in auxiliary terminals	IP 20		–		

Other technical characteristics are the same as those of standard A... contactors.

2

Specific Contactors

UA... 3-pole Contactors for Capacitor Switching

Peak Current $\hat{I} \leq 100$ Times the rms Current



Application

The **UA...** contactors can be used for the switching of capacitor banks whose inrush current peaks are less than or equal to 100 times nominal rms current. The table below gives the permissible powers according to operational voltage and temperature close to the contactor. It also specifies the maximum peak current **$\hat{I}$ values** accepted by the contactor.

The capacitors must be discharged (maximum residual voltage at terminals ≤ 50 V) before being re-energized when the contactors are making.

In these conditions, electrical durability of contactors is equal to 100 000 operating cycles.

Description

See general design for **A...** standard contactors.

Selection Table according to IEC

Type	Power in kvar 50/60 Hz (AC-6b)															Max. permissible peak current $\hat{I}$ (kA) $U_o \leq 500$ V $U_o > 500$ V	
	230/240 V			400/415 V			440 V			500/550 V			690 V				
	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C		
UA 16	7.5	6.7	6	12.5	11.7	10	13.7	13	11	15.5	14.7	12.5	21.5	20	17	1.8	1.6
UA 26	12	11	8.5	20	18.5	14.5	22	20	16	22	22	19.5	30	30	25	3	2.7
UA 30	16	16	11	27.5	27.5	19	30	30	20	34	34	23.5	45	45	32	3.5	3.1
UA 50	20	20	19	33	33	32	36	36	35	40	40	40	55	55	52	5	4.5
UA 63	25	25	21	45	43	37	50	48	41	50	50	45	70	70	60	6.5	5.8
UA 75	30	30	22	50	50	39	55	53	43	62	62	47.5	75	75	65	7.5	6.75
UA 95	35	35	30	65	65	55	65	65	55	70	70	60	80	80	70	9.3	8
UA 110	40	40	35	75	70	65	75	75	70	80	80	75	90	90	85	10.5	9

For **220 V** and **380 V**, multiply by **0.9** the rated values at 230 V and 400 V respectively.

Example: 50 kvar/400 V corresponding to $0.9 \times 50 = 45$ kvar/380 V.

The capacitor bank will be protected by gG type fuses whose rating is equal to 1.5 ... 1.8 times nominal current.

Selection Table according to UL/CSA

Type	Power in kvar - 60 Hz		
	240 V 40 °C	480 V 40 °C	600 V 40 °C
UA 26	12.5	25	30
UA 30	16	32	40
UA 50	20	40	50
UA 75	27.5	55	70
UA 95	35	70	75
UA 110	40	80	85

If, in an application, the current peak is greater than the maximum peak current $\hat{I}$ specified in the tables above, select a higher rating, refer to the **UA..RA** contactors, or add inductances. (see Application Guide "**Contactors for Capacitor Switching**").

UA... 3-pole Contactors for Capacitor Switching

Peak Current $\hat{I} \leq 100$ Times the rms Current



UA 16-30-10



UA 30-30-10



UA 50-30-00



UA 110-30-00

Ordering Details

IEC	UL/CSA	Auxiliary contacts fitted	Type	Order code	Weight kg
Rated power 400 V 40 °C kvar	Max. peak current $\hat{I}$ kA 480 V 40 °C kvar		state coil voltage (see table below)	state coil voltage code	Packing 1 piece
12.5	1.8	1 —	UA 16-30-10	1SBL 181 022 R□□10	0.340
20	3	1 —	UA 26-30-10	1SBL 241 022 R□□10	0.600
27.5	3.5	1 —	UA 30-30-10	1SBL 281 022 R□□10	0.710
33	5	— — 1 1	UA 50-30-00 UA 50-30-11	1SBL 351 022 R□□00 1SBL 351 022 R□□11	1.160 1.200
45	6.5	— — 1 1	UA 63-30-00 UA 63-30-11	1SBL 371 022 R□□00 1SBL 371 022 R□□11	1.160 1.200
50	7.5	— — 1 1	UA 75-30-00 UA 75-30-11	1SBL 411 022 R□□00 1SBL 411 022 R□□11	1.160 1.200
65	9.3	— — 1 1	UA 95-30-00 UA 95-30-11	1SFL 431 022 R□□00 1SFL 431 022 R□□11	2.000 2.040
75	10.5	— — 1 1	UA 110-30-00 UA 110-30-11	1SFL 451 022 R□□00 1SFL 451 022 R□□11	2.000 2.040

Coil voltages and codes

Voltage □□ V - 50Hz	Voltage □□ V - 60Hz	Code □□
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

2

Specific Contactors

>> Accessory Fitting Details	page 2/40	>> General - Approvals	section 7
>> Accessory Ordering Details	section 4	>> Terminal Marking and Positioning	section 8
>> Technical Data	page 2/41	>> Dimensions	section 9

UA... 3-pole Contactors for Capacitor Switching

Peak Current $\hat{I} \leq 100$ Times the rms Current



Accessory Fitting Details

Contactor configuration			Front mounted accessories			Side mounted accessories	
Contactor types	Main poles	Available auxiliary contacts	 Auxiliary contact 1-pole CA 5-..	 Auxiliary contact 4-pole CA 5-..	 Pneumatic Timer TP .. A	 Auxiliary contact 2-pole CAL...	
UA 16-30-10	3 0	1 0	1 to 4 x CA 5-..	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A	+	1 to 2 x CAL 5-11
UA 26-30-10	3 0	1 0	1 to 4 x CA 5-..	or 1 x CA 5-.. (4-pole)	or 1 x TP .. A	+	1 to 2 x CAL 5-11
UA 30-30-10	3 0	1 0	1 to 5 x CA 5-..	or 1 x CA 5-.. (4-pole) + 1 x 1-pole CA 5-..	or 1 x TP .. A + 1 x CA 5-.. (1-pole)	+	1 to 2 x CAL 5-11
UA 50-30-00	3 0	0 0					
UA 63-30-00	3 0	0 0	1 to 6 x CA 5-..	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-..	or 1 x TP .. A + 2 x CA 5-.. (1-pole)	+	1 to 2 x CAL 5-11
UA 75-30-00	3 0	0 0					
UA 95-30-00	3 0	0 0					
UA 110-30-00	3 0	0 0	1 to 6 x CA 5-..	or 1 x CA 5-.. (4-pole) + 2 x 1-pole CA 5-..	—	+	1 to 2 x CAL 18-11

UA... 3-pole Contactors for Capacitor Switching

Peak Current $\hat{I} \leq 100$ Times the rms Current

2

Specific Contactors

Technical Data

Types	UA 16	UA 26	UA 30	UA 50 UA 63 UA 75	UA 95 UA 110	
Short-circuit protection gG type fuses	sized 1.5 ... 1.8 I _n of the capacitor					
Max. electrical switching frequency Operating cycles/h	240					
Electrical durability AC-6b operating cycles at U _e ≤ 690 V	100 000					
Connecting capacity (min. ... max.) Main conductors (poles)						
Rigid: solid (≤ 4 mm²) stranded (≥ 6 mm²)	 1 x mm²  2 x mm²	1 ... 4 1 ... 4	1.5 ... 6 1.5 ... 6	2.5 ... 16 2.5 ... 16	6 ... 50 6 ... 25	10 ... 95 6 ... 35
Flexible with cable end	 1 x mm²  2 x mm²	0.75 ... 2.5 0.75 ... 2.5	0.75 ... 4 0.75 ... 4	2.5 ... 10 2.5 ... 10	6 ... 35 6 ... 16	10 ... 70 6 ... 35
Lugs	 L mm ≤ l mm >	7.7 3.7	10 4.2	— —	— —	— —
Auxiliary conductors (built-in auxiliary terminals + coil terminals)						
Rigid solid	 1 x mm²  2 x mm²	1 ... 4 1 ... 4				0.75 ... 2.5 0.75 ... 2.5
Flexible with cable end	 1 x mm²  2 x mm²	0.75 ... 2.5 0.75 ... 2.5	1 ... 2.5			0.75 ... 2.5
Lugs						
Built-in aux. terminals	 L mm ≤ l mm >	7.7 3.7	10 4.2	8 3.7	— —	— —
Coil terminals	 L mm ≤ l mm >	8 3.7				
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact in acc. with EN 50274					
— Main terminals	IP 20			IP 10		
— Coil terminals	IP 20					
— Built-in auxiliary terminals	IP 20			—		

Other technical characteristics are the same as those of standard A... contactors.

A... and AF... Standard 3-pole Contactors for Capacitor Switching

Single Step - Peak Current $\hat{I} \leq 30$ Times the rms Current



Application

The **A...** and **AF...** contactors are suited for capacitor bank switching for the peak current and power values in the table below. The capacitors must be discharged (maximum residual voltage at terminals ≤ 50 V) before being re-energized when the contactors are making. In these conditions, electrical durability of contactors is equal to 100 000 operating cycles.

Description

See "General Design" for **A...** and **AF...** contactors

Selection Table according to IEC

Type	Power in kvar 50/60 Hz (AC-6b)															Max. peak current
	230/240 V			400/415 V			440 V			500/550V			690 V			Î (kA)
	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	40°C	55°C	70°C	
A 9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
A 12	7	7	6	11	11	9.5	12	12	10.5	14	14	12	19	19	16.5	0.7
A 16	7.5	7.5	6	12.5	12.5	10	14	14	10.5	15.5	15.5	12	21.5	21.5	16.5	1
A 26	11.5	11.5	9	19	19	15	20	20	16.5	23	23	19	32	32	26	1.6
A 30	13	13	11	22	22	18.5	24	24	20.5	28	28	23	38	38	32	1.9
A 40	15	15	12	26	26	20	29	29	22	35	35	25	46	46	34.5	2.1
A/AF 50	22	22	20	38	38	34	42	42	37	48	48	42	65	65	58.5	2.3
A/AF 63	25	25	23	43	43	39	47	47	42.5	54	54	48.5	74	74	67	2.5
A/AF 75	28	28	24.5	48	48	41	52	52	45	60	60	51	82	82	70	2.6
A/AF 95	35	35	33	60	60	53	63	63	58	75	75	70	80	80	75	4
A/AF 110	40	40	35	70	70	60	75	75	65	83	83	78	90	90	85	4
A/AF 145	50	50	42	90	90	74	93	93	80	110	110	96	110	110	110	4
A/AF 185	60	60	45	110	110	83	115	115	85	135	135	102	135	135	135	5
A/AF 210	75	75	57	130	130	105	135	135	110	160	160	130	160	160	160	6.5
A/AF 260	85	85	70	145	145	135	155	155	140	180	180	165	200	200	200	8
A/AF 300	100	100	85	165	165	155	180	180	163	210	210	196	240	240	240	8
AF 400	120	120	105	210	210	195	220	220	200	260	260	241	300	300	300	10
AF 460	140	140	120	240	240	225	260	260	230	325	325	300	325	325	325	10
AF 580	170	170	160	285	285	275	300	300	290	350	350	340	440	440	440	12
AF 750	220	220	190	400	400	370	410	410	380	490	490	435	600	600	600	12

Note: For 3-pole A 16 ... A 110 contactors used with anti-resonance inductances (**Several mH**, built specially to suppress inrush current), see the Application Guide "Contactors for Capacitor Switching".

If, in an application, the current peak is greater than the maximum peak current $\hat{I}$ specified in the table above, select a higher rating, refer to the **UA...** contactors, or add inductances, see the **Application Guide "Contactors for Capacitor Switching"**.

The capacitor bank will be protected by gG type fuses whose rating is equal to 1.5 ... 1.8 times nominal current.

A... and AF... Standard 3-pole Contactors for Capacitor Switching



Single Step - Peak Current $\hat{I} \leq 30$ Times the rms Current

Ordering Details

IEC Power 400 V 40 °C kvar	Max. peak current $\hat{I}$ kA	Auxiliary contacts fitted 	Type state coil voltage (see table below)	Order code state coil voltage code (see table below)	Weight kg Pack ^{ing} 1 piece
11	0.7	1 -	A 12-30-10	1SBL 161 001 R 10	0.340
12.5	1	1 -	A 16-30-10	1SBL 181 001 R 10	0.340
19	1.6	1 -	A 26-30-10	1SBL 241 001 R 10	0.600
22	1.9	1 -	A 30-30-10	1SBL 281 001 R 10	0.710
26	2.1	1 -	A 40-30-10	1SBL 321 001 R 10	0.710
38	2.3	- -	A 50-30-00 AF 50-30-00	1SBL 351 001 R 00 1SBL 357 001 R 00	1.160 1.180
43	2.5	- -	A 63-30-00 AF 63-30-00	1SBL 371 001 R 00 1SBL 377 001 R 00	1.160 1.180
48	2.6	- -	A 75-30-00 AF 75-30-00	1SBL 411 001 R 00 1SBL 417 001 R 00	1.160 1.180
60	4	- -	A 95-30-00 AF 95-30-00	1SFL 431 001 R 00 1SFL 437 001 R 00	2.000 2.030
70	4	- -	A 110-30-00 AF 110-30-00	1SFL 451 001 R 00 1SFL 457 001 R 00	2.000 2.030
90	4	1 1	A 145-30-11 AF 145-30-11	1SFL 471 001 R 11 1SFL 477 001 R 11	3.500 3.600
110	5	1 1	A 185-30-11 AF 185-30-11	1SFL 491 001 R 11 1SFL 497 001 R 11	3.500 3.600
130	6.5	1 1	A 210-30-11 AF 210-30-11	1SFL 511 001 R 11 1SFL 517 001 R 11	6.100 6.200
145	8	1 1	A 260-30-11 AF 260-30-11	1SFL 531 001 R 11 1SFL 537 001 R 11	6.100 6.200
165	8	1 1	A 300-30-11 AF 300-30-11	1SFL 551 001 R 11 1SFL 557 001 R 11	6.100 6.200
210	10	1 1	AF 400-30-11	1SFL 577 001 R 11	12.00
240	10	1 1	AF 460-30-11	1SFL 597 001 R 11	12.00
285	12	1 1	AF 580-30-11	1SFL 617 001 R 11	15.00
400	12	1 1	AF 750-30-11	1SFL 637 001 R 11	15.00

Coil voltages and codes: A 12 ... A 300

Voltage V - 50Hz	Voltage V - 60Hz	Code
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

Coil voltages and codes: AF 50 ... AF 300

Voltage V - 50/60Hz	Voltage V d.c.	Code
-	20 ... 60	7 2 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

Coil voltages and codes: AF 400 ... AF 750

Voltage V - 50/60Hz	Voltage V d.c.	Code
-	24 ... 60	6 8 (1)
48 ... 130	48 ... 130	6 9
100 ... 250	100 ... 250	7 0
250 ... 500	250 ... 500	7 1

(1) The connection polarities indicated close to the coil terminals must be respected: **A1** for the **positive** pole and **A2** for the **negative** pole.

>> Accessory Fitting Details page 2/8, 2/12

>> Accessory Ordering Details section 4

>> AF... Contactors with Electronic Coil Interface: electromagnetic compatibility pages 2/19, 2/21

2

Specific Contactors



A 26-30-10



A 50-30-00



A 95-30-00



AF 750-30-11

GA 75, GAE 75 Contactors for d.c. Switching

Application

GA 75 and **GAE 75** contactors are designed for d.c. circuit switching.

Arc suppression is more difficult in d.c. than in a.c. To choose a contactor, it is necessary to know the current and voltage to be broken as well as the L/R time constant of the power circuit to be controlled.

For your information, here are some typical time constant values:

DC-1: non inductive loads such as resistance furnaces: L/R $\approx$ 1 ms,

DC-3: shunt motors: L/R $\approx$ 2 ms,

DC-5: series motors: L/R $\approx$ 7.5 ms.

Remark: the addition of a resistor in parallel with an inductive winding makes arc suppression easier.

Description

GA 75 and **GAE 75** contactors are of the block type design.

- Main poles

GA 75 and GAE 75 contactors are fitted with arc chutes with permanent magnets specially designed for d.c. breaking.

The three contactor paths are arranged in series via two supplied and fitted insulated connections (25 mm²).

The GA 75 and GAE 75 are "single-pole" devices for which the connection polarities indicated next to the connection terminals must be respected. Furthermore, they are marked **1L1** for the positive terminal and **2T1** for the negative terminal.

Remark: Main contacts cannot be changed.

- Auxiliary contact: 1 **CAL 5-11** side mounted add-on auxiliary contact block (GA 75-10-11 and GAE 75-10-11 types).

- Control circuit

- **GA 75** a.c. operated,
- **GAE 75** d.c. operated.

- Accessories: a wide range of accessories is available.

Specific Technical Data

– Rated insulation voltage **U_i** = 1000 V d.c. according to IEC 60947-4-1 and EN 60947-4-1.

– Maximum switching frequencies: 300 operating cycles/h.

– Maximum rated operational current **I_e** acc. to IEC

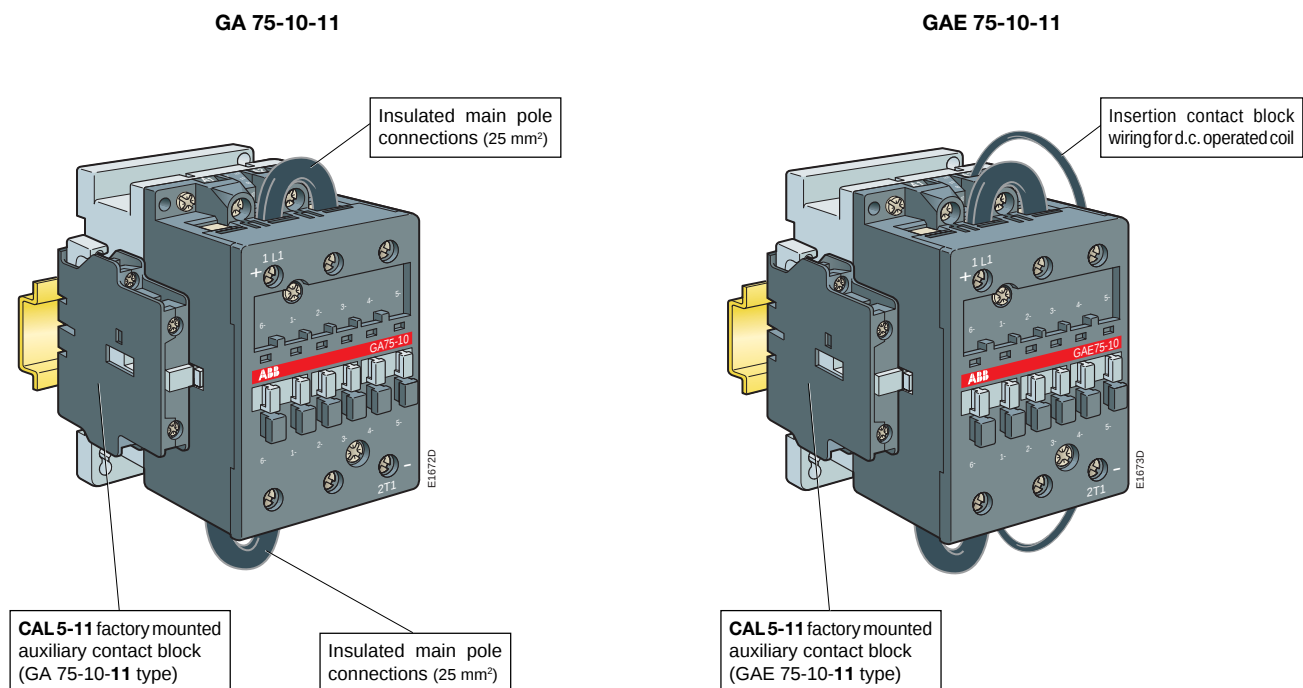
DC-1	$\theta \leq 55\text{ }^{\circ}\text{C}$	220 V < U _e ≤ 440 V	100 A
		440 V < U _e ≤ 600 V	75 A
DC-3	–	220 V < U _e ≤ 440 V	85 A
DC-5	–	110 V < U _e ≤ 220 V	85 A
		220 V < U _e ≤ 440 V	35 A

– Maximum rated operational current **I_e** acc. to UL/CSA

General use	U _e ≤ 440 V	100 A
	U _e ≤ 600 V	75 A
	U _e ≤ 1000 V	35 A

Other technical data are the same as those of standard **A...** contactors.

GA 75 and GAE 75 contactors specific design (see A 9 ... A 110 contactors for general design)



GA 75, GAE 75 Contactors for d.c. Switching



GA 75-10-11



GAE 75-10-11

Ordering Details

IEC Rated operational current			Available auxiliary contacts	Type	Order code	Weight kg
DC-1 440 V $\theta \leq 55^\circ\text{C}$ A	DC-3 440 V A	DC-5 220 V A				
				state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
100	85	85	— 1	GA 75-10-00 GA 75-10-11	1SBL 411 025 R 1SBL 411 025 R	1.220 1.260
100	85	85	— 1	GAE 75-10-00 GAE 75-10-11	1SBL 419 025 R 1SBL 419 025 R	1.260 1.300

Coil voltages and codes: GA 75

Voltage V - 50Hz	Voltage V - 60Hz	Code
24	24	8 1
48	48	8 3
110	110 ... 120	8 4
220 ... 230	230 ... 240	8 0
230 ... 240	240 ... 260	8 8
380 ... 400	400 ... 415	8 5
400 ... 415	415 ... 440	8 6

Other voltages: page 0/1.

Coil voltages and codes: GAE 75

Voltage V d.c.	Code
12	8 0
24	8 1
42	8 2
48	8 3
50	2 1
60	8 4
75	8 5
110	8 6
125	8 7
220	8 8
240	8 9
250	3 8

Connection Diagrams

In d.c. circuits, the source to earth (or frame) connection mode is an important element.

Three modes are mainly used:

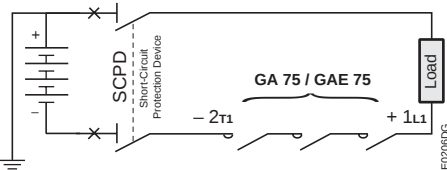
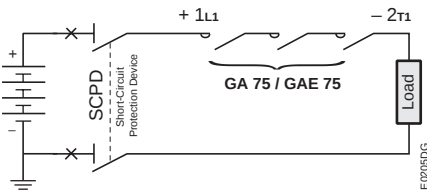
- A** – insulated source, i.e. unearthed (or not connected to the frame),
- B** – source earthed via its central point,
- C** – source earthed via one of its outer poles.

Modes **A** and **B** do not impose any constraints with regard to the distribution of the contactor poles between the two source / load connecting branches. Mode **C** requirements are therefore suitable for modes **A** and **B**.

For mode **C**, all the poles necessary for breaking must be installed in series between the load and the unearthed (also not connected to the frame) source polarity.

We recommend this solution for all connection modes.

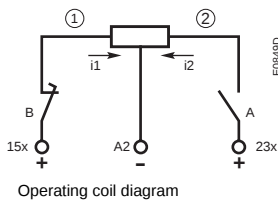
The above provisions relate to power circuit switching, the SCPD (Short-Circuit Protection Device) must comply with protection rules.



>> Contactor Selection for d.c. Circuit Switching	page 2/60
>> Accessories	section 4
>> General - Approvals	section 7
>> Terminal Marking and Positioning	section 8
>> Dimensions	section 9

AM... Magnetically Latched Contactors

d.c. Operated



Application

These contactors provide a safety function in those circuits where standard contactors would drop out in the event of a faulty control circuit supply voltage, i.e. excessive voltage drops, control circuit voltage failures. They also provide an energy saving function in those circuits where contactors are used for an uninterrupted duty, i.e. distribution or current carrying duty.

This type of contactor is particularly suitable for industrial processes where voltage sags have heavy consequences and is totally immune to voltage dips.

Description

The **AM...** magnetically latched contactors are very similar in construction and dimensions to the **A...** standard contactors of equal rating. Only the electro-magnet and coil have a specific design in order to achieve the latching and de-latching operations.

The operating coil is built with 3 connecting terminals and 2 windings which, when energized, create two magnetic fields of opposite strength.

The coil windings must be energized from a d.c. supply, polarity (+ and -) must be observed.

Operation

- Contactor closing i.e. latching via **"B" circuit**. The contactor is held in closed position due to the circuit remanency.
- Contactor opening, i.e. de-latching via **"A" circuit**.
- On closing and opening the coil windings are automatically controlled and briefly energized through **"B"** (N.C.) and **"A"** (N.O.) auxiliary contacts.

The **AM...** contactors have two resting positions, **closed position** and **open position** and are delivered in closed position.

Changeover from one position to another is achieved by impulses on the coil with a minimum duration of 100 ms.

Coil operating limits: 0.85 ... 1.1 U_n

Technical Data

Same technical data as for the **AE 50**, **AE 75** contactors with the exception of:

- coil consumption: 210 W on latching, and 45 W on de-latching.
- mounting positions: position 5 is prohibited (see "Technical Data" for mounting position diagram).

>> A... Standard Contactor Description	page 2/6
>> Accessories	section 4
>> Technical Data	page 2/64

>> General - Approvals	section 7
>> Terminal Marking and Positioning	section 8
>> Dimensions	section 9

AM... Magnetically Latched Contactors

d.c. Operated



AM 75-30-22



AM 45-22-22

Ordering Details

Contactors with 3 N.O. main poles

IEC Rated power 400 V AC-3 kW	Rated current $\theta \leq 40\text{ }^{\circ}\text{C}$ AC-1 A	Available auxiliary contacts	Type	Order code	Weight kg
			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
22	100	2 2	AM 50-30-22	1SBL 358 029 R 22	1.230
37	125	2 2	AM 75-30-22	1SBL 418 029 R 22	1.230

Contactors with 2 N.O. + 2 N.C. main poles

IEC AC-1 Rated current	Available auxiliary contacts	Type	Order code	Weight kg
$\theta \leq 40\text{ }^{\circ}\text{C}$ A	$\theta \leq 55\text{ }^{\circ}\text{C}$ A		state coil voltage (see table below)	state coil voltage code (see table below)
70	60	2 2	AM 45-22-22	1SBL 338 529 R 22
125	105	2 2	AM 75-22-22	1SBL 418 529 R 22

Coil voltages and codes

Voltage V d.c.	Code
12	8 0
24	8 1
42	8 2
48	8 3
50	2 1
60	8 4
75	8 5
110	8 6
125	8 7
220	8 8
240	8 9
250	3 8

Accessories

A wide range of accessories is available.

Note: Max. of 2 CA 5-... 1-pole auxiliary contact blocks can be added on the AM... 3-pole contactors only.

>> A... Standard Contactor Description	page 2/6	>> General - Approvals	section 7
>> Accessories	section 4	>> Terminal Marking and Positioning	section 8
>> Technical Data	page 2/64	>> Dimensions	section 9

EH 1200 3-pole Contactor for non Inductive Loads

a.c. Operated or d.c. Operated



Application

The **EH 1200** contactor is designed for non inductive or slightly inductive loads (Utilization category AC-1 according to IEC 60947-4-1 standard, or General Use according to UL). Not suitable for motor applications.

Description

- Main poles and auxiliary contact blocks:
 - 3 main poles,
 - side mounted add-on auxiliary contact blocks.
- Control circuit:
 - The magnet system is d.c. operated with economizing resistor circuit, operated by an CCL 16-11 E auxiliary contact.
 - A rectifier system is used for the a.c. version, the control circuit connection is directly on the rectifier with push on terminals (6.3 mm).
- Accessories:
 - **CAL 16-11..** auxiliary contact blocks.
 - **RC-EH 800/10** surge suppressor for d.c. operated. (Not needed for a.c. operated.)

Accessory Fitting Details

Mounting positions of the auxiliary contacts

Auxiliary contact types and connecting diagrams

CAL16-11 A CAL16-11 C

EH 1200... 3-pole contactors

Contactor types	Main poles	Available auxiliary contacts	Add-on auxiliary contact blocks 2-pole CAL 16-11...	Mounting positions
				Factory mounted auxiliary contacts Add-on CAL 16-11 auxiliary contacts
EH 1200	3 0	1 1	1 x CAL 16-11 C	

EH 1200 3-pole Contactor for non Inductive Loads

a.c. Operated or d.c. Operated



EH 1200-30-11

Ordering Details

IEC	UL	Available auxiliary contacts	Type	Order code	Weight kg
AC-1 Rated current $\theta \leq 40^\circ\text{C}$ A	General use rating 600 V A		state coil voltage (see table below)	state coil voltage code (see table below)	Packing 1 piece
1200	1200	1 1 2 2	EH 1200-30-11 EH 1200-30-22	SK 828 006- SK 828 032-	18.00 18.00

Coil voltages and codes: EH 1200

Voltage V - 50/60 Hz	Voltage V - d.c.	Code
—	24	D B
—	110	D E
110 ... 120	—	E F
220 ... 240	—	E L
380 ... 400	—	E P

Technical Data

Main Pole - Utilization Characteristics

Rated insulation voltage U_i	V	1000
Rated operational current I_e / AC-1 for air temperature close to contactor		
U_e max. 1000 V	$\theta \leq 40^\circ\text{C}$ A	1200
	$\theta \leq 55^\circ\text{C}$ A	1000
	$\theta \leq 70^\circ\text{C}$ A	850
with terminal bars	mm	2 x 80 x 5
UL rating		
General use	600 V A	1200
Rated short-time withstand current I_{cw} at 40°C ambient temp., in free air, from a cold state		
	1 s A	8000
	10 s A	7200
	30 s A	5200
	1 min A	4000
	15 min A	1500
Electrical durability - AC-1, 1200 A		
— max. 440 V	operations	150 ... 200 000
— max. 690 V	operations	70 ... 100 000
— max. 1000 V	operations	10 ... 30 000
Mechanical durability	million of operations	0.5 ... 1

Magnet System Characteristics

Coil consumption		
— pull-in a.c.	VA	1000 ... 1400
— pull-in d.c.	W	1200
— holding a.c.	VA/W	20 ... 25
— holding d.c.	W	21
Operating time		
between coil energization and		
— N.O. contact closing	ms	60 ... 80
— N.C. contact opening	ms	55 ... 75
between coil de-energization and		
— N.O. contact opening	ms	13 ... 38
— N.C. contact closing	ms	10 ... 35

>> Connecting Characteristics: see "Dimensions" ... section 9
>> Accessories (See EK Contactors) section 4

>> Terminal Marking section 8
>> Dimensions section 9

2

Specific Contactors

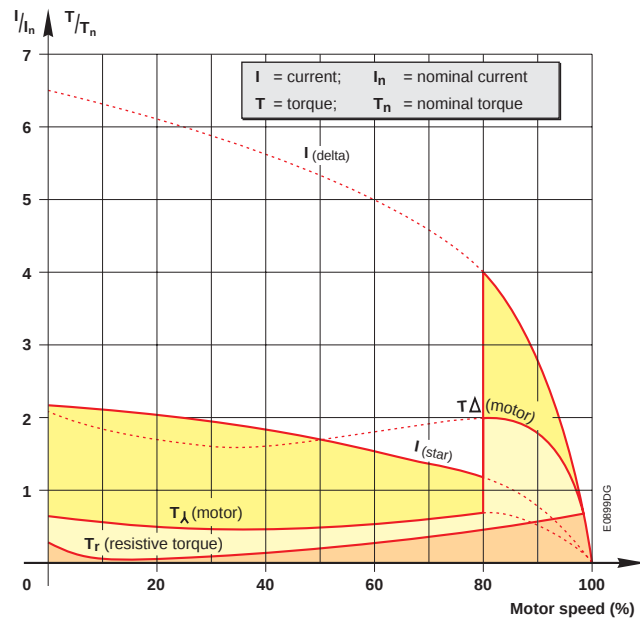
Star-Delta Starting of Three-Phase Asynchronous Motors

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 400 V star-delta starting must be designed for 400 V in "delta" connection. Its usual designation is "400 V / 690 V motor". The motor must be constructed with 6 terminal windings.

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 10 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: When AF... contactor types are used as **delta** and **star** contactors or an A... contactor as **star** contactor with an AF... contactor as **delta** contactor, the use of a timer including a dwelling time (or transition time) e.g. TE5S is not recommended. A timer set for the starting duration in star connection is enough. 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.

Star-Delta Starting of Three-Phase Asynchronous Motors

Controlgear Selection Guide - For more technical information, refer to ABB Starting Combinations catalogue

Motor power, kW Ambient temperature = 55 °C						Max. starting time from cold state (3)	Contactors			O/L Relay (1)	Timer	Set of power connections
220- 230 V	240 V	380- 400 V	415 V	500 V	660- 690 V		KM1 Main	KM3 Delta	KM2 Star			
4	4	7.5	7.5	5.5	5.5	15	A 9	A 9	A 9	TA 25 DU	TE5S	BED 16-1 (4)
5.5	5.5	11	11	7.5	7.5	15	A 12	A 12	A 9	TA 25 DU	TE5S	BED 16-1 (4)
9	11	15	15	15	11	15	A 16	A 16	A 12	TA 25 DU	TE5S	BED 16-1 (4)
12.5	12.5	22	22	22	15	15	A 26	A 26	A 16	TA 25 DU	TE5S	BED 26-1 (4)
15	15	25	25	25	18.5	15	A 30	A 30	A 26	TA 25 DU	TE5S	BED 40-1 (4)
18.5	22	37	37	37	37	30	A 40	A 40	A 26	TA 42 DU	TE5S	BED 40-1 (4)
25	25	45	45	45	45	30	A 50	A 50	A 30	TA 75 DU	TE5S	BED 50-1 (4)
30	33	55	55	63	59	30	A 63	A 63	A 40	TA 75 DU	TE5S	BED 50-1 (4)
37	40	63	70	75	63	30	A 75	A 75	A 50	TA 75 DU	TE5S	BED 75-1 (4)
45	45	75	75	90	90	20	A 95	A 95	A 75	TA 110 DU	TE5S	BED 95 (5)
55	59	90	100	110	132	20	A 110	A 110	A 95	TA 110 DU	TE5S	BED 110 (5)
75	75	132	132	160	160	20	A 145	A 145	A 110	TA 200 DU	TE5S	BED 145 (5)
90	90	160	160	200	250	20	A 185	A 185	A 145	TA 200 DU	TE5S	BED 185 (5)
110	110	200	200	250	315	20	A 210	A 210	A 185	TA 450 DU	TE5S	BED 210 (5)
140	140	220	250	295	355	20	A 260	A 260	A 210	TA 450 DU	TE5S	BED 300 (5)
160	160	250	250	355	450	20	A 300	A 300	A 260	TA 450 DU	TE5S	BED 300 (5)
180	200	355	355	450	560	20	AF 400	AF 400	A 260	E 500 DU	(2)	BED 400 (5)
250	250	450	475	560	670	20	AF 460	AF 460	A 300	E 500 DU	(2)	BED 400 (5)
315	315	560	600	700	750	20	AF 580	AF 580	AF 400	E 800 DU	(2)	BED 580 (5)
400	400	670	670	750	900	20	AF 750	AF 750	AF 460	E 800 DU	(2)	BED 580 (5)
450	475	830	900	960	1350	20	AF 1350	AF 1350	AF 580 (6)	E 1250 DU	(2)	—
560	600	1000	1050	1150	1600	20	AF 1650	AF 1650	AF 750 (6)	E 1250 DU	(2)	—

For motors above 670 kW/400 V, it is recommended to use Closed Transition Star-Delta starting. Contact your ABB Office for selection.

(1) The setting current value is: nominal motor current x 0.58.

(2) Contactor Relay type N + TP timer can be used as the AF contactors have a slight delay in closing.

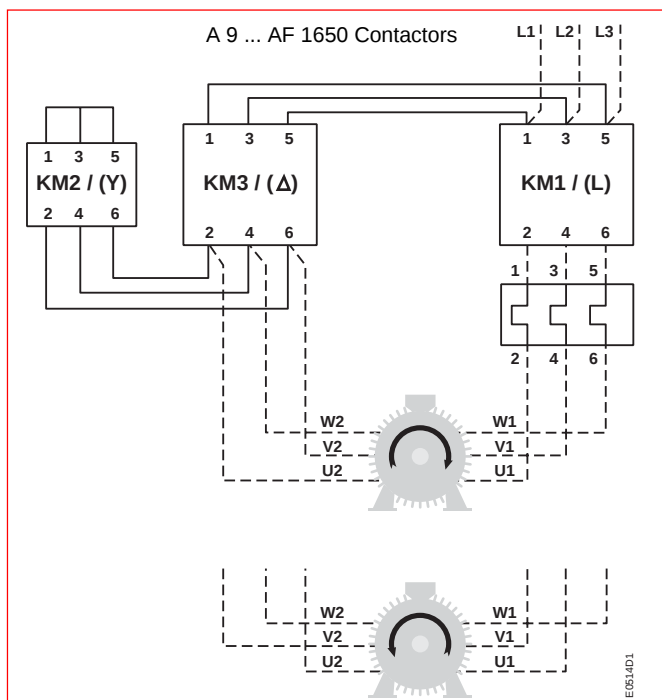
(3) Usual time value = 6 ... 10 s.

(4) Version without space for mechanical interlock.

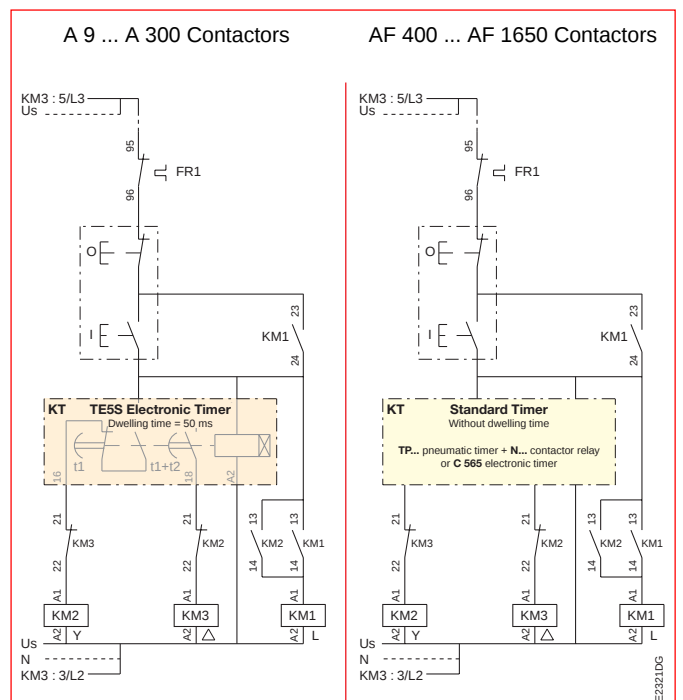
(5) Version with space for mechanical interlock.

(6) Use AF 1350 in case of mechanical interlock.

Power circuit diagram



Control circuit diagrams - Remote control



Control of Three-Phase Slip-Ring Motors

Contactors Selection

General

Three kinds of contactors are used to control three-phase slip-ring motors: the **stator contactor**, the **acceleration contactor(s)** and the **rotor short-circuit contactor**. Refer to the diagram opposite.

The selection tables below concern complete smooth starting, excluding specific cases, such as: intermittent operation, regenerative current, controlled slipping, etc. for which you need to consult our specialised departments.

The starting and breaking technical data for slip-ring motors are defined in standard IEC 60947-4-1 in the AC-2 utilization category.

The load factor is defined by the equation: $L.F. (\%) = \frac{\text{Operating cycle}}{\text{Cycle time (Operating cycle + Rest cycle)}} \times 100$

Stator Contactor

Closing of the starting current, conditioned by the value of the rotor resistances: it may reach 1.5 to 4 times rated motor operational current.

Breaking of the rated operational current, or of the starting current, with possible regenerative current.

The following table gives the **permissible values of the I_e / AC-2 rated operational stator current**, as a function of load factor.

Temperature of 55 °C maximum near the contactor.

Maximum switching frequency and Electrical durability in AC-2 category: see "Technical Data".

Contactors				A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110	
Load factor	15%	I _e / AC-2	A	13.5	19	26	35	50	55	70	95	125	200	220	
	25%	I _e / AC-2	A	12	17	23	32	45	50	63	85	110	165	185	
	40%	I _e / AC-2	A	10.5	15	19.5	27	39	42	54	73	95	135	150	
	60%	I _e / AC-2	A	9.5	13	17.5	24	34	37	48	65	85	120	135	
S7 acc. to IEC 34-1: periodical continuous duty with electrical braking				A	9	12	17	26	32	35	45	60	75	96	110

Acceleration Contactors

The sizing of these contactors is based on the AC-1 rated operational current (see "Technical Data") that we recall below for the **maximum ambient temperature of 55 °C**. **Delta connection** of these contactors is considered (reduce currents by 35% if star connection is used).

The table opposite lists the **factors to be applied to the AC-1 current** of the contactors in order to obtain the permissible limit value of the motor rated operational rotor current. This table takes into account the number of cycles an hour (without inching) and the current flow time per cycle, in the contactor.

Number of cycles an hour	1	3	6	12	20	30	60	120
Current flow time per cycle	Factors applicable to I_e / AC-1							
5 s	5.2	4.9	4.7	4.3	4.0	3.7	3.4	2.8
10 s	3.8	3.6	3.4	3.1	3.0	2.8	2.6	2.2
20 s	2.8	2.7	2.6	2.5	2.4	2.2	2.0	1.6
30 s	2.4	2.3	2.2	2.1	2.1	1.9	1.7	–
40 s	2.2	2.1	2.0	1.9	1.9	1.7	1.5	–
60 s	1.9	1.8	1.8	1.7	1.7	1.5	–	–

Contactors		A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110	
Rated operational current I _e / AC-1 for air temperature near the contactor ≤ 55 °C		A	22	25	27	40	55	60	85	95	105	135	145

Rotor Short-Circuit Contactor

The duty of this contactor is characterised by small closing stresses. The decisive factor is the thermal stress. **Delta connection** of the contactor is considered (reduce currents by 35% if star connection is used).

The following table gives the **permissible values of the rated operational rotor current**, as a function of load factor.

Temperature: 55 °C maximum near the contactor.

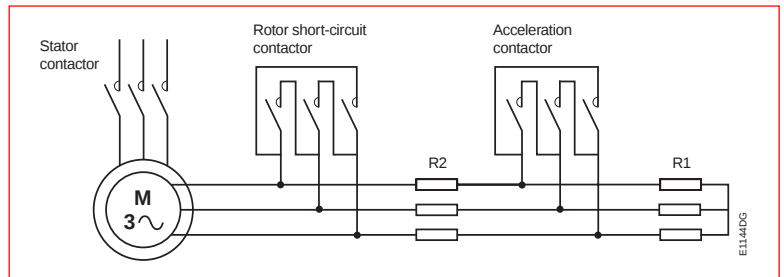
Contactors			A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110	
Load factor	15%	A	45	58	70	105	112	125	160	210	245	290	330	
	25%	A	40	51	63	93	102	115	140	180	215	260	300	
	40%	A	35	42	54	80	87	95	120	155	185	230	260	
	60%	A	30	39	47	70	76	86	110	140	163	200	230	
S7 acc. to IEC 34-1: periodical continuous duty with electrical braking			A	28	35	40	58	72	85	100	130	152	170	200
Rated operational rotor voltage:														
– Maximum values for starting and breaking		V	1100 (1320 if star connection)									2200 (2600)		
– Maximum values for starting and electrical braking		V	550 (600 if star connection)									690 (730)		

Control of Three-Phase Slip-Ring Motors

Contactors Selection

Example of a Three-Stroke Starter

- The first stroke corresponds to energisation of the motor by the **stator contactor**: all the resistances are operational in the rotor circuit.
- At the second stroke, the **acceleration contactor** short-circuits the first resistance stack.
- At the third stroke, the **rotor short-circuit contactor** is activated by eliminating the last resistance stack, thus completing the starting period.



The selection table for A 9 ... A 110 contactors can be used for the AL 9 ... AE 110 types.
The selection table for A 50 ... A 300 contactors can be used for the AF 50 ... AF 300 types.

Contactors				A 145	A 185	A 210	A 260	A 300	AF 400	AF 460	AF 580	AF 750	AF 1350	AF 1650
Load factor	15%	I_e / AC-2	A	335	360	425	530	625	850	950	1150	1500	1720	2100
	25%	I_e / AC-2	A	270	300	350	440	515	680	780	975	1250	1430	1750
	40%	I_e / AC-2	A	215	250	300	370	430	580	650	800	1050	1200	1470
	60%	I_e / AC-2	A	180	220	255	315	370	480	550	700	900	1030	1250
S7 acc. to IEC 34-1: periodical continuous duty with electrical braking				A	145	185	210	260	400	460	580	750	860	1050

Contactors				A 145	A 185	A 210	A 260	A 300	AF 400	AF 460	AF 580	AF 750	AF 1350	AF 1650
Rated operational current I_e / AC-1 for air temperature near the contactor $\leq 55^\circ\text{C}$				A	230	250	300	350	500	600	700	800	1150	1450

Contactors				A 145	A 185	A 210	A 260	A 300	AF 400	AF 460	AF 580	AF 750	AF 1350	AF 1650
Load factor	15%	A		540	580	750	830	950	1200	1400	1650	1900	2400	2800
	25%	A		490	530	650	725	830	1050	1250	1450	1650	2100	2500
	40%	A		425	460	575	630	720	950	1100	1300	1450	1850	2200
	60%	A		375	400	500	575	650	810	975	1150	1300	1650	1950
S7 acc. to IEC 34-1: periodical continuous duty with electrical braking				A	325	350	430	480	700	840	980	1150	1500	1800
Rated operational rotor voltage:														
– Maximum values for starting and breaking				V	2200		3000		(2600 if star connection)		(3600 if star connection)			
– Maximum values for starting and electrical braking				V	690				(730 if star connection)					

Autotransformer Starters

Contactor Selection

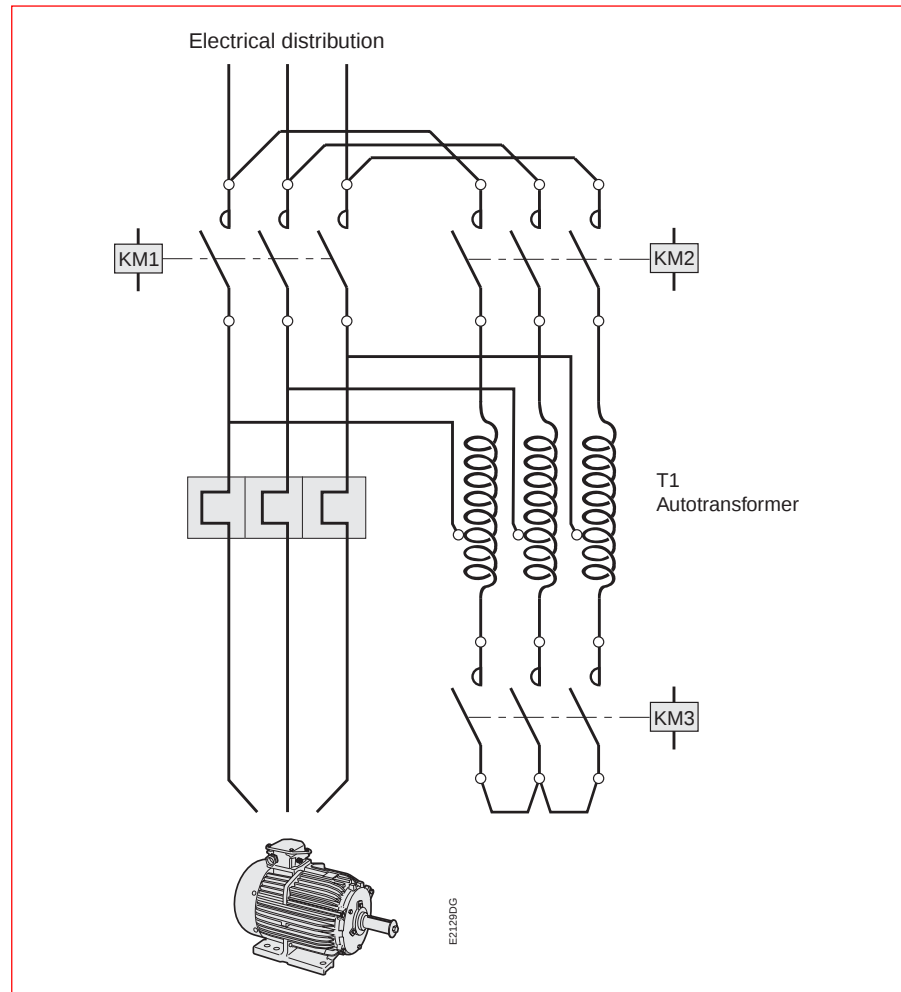
General

An autotransformer starter allows to start a squirrel cage motor with a reduced starting current due to the reduced voltage within the accelerating duration.

At the contrary of the Star-Delta wiring, this autotransformer starting method needs three wires and three terminals on the motor.

At the starting period, the motor is wired to the autotransformer taps: the Star Contactor "KM3" and the Autotransformer Contactor "KM2" are closed, the motor is under reduced voltage. Consequently, the torque is reduced as the square of the applied voltage. The autotransformers are generally equipped of three taps at each phase in order to adapt the starting parameters to the field requirements.

When the motor reaches 80 ... 95% of its nominal speed, the Star Contactor opens. Then, the Line Contactor "KM1" is making and the Autotransformer Contactor is opening. This starting process is done without any network interruption.



Selection Table (I_d starting current / I_n nominal current ≤ 8 - Acceleration time $\leq 20s$ - 30 cycles / h max.)

kW Motor ratings 50/60 Hz					Contactors					
220/240 V	380/400 V	415 V	440 V	690 V	KM1	KM2				KM3
					Line	Autotransformer taps:				Star
						90%	80%	70%	60%	
4	7.5	7.5	7.5	9	A 16	A 16	A 12	A 9	A 9	A 9
6.5	11	11	11	15	A 26	A 26	A 16	A 16	A 12	A 16
11	18.5	18.5	18.5	22	A 40	A 30	A 26	A 26	A 16	A 26
15	22	22	22	30	A 50	A 40	A 30	A 30	A 26	A 30
18.5	30	30	30	37	A 63	A 50	A 40	A 40	A 26	A 40
22	37	37	37	40	A 75	A 63	A 50	A 40	A 30	A 40
25	45	45	45	55	A 95	A 95	A 63	A 50	A 40	A 50
30	55	55	55	75	A 110	A 110	A 95	A 63	A 50	A 63
45	75	75	75	110	A 145	A 145	A 110	A 95	A 75	A 95
55	90	90	90	132	A 185	A 145	A 145	A 110	A 95	A 95
59	110	110	110	160	A 210	A 185	A 145	A 145	A 95	A 110
80	140	140	140	200	A 260	A 260	A 185	A 145	A 110	A 145
90	160	160	160	250	A 300	A 260	A 210	A 185	A 145	A 185
110	200	220	220	315	AF 400	AF 400	A 260	A 210	A 185	A 185
132	250	250	250	355	AF 460	AF 400	A 300	A 260	A 185	A 210
160	315	355	355	500	AF 580	AF 580	AF 400	A 300	A 210	A 300
220	400	425	450	600	AF 750	AF 750	AF 580	AF 400	A 300	AF 400
257	475	500	560	—	AF 1350	AF 750	AF 580	AF 460	AF 400	AF 460
315	560	600	670	—	AF 1650	AF 1350	AF 750	AF 580	AF 460	AF 580

The selection table for A 9 ... A 110 contactors can be used for the AL 9 ... AE 110 types.

The selection table for A 50 ... A 300 contactors can be used for the AF 50 ... AF 300 types.

LV/LV Three-phase Transformer Switching

Contactor Selection

AC-6a Utilization Category according to IEC 60947-4-1

General

Switching the primary of 3-phase transformers, on energization of the transformer, is characterized by high current peaks due to the magnetization phenomena. These current peaks are roughly 20 to 30 times the transformer nominal current.

Selection Table

The tables below show the operational ratings for a maximum switching frequency of 60 operating cycles per hour.

Table for 9 to 110 A ratings

a.c. operated contactors	A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110
a.c. / d.c. operated (electronic coil interface)	–	–	–	–	–	–	AF 50	AF 63	AF 75	AF 95	AF 110
d.c. operated contactors	AL 9	AL 12	AL 16	AL 26	AL 30	AL 40	AE 50	AE 63	AE 75	AE 95	AE 110

Operational power at U_e : 50/60 Hz - according to AC-6a

220/240 V	kVA	4	4	5	9.5	13	15	19	20	22	23	26
380/400 V	kVA	7	7	8	16.5	22	26	33	35	37.5	39	46
415/440 V	kVA	8	8	9	18	24	28.5	36	38	41	43	50
500 V	kVA	9.5	9.5	10.5	21.5	28	34.5	43	46	49	52	60
660/690 V	kVA	12.5	12.5	14	28.5	37	45.5	57	60.5	65	68	80
Max. permissible $\hat{I}_{peak}$	A	330	330	360	750	1000	1200	1500	1600	1700	1800	2100

Table for 145 to 1650 A ratings

a.c. operated contactors	A 145	A 185	A 210	A 260	A 300	–	–	–	–	–	–
a.c. / d.c. operated (electronic coil interface)	AF 145	AF 185	AF 210	AF 260	AF 300	AF 400	AF 460	AF 580	AF 750	AF 1350	AF 1650
d.c. operated contactors	–	–	–	–	–	–	–	–	–	–	–

Operational power at U_e : 50/60 Hz - according to AC-6a

220/240 V	kVA	35	45	50	55	60	95	100	110	130	160	190
380/400 V	kVA	60	75	90	95	100	165	170	190	240	275	350
415/440 V	kVA	65	80	100	110	115	180	190	210	270	325	390
500 V	kVA	80	100	120	130	140	220	230	250	320	–	–
660/690 V	kVA	105	130	150	170	180	290	300	310	410	–	–
Max. permissible $\hat{I}_{peak}$	kA	3.0	3.5	4.2	4.6	5.0	7.7	8.4	9.3	12.0	–	–

2

Applications

Lighting Circuit Switching

Contactor Selection

General

Contactor selection criteria for control of lighting circuits are as follows:

- type, power rating and number of lamps,
- connection mode,
- current values on closing and in steady state,
- power factor,
- presence or not of correction capacitors.

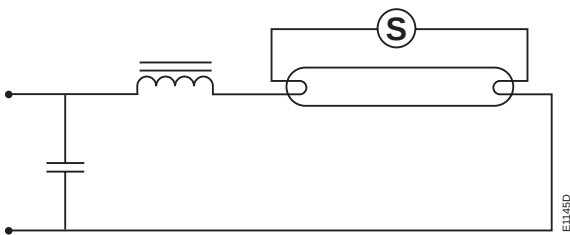
Lighting circuits

In a given circuit, the number and power rating of lamps are defined and cannot result in overload. Only short-circuit protection has to be provided. gG fuses or modular circuit-breakers will be chosen for this purpose.

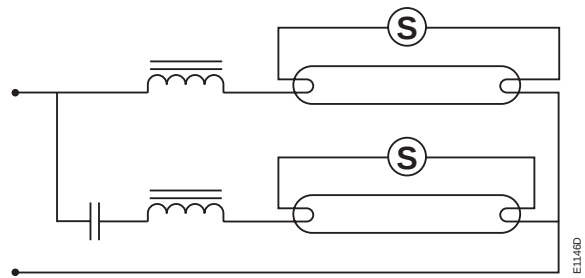
The lamps have very specific technical data, according to their construction type.

- Incandescent lamps have a very high current on closing: more than 15 times nominal current. They do not introduce a large phase displacement between current and voltage.
- Fluorescent tubes are equipped with a ballast whose purpose is two-fold: contribute to ignition and limit current to nominal value once steady state is reached. This ballast is a reactor that considerably lowers the power factor. It may or may not be compensated.

Individual compensation
(parallel compensation)



Serial compensation in dual mounting



Selection of Contactors

The following tables indicate, for each contactor type, **the maximum permissible number of lamps per phase**. Air temperature, near the contactor, must be **limited to 55 °C**.

Numbers are given for a **230 V voltage distributed between phase and neutral**: single-phase (phase + neutral) or three-phase (3 phases + neutral) distribution, lamps are wired in star connection.

In the case of a three-phase supply without neutral, 230 V phase-to-phase, the permissible number of lamps per phase will be that given in the tables multiplied by 0.58.

Example: 120 x 100W / 230V incandescent lamps - 400 V three-phase network with distributed neutral.
Calculate the number of lamps per phase: $120 : 3 = 40$. On the **100 W** line of the incandescent lamp table, contactor A12 is limited to 38 lamps per phase, you must thus **select contactor A 16 which accepts up to 42 lamps per phase**.

The selection table for A 50 ... A 110 contactors can be used for the AF 50 ... AF 110 types.

The selection table for AL 9 ... AE 110 contactors can be used for the TAL 9 ... TAE 110 types.

Contactor Selection Tool for Lighting Circuit Switching

Tool for selection of the contactors according to the lamp technologies.

Available on the ABB Website:

www.abb.com/lowvoltage

right menu: "Support"

search: "Online Product Selection Tools"

select: "Contactors: Lighting Circuit Switching"



Lighting Circuit Switching

Contactors Selection

Selection Table

a.c. operated contactors	A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110
d.c. operated contactors	AL 9	AL 12	AL 16	AL 26	AL 30	AL 40	AE 50	AE 63	AE 75	AE 95	AE 110
Lamp characteristics	Maximum permissible number of lamps per phase										
W	A	μF									

Incandescent and halogen lamps

according to AC-5b

Voltage: 220/240 V a.c.

60	0.27	—	57	65	70	103	142	155	220	246	272	355	390
100	0.45	—	34	38	42	62	85	93	132	147	163	210	240
200	0.91	—	17	19	20	30	42	46	65	73	80	105	120
300	1.37	—	11	12	13	20	28	30	43	48	53	70	80
500	2.28	—	6	7	8	12	16	18	26	29	32	42	48
1000	4.55	—	3	4	4	6	8	9	13	14	16	21	24

Fluorescent lamps without compensation - Fluorescent lamps with electronic starter

according to AC-5a

Voltage: 220/240 V a.c.

20	0.38	—	40	44	50	73	100	110	157	173	192	250	278
40	0.45	—	33	37	42	62	84	93	133	145	162	210	234
65	0.70	—	21	24	27	40	54	60	85	94	104	135	150
80	0.80	—	18	21	23	35	47	52	75	82	91	118	132
100	1.15	—	13	14	16	24	33	36	52	57	63	82	92
110	1.20	—	12	14	15	23	31	35	50	55	60	79	88

Fluorescent lamps with parallel compensation

according to AC-5a

Voltage: 220/240 V a.c.

20	0.18	5	83	94	105	155	215	233	335	360	400	530	580
40	0.26	5	58	65	75	107	150	160	230	255	280	365	400
65	0.42	7	35	40	45	66	92	100	142	158	173	225	250
80	0.52	7	28	32	36	53	74	80	115	126	140	180	200
100	0.65	16	23	26	29	43	59	64	92	101	112	145	160
110	0.70	18	21	24	27	40	55	59	85	94	104	135	150

Fluorescent lamps in dual mounting

according to AC-5a

Voltage: 220/240 V a.c.

2 x 20	2 x 0.14	—	2 x 54	2 x 62	2 x 67	2 x 99	2 x 137	2 x 148	2 x 214	2 x 236	2 x 260	2 x 336	2 x 375
2 x 40	2 x 0.25	—	2 x 30	2 x 35	2 x 38	2 x 56	2 x 77	2 x 84	2 x 120	2 x 133	2 x 147	2 x 190	2 x 208
2 x 65	2 x 0.40	—	2 x 19	2 x 21	2 x 23	2 x 35	2 x 48	2 x 52	2 x 75	2 x 83	2 x 90	2 x 120	2 x 130
2 x 80	2 x 0.48	—	2 x 16	2 x 18	2 x 19	2 x 29	2 x 40	2 x 43	2 x 62	2 x 68	2 x 76	2 x 100	2 x 110
2 x 100	2 x 0.60	—	2 x 12	2 x 14	2 x 15	2 x 22	2 x 32	2 x 34	2 x 49	2 x 55	2 x 60	2 x 80	2 x 88
2 x 110	2 x 0.65	—	2 x 11	2 x 13	2 x 14	2 x 21	2 x 29	2 x 32	2 x 46	2 x 51	2 x 56	2 x 73	2 x 82

Compact fluorescent lamps

according to AC-5a

Voltage: 220/240 V a.c.

5	0.045	—	342	388	422	622	855	930	1330	1470	1630	2100	2350
7	0.075	—	205	233	252	372	512	558	798	886	978	1250	1400
11	0.105	—	146	166	180	266	366	398	570	632	700	900	1000
15	0.135	—	114	128	140	205	285	310	440	490	540	700	780
20	0.160	—	96	109	118	175	240	262	375	415	458	590	650
23	0.180	—	85	96	105	155	212	230	330	368	408	525	580

Lighting Circuit Switching

Contactor Selection

Selection Table

a.c. operated contactors	A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110
d.c. operated contactors	AL 9	AL 12	AL 16	AL 26	AL 30	AL 40	AE 50	AE 63	AE 75	AE 95	AE110
Lamp characteristics	Maximum permissible number of lamps per phase										
W	A	μF									

Low pressure sodium vapour lamps without compensation

Voltage: 220/240 V a.c.

35	1.4	—	10	11	12	17	23	26	36	41	45	58	63
55	1.4	—	10	11	12	17	23	26	36	41	45	58	63
90	2.1	—	6	7	8	11	16	17	24	27	30	39	42
135	3.1	—	4	5	5	8	11	12	16	18	20	26	28
180	3.1	—	4	5	5	8	11	12	16	18	20	26	28

Low pressure sodium vapour lamps with parallel compensation

Voltage: 220/240 V a.c.

35	0.6	20	21	23	25	38	46	50	83	96	104	135	147
55	0.6	20	21	23	25	38	46	50	83	96	104	135	147
90	0.9	25	14	15	17	25	31	33	56	64	69	90	98
135	0.9	45	14	15	17	25	31	33	56	64	69	90	98
180	0.9	45	14	15	17	25	31	33	56	64	69	90	98

High pressure sodium vapour lamps without compensation

Voltage: 220/240 V a.c.

150	1.8	—	6	7	8	11	15	17	23	26	29	38	41
250	3	—	4	4	5	7	9	10	14	16	17	23	25
400	4.4	—	3	3	3	4	6	7	9	10	12	15	17
600	6.2	—	1	2	2	3	4	5	7	8	8	11	12
1000	10.3	—	—	1	1	2	3	3	4	5	5	6	7

High pressure sodium vapour lamps with parallel compensation

Voltage: 220/240 V a.c.

150	1	20	13	14	15	23	28	30	50	58	63	81	88
250	1.5	36	8	9	10	15	18	20	33	38	42	54	59
400	2.5	48	5	5	6	9	11	12	20	23	25	32	36
600	3.3	65	4	4	5	7	8	9	15	17	19	24	27
1000	6.2	100	—	—	—	4	4	5	8	9	10	13	14

High pressure mercury vapour lamps without compensation

Voltage: 220/240 V a.c.

50	0.60	—	18	20	22	33	46	50	70	79	100	125	135
80	0.80	—	14	16	17	25	34	37	53	59	75	95	100
125	1.15	—	10	11	12	17	24	26	37	41	52	65	70
250	2.15	—	5	6	6	9	13	14	20	22	28	35	35
400	3.25	—	3	4	4	6	8	9	13	15	19	23	25
700	5.40	—	2	2	2	4	5	5	8	9	11	14	15
1000	7.50	—	1	1	2	3	4	4	6	6	8	10	11

Voltage: 380/415 V a.c.

2000	8	—	1	1	1	2	3	4	5	6	7	9	10
------	---	---	---	---	---	---	---	---	---	---	---	---	----

High pressure mercury vapour lamps with compensation

Voltage: 220/240 V a.c.

50	0.28	7	39	44	48	71	98	107	150	169	214	270	290
80	0.43	8	25	29	31	46	64	70	99	110	139	170	185
125	0.66	10	16	19	20	30	42	45	64	72	90	110	120
250	1.28	18	8	10	10	16	21	23	33	37	47	57	60
400	2.05	25	5	6	7	10	13	15	21	23	29	34	38
700	3.55	40	3	3	4	6	8	8	12	13	17	20	23
1000	4.83	60	2	2	3	4	6	6	9	10	12	14	16

Voltage: 380/415 V a.c.

2000	5.45	35	2	2	2	3	5	5	8	9	11	13	15
------	------	----	---	---	---	---	---	---	---	---	----	----	----

Lighting Circuit Switching

Contactors Selection

Selection Table

a.c. operated contactors	A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110
d.c. operated contactors	AL 9	AL 12	AL 16	AL 26	AL 30	AL 40	AE 50	AE 63	AE 75	AE 95	AE110
Lamp characteristics	Maximum permissible number of lamps per phase										
W	A	μF									

Metal iodine vapour lamps without compensation

Voltage: 220/240 V a.c.

250	3	—	4	4	5	7	10	11	15	17	19	25	27
400	4	—	3	3	4	5	7	8	11	13	14	18	20
1000	9.5	—	1	1	1	2	3	3	5	5	6	8	8
2000	16.5	—	—	—	1	1	2	2	3	3	3	5	5

Voltage: 380/415 V a.c.

2000	10.5	—	1	1	1	2	3	3	4	5	6	7	8
------	------	---	---	---	---	---	---	---	---	---	---	---	---

Metal iodine vapour lamps with compensation

Voltage: 220/240 V a.c.

250	1.32	33	9	10	11	16	23	25	35	39	44	56	60
400	2.22	45	5	6	7	10	13	15	21	23	26	33	36
1000	5.14	85	2	3	3	4	6	6	9	10	11	14	15
2000	11.5	148	1	1	1	2	2	3	4	4	5	6	7

Voltage: 380/415 V a.c.

2000	6.1	60	2	2	2	3	5	5	7	8	9	12	13
------	-----	----	---	---	---	---	---	---	---	---	---	----	----

2

Applications

d.c. Circuit Switching

Contactor Selection

General

The arc switching on d.c. is more difficult than on a.c.

- 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).

Selection Table - After selection from the ratings quoted in the tables below, please refer to "Ordering Details".

a.c. operated contactors	A 9	A 12	A 16	A 26	A 30	A 40	A 45	A 50	A 63	A 75	GA 75
a.c. / d.c. operated (electronic coil interface)	–	–	–	–	–	–	AF 45	AF 50	AF 63	AF 75	–
d.c. operated contactors	AL 9	AL 12	AL 16	AL 26	AL 30	AL 40	AE 45	AE 50	AE 63	AE 75	GAE 75

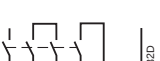
Utilization category DC-1, $L/R \leq 1$ ms

	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	120
	110 V	A	10	15	20	–	–	–	–	–	–	–	120
	220 V	A	–	–	–	–	–	–	–	–	–	–	120
	440 V	A	–	–	–	–	–	–	–	–	–	–	100
	600 V	A	–	–	–	–	–	–	–	–	–	–	75
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	25	27	30	45	55	60	70	100	110	120	–
	220 V	A	10	15	20	–	–	–	–	–	–	–	–
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	25	27	30	45	55	60	70	100	110	120	–
	220 V	A	25	27	30	45	55	60	70	100	110	120	–
	≤ 72 V	A	25	27	30	45	–	–	70	100	–	120	–
	110 V	A	25	27	30	45	–	–	70	100	–	120	–
	220 V	A	25	27	30	45	–	–	70	100	–	120	–
	440 V	A	10	15	20	–	–	–	–	–	–	–	–

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

	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	120
	110 V	A	6	7	8	–	–	–	–	–	–	–	120
	220 V	A	–	–	–	–	–	–	–	–	–	–	100
	440 V	A	–	–	–	–	–	–	–	–	–	–	85
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	25	27	30	45	55	60	70	100	110	120	–
	220 V	A	6	7	8	–	–	–	–	–	–	–	–
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	25	27	30	45	55	60	70	100	110	120	–
	220 V	A	25	27	30	45	55	60	70	100	110	120	–
	≤ 72 V	A	25	27	30	45	–	–	70	100	–	120	–
	110 V	A	25	27	30	45	–	–	70	100	–	120	–
	220 V	A	25	27	30	45	–	–	70	100	–	120	–
	440 V	A	6	7	8	–	–	–	–	–	–	–	–

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

	≤ 72 V	A	9	12	16	25	30	40	50	50	63	75	85
	110 V	A	4	4	4	–	–	–	–	–	–	–	85
	220 V	A	–	–	–	–	–	–	–	–	–	–	85
	440 V	A	–	–	–	–	–	–	–	–	–	–	35
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	10	15	20	30	45	50	70	80	90	100	–
	220 V	A	4	4	4	–	–	–	–	–	–	–	–
	≤ 72 V	A	25	27	30	45	55	60	70	100	110	120	–
	110 V	A	25	27	30	45	55	60	70	100	110	120	–
	220 V	A	9	12	16	25	30	40	50	50	63	75	–
	≤ 72 V	A	25	27	30	45	–	–	70	100	–	120	–
	110 V	A	25	27	30	45	–	–	70	100	–	120	–
	220 V	A	10	15	20	30	–	–	70	70	–	100	–
	440 V	A	4	4	4	–	–	–	–	–	–	–	–

d.c. Circuit Switching

Contactor Selection

The selection table for AL 9 ... AE 110 contactors can be used for the TAL 9 ... TAE 110 types.

a.c. operated contactors	A 95	A 110	A 145	A 185	A 210	A 260	A 300	–	–	–	–
a.c. / d.c. operated (electronic coil interface)	AF 95	AF 110	AF 145	AF 185	AF 210	AF 260	AF 300	AF 400	AF 460	AF 580	AF 750
d.c. operated contactors	AE 95	AE 110	–	–	–	–	–	–	–	–	–

Utilization category DC-1, L/R ≤ 1 ms

 ≤ 110 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	145	160	250	275	350	400	450	600	700	800	1050
440 V A	–	–	–	–	–	–	–	600	700	800	1050
600 V A	–	–	–	–	–	–	–	600	700	800	1050

Utilization category DC-3, L/R ≤ 2.5 ms

 ≤ 110 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	145	160	250	275	350	400	450	600	700	800	1050
440 V A	–	–	–	–	–	–	–	600	700	800	1050
600 V A	–	–	–	–	–	–	–	600	700	800	1050

Utilization category DC-5, L/R ≤ 15 ms

 ≤ 110 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	–	–	–	–	–	–	–	600	700	800	1050
 ≤ 110 V A	145	160	250	275	350	400	450	600	700	800	1050
220 V A	145	160	250	275	350	400	450	600	700	800	1050
440 V A	–	–	–	–	–	–	–	600	700	800	1050
600 V A	–	–	–	–	–	–	–	600	700	800	1050

Technical Data

- The tables indicate for the standard contactors the I_o 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_o and the pole coupling details.
Ampere values quoted in these tables are valid for a -25 ... +70 °C temperature close to the contactors, as long as the **AC-1 Ampere values** for the corresponding ambient temperature **are not exceeded**.
- Max. switching frequency: 300 cycles/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).

>> AC-1 Ampere values pages 2/64, 2/65

>> Accessories section 4

>> Utilization Categories section 7

d.c. Circuit Switching

EK... Contactor Selection

General

The arc switching on d.c. is more difficult than on a.c.

- 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 ≤ 1 ms), inductive loads such as shunt motors (L/R ≤ 2 ms) or series motors (L/R ≤ 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_n 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_n and the pole coupling details.
Ampere values quoted in the tables below are valid for a -25 ... +70 °C temperature close to the contactors, as long as the **AC-1 Ampere values** for the corresponding ambient temperature **are not exceeded**.
- Max. switching frequency: 300 cycles/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).

Selection Table - After selection from the ratings quoted in the tables below, please refer to "Ordering Details".

a.c. / d.c. operated contactors	EK 110	EK 150	EK 175	EK 210	EK 370	EK 550	EK 1000
---------------------------------	--------	--------	--------	--------	--------	--------	---------

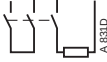
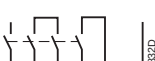
Utilization category DC-1, L/R ≤ 1 ms

	≤ 72 V	A	120	145	210	210	370	550	—
	110 V	A	120	145	210	210	370	550	—
	≤ 72 V	A	200	200	300	300	550	800	—
	110 V	A	200	200	300	300	550	800	—
	220 V	A	200	200	300	300	550	800	—
	≤ 72 V	A	200	200	300	300	550	800	—
	110 V	A	200	200	300	300	550	800	—
	220 V	A	200	200	300	300	550	800	—
	440 V	A	—	—	210	210	450	650	—
	600 V	A	—	—	—	—	450	650	—
	≤ 72 V	A	200	200	300	300	550	800	—
	110 V	A	200	200	300	300	550	800	—
	220 V	A	200	200	300	300	550	800	—
	440 V	A	200	200	260	300	450	650	—
	600 V	A	—	—	260	300	450	650	—

Utilization category DC-3, L/R ≤ 2 ms

	≤ 72 V	A	120	145	210	210	370	550	—
	110 V	A	135	145	210	210	450	650	—
	≤ 72 V	A	135	135	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	≤ 72 V	A	135	145	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	440 V	A	—	—	210	210	450	650	—
	600 V	A	—	—	—	—	450	650	—
	≤ 72 V	A	135	145	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	440 V	A	135	135	210	210	450	650	—
	600 V	A	—	—	170	210	450	650	—

Utilization category DC-5, L/R ≤ 7.5 ms

	≤ 72 V	A	135	145	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	≤ 72 V	A	135	145	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	440 V	A	—	—	210	210	450	650	—
	600 V	A	—	—	—	—	450	650	—
	≤ 72 V	A	135	145	210	210	450	650	—
	110 V	A	135	135	210	210	450	650	—
	220 V	A	135	135	210	210	450	650	—
	440 V	A	135	135	210	210	450	650	—
	600 V	A	—	—	170	210	450	650	—

Auxiliary Contacts for Safety Circuits

3-pole Contactors

Mechanically Linked Contact Elements for Contactors

(known as "forced contacts", "positively activated contacts" or "linked contacts").

Definitions from standards: mechanically linked contact elements  according to IEC 60947-5-1, Annex L 3.0.

Combination of "n" Make auxiliary contact element(s) and "m" Break auxiliary contact element(s) are designed in such a way that they cannot be in the closed position simultaneously.

One control circuit device may have more than one group of mechanically linked contact elements.

The table below gives the contactors that offer mechanically linked auxiliary contacts according to IEC 60947-5-1, Annex L.

Mirror Contacts

Definitions from standards: mirror contact  according to IEC 60947-4-1, Annex F 2.1.

Normally closed **auxiliary contact** (N.C.) which cannot be in the closed position simultaneously with the normally open (N.O.) **main contact**.

The table below indicates the contactors that offer a built-in auxiliary mirror contact.

The **CA 5-13, CA 5-22, CA 5-31, CA 5-04** and **CA 5-01** (respectively 4-pole and 1-pole auxiliary contact blocks) and the **CAL 5-11** (2-pole auxiliary contact block) when fitted on **A 9 ... A 75, AF 45 ... AF 75** or **AL 9 ... AL 40** contactors **have their own N.C. auxiliary mirror contacts**.

The **CAL 18-11** 2-pole auxiliary contact blocks when fitted on **A 95 ... A 300** and **AF 95 ... AF 750** contactors **have their own N.C. auxiliary mirror contacts**.

For **AF 1350, AF 1650** use 2 N.C. auxiliary contacts in series for mirror contact, one **CAL 18-11** on each side of the contactor.

3-pole A... and AL... contactors

+ one CA 5-... 4-pole add-on auxiliary contact block

Contactors	Built-in auxiliary contacts	Add-on auxiliary contact blocks		
		+ CA 5-22...	or CA 5-31...	or CA 5-40...
				
A/AL 9-30-10	1 –	2 2	3 1	
A/AL 9-30-01	– 1	2 2	3 1	4 –
A/AL 12-30-10	1 –	2 2	3 1	
A/AL 12-30-01	– 1	2 2	3 1	4 –
A/AL 16-30-10	1 –	2 2	3 1	
A/AL 16-30-01	– 1	2 2	3 1	4 –
A/AL 26-30-10	1 –	2 2	3 1	
A/AL 26-30-01	– 1	2 2	3 1	4 –
A/AL 30-30-10	1 –	2 2	3 1	
A/AL 30-30-01	– 1	2 2	3 1	4 –
A/AL 40-30-10	1 –	2 2	3 1	
A/AL 40-30-01	– 1	2 2	3 1	4 –

The information provided for **AL** contactors can also be used for **AL...Z...** and **TAL...** contactors.

For each contactor type, see "Accessory Fitting Details".

Direct Opening Action of N.C. Built-in Auxiliary Contacts

Annex K2.1 of IEC 60947-5-1 defines a control switch with direct opening action: "the full contact opening of the break contact element(s) is obtained when the actuator is moved through the direct opening travel by applying the force stated by the manufacturer".

The N.C. built-in auxiliary contacts of contactors **ARE NOT CONCERNED** by the annex K.

Nevertheless, N.C. auxiliary contacts are designed to have "direct opening action" and are suitable for uses such as lifts / elevators (acc. to EN 81-1).

A... and AF... Contactors

AL..., TAL... and AE..., TAE... Contactors

Technical Data

Main Pole - Utilization Characteristics acc. to IEC

Contactor types: A...		9	12	16	26	30	40	45	50	63	75	95	110		
AL..., TAL...		9	12	16	26	30	40	-	-	-	-	-	-		
AE..., TAE..., AF...		-	-	-	-	-	-	45	50	63	75	95	110		
Rated operational voltage U _e max. V		690						1000 (690 for AF... contactors)				1000			
Rated frequency limits Hz		25 ... 400													
Conventional free-air thermal current I _{th} acc. to IEC 60947-4-1, open contactors, θ ≤ 40 °C		26	28	30	45	65	65	100	100	125	125	145	160		
with conductor cross-sectional area mm ²		4	4	4	6	16	16	35	35	50	50	50	70		
Rated operational current I _e / AC-1 for air temperature close to contactor		25	27	30	45	55	60	70	100	115	125	145	160		
U _e max. 690 V - 50/60 Hz		22	25	27	40	55	60	60	85	95	105	135	145		
with conductor cross-sectional area mm ²		18	20	23	32	39	42	50	70	80	85	115	130		
		2.5	4	4	6	10	16	25	35	50	50	50	70		
Utilization category AC-3 for air temperature close to contactor ≤ 55 °C															
Max. rated operational current I _e AC-3 (1)		9	12	17	26	33	40	40	53	65	75	96	110		
	220-230-240 V	A	9	12	17	26	33	40	53	65	75	96	110		
	380-400 V	A	9	12	17	26	32	37	50	65	75	96	110		
	415 V	A	9	12	17	26	32	37	50	65	75	96	110		
	440 V	A	9	12	16	26	32	37	45	65	70	93	100		
	500 V	A	9	12	14	22	28	33	45	55	65	80	100		
	690 V	A	7	9	10	17 (4)	21 (4)	25 (4)	35	43	46	65	82		
1000 V		A	-	-	-	-	-	-	23 (6)	25 (6)	28 (6)	30	30		
Rated operational power AC-3 (1)		220-230-240 V	kW	2.2	3	4	6.5	9	11	11	15	18.5	22	25	30
	380-400 V	kW	4	5.5	7.5	11	15	18.5	18.5	22	30	37	45	55	
	415 V	kW	4	5.5	9	11	15	18.5	18.5	25	37	40	55	59	
	440 V	kW	4	5.5	9	15	18.5	22	22	25	37	40	55	59	
	500 V	kW	5.5	7.5	9	15	18.5	22	22	30	37	45	55	59	
	690 V	kW	5.5	7.5	9	15 (4)	18.5 (4)	22 (4)	22	30	37	40	55	75	
	1000 V	kW	-	-	-	-	-	-	-	30 (6)	33 (6)	37 (6)	40	40	
Rated operational current I _e / AC-8a without thermal O/L relay - U _e 400 V - θ ≤ 40 °C		A	12	16	22	30	40	50	-	63	85	95	120	140	
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 for contactors without thermal O/L relay - Motor protection excluded (2) U _e ≤ 500 V a.c. - gG type fuse		A	25	32	32	50	63	80	100	125	160	160	200		
Rated short-time withstand current I _{cw} at 40 °C ambient temp., 1 s		A	250	280	300	400	600	1000				1320	1320		
in free air, 10 s		A	100	120	140	210	400	650				800	800		
from a cold state, 30 s		A	60	70	80	110	225	370				500	500		
1 min		A	50	55	60	90	150	250				350	350		
15 min		A	26	28	30	45	65	110	110	135	135	160	175		
Maximum breaking capacity (5) cos φ = 0.45 at 440 V		A	250			420	820 (5)	900	1300			1160			
(cos φ = 0.35 for I _e > 100 A) at 690 V		A	90 (5)			170 (5)	340 (5)	490	630			800			
Heat dissipation per pole I _e / AC-1		W	0.8	1	1.2	1.8	2.5	2.5	5	6.5	7	6.5	7.5		
I _e / AC-3		W	0.1	0.2	0.35	0.6	0.9	0.65	1.3	1.5	2	2.7	3.6		
Max. electrical switching frequency															
- for AC-1		cycles/h	600					600 (300 for AF..., AE... TAE...)				300			
- for AC-3		cycles/h	1200					600 (300 for AF..., AE... TAE...)				300			
- for AC-2, AC-4		cycles/h	300					150				150			
Mechanical durability															
- millions of operating cycles								10 (5 for AE... and TAE... contactors)							
- max. switching frequency		cycles/h						3600 (300 for AF... contactors)							

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 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".

(3) Unauthorized for TAL..., TAE... contactors.

(6) AF... contactors excluded.

(4) AC-3, 690 V values for AL... and TAL... contactors

Types	AL 26 TAL 26	AL 30 TAL 30	AL 40 TAL 40
Rated current I _e A	13	18	21
Rated power kW	11	15	18.5

(5) Max. breaking capacity for AL... and TAL... contactors

Types	AL 9 ... TAL 9 ...	AL 16 TAL 16	AL 26 TAL 26	AL 30, AL 40 TAL 30, TAL 40
440 V A	250		420	470
690 V A	100		106	175

>> Electrical Durability Curves page 2/81

>> Motor Rated Powers and Currents page 0/0

>> Coordination with SCPD section 7

A... and AF... Contactors

Technical Data

Main Pole - Utilization Characteristics acc. to IEC

Contactor types: A...		145	185	210	260	300	–	–	–	–	–	
AF...		145	185	210	260	300	400	460	580	750	1350 1650	
Rated operational voltage U _e max. V		1000		690		1000						
Rated frequency limits Hz		25 ... 400										
Conventional free-air thermal current I _{th}												
acc. to IEC 60947-4-1, open contactors, θ ≤ 40 °C		A		A		A		A		A		
with conductor cross-sectional area (3)		mm ²		mm ²		mm ²		mm ²		mm ²		
Rated operational current I _e / AC-1												
for air temperature close to contactor												
U _e max. 690 V - 50/60 Hz	θ ≤ 40 °C	A	250	275	350	400	500 ⁽⁵⁾	600	700	800	1050	1350 1650
	θ ≤ 55 °C	A	230	250	300	350	400	500	600	700	875	1150 1450
	θ ≤ 70 °C	A	180	180	240	290	325	400	480	580	720	1000 1270
U _e max. 1000 V - 50/60 Hz	θ ≤ 40 °C	A	180	200	–	–	–	600	700	800	1000	1350 1650
	θ ≤ 55 °C	A	180	200	–	–	–	500	600	700	875	1150 1450
	θ ≤ 70 °C	A	180	180	–	–	–	400	480	580	720	1000 1270
with conductor cross-sectional area		mm ²		mm ²		mm ²		mm ²		mm ²		
Utilization category AC-3												
for air temperature close to contactor ≤ 55 °C												
Max. rated operational current I _e AC-3 ⁽¹⁾												
220-230-240 V		A	145	185	210	260	305	400	460	580	750	860 1050
3-phase motors	380-400 V	A	145	185	210	260	305	400	460	580	750	860 1050
	415 V	A	145	185	210	260	300	400	460	580	750	860 1050
	440 V	A	145	185	210	240	280	400	460	580	750	860 1050
	500 V	A	145	170	210	240	280	400	460	580	750	800 950
	690 V	A	120	170	210	220	280	350	400	500	650	800 950
	1000 V	A	80	95	–	–	–	155	200	250	300	– –
Rated operational power AC-3 ⁽¹⁾												
220-230-240 V		kW	45	55	59	80	90	110	132	160	220	257 315
1500 r.p.m. 50 Hz 1800 r.p.m. 60 Hz 3-phase motors	380-400 V	kW	75	90	110	140	160	200	250	315	400	475 560
	415 V	kW	75	90	110	140	160	220	250	355	425	500 600
	440 V	kW	75	90	110	140	160	220	250	355	450	560 670
	500 V	kW	90	110	132	180	200	250	315	400	520	560 700
	690 V	kW	110	132	160	200	250	315	355	500	600	750 900
	1000 V	kW	110	132	–	–	–	220	280	355	400	– –
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 for contactors without thermal O/L relay - Motor protection excluded (2)										Please consult us for coordination with circuit-breaker		
U _e ≤ 500 V a.c. - gG type fuse		A	315	355	400	500	630	800	1000			
Rated short-time withstand current I _{cw}												
at 40 °C ambient temp., 1 s		A	1800	2000	2500	3500	4600	7000	10000	12000		
in free air, 10 s		A	1200	1500	1700	2400	4400	6400	8000	10000		
from a cold state, 30 s		A	800	1000	1200	1500	3100	4500	6000	7500		
1 min		A	600	800	1000	1100	2500	3500	4500	5500		
15 min		A	280	320	400	500	840	1300	1600	2200		
Maximum breaking capacity												
cos φ = 0.45 at 440 V		A	1500	2000	2300	2600	3000	4000	5000	6000	7500	10000 12000
(cos φ = 0.35 for I _e > 100 A) at 690 V		A	1200	1600	2000	2400	2500	3500	4500	5000	7000	– –
Heat dissipation per pole I _e / AC-1		W	13	16	18	25	32	30	42	32	50	80
I _e / AC-3		W	5	8	9	14	18	16	21	17	28	50
Max. electrical switching frequency												
– for AC-1		cycles/h	300		300		300		300		60	
– for AC-3		cycles/h	300		300		300		300		60	
– for AC-2, AC-4		cycles/h	150		150		60		60		60	
Mechanical durability												
– millions of operating cycles			5				3				0.5	
– max. switching frequency		cycles/h	3600 (300 for AF... contactors)				300				60	

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 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".

(3) Conductors with preparation.

(4) Dimensions of the bars (in mm).

(5) For currents above 450 A use 300 mm² and terminal extension / enlargement pieces (LX 300 / LW 300: see "Accessories").

A... and AF... Contactors

AL..., TAL... and AE..., TAE... Contactors

Technical Data

Main Pole - Utilization Characteristics acc. to UL/CSA

Contactor types: A...			9	12	16	26	30	40	45	50	63	75	95	110
AL..., TAL...			9	12	16	26	30	40	–	–	–	–	–	–
AE..., TAE..., AF...			–	–	–	–	–	–	45	50	63	75	95	110
NEMA size			00	0	–	1	1P	–	2	2	–	3	–	–
General use rating														
Amp-rating	600 V	A	21	25	30	40	50	60	80	80	90	105	125	140
3-phase motor rating														
Amp-rating (1)														
	200-208 V	A	7.8	11	17.5	25.3	32.2	32.2	48.3	48.3	62.1	78.2	92	92
	220-240 V	A	6.8	9.6	15.2	28	28	42	54	54	68	80	80	104
	440-480 V	A	7.6	11	14	27	34	40	52	52	77	77	77	96
	550-600 V	A	9	11	17	27	32	41	52	52	77	77	77	99
Motor power (1)														
	200-208 V	hp	2	3	5	7.5	10	10	15	15	20	25	30	30
	220-240 V	hp	2	3	5	10	10	15	20	20	25	30	30	40
	440-480 V	hp	5	7.5	10	20	25	30	40	40	60	60	60	75
	550-600 V	hp	7.5	10	15	25	30	40	50	50	75	75	75	100
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded														
Fuse rating	A		35	35	60	90	150	150	175	175	200	200	200	200
Fuse type, 600 V			FRS-R						J					
Max. electrical switching frequency														
– for general use	cycles/h		600						600 (300 for AF..., AE...)					
– for motor use	cycles/h		1200						600 (300 for AF..., AE...)					

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 3-phase motors, see "Motor Rated Operational Powers and Currents".

General Technical Data

Contactor types: A...		9	12	16	26	30	40	45	50	63	75	95	110
		9	12	16	26	30	40	–	–	–	–	–	–
		–	–	–	–	–	–	45	50	63	75	95	110
Rated insulation voltage U _i													
according to IEC 60947-4-1	V	1000											
according to UL/CSA	V	600											
Rated impulse withstand voltage U _{imp}		8											
Standards		Devices complying with IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1											
Air temperature close to contactor		see "Conditions for use", for control voltage limits and authorized mounting positions											
– fitted with thermal O/L relay	°C	-25 to +55											
– without thermal O/L relay	°C	-40 to +70 ⁽¹⁾											
– for storage	°C	-60 to +80										-40 to +70	
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II										acc. to IEC 68-2-30	
Operating altitude		m	≤ 3000										

1/2 sinusoidal shock for 11 ms: no change in contact position														
A 9 ... A 40 contactors			AL 9 ... AL 40 contactors				A 45 ... A 110 and AF 45 ... AF 110 contactors							
			TAL 9 ... TAL 40 contactors				AE 45 ... AE 110 and TAE 45 ... TAE 110 contactors							
			Closed position	Open position	Closed position	Open position	Closed position	Open position	Closed position	Open position	Closed position	Open position	Note : for A 95, AE 95, TAE 95, AF 95 A 110, AE110, TAE110, AF 110 contactors, these values are not valid for rail mounting.	
			20 g	20 g	20 g	10 g	20 g	20 g	20 g	20 g	20 g	20 g		
			10 g	5 g	15 g	5 g	10 g	5 g (2)	10 g	5 g (2)	10 g	5 g (2)		
			15 g	15 g	10 g	10 g	15 g (3)	15 g (3)	15 g (3)	15 g (3)	15 g (3)	15 g (3)		
			20 g	20 g	20 g	8 g	20 g	20 g	20 g	20 g	20 g	20 g		
			20 g	20 g	14 g	8 g	20 g	20 g	20 g	20 g	20 g	20 g		

(1) 55 °C max. for TAL... and TAE... contactors

(2) 3 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22

(3) 10 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22

A... and AF... Contactors

Technical Data

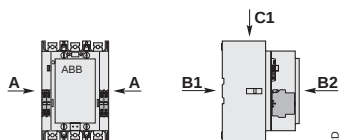
Main Pole - Utilization Characteristics acc. to UL/CSA

Contactor types: A...			145	185	210	260	300	–	–	–	–	–	–								
AF...			145	185	210	260	300	400	460	580	750	1350	1650								
NEMA size			4	–	–	5	–	–	6	–	7	–	8								
General use rating																					
Amp-rating	600 V	A	230	250	300	350	400	550	650	750	900	1350	1650								
3-phase motor rating																					
Amp-rating ⁽¹⁾																					
	200-208 V	A	119.6	149.5	166.8	220.8	285.2	358.8	414	552	692.3	954	1030								
	220-240 V	A	130	145	192	248	248	360	480	604	722	954	1030								
	440-480 V	A	124	156	180	240	302	414	477	590	722	954	1030								
	550-600 V	A	125	144	192	242	289	382	472	578	672	944	1050								
Motor power ⁽¹⁾																					
	200-208 V	hp	40	50	60	75	100	125	150	200	250	–	–								
	220-240 V	hp	50	60	75	100	100	150	200	250	300	400	450								
	440-480 V	hp	100	125	150	200	250	350	400	500	600	800	900								
	550-600 V	hp	125	150	200	250	300	400	500	600	700	1000	1150								
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded																					
Fuse rating		A	300	400	800				1000	1200											
Fuse type, 600 V			J/K5						L			Please consult us for coordination with circuit-breaker									
Max. electrical switching frequency																					
– for general use		cycles/h	300																		
– for motor use		cycles/h	300																		

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 3-phase motors, see "Motor Rated Operational Powers and Currents".

General Technical Data

Contactor types: A...			145	185	210	260	300	–	–	–	–	–	–
AF...			145	185	210	260	300	400	460	580	750	1350	1650
Rated insulation voltage U _i according to IEC 60947-4-1			1000										
according to UL/CSA			600										
Rated impulse withstand voltage U _{imp}			8										
Standards			Devices complying with IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1										
Air temperature close to contactor			see "Conditions for use", for control voltage limits and authorized mounting positions										
– fitted with thermal O/L relay		°C	-25 to +55										
– fitted with electronic O/L relay		°C	-25 to +70										
– without O/L relay		°C	-40 to +70										
– for storage		°C	-40 to +70										
Climatic withstand			acc. to IEC 60068-2-30										
Operating altitude			≤ 3000										
Shock withstand													
acc. IEC 60068-2-27 and EN 60068-2-27			1/2 sinusoidal shock for 30 ms: no change in contact position										
Mounting position 1			5 g in all directions (A, B1, B2, C1, C2)										



A... and AF... Contactors

Technical Data

Magnet System Characteristics for A... Contactors

Contactor types: A...			9	12	16	26	30	40	45	50	63	75	95	110	
Rated control circuit voltage U_c															
– at 50 Hz	V		24 ... 690												
– at 60 Hz	V		24 ... 690												
Coil operating limits acc. to IEC 60947-4-1			0.85 ... 1.1 x U _c (at θ ≤ 55 °C)											0.85 ... 1.1 x U _c (at θ ≤ 70 °C)	
			Please also refer to "Conditions for Use"												
Drop-out voltage in % of U _c			approx. 40 ... 65 %												
Coil consumption															
Average pull-in value	50 Hz	VA	70			120			180			350			
	60 Hz	VA	80			140			210			450			
	50/60 Hz ⁽¹⁾	VA/VA	74/70			125/120			190/180			410/365			
Average holding value	50 Hz	VA/W	8/2			12/3			18/5.5			22/6.5			
	60 Hz	VA/W	8/2			12/3			18/5.5			26/8			
	50/60 Hz ⁽¹⁾	VA/W	8/2			12/3			18/5.5			27/7.5			
Operating time															
between coil energization and:															
– N.O. contact closing	ms		10 ... 26			8 ... 21			8 ... 27			10 ... 25			
– N.C. contact opening	ms		7 ... 21			6 ... 18			7 ... 22			7 ... 22			
between coil de-energization and:															
– N.O. contact opening	ms		4 ... 11			4 ... 11			4 ... 11			7 ... 15			
– N.C. contact closing	ms		9 ... 16			7 ... 14			7 ... 14			10 ... 18			

(1) 50/60 Hz coils: see "Coil Voltage Code Table".

Magnet System Characteristics for AF... Contactors

Contactor types: AF...			–	–	–	–	–	–	45	50	63	75	95	110
Rated control circuit voltage U_c														
– at 50 Hz		V							48 ... 250				48 ... 250	
– at 60 Hz		V							48 ... 250				48 ... 250	
– d.c.		V							20 ... 250				20 ... 250	
Coil operating limits acc. to IEC 60947-4-1									0.85 x U _c min. ... 1.1 x U _c max. (at θ ≤ 70 °C)					
									Please also refer to "Conditions for Use"					
Drop-out voltage in % of U _c min.									55 %					
Coil consumption														
Average pull-in value	50 Hz	VA							210				350	
	60 Hz	VA							210				350	
	d.c.	W							190				400	
Average holding value	50 Hz	VA/W							7/2.8				7/3.5	
	60 Hz	VA/W							7/2.8				7/3.5	
	d.c.	W							2.8				2	
Operating time														
between coil energization and:														
– N.O. contact closing		ms							30 ... 100				30 ... 80	
– N.C. contact opening		ms							27 ... 95				27 ... 77	
between coil de-energization and:														
– N.O. contact opening		ms							30 ... 110				55 ... 125	
– N.C. contact closing		ms							35 ... 115				60 ... 130	

A... and AF... Contactors

Technical Data

2

Technical Data

Magnet System Characteristics for A... Contactors

Contactor types: A...	145	185	210	260	300	-	-	-	-
Rated control circuit voltage U_c									
– at 50 Hz V	24 ... 690								
– at 60 Hz V	24 ... 690								
Coil operating limits acc. to IEC 60947-4-1	0.85 ... $1.1 \times U_c$ (at $\theta \leq 70^\circ\text{C}$) Please also refer to "Conditions for Use"								
Drop-out voltage in % of U_c	approx. 40 ... 65 %								
Coil consumption									
Average pull-in value 50 Hz VA	550		1350						
60 Hz VA	600		1550						
50/60 Hz (1) VA/VA	700/650		1700/1550						
Average holding value 50 Hz VA/W	35/11		60/16						
60 Hz VA/W	40/12		65/19						
50/60 Hz (1) VA/W	44/13		80/21						
Operating time									
between coil energization and:									
– N.O. contact closing ms	13 ... 27		17 ... 35						
– N.C. contact opening ms	8 ... 22		12 ... 30						
between coil de-energization and:									
– N.O. contact opening ms	5 ... 10		7 ... 13						
– N.C. contact closing ms	9 ... 13		10 ... 16						

(1) 50/60 Hz coils: see "Coil Voltage Code Table".

Magnet System Characteristics for AF... Contactors

Contactor types: AF...	145	185	210	260	300	400	460	580	750	1350	1650
Rated control circuit voltage U_c											
– at 50 Hz V	48 ... 250					48 ... 500				100 ... 250	
– at 60 Hz V	48 ... 250					48 ... 500				100 ... 250	
– d.c. V	20 ... 250					24 ... 500				100 ... 250	
Coil operating limits acc. to IEC 60947-4-1	0.85 ... $1.1 \times U_c$ (at $\theta \leq 70^\circ\text{C}$) Please also refer to "Conditions for Use"										
Drop-out voltage in % of U_c min.	55 %										
Coil consumption											
Average pull-in value 50 Hz VA	430		470			890		850		1900	
60 Hz VA	430		470			890		850		1900	
d.c. W	500		520			990		950		1700	
Average holding value 50 Hz VA/W	12/3.5		10/2.5			12/4		12/4.5		48/17	
60 Hz VA/W	12/3.5		10/2.5			12/4		12/4.5		48/17	
d.c. W	2		2			4		4.5		16	
Operating time											
coil supply between A1-A2											
between coil energization and:											
– N.O. contact closing ms	30 ... 115					50 ... 120				50 ... 80	
– N.C. contact opening ms	30 ... 115					50 ... 120				50 ... 80	
between coil de-energization and:											
– N.O. contact opening ms	25 ... 80					33 ... 70				35 ... 55	
– N.C. contact closing ms	25 ... 80					33 ... 70				35 ... 55	
control input for PLC's											
between coil energization and:											
– N.O. contact closing ms	–	–	–	–	–	40 ... 60		40 ... 90		40 ... 65	
– N.C. contact opening ms	–	–	–	–	–	40 ... 60		40 ... 90		40 ... 65	
between coil de-energization and:											
– N.O. contact opening ms	–	–	–	–	–	10 ... 30				10 ... 30	
– N.C. contact closing ms	–	–	–	–	–	10 ... 30				10 ... 30	

AL..., AE... and TAL..., TAE... Contactors

Technical Data

Magnet System Characteristics for AL... and AE... Contactors

Contactor types: AL...				9	12	16	26	30	40	-	-	-	-	-	-		
AE...				-	-	-	-	-	-	45	50	63	75	95	110		
Rated control circuit voltage U _c				12 ... 250 (24 and 48 for AL..Z version)							12 ... 250						
V d.c.																	
Coil operating limits acc. to IEC 60947-4-1				0.85 ... 1.1 x U _c (at θ ≤ 55 °C)												0.85 ... 1.1 x U _c (at θ ≤ 70 °C)	
				Please also refer to "Conditions for Use"													
Drop-out voltage in % of U _c				approx. 10 ... 30 %						approx. 15 ... 40 %							
Coil consumption - Average values																	
– pull-in value		W		3 (2.4 for AL..Z version)		3.5				200				400			
– holding value		W		3 (2.4 for AL..Z version)		3.5				4				2.4			
Coil time constant																	
– open		L/R	ms	28		38				3				6			
– closed		L/R	ms	74		62				15				30 ... 40			
Operating time																	
between coil energization and:																	
– N.O. contact closing		ms		50 ... 100		55 ... 110				13 ... 30				15 ... 25			
– N.C. contact opening		ms		20 ... 70		25 ... 75				10 ... 27				12 ... 22			
between coil de-energization and:																	
– N.O. contact opening		ms		10 ... 17 (1)		12 ... 18 (1)				5 ... 15 (1)				15 ... 20 (1)			
– N.C. contact closing		ms		16 ... 27 (1)		18 ... 28 (1)				8 ... 18 (1)				18 ... 23 (1)			

(1) The use of surge suppressors increases the opening time with a factor of 1.1 to 1.5 for a varistor suppressor and a factor of 1.5 to 3 for a diode suppressor.

Magnet System Characteristics for TAL... and TAE... Contactors

Contactor types: TAL...	9	12	16	26	30	40	-	-	-	-	-	-
TAE...	-	-	-	-	-	-	45	50	-	75	95	110
Rated control circuit voltage U_c V d.c.	17 ... 264											
Coil operating limits	U_c min. ... U_c max. (at $\theta \leq 55^\circ\text{C}$) Please also refer to "Conditions for Use"											
Drop-out voltage in % of U_c max.	approx. 9 ... 25 %						approx. 10 ... 35 %					
Coil consumption												
values for U_c min. ... U_c max.												
- pull-in value	W	2.5 ... 8.5		2.7 ... 9			120 ... 250		250 ... 700			
- holding value	W	2.5 ... 8.5		2.7 ... 9			1.7 ... 6.5		2 ... 7			
Coil time constant												
- open	L/R	ms 28		38			3		6			
- closed	L/R	ms 74		62			15		40			
Operating time												
between coil energization and:												
- N.O. contact closing	ms	50 ... 100		55 ... 110			13 ... 30		15 ... 25			
- N.C. contact opening	ms	20 ... 70		25 ... 75			10 ... 27		12 ... 22			
between coil de-energization and:												
- N.O. contact opening	ms	10 ... 17 (1)		12 ... 18 (1)			5 ... 15 (1)		15 ... 20 (1)			
- N.C. contact closing	ms	16 ... 27 (1)		18 ... 28 (1)			8 ... 18 (1)		18 ... 23 (1)			

(1) The use of surge suppressors increases the opening time with a factor of 1.1 to 1.5 for a varistor suppressor and a factor of 1.5 to 3 for a diode suppressor.

A..., AL..., AL..Z... and TAL... Contactors

Technical Data

Built-in Auxiliary Contacts - Other auxiliary contacts see "Accessories"

Utilization characteristics acc. to IEC

Contactor types: A..., AL..., TAL...		9	12	16	26	30	40
AL..Z...		9	12	16	–	–	–
Rated operational voltage U _e max. V		690					
Conventional free air thermal current I _{th} - θ ≤ 40 °C A		16					
Rated frequency limits Hz		25 ... 400					
Rated operational current I _e / AC-15 according to IEC 60947-5-1							
24-127 V 50/60 Hz	A	6					
220-240 V 50/60 Hz	A	4					
380-440 V 50/60 Hz	A	3					
500 V 50/60 Hz	A	2					
690 V 50/60 Hz	A	2					
Rated operational current I _e / DC-13 according to IEC 60947-5-1							
24 V d.c.	A	6 (144 W)					
48 V d.c.	A	2.8 (134 W)					
72 V d.c.	A	2 (144 W)					
110 V d.c.	A	1.1 (121 W)					
125 V d.c.	A	1.1 (138 W)					
220 V d.c.	A	0.55 (121 W)					
250 V d.c.	A	0.55 (138 W)					
Making capacity acc. to IEC 60947-5-1		10 x I _e / AC-15					
Breaking capacity acc. to IEC 60947-5-1		10 x I _e / AC-15					
Short-circuit protection gG type fuse A		10					
Rated short-time withstand current I _{cw}							
for 1.0 s	A	100					
for 0.1 s	A	140					
Minimum switching capacity V / mA		17 / 5 (1)					
Non-overlapping time between N.O. and N.C. contacts ms		≥ 2					
Heat dissipation per pole at 6 A W		0.10					

(1) For AL..., AL..Z..., TAL... contactors, failure rate $\leq 10^{-7}$ according to IEC 60947-5-4.

Utilization characteristics acc. to UL/CSA

Contactor types: A..., AL..., TAL...		9	12	16	26	30	40
AL..Z...		9	12	16	-	-	-
Max. rated voltage	V	600					
Pilot duty		A 600, P 300					

A... and AF... Contactors

AL..., AE... and TAL..., TAE... Contactors

Technical Data

Mounting Characteristics

Contactor types: A...	9	12	16	26	30	40	45	50	63	75	95	110
	AL..., TAL...	9	12	16	26	30	40	–	–	–	–	–
	AE..., TAE..., AF...	–	–	–	–	–	–	45	50	63	75	95 110
Mounting positions	see "Conditions for use"											
Mounting distances	The contactors can be assembled side by side - Except for TAL... contactors: see "Dimensions"											
Fixing												
on rail	 35 x 7.5 mm						 35 x 15 mm					
according to IEC 60715, EN 60715	 35 x 15 mm						 75 x 25 mm			75 x 25 mm		
by screws (not supplied)	2 x M4						2 x M6					

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactor types: A...	9	12	16	26	30	40	45	50	63	75	95	110
AL...	9	12	16	26	30	40	–	–	–	–	–	–
AE...	–	–	–	–	–	–	45	50	63	75	95	110
Control voltage / Ambient temperature												
Mounting positions 1, 2, 3, 4, 5	$\leq 55^\circ\text{C}$						$0.85 \dots 1.1 \times U_e$					
	$55 \dots 70^\circ\text{C}$						U_e					
							$0.85 \dots 1.1 \times U_e$					
Mounting pos. 1 $\pm 30^\circ$ (unauthorized for AL...Z... types)	$\leq 55^\circ\text{C}$						$0.85 \dots 1.1 \times U_e$					
	$55 \dots 70^\circ\text{C}$						U_e					
							$0.85 \dots 1.1 \times U_e$					
Mounting pos. 6 (Position 6 unauthorized for AL... and AL...Z... types)	$\leq 55^\circ\text{C}$						$0.95 \dots 1.1 \times U_e$					
	$> 55^\circ\text{C}$						unauthorized					
Contactor types: TAL...	9	12	16	26	30	40	–	–	–	–	–	–
TAE...	–	–	–	–	–	–	45	50	–	75	95	110
Control voltage / Ambient temperature												
Mounting positions 1, 1 $\pm 30^\circ$, 2, 3, 4, 5	$\leq 55^\circ\text{C}$						$U_e \text{ min.} \dots U_e \text{ max.}$					
	$> 55^\circ\text{C}$						unauthorized					
Mounting pos. 6	–						unauthorized					
Contactor types: AF...	–	–	–	–	–	–	45	50	63	75	95	110
Control voltage / Ambient temperature												
Mounting positions 1, 1 $\pm 30^\circ$, 2, 3, 4, 5	$\leq 70^\circ\text{C}$						$0.85 \times U_e \text{ min.} \dots 1.1 \times U_e \text{ max.}$					
Mounting pos. 6	–						unauthorized					

Notes for 4-pole contactors

Whatever the coil voltage: Pos. 5 unauthorized for AL 9-22-00, AL 16-22-00, AL 26-22-00, TAL 9-22-00, TAL 16-22-00, TAL 26-22-00, A 45-22-00, AE 45-22-00, AF 45-22-00, A 75-22-00, AE 75-22-00, AF 75-22-00 contactors.

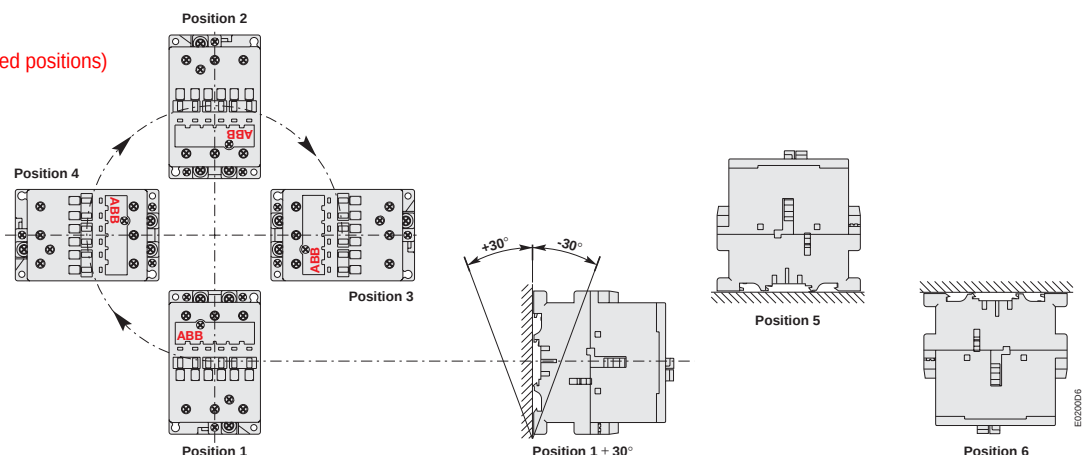
For 60 Hz coil voltage: (only for devices fitted with CA 5-... and CAL 5-11 auxiliary contacts or TP timer)

- A 45-40-00, A 50-40-00 and A 75-40-00 contactors
Mounting positions 1 to 5 and ambient temperature $\leq 55^\circ\text{C}$: tolerance reduced to $0.9 \dots 1.1 U_e$ (instead of $0.85 \dots 1.1 U_e$) for coil voltage codes 7 □ and 8 □.
- A 45-22-00 and A 75-22-00 contactors
Mounting positions 1 to 4 and ambient temperature $\leq 55^\circ\text{C}$: tolerance reduced to $0.9 \dots 1.1 U_e$ (instead of $0.85 \dots 1.1 U_e$) for coil voltage codes 7 □ and 8 □.

For mounting position 6 or ambient temperature of 55 to 70°C the information given on this page remains applicable.

Mounting Positions

(see the above table for authorized positions)



A... and AF... Contactors

Technical Data

Mounting Characteristics

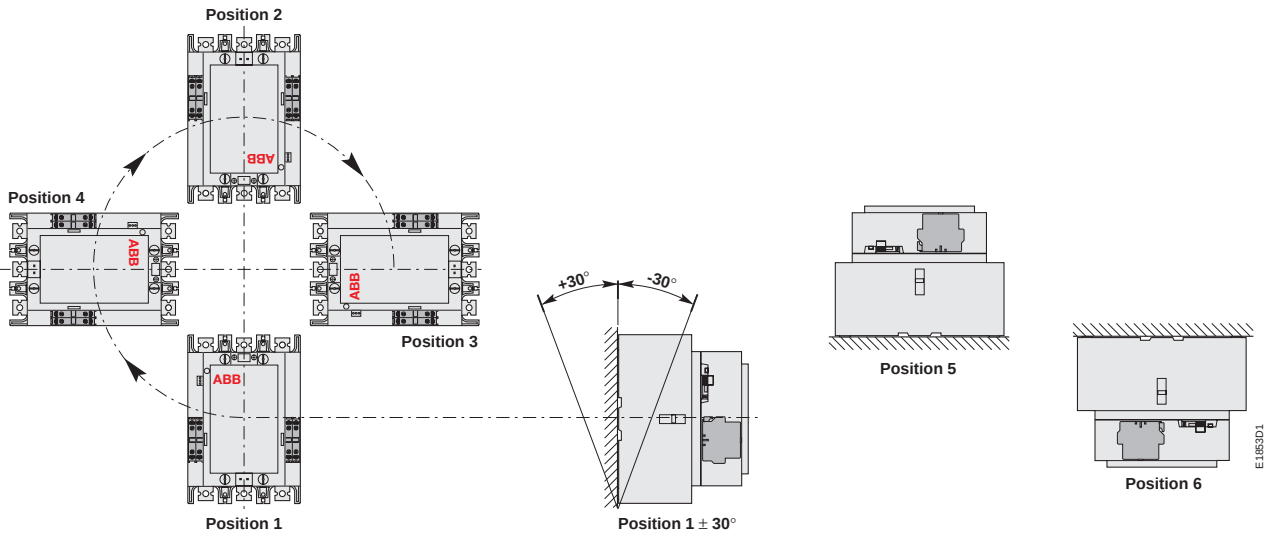
Contactor types: A...	145	185	210	260	300	–	–	–	–	–	–	
	AF...	145	185	210	260	300	400	460	580	750	1350	1650
Mounting positions	see "Conditions for use"											
Mounting distances	No mounting distance required between contactors											
Fixing												
on rail	–	–	–	–	–	–	–	–	–	–	–	–
according to IEC 60715, EN 60715												
by screws (not supplied)	4 x M5						4 x M6			4 x M8		

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactor types: A...		145	185	210	260	300	-		-		-	
Control voltage / Ambient temperature												
Mounting positions	≤ 70 °C	0.85 ... 1.1 x U _e				-	-	-	-	-	-	
1, 1 ± 30°, 2, 3, 4, 5												
Mounting position 6	-	unauthorized				-	-	-	-	-	-	
Contactor types: AF..		145	185	210	260	300	400	460	580	750	1350	1650
Control voltage / Ambient temperature												
Mounting positions	≤ 70 °C	0.85 x U _e min. ... 1.1 x U _e max.										
1, 1 ± 30°, 2, 3, 4, 5												
Mounting position 6	-	unauthorized										

Mounting Positions (see the above table for authorized positions)



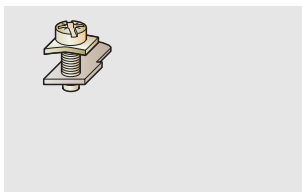
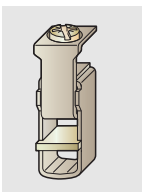
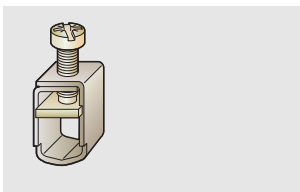
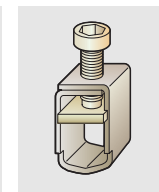
A... and AF... Contactors

AL..., AE... and TAL..., TAE... Contactors

Technical Data

Connecting Characteristics

Contactor types: A...		9	12	16	26	30	40	45	50	63	75	95	110
AL..., TAL...		9	12	16	26	30	40	–	–	–	–	–	–
AE..., TAE..., AF...		–	–	–	–	–	–	45	50	63	75	95	110

Main terminals					
		with cable clamp	with double connector 2 x (5.6 x 6.5 mm)	with single connector (13 x 10 mm)	with single connector (14 x 14 mm)

Connecting capacity (min. ... max.)													
Main conductors (poles)													
Rigid: solid (≤ 4 mm²)		1 x mm²	1 ... 4	1.5 ... 6	2.5 ... 16	6 ... 50					10 ... 95		
		2 x mm²	1 ... 4	1.5 ... 6	2.5 ... 16	6 ... 25					6 ... 35		
Rigid with connector													
single for Cu cable		mm²	–	–	–	–	–	–	–	–	–	–	–
single for Al/Cu cable		mm²	–	–	–	–	–	–	–	–	–	–	–
double for Al/Cu cable		mm²	–	–	–	–	–	–	–	–	–	–	–
Flexible with cable end													
		1 x mm²	0.75 ... 2.5	0.75 ... 4	2.5 ... 10	6 ... 35					10 ... 70		
		2 x mm²	0.75 ... 2.5	0.75 ... 4	2.5 ... 10	6 ... 16					6 ... 35		
Bars or lugs			L mm ≤ I mm >	7.7 3.7	10 4.2	– –	– –	– –	– –	– –	– –	30 (2) 6	
Capacity acc. to UL/CSA		AWG	10-18	8-12	4-8	1-8					6-2/0		

Auxiliary conductors (built-in auxiliary terminals + coil terminals)														
Rigid solid		1 x mm²	1 ... 4									0.75 ... 2.5		
		2 x mm²	1 ... 4									0.75 ... 2.5		
Flexible with cable end		1 x mm²	0.75 ... 2.5					1 ... 2.5				0.75 ... 2.5		
		2 x mm²	0.75 ... 2.5											
Lugs			L mm ≤ I mm >	7.7 3.7	(1) (1)	8 3.7								
Capacity acc. to UL/CSA		AWG	18-14											

Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529		Protection against direct contact in acc. with EN 50274													
– Main terminals		IP 20					IP 10								
– Coil terminals		IP 20													
– Built-in auxiliary terminals		IP 20					– – – – – –								
		(delivered in open position, screws of unused terminals must be tightened)													
Main terminals		(+, -) pozidriv 2 screws										hexagon socket			
		M3.5		M4	M5	M6	M8 (s = 4 mm)								
Coil terminals		M3.5 (+, -) pozidriv 2 screws with cable clamp													
Built-in auxiliary terminals		(+, -) pozidriv 2 screws with cable clamp										– – – – – –			
		M3.5		M4	M3.5	– – – – –				– – – –					

Tightening torque													
Main pole terminals													
– recommended	Nm / lb.in	1.00 / 9	1.7 / 15	2.30 / 20	4.00 / 35					6.00 / 53			
– max.	Nm	1.20	2.20	2.60	4.50					6.50			
Coil terminals													
– recommended	Nm / lb.in	1.00 / 9											
– max.	Nm	1.20											
Built-in auxiliary terminals													
– recommended	Nm / lb.in	1.00 / 9	1.7 / 15	1.00 / 9	–	–	–	–	–	–	–	–	
– max.	Nm	1.20	2.20	1.20	–	–	–	–	–	–	–	–	

(1) L ≤ 8 and I > 3.7 for coil terminals - L ≤ 10 and I > 4.2 for built-in auxiliary terminals.

(2) With LW 110 enlargement piece: see "Accessories".

>> Terminal Marking and Positioning section 8

>> Accessories section 4

Technical Data

Technical Data

EK... Contactors

Technical Data

Main Pole - Utilization Characteristics acc. to IEC

Contactor types: EK...		110	150	175	210	370	550	1000
Rated operational voltage U_e max. V		1000						
Rated frequency limits Hz		25 ... 400						
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\theta \leq 40^\circ\text{C}$ with conductor cross-sectional area		A	A	A	A	A	A	A
		mm ²	mm ²	mm ²	mm ²	mm ²	mm ²	mm ²
Rated operational current I_e / AC-1 for air temperature close to contactor								
U_e max. 1000 V - 50/60 Hz		$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A	$\theta \leq 40^\circ\text{C}$ A
		$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A	$\theta \leq 55^\circ\text{C}$ A
		$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A	$\theta \leq 70^\circ\text{C}$ A
with conductor cross-sectional area		mm ²	mm ²	mm ²	mm ²	mm ²	mm ²	mm ²
Utilization category AC-3 for air temperature close to contactor $\leq 55^\circ\text{C}$ Max. rated operational current I_e AC-3 ⁽¹⁾								
220-230-240 V		A	A	A	A	A	A	A
3-phase motors 380-400 V		A	A	A	A	A	A	A
415 V		A	A	A	A	A	A	A
440 V		A	A	A	A	A	A	A
500 V		A	A	A	A	A	A	A
690 V		A	A	A	A	A	A	A
1000 V		A	A	A	A	A	A	A
Rated operational power AC-3 ⁽¹⁾								
220-230-240 V		kW	kW	kW	kW	kW	kW	kW
1500 r.p.m. 50 Hz 380-400 V		kW	kW	kW	kW	kW	kW	kW
1800 r.p.m. 60 Hz 3-phase motors		kW	kW	kW	kW	kW	kW	kW
415 V		kW	kW	kW	kW	kW	kW	kW
440 V		kW	kW	kW	kW	kW	kW	kW
500 V		kW	kW	kW	kW	kW	kW	kW
690 V		kW	kW	kW	kW	kW	kW	kW
1000 V		kW	kW	kW	kW	kW	kW	kW
Rated making capacity AC-3 according to IEC 60947-4-1		10 x I_e AC-3						
Rated breaking capacity AC-3 according to IEC 60947-4-1		8 x I_e AC-3						
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded (2) $U_e \leq 500$ V a.c. - gG type fuse		A	A	A	A	A	A	A
Rated short-time withstand current I_{cw} at 40°C ambient temp., in free air, from a cold state								
1 s		A	A	A	A	A	A	A
10 s		A	A	A	A	A	A	A
30 s		A	A	A	A	A	A	A
1 min		A	A	A	A	A	A	A
15 min		A	A	A	A	A	A	A
Maximum breaking capacity $\cos \varphi = 0.45$ ($\cos \varphi = 0.35$ for $I_e > 100$ A)								
at 440 V		A	A	A	A	A	A	A
at 690 V		A	A	A	A	A	A	A
Heat dissipation per pole I_e / AC-1		W	W	W	W	W	W	W
I_e / AC-3		W	W	W	W	W	W	W
Max. electrical switching frequency								
- for AC-1		cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h
- for AC-3		cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h
- for AC-2, AC-4		cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h
Mechanical durability								
- millions of operating cycles								
- max. mechanical switching frequency		cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h	cycles/h

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 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"

EK... Contactors

Technical Data

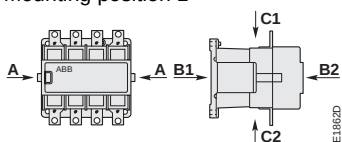
Main Pole - Utilization Characteristics acc. to UL/CSA

Contactor types: EK...	110	150	175	210	370	550	1000
NEMA Size	—	—	—	—	—	—	—
General use rating							
Amp-rating (1) 600 V A	170	200	250	300	420	540	—
Short-circuit protection							
Fuse rating A	400				1200		—
Fuse type, 600 V	J				L		—
Max. electrical switching frequency for general use cycles/h	300						

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m., 50Hz or 1800 r.p.m., 60Hz, 3-phase motors, see "Motor Rated Operational Powers and Currents".

General Technical Data

Contactor types: EK...	110	150	175	210	370	550	1000
Rated insulation voltage U_i according to IEC 60947-4-1 V	1000						
according to UL/CSA V	600						
Rated impulse withstand voltage U_{imp} kV	8						
Standards	Devices complying with IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1						
Air temperature close to contactor	see "Conditions for use", for control voltage limits and authorized mounting positions						
– fitted with thermal O/L relay °C	-25 to +55						—
– without thermal O/L relay °C	-40 to +70						
– for storage °C	-50 to +70						
Climatic withstand	acc. to IEC 60068-2-30						
Operating altitude m	≤ 3000						
Shock withstand	1/2 sinusoidal shock for 15 ms: no change in contact position						
acc. IEC 60068-2-27 and EN 60068-2-27	Contactor in closed or open position						
Mounting position 1	10 g in all directions (A, B1, B2, C1, C2)						



2

Technical Data

EK... Contactors

Technical Data

Magnet System Characteristics for EK... Contactors - a.c. Operated

Contactor types: EK...	110	150	175	210	370	550	1000
Rated control circuit voltage U_c							
– at 50 Hz V	24 ... 500				48 ... 500		
– at 60 Hz V	24 ... 600				110 ... 600		
Coil operating limits	$\theta \leq 70^\circ\text{C}$						
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$						
Drop-out voltage in % of U_c	approx. 45 ... 65 % (20 ... 50 % for "E" coil voltage codes)				approx. 45 ... 65 %		
Coil consumption							
Average pull-in value 50 Hz(1) VA	800		1100		3500		
60 Hz(1) VA	900		1200		4000		
50/60 Hz(2) VA/VA	500/500		630/630		3800/3400		
Average holding value 50 Hz(1) VA/W	44/15		52/18		125/50		
60 Hz(1) VA/W	52/18		65/22		140/60		
50/60 Hz(2) VA/W	2.5/2.5		2.5/2.5		140/60		
Operating time							
between coil energization and:							
– N.O. contact closing ms	20 ... 40(1) / 30 ... 50(2)				30 ... 60		
– N.C. contact opening ms	15 ... 35(1) / 25 ... 45(2)				25 ... 55		
between coil de-energization and:							
– N.O. contact opening ms	7.5 ... 15(1) / 95 ... 120(2)				10 ... 20		
– N.C. contact closing ms	10 ... 18(1) / 100 ... 125(2)				13 ... 23		

(1) "A" coil voltage codes, see "Coil Voltage Code Table" (2) 50/60 Hz "E" coil voltage codes, see "Coil Voltage Code Table"

Magnet System Characteristics for EK... Contactors - d.c. Operated

Contactor types: EK...	110	150	175	210	370	550	1000
Rated control circuit voltage U_c							
V d.c.	12 ... 220				24 ... 220		
Coil operating limits	$\theta \leq 70^\circ\text{C}$						
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$						
Drop-out voltage in % of U_c	approx. 15 ... 50 %						
Coil consumption - Average values							
– pull-in value W	500		630		1100		
– holding value W	2.5		2.5		20		
Coil time constant							
– open L/R ms	8				12		
– closed L/R ms	50				60		
Operating time							
between coil energization and:							
– N.O. contact closing ms	30 ... 50				60 ... 80		
– N.C. contact opening ms	27 ... 47				55 ... 75		
between coil de-energization and:							
– N.O. contact opening ms	10 ... 35						
– N.C. contact closing ms	13 ... 38						

EK... Contactors

Technical Data

Mounting Characteristics

Contactor types: EK...	110	150	175	210	370	550	1000
Mounting positions	see "Conditions for use"						
Mounting distances	see "Dimension drawings" for distances required between contactors						
Fixing by screws (supplied)	4 x M6				4 x M6 (1)		

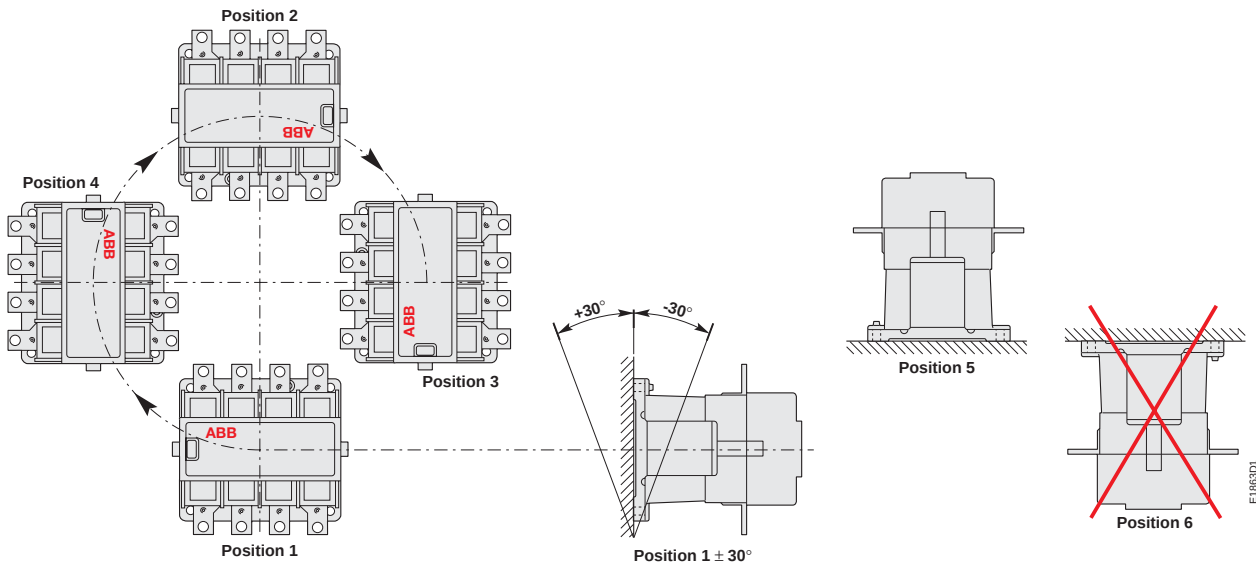
(1) Damping elements are supplied

Conditions for Use

Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactor types: EK...		110	150	175	210	370	550	1000
Control voltage / Ambient temperature								
Mounting positions	≤ 70 °C	0.85 ... 1.1 x U _c						
1, 1 ± 30°, 3, 4, 5								
Mounting position 2	≤ 70 °C	unauthorized				0.85 ... 1.1 x U _c		
Mounting position 6	–	unauthorized						

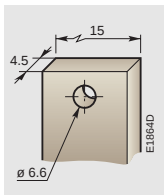
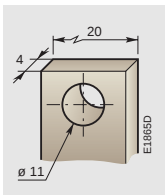
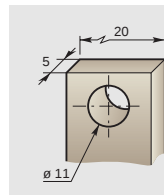
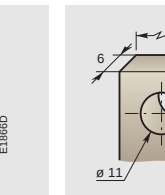
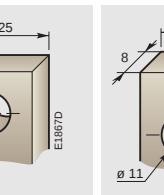
Mounting Positions (see the above table for authorized positions)



EK... Contactors

Technical Data

Connecting Characteristics

Contactor types: EK...	110	150	175	210	370	550	1000
Main terminals Flat type							
Connecting capacity (min. ... max.) Main conductors (poles)							
Rigid:							
1 x mm ²	—	—	—	—	—	—	—
2 x mm ²	—	—	—	—	—	—	—
Rigid with connector							
single for Cu cable	25 ... 120	25 ... 185			70 ... 300		—
single for Al/Cu cable	10 ... 70	35 ... 120			70 ... 300		95 ... 300
double for Al/Cu cable	—	—			2 x 35 ... 185		2 x 95 ... 300
Flexible							
1 x mm ²	—	—	—	—	—	—	—
2 x mm ²	—	—	—	—	—	—	—
Bars or lugs							
L mm ≤	30	30	33		55		
Ø mm >	6	10	10		10		
Capacity acc. to UL/CSA AWG	8-3/0		6-250 MCM		2x4-500 MCM	3x4-500 MCM	—
Auxiliary conductors (coil terminals)							
Rigid solid							
1 x mm ²	0.5 ... 2.5						
2 x mm ²	0.5 ... 2.5						
Flexible with cable end							
1 x mm ²	0.5 ... 2.5						
2 x mm ²	0.5 ... 2.5						
Lugs							
L mm ≤	8						
l mm >	3.7						
Capacity acc. to UL/CSA AWG	18-14						—
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact in acc. with EN 50274						
– Main terminals	IP 00						
– Coil terminals	IP 20						
Screw terminals							
Main terminals	Screws and bolts						
	M6 M10						
Coil terminals (delivered in open position)	M3.5 (+,-) pozidriv 2 screws with cable clamp						
Tightening torque							
Main pole terminals							
– recommended	Nm / lb.in	5 / 44	18 / 160				
– max.	Nm	6	22				
Coil terminals							
– recommended	Nm / lb.in	1.00 / 9					
– max.	Nm	1.20					

Contactor Electrical Durability and Utilization Categories

2

Technical Data

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-2, 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.

For the AC-2 applications, the I_e values are given in the "stator contactor table" (see "Control of Three-Phase Slip-ring Motors").

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.

Among the different utilization categories, the uninterrupted duty implies the following remark. 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.

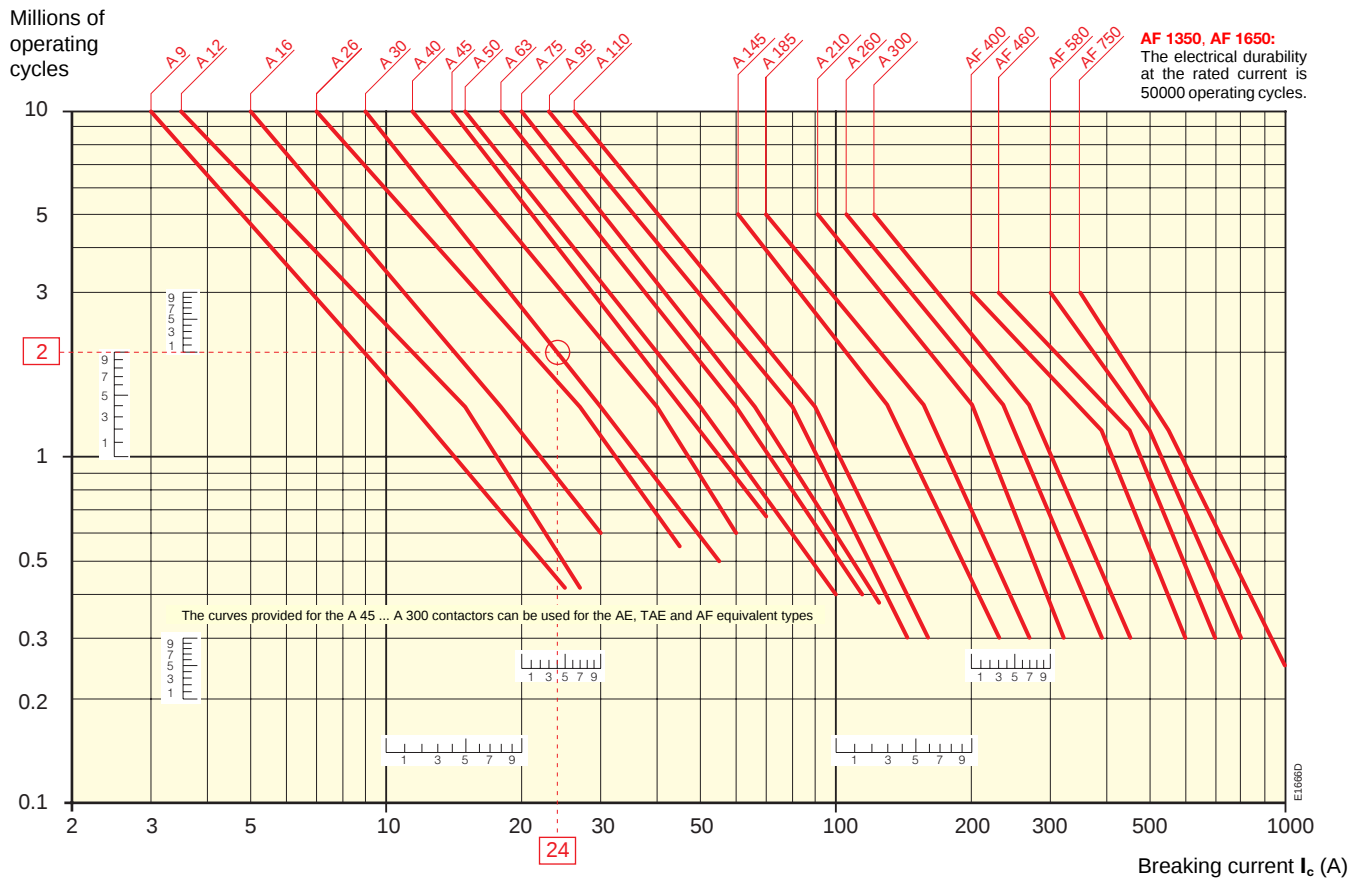
For long term service, some verifications of preventing maintenance are needed to check the functionality of the concerned product (consult us). Over a duration of five years, in these conditions the contactor might present high internal resistance. We recommend to change the contactor or change the contacts.

A... Contactors

Electrical Durability

Electrical Durability for **AC-1** Utilization Category - $U_e \leq 690$ V. Ambient Temperature ≤ 55 °C

Switching non-inductive or slightly inductive loads. The breaking current I_e for AC-1 is equal to the rated operational current of the load.
Maximum electrical switching frequency: see "Technical Data".



Example:

$I_e / AC-1 = 24$ A – Electrical durability required = 2 million operating cycles.

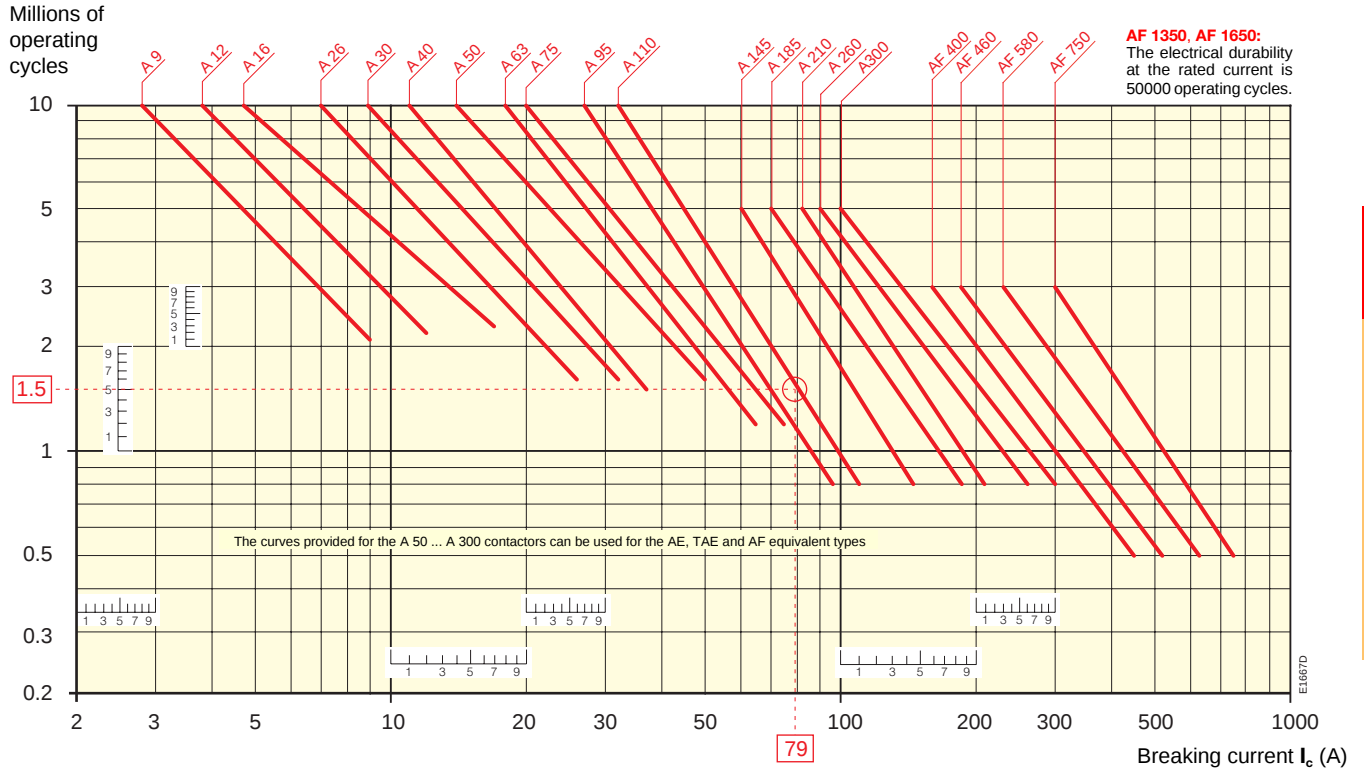
Using the AC-1 curves above select the A 30 contactor at intersection "O" (24 A / 2 million operating cycles).

A... Contactors

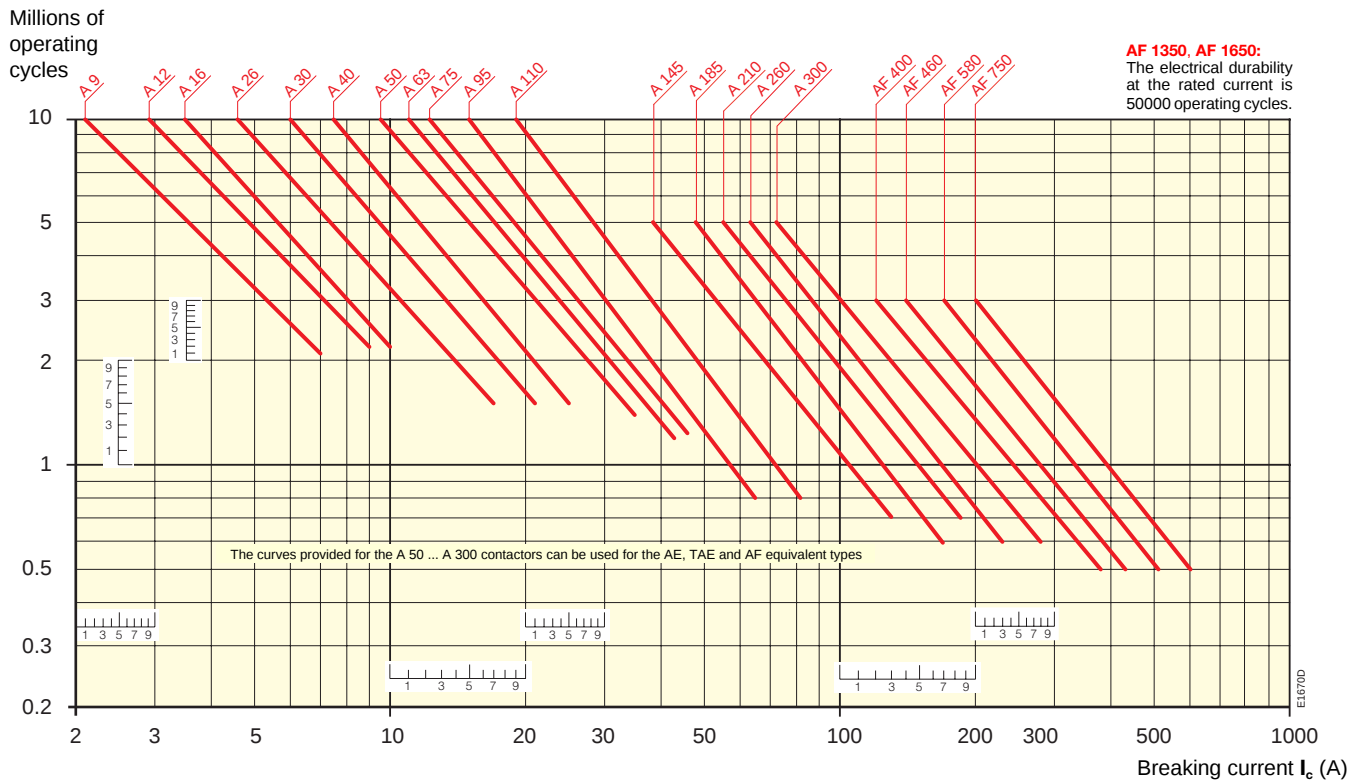
Electrical Durability

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

Electrical Durability for **AC-3** Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 55 °C



Electrical Durability for **AC-3** Utilization Category - 440 V < $U_e \leq 690$ V. Ambient Temperature ≤ 55 °C



Example:

Motor power 40 kW for AC-3 - $U_e = 400$ V and $I_b = 79$ A utilization – Electrical durability required = 1.5 million operating cycles.

For AC-3: $I_b = I_e$. Select the A 110 contactor at intersection "O" (79 A / 1.5 million operating cycles) on the curves (AC-3 - $U_e \leq 440$ V).

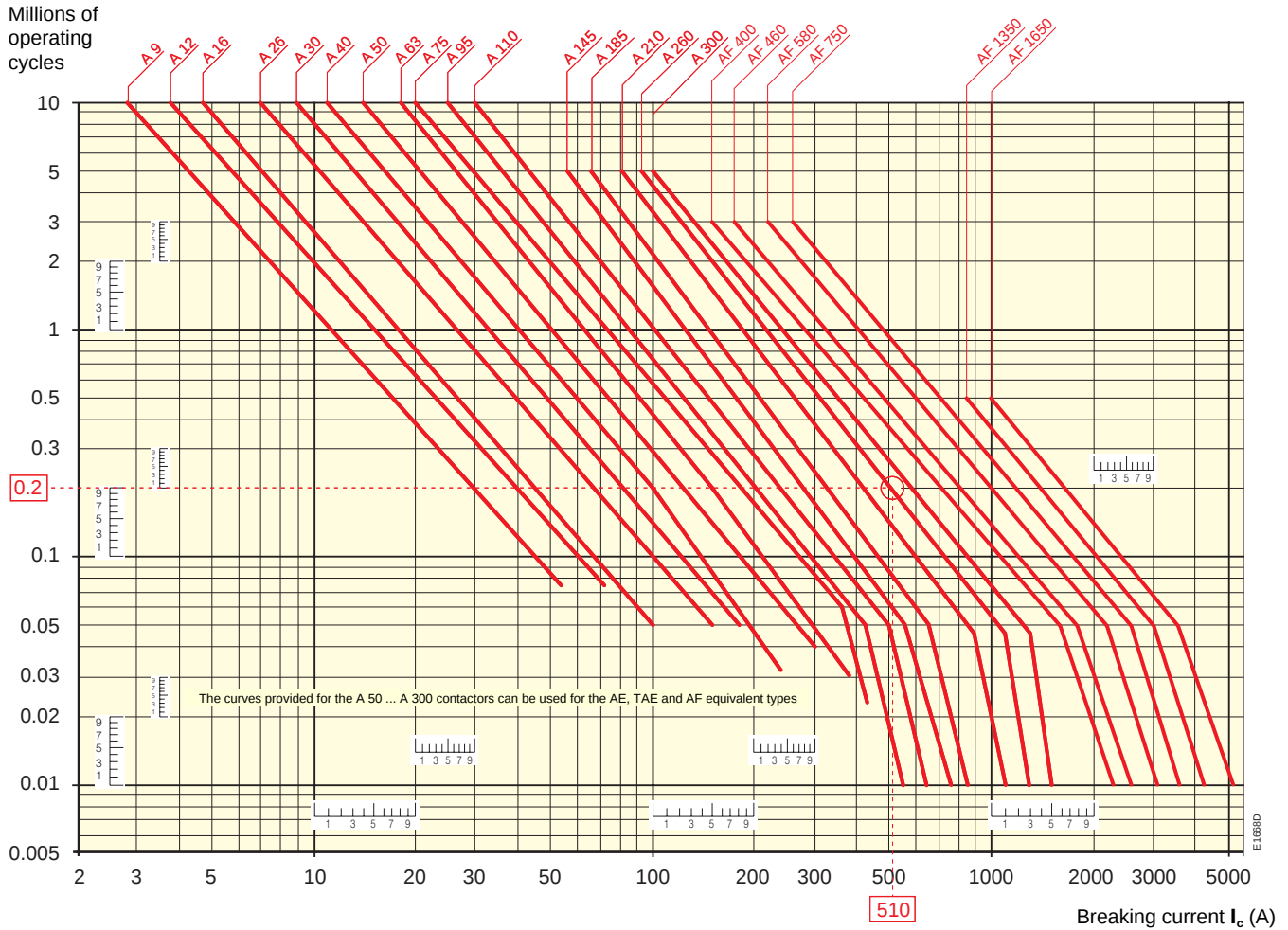
A... Contactors

Electrical Durability

Electrical Durability for **AC-2** or **AC-4** Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 55 °C

Maximum electrical switching frequency: see "Technical Data".

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current I_b is equal to $2.5 \times I_e$ for AC-2 and $6 \times I_e$ for **AC-4**, keeping in mind that I_e is the motor rated operational current (I_e = motor full-load current).



Example:

Motor power 45 kW for AC-4 - $U_e = 400$ V and $I_e = 85$ A utilization – Electrical durability required = 0.2 million operating cycles.

For AC-4: $I_b = 6 \times I_e = 510$ A - Select the A 260 contactor at intersection "○" (510 A / 0.2 million operating cycles) on the curves (AC-4 - $U_e \leq 440$ V).

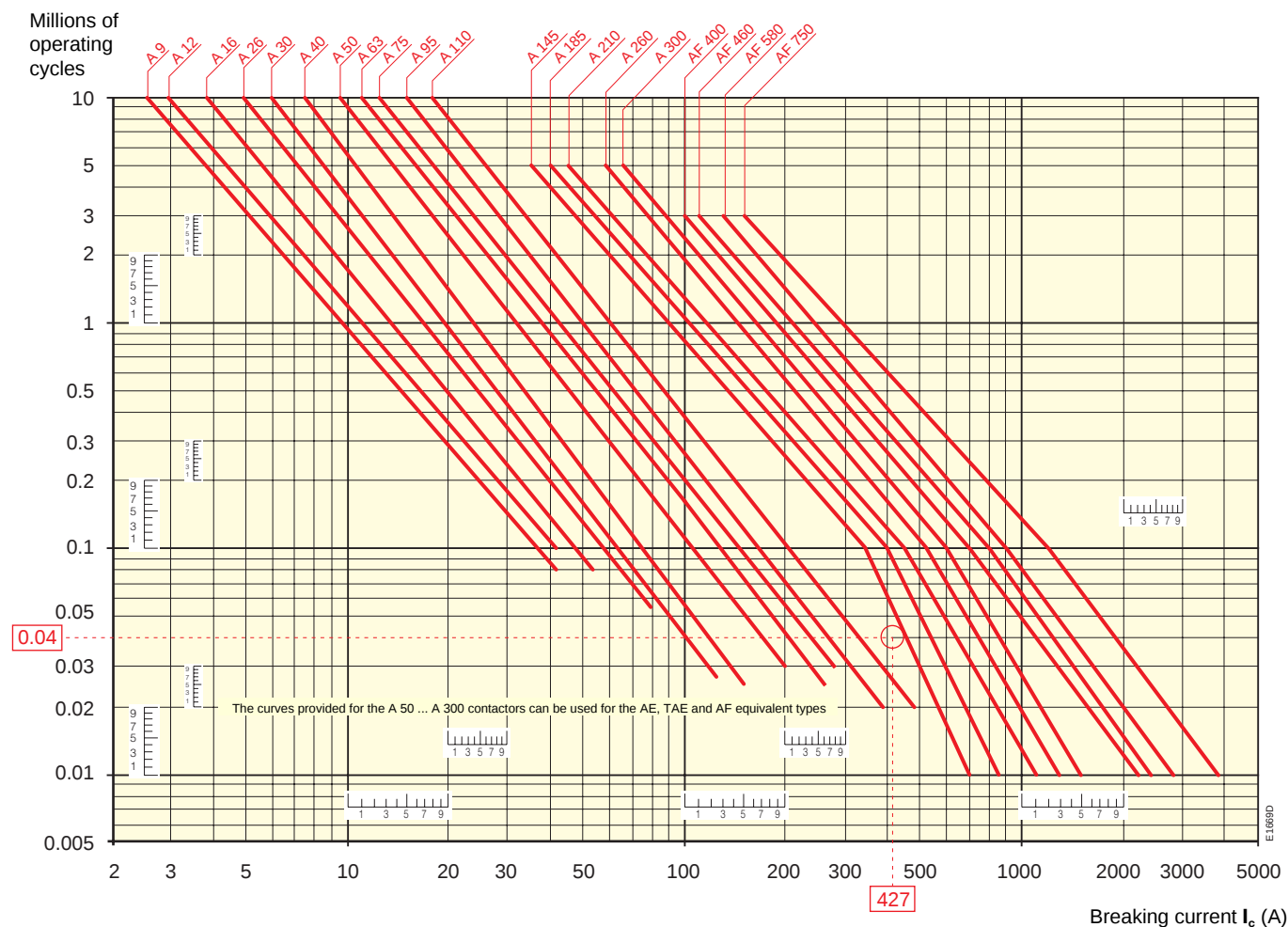
A... Contactors

Electrical Durability

Electrical Durability for **AC-2** or **AC-4** Utilization Category - $440\text{ V} < U_e \leq 690\text{ V}$. Ambient Temperature $\leq 55\text{ }^{\circ}\text{C}$

Maximum electrical switching frequency: see "Technical Data".

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current I_c is equal to $2.5 \times I_e$ for AC-2 and $6 \times I_e$ for **AC-4**, keeping in mind that I_e is the motor rated operational current (I_e = motor full-load current).



Example:

Motor power 59 kW for AC-4 - $U_e = 600\text{ V}$ and $I_e = 71.1\text{ A}$ utilization – Electrical durability required = 0.04 million operating cycles.

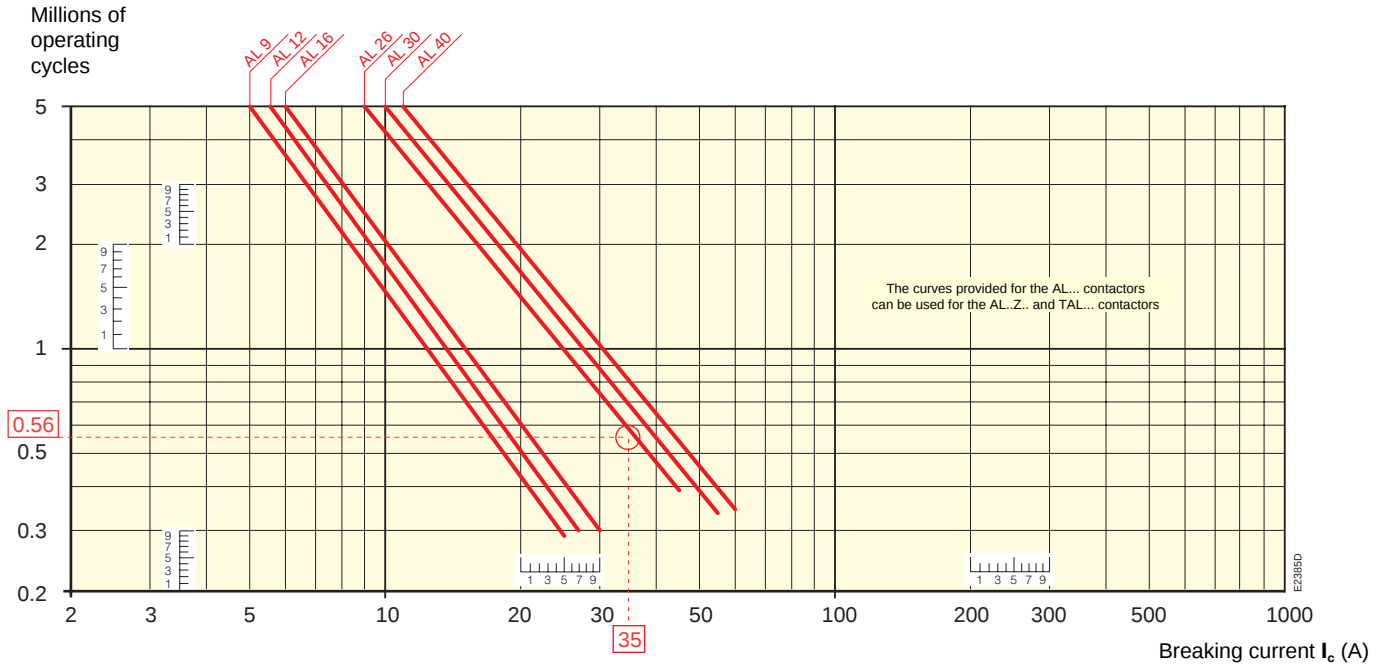
For AC-4: $I_c = 6 \times I_e = 426.6\text{ A}$ - Select the A 145 contactor at intersection "O" (427 A / 0.04 million operating cycles) on the curves (AC-4 - $440\text{ V} < U_e \leq 690\text{ V}$).

AL.. Contactors

Electrical Durability

Electrical Durability for **AC-1** Utilization Category $U_e \leq 690$ V. Ambient Temperature ≤ 55 °C

Switching non-inductive or slightly inductive loads. The breaking current I_b for AC-1 is equal to the rated operational current of the load. Maximum electrical switching frequency: see "Technical Data".



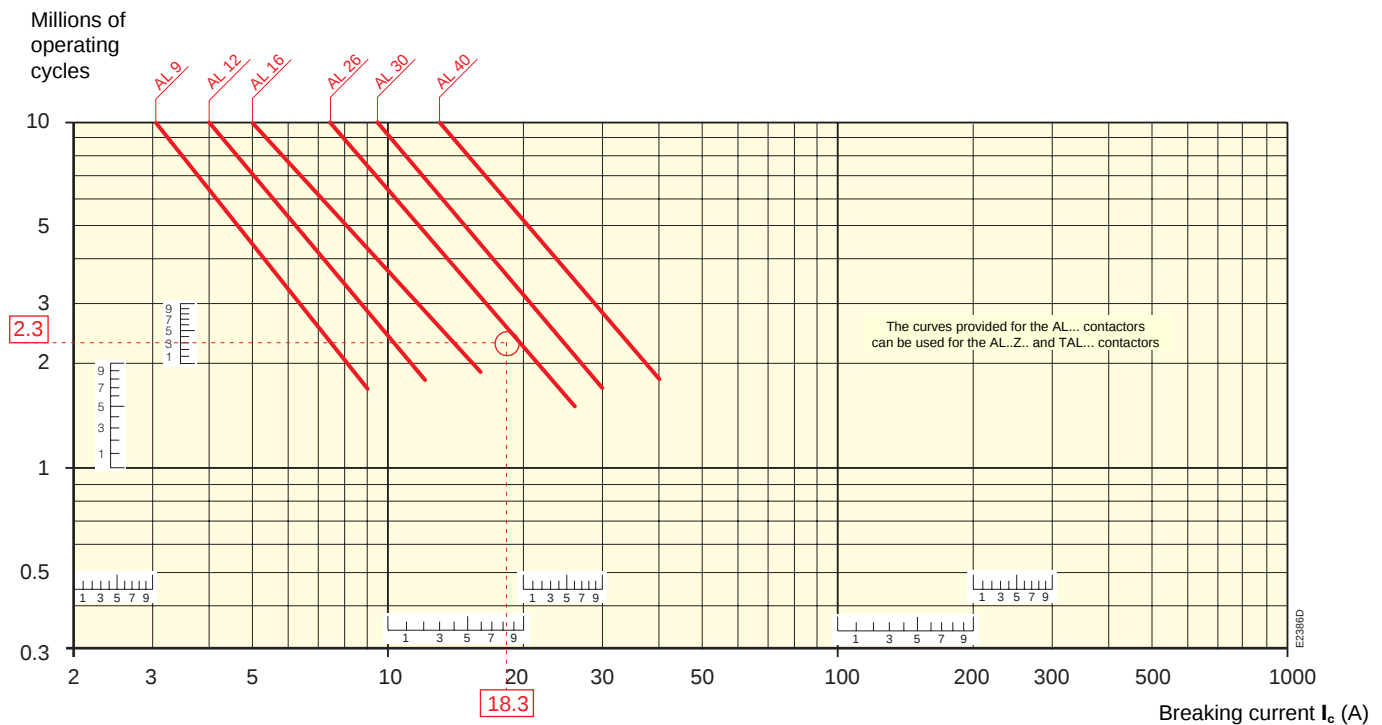
Example:

I_b / AC-1 = 35 A – Electrical durability required = 560 000 operating cycles.

Using the AC-1 curves above select the AL 26 contactor at intersection "O" (35 A / 560 000 operating cycles).

Electrical Durability for **AC-3** Utilization Category - $U_e \leq 500$ V. Ambient Temperature ≤ 55 °C

Switching cage motors: starting and switching off running motors. The breaking current I_b 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".



Example:

Motor power 9 kW for AC-3 - $U_e = 400$ V and $I_e = 18.3$ A utilization – Electrical durability required = 2.3 million operating cycles.

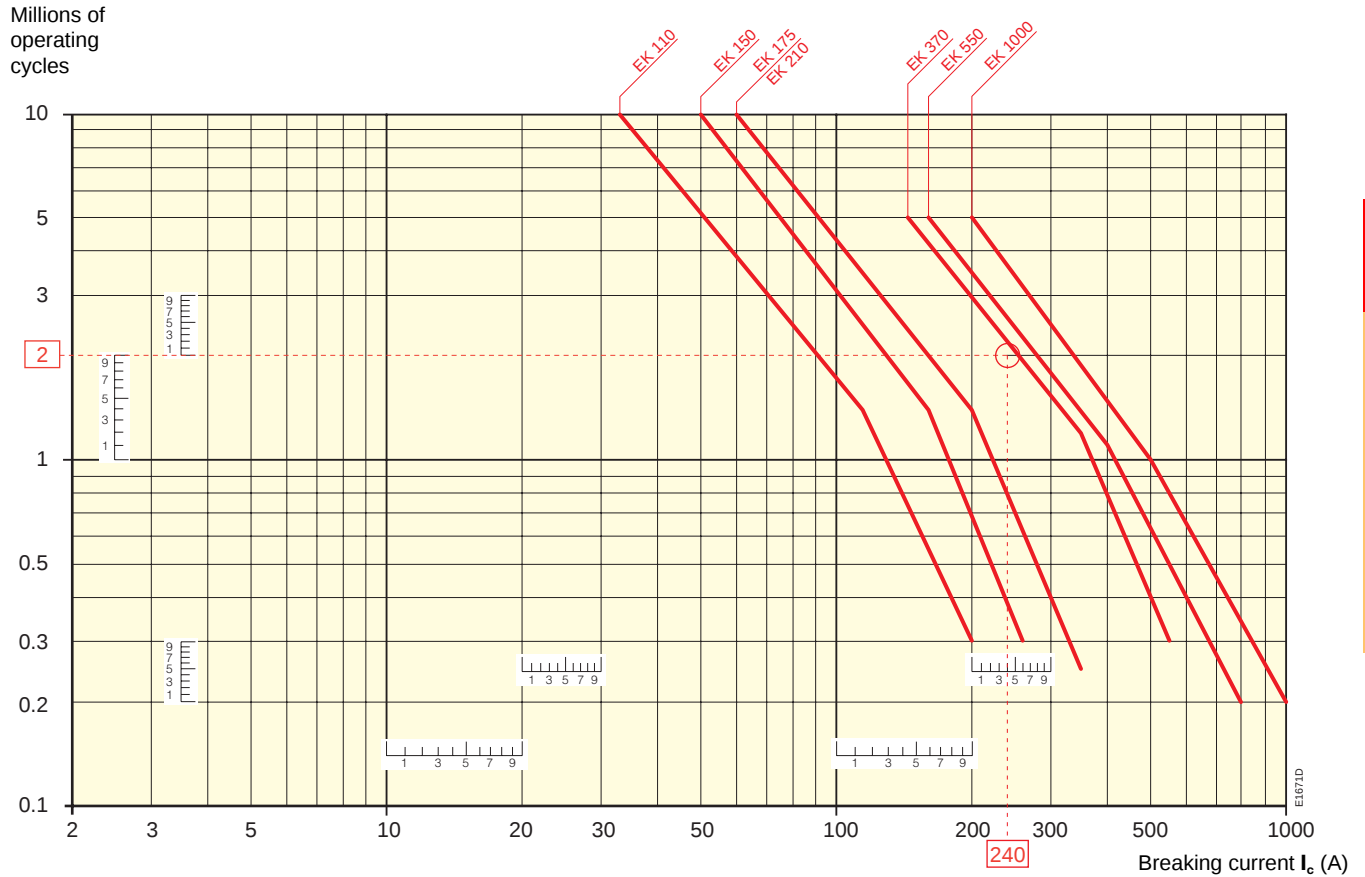
For AC-3: $I_b = I_e$. Select the AL 26 contactor at intersection "O" (18.3 A / 2.3 million operating cycles) on the curves (AC-3 - $U_e \leq 500$ V).

EK... Contactors

Electrical Durability

Electrical Durability for **AC-1** Utilization Category. Ambient Temperature $\leq 55^\circ\text{C}$

Switching non-inductive or slightly inductive loads. The breaking current I_b for AC-1 is equal to the rated operational current of the load. Maximum electrical switching frequency: see "Technical Data".



Example:

$I_b / \text{AC-1} = 240 \text{ A}$ – Electrical durability required = 2 million operating cycles.

Using the AC-1 curves above select the EK 370 contactor at intersection "O" (240 A / 2 million operating cycles).

Influence of the Length of Conductors used in Contactor Control Circuit



A 50-30-00



AF 460-30-11

Under certain conditions the excessive length of the control circuit conductors may prevent the contactor from carrying out closing and opening orders.

- **no closing:** due to excessive voltage drop (in a.c. or d.c.).
- **no opening:** due to excessive capacitance (in a.c.).

Contactor Closing (contactor with a.c. or d.c. operated coil)

The voltage drop is due to the pull-in current (pull-in power) and to the resistance of the control circuit conductors.

The table and graph below can be used to determine the **single length of line feeders** (distance between the control device and the contactor coil) in relation to:

- the coil pull-in consumption.
- the supply voltage.
- the connecting wire cross-sectional area.

The graph has been drawn for a max. line voltage drop of 5 %.

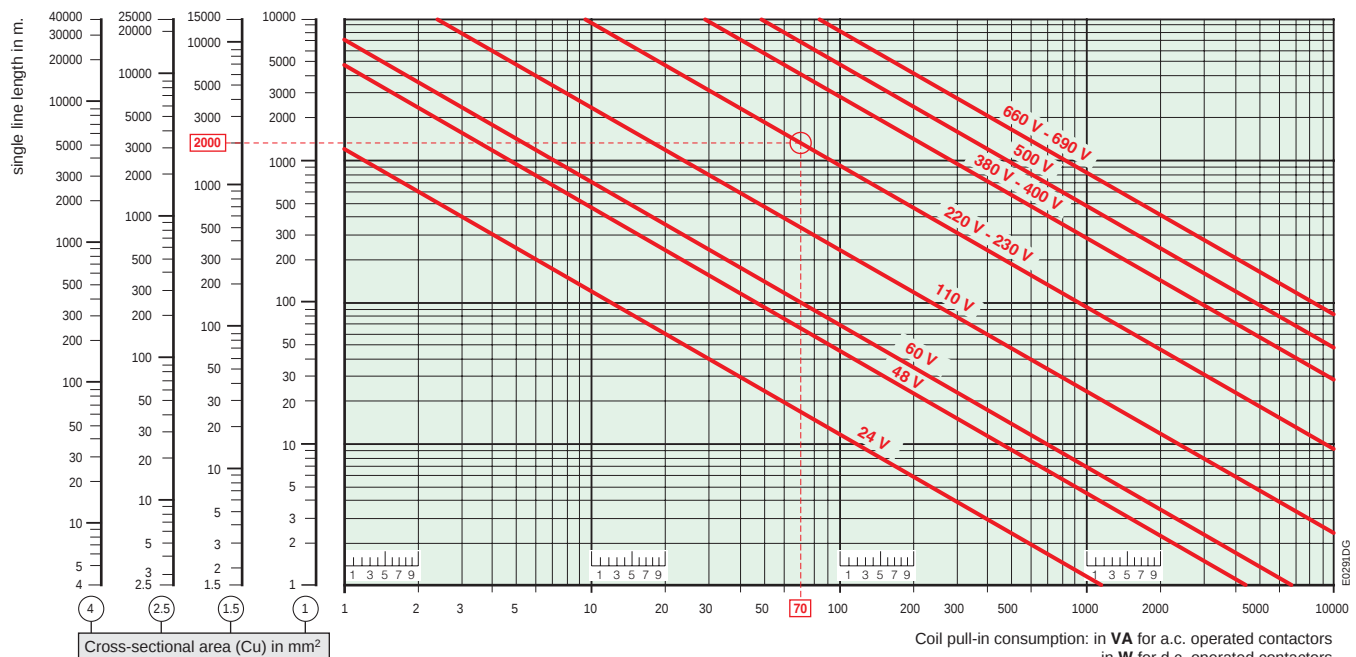
Coil pull-in consumption (average value)

Contactors	a.c. control circuit 50 Hz
A 9, 12, 16	70 VA
A 26, 30, 40	120 VA
A 45, 50, 63, 75	180 VA
A 95, 110	450 VA
A 145, 185	700 VA
A 210, 260, 300	1700 VA
AF 45, 50, 63, 75	210 VA
AF 95, 110	350 VA
AF 145, 185	430 VA
AF 210, 260, 300	470 VA
AF 400, 460	890 VA
AF 580, 750	850 VA
AF 1350, 1650	1900 VA

Contactors	d.c. control circuit
AL 9Z, 12Z, 16Z	2.4 W
AL 9, 12, 16	3 W
AL 26, 30, 40	3.5 W
AE 45, 50, 63, 75	200 W
AE 95, 110	400 W
AF 45, 50, 63, 75	190 W
AF 95, 110	400 W
AF 145, 185	500 W
AF 210, 260, 300	520 W
AF 400, 460	990 W
AF 580, 750	950 W
AF 1350, 1650	1700 W

Permissible single length for the control circuit conductors on contactor closing:

Depending on the coil pull-in power consumption on the supply voltage and on the control circuit conductor cross-sectional area.



Example:

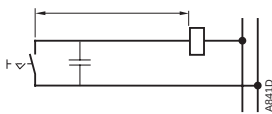
A 9 contactor

Coil voltage: 230 V 50 Hz, contactor coil pull-in power consumption: 70 VA,
control circuit conductor cross-sectional area: Cu 1.5 mm².

Max. permissible length: 2000 m.

Influence of the Length of Conductors used in Contactor Control Circuit

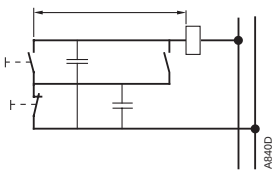
Single control line length



Wiring diagram A

Via maintained pushbutton and 2-core cable (with a capacity of 0.2 µF/km, for example).

Single control line length



Wiring diagram B

Via momentary pushbutton plus hold-in contact and 3-core cable (with a capacity of 2 x 0.2 = 0.4 µF/km, for example).

Contactor Opening (contactor with a.c. operated coil)

Under certain conditions, an **a.c. operated** contactor does not open when the control circuit is de-energized. This is due to a critical capacity of the excessively long control circuit line and the type of contactor coil control layout (see diagrams A and B opposite).

This may be caused by the following factors:

- high control voltage.
- low coil holding consumption.
- low contactor drop-out voltage (according to IEC 60947-4-1: 0.2 to 0.75 x U_e).

If lines longer than those indicated are required, the following measures must be taken:

- select a contactor with a higher rating.
- select a lower control voltage.
- connect "R_p" resistance in parallel with the contactor coil:

$$R_p = \frac{10^3}{C} \quad (\text{with } C \text{ in } \mu\text{F})$$

The table and graph below can be used to determine the **single length of line feeders** (distance between the control device and the contactor coil) in relation to:

- the coil holding consumption VA.
- the supply voltage.
- the capacity in µF/km (depending on the control layout).

Wiring diagrams **A** and **B** opposite show two supply and coil control wiring examples.

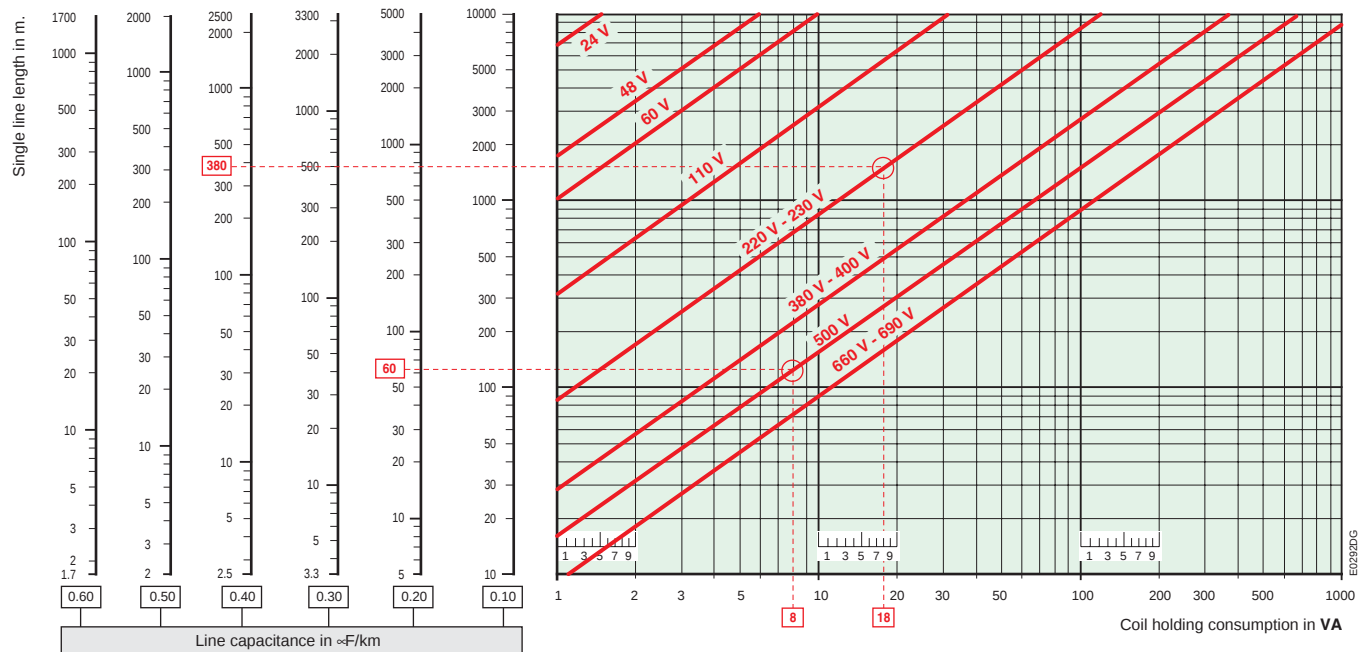
Coil holding consumption (average value)

Contactors	a.c. control circuit 50 Hz
A 9, 12, 16	8 VA
A 26, 30, 40	12 VA
A 45, 50, 63, 75	18 VA
A 95, 110	22 VA
A 145, 185	35 VA
A 210, 260, 300	60 VA

Contactors	a.c. control circuit 50 Hz
AF 45, 50, 63, 75	7 VA
AF 95, 110	7 VA
AF 145, 185	12 VA
AF 210, 260, 300	10 VA
AF 400, 460	12 VA
AF 580, 750	12 VA
AF 1350, 1650	48 VA

Permissible single length for the control circuit conductors on contactor opening:

Depending on the coil holding power consumption, on the supply voltage and on the control circuit conductor capacity.



Examples:

A 16 contactor

Coil voltage U_e = 500 V, 50 Hz, 8 VA contactor coil holding consumption, control type: diagram A, via maintained pushbutton, and 2-core cable with a capacity of 0.2 µF/km.

Max. permissible length: 60 m.

A 50 contactor

Coil voltage U_e = 230 V, 50 Hz, 18 VA contactor coil holding consumption, control type: diagram B via momentary pushbutton, hold-in contact and 3-core cable with a capacity of 2 x 0.2 µF/km = 0.4 µF/km.

Max. permissible length: 380 m.

Parallel Connection of Main Poles

Parallel Connection of Main Poles

Purpose: Increasing the a.c. resistive load.

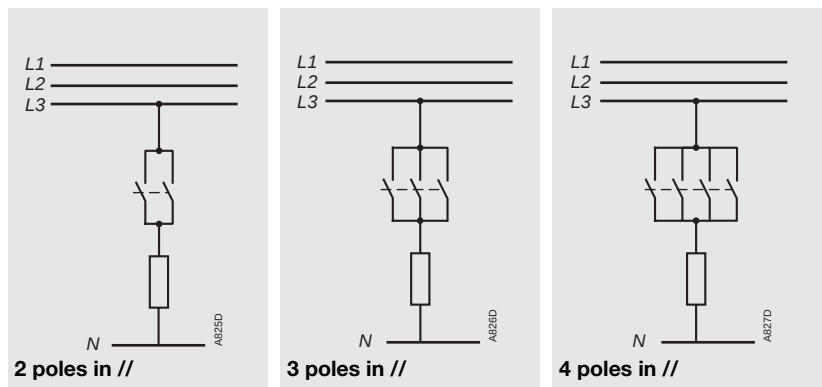
Remarks:

- Parallel connection of main poles to increase the d.c. resistive load is not acceptable.
- Parallel connection of main poles doesn't increase the breaking capacity.

Means: The poles can be connected in parallel via connecting strips: see "Accessories".

- LP and LH for parallel connection of 2 poles,
- LY and LF for parallel connection of 3 poles,
- LG for parallel connection of 4 poles.

The table below shows the uprating factor for I_e / AC-1 max. in relation to the number of poles in parallel and for a max. switching frequency.



Contactors a.c. Operated	d.c. Operated	Cycles / h	Factor to be applied to the rated operational current I _e / AC-1 to obtain the permissible current I _e / AC-1 with "n" poles in parallel.		
3-pole contactors					
A 9 ... A 75	AL..., TAL...	600	1.6	2.2	–
AF 50 ... AF 75	AE..., TAE... AF 50 ... AF 75	300	1.6	2.2	–
A 95 ... A 300 AF 145 ... AF 750	AF 145 ... AF 750	300	1.6	2.2	–
AF 1350, AF 1650	AF 1350, AF 1650	30	1.6	2.2	–
4-pole contactors					
A 9 ... A 75	AL..., TAL...	600	1.6	2.2	2.6
AF 45 ... AF 75	AE..., TAE... AF 45 ... AF 75	300	1.6	2.2	2.6
EK...	EK...	300	1.6	2.2	2.8

Temporary or Intermittent Duty

Utilization of Contactors for Temporary / Intermittent Duty

The table below shows the factor (known as "On-Load Factor") to be applied to the rated operational current I_e / AC-1 to obtain the permissible operational current I_e / AC-1 in relation to the switching frequency and the current flow time per cycle.

Operating cycles per hour	1	2	3	6	12	20	30	60	120
Preferred classes acc. to IEC 60947-4-1	1	–	3	–	12	–	30	–	120
Current flow time per cycle	Factors applicable to I_e / AC-1								
5 s	5.2	5	4.9	4.7	4.3	4.0	3.7	3.4	2.8
10 s	3.8	3.7	3.6	3.4	3.1	3.0	2.8	2.6	2.2
20 s	2.8	2.7	2.7	2.6	2.5	2.4	2.2	2.0	1.6
30 s	2.4	2.3	2.3	2.2	2.1	2.1	1.9	1.7	–
40 s	2.2	2.1	2.1	2.0	1.9	1.9	1.7	1.5	–
60 s	1.9	1.8	1.8	1.8	1.7	1.7	1.5	–	–

Example:

A 9 contactor (intermittent duty, resistive load)

Rated operational current I_e / AC-1 at 55 °C

(see "Technical Data: Main Pole Utilization Characteristics")

Switching frequency

Current flow time per cycle

Factor to be applied to the current I_e / AC-1

Permissible current: $2.7 \times 22 =$

22 A

2 operating cycles/h

20 s

2.7

59 A



Questionnaire for Product Specifications : Block Contactors

Customer :	ABB correspondent :
Contact person :	Contact person :
Tel : e-mail :	Tel : e-mail :
Project :	Date :

APPLICATION

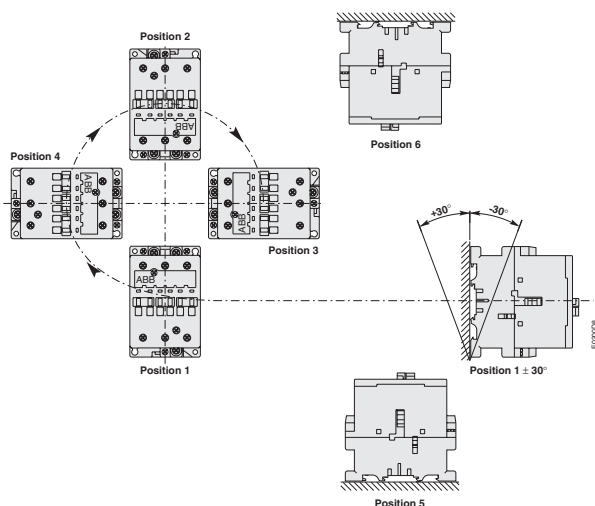
Type of load : No of phases
Utilisation category (AC / DC) : %AC4 if any :
Voltage **Un** : **V** **Cos φ** : frequency :
L/R ms

Nominal current **In** : **A**
Making current : **A** Breaking current **A**
Duty : continuous - temporary - intermittent
Load factor (% of ON time) : %

Number of cycles per hour or per year :
Expected durability : cycles
Number of main poles NO NC
Other information :

INSTALLATION

Ambient temperature : °C
Ambient environment :
Humidity % :
Chemical pollution :
Other :
Mounting position (see drawing) :



Wiring : standard (clamping screws or cage connectors)
ring tongue / flat pins (faston)

Other : Cross section :
Additional comments :

CONTROL CIRCUIT

Coil voltage **V** DC / AC **f** = Hz
Minimum / maximum : ... **V** to **V**
Surge suppressor : type :
Interface with PLC :
Accessories :
Number of auxiliary contacts : NO : NC
Low level contacts :

PROTECTION

Short circuit protection :
Type : fuse - circuit breaker - MMS
Max short circuit current : **A**
Motor protection : overload relay - MMS

LOGISTIC AND PACKAGING

Quantity by batch :
Delivery order :

APPROVALS AND OTHER REQUIREMENTS

Reference standards :
Required approvals :
Customer specifications :
Shock and vibrations :
Expected quantity : per Year
Expected first delivery date : and Qty :
Quantity on first 6 month : on first year :
Specific quality assurance clauses :
Other comments :

This document is used to define the contactor specifications according to the complete information on the application

ABB Entrelec - Control Division - France

DQ01036 rev 1

Please photocopy and forward (see catalogue last back cover page).



Questionnaire

DQ01036 rev 1

1SBC100122C0202