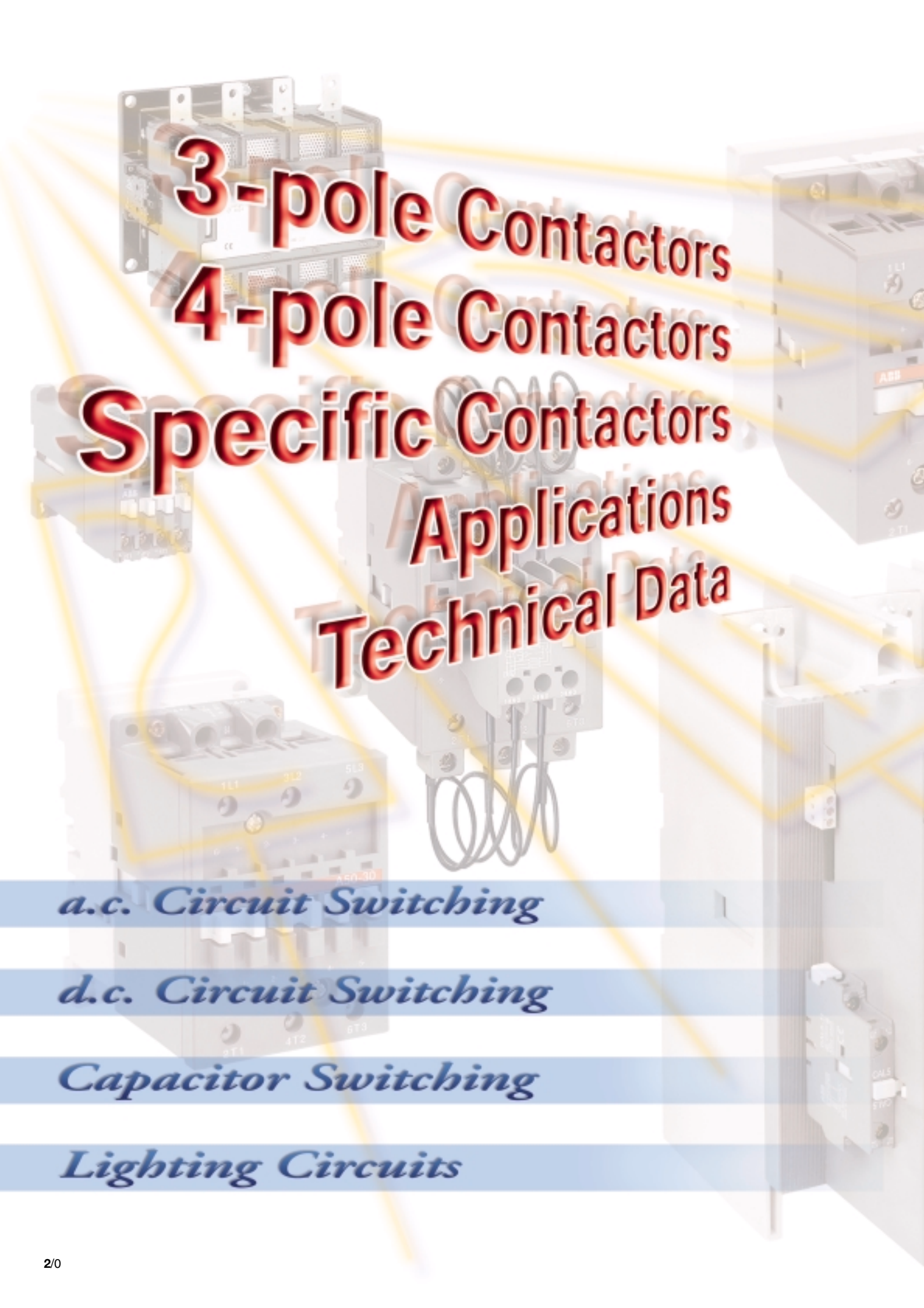




3-pole Contactors 4-pole Contactors Specific Contactors Applications Technical Data

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) and Main Accessories	2/6
A 145 ... AF 750 Contactors (a.c. Operated) and Main Accessories	2/12
AF 50 ... AF 110 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/18
AF 145 ... AF 750 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/20
AE ... and TAE Contactors (d.c. Operated with Double-Winding Coil)	2/22
BC ... and TBC Contactors (d.c. Operated with Solid Magnet Circuit)	2/24

4-pole Contactors: Ordering Details

A 9 ... A 75 Contactors (a.c. Operated) and Main Accessories	2/26
EK 110 ... EK 1000 Contactors (a.c. Operated) and Main Accessories	2/28
AF 45 ... AF 75 Contactors (a.c. / d.c. Operated with Electronic Coil Interface)	2/30
AE ... and TAE Contactors (d.c. Operated with Double-Winding Coil)	2/31
EK 110 ... EK 1000 Contactors (d.c. Operated)	2/32
BC ... and TBC Contactors (d.c. Operated with Solid Magnet Circuit)	2/33

Specific Contactors: Ordering Details

UA... Contactors for Capacitor Switching	2/39
UA .. -R Contactors for Capacitor Switching	2/41
GA 75 and GAE 75 Contactors for d.c. Switching	2/43
AM... Magnetically Latched Contactors	2/45

Applications and Contactor Selection

Capacitor Switching	2/34
Star-Delta Starting	2/46
Control of Three-Phase Slip-Ring Motors	2/48
Autotransformer Starting	2/50
LV/LV Three-Phase Transformer Switching	2/51
Lighting Circuit Switching	2/52
d.c. Circuit Switching	2/56

Technical Data

A..., AF..., AE... and TAE Contactors	2/60
BC... and TBC... Contactors	2/72
EK... Contactors	2/78
Contactor Electrical Durability and Utilization Categories	2/83
Influence of the Length of Conductors used in Contactor Control Circuit	2/90
Parallel Connection of Main Poles	2/92
Temporary or Intermittent Duty	2/93

Questionnaire	2/94
---------------------	------

a.c. Circuit Switching

Switching of 3-phase Cage Motors

AC-3 utilization category

When **making**, the motor current is about $6 \times I_n$.
Breaking while the motor is running at I_n motor F.L.C.

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
kW	4	5.5	7.5	11	15	18.5
A	9	12	17	26	32	37
A	9	12	17	26	32	37
A	7	9	10	17	21	25

Switching of Resistive Circuits

AC-1 utilization category

When **making**, the switched-on current is equal to the I_n load rated current with $\cos \varphi \geq 0.95$.

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		mm²
● Rated operational voltage		V

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

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).



a.c. Control circuit supply

Types

A 9-30-10
A 12-30-10
A 16-30-10

A 26-30-10
A 30-30-10
A 40-30-10



a.c. & d.c. Control circuit supply (Electronic coil interface)

Types

-

-



d.c. Control circuit supply

Types

AE 9-30-00
AE 12-30-00
AE 16-30-00

AE 26-30-00
AE 30-30-00
AE 40-30-00

Contactor Main Accessories

Selection & Ordering

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

Auxiliary contacts



CA 5-..., 1-pole
CAL 5-..., 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
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 TP 40 IA, TP TE5S Direct timing - Independent

Interlocks



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

Types

VE 5-1
VM 5-1

Surge suppressors



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

Types

RV 5
RC 5-1

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

Types & setting range in Amps

TA 25 DU...				TA 42 DU...			
0.10...0.16	1.0...1.4	3.5...5.0	13...19	22...32			
0.16...0.25	1.3...1.8	4.5...6.5	18...25	29...42			
0.25...0.40	1.7...2.4	6.0...8.5	24...32				
0.40...0.63	2.2...3.1	7.5...11					
0.63...1.0	2.8...4.0	10...14					
E16 DU...-10							
0.1...0.32	0.9...2.7	5.7...18.9					
0.3...1.0	2...6.3						

For further information:

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

Types pages	A..	AF..	AE../TAE	BC../TBC..	UA../UA...-R	GA../GAE..	AM..
pages	2/6 ... 2/12	2/18 ... 2/20	2/22	2/24	2/34 ... 2/40	2/42	2/44
pages	2/7 ... 2/13	2/19 ... 2/21	2/23	2/25	2/39 ... 2/41	2/43	2/45
pages	2/60		2/71	2/72 ... 2/77	2/41, 2/60	2/42	2/44

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
22 30 37	45 55	75 90	110 140 160	200 250	315 400
50 65 75 50 65 75 35 43 46	96 110 96 110 65 82	145 185 145 185 120 170	210 260 305 210 260 300 210 220 280	400 460 400 460 350 400	580 750 580 750 500 650
100 115 125 85 95 105 70 80 85	145 160 135 145 115 130	250 275 230 250 180 180	350 400 500 300 350 400 240 290 325	600 700 500 600 400 480	800 1050 700 800 580 720
35 50 50	50 70	120 150	185 240 300	2 x 185 2 x 240	2 x 240 bar / mm 2 x 80 x 5
1000			690		

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 50-30-00 AF 63-30-00 AF 75-30-00	AF 95-30-00 AF 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
AE 50-30-00 AE 63-30-00 AE 75-30-00	AE 95-30-00 AE 110-30-00				

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

180 IA Inverse timing - Front mounting	TE5S Independent mounting	TE5S Direct timing - Independent mounting
--	---------------------------	---

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

RV 5 RC 5-2	RC 5-2	The built-in coil interface eliminates the need of extra surge suppressors on these sizes
----------------	--------	---

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
---	---	--	---	-----------------------	-----------------------

Information about:

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

>> Terminal Marking section 8
>> Dimensions section 9

a.c. Circuit Switching

Switching of Resistive Circuits

AC-1 utilization category

When making, the switched-on current is equal to the I_n load rated current with $\cos \varphi \geq 0.95$.

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

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).

4 N.O. main poles

	a.c. Control circuit supply	Types	A 9-40-00 A 16-40-00	A 26-40-00	
	d.c. Control circuit supply	Types	—	—	

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

	a.c. Control circuit supply	Types	A 9-22-00 A 16-22-00	A 26-22-00	
--	------------------------------------	-------	-------------------------	------------	--

Contactor Main Accessories

Selection & Ordering

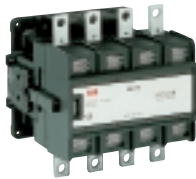
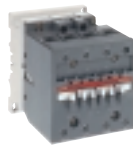
- ▶ Select accessory type and quote required data in plain text.

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 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 - Independent	
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.	Types	RV 5 RC 5-1	

For further information:

	Types	A..	EK..	AF..	AE../TAE..	BC../TBC..	AM..
>> Ordering Details	pages	2/26	2/28, 2/32	2/30	2/31	2/33	2/45
>> Technical Data	pages	2/60 ... 2/71	2/78 ... 2/82	2/60 ... 2/71	2/72 ... 2/77	2/44	

4-pole Contactors



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

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	—	—	—	—
------------	---	------------	---	---	---	---

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 - Independent 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	— 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.

(☞ next pages in this section).

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.

Auxiliary contacts for safety circuits: ☞ page 7/5.

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

(☞ next pages and section 4).

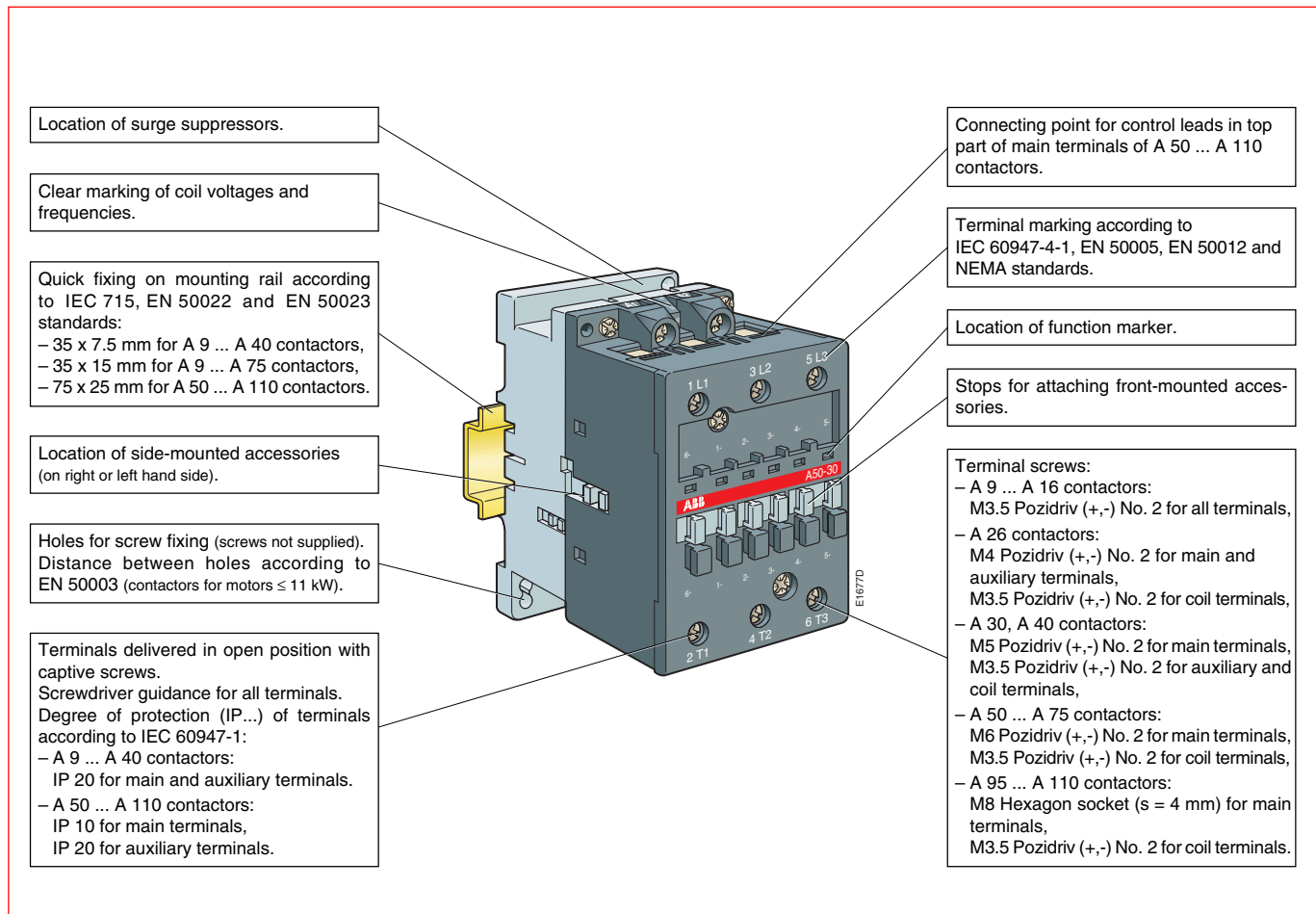
A 9 ... A 40 2-stack contactors:

- 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 ☞ next pages in this section

- 4-pole: A 9 ... A 75 contactors (with 4 N.O. or 2 N.O. + 2 N.C. main poles).
- a.c./d.c. operated controlled supply: AF 50 ... AF 110 contactors.
- d.c. operated: AE 9 ... AE 110 contactors.
- d.c. operated with large coil voltage range: TAE 50 ... TAE 110 contactors.
- contactors for capacitor switching (UA..., UA...-R types), contactors for d.c. switching (GA..., GAE... types).

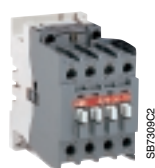


A 9 ... A 110 3-pole Contactors

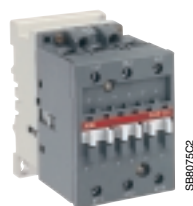
a.c. Operated



A 9-30-10



A 26-30-10



A 50-30-00



A 95-30-00

Ordering Details

Rated operational current AC-3 400 V A	AC-1 $\theta \leq 40^\circ\text{C}$ A	Auxiliary contacts fitted		Type	Order code	Weight kg
		1 st stack	2 nd stack			
					state coil voltage (see table below)	Pack ^{ing} 1 piece
9	25	1	—	A 9-30-10	1SBL 14 1001 R 10	0.340
		—	1	A 9-30-01	1SBL 14 1001 R 01	0.340
		—	2	A 9-30-22	1SBL 14 1001 R 22	0.400
		1	2	A 9-30-32	1SBL 14 1001 R 32	0.400
12	27	1	—	A 12-30-10	1SBL 16 1001 R 10	0.340
		—	1	A 12-30-01	1SBL 16 1001 R 01	0.340
		—	2	A 12-30-22	1SBL 16 1001 R 22	0.400
		1	2	A 12-30-32	1SBL 16 1001 R 32	0.400
17	30	1	—	A 16-30-10	1SBL 18 1001 R 10	0.340
		—	1	A 16-30-01	1SBL 18 1001 R 01	0.340
		—	2	A 16-30-22	1SBL 18 1001 R 22	0.400
		1	2	A 16-30-32	1SBL 18 1001 R 32	0.400
26	45	1	—	A 26-30-10	1SBL 24 1001 R 10	0.600
		—	1	A 26-30-01	1SBL 24 1001 R 01	0.600
		1	2	A 26-30-32	1SBL 24 1001 R 32	0.660
		—	—	—	—	—
32	55	1	—	A 30-30-10	1SBL 28 1001 R 10	0.710
		—	1	A 30-30-01	1SBL 28 1001 R 01	0.710
		1	2	A 30-30-32	1SBL 28 1001 R 32	0.770
		—	—	—	—	—
37	60	1	—	A 40-30-10	1SBL 32 1001 R 10	0.710
		—	1	A 40-30-01	1SBL 32 1001 R 01	0.710
		1	2	A 40-30-32	1SBL 32 1001 R 32	0.770
		—	—	—	—	—
50	100	—	—	A 50-30-00	1SBL 35 1001 R 00	1.160
		1	1	A 50-30-11	1SBL 35 1001 R 11	1.200
		—	2	A 50-30-22	1SBL 35 1001 R 22	1.230
		—	—	—	—	—
65	115	—	—	A 63-30-00	1SBL 37 1001 R 00	1.160
		1	1	A 63-30-11	1SBL 37 1001 R 11	1.200
		—	2	A 63-30-22	1SBL 37 1001 R 22	1.230
		—	—	—	—	—
75	125	—	—	A 75-30-00	1SBL 41 1001 R 00	1.160
		1	1	A 75-30-11	1SBL 41 1001 R 11	1.200
		—	2	A 75-30-22	1SBL 41 1001 R 22	1.230
		—	—	—	—	—
96	145	—	—	A 95-30-00	1SFL 43 1001 R 00	2.000
		1	1	A 95-30-11	1SFL 43 1001 R 11	2.040
		—	2	A 95-30-22	1SFL 43 1001 R 22	2.070
		—	—	—	—	—
110	160	—	—	A 110-30-00	1SFL 45 1001 R 00	2.000
		1	1	A 110-30-11	1SFL 45 1001 R 11	2.040
		—	2	A 110-30-22	1SFL 45 1001 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.

>> Main Accessories page 2/8
>> Thermal O/L Relays page 2/10
>> Technical Data page 2/60

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

A 9 ... A 110 3-pole Contactors

Main Accessories

Fitting Details

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

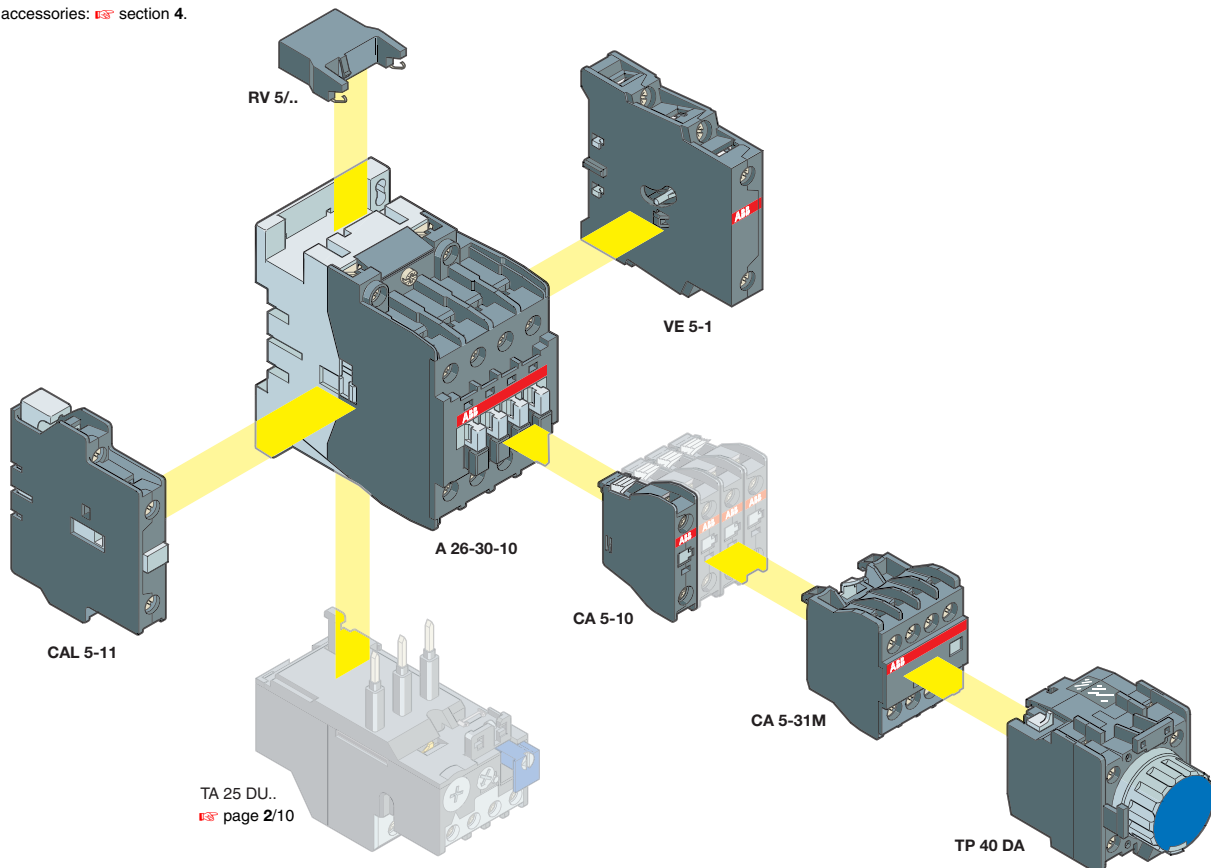
Contactor types	Main poles		Available auxiliary contacts	Front mounted accessories			Side mounted accessories	
				Auxiliary contact 1-pole CA 5-..	Auxiliary contact 4-pole CA 5-..	Pneumatic timer TP .. A	Auxiliary contact 2-pole CAL 5-11	Interlock unit VM 5-.. or VE 5-..
A 9 ... A 26	3 0	1 0		1 to 4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

(1) In mounting position 5 (see pages 2/68), max. 2 x N.C. front-mounted auxiliary contacts only are acceptable - The CAL 5-11 side-mounted blocks offer additional N.C. contacts.

(2) For A 9, A 12, A 16-30-01 + TP..DA in mounting position 5, please consult us.

Contactor and main accessories

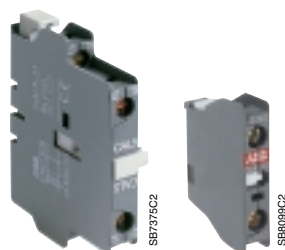
Other accessories: see section 4.



ET684D

A 9 ... A 110 3-pole Contactors

Main Accessories



CAL 5-11

CA 5-10



TP 40 DA



TE5S-240



VE 5-1



RV 5/50

RC 5-1/50

Ordering Details

Auxiliary Contact Blocks

Mounting on contactors	Positioning	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				1 piece
A 9 ... A 110	Front face	1 – – 1	CA 5-10	1SBN 01 0010 R1010	10	0.014
			CA 5-01	1SBN 01 0010 R1001	10	0.014
A 9 ... A 40	Front face	3 1 2 2	CA 5-31 M	1SBN 01 0040 R1131	2	0.060
			CA 5-22 M	1SBN 01 0040 R1122	2	0.060
A 9 ... A 110	Side	1 1	CAL 5-11	1SBN 01 0020 R1011	2	0.050

Pneumatic Timers

Mounting on contactors	Timing range	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				
A 9 ... A 75	Direct 0.1 ... 40 s	1 1	TP 40 DA	1SBN 02 0300 R1000	1	0.070
	Direct 10 ... 180 s	1 1	TP 180 DA	1SBN 02 0300 R1001	1	0.070
	Inverse 0.1 ... 40 s	1 1	TP 40 IA	1SBN 02 0301 R1000	1	0.070
	Inverse 10 ... 180 s	1 1	TP 180 IA	1SBN 02 0301 R1001	1	0.070

Electronic Timers for star-delta starters (dwelling time 50 ms)

Mounting	Timing range	Supply voltage V	Type	Order Code	Pack ^{ing} piece	Weight kg
Independent	Direct	24 a.c. / d.c.	TE5S-24	1SBN 02 0010 R1001	1	0.080
	0.8 ... 8 s	110 ... 120 a.c.	TE5S-120	1SBN 02 0010 R1002	1	0.080
	or	220 ... 240 a.c.	TE5S-240	1SBN 02 0010 R1003	1	0.080
	6 ... 60 s	380 ... 440 a.c.	TE5S-440	1SBN 02 0010 R1004	1	0.080

Interlocks

Mounting on contactors	Feature	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				
A 9 ... A 40	Mech. / electrical	– 2	VE 5-1	1SBN 03 0110 R1000	1	0.076
A 50 ... A 110		– 2	VE 5-2	1SBN 03 0210 R1000	1	0.146
A 9 ... A 40	Mechanical	– –	VM 5-1	1SBN 03 0100 R1000	1	0.066

Note: Use type VE 5-2 for mechanical and electrical interlocking between A 40 and A 50 contactors.

Surge Suppressors

Mounting on contactors	Feature	Voltage range	Type	Order Code	Pack ^{ing} piece	Weight kg
						1 piece
A 9 ... A 110	Varistor	24 ... 50 V a.c./d.c.	RV 5/50	1SBN 05 0010 R1000	2	0.015
		50 ... 133 V a.c./d.c.	RV 5/133	1SBN 05 0010 R1001	2	0.015
		110 ... 250 V a.c./d.c.	RV 5/250	1SBN 05 0010 R1002	2	0.015
		250 ... 440 V a.c./d.c.	RV 5/440	1SBN 05 0010 R1003	2	0.015
A 9 ... A 40	RC	24 ... 50 V a.c.	RC 5-1/50	1SBN 05 0100 R1000	2	0.012
		50 ... 133 V a.c.	RC 5-1/133	1SBN 05 0100 R1001	2	0.012
		110 ... 250 V a.c.	RC 5-1/250	1SBN 05 0100 R1002	2	0.012
		250 ... 440 V a.c.	RC 5-1/440	1SBN 05 0100 R1003	2	0.012
A 50 ... A 110	RC	24 ... 50 V a.c.	RC 5-2/50	1SBN 05 0200 R1000	2	0.015
		50 ... 133 V a.c.	RC 5-2/133	1SBN 05 0200 R1001	2	0.015
		110 ... 250 V a.c.	RC 5-2/250	1SBN 05 0200 R1002	2	0.015
		250 ... 440 V a.c.	RC 5-2/440	1SBN 05 0200 R1003	2	0.015

Other Accessories

A wide range of accessories is available:  section 4

- various auxiliary contact blocks for specific controls and use,
- interface relays,
- connecting auxiliaries: strips, connectors, additional pieces, etc.
- impulse contact blocks, lamp holder and fuse holder blocks,
- function marker.

>> Technical Data of Accessories section 4
>> Auxiliary Contacts for Safety Circuits page 7/5

>> Dimensions section 9

A 9 ... A 110 3-pole Contactors

Thermal O/L Relays

Fitting Details

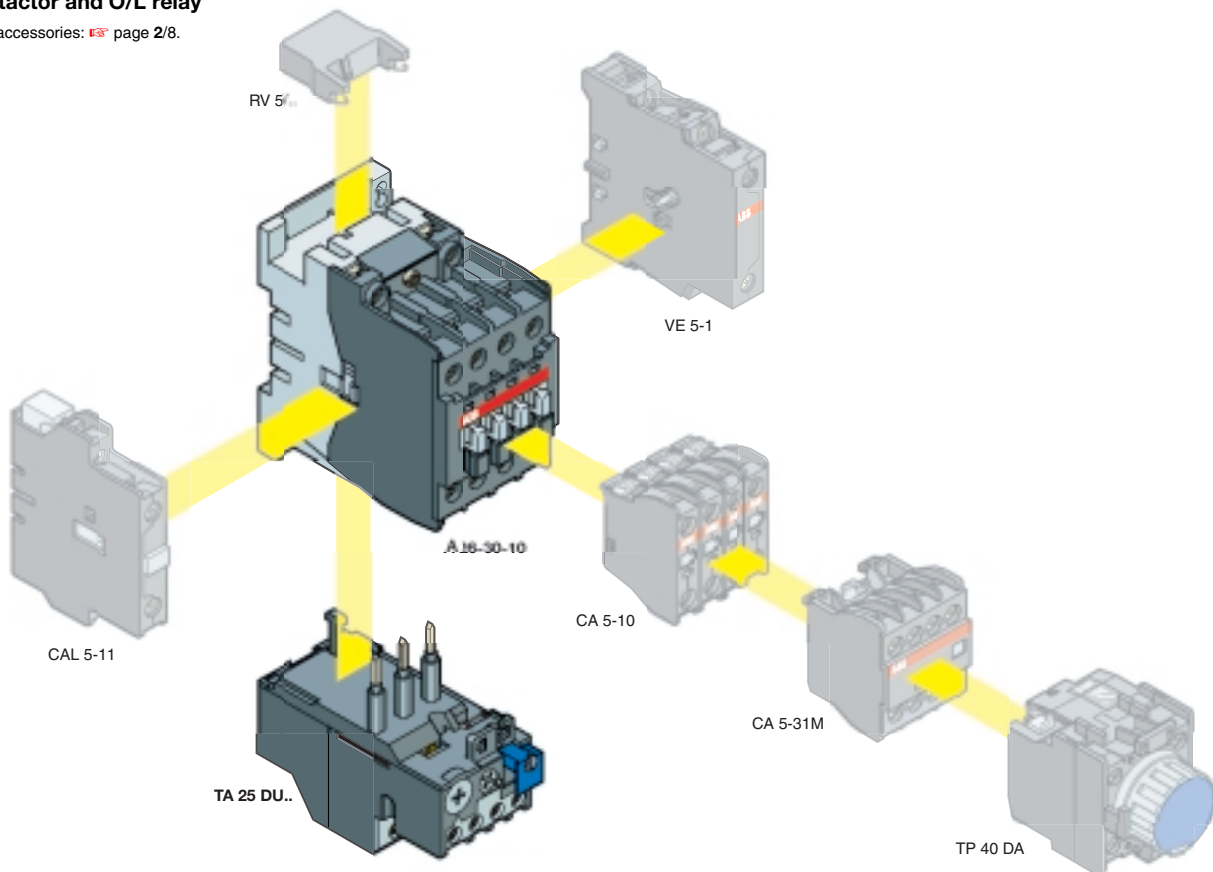
The addition of a thermal O/L relay on the contactor does not prevent fitting of many other accessories as shown below and described on page 2/8.

Contactor type	A 9 ... A 26	A 30 ... A 40	A 50 ... A 75	A 95 ... A 110
Thermal O/L relay	TA 25 DU..	TA 25 DU.. (1) TA 42 DU.. (1)	TA 75 DU..	TA 80 DU.. (1) TA 110 DU.. (1)

(1) According to the setting range related to the motor F.L.C.

Contactor and O/L relay

Main accessories:  page 2/8.



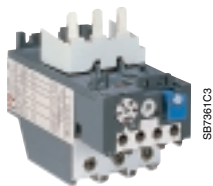
E1685D

A 9 ... A 110 3-pole Contactors

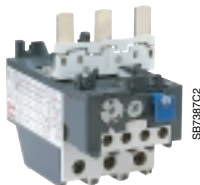
Thermal O/L Relays



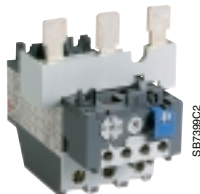
TA 25 DU



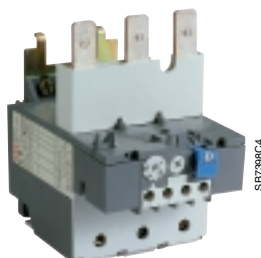
TA 42 DU



TA 75 DU



TA 80 DU



TA 110 DU

Ordering Details

Thermal O/L Relays, Class 10A

For contactors:	Setting range	Type	Order code	Weight kg Pack ^{ing} 1 piece
A 9 ... A 30	A			
	0.10 ... 0.16	TA 25 DU 0.16	1SAZ 21 1201 R1005	0.150
	0.16 ... 0.25	TA 25 DU 0.25	1SAZ 21 1201 R1009	0.150
	0.25 ... 0.40	TA 25 DU 0.4	1SAZ 21 1201 R1013	0.150
	0.40 ... 0.63	TA 25 DU 0.63	1SAZ 21 1201 R1017	0.150
	0.63 ... 1.00	TA 25 DU 1.0	1SAZ 21 1201 R1021	0.150
	1.0 ... 1.4	TA 25 DU 1.4	1SAZ 21 1201 R1023	0.150
	1.3 ... 1.8	TA 25 DU 1.8	1SAZ 21 1201 R1025	0.150
	1.7 ... 2.4	TA 25 DU 2.4	1SAZ 21 1201 R1028	0.150
	2.2 ... 3.1	TA 25 DU 3.1	1SAZ 21 1201 R1031	0.150
	2.8 ... 4.0	TA 25 DU 4.0	1SAZ 21 1201 R1033	0.150
	3.5 ... 5.0	TA 25 DU 5.0	1SAZ 21 1201 R1035	0.150
	4.5 ... 6.5	TA 25 DU 6.5	1SAZ 21 1201 R1038	0.150
	6.0 ... 8.5	TA 25 DU 8.5	1SAZ 21 1201 R1040	0.150
	7.5 ... 11	TA 25 DU 11	1SAZ 21 1201 R1043	0.150
	10 ... 14	TA 25 DU 14	1SAZ 21 1201 R1045	0.150
	13 ... 19	TA 25 DU 19	1SAZ 21 1201 R1047	0.150
	18 ... 25	TA 25 DU 25	1SAZ 21 1201 R1051	0.150
	24 ... 32	TA 25 DU 32	1SAZ 21 1201 R1053	0.170
A 30 ... A 40	18 ... 25	TA 42 DU 25	1SAZ 31 1201 R1001	0.330
	22 ... 32	TA 42 DU 32	1SAZ 31 1201 R1002	0.330
	29 ... 42	TA 42 DU 42	1SAZ 31 1201 R1003	0.330
A 50 ... A 75	18 ... 25	TA 75 DU 25	1SAZ 32 1201 R1001	0.330
	22 ... 32	TA 75 DU 32	1SAZ 32 1201 R1002	0.330
	29 ... 42	TA 75 DU 42	1SAZ 32 1201 R1003	0.330
	36 ... 52	TA 75 DU 52	1SAZ 32 1201 R1004	0.330
	45 ... 63	TA 75 DU 63	1SAZ 32 1201 R1005	0.330
	60 ... 80	TA 75 DU 80	1SAZ 32 1201 R1006	0.330
A 95 ... A 110	29 ... 42	TA 80 DU 42	1SAZ 33 1201 R1003	0.360
	36 ... 52	TA 80 DU 52	1SAZ 33 1201 R1004	0.360
	45 ... 63	TA 80 DU 63	1SAZ 33 1201 R1005	0.360
	60 ... 80	TA 80 DU 80	1SAZ 33 1201 R1006	0.360
	65 ... 90	TA 110 DU 90	1SAZ 41 1201 R1001	0.750
	80 ... 110	TA 110 DU 110	1SAZ 41 1201 R1002	0.750

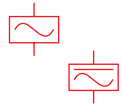
Separate Mounting Kit

For O/L relays:	Type	Order code	Weight kg Pack ^{ing} 1 piece
TA 25 DU ≤ 25	DB 25/25 A	1SAZ 20 1108 R0001	0.050
TA 25 DU 32	DB 25/32 A	1SAZ 20 1108 R0002	0.075
TA 42 DU, TA 75 DU, TA 80 DU	DB 80	1SAZ 30 1110 R0001	0.170
TA 110 DU	DB 200	1SAZ 40 1110 R0001	0.230

A 145 ... AF 750 3-pole Contactors

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

a.c. / d.c. Operated - AF 400 ... AF 750 Contactors



Application

A 145 ... AF 750 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 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...

(next pages in this section).

Description

The **A 145 ... AF 750** 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,

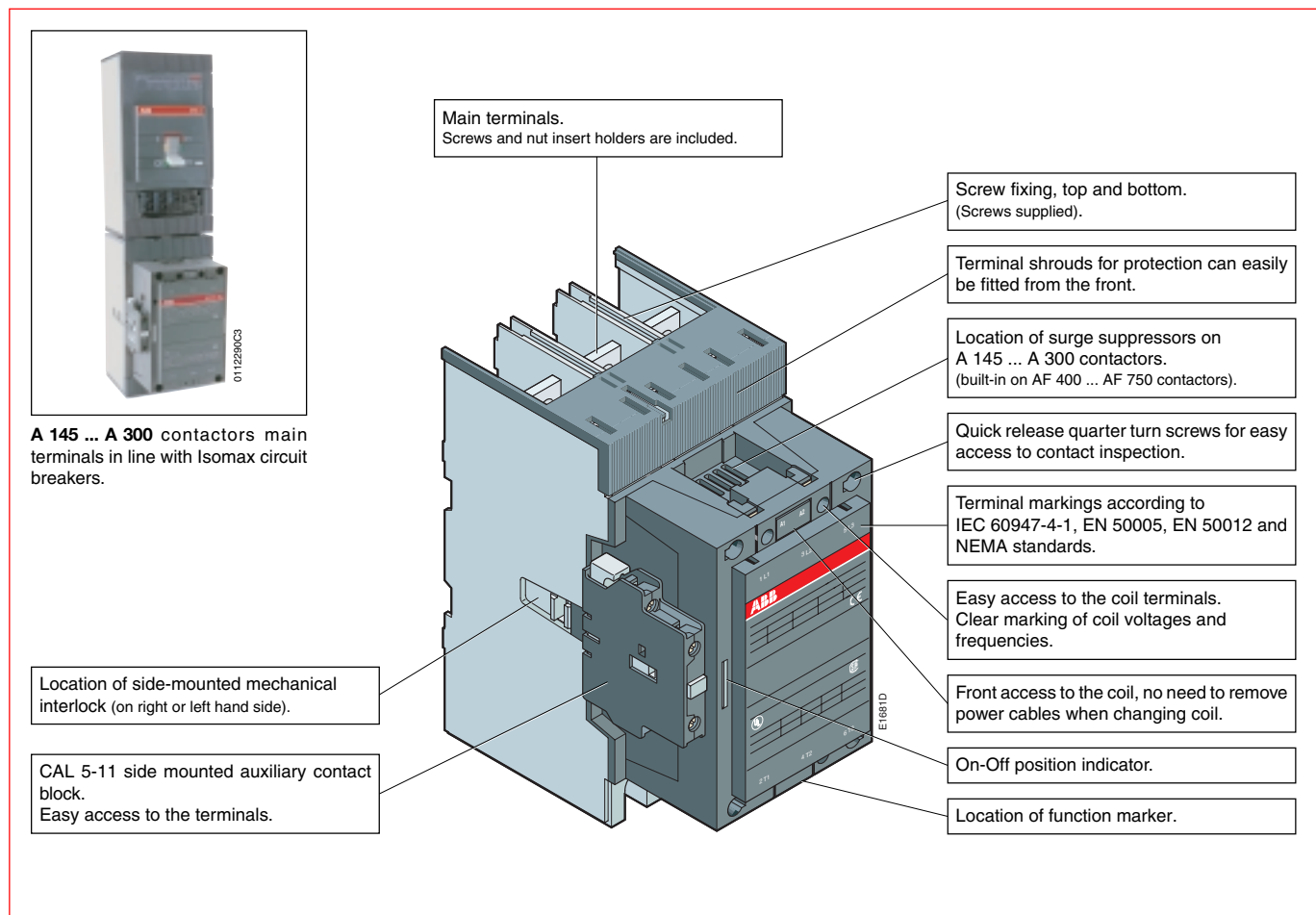
AF 400 ... AF 750 contactors: a.c. operated, large voltage range, with electronic coil interface, with laminated magnet circuit.

Contactors AF 400 ... AF 750 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 (Description page 2/20).

- Accessories: a wide range of accessories is available (next pages and section 4).

Variants next pages in this section

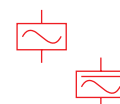
- a.c./d.c. operated, large voltage range, with electronic coil interface: AF 145 ... AF 300 contactors.



A 145 ... AF 750 3-pole Contactors

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

a.c. / d.c. Operated - AF 400 ... AF 750 Contactors



Ordering Details

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40^\circ \text{C}$ A			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
145	250	1 2	1 2	A 145-30-11 A 145-30-22	1SFL 47 1001 R 11 1SFL 47 1001 R 22	3.500 3.500
185	275	1 2	1 2	A 185-30-11 A 185-30-22	1SFL 49 1001 R 11 1SFL 49 1001 R 22	3.500 3.500
210	350	1 2	1 2	A 210-30-11 A 210-30-22	1SFL 51 1001 R 11 1SFL 51 1001 R 22	6.100 6.100
260	400	1 2	1 2	A 260-30-11 A 260-30-22	1SFL 53 1001 R 11 1SFL 53 1001 R 22	6.100 6.100
305	500	1 2	1 2	A 300-30-11 A 300-30-22	1SFL 55 1001 R 11 1SFL 55 1001 R 22	6.100 6.100
400	600	1 2	1 2	AF 400-30-11 AF 400-30-22	1SFL 57 7001 R 11 1SFL 57 7001 R 22	12.00 12.00
460	700	1 2	1 2	AF 460-30-11 AF 460-30-22	1SFL 59 7001 R 11 1SFL 59 7001 R 22	12.00 12.00
580	800	1 2	1 2	AF 580-30-11 AF 580-30-22	1SFL 61 7001 R 11 1SFL 61 7001 R 22	15.00 15.00
750	1050	1 2	1 2	AF 750-30-11 AF 750-30-22	1SFL 63 7001 R 11 1SFL 63 7001 R 22	15.00 15.00

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

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

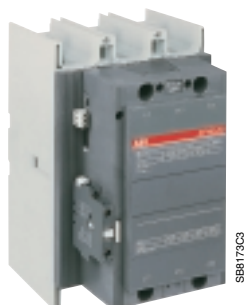
AF... contactors with electronic coil interface: electromagnetic compatibility and **A** or **B** environment definitions see page 2/21.



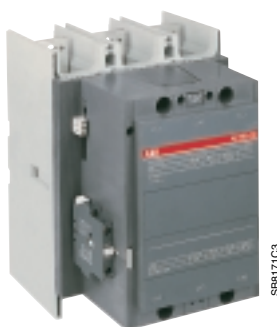
A 145-30-11



A 300-30-11



AF 460-30-11



AF 750-30-11

>> Main Accessories page 2/14
>> Thermal & Electronic O/L Relays page 2/16
>> Technical Data page 2/61

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

A 145 ... AF 750 3-pole Contactors

Main Accessories

Fitting Details

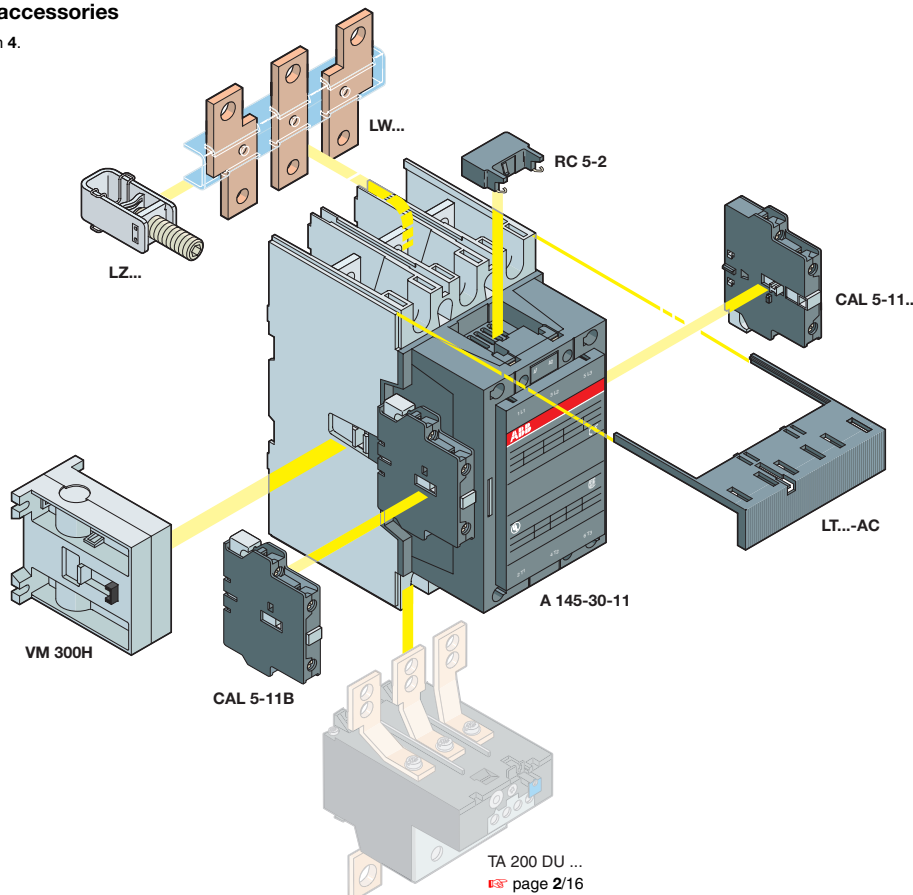
Contactor types	Main poles	Available auxiliary contacts	Add-on auxiliary contact blocks (N.O. + N.C.) CAL 5-11, CAL 5-11B	Mechanical interlock units (for two horizontal mounted contactors)	Mounting and positioning Factory mounted auxiliary contacts Add-on CAL 5-11 auxiliary contacts Add-on CAL 5-11B auxiliary contacts
A 145 ... A 300 AF 145 ... AF 750	3 0 3 0	1 1 1 1	1 x CAL 5-11 + 2 x CAL 5-11B	—	
A 145 ... A 300 AF 145 ... AF 750	3 0 3 0	2 2 2 2	— 2 x CAL 5-11B	—	
A 145 ... A 185 AF 145 ... AF 185	3 0 3 0	1 1 1 1	2 x CAL 5-11 (1) + 3 x CAL 5-11B (1) + VM ...H (2)		
A 145 ... A 185 AF 145 ... AF 185	3 0 3 0	2 2 2 2	— 3 x CAL 5-11B (1) + VM ...H (2)		
A 210 ... A 300 AF 210 ... AF 750	3 0 3 0	1 1 1 1	2 x CAL 5-11 (1) + 4 x CAL 5-11B (1) + VM ...H (2)		
A 210 ... A 300 AF 210 ... AF 750	3 0 3 0	2 2 2 2	— 4 x CAL 5-11B (1) + VM ...H (2)		

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

(2) Interlock type, according to the contactor ratings (E next page).

Contactor and main accessories

Other accessories: E section 4.



TA 200 DU ...
E page 2/16

E1688D

A 145 ... AF 750 3-pole Contactors

Main accessories



CAL 5-11



TE5S-240



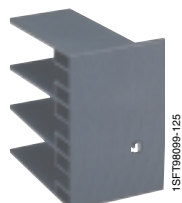
VM 300H



RC...



LT...-AC



LT...-AL

Ordering Details

Auxiliary Contact Blocks

Mounting on contactors	Positioning	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
A 145 to AF 750	Side	1 1	CAL 5-11	1SBN 01 0020 R1011	1	0.050
		1 1	CAL 5-11B	1SBN 01 0420 R3311	1	0.050

Electronic Timers for star-delta starters (dwelling time 50 ms) - (Prohibited with AF... contactors, see pages 2/46, 2/47)

Mounting	Timing range	Supply voltage V	Type	Order Code	Pack ^{ing} piece	Weight kg
Independent	Direct 0.8 ... 8 s or 6 ... 60 s	24 a.c. / d.c.	TE5S-24	1SBN 02 0010 R1001	1	0.080
		110 ... 120 a.c.	TE5S-120	1SBN 02 0010 R1002	1	0.080
		220 ... 240 a.c.	TE5S-240	1SBN 02 0010 R1003	1	0.080
		380 ... 440 a.c.	TE5S-440	1SBN 02 0010 R1004	1	0.080

Interlocks for two horizontal mounted contactors

Left contactor	Right contactor	Feature	Type	Order Code	Pack ^{ing} piece	Weight kg
A 95 ... 300	A 145 ... 300	Mechanical	VM 300H	1SFN 03 4700 R1000	1	0.150
A 210 ... 300	AF 400 ... 460	Mechanical	VM 300/460H	1SFN 03 5100 R1000	1	0.150
AF 400 ... 750	AF 400 ... 460	Mechanical	VM 750H	1SFN 03 5700 R1000	1	0.200

Surge Suppressors

Mounting on contactors	Feature	Voltage range	Type	Order Code	Pack ^{ing} piece	Weight kg
A 145 ... 300	RC	24 ... 50 V a.c.	RC 5-2/50	1SBN 05 0200 R1000	1	0.015
		50 ... 133 V a.c.	RC 5-2/133	1SBN 05 0200 R1001	1	0.015
		110 ... 250 V a.c.	RC 5-2/250	1SBN 05 0200 R1002	1	0.015
		250 ... 440 V a.c.	RC 5-2/440	1SBN 05 0200 R1003	1	0.015

Note: The built-in coil interface eliminates the need of extra surge suppressors on the AF 400 to AF 750 contactors.

Shrouds (terminal protection acc. to VDE 0106, part 100)

Mounting on contactors	Suitable for contactor with	Type	Order Code	Pack ^{ing} piece	Weight kg
A 145, A 185	Cable connectors	LT 185-AC	1SFN 12 4701 R1000	2	0.050
A 145, A 185	Cable lugs	LT 185-AL	1SFN 12 4703 R1000	2	0.220
A 210 ... A 300	Cable connectors	LT 300-AC	1SFN 12 5101 R1000	2	0.070
A 210 ... A 300	Cable lugs	LT 300-AL	1SFN 12 5103 R1000	2	0.280
AF 400, AF 460	Cable connectors	LT 460-AC	1SFN 12 5701 R1000	2	0.100
AF 400, AF 460	Cable lugs	LT 460-AL	1SFN 12 5703 R1000	2	0.800
AF 580, AF 750	Cable connectors	LT 750-AC	1SFN 12 6101 R1000	2	0.120
AF 580, AF 750	Cable lugs	LT 750-AL	1SFN 12 6103 R1000	2	0.825

Other Accessories

A wide range of accessories is available: see section 4

- **LZ...** connectors,
- **LW...** enlargement pieces for terminals,
- connecting auxiliaries: shorting bars, connection bars, additional pieces, etc.
- shrouds for shorting bars,
- interlocks for two vertical contactors,
- adapter plates.

>> Technical Data of Accessories section 4

>> Dimensions section 9

A 145 ... AF 750 3-pole Contactors

Thermal & Electronic O/L Relays

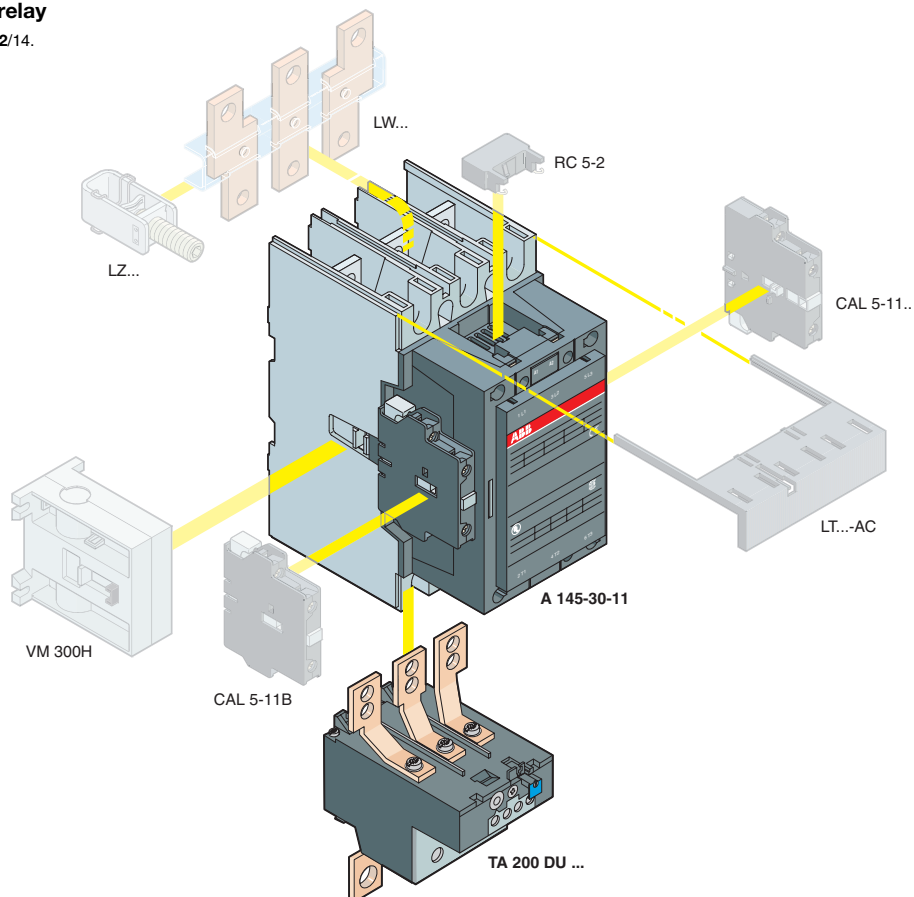
Fitting Details

The addition of a thermal O/L relay on the contactor does not prevent fitting of many other accessories as shown below and described on page 2/14.

Contactor type	A 145, A 185	A 210 ... A 300	AF 400, AF 460	AF 580, AF 750
Thermal O/L relay	TA 200 DU...	TA 450 DU...	–	–
Electronic O/L relay	E 200 DU...	E 320 DU...	E 500 DU...	E 800 DU...

Contactor and O/L relay

Main accessories:  page 2/14.



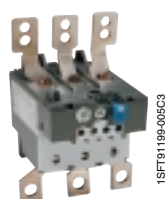
E1687D

A 145 ... AF 750 3-pole Contactors

Thermal & Electronic O/L Relays

2

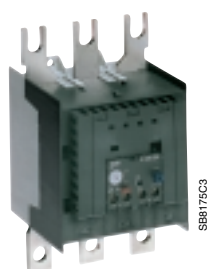
3-pole Contactors



TA 200 DU



TA 450 DU



E 320 DU



E 800 DU



A 185 contactor with
E 200 DU electronic O/L relay and
LT 200 E terminal shroud

Ordering Details

Thermal O/L Relays, Class 10A

For contactors:	Setting range	Type	Order code	Weight kg Pack ^{ing} 1 piece
A				
A 145, A 185	66 ... 90	TA 200 DU 90	1SAZ 42 1201 R1001	0.750
	80 ... 110	TA 200 DU 110	1SAZ 42 1201 R1002	0.750
	100 ... 135	TA 200 DU 135	1SAZ 42 1201 R1003	0.750
	110 ... 150	TA 200 DU 150	1SAZ 42 1201 R1004	0.750
	130 ... 175	TA 200 DU 175	1SAZ 42 1201 R1005	0.750
	150 ... 200	TA 200 DU 200	1SAZ 42 1201 R1006	0.750
A 210 ... A 300	130 ... 185	TA 450 DU 185	1SAZ 51 1201 R1001	1.500
	165 ... 235	TA 450 DU 235	1SAZ 51 1201 R1002	1.500
	220 ... 310	TA 450 DU 310	1SAZ 51 1201 R1003	1.500

Electronic O/L Relays, Adjustable Class 10, 20 and 30

For contactors:	Setting range	Type	Order code	Weight kg Pack ^{ing} 1 piece
A				
A 145, A 185	60 ... 200	E 200 DU	1SAX 51 1001 R0001	1.120
A 210 ... A 300	100 ... 320	E 320 DU	1SAX 61 1001 R0002	1.260
AF 400, AF 460	150 ... 500	E 500 DU	1SAX 71 1001 R0001	1.210
AF 580, AF 750	250 ... 800	E 800 DU	1SAX 81 1001 R0001	4.240

Kit for Mounting on the Contactors

For contactors:	For O/L relays:	Type	Order code	Weight kg Pack ^{ing} 1 piece
A 145, A 185	TA 450 DU/SU	DT 450/A 185	1SAZ 50 1901 R0001	0.500
A 210 ... A 300		DT 450/A 300	1SAZ 50 1902 R1001	0.750
AF 400, AF 460	E 500 DU	DT 500/AF 460	1SAX 70 1902 R0001	0.720
AF 580, AF 750	E 800 DU	DT 800/AF 750	1SAX 80 1902 R0001	1.400

Separate Mounting Kit

For O/L relay:	Type	Order code	Weight kg Pack ^{ing} 1 piece
TA 200 DU	DB 200	1SAZ 40 1110 R0001	0.230

Terminal Shrouds for TA 200 DU Thermal O/L Relay

Fitting	Type	Order code	Weight kg Pack ^{ing} 1 piece
Load side	LT 200/A	1SAZ 40 1901 R1001	0.070
Between TA 200 DU and A 145, A 185	LT 185-AY	1SFN 12 4704 R1000	0.050

Terminal Shrouds for Electronic O/L Relay

For electronic O/L relay	Type	Order code	Weight kg Pack ^{ing} 1 piece
E 200 DU	LT 200 E	1SAX 50 1904 R0001	0.120
E 320 DU	LT 320 E	1SAX 60 1904 R0001	0.120
E 500 DU	LT 500 E	1SAX 70 1904 R0001	0.240
E 800 DU	LT 800 E	1SAX 80 1904 R0001	0.240

>> Technical Data section 5

>> Dimensions section 9

AF 50 ... AF 110 3-pole Contactors

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

Electronic Coil Interface



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 different countries where the final machine will be used 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:

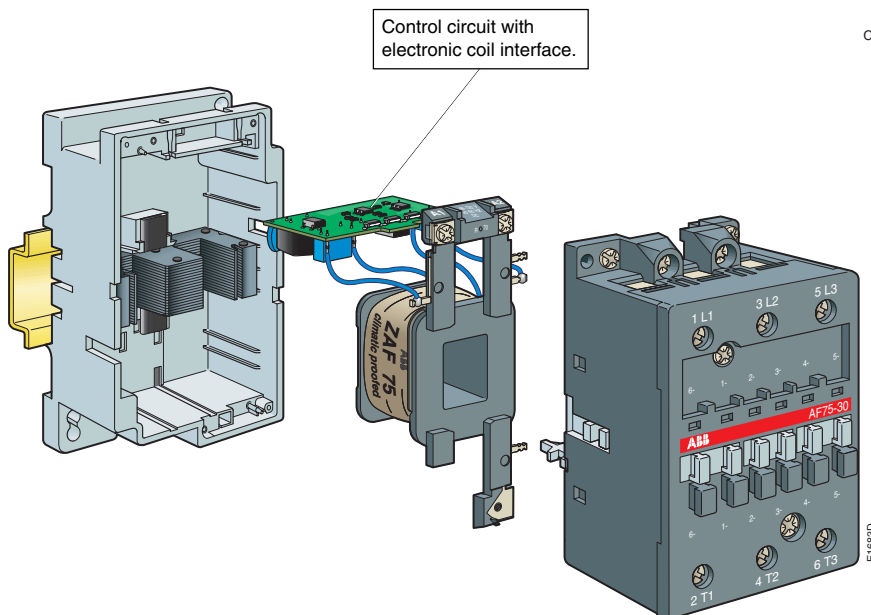
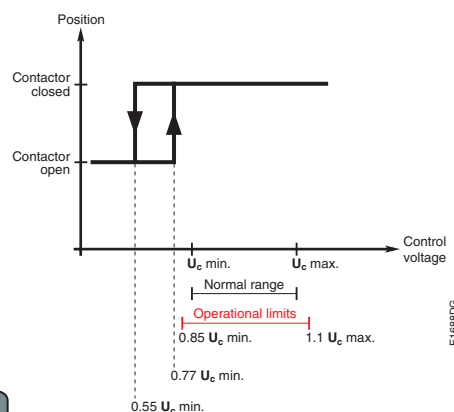
The contactors are fitted with an electronic interface that very precisely controls the voltage to the coil. The electronic control circuit always works using d.c. current through the coil and in a.c. operation the current is rectified before being applied to the coil. To achieve the levels of the currents 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

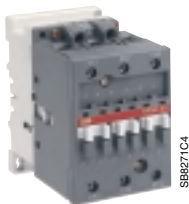
- Wide voltage range, e.g. 100 ... 250 V a.c. and d.c.,
 - Can manage large voltage variations,
 - Reduced power consumption,
 - Very distinct closing and opening,
 - Noise free,
 - Can withstand voltage interruptions or voltage dips in the control supply (≤ 20 ms).
- Accessories: a wide range of accessories is available (☞ next pages and section 4).

AF... contactors specific design (☞ page 2/6 for general design).

Operating diagram



AF 50 ... AF 110 3-pole Contactors
a.c. / d.c. Operated - Large Voltage Range
Electronic Coil Interface



AF 50-30



AF 95-30

Ordering Details

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40\text{ }^{\circ}\text{C}$ A			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
50	100	—	—	AF 50-30-00 AF 50-30-11	1SBL 35 7001 R 00 1SBL 35 7001 R 11	1.180 1.220
65	115	—	—	AF 63-30-00 AF 63-30-11	1SBL 37 7001 R 00 1SBL 37 7001 R 11	1.180 1.220
75	125	—	—	AF 75-30-00 AF 75-30-11	1SBL 41 7001 R 00 1SBL 41 7001 R 11	1.180 1.220
96	145	—	—	AF 95-30-00 AF 95-30-11	1SFL 43 7001 R 00 1SFL 43 7001 R 11	2.030 2.070
110	160	—	—	AF 110-30-00 AF 110-30-11	1SFL 45 7001 R 00 1SFL 45 7001 R 11	2.030 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 international standards IEC 60947-1 (2000-10-Ed.3.1), 60947-4-1 (2000-11-Ed.2) and European standards 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 (EN 50082-2 article 4) including highly disturbing sources".

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

>> Main Accessories	page 2/8	>> General - Approvals	section 7
>> Thermal O/L Relays	page 2/10	>> Terminal Marking and Positioning	section 8
>> Technical Data	page 2/60	>> Dimensions	section 9

AF 145 ... AF 750 3-pole Contactors

a.c. / d.c. Operated - Large Voltage Range
Electronic Coil Interface



Application

AF 145 ... AF 750 contactors are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 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 different countries where the final machine will be used 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 750** 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

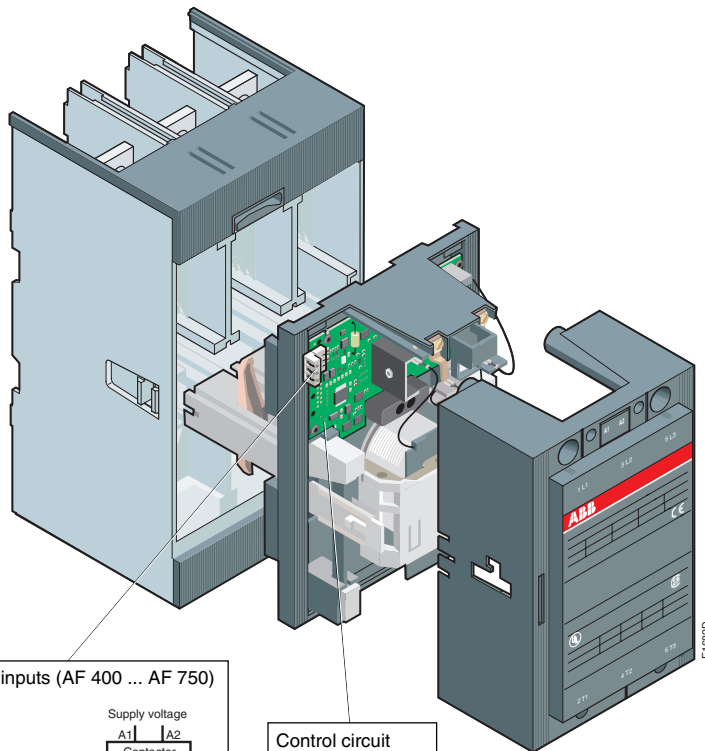
- Wide voltage range, e.g. 100 ... 250 V a.c. and d.c.,
- Can manage large voltage variations,
- Reduced power consumption,
- Very distinct closing and opening,
- Noise free,
- Can withstand voltage interruptions or voltage dips in the control supply (≤ 20 ms).

● Control inputs

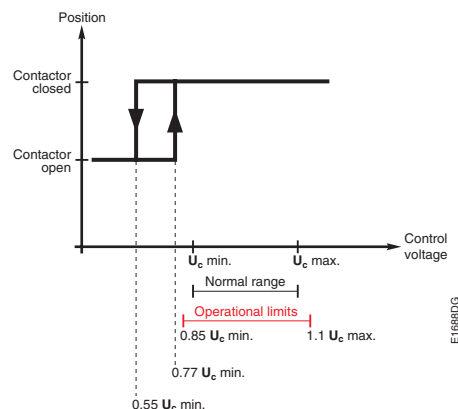
The large sizes **AF 400 ... AF 750** are as standard equipped with low voltage inputs for control, for example by a PLC (see drawing below).

● Accessories: a wide range of accessories is available (see section 4).

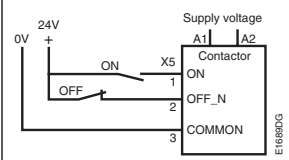
AF... contactors specific design (see page 2/12 for general design)



Operating diagram



Control inputs (AF 400 ... AF 750)



Control circuit with electronic coil interface.

AF 145 ... AF 750 3-pole Contactors

a.c. / d.c. Operated - Large Voltage Range
Electronic Coil Interface



AF 185-30-11



AF 300-30-11



AF 460-30-11



AF 750-30-11

Ordering Details

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40^\circ\text{C}$ A			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
145	250	1 2	1 2	AF 145-30-11 AF 145-30-22	1SFL 47 7001 R 1SFL 47 7001 R	3.600 3.600
185	275	1 2	1 2	AF 185-30-11 AF 185-30-22	1SFL 49 7001 R 1SFL 49 7001 R	3.600 3.600
210	350	1 2	1 2	AF 210-30-11 AF 210-30-22	1SFL 51 7001 R 1SFL 51 7001 R	6.200 6.200
260	400	1 2	1 2	AF 260-30-11 AF 260-30-22	1SFL 53 7001 R 1SFL 53 7001 R	6.200 6.200
305	500	1 2	1 2	AF 300-30-11 AF 300-30-22	1SFL 55 7001 R 1SFL 55 7001 R	6.200 6.200
400	600	1 2	1 2	AF 400-30-11 AF 400-30-22	1SFL 57 7001 R 1SFL 57 7001 R	12.00 12.00
460	700	1 2	1 2	AF 460-30-11 AF 460-30-22	1SFL 59 7001 R 1SFL 59 7001 R	12.00 12.00
580	800	1 2	1 2	AF 580-30-11 AF 580-30-22	1SFL 61 7001 R 1SFL 61 7001 R	15.00 15.00
750	1050	1 2	1 2	AF 750-30-11 AF 750-30-22	1SFL 63 7001 R 1SFL 63 7001 R	15.00 15.00

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 - 50Hz	Voltage V - 60Hz	Code
—	24 ... 60	6 8 (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 international standards IEC 60947-1 (2000-10-Ed.3.1), 60947-4-1 (2000-11-Ed.2) and European standards 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 (EN 50082-2 article 4) including highly disturbing sources".

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

>> Main Accessories page 2/14
>> Thermal & Electronic O/L Relays page 2/16
>> Technical Data page 2/61

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

2

3-pole Contactors

AE... and TAE... 3-pole Contactors

d.c. Operated with Double-Winding Coil



Application

AE 9 ... AE 110 contactors, as well as **TAE...** versions, 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 **TAE...** contactors are designed to operate in control circuits with large voltage variations. Example: battery supply.

Description

The **AE...** series 3-pole contactors are d.c. operated contactors.

The **TAE...** series 3-pole contactors are d.c. operated contactors with **large coil voltage range**.

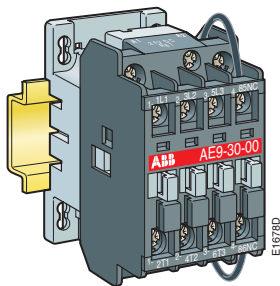
- Main poles and auxiliary contact blocks
 - 3 main poles,
 - front and side mounted add-on auxiliary contact blocks.

Auxiliary contacts for safety circuits: page 7/5.
- Control circuit: laminated magnet circuit and double-winding coil fed from d.c. supply via an insertion contact mounted on the device
 - AE 9 ... AE 40: built-in lagging contact for insertion of the second winding,
 - AE 50 ... AE 110, TAE 50 ... TAE 110: side mounted add-on lagging contact, for insertion of the second winding (factory mounted).
- Accessories: a wide range of accessories is available (section 4).

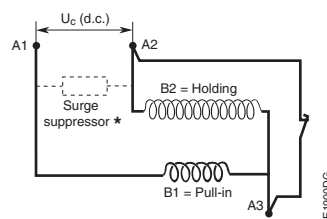
Variants next pages in this section

- 4-pole: AE 45 ... AE 75 contactors (with 4 N.O. main poles or 2 N.O. + 2 N.C. main poles),
- 4-pole: TAE 45 ... TAE 75 contactors (with 4 N.O. main poles).

AE... and TAE... contactors specific design (page 2/6 for general design)



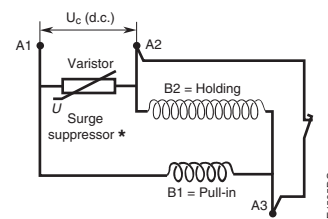
- **AE 9 ... AE 40:** Built-in lagging contact for insertion of the "holding" winding



AE 9 ... AE 40, $U_c < 110$ V d.c.

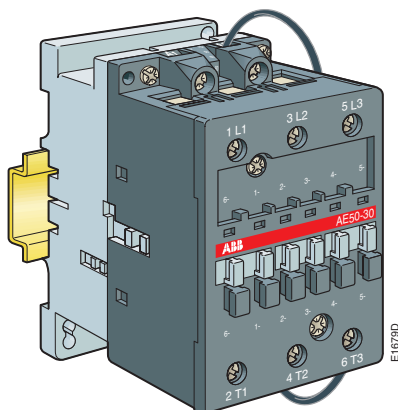
* Addition of RT 5 or RV 5 surge suppressor, if required.

Please order separately (page 4/15).

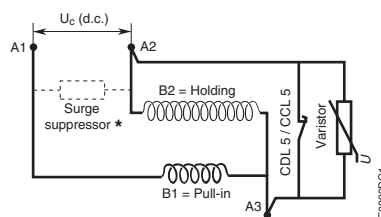


AE 9 ... AE 40, $U_c \geq 110$ V d.c.

* RV 5 surge suppressor fitted as standard (RT 5 type on request).



- **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

C..5-01 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 5-01 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 (page 4/15).

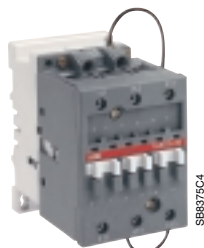
AE... and TAE... 3-pole Contactors
d.c. Operated with Double-Winding Coil



AE 12-30-00

Coil voltages and codes: 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



TAE 50-30-00

Coil voltages and codes: TAE...

Voltage - U _c ... 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 for the TAE... contactors.

Ordering Details: AE...

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40\text{ }^{\circ}\text{C}$ A			state coil voltage  (see opposite table)	state coil voltage code  (see opposite table)	Pack ^{ing} 1 piece
9	25	—	—	AE 9-30-00 	1SBL 14 9001 R 	0.340
12	27	—	—	AE 12-30-00 	1SBL 16 9001 R 	0.340
16	30	—	—	AE 16-30-00 	1SBL 18 9001 R 	0.340
26	45	—	—	AE 26-30-00 	1SBL 24 9001 R 	0.600
32	55	—	—	AE 30-30-00 	1SBL 28 9001 R 	0.710
37	60	—	—	AE 40-30-00 	1SBL 32 9001 R 	0.710
50	100	—	—	AE 50-30-00 	1SBL 35 9001 R 	1.200
		1	1	AE 50-30-11 	1SBL 35 9001 R 	1.240
65	115	—	—	AE 63-30-00 	1SBL 37 9001 R 	1.200
		1	1	AE 63-30-11 	1SBL 37 9001 R 	1.240
75	125	—	—	AE 75-30-00 	1SBL 41 9001 R 	1.200
		1	1	AE 75-30-11 	1SBL 41 9001 R 	1.240
96	145	—	—	AE 95-30-00 	1SFL 43 9001 R 	2.040
		1	1	AE 95-30-11 	1SFL 43 9001 R 	2.070
110	160	—	—	AE 110-30-00 	1SFL 45 9001 R 	2.040
		1	1	AE 110-30-11 	1SFL 45 9001 R 	2.070

Ordering Details: TAE... (Contactors with large coil voltage range)

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40\text{ }^{\circ}\text{C}$ A			state coil voltage  (see opposite table)	state coil voltage code  (see opposite table)	Pack ^{ing} 1 piece
50	100	— 1	— 1	TAE 50-30-00  TAE 50-30-11 	1SBL 35 9061 R  1SBL 35 9061 R 	1.200 1.240
75	125	— 1	— 1	TAE 75-30-00  TAE 75-30-11 	1SBL 41 9061 R  1SBL 41 9061 R 	1.200 1.240
96	145	— 1	— 1	TAE 95-30-00  TAE 95-30-11 	1SFL 43 9061 R  1SFL 43 9061 R 	2.040 2.070
110	160	— 1	— 1	TAE 110-30-00  TAE 110-30-11 	1SFL 45 9061 R  1SFL 45 9061 R 	2.040 2.070

Note: For selection and use of surge suppressors (e.g. diode, varistor, etc.) see page 4/15.

>> Main Accessories page 2/8
>> Thermal O/L Relays page 2/10
>> Technical Data page 2/60

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

2

3-pole Contactors

BC... and TBC... 3-pole Contactors

d.c. Operated with Solid Magnetic Circuit



Application

BC 9 ... BC 30 contactors, as well as **TBC...** versions, are mainly used for controlling 3-phase motors and generally for controlling power circuits up to 690 V a.c. and 440 V d.c.

The **TBC...** contactors are designed to operate in control circuits with large voltage variations. Example: battery supply.

Description

The **BC...** series 3-pole contactors are d.c. operated contactors.

The **TBC...** series 3-pole contactors are d.c. operated contactors with **large coil voltage range**.

- Main poles and auxiliary contact blocks

BC 9 ... BC 25 and **TBC 9 ... TBC 25** 1-stack contactors:

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

Auxiliary contacts for safety circuits: page 7/5.

TBC 30 1-stack contactors:

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

Auxiliary contacts for safety circuits: page 7/5.

BC 18 and **BC 30** 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.

TBC 30 2-stack contactors:

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

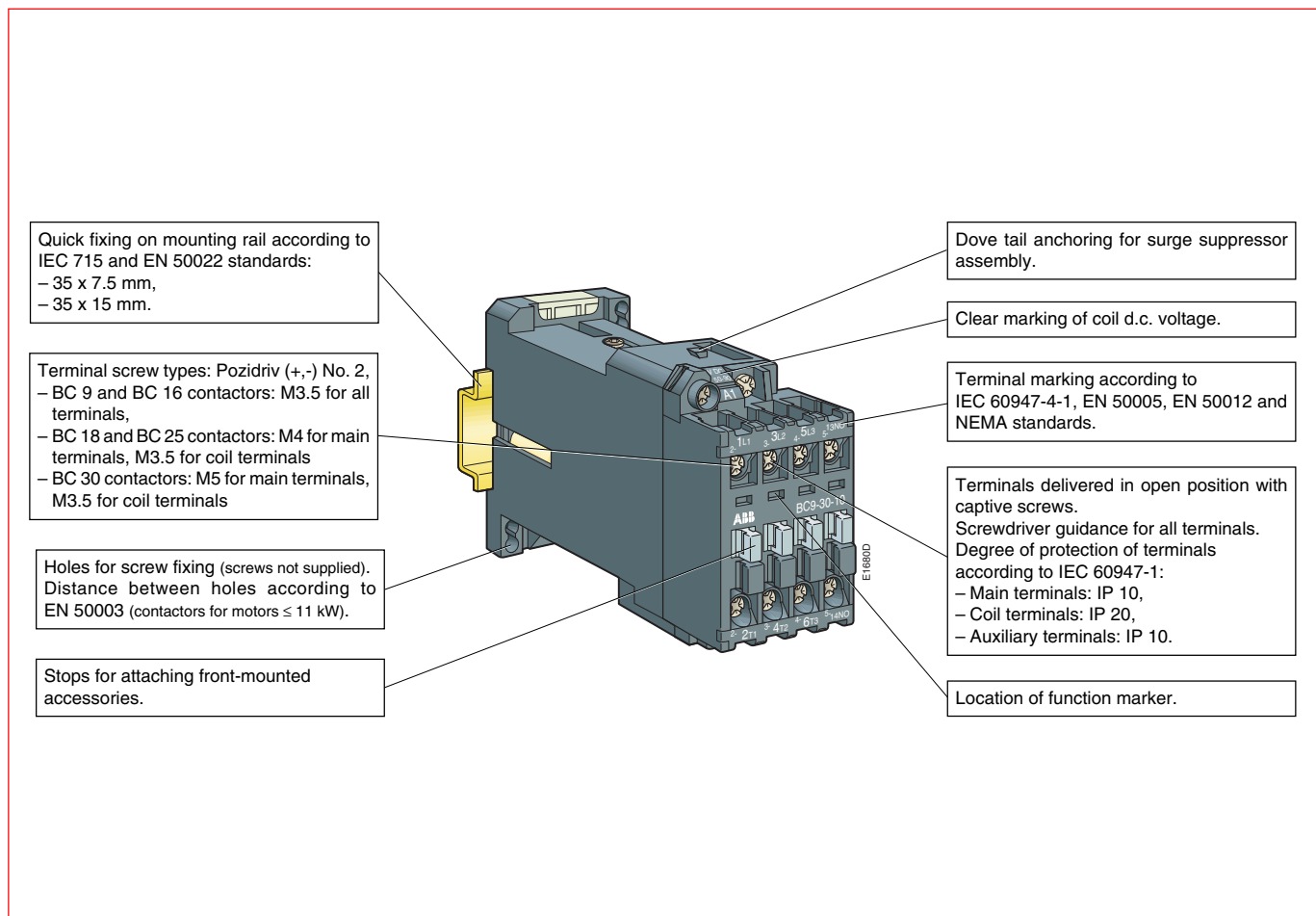
The built-in auxiliary contact elements are mechanically linked.

- Control circuit: d.c. operated with solid magnetic circuit.

- Accessories: a wide range of accessories is available (section 4).

Variants next pages in this section

- 4-pole BC 9 ... BC 25 contactors (with 4 N.O. main poles or 2 N.O. + 2 N.C. main poles).
- 4-pole TBC 9 ... TBC 25 contactors (with 4 N.O. main poles or 2 N.O. + 2 N.C. main poles).



BC... and TBC... 3-pole Contactors

d.c. Operated with Solid Magnetic Circuit



BC 9-30-10

Coil voltages and codes: BC...

Voltage - U _e V d.c.	Code R□□
12	0..7
24	0..1
42	0..2
48	1..6
50	1..7
60	0..3
75	2..2
110	0..4
125	2..7
220	0..5
240	3..3
250	3..4



TBC 25-30-10

Coil voltages and codes: TBC...

Voltage - U _e V d.c.	Code R□□
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_e min. and U_e max. values for the TBC... contactors.

Ordering Details: BC...

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 θ ≤ 40 °C A	1 st stack	2 nd stack			
				state coil voltage (see opposite table)	state coil voltage code (see opposite table)	Pack ^{ing} 1 piece
9	22	1	—	BC 9-30-10	FPL 141 3001 R□10□	0.540
		—	1	BC 9-30-01	FPL 141 3001 R□01□	0.540
16	28	1	—	BC 16-30-10	FPL 181 3001 R□10□	0.540
		—	1	BC 16-30-01	FPL 181 3001 R□01□	0.540
16	36	—	2	BC 18-30-22	GJL 222 3001 R□22□	0.570
25	45	1	—	BC 25-30-10	GJL 241 3001 R□10□	0.620
		—	1	BC 25-30-01	GJL 241 3001 R□01□	0.620
30	55	—	—	BC 30-30-00	GJL 281 3001 R□00□	0.700
		—	2	BC 30-30-22	GJL 282 3001 R□22□	0.760

Ordering Details: TBC... (Contactors with large coil voltage range)

Rated operational current		Auxiliary contacts fitted		Type	Order code	Weight kg
AC-3 400 V A	AC-1 θ ≤ 40 °C A	1 st stack	2 nd stack			
				state coil voltage (see opposite table)	state coil voltage code (see opposite table)	Pack ^{ing} 1 piece
9	22	1	—	TBC 9-30-10	FPL 141 3061 R□10□	0.540
		—	1	TBC 9-30-01	FPL 141 3061 R□01□	0.540
16	28	1	—	TBC 16-30-10	FPL 181 3061 R□10□	0.540
		—	1	TBC 16-30-01	FPL 181 3061 R□01□	0.540
25	45	1	—	TBC 25-30-10	GJL 241 3061 R□10□	0.620
		—	1	TBC 25-30-01	GJL 241 3061 R□01□	0.620
30	55	—	—	TBC 30-30-00	GJL 281 3061 R□00□	0.700
		—	2	TBC 30-30-22	GJL 282 3061 R□22□	0.760

Note: For selection and use of surge suppressors (e.g. diode, varistor, etc.) see page 4/15.

>> Accessories section 4
>> Thermal O/L Relays section 5
>> Technical Data page 2/72

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

2

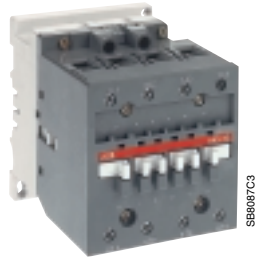
3-pole Contactors

A 9 ... A 75 4-pole Contactors

a.c. Operated



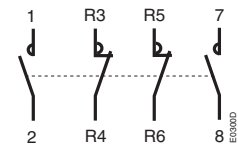
A 9-40-00



A 45-40-00



A 9-22-00



Ordering Details

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece

4 N.O. main poles

25	— —	A 9-40-00	1SBL 14 1201 R	0.340
30	— —	A 16-40-00	1SBL 18 1201 R	0.340
45	— —	A 26-40-00	1SBL 24 1201 R	0.610
70	— —	A 45-40-00	1SBL 33 1201 R	1.390
100	— —	A 50-40-00	1SBL 35 1201 R	1.390
125	— —	A 75-40-00	1SBL 41 1201 R	1.390

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

25	— —	A 9-22-00	1SBL 14 1501 R	0.340
30	— —	A 16-22-00	1SBL 18 1501 R	0.340
45	— —	A 26-22-00	1SBL 24 1501 R	0.610
70	— —	A 45-22-00	1SBL 33 1501 R	1.400
125	— —	A 75-22-00	1SBL 41 1501 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

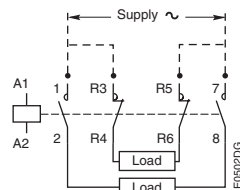
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK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



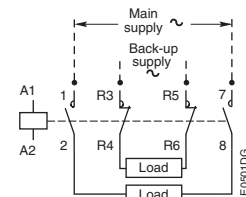
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

- Single supply and 2 separate loads



- 2 separate supplies and 2 separate loads

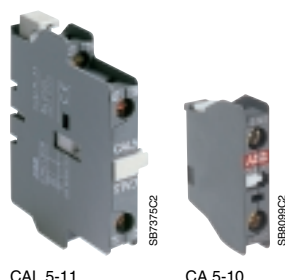


>> Main Accessories page 2/27
>> Technical Data page 2/60
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

A 9 ... A 75 4-pole Contactors

Main Accessories



CAL 5-11

CA 5-10



TP 40 DA



VE 5-1



RV 5/50

RC 5-1/50

Ordering Details

Auxiliary Contact Blocks

Mounting on contactors	Positioning	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				1 piece
A 9 ... A 75	Front face	1 –	CA 5-10	1SBN 01 0010 R1010	10	0.014
		– 1	CA 5-01	1SBN 01 0010 R1001	10	0.014
		4 –	CA 5-40 E	1SBN 01 0040 R1040	2	0.060
		2 2	CA 5-22 E	1SBN 01 0040 R1022	2	0.060
A 9 ... A 75	Side	1 1	CAL 5-11	1SBN 01 0020 R1011	2	0.050

Pneumatic Timers

Mounting on contactors	Timing range	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				
A 9 ... A 75	Direct 0.1 ... 40 s	1 1	TP 40 DA	1SBN 02 0300 R1000	1	0.070
	Direct 10 ... 180 s	1 1	TP 180 DA	1SBN 02 0300 R1001	1	0.070
	Inverse 0.1 ... 40 s	1 1	TP 40 IA	1SBN 02 0301 R1000	1	0.070
	Inverse 10 ... 180 s	1 1	TP 180 IA	1SBN 02 0301 R1001	1	0.070

Interlocks

Mounting on contactors	Feature	Contacts	Type	Order Code	Pack ^{ing} piece	Weight kg
		 				
A 9 ... A 26	Mech. / electrical	– 2	VE 5-1	1SBN 03 0110 R1000	1	0.076
A 45 ... A 75		– 2	VE 5-2	1SBN 03 0210 R1000	1	0.146
A 9 ... A 26	Mechanical	– –	VM 5-1	1SBN 03 0100 R1000	1	0.066

Surge Suppressors

Mounting on contactors	Feature	Voltage range	Type	Order Code	Pack ^{ing} piece	Weight kg
						1 piece
A 9 ... A 75	Varistor	24 ... 50 V a.c./d.c.	RV 5/50	1SBN 05 0010 R1000	2	0.015
		50 ... 133 V a.c./d.c.	RV 5/133	1SBN 05 0010 R1001	2	0.015
		110 ... 250 V a.c./d.c.	RV 5/250	1SBN 05 0010 R1002	2	0.015
		250 ... 440 V a.c./d.c.	RV 5/440	1SBN 05 0010 R1003	2	0.015
A 9 ... A 26	RC	24 ... 50 V a.c.	RC 5-1/50	1SBN 05 0100 R1000	2	0.012
		50 ... 133 V a.c.	RC 5-1/133	1SBN 05 0100 R1001	2	0.012
		110 ... 250 V a.c.	RC 5-1/250	1SBN 05 0100 R1002	2	0.012
		250 ... 440 V a.c.	RC 5-1/440	1SBN 05 0100 R1003	2	0.012
A 45 ... A 75	RC	24 ... 50 V a.c.	RC 5-2/50	1SBN 05 0200 R1000	2	0.015
		50 ... 133 V a.c.	RC 5-2/133	1SBN 05 0200 R1001	2	0.015
		110 ... 250 V a.c.	RC 5-2/250	1SBN 05 0200 R1002	2	0.015
		250 ... 440 V a.c.	RC 5-2/440	1SBN 05 0200 R1003	2	0.015

Other Accessories

A wide range of accessories is available :  section 4

- various auxiliary contact blocks for specific controls and use,
- interface relays,
- connecting auxiliaries: strips, connectors, additional pieces, etc.
- impulse contact blocks, lamp holder and fuse holder blocks,
- function marker.

EK 110 ... EK 1000 4-pole Contactors

a.c. Operated



EK 175-40-11



EK 370-40-11



EK 1000-40-11

Ordering Details

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
200	1 1	EK 110-40-11	SK 824 440-	4.300
	2 2	EK 110-40-22	SK 824 450-	4.350
	2 1	EK 110-40-21	SK 824 440-E	4.350
250	1 1	EK 150-40-11	SK 824 441-	4.350
	2 2	EK 150-40-22	SK 824 451-	4.400
	2 1	EK 150-40-21	SK 824 441-E	4.400
300	1 1	EK 175-40-11	SK 825 440-	6.600
	2 2	EK 175-40-22	SK 825 448-	6.650
	2 1	EK 175-40-21	SK 825 440-E	6.650
350	1 1	EK 210-40-11	SK 825 441-	6.600
	2 2	EK 210-40-22	SK 825 451-	6.650
	2 1	EK 210-40-21	SK 825 441-E	6.650
550	1 1	EK 370-40-11	SK 827 040-	17.20
	2 2	EK 370-40-22	SK 827 042-	17.20
800	1 1	EK 550-40-11	SK 827 041-	17.20
	2 2	EK 550-40-22	SK 827 043-	17.20
1000	1 1	EK 1000-40-11	SK 827 044-	17.50
	2 2	EK 1000-40-22	SK 827 045-	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	—	A D
—	110	A E
110	120	A F
220 ... 230	*	A L
230 ... 240	—	A M
—	380	A N
380 ... 400	440	A P
400 ... 415	—	A R

* 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	E F
115 ... 127	E G
220 ... 230	E L
230 ... 240	E M
380 ... 400	E P
400 ... 415	E R

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

Voltage V - 50Hz	Voltage V - 60Hz	Code
110	110 ... 120	E F
110 ... 115	115 ... 127	E G
220	220 ... 240	E L
220 ... 230	230 ... 255	E M
380	380 ... 415	E P
380 ... 400	400 ... 440	E R

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

>> Main Accessories page 2/29
>> Technical Data page 2/78
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

EK 110 ... EK 1000 4-pole Contactors

Main Accessories



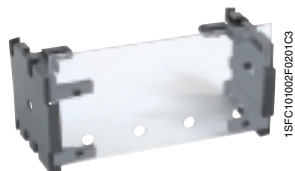
CAL 16-11 B



VH 145



RC-EH 300/48



LT 210-EK

Ordering Details

Auxiliary Contact Blocks

Mounting on contactors	Positioning	Contacts	Type	Order Code	Weight kg 1 piece
EK 110 ... EK 1000	Side	1 1	CAL 16-11 B	SK 829 002-B	0.050
		1 1	CAL 16-11 C	SK 829 002-C	0.050
		1 1	CAL 16-11 D	SK 829 002-D	0.050

Interlocks for two horizontal mounted contactors

Mounting on contactors	Feature	Contacts	Type	Order Code	Weight kg 1 piece
EK 110, EK 150	Mech. / elec.	– 2	VH 145	SK 829 071-A	0.130
EK 175, EK 210		– 2	VH 300	SK 829 071-B	0.130
EK 370, EK 550 EK 1000	Mechanical	– –	VH 800	SK 829 070-F	6.000

Note: For interlocking between two contactors of a different size: see section 4.

Surge Suppressors

Mounting on contactors	Feature	Voltage range	Type	Order Code	Weight kg 1 piece
EK 110 ... EK 210	RC	24 ... 48 V a.c.	RC-EH 300/48	SK 829 007-A	0.015
		110 ... 415 V a.c.	RC-EH 300/415	SK 829 007-B	0.015
EK 370 ... EK 1000	RC	48 ... 110 V a.c.	RC-EH 800/110	SK 829 007-C	0.015
		220 ... 600 V a.c.	RC-EH 800/600	SK 829 007-D	0.015

Shrouds (terminal protection VDE 106, part 100)

Mounting on contactors	Suitable for contactor with	Type	Order Code	Weight kg 1 piece
EK 110, EK 150	cable lugs or	LT 150-EK	SK 178 001-HB	0.139
EK 175, EK 210		LT 210-EK	SK 178 001-KB	0.152
EK 370, EK 550	cable clamps	LT 550-EK	SK 178 001-LB	0.190
EK 1000		LT 1000-EK	SK 178 001-MB	0.200

Other Accessories

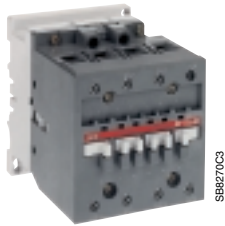
A wide range of accessories is available: see section 4

- auxiliary contact blocks for specific controls and use,
- connecting auxiliaries: connectors for main poles, connections sets,
- plates for changeover contactors, etc.

AF 45 ... AF 75 4-pole Contactors

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

Electronic Coil Interface



AF 75-40-00

Ordering Details

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece

4 N.O. main poles

70	— —	AF 45-40-00	1SBL 33 7201 R	1.420
100	— —	AF 50-40-00	1SBL 35 7201 R	1.420
125	— —	AF 75-40-00	1SBL 41 7201 R	1.420

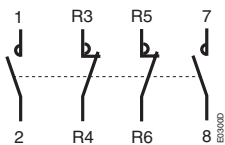
2 N.O. + 2 N.C. main poles

70	— —	AF 45-22-00	1SBL 33 7501 R	1.420
125	— —	AF 75-22-00	1SBL 41 7501 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

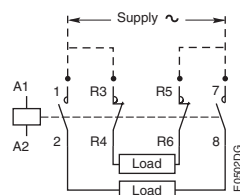
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK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



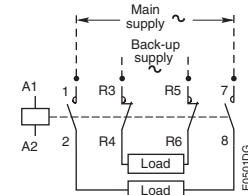
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block Diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



Electromagnetic compatibility

AF... contactors comply with international standards IEC 60947-1 (2000-10-Ed.3.1), 60947-4-1 (2000-11-Ed.2) and European standards 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:

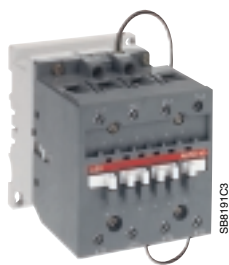
Environment A: "Mainly relates to low-voltage non public or industrial networks/locations/installations (see EN 50082-2 article 4) including highly disturbing sources".

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".

>> Main Accessories page 2/27
>> Technical Data page 2/60
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

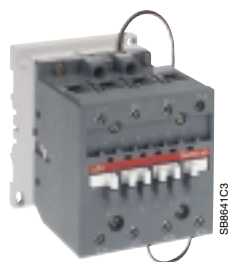
AE... and TAE... 4-pole Contactors
d.c. Operated with Double-Winding Coil



AE 50-40-00

Coil voltages and codes: 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



TAE 50-40-00

Coil voltages and codes: TAE...

Voltage - U _c 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 for the TAE... contactor relays.

Ordering Details: AE...

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see opposite table)	state coil voltage code (see opposite table)	Pack ^{ing} 1 piece

4 N.O. main poles

70	- -	AE 45-40-00	1SBL 33 9201 R	1.430
100	- -	AE 50-40-00	1SBL 35 9201 R	1.430
125	- -	AE 75-40-00	1SBL 41 9201 R	1.430

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

70	- -	AE 45-22-00	1SBL 33 9501 R	1.440
125	- -	AE 75-22-00	1SBL 41 9501 R	1.440

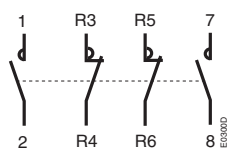
Ordering Details: TAE... (Contactors with large coil voltage range)

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see opposite table)	state coil voltage code (see opposite table)	Pack ^{ing} 1 piece

4 N.O. main poles

70	- -	TAE 45-40-00	1SBL 33 9261 R	1.430
100	- -	TAE 50-40-00	1SBL 35 9261 R	1.430
125	- -	TAE 75-40-00	1SBL 41 9261 R	1.430

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



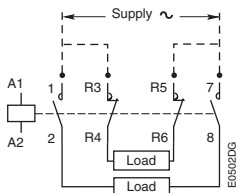
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK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



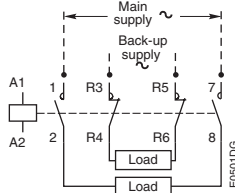
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



Note: For selection and use of surge suppressors (e.g. diode, varistor, etc.) see page 4/15.

>> Main Accessories page 2/27
>> Technical Data page 2/60
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

EK 110 ... EK 1000 4-pole Contactors

d.c. Operated



EK 175-40



EK 370-40



EK 1000-40

Ordering Details

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
200	2 1	EK 110-40-21	SK 824 440-D	4.350
250	2 1	EK 150-40-21	SK 824 441-D	4.400
300	2 1	EK 175-40-21	SK 825 440-D	6.650
350	2 1	EK 210-40-21	SK 825 441-D	6.650
550	2 1	EK 370-40-21	SK 827 040-D	17.20
800	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.

>> Main Accessories page 2/29
>> Technical Data page 2/78
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

BC... and TBC... 4-pole Contactors

d.c. Operated with Solid Magnetic Circuit



BC 16-40-00

Coil voltages and codes: BC...

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



TBC 25-40-00

Coil voltages and codes: TBC...

Voltage - U_c V d.c.	Code R□□□
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 for the TBC... contactors.

Ordering Details: BC...

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage $\square\square\square$ (see opposite table)	state coil voltage code $\square\square\square$ (see opposite table)	Pack ^{ing} 1 piece

4 N.O. main poles

22	- -	BC 9-40-00 $\square\square\square$	FPL 141 3201 R□00□	0.540
28	- -	BC 16-40-00 $\square\square\square$	FPL 181 3201 R□00□	0.540
45	- -	BC 25-40-00 $\square\square\square$	GJL 241 3201 R□00□	0.620

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

22	- -	BC 9-22-00 $\square\square\square$	FPL 141 3501 R□00□	0.540
28	- -	BC 16-22-00 $\square\square\square$	FPL 181 3501 R□00□	0.540
45	- -	BC 25-22-00 $\square\square\square$	GJL 241 3501 R□00□	0.620

Ordering Details: TBC... (Contactors with large coil voltage range)

Rated operational current	Auxiliary contacts fitted	Type	Order code	Weight kg
AC-1 $\theta \leq 40^\circ\text{C}$ A		state coil voltage $\square\square\square$ (see opposite table)	state coil voltage code $\square\square\square$ (see opposite table)	Pack ^{ing} 1 piece

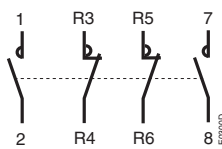
4 N.O. main poles

22	- -	TBC 9-40-00 $\square\square\square$	FPL 141 3261 R□00□	0.540
28	- -	TBC 16-40-00 $\square\square\square$	FPL 181 3261 R□00□	0.540
45	- -	TBC 25-40-00 $\square\square\square$	GJL 241 3261 R□00□	0.620

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

22	- -	TBC 9-22-00 $\square\square\square$	FPL 141 3561 R□00□	0.540
28	- -	TBC 16-22-00 $\square\square\square$	FPL 181 3561 R□00□	0.540
45	- -	TBC 25-22-00 $\square\square\square$	GJL 241 3561 R□00□	0.620

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



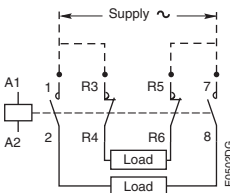
These contactors are suitable for controlling 2 separate circuits, i.e. 2 loads with 2 separate supplies, or 1 circuit comprising 2 separate loads with a single supply (see diagrams below). When the contactor operates there is no mechanical overlapping between the N.O. poles and the N.C. poles: BREAK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



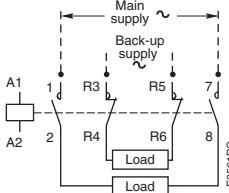
These contactors are not suitable for a reversing starter or star-delta starter or for controlling a single load from 2 separate supplies.

Block diagrams

● Single supply and 2 separate loads



● 2 separate supplies and 2 separate loads



Note: For selection and use of surge suppressors (e.g. diode, varistor, etc.) see page 4/15.

>> Accessories section 4
>> Technical Data page 2/72
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

2

4-pole Contactors

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.

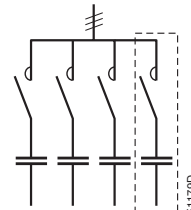


Fixed power factor correction

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.



Automatic power factor correction

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 831-1 Edition 04/97 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 $\hat{I}$).

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.

A... and AF... Standard Contactors (A 12 ... A 300 and AF 400 ... AF 750)

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

☞ Refer to the table on page 2/36 for the operational values.



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

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

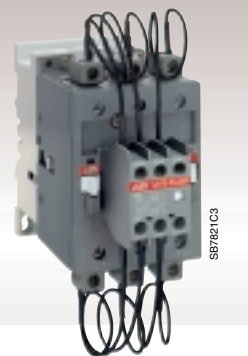
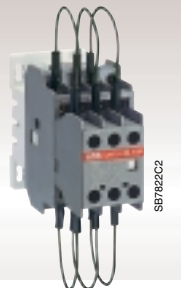
☞ Refer to the table on page 2/38 for the operational values.



UA...-R Contactors for Capacitor Switching (UA 16-R ... UA 75-R) with insertion of damping resistors.

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

☞ Refer to the table on page 2/40 for the operational values.



● 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", or in the selection tools available on the ABB Website ☞ www.abb.com/lowvoltage ☞ left menu: "Low Voltage On-Line" ☞ select: "Support Tools".

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

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 kvar ratings acc. to the table below are applicable to "star" connected capacitors (less current, cable savings).
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

- **A 12 ... A 110** 3-pole contactors  page 2/6,
- **A 145 ... AF 750** 3-pole contactors  page 2/12.

Selection Table

Type	Powers in kvar 50/60 Hz (AC - 6b)															Max. peak current İ (kA)
	220/240 V			380/400 V			415/440 V			500/550V			660/690 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	
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 50	22	22	20	38	38	34	42	42	37	48	48	42	65	65	58.5	2.3
A 63	25	25	23	43	43	39	47	47	42.5	54	54	48.5	74	74	67	2.5
A 75	28	28	24.5	48	48	41	52	52	45	60	60	51	82	82	70	2.6
A 95	35	35	33	60	60	53	63	63	58	75	75	70	80	80	75	4
A 110	40	40	35	70	70	60	75	75	65	83	83	78	90	90	85	4
A 145	50	50	42	90	90	74	93	93	80	110	110	96	110	110	110	4
A 185	60	60	45	105	105	78	115	115	85	135	135	102	135	135	135	5
A 210	75	75	57	125	125	100	135	135	110	160	160	130	160	160	160	6.5
A 260	85	85	70	140	140	130	155	155	140	180	180	165	200	200	200	8
A 300	100	100	85	160	160	150	180	180	163	210	210	196	240	240	240	8
AF 400	120	120	105	200	200	185	220	220	200	260	260	241	300	300	300	10
AF 460	140	140	120	230	230	215	260	260	230	325	325	300	325	325	325	10
AF 580	170	170	160	270	270	260	300	300	290	350	350	340	440	440	440	12
AF 750	220	220	190	390	370	332	410	410	380	490	480	435	600	600	600	12

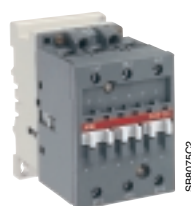
If, in an application, the current peak is greater than the maximum peak current $\hat{I}$ specified in the last column in the table, select a higher rating, refer to the **UA...** contactors ( page 2/38) or add inductances ( Application Guide "Contactors for Capacitor Switching").

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

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



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



A 50-30-00



A 95-30-00



AF 750-30-11

Ordering Details

Power 400 V 40 °C kvar	Max. peak current $\hat{I}$ kA	Auxiliary contacts fitted	Type	Order code	Weight kg
			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
11	0.7	1 –	A 12-30-10	1SBL 16 1001 R 10	0.340
12.5	1	1 –	A 16-30-10	1SBL 18 1001 R 10	0.340
19	1.6	1 –	A 26-30-10	1SBL 24 1001 R 10	0.600
22	1.9	1 –	A 30-30-10	1SBL 28 1001 R 10	0.710
26	2.1	1 –	A 40-30-10	1SBL 32 1001 R 10	0.710
38	2.3	– – 1 1	A 50-30-00 A 50-30-11	1SBL 35 1001 R 00 1SBL 35 1001 R 11	1.160 1.200
43	2.5	– – 1 1	A 63-30-00 A 63-30-11	1SBL 37 1001 R 00 1SBL 37 1001 R 11	1.160 1.200
48	2.6	– – 1 1	A 75-30-00 A 75-30-11	1SBL 41 1001 R 00 1SBL 41 1001 R 11	1.160 1.200
60	4	– – 1 1	A 95-30-00 A 95-30-11	1SFL 43 1001 R 00 1SFL 43 1001 R 11	2.000 2.040
70	4	– – 1 1	A 110-30-00 A 110-30-11	1SFL 45 1001 R 00 1SFL 45 1001 R 11	2.000 2.040
90	4	1 1	A 145-30-11	1SFL 47 1001 R 11	3.500
105	5	1 1	A 185-30-11	1SFL 49 1001 R 11	3.500
125	6.5	1 1	A 210-30-11	1SFL 51 1001 R 11	6.100
140	8	1 1	A 260-30-11	1SFL 53 1001 R 11	6.100
160	8	1 1	A 300-30-11	1SFL 55 1001 R 11	6.100
200	10	1 1	AF 400-30-11	1SFL 57 7001 R 11	12.00
230	10	1 1	AF 460-30-11	1SFL 59 7001 R 11	12.00
270	12	1 1	AF 580-30-11	1SFL 61 7001 R 11	15.00
390	12	1 1	AF 750-30-11	1SFL 63 7001 R 11	15.00

Coil voltages and codes: A 12 ... A 110

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: 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

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

AF... contactors with electronic coil interface: electromagnetic compatibility and A or B environment definitions page 2/21.

>> Accessories section 4
>> Technical Data page 2/60
>> General - Approvals section 7

>> Terminal Marking and Positioning section 8
>> Dimensions section 9

UA... 3-pole Contactors for Capacitor Switching



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

Application

The **UA..** contactors have been specially developed 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 kvar ratings acc. to the table below are applicable to "star" connected capacitors (less current, cable savings).

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 (☞ page 2/6)

Selection Table

Type	Powers in kvar 50/60 Hz (AC - 6b)															Max. permissible peak current $\hat{I}$ (kA)	
	230/240 V			400/415 V			440 V			500/550 V			660/690 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	≤ 500 V	U _e > 500 V
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	29	60/65*	60/65*	50/55*	65	65	55	70	70	60	86	86	70	9.3	8
UA 110	40	39	34	74	70/75*	65	75	75	67	80	80	75	90	90	85	10.5	9

(*) Use these values for $U_e = 415$ V

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.

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...-R** contactors (☞ page 2/40) or add inductances (☞ 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.

UA... 3-pole Contactors for Capacitor Switching

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



UA 30-30-10



UA 50-30-00



UA 110-30-00

Ordering Details

Power	Max. peak current $U_e \leq 500$ V	Auxiliary contacts fitted	Type	Order code	Weight kg
400 V 40 °C kvar	$\hat{I}$ kA		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
12.5	1.8	1 –	UA 16-30-10	1SBL 18 1022 R 10	0.340
20	3	1 –	UA 26-30-10	1SBL 24 1022 R 10	0.600
27.5	3.5	1 –	UA 30-30-10	1SBL 28 1022 R 10	0.710
33	5	– – 1 1	UA 50-30-00 UA 50-30-11	1SBL 35 1022 R 00 1SBL 35 1022 R 11	1.160 1.200
45	6.5	– – 1 1	UA 63-30-00 UA 63-30-11	1SBL 37 1022 R 00 1SBL 37 1022 R 11	1.160 1.200
50	7.5	– – 1 1	UA 75-30-00 UA 75-30-11	1SBL 41 1022 R 00 1SBL 41 1022 R 11	1.160 1.200
60	9.3	– – 1 1	UA 95-30-00 UA 95-30-11	1SFL 43 1022 R 00 1SFL 43 1022 R 11	2.000 2.040
74	10.5	– – 1 1	UA 110-30-00 UA 110-30-11	1SFL 45 1022 R 00 1SFL 45 1022 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.

>> Accessories section 4	>> Terminal Marking and Positioning section 8
>> Technical Data page 2/60	>> Dimensions section 9
>> General - Approvals section 7	

UA...-R 3-pole Contactors for Capacitor Switching



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

Application

The **UA ...-R** contactors can be used in installations in which 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 kvar ratings acc. to the table below are applicable to "star" connected capacitors (less current, cable savings).

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 $U_e \geq 500$ V.

Description

The **UA...-R** contactors are fitted with a special front-mounted block ensuring the serial insertion in the circuit of damping resistors limiting current peak on energizing of the capacitor bank. Their connection also ensures capacitor precharging in order to limit the second current peak occurring on making of the main poles a few milliseconds later.

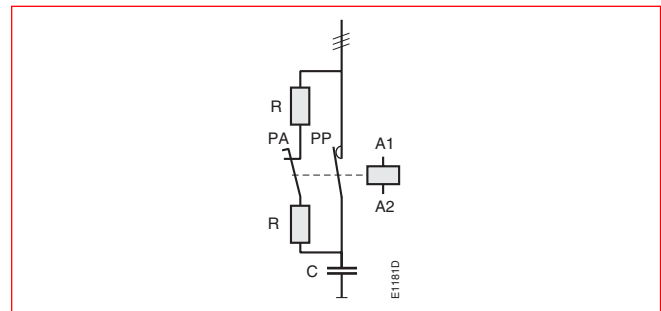
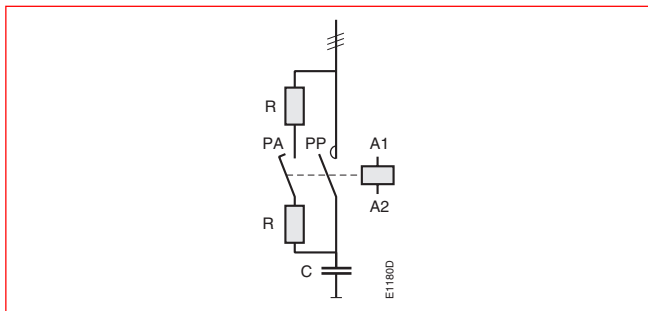
Operating principle

The front-mounted block mechanism of the **UA...-R** contactors alternately ensures early making and breaking of the auxiliary "PA" poles with respect to the main "PP" poles of the contactor.

When the coil is energized, the early making auxiliary poles connect the capacitor to the network via the set of resistors, thus attenuating the current peak. A few milliseconds later, the contactor main poles short-circuit the resistors with a new reduced inrush current.

The insertion contacts remain closed, ready to operate as early-breaking contacts for the next breaking sequence.

When the coil is de-energized, early breaking of the auxiliary poles ensures that the capacitor is disconnected via the main poles.



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

Selection Table

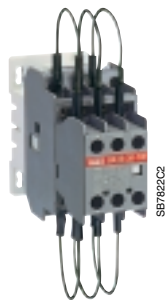
Type	Powers in kvar - 50/60 Hz (AC-6b)															Max. permissible peak current $\hat{I}$	gG type fuses max. (*)
	220/240 V			380/400/415 V			440 V			500/550 V			660/690 V				
	40 °C	55 °C	70 °C	40 °C	55 °C	70 °C	40 °C	55 °C	70 °C	40 °C	55 °C	70 °C	40 °C	55 °C	70 °C		
UA 16-30-10-R	8	7.5	6	12.5	12.5	10	15	13	11	18	16	12.5	22	21	17	No limit	80
UA 26-30-10-R	12.5	11.5	9	22	20	15.5	24	20	17	30	25	20	35	31	26		125
UA 30-30-10-R	16	16	11	30	27.5	19.5	32	30	20.5	34	34	25	45	45	32		200
UA 50-30-00-R	25	24	20	40	40	35	50	43	37	55	50	46	72	65	60		200
UA 63-30-00-R	30	27	23	50	45	39	55	48	42.5	65	60	50	80	75	65		200
UA 75-30-00-R	35	30	25	60	50	41	65	53	45	75	65	55	100	80	70		200

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

UA...-R 3-pole Contactors for Capacitor Switching



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



UA 16-30-10-R



UA 30-30-10-R



UA 75-30-00-R

Ordering Details

Power	Auxiliary contacts fitted	Type	Order code	Weight kg
400 V 40 °C kvar		state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
12.5	1 -	UA 16-30-10-R	1SBL 18 1023 R 10	0.460
22	1 -	UA 26-30-10-R	1SBL 24 1023 R 10	0.710
30	1 -	UA 30-30-10-R	1SBL 28 1023 R 10	0.810
40	- -	UA 50-30-00-R	1SBL 35 1023 R 00	1.350
50	- -	UA 63-30-00-R	1SBL 37 1023 R 00	1.350
60	- -	UA 75-30-00-R	1SBL 41 1023 R 00	1.350

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.

Technical Data

Types	UA 16..-R	UA 26..-R	UA 30..-R	UA 50..-R UA 63..-R UA 75..-R
Short-circuit protection gG type fuses	sized 1.5 ... 1.8 I _n of the capacitor			
Max. electrical switching frequency cycles / h	240			
Electrical durability AC-6b - operating cycles at U _e ≤ 440 V - operating cycles at U _e ≥ 500 V	250 000 100 000			
Connecting capacity (min. ... max.) Main conductors (poles) Rigid solid (≤ 4 mm ²) Rigid stranded (≥ 6 mm ²)	1 ... 4 1.5 ... 6 2.5 ... 16 6 ... 50 - - 2.5 ... 16 + 2.5 ... 6 6 ... 25 + 6 ... 16			
Flexible with cable end 1 x mm ² 2 x mm ²	0.75 ... 2.5 1 ... 4 2.5 ... 10 6 ... 35 - - 2.5 ... 10 + 2.5 ... 4 6 ... 16 + 6 ... 10			
Degree of protection acc. to IEC 60947-1, EN 60947-1 and IEC 60529, EN 60529 - Main terminals - Coil terminals - Auxiliary terminals	IP 20 IP 10 IP 20 IP 20			

Other technical characteristics are the same as those of standard A ... contactors. page 2/60

>> Accessories section 4 >> Terminal Marking and Positioning section 8
>> General - Approvals section 7 >> Dimensions section 9

2

Specific Contactors

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: Contacts cannot be changed.

● Auxiliary contact: 1 side mounted add-on auxiliary contact block (GA 75-10-11 and GAE 75-10-11 only).

● Control circuit

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

● 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 .

DC-1	$\theta \leq 40$ °C	$U_e \leq 400$ V	100 A
	$\theta \leq 40$ °C	$U_e \leq 600$ V	75 A
DC-3	–	$U_e \leq 440$ V	85 A
DC-5	–	$U_e \leq 220$ V	85 A
	–	$U_e \leq 440$ V	35 A

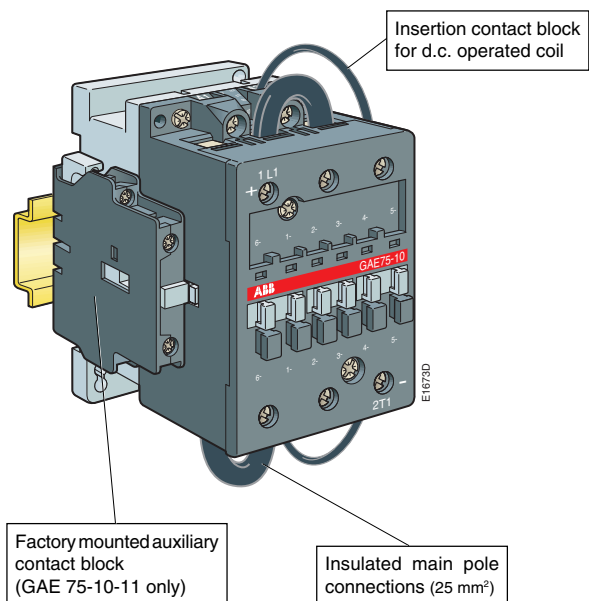
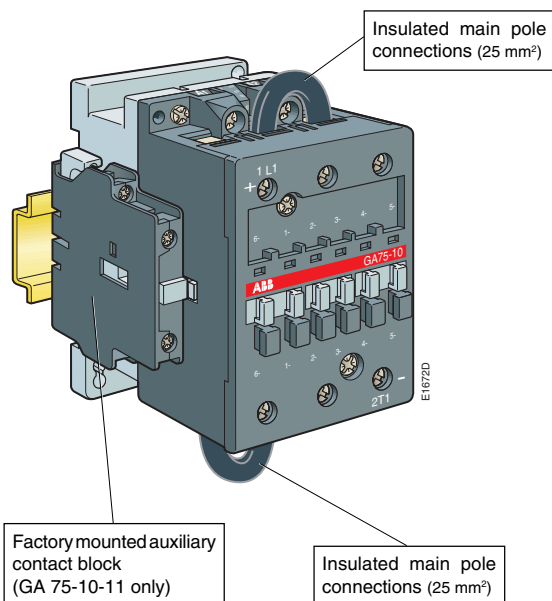
Other technical data are the same as those of standard A... contactors (see page 2/60).

● Accessories: a wide range of accessories is available (see section 4).

GA 75 and GAE 75 contactors specific design (see page 2/6 for general design)

GA 75-10-11

GAE 75-10-11



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



GA 75-10-11



GAE 75-10-11

Ordering Details

Rated operational current			Available auxiliary contacts	Type	Order code	Unit weight kg
DC-1 440 V $\theta \leq 40^\circ\text{C}$ A	DC-3 440 V A	DC-5 220 V A				
100	85	85	— — 1 1	state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
100	85	85	— — 1 1	GA 75-10-00	1SBL 41 1025 R 00	1.22
				GA 75-10-11	1SBL 41 1025 R 11	1.26
100	85	85	— — 1 1	GAE 75-10-00	1SBL 41 9025 R 00	1.26
				GAE 75-10-11	1SBL 41 9025 R 11	1.30

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:

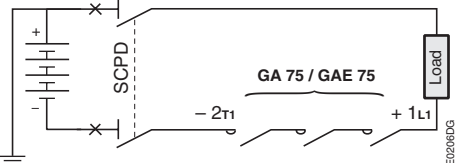
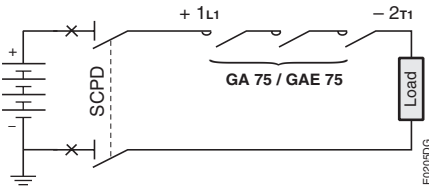
- A** – insulated source, i.e. unearthed (or not connected to the frame),
- B** – source earthed via its central point,
- C** – source earthed via one of its outer poles.

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.

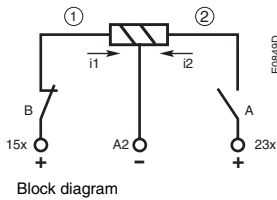
The above provisions relate to power circuit switching, the SCPD (Short-Circuit Protection Device) must comply with protection rules.



>> Contactor Selection for d.c. Circuit Switching	page 2/56
>> 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 (i1 - i2) which, when energized, create two magnetic fields of opposite strength (E30 block diagram).

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 contactors have two resting positions: **closed position** and **open 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_e

Technical Data

Same technical data as for the **AE...** contactors (E30 page 2/60) with the exception of:

- coil consumption: 210 W on latching, and 45 W on de-latching.
- mounting positions: position 5 is prohibited (E30 page 2/68).

AM... Magnetically Latched Contactors

d.c. Operated



AM 75-30-22



AM 45-22-22

Ordering Details

Contactors with 3 N.O. main poles

Rated operational current		Available auxiliary contacts		Type	Order code	Weight kg
AC-3 400 V A	AC-1 $\theta \leq 40\text{ }^{\circ}\text{C}$ A			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
50	100	2	2	AM 50-30-22	1SBL 35 8029 R 22	1.230
75	125	2	2	AM 75-30-22	1SBL 41 8029 R 22	1.230

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

Rated operational current		Available auxiliary contacts		Type	Order code	Weight kg
AC-1 $\theta \leq 40\text{ }^{\circ}\text{C}$ A	AC-1 $\theta \leq 55\text{ }^{\circ}\text{C}$ A			state coil voltage (see table below)	state coil voltage code (see table below)	Pack ^{ing} 1 piece
70	60	2	2	AM 45-22-22	1SBL 33 8529 R 22	1.440
125	105	2	2	AM 75-22-22	1SBL 41 8529 R 22	1.440

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 :  section 4.

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

Star-Delta Starting of Three-Phase Asynchronous Motors

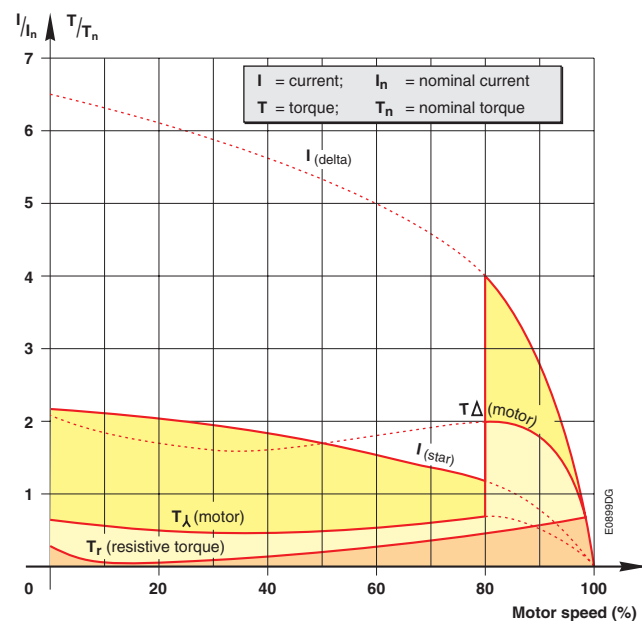
General

When starting, the motor has to overcome the load torque and inertia of the driven machine. During this phase, current must remain within the limits acceptable by the mains.

Inertia, load torque and mains are commonly fixed data.

Although the type of starting reduces the inrush current as required, it also reduces the torque supplied by the motor. The result is a starting time that varies according to the starting process used.

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 currents are commonly read during star-delta switching.

Utilization

During the initial starting phase ("star" connection), the resistive torque of the driven machine must remain, irrespective of speed, less than the "star" motor torque until "star-delta" switching occurs.

This starting mode is therefore ideal for machines with no-load starting:

- machine-tools,
- centrifugal compressors,
- wood working machines, etc.

In order to prevent a high current peak, at least 80 - 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 or similar is not necessary. 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

Ambient temperature = 55 °C.

For more technical information, refer to ABB Starting Combinations catalogue.

Motor power, kW						Max. starting time from cold (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)

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

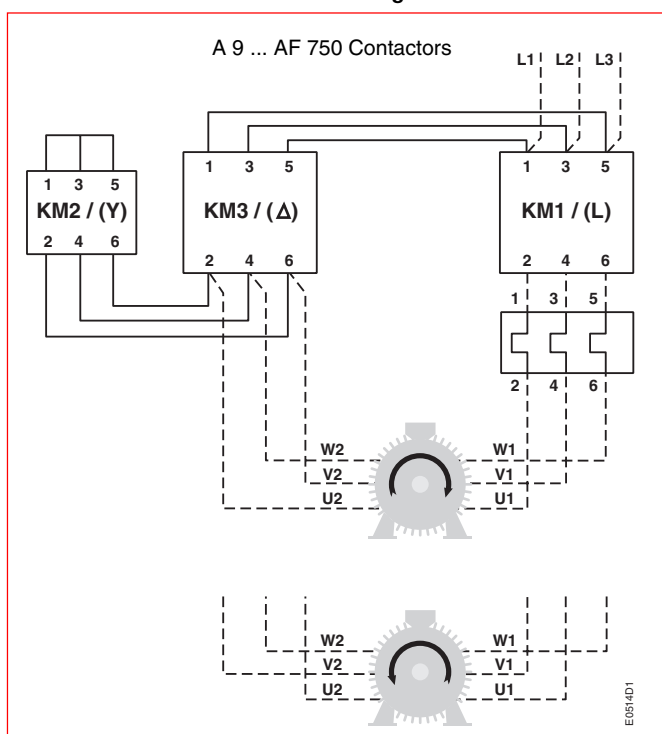
(2) Contactor Relay type N + TP timer can be used as the AF contactors have a slight delay in closing.

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

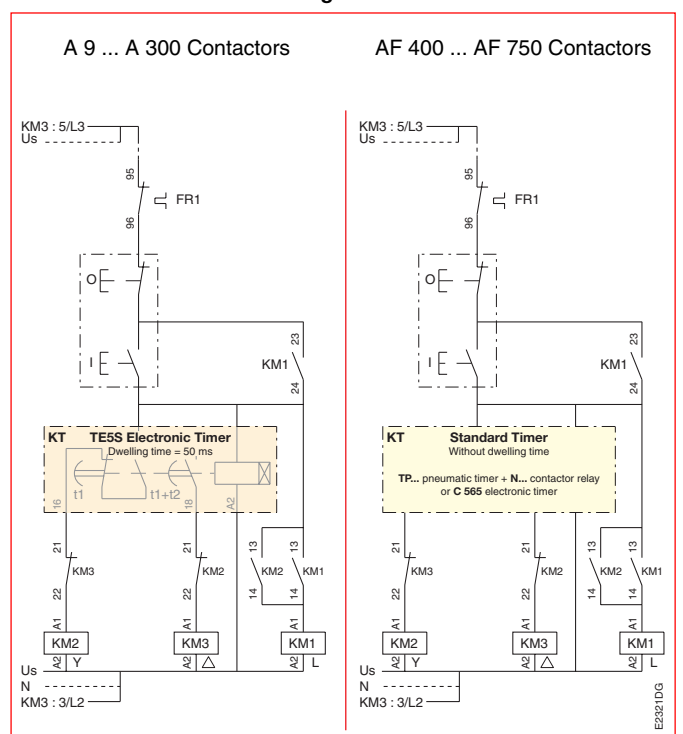
(4) Version without space for mechanical interlock.

(5) Version with space for mechanical interlock.

Power circuit diagram



Control circuit diagrams - Remote control



Control of Three-Phase Slip-Ring Motors

Contactor 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.

Maximum switching frequency of 600 cycles an hour and temperature of 55 °C maximum near the contactor.

Electrical durability in AC-2 category is given in page 2/86 and 2/87

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 p. 2/62 and 2/63) 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.

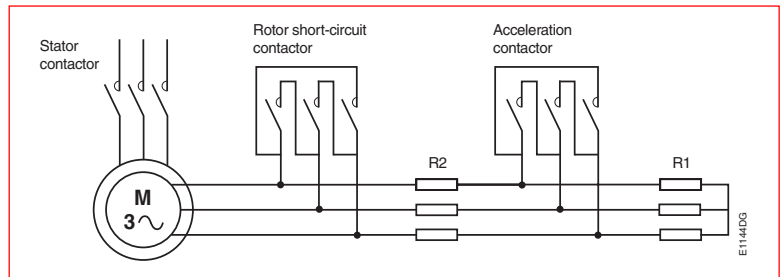
Contactors			A 9	A 12	A 16	A 26	A 30	A 40	A 50	A 63	A 75	A 95	A 110	
Load factor	15%	A	45	58	70	105	112	125	160	210	245	290	330	
	25%	A	40	51	63	93	102	115	140	180	215	260	300	
	40%	A	35	42	54	80	87	95	120	155	185	230	260	
	60%	A	30	39	47	70	76	86	110	140	163	200	230	
S7 acc. to IEC 34-1: periodical 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 AE 9 ... AE 110 and TAE 50 ... TAE 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
Load factor	15%	I_e / AC-2	A	335	360	425	530	625	850	950	1150	1500
	25%	I_e / AC-2	A	270	300	350	440	515	680	780	975	1250
	40%	I_e / AC-2	A	215	250	300	370	430	580	650	800	1050
	60%	I_e / AC-2	A	180	220	255	315	370	480	550	700	900
S7 acc. to IEC 34-1: periodical continuous duty with electrical braking				A	145	185	210	260	400	460	580	750

Contactors		A 145	A 185	A 210	A 260	A 300	AF 400	AF 460	AF 580	AF 750	
Rated operational current I _e / AC-1 for air temperature near the contactor ≤ 55 °C		A	230	250	300	350	400	500	600	700	800

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

Autotransformer Starters

Contactor Selection

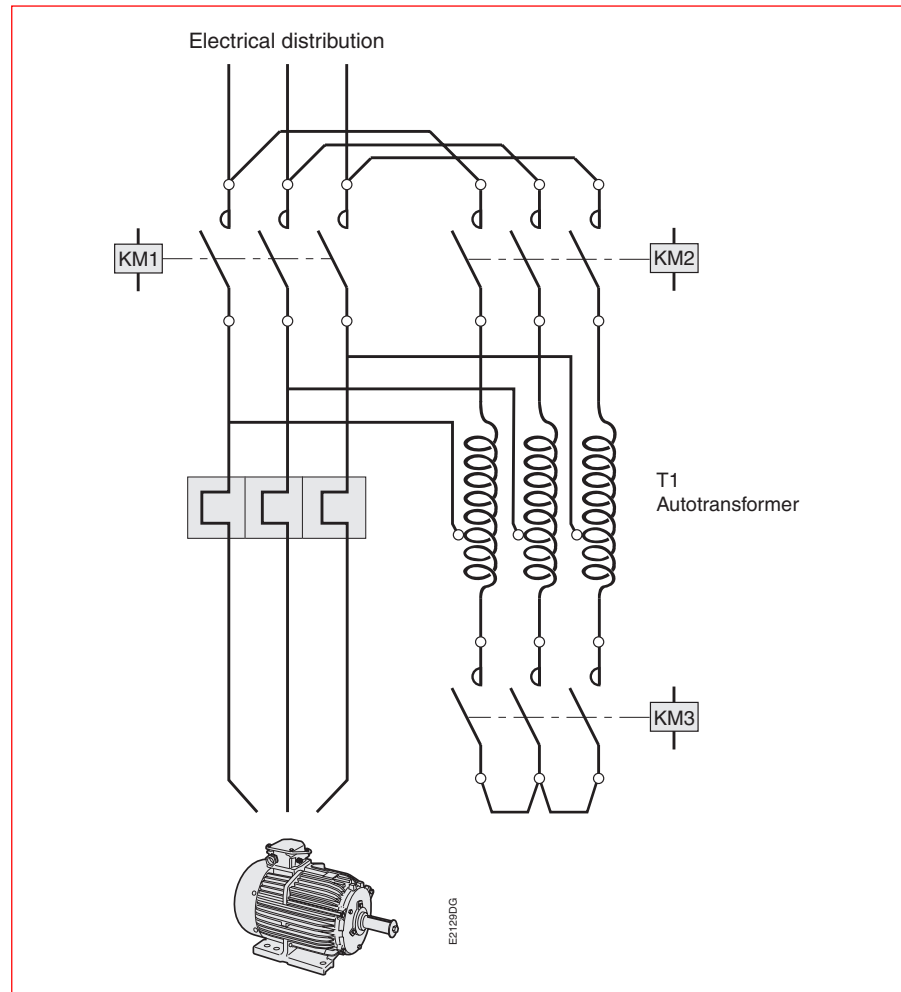
General

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

kW Motor ratings 50/60 Hz					Contactors					
220/240 V	380/400 V	415 V	440 V	690 V	KM1 Line	KM2 Autotransformer taps:				KM3 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

I_d starting current / I_n nominal current ≤ 8
Acceleration time ≤ 20 s
30 cycles / h max.

The selection table for A 9 ... A 110 contactors can be used for the AE 9 ... AE 110 and the TAE 50 ... TAE 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

Contactors 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	AE 9	AE 12	AE 16	AE 26	AE 30	AE 40	AE 50	AE 63	AE 75	AE 95	AE 110

Operational power at U_g : 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 750 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	–	–
d.c. operated contactors	–	–	–	–	–	–	–	–	–	–	–

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

220/240 V	kVA	35	45	50	55	60	95	100	110	130	–	–
380/400 V	kVA	60	75	90	95	100	165	170	190	240	–	–
415/440 V	kVA	65	80	100	110	115	180	190	210	270	–	–
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	–	–

Note: The selection table for AE... contactors can be used for the TAE... types.

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.

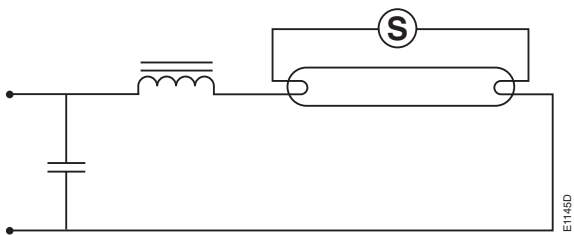
Lighting circuits

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.

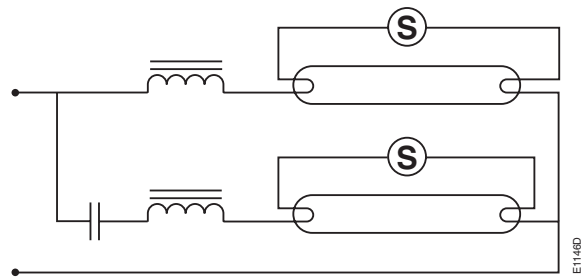
The lamps have very specific technical data, according to their construction type.

- 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 AE 50 ... AE 110 contactors can be used for the TAE 50 ... TAE 110 types.

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	AE 9	AE 12	AE 16	AE 26	AE 30	AE 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	AE 9	AE 12	AE 16	AE 26	AE 30	AE 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	–	43	49	53	79	109	118	168	188	208	–	–
80	0.80	–	27	30	33	49	68	74	105	117	130	–	–
125	1.15	–	17	19	21	31	43	47	67	75	83	–	–
250	2.15	–	8	9	10	15	21	23	33	37	41	–	–
400	3.25	–	5	6	6	9	13	14	21	23	26	–	–
700	5.40	–	3	3	3	5	7	8	12	13	14	–	–
1000	7.50	–	2	2	2	3	5	5	8	9	10	–	–

Voltage: 380/415 V a.c.

2000	8	–	1	1	1	1	2	2	4	4	5	–	–
------	---	---	---	---	---	---	---	---	---	---	---	---	---

High pressure mercury vapour lamps with compensation

Voltage: 220/240 V a.c.

50	0.28	7	39	41	42	64	75	88	129	146	163	–	–
80	0.43	8	24	27	30	44	61	66	94	105	117	–	–
125	0.66	10	15	17	19	28	39	42	60	67	74	–	–
250	1.28	18	7	8	9	14	19	21	30	33	37	–	–
400	2.05	25	4	5	6	8	12	13	18	21	23	–	–
700	3.55	40	2	3	3	5	7	7	10	12	13	–	–
1000	4.83	60	1	2	2	3	4	5	7	8	9	–	–

Voltage: 380/415 V a.c.

2000	5.45	35	1	1	2	3	4	4	6	7	8	–	–
------	------	----	---	---	---	---	---	---	---	---	---	---	---

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	AE 9	AE 12	AE 16	AE 26	AE 30	AE 40	AE 50	AE 63	AE 75	AE 95	AE 110
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	–	9	10	11	16	22	25	35	39	43	–	–
400	4	–	5	6	6	10	13	15	21	23	26	–	–
1000	9.5	–	2	2	2	4	5	6	9	10	11	–	–
2000	16.5	–	1	1	1	2	3	3	4	5	5	–	–

Voltage: 380/415 V a.c.

2000	10.5	–	2	2	2	3	5	5	8	9	10	–	–
------	------	---	---	---	---	---	---	---	---	---	----	---	---

Metal iodine vapour lamps with compensation

Voltage: 220/240 V a.c.

250	1.32	33	6	7	9	13	15	18	27	31	34	–	–
400	2.22	45	4	5	6	8	11	13	18	21	23	–	–
1000	5.14	85	1	2	2	3	4	5	6	8	9	–	–
2000	11.5	148	0	1	1	1	2	2	3	4	4	–	–

Voltage: 380/415 V a.c.

2000	6.1	60	1	1	2	3	4	4	6	7	8	–	–
------	-----	----	---	---	---	---	---	---	---	---	---	---	---

2

Applications

d.c. Circuit Switching

A..., AF..., AE..., GA... and GAE... 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).

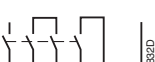
Selection Table - After selection from the ratings quoted in the tables below, please refer to "Ordering Details" in this section.

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	AE 9	AE 12	AE 16	AE 26	AE 30	AE 40	AE 45	AE 50	AE 63	AE 75	GAE 75

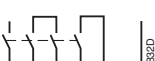
Utilization category DC-1, $L/R \leq 1$ ms

	≤ 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

A..., AF... and AE... Contactor Selection

The selection table for AE 50 ... AE 110 contactors can be used for the TAE 50 ... 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

 A 829D	110 V	A	–	–	–	–	–	–	600	700	800	1050	
 A 830D	110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	–	–	–	–	–	–	600	700	800	1050	
 A 831D	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

 A 829D	110 V	A	–	–	–	–	–	–	–	600	700	800	1050
 A 830D	110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	–	–	–	–	–	–	–	600	700	800	1050
 A 831D	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

 A 829D	110 V	A	–	–	–	–	–	–	–	600	700	800	1050
 A 830D	110 V	A	145	160	250	275	350	400	450	600	700	800	1050
	220 V	A	–	–	–	–	–	–	–	600	700	800	1050
 A 831D	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 (see section 7 for more details), the operating voltage U_o 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** (see page 2/62) for the corresponding ambient temperature **are not exceeded**.
- Max. switching frequency: 300 ops/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).
- Accessories, see section 4.

d.c. Circuit Switching

BC... 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 ($L/R \leq 1$ ms), inductive loads such as shunt motors ($L/R \sim 2$ ms) or series motors ($L/R \sim 7.5$ 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 (see section 7 for more details), the operating voltage U_n and the pole coupling details. Ampere values quoted in the tables below are valid for a $-25 \dots +70$ °C temperature close to the contactors, as long as the **AC-1 Ampere values** (see page 2/73) for the corresponding ambient temperature **are not exceeded**.
- Max. switching frequency: 300 ops/h.
- For series connection of the poles, use connecting strips LP and LH described in section 4.
- 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" in this section.

d.c. operated contactors			BC 9	BC 16	BC 25	BC 30
Utilization category DC-1, $L/R \leq 1$ ms						
 A 920D	≤ 72 V	A	22	28	45	55
	110 V	A	5	10	—	—
 A 930D	≤ 72 V	A	22	28	45	55
	110 V	A	22	28	45	55
	220 V	A	5	10	—	—
 A 911D	≤ 72 V	A	22	28	45	55
	110 V	A	22	28	45	55
	220 V	A	22	28	45	55
 A 932D	≤ 72 V	A	22	28	45	—
	110 V	A	22	28	45	—
	220 V	A	22	28	45	—
	440 V	A	5	10	—	—
Utilization category DC-3, $L/R \leq 2$ ms						
Utilization category DC-5, $L/R \leq 7.5$ ms						
 A 920D	≤ 72 V	A	5	9	15	25
	110 V	A	2	2	—	—
 A 930D	≤ 72 V	A	9	18	25	30
	110 V	A	8	16	20	30
	220 V	A	2	2	—	—
 A 911D	≤ 72 V	A	10	16	25	30
	110 V	A	10	16	25	30
	220 V	A	10	10	15	25
 A 932D	≤ 72 V	A	10	16	25	—
	110 V	A	10	16	25	—
	220 V	A	10	16	20	—
	440 V	A	2	2	—	—

The selection table for BC... contactors can be used for the TBC... types.

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 ($L/R \approx 1$ ms), inductive loads such as shunt motors ($L/R \approx 2$ ms) or series motors ($L/R \approx 7.5$ ms).
- The addition of a resistor in parallel with an inductive winding helps in the elimination of the arcs.
- All the poles required for breaking must be connected in series between the load and the source polarity not linked to earth (or chassis).

Technical Data

- The tables indicate for the standard contactors the I_e max. operating currents depending on: the utilization category (i.e. L/R) DC-1, DC-3, DC-5 as defined in the IEC 60947-4-1 publication (see section 7 for more details), the operating voltage U_e and the pole coupling details. Ampere values quoted in the tables below are valid for a $-25 \dots +70$ °C temperature close to the contactors, as long as the **AC-1 Ampere values** (see page 2/79) for the corresponding ambient temperature **are not exceeded**.
- Max. switching frequency: 300 ops/h.
- For switching higher d.c. ratings, we recommend the use of bar mounted contactors, R series (63 ... 2000 A).
- Accessories, see section 4.

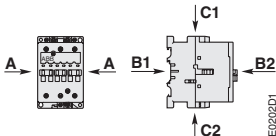
Selection Table - After selection from the ratings quoted in the tables below, please refer to "Ordering Details" in this section.

a.c. / d.c. operated contactors			EK 110	EK 150	EK 175	EK 210	EK 370	EK 550	EK 1000
Utilization category DC-1, $L/R \leq 1$ 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, $L/R \leq 2$ ms									
	≤ 72 V	A	120	145	210	210	370	550	—
	110 V	A	135	145	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, $L/R \leq 7.5$ 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	—

A..., AF..., AE... and TAE... Contactors

Technical Data

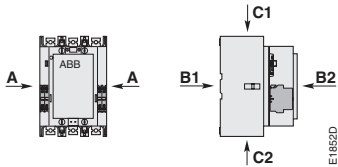
General Technical Data

Contactor types: A..., AE...	9	12	16	26	30	40	45	50	63	75	95	110
AF..., TAE...	–	–	–	–	–	–	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}	kV 8											
Standards	Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1											
Certifications - Approvals	section 7											
Air temperature close to contactor	"Conditions for use" page 2/68, 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 (55 max. for TAE... contactors)											
– for storage	°C -60 to +80											
Climatic withstand	acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II											
Operating altitude	m ≤ 3000											
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27	1/2 sinusoidal shock for 11 ms: no change in contact position											
Mounting position 1 (page 2/68)	Shock direction Making position Breaking position											
	A 20 g 20 g											
	B1 10 g 5 g (1)											
	B2 15 g (2) 15 g (2)											
	C1 20 g 20 g											
	C2 20 g 20 g											
	(1) (3 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22)											
(2) (10 g for AF 45-22, AE 45-22, AF 75-22 and AE 75-22)												
Not valid for DIN-rail mounting												

A... and AF... Contactors
Technical Data

General Technical Data

Contactor types: A...	145	185	210	260	300	-	-	-	-
	145	185	210	260	300	400	460	580	750
Rated insulation voltage Ui according to IEC 60947-4-1	1000								
	600								
Rated impulse withstand voltage Uimp.	8								
Standards	Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1								
Certifications - Approvals	section 7								
Air temperature close to contactor	"Conditions for use" page 2/69 , for control voltage limits and authorized mounting positions								
	-25 to +55								
	-40 to +70								
	-40 to +70								
Climatic withstand	acc. to IEC 60068-2-30								
Operating altitude	≤ 3000								
Shock withstand	1/2 sinusoidal shock for 30 ms: no change in contact position								
acc. IEC 60068-2-27 and EN 60068-2-27	5 g in all directions (A, B1, B2, C1, C2)								
Mounting position 1									



A..., AF..., AE... and TAE... Contactors

Technical Data

Main Pole - Utilization Characteristics

Contactor types: A..., AE...		9	12	16	26	30	40	45	50	63	75	95	110	
AF..., TAE...		–	–	–	–	–	–	45	50	63	75	95	110	
Rated operational voltage U _e max. V		690						1000 (690 for AF... contactors)						
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	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														
U _e max. 690 V	θ ≤ 40 °C	A	25	27	30	45	55	60	70	100	115	125	145	160
	θ ≤ 55 °C	A	22	25	27	40	55	60	60	85	95	105	135	145
	θ ≤ 70 °C (4)	A	18	20	23	32	39	42	50	70	80	85	115	130
	with conductor cross-sectional area	mm ²	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														
Rated operational current I _e AC-3 (1)														
	220-230-240 V	A	9	12	17	26	33	40	40	53	65	75	96	110
	3-phase motors 380-400 V	A	9	12	17	26	32	37	37	50	65	72	96	110
	415 V	A	9	12	17	26	32	37	37	50	65	72	96	110
	440 V	A	9	12	16	26	32	37	37	45	65	70	93	100
	500 V	A	9	12	14	22	28	33	33	45	55	65	80	100
	690 V	A	7	9	10	17	21	25	25	35	43	46	65	82
	1000 V	A	–	–	–	–	–	–	–	23 (3)	25 (3)	28 (3)	30 (3)	30 (3)
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
	3-phase motors 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	18.5	22	22	30	37	40	55	75
	1000 V	kW	–	–	–	–	–	–	–	30 (3)	33 (3)	37 (3)	40 (3)	40 (3)
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 ≤ 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., in free air,														
from a cold state														
	1 s	A	250	280	300	400	600		1000				1320	1320
	10 s	A	100	120	140	210	400		650				800	800
	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														
cos φ = 0.45 (cos φ = 0.35 for I _e > 100 A)														
	at 440 V	A	250			420	820		900	1300			1160	
	at 690 V	A	90			170	340		490	630			800	
Heat dissipation per pole I _e / AC-1 W			0.8	1	1.2	1.8	2.5	3	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	1.3	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 for AE...)						600 (300 for AF..., AE... TAE...)				300	
– for AC-2, AC-4		cycles/h	300						150				150	
Electrical durability		pages 2/83 ... 2/87												
Mechanical durability														
– millions of operating cycles		10 (5 for AE... and TAE... contactors)												
– max. mechanical switching frequency		cycles/h	3600 (300 for AF... contactors)											

(1) For the corresponding kW/hp/A values of 1500 r.p.m., 50Hz, 3-phase motors, see page 0/0.
(2) For the protection of motor starters against short circuits, see page 7/16.

(3) AF... contactors excluded.
(4) Unauthorized for TAE... contactors.

A... and AF... Contactors

Technical Data

Main Pole - Utilization Characteristics

Contactor types: A...		145	185	210	260	300	–	–	–	–
AF...		145	185	210	260	300	400	460	580	750
Rated operational voltage U_e max. V		690								
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 (3) mm ²		A	250	275	350	400	500	600	700	800 1050
			120	150	185	240	300 (5)	2 x 185	2 x 240	2 x 240 2 x 80 x 5 (4)
Rated operational current I_e / AC-1 for air temperature close to contactor										
U_e max. 690 V	$\theta \leq 40^\circ\text{C}$	A	250	275	350	400	500	600	700	800 1050
	$\theta \leq 55^\circ\text{C}$	A	230	250	300	350	400	500	600	700 800
	$\theta \leq 70^\circ\text{C}$	A	180	180	240	290	325	400	480	580 720
	with conductor cross-sectional area	mm ²	120	150	185	240	300 (5)	2 x 185	2 x 240	2 x 240 2 x 80 x 5 (4)
Utilization category AC-3 for air temperature close to contactor $\leq 55^\circ\text{C}$										
Rated operational current I_e AC-3 (1)										
	220-230-240 V	A	145	185	210	260	305	400	460	580 750
	3-phase motors 380-400 V	A	145	185	210	260	305	400	460	580 750
	415 V	A	145	185	210	260	300	400	460	580 750
	440 V	A	145	185	210	240	280	400	460	580 750
	500 V	A	145	170	210	240	280	400	460	580 750
	690 V	A	120	170	210	220	280	350	400	500 650
	1000 V	A	–	–	–	–	–	–	–	–
Rated operational power AC-3 (1)										
	220-230-240 V	kW	45	55	59	80	90	110	132	160 220
	1500 r.p.m. 50 Hz 3-phase motors 380-400 V	kW	75	90	110	140	160	200	250	315 400
	415 V	kW	75	90	110	140	160	220	250	355 425
	440 V	kW	75	90	110	140	160	220	250	355 450
	500 V	kW	90	110	132	180	200	250	315	400 520
	690 V	kW	110	132	160	200	250	315	355	500 600
	1000 V	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	315	355	400	500	630	800	1000	
Rated short-time withstand current I_{cw} at 40 °C ambient temp., in free air, from a cold state										
	1 s	A	1800	2000	2500	3500	4600	7000		
	10 s	A	1200	1500	1700	2400	4400	6400		
	30 s	A	800	1000	1200	1500	3100	4500		
	1 min	A	600	800	1000	1100	2500	3500		
	15 min	A	280	320	400	500	840	1300		
Maximum breaking capacity $\cos \varphi = 0.45$ ($\cos \varphi = 0.35$ for $I_e > 100$ A)										
	at 440 V	A	1500	2000	2300	2600	3000	4000	5000	6000 7500
	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
I_e / AC-3		W	5	8	9	14	18	16	21	17 28
Max. electrical switching frequency										
– for AC-1	cycles/h		300		300		300		300	
	cycles/h		300		300		300		300	
	cycles/h		150		150		60		60	
Electrical durability			pages 2/83 ... 2/87				–	–	–	–
Mechanical durability										
– millions of operating cycles			5				3			
	– max. mechanical switching frequency	cycles/h	3600 (300 for AF... contactors)				300			

(1) For the corresponding kW/hp/A values of 1500 r.p.m., 50Hz, 3-phase motors, see page 0/0.
(2) For the protection of motor starters against short circuits, see page 7/16.
(3) Conductors with preparation.

(4) Dimensions of the bars (in mm).
(5) For currents above 450 A use terminal extension / enlargement pieces (LX 300 / LW 300 see page 4/25).

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		20 ... 690											
– at 60 Hz	V		24 ... 600											
Coil operating limits														
according to IEC 60947-4-1			θ ≤ 55 °C										θ ≤ 70 °C	
			0.85 ... 1.1 x U _c										0.85 ... 1.1 x U _c	
Drop-out voltage in % of U _c			roughly 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: voltage codes 8 0 to 8 8.  page 0/1

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													
– at 60 Hz	V													
– d.c.	V													
Coil operating limits														
according to IEC 60947-4-1														
Drop-out voltage in % of U _c			55 %											
Coil consumption														
Average pull-in value	50 Hz	VA												
	60 Hz	VA												
	d.c.	W												
Average holding value	50 Hz	VA/W												
	60 Hz	VA/W												
	d.c.	W												
Operating time														
between coil energization and:														
– N.O. contact closing	ms													
– N.C. contact opening	ms													
between coil de-energization and:														
– N.O. contact opening	ms													
– N.C. contact closing	ms													

A... and AF... Contactors

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	$\theta \leq 70\text{ °C}$								
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$								
Drop-out voltage in % of U_c	roughly 25 ... 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: voltage codes 8 0 to 8 8.  page 0/1

Magnet System Characteristics for AF... Contactors

Contactor types: AF...	145	185	210	260	300	400	460	580	750
Rated control circuit voltage U_c									
– at 50 Hz V	48 ... 250								
– at 60 Hz V	48 ... 250								
– d.c. V	24 ... 250								
Coil operating limits	$\theta \leq 70\text{ °C}$								
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$								
Drop-out voltage in % of U_c	55 %								
Coil consumption									
Average pull-in value 50 Hz VA	430		470			890		850	
60 Hz VA	430		470			890		850	
d.c. W	500		520			990		950	
Average holding value 50 Hz VA/W	12/3.5		10/2.5			12/4		12/4.5	
60 Hz VA/W	12/3.5		10/2.5			12/4		12/4.5	
d.c. W	2		2			4		4.5	
Operating time									
between coil energization and:									
– N.O. contact closing ms	30 ... 115					50 ... 120			
– N.C. contact opening ms	30 ... 115					50 ... 120			
between coil de-energization and:									
– N.O. contact opening ms	25 ... 80					40 ... 70			
– N.C. contact closing ms	25 ... 80					40 ... 70			

AE... and TAE... Contactors

Technical Data

Magnet System Characteristics for AE... Contactors

Contactor types: AE...				9	12	16	26	30	40	45	50	63	75	95	110
Rated control circuit voltage U _c V d.c.				12 ... 250											
Coil operating limits according to IEC 60947-4-1				θ ≤ 55 °C 0.85 ... 1.1 x U _c										θ ≤ 70 °C	
Drop-out voltage in % of U _c				roughly 10 ... 30 %						roughly 15 ... 40 %					
Coil consumption - Average values															
– pull-in value		W		90		110		200		400					
– holding value		W		2		2.5		4		2.4					
Coil time constant															
– open		L/R	ms	2		3		3		6					
– closed		L/R	ms	9		16		15		30 ... 40					
Operating time															
between coil energization and:															
– N.O. contact closing		ms		10 ... 16		13 ... 21		13 ... 30		15 ... 25					
– N.C. contact opening		ms		8 ... 12		11 ... 16		10 ... 27		12 ... 22					
between coil de-energization and:															
– N.O. contact opening		ms		5 ... 14 (1)		6 ... 12 (1)		5 ... 15 (1)		15 ... 20 (1)					
– N.C. contact closing		ms		11 ... 17 (1)		8 ... 16 (1)		8 ... 18 (1)		18 ... 23 (1)					

(1) The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.
AE 9 ... AE 40 contactors and $U_c \geq 110\text{ V}$: table values for contactors with **RV 5** surge suppressor (factory mounted).

Magnet System Characteristics for TAE... Contactors

Contactor types: TAE...	-	-	-	-	-	-	45	50	-	75	95	110
Rated control circuit voltage U_c V d.c.							17 ... 264					
Coil operating limits according to IEC 60947-4-1							$\theta \leq 55\text{ }^{\circ}\text{C}$ U_c min. ... U_c max.					
Drop-out voltage in % of U_c max.							roughly 20 ... 35 %					
Coil consumption values for U_c min. ... U_c max.												
- pull-in value	W								120 ... 250		300 ... 1000	
- holding value	W								1.7 ... 6.5		2 ... 7	
Coil time constant												
- open	L/R	ms							3		6	
- closed	L/R	ms							15		40	
Operating time												
between coil energization and:												
- N.O. contact closing	ms								13 ... 30		15 ... 25	
- N.C. contact opening	ms								10 ... 27		12 ... 22	
between coil de-energization and:												
- N.O. contact opening	ms								5 ... 15 (1)		15 ... 20 (1)	
- N.C. contact closing	ms								8 ... 18 (1)		18 ... 23 (1)	

(1) The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.

A... Contactors

Technical Data

Built-in Auxiliary Contacts - Utilization Characteristics

Contactor types: A...	9	12	16	26	30	40	45	50	63	75	95	110
Rated operational voltage U_e max. V	690						–	–	–	–	–	–
Conventional free air thermal current I_{th} - $\theta \leq 40$ °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 / W	6 / 144						–	–	–	–	–	–
48 V d.c. A / W	2.8 / 134						–	–	–	–	–	–
72 V d.c. A / W	2 / 144						–	–	–	–	–	–
125 V d.c. A / W	1.1 / 138						–	–	–	–	–	–
250 V d.c. A / W	0.55 / 138						–	–	–	–	–	–
Rated making capacity acc. to IEC 60947-5-1	10 x I_e / AC-15						–	–	–	–	–	–
Rated 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						–	–	–	–	–	–
Non-overlapping time between N.O. and N.C. contacts ms	≥ 2						–	–	–	–	–	–
Insulating resistance at 500 V d.c. after durability test MOhm	5						–	–	–	–	–	–
Heat dissipation per pole at 6 A W	0.10						–	–	–	–	–	–
Electrical durability	ES page 4/35											

2

Technical Data

A..., AF..., AE... and TAE... Contactors

Technical Data

Mounting Characteristics

Contactor types: A..., AE...	9	12	16	26	30	40	45	50	63	75	95	110
AF..., TAE...	–	–	–	–	–	–	45	50	63	75	95	110
Mounting positions	"Conditions for use"											
Mounting distances	The contactors can be assembled side by side											
Fixing												
on DIN rail												
according to IEC 715 and EN 50022 / EN 50023												
by screws (not supplied)												
	35 x 7.5 mm						35 x 15 mm			75 x 25 mm		
	35 x 15 mm						75 x 25 mm			75 x 25 mm		
	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.

Contactors	Mounting position	Ambient temperature	Control voltage
A 9 ... A 110, AE 9 ... AE 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 55 °C	0.85 ... 1.1 x U _c
		55 ... 70 °C	U _c
	6	≤ 55 °C	0.95 ... 1.1 x U _c
		> 55 °C unauthorized	–
AF 45 ... AF 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 U _c min. ... 1.1 x U _c max.
	6 unauthorized	–	–
TAE 45 ... TAE 110	1, 1 ± 30°, 2, 3, 4, 5	≤ 55 °C	U _c min. ... U _c max.
		> 55 °C unauthorized	–
	6 unauthorized	–	–

Notes for 4-pole contactors

Whatever the coil voltage: Pos. 5 unauthorized for A 45-22-00, AE 45-22-00, A 75-22-00, AE 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

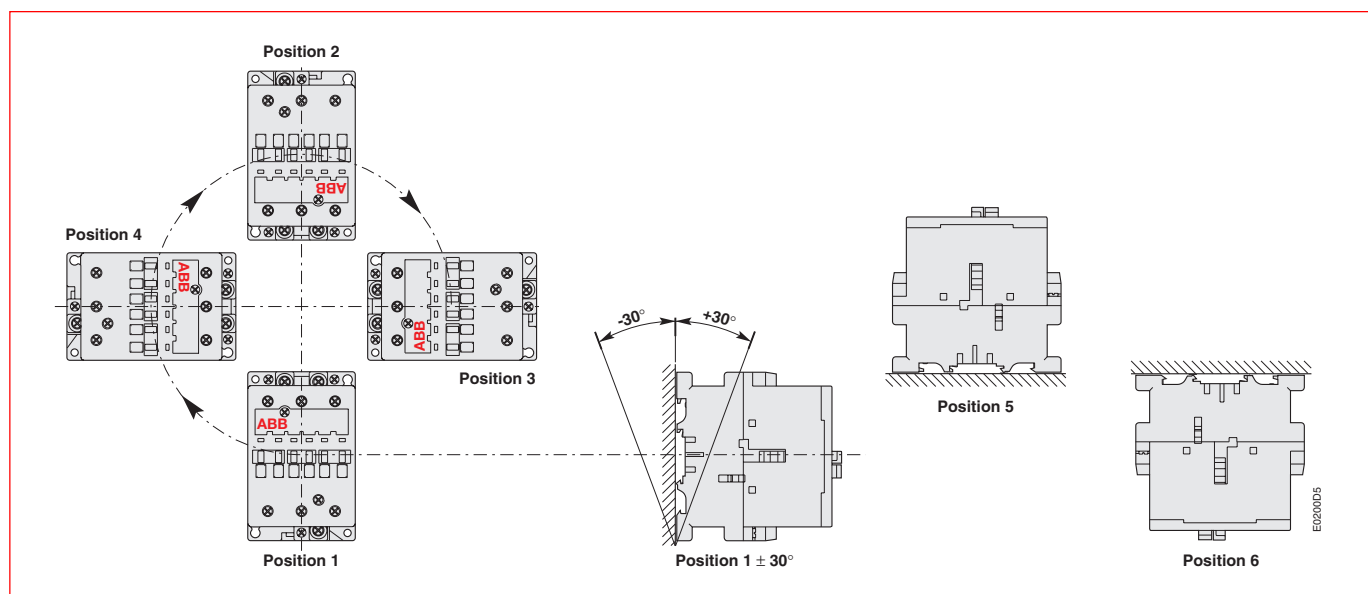
Mounting positions 1 to 5 and ambient temperature ≤ 55 °C: tolerance reduced to 0.9 ... 1.1 U_c (instead of 0.85 ... 1.1 U_c) for coil voltage codes 7 □ and 8 □.

– A 45-22-00 and A 75-22-00 contactors

Mounting positions 1 to 4 (pos. 5 unauthorized) and ambient temperature ≤ 55 °C: tolerance reduced to 0.9 ... 1.1 U_c (instead of 0.85 ... 1.1 U_c) 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

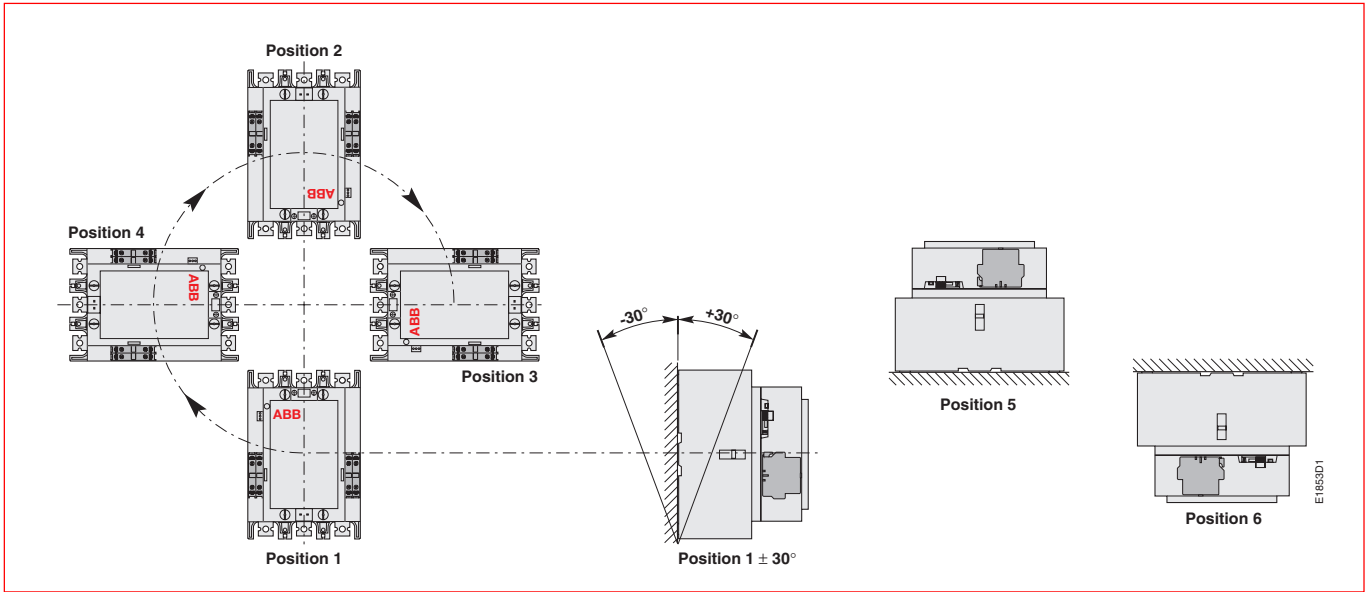
Contactor types: A...	145	185	210	260	300	-	-	-	-
AF...	145	185	210	260	300	400	460	580	750
Mounting positions	"Conditions for use"								
Mounting distances	No mounting distance required between contactors								
Fixing									
on DIN rail	-	-	-	-	-	-	-	-	-
according to IEC 715 and EN 50022 / EN 50023									
by screws (not supplied)	4 x M5							4 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.

Contactors	Mounting position	Ambient temperature	Control voltage
A 145 ... A 300	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 ... 1.1 x U _c
	6 unauthorized	-	-
AF 145 ... AF 750	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 x U _c min. ... 1.1 x U _c max.
	6 unauthorized	-	-

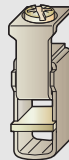
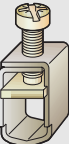
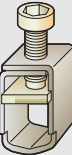
Mounting Positions (see the above table for authorized positions)



A..., AF..., AE... and TAE... Contactors

Technical Data

Connecting Characteristics

Contactor types: A..., AE...	9		12		16		26		30		40		45		50		63		75		95		110		
AF..., TAE...	-		-		-		-		-		-		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											
stranded (≥ 6 mm²)				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 ≤ l mm >		8 3.7		10 4.2		- -		- -		- -		- -		- -		30 (2) 6					
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 ≤ l mm >		8 3.7		(1) (1)		8 3.7															
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529																									
- Main terminals																									
- Coil terminals																									
- Built-in auxiliary terminals																									
Screw terminals																									
Main terminals																									
Coil terminals																									
Built-in auxiliary terminals																									
Tightening torque																									
Main pole terminals																									
- recommended																									
- max.																									
Coil terminals																									
- recommended																									
- max.																									
Built-in auxiliary terminals																									
- recommended																									
- max.																									
Terminal marking and positioning																									

 section 8

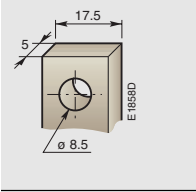
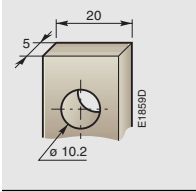
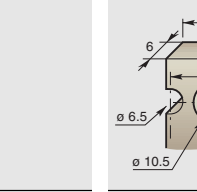
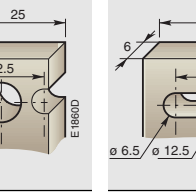
(1) $L \leq 8$ and $l > 3.7$ for coil terminal - $L \leq 10$ and $l > 4.2$ for built-in auxiliary terminals.

(2) With LW 110 enlargement piece.  page 4/25.

A... and AF... Contactors

Technical Data

Connecting Characteristics

Contactor types: A...	145	185	210	260	300	-	-	-	-
AF...	145	185	210	260	300	400	460	580	750
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	6 ... 185	16 ... 240	240	300					
single for Al/Cu cable	25 ... 150	120 ... 240	240	300					
double for Al/Cu cable	-	2 x 95 ... 120	2 x 240	3 x 185					
Flexible									
1 x mm ²	-	-	-	-	-	-	-	-	-
2 x mm ²	-	-	-	-	-	-	-	-	-
Bars or lugs									
L mm ≤	24	32	47 / 45	52 / 50					
Ø mm >	8	10	10	12					
Auxiliary conductors (coil terminals)									
Rigid solid									
1 x mm ²	1 ... 4	1 ... 4							
2 x mm ²	1 ... 4	1 ... 4							
Flexible with cable end									
1 x mm ²	0.75 ... 2.5	0.75 ... 2.5							
2 x mm ²	0.75 ... 2.5	0.75 ... 2.5							
Lugs									
L mm ≤	8	3.7							
l mm >	3.7								
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact acc. to VDE 0106 - part 100								
- Main terminals	IP 00								
- Coil terminals	IP 20								
- Built-in auxiliary terminals	-								
Screw terminals									
Main terminals	Screws and bolts								
	M8	M10	M10	M12					
Coil terminals (delivered in open position)	M3.5 (+,-) pozidriv 2 screws with cable clamp								
Built-in auxiliary terminals	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
Tightening torque									
Main pole terminals									
- recommended	Nm / lb.in	18 / 160	28 / 240	40 / 354	45 / 443				
- max.	Nm	20	30	44	49				
Coil terminals									
- recommended	Nm / lb.in	1.00 / 9							
- max.	Nm	1.20							
Built-in auxiliary terminals									
- recommended	Nm / lb.in	-	-	-	-	-	-	-	-
- max.	Nm	-	-	-	-	-	-	-	-
Terminal marking and positioning	section 8								

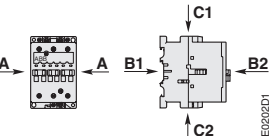
2

Technical Data

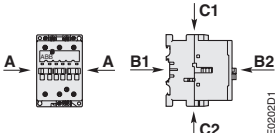
BC... and TBC... Contactors

Technical Data

General Technical Data for BC... Contactors

Contractor types: BC...		9	16	18	25	30																		
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 international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1																						
Certifications - Approvals		section 7																						
Air temperature close to contactor		"Conditions for use" page 2/76, 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	-60 to +80																						
Climatic withstand		acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II																						
Operating altitude		m	≤ 3000																					
Shock withstand		1/2 sinusoidal shock for 11 ms: no change in contact position																						
acc. IEC 60068-2-27 and EN 60068-2-27																								
Mounting position 1 (page 2/76)																								
		<table><tr><th>Shock direction</th><th>Making position</th><th>Breaking position</th></tr><tr><td>A</td><td>20 g</td><td>20 g</td></tr><tr><td>B1</td><td>10 g</td><td>5 g</td></tr><tr><td>B2</td><td>15 g</td><td>15 g</td></tr><tr><td>C1</td><td>20 g</td><td>20 g</td></tr><tr><td>C2</td><td>20 g</td><td>20 g</td></tr></table>					Shock direction	Making position	Breaking position	A	20 g	20 g	B1	10 g	5 g	B2	15 g	15 g	C1	20 g	20 g	C2	20 g	20 g
Shock direction	Making position	Breaking position																						
A	20 g	20 g																						
B1	10 g	5 g																						
B2	15 g	15 g																						
C1	20 g	20 g																						
C2	20 g	20 g																						

General Technical Data for TBC... Contactors

Contactor types: TBC...	9	16	–	25	30																	
Rated insulation voltage U_i according to IEC 60947-4-1 according to UL/CSA	V V	1000 600																				
Rated impulse withstand voltage U_{imp}	kV	8																				
Standards	Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1																					
Certifications - Approvals	E section 7																					
Air temperature close to contactor – fitted with thermal O/L relay – without thermal O/L relay – for storage	°C °C °C	-25 to +55 -40 to +55 -60 to +80																				
Climatic withstand	acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II																					
Operating altitude	m	≤ 3000																				
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27 Mounting position 1 (E page 2/76)	1/2 sinusoidal shock for 11 ms: no change in contact position																					
		<table><tr><th>Shock direction</th><th>Making position</th><th>Breaking position</th></tr><tr><td>A</td><td>15 g*</td><td>10 g</td></tr><tr><td>B1</td><td>10 g</td><td>5 g**</td></tr><tr><td>B2</td><td>10 g</td><td>6 g***</td></tr><tr><td>C1</td><td>10 g</td><td>4 g</td></tr><tr><td>C2</td><td>10 g</td><td>4 g</td></tr></table>			Shock direction	Making position	Breaking position	A	15 g*	10 g	B1	10 g	5 g**	B2	10 g	6 g***	C1	10 g	4 g	C2	10 g	4 g
Shock direction	Making position	Breaking position																				
A	15 g*	10 g																				
B1	10 g	5 g**																				
B2	10 g	6 g***																				
C1	10 g	4 g																				
C2	10 g	4 g																				
Exceptions: * 12g for TBC 30-30-00, ** 4g for TBC 16-22-00, *** 5g for TBC 25-30-01																						

BC... and TBC... Contactors

Technical Data

2

Technical Data

Main Pole - Utilization Characteristics

Contactor types: BC...		9	16	18	25	30
TBC...		9	16	–	25	30
Rated operational voltage U _e max. V		690				
Rated frequency limits Hz		25 ... 400				
Conventional free-air thermal current I _{th} acc. to IEC 60947-4-1, open contactors θ ≤ 40 °C						
with conductor cross-sectional area mm ²		26 4	28 4	36 6	45 6	65 10
Rated operational current I _e / AC-1 for air temperature close to contactor						
U _e max. 690 V	θ ≤ 40 °C	A 22	28	36	45	55
	θ ≤ 55 °C	A 20	25	32	40	45
	θ ≤ 70 °C ⁽⁵⁾	A 17	23	28	32	36
	with conductor cross-sectional area mm ²	2.5	4	6	6	6
Utilization category AC-3 for air temperature close to contactor ≤ 55 °C						
Rated operational current I _e AC-3 ⁽¹⁾						
	220-230-240 V	A 9	16	16	25	33 ⁽³⁾
	3-phase motors 380-400 V	A 9	16	16	25	30
	415 V	A 9	16	16	25	30
	440 V	A 9	16	16	20	27
	500 V	A 7	13	13	17	23
	690 V	A 6	8	9	13	18
Rated operational power AC-3 ⁽¹⁾						
	220-230-240 V	kW 2.2	4	4	6.5 ⁽⁴⁾	9
	1500 r.p.m. 50 Hz 380-400 V	kW 4	7.5	7.5	11	15
	1800 r.p.m. 60 Hz	kW 4	7.5	7.5	11	15
	3-phase motors 415 V	kW 4	7.5	7.5	11	15
	440 V	kW 4	7.5	7.5	11	15
	500 V	kW 4	7.5	7.5	11	15
690 V	kW 4	5.5	7.5	11	15	
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 ≤ 500 V a.c. - gG type fuse		A 25	32/35	40	50	63
Rated short-time withstand current I _{cw} at 40 °C ambient temp., in free air, from a cold state						
1 s		A 200	280	280	350	400
10 s		A 90	130	130	200	250
30 s		A 50	70	70	110	150
1 min		A 40	50	50	90	120
15 min		A 26	28	36	45	65
Maximum breaking capacity cos φ = 0.45 (cos φ = 0.35 for I _e > 100 A)						
at 440 V		A 200			315	380
at 690 V		A 120			210	290
Heat dissipation per pole I _e / AC-1 W		0.55	1.5	1.80	2.4	2.2
I _e / AC-3 W		0.10	0.4	0.45	0.6	0.6
Max. electrical switching frequency						
– for AC-1 cycles/h		600			600	
– for AC-3 cycles/h		1200 ⁽⁶⁾			600	
– for AC-2, AC-4 cycles/h		300			150	
Electrical durability		pages 2/83, 2/88				
Mechanical durability						
– millions of operating cycles		10			10	
– max. mechanical switching frequency cycles/h		6000			3000	

(1) For the corresponding kW/hp/A values of 1500 r.p.m., 50Hz, 3-phase motors, see page 0/0.

(2) For the protection of motor starters against short circuits, see page 7/16.

(3) 32 A at 240 V.

(4) 7.5 kW at 240 V.

(5) Unauthorized for TBC... contactors.

(6) 600 cycles/h for BC 9-22-00, BC 16-22-00 and TBC 9-22-00, TBC 16-22-00 contactors.

BC... and TBC... Contactors

Technical Data

Magnet System Characteristics for BC... Contactors

Contactor types: BC...			9	16	18	25	30
Rated control circuit voltage U_c							
V d.c.			12 ... 250				
Coil operating limits			$\theta \leq 55\text{ }^{\circ}\text{C}$				
according to IEC 60947-4-1			$0.85 \dots 1.1 \times U_c$				
Drop-out voltage in % of U_c			roughly 15 ... 30 %				
Coil consumption - Average values							
– pull-in value		W	7				
– holding value		W	7				
Coil time constant							
– open		L/R	ms	40			
– closed		L/R	ms	90			
Operating time							
between coil energization and:							
– N.O. contact closing		ms	50 ... 75				
– N.C. contact opening		ms	45 ... 70				
between coil de-energization and:							
– N.O. contact opening		ms	15 ... 30 (1)				
– N.C. contact closing		ms	17 ... 32 (1)				

(1) The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.

Magnet System Characteristics for TBC... Contactors

Contactor types: TBC...			9	16	-	25	30
Rated control circuit voltage U_c V d.c.			17 ... 264				
Coil operating limits according to IEC 60947-4-1			$\theta \leq 55\text{ }^{\circ}\text{C}$ U_c min. ... U_c max.				
Drop-out voltage in % of U_c max.			roughly 9 ... 25 %				
Coil consumption values for U_c max. and 20 °C							
- pull-in value	W		9				
- holding value	W		9				
Coil time constant							
- open	L/R	ms	40				
- closed	L/R	ms	90				
Operating time							
between coil energization and:							
- N.O. contact closing	ms		50 ... 75				
- N.C. contact opening	ms		45 ... 70				
between coil de-energization and:							
- N.O. contact opening	ms		15 ... 30 (1)				
- N.C. contact closing	ms		17 ... 32 (1)				

(1) The use of surge suppressors increases the opening time on a scale of 1.1 to 1.5 for a varistor suppressor and on a scale of 4 to 8 for a diode suppressor.

BC... and TBC... Contactors

Technical Data

Built-in Auxiliary Contacts - Utilization Characteristics

Contactor types: BC...	9	16	18	25	30
TBC...	9	16	–	25	30
Rated operational voltage U_e max. V	690				
Conventional free air thermal current I_{th} - $\theta \leq 40$ °C A	10	16	10	16	
Rated frequency limits Hz	25 ... 400				
Rated operational current I_e / AC-15 acc. 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 acc. to IEC 60947-5-1					
24 V d.c. A / W	6 / 144				
48 V d.c. A / W	2.8 / 134				
72 V d.c. A / W	2 / 144	1 / 72	2 / 144	1 / 72	
125 V d.c. A / W	1.1 / 138	0.55 / 138	1.1 / 138	0.55 / 138	
250 V d.c. A / W	0.55 / 138	0.3 / 75	0.55 / 138	0.3 / 75	
Rated making capacity according to IEC 60947-5-1	10 x I_e / AC-15				
Rated breaking capacity according 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	50	100	50	100	
for 0.1 s A	100	140	100	140	
Minimum switching capacity V / mA	24 / 5	17 / 5	24 / 5	17 / 5	
Non-overlapping time between N.O. and N.C. contacts ms	≥ 2				
Heat dissipation per pole at 6 A W	0.15				
Electrical durability	page 4/35				

2

Technical Data

BC... and TBC... Contactors

Technical Data

Mounting Characteristics

Contactor types: BC...	9	16	18	25	30
TBC...	9	16	–	25	30
Mounting positions	"Conditions for use"				
Mounting distances	"Dimension drawings" (section 9) for distances required between contactors				
Fixing					
on DIN rail	35 x 7.5 mm				
according to IEC 715 and EN 50022	35 x 15 mm				
by screws (not supplied)	2 x M4				

Conditions for Use

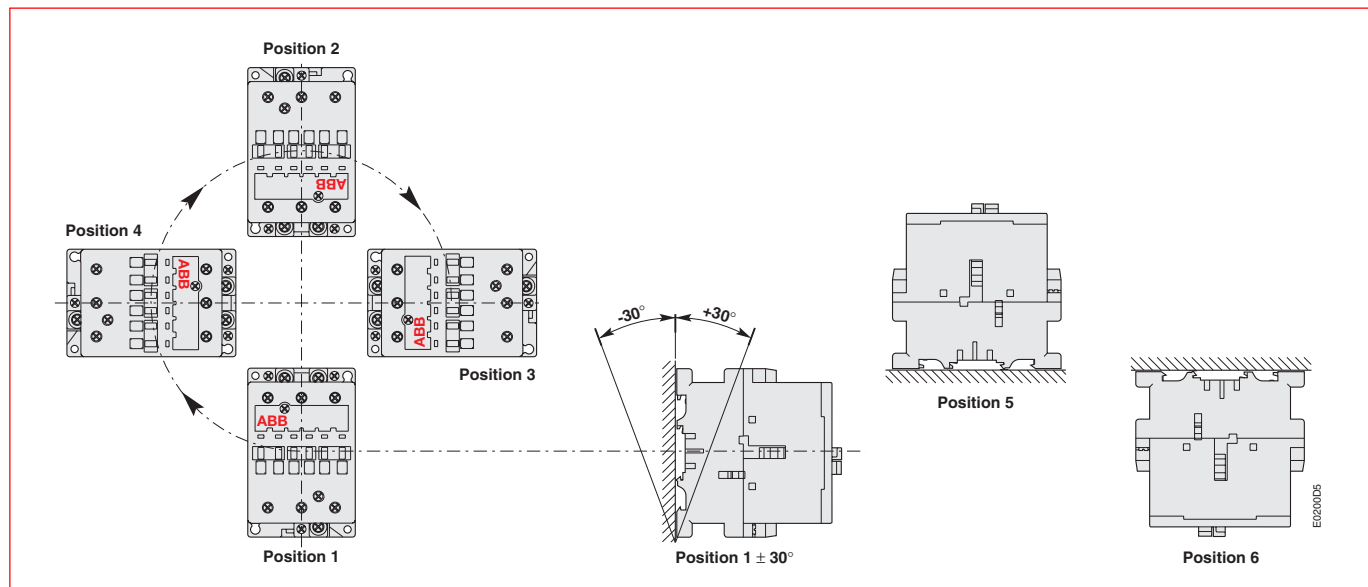
Sustainable utilization conditions for contactors involving at the same time the Mounting position, Ambient temperature and Control voltage operating limits are summarized in the table below.

Contactors	Mounting position	Ambient temperature	Control voltage
BC 9 ... BC 30	1, 3, 4, 5	≤ 55 °C	0.85 ... 1.1 x U_c
		55 ... 70 °C	U_c
	1 ± 30°, 2	≤ 55 °C	0.95 ... 1.1 x U_c
		55 ... 70 °C	U_c
	6	≤ 55 °C	0.95 ... 1.1 x U_c
		> 55 °C unauthorized	–
TBC 9 ... TBC 30	1, 1 ± 30°, 3, 4,	≤ 55 °C	U_c min. ... U_c max.
	2, 5, 6 unauthorized	> 55 °C unauthorized	–

Note: BC... contactors in position 5: – do not use RT 7 surge suppressors
– $U_c \leq 440$ V d.c.

BC 9-22-00 ... BC 25-22-00: position 5 unauthorized.

Mounting Positions (see the above table for authorized positions)



BC... and TBC... Contactors

Technical Data

Connecting Characteristics

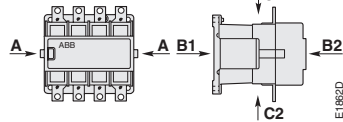
Contactor types: BC...	9	16	18	25	30
TBC...	9	16	–	25	30
 with cable clamp					
Connecting capacity (min. ... max.)					
Main conductors (poles)					
Rigid: solid ($\leq 4\text{ mm}^2$) }  1 x mm²	1 ... 4		1.5 ... 6		2.5 ... 10
stranded ($\geq 6\text{ mm}^2$) }  2 x mm²	1 ... 4		1.5 ... 6		2.5 ... 10
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	1 ... 2.5		1.5 ... 4		2.5 ... 6
 2 x mm²	0.75 ... 2.5		1.5 ... 4		2.5 ... 6
Bars or lugs  L mm $\leq$					
l mm $>$	8		10		13
	3.7		4.2		5
Auxiliary conductors (built-in auxiliary terminals + coil terminals)					
Rigid solid					
 1 x mm²	1 ... 4				
 2 x mm²	1 ... 4				
Flexible with cable end					
 1 x mm²	1 ... 2.5				
 2 x mm²	0.75 ... 2.5				
Lugs  L mm $\leq$					
l mm $>$	8				
	3.7				
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529					
– Main terminals	Protection against direct contact acc. to VDE 0106 - Part. 100				
– Coil terminals	IP 10				
– Built-in auxiliary terminals	IP 20				
	IP 10				
(delivered in open position, screws of unused terminals must be tightened)					
(+,–) pozidriv 2 screws					
M3.5	M4			M5	
M 3.5 (+,–) pozidriv 2 screws with cable clamp					
(+,–) pozidriv 2 screws with cable clamp					
M3.5	M4			–	
Tightening torque					
Main pole terminals					
– recommended Nm / lb.in	1.00 / 9	1.70 / 15		2.80 / 25	
– max. Nm	1.20	2.20		3.20	
Coil terminals					
– recommended Nm / lb.in	1.00 / 9				
– max. Nm	1.20				
Built-in auxiliary terminals					
– recommended Nm / lb.in	1.00 / 9	1.70 / 15		1.00 / 9	
– max. Nm	1.20	2.20		1.20	
Terminal marking and positioning					
 section 8					

EK... Contactors

Technical Data

General Technical Data

Contactor types: EK...		110	150	175	210	370	550	1000
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 international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1						
Certifications - Approvals		section 7						
Air temperature close to contactor		"Conditions for use" page 2/81, 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								
acc. IEC 60068-2-27 and EN 60068-2-27								
Mounting position 1 (page 2/81)		1/2 sinusoidal shock for 15 ms: no change in contact position						
		Contactor in making or breaking position						
		Shock direction: A, C1, C2: 10 g						
		B1: 10 g						
		B2: 10 g						



EK... Contactors

Technical Data

2

Technical Data

Main Pole - Utilization Characteristics

Contactor types: EK...		110	150	175	210	370	550	1000		
Rated operational voltage U_e max. V		1000							690	
Rated frequency limits Hz		25 ... 400								
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors $\theta \leq 40\text{ }^{\circ}\text{C}$ with conductor cross-sectional area		A	200	250	300	350	550	800	1000	
		mm ²	95	150	185	240	2 x 185	2 x 240	2 x 300	
Rated operational current I_e / AC-1 for air temperature close to contactor										
U_e max. 690 V	$\theta \leq 40\text{ }^{\circ}\text{C}$	A	200	250	300	350	550	800	1000	
	$\theta \leq 55\text{ }^{\circ}\text{C}$	A	180	230	270	310	470	650	800	
	$\theta \leq 70\text{ }^{\circ}\text{C}$	A	155	200	215	250	400	575	720	
with conductor cross-sectional area		mm ²	95	150	185	240	2 x 185	2 x 240	2 x 300	
Utilization category AC-3 for air temperature close to contactor $\leq 55\text{ }^{\circ}\text{C}$										
Rated operational current I_e AC-3 ⁽¹⁾										
	220-230-240 V	A	120	145	210	400	550	—		
	3-phase motors 380-400 V	A	120	145	210	400	550	—		
	415 V	A	120	145	210	400	550	—		
	440 V	A	120	145	210	370	550	—		
	500 V	A	120	145	210	370	550	—		
	690 V	A	120	120	210	370	550	—		
	1000 V	A	64	80	113	155	175	—		
Rated operational power AC-3 ⁽¹⁾										
	220-230-240 V	kW	30	45	59	110	160	—		
	1500 r.p.m. 50 Hz 3-phase motors 380-400 V	kW	55	75	110	200	280	—		
	415 V	kW	55	75	110	220	315	—		
	440 V	kW	59	75	110	220	315	—		
	500 V	kW	75	90	132	250	400	—		
	690 V	kW	110	110	160	355	500	—		
	1000 V	kW	90	110	160	220	250	—		
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	250		355	630	800	1000		
Rated short-time withstand current I_{cw} at 40 °C ambient temp., in free air, from a cold state										
1 s		A	1700	1800	2300	5500	6800			
10 s		A	900	1200	1680	5300	6400			
30 s		A	600	700	1000	3700	4400			
1 min		A	450	550	800	3000	3400			
15 min		A	210	250	320	1000	1200			
Maximum breaking capacity $\cos \varphi = 0.45$ ($\cos \varphi = 0.35$ for $I_e > 100$ A)										
at 440 V		A	1400	1500	2000	5000	5400	—		
at 690 V		A	1100	1200	1700	5000	5400	—		
Heat dissipation per pole I_e / AC-1		W	10	13	18	40	60	80		
I_e / AC-3		W	3	5	9	15	25	—		
Max. electrical switching frequency										
— for AC-1		cycles/h	300							300
— for AC-3		cycles/h	300							—
— for AC-2, AC-4		cycles/h	150							—
Electrical durability			pages 2/83, 2/89							
Mechanical durability										
— millions of operating cycles			10							5
— max. mechanical switching frequency		cycles/h	3600							3600

(1) For the corresponding kW/hp/A values of 1500 r.p.m., 50Hz, 3-phase motors, see page 0/0.

(2) For the protection of motor starters against short circuits, see page 7/16.

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	$\theta \leq 70\text{ °C}$						
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$						
Drop-out voltage in % of U_c	roughly 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  page 0/1							
(2) 50/60 Hz "E" coil voltage codes  page 0/1							

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	$\theta \leq 70\text{ °C}$						
according to IEC 60947-4-1	$0.85 \dots 1.1 \times U_c$						
Drop-out voltage in % of U_c	roughly 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	"Conditions for use"						
Mounting distances	"Dimension drawings" (section 9) for distances required between contactors						
Fixing by screws (supplied)	4 x M6				4 x M6 (1)		

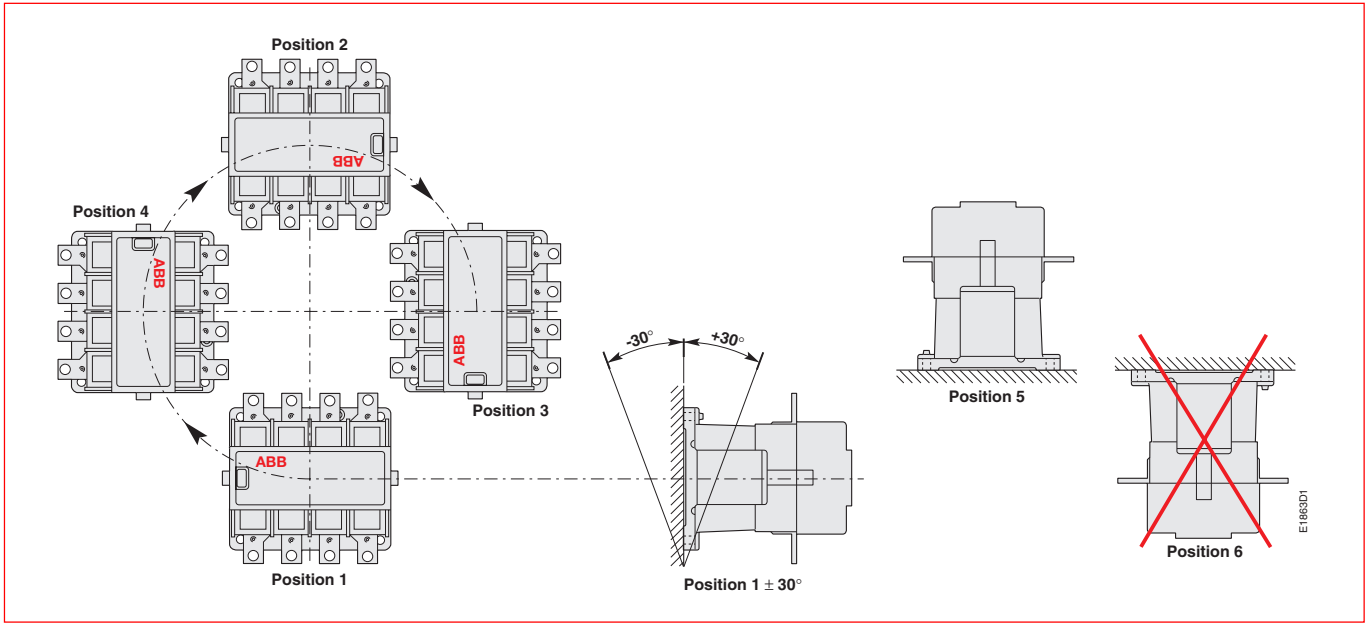
(1) Damping elements are supplied

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.

Contactors	Mounting position	Ambient temperature	Control voltage
E 110 ... EK 210	1, 1 ± 30°, 3, 4, 5	≤ 70 °C	0.85 ... 1.1 x U _c
	2, 6 unauthorized		
E 370 ... EK 1000	1, 1 ± 30°, 2, 3, 4, 5	≤ 70 °C	0.85 ... 1.1 x U _c
	6 unauthorized		

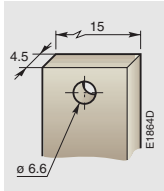
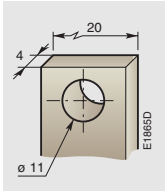
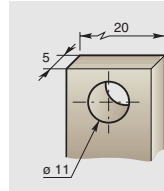
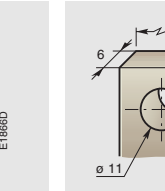
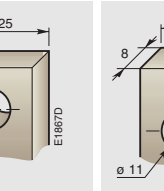
Mounting Positions (see the above table for authorized positions)



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		
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						
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529	Protection against direct contact acc. to VDE 0106 - Part. 100						
– 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					
Terminal marking and positioning	section 8						

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 pages 2/84 ... 2/89, 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.

These curves have been plotted for 400 V - 50 Hz 3-phase currents but remain valid up to 690 V - 40 ... 60 Hz provided that a check is carried out to make sure that at the operational voltage U_e , the current I_e normally drawn by the load does not exceed the value of the contactor rated operational current: I_e / AC-1 for category AC-1 and I_e / AC-3 for categories AC-3 and AC-4. The values are given for each type of contactor in pages 2/62, 2/63, 2/73, and 2/79 (Technical Data).

For the AC-2 applications, the I_e values are given in the "stator contactor table", page 2/48

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, page 0/0).
- 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, page 0/0).
- 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 operations **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 pages 2/62, 2/63, 2/73, and 2/79.

● For the selected contactor make a note of the following in relation to the voltage using diagram AC-3 page 2/85 and AC-4 page 2/86 or 2/87:

- 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.

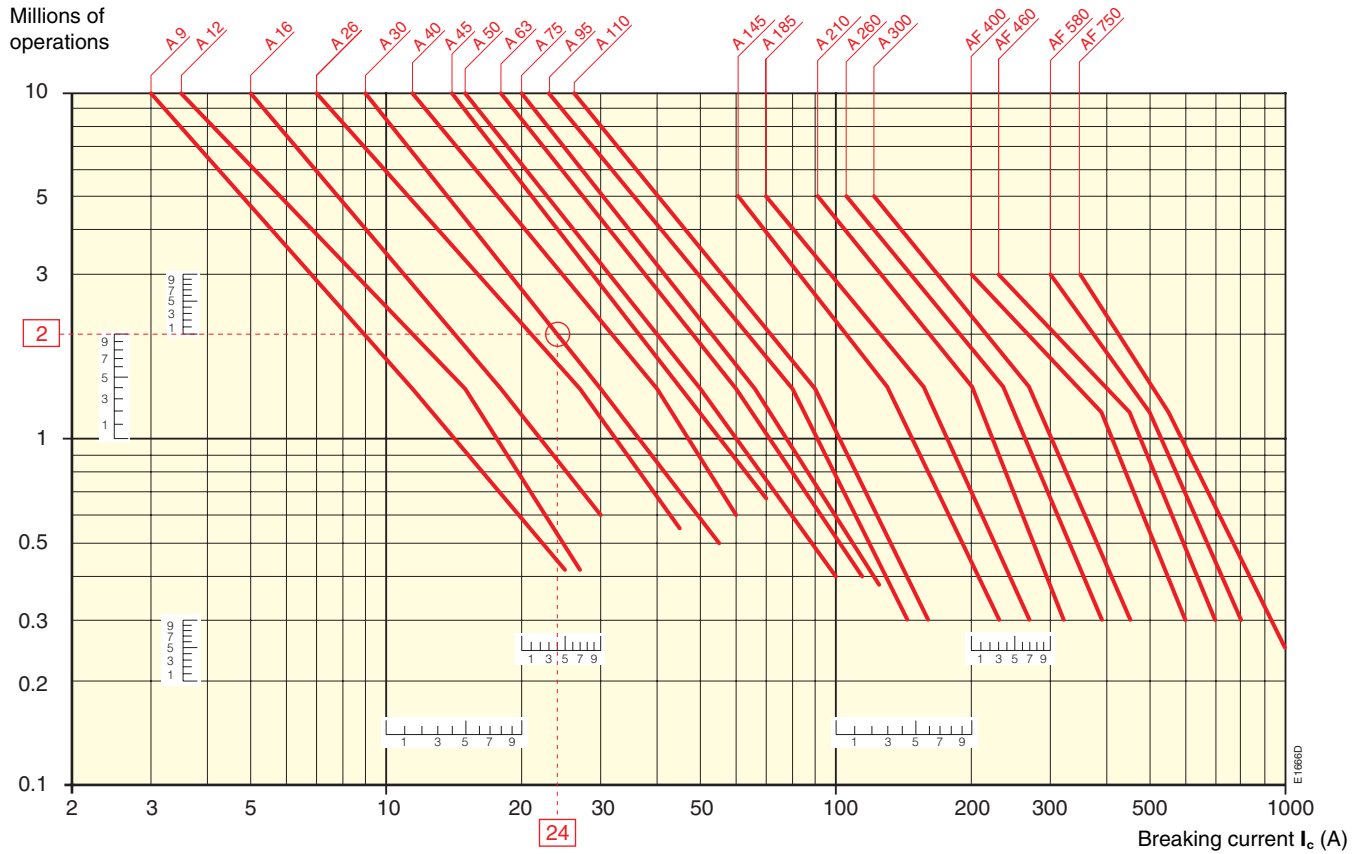
For long term service, some verifications of preventing maintenance are needed to check the functionality of the concerned product (consult us). Over a duration of five years, in these conditions the contactor might present high internal resistance. We recommend to change the contactor or change the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

A... Contactors

Electrical Durability

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

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.



Example:

$I_b / \text{AC-1} = 24\text{ A}$ – Electrical durability required = 2 million operations.

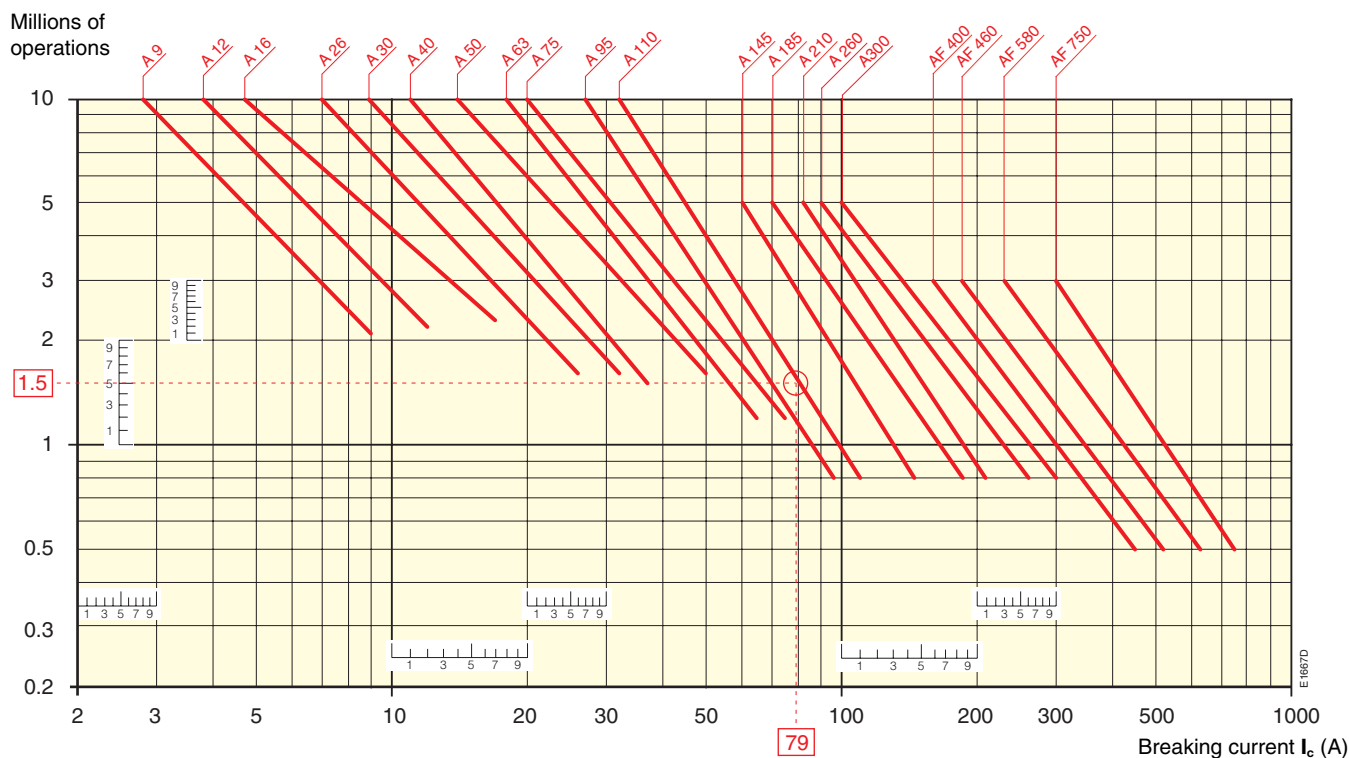
Using the AC-1 curves above select the A 30 contactor at intersection "O" (24 A / 2 million operations).

A... Contactors

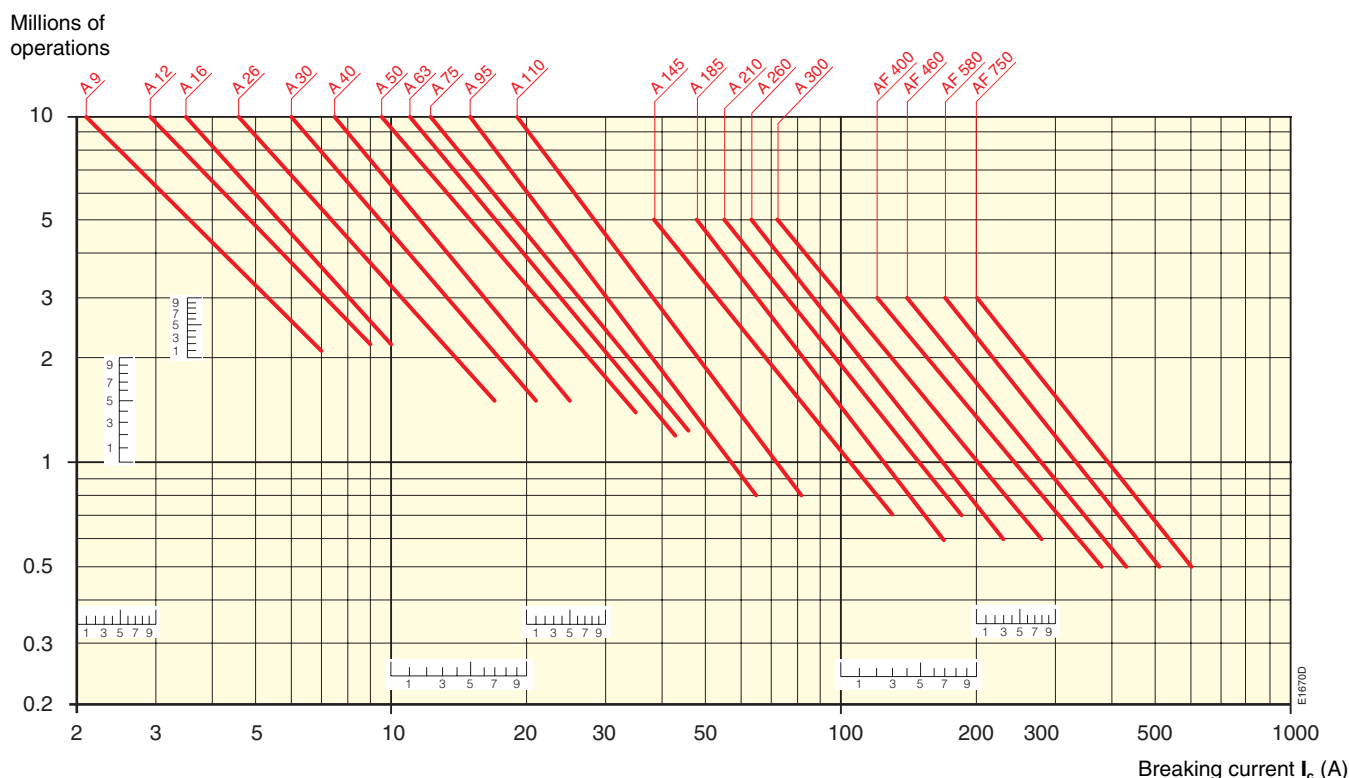
Electrical Durability

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).

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 utilization – Electrical durability required = 1.5 million operations.

As stated on the page 0/0: 40 kW, 400 V corresponds to $I_b = 79$ A. For AC-3: $I_b = I_e$. Select the A 110 contactor at intersection "O" (79 A / 1.5 million operations) on the curves (AC-3 - $U_e \leq 440$ V).

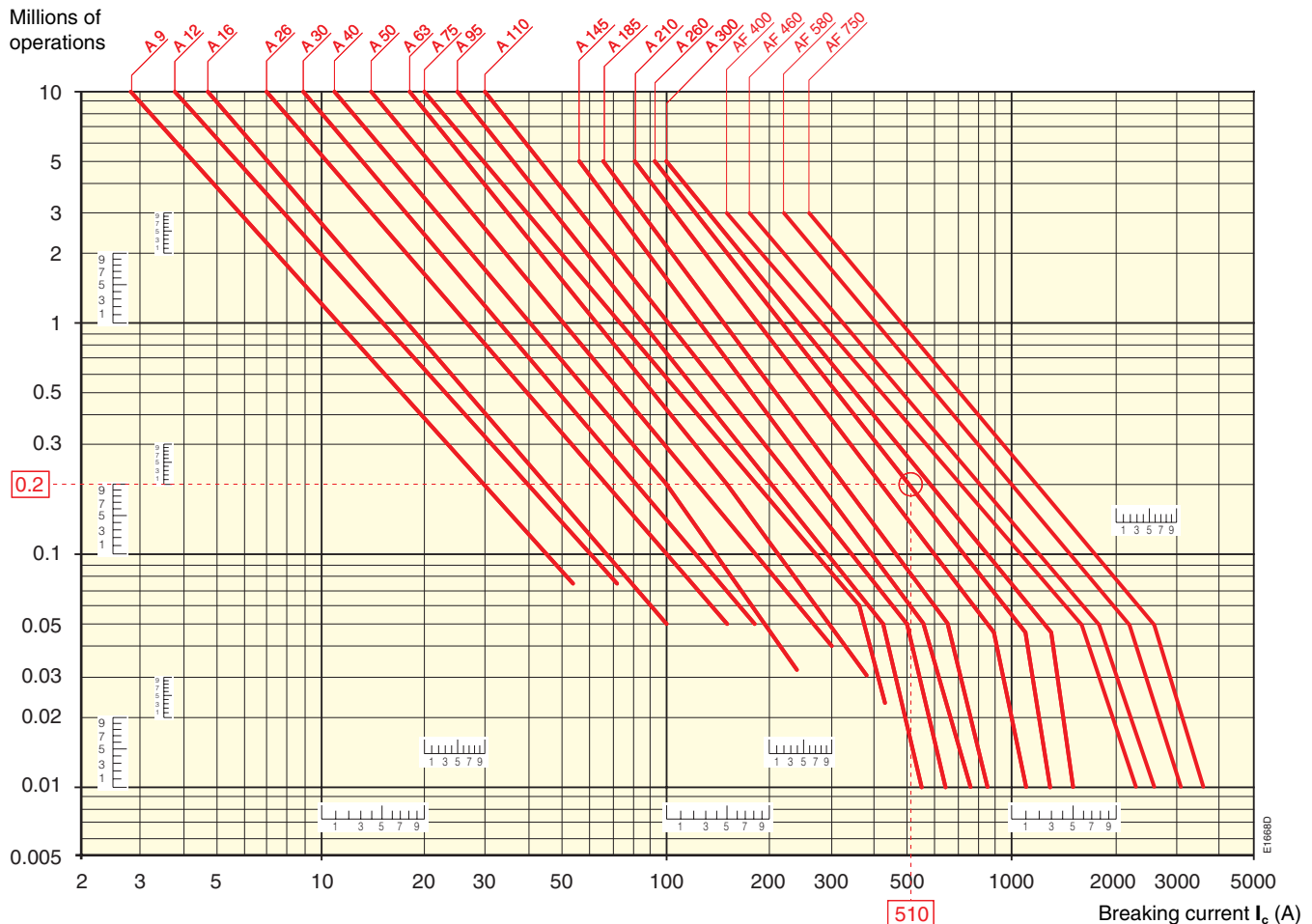
A... Contactors

Electrical Durability

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

Maximum number of AC-2 or AC-4 operations: 300 per hour for A 9 ... A 40 contactors,
150 per hour for A 50 ... A 300 contactors,
60 per hour for AF 400 ... AF 750 contactors.

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 utilization – Electrical durability required = 0.2 million operations.

As stated on page 0/0: 45 kW, 400 V corresponds to $I_e = 85$ A.

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

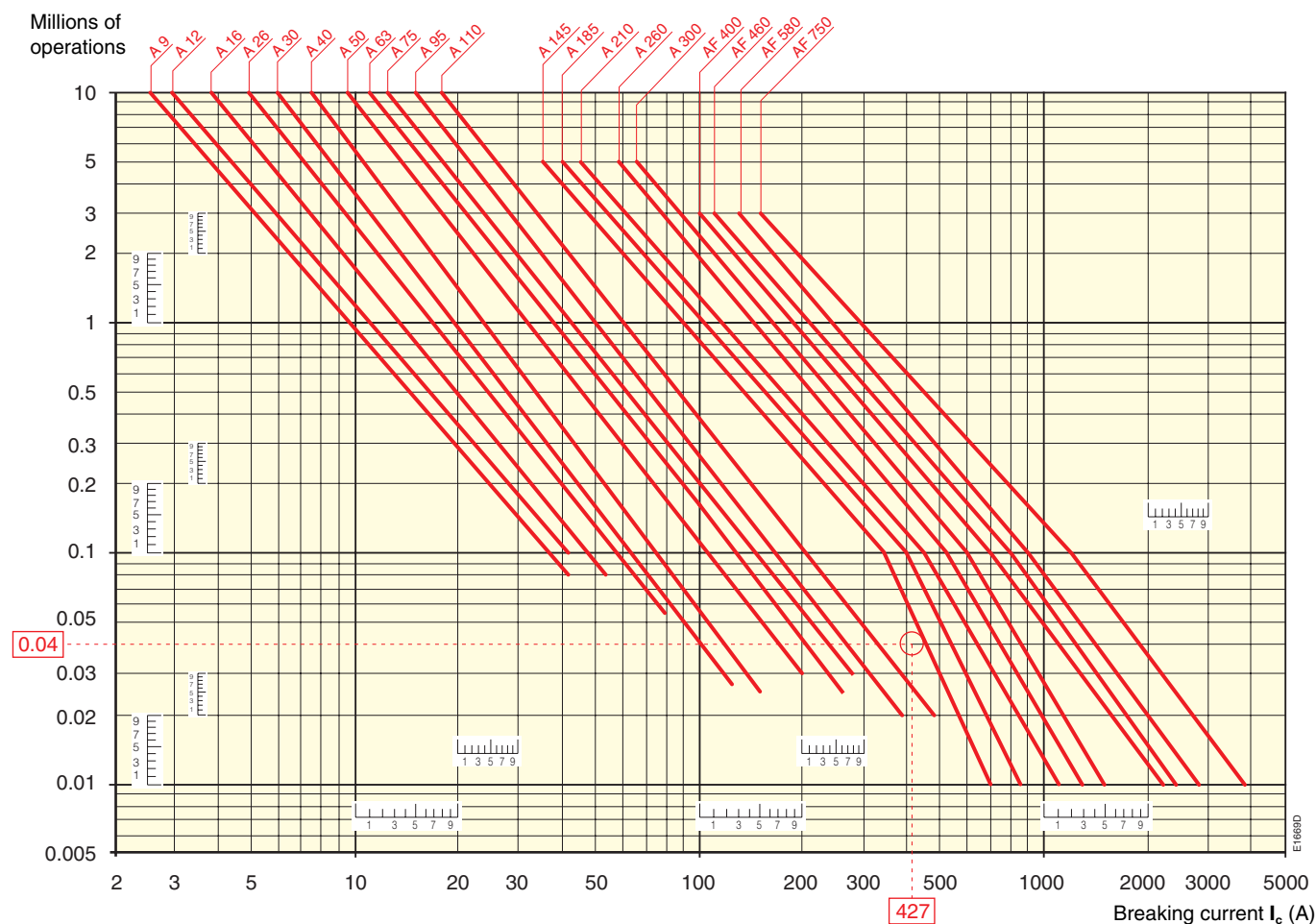
A... Contactors

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 number of AC-2 or AC-4 operations: 300 per hour for A 9 ... A 40 contactors,
150 per hour for A 50 ... A 300 contactors,
60 per hour for AF 400 ... AF 750 contactors.

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 - $U_e = 600\text{ V}$ utilization – Electrical durability required = 0.04 million operations.

As stated on page 0/0: 59 kW, 600 V corresponds to $I_e = 71.1\text{ A}$.

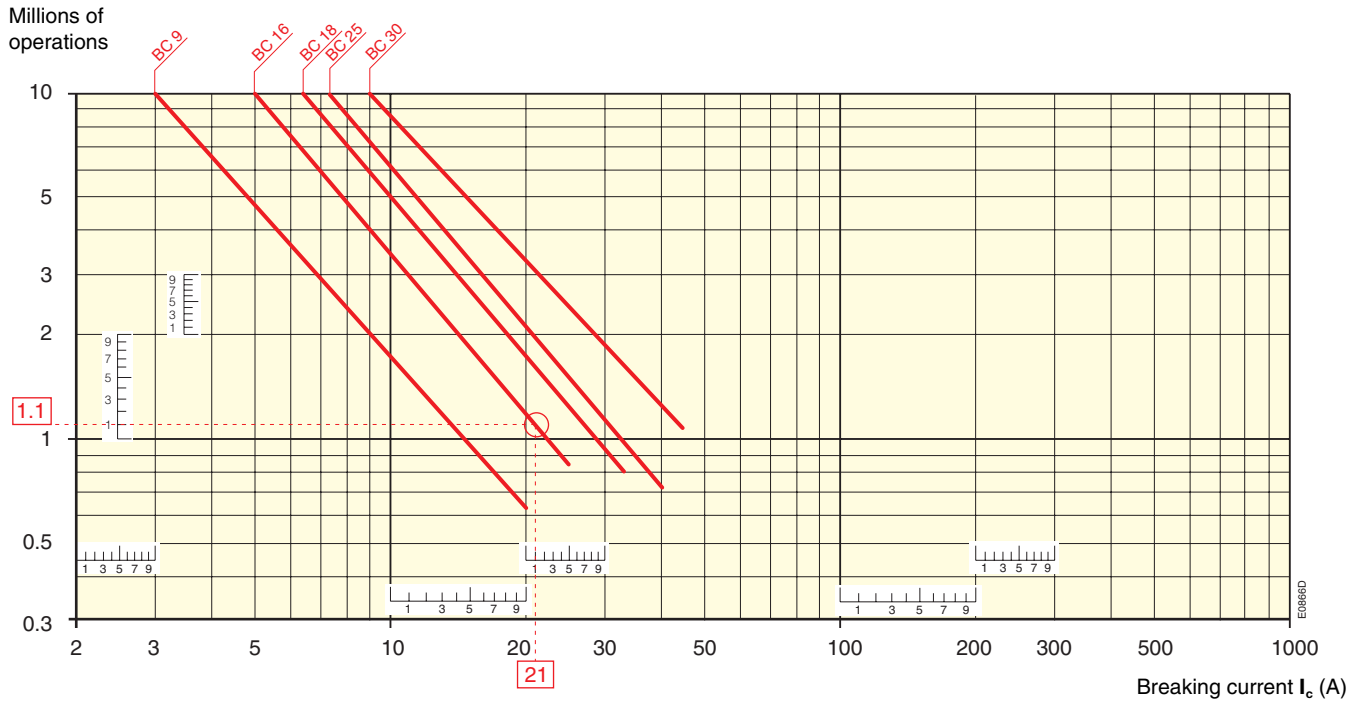
For AC-4: $I_c = 6 \times I_e = 426.6\text{ A}$ - Select the A 145 contactor at intersection "O" (427 A / 0.04 million operations) on the curves (AC-4 - $440\text{ V} < U_e \leq 690\text{ V}$).

BC... 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_e for AC-1 is equal to the rated operational current of the load.



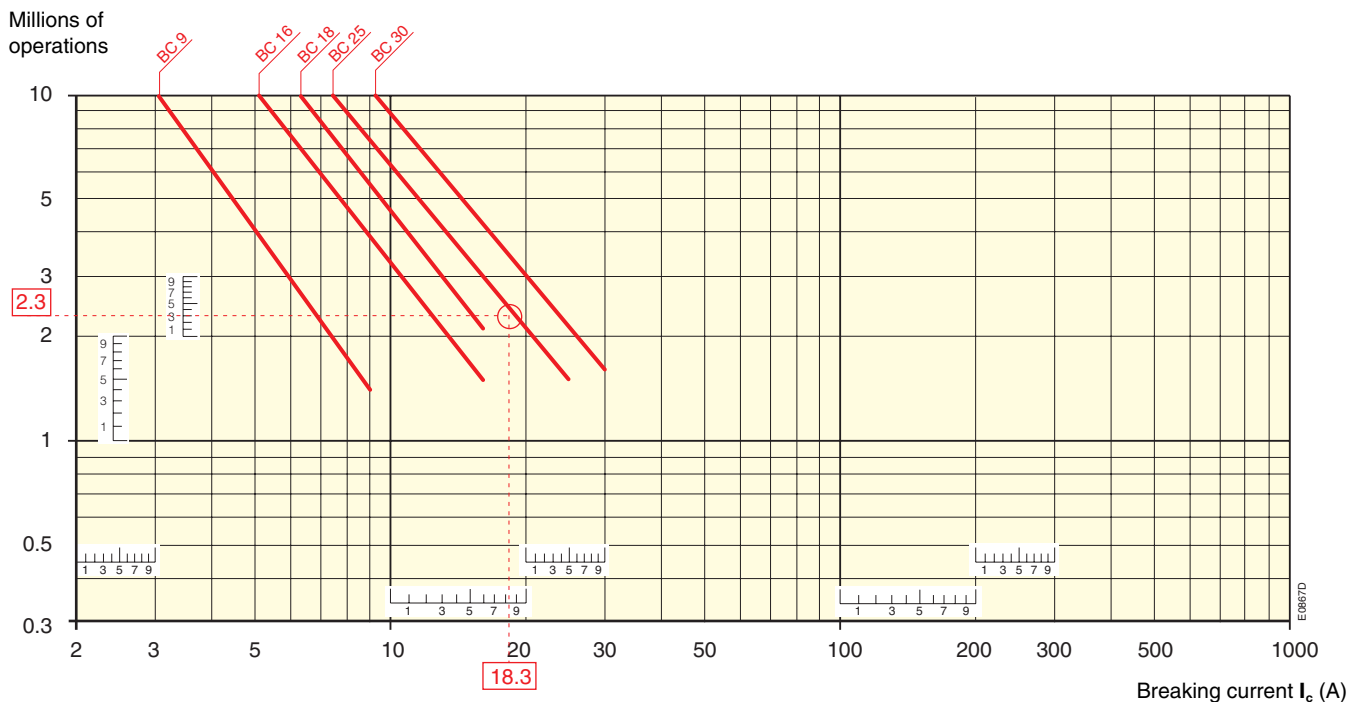
Example:

$I_e / \text{AC-1} = 21 \text{ A}$ – Electrical durability required = 1.1 million operations.

Using the AC-1 curves above select the BC 16 contactor at intersection "O" (21 A / 1.1 million operations).

Electrical Durability for **AC-3** Utilization Category - $U_e \leq 500 \text{ V}$. Ambient Temperature $\leq 55^\circ\text{C}$

Switching cage motors: starting and switching off running motors. The breaking current I_e for AC-3 is equal to the rated operational current I_e (I_e = motor full load current).



Example:

Motor power 9 kW for AC-3 - $U_e = 400 \text{ V}$ utilization – Electrical durability required = 2.3 million operations.

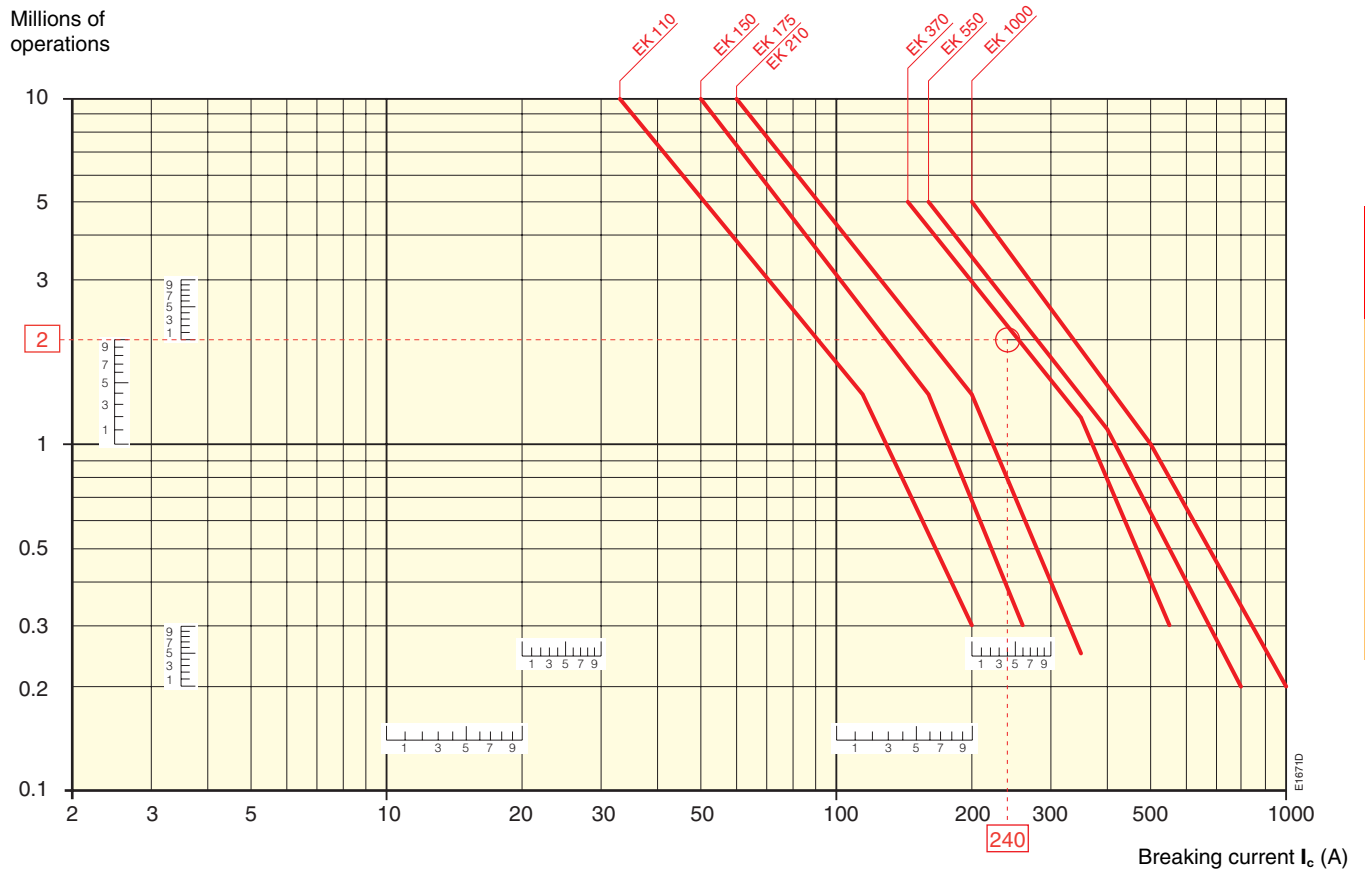
As stated on the page 0/0: 9 kW, 400 V corresponds to $I_e = 18.3 \text{ A}$. For AC-3: $I_e = I_e$. Select the BC 25 contactor at intersection "O" (18.3 A / 2.3 million operations) on the curves (AC-3 - $U_e \leq 500 \text{ V}$).

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_c for AC-1 is equal to the rated operational current of the load.



Example:

$I_c / \text{AC-1} = 240 \text{ A}$ – Electrical durability required = 2 million operations.

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

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. fed control circuit)

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 %.

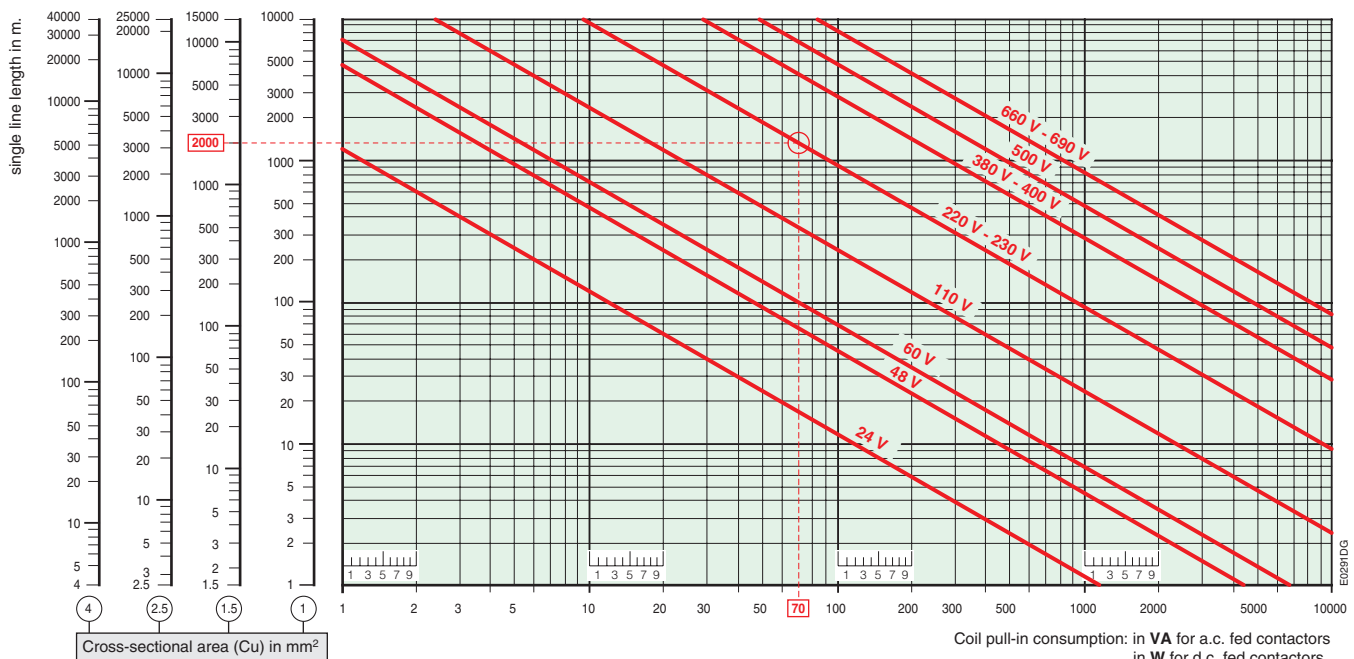
Coil pull-in consumption (average value)

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

Contactors	d.c. control circuit
AE 9, 12, 16	90 W
AE 26, 30, 40	110 W
AE 45, 50, 63, 75	200 W
AE 95, 110	400 W
BC 9, 16, 18, 25, 30	7 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

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:

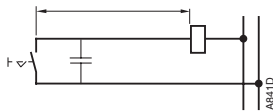
A 9 contactor

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

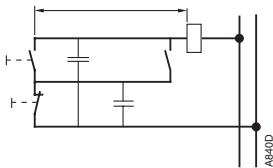
Single control line length



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. fed control circuit)

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" impedances in parallel with the contactor coil:

$$\text{sizing of parallel resistor: } R_p = \frac{10^3}{C} \quad (\text{with } C \text{ in } \mu\text{F})$$

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.

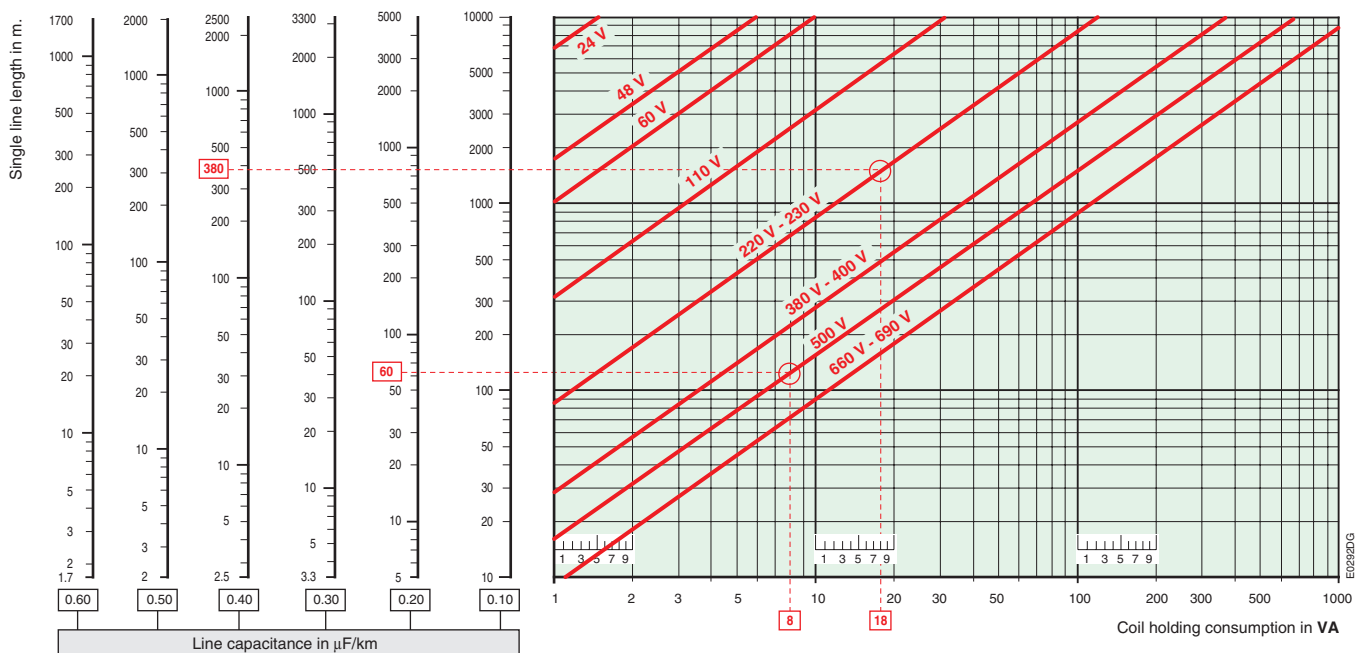
Coil holding consumption (average value)

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

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.

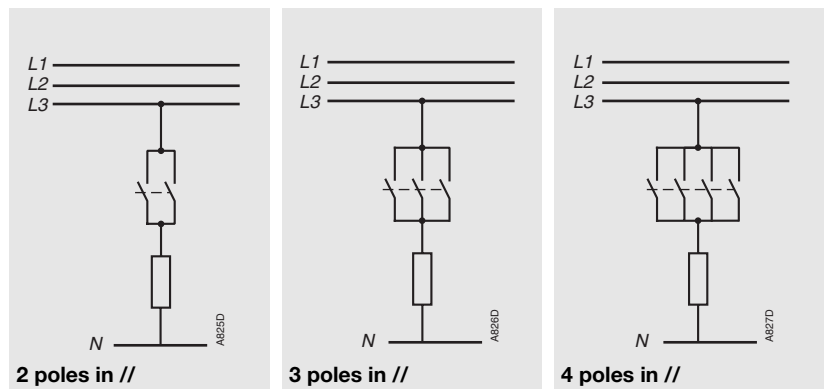
Remarks:

- 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:  accessories section 4.

- 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			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.		
d.c. Operated	Cycles / h				
3-pole contactors					
A 9 ... A 75 AF 50 ... AF 75	AF 50 ... AF 75 AE..., TAE... BC..., TBC...	600	1.6	2.2	–
A 95 ... A 300 AF 145 ... AF 750	AF 145 ... AF 750	300	1.6	2.2	–
4-pole contactors					
A 9 ... A 75 AF 45 ... AF 75	AF 45 ... AF 75 AE..., TAE... BC..., TBC...	600	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 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	120	60	20	6	2	1
Current flow time per cycle in seconds.	Factor to be applied to the rated operational current I_e / AC-1 max. to obtain the permissible current I_e / AC-1 for temporary / intermittent duty.					
5	2.8	3.4	4	4.7	5	5.2
10	2.2	2.6	3	3.4	3.7	3.8
20	1.6	2	2.4	2.6	2.7	2.8
30	–	1.7	2.1	2.2	2.3	2.4
40	–	1.5	1.9	2.0	2.1	2.2
60	–	–	1.7	1.8	1.8	1.9

Example:

A 9 contactor (intermittent duty, resistive load)

Rated operational current I_e / AC-1 at 55 °C (🔍 page 2/62)

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 operations/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

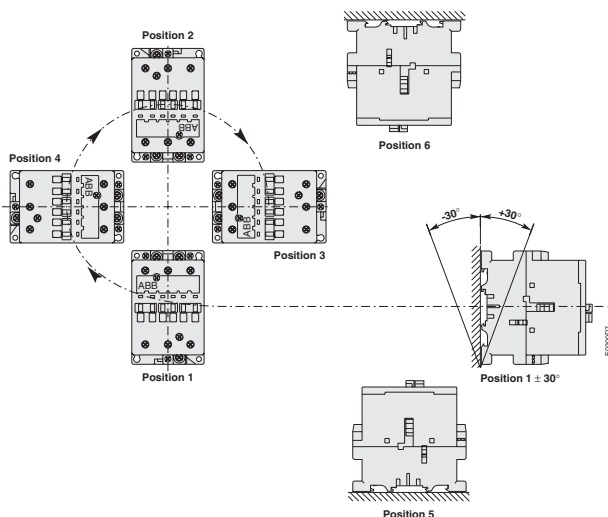
Type of load : No of phases
Utilisation category (AC / DC) : %AC4 if any :
Voltage **Un** : **V** **Cos φ** : frequency :
L/R ms

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 :
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 :
Interface with PLC :
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 Control - France

DQ01036 rev 0

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

Questionnaire also available in Word and .PDF formats on the ABB Website:

🌐 www.abb.com/lowvoltage 📄 left menu: "Low Voltage On-Line" 🛠 select: "Support Tools".



Questionnaire

DQ01036 rev 0

1SBC100122C0201