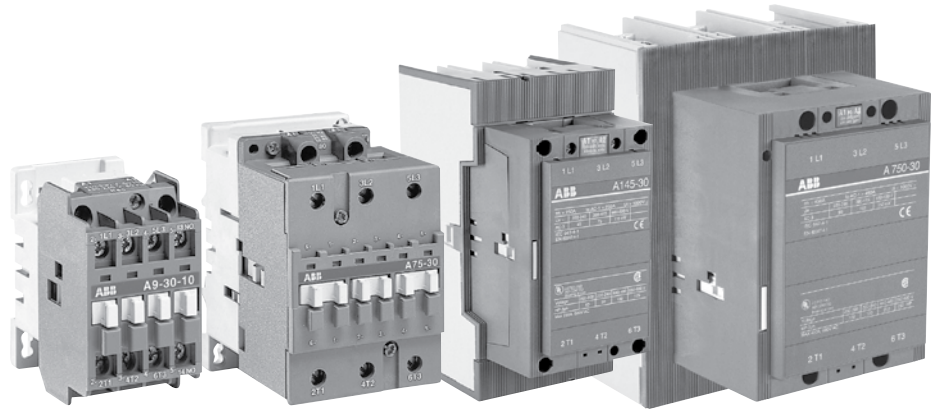




## Across the line contactors A9 - AF1650

1



# Across the line Contactors

### A9 - A110

- Maximum UL/CSA horsepower ratings according to UL508 and CSA22.2 No. 14
- Includes NEMA sizes 00 - 3
- CE mark
- Compact space saving design
- Standard auxiliary contact configurations:
  - A9 - A40           1 NO or 1 NC
  - A50 - A110       1 NO & 1 NC
- Contactor sizes A50 - A110 can be supplied without auxiliaries
- Additional auxiliary contact blocks are available
- D.C. ratings & D.C. control operation available
- Fast, snap-on DIN rail mounting
- Double break contact design
- Snap-on front mounted accessories include mechanical latch, pneumatic timer, and 1 & 4 pole auxiliary contact blocks
- Contactors ensure positive safety between their auxiliary contact blocks.
- Easy coil change
- Captive terminal screws
- NEMA, UL, IEC, CSA, VDE and most other international standards
- Touch safe design: All connection terminals are protected against accidental touch
- Terminals supplied open for ease of wiring
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- Screwdriver guide holes
- UL File No: E39231 (A9 - A75); (AE9 - AE75); (AL9 - AL40); (AF50 - AF75)
- UL File No: E36588 (A95 - A110); (AE95 - AE110); (AF145 - AF750)
- CSA File No: LR56745 (A9 - A75); (AE9 - AE75); (AF50 - AF75)
- CSA File No: LR19700 (A95 - A110); (AE95 - AE110); (AF145 - AF750)
- CSA approved for elevator service

### A145 - AF1650

- Maximum UL/CSA horsepower ratings according to UL508 and CSA22.2 No. 14
- Includes NEMA sizes 4 - 8
- CE mark
- 1 NO & 1 NC auxiliary contacts are standard and up to 6 additional auxiliary contacts may be added to provide a total of 8 (4 NO & 4 NC)
- Contactors ensure positive safety between their auxiliary contact blocks.
- D.C. ratings and D.C. control operation available
- Easy maintenance of main contacts and coil inspection
- Can be mounted in any position
- Terminal lugs sold separately. See page 1.25.
- Operates over an extended voltage range of 85% to 110% of rated control voltage
- NEMA, UL, IEC, CSA, VDE and most other international standards
- UL File No: E36588 (A/AF145 - AF750)
- UL File No: E73397 (AF1350 - AF1650)
- CSA File No: LR19700

# A9 - A300

## General information

### AC operated, UL rated, 3 phase

#### Application

A-Line contactors are mainly used for controlling 3-phase motors and for controlling power circuits corresponding to their operating characteristics up to 690 and even 1000 VAC, and 440 VDC.

#### Description of 3 pole and 4 pole contactors A9 - A300

All A-Line contactors can be assembled side by side. The add-on or built-in auxiliary contacts are suitable for low level currents.

#### Control circuit types

- A-Line types: AC operated with laminated magnetic circuit.

#### Contactors types

- 3 pole contactors with NO or NC built in auxiliary contact for A9 - A40 contactors; factory assembled auxiliary contacts for A50 - A300 contactors
- 4 pole contactors: 4 NO or 2 NO & 2 NC without any auxiliary contacts. (A9 - A75)

Quick mounting on DIN rail: EN 50022 and EN 50023 standards:

35 x 7.5mm for A9 - A40

35 x 15mm for A9 - A75

75mm for A45 - A110

Location of side mounted accessories: on right or left hand side. Factory mounted on left hand side for CAL5 on A50 - A300

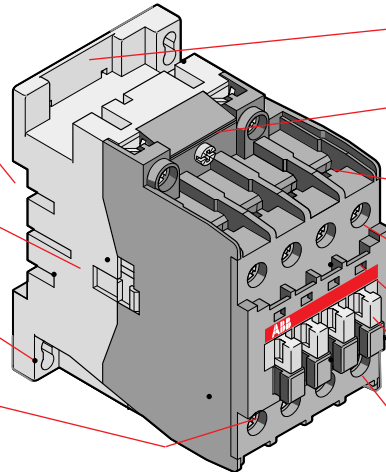
Holes for screw mounting (screws not supplied). Distance between holes according to EN 50003.

Terminals in A9 - A110 contactors are delivered in open position with captive screws (screws of unused terminals must be tightened).

Screwdriver guidance for all terminals makes it possible to use motorized screwdrivers.

All terminals provide protection against accidental direct contact with live parts according to VDE0106 - Part. 100.

All A9 - A40 contactor terminals as well as A45 - A300 contactor auxiliary contact and coil terminals ensure IP20 degree of protection according to IEC 947-1.



A9 - A300

Location of surge suppressors.

Clear marking of coil voltages and frequencies.

Connecting point for control leads in top part of main terminals of A50 - A75 contactors. For A95 & A110 contactors these are additional power connections.

Terminal marking according to IEC 947-4-1, EN 50005, EN 50012 and NEMA standards.

Location of function marker.

Stops for attaching front mounted accessories.

Terminal screws:

- Posidrive (+,-) No 2 for all A9 - A75
- M8 hex threaded socket screw for A95 - A300 main terminals.

## Catalog number explanation

### A9-30-10-84

Frame size

Power pole

30 = 3 NO

40 = 4 NO

22 = 2 NO & 2 NC

Coil voltage

(see coil voltage selection chart)

Auxiliary contacts

10 = 1 NO & 0 NC

01 = 0 NO & 1 NC

11 = 1 NO & 1 NC

00 = No auxiliary provided

22 = 2 NO & 2 NC

#### Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A		81	83	84	84		34	36	80	42		86	86	51	53	55
50	A		81	83	84				80			85	86			55	

For other voltages, see page 1.24.

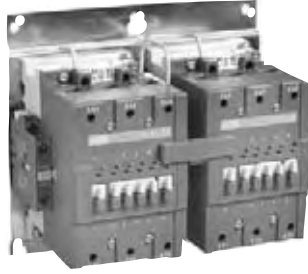
# A9 - A300

Non-reversing, mechanically interlocked, reversing  
AC operated, UL rated, 3 phase

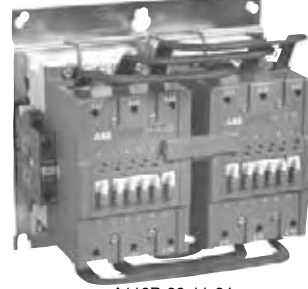
Across the line  
contactors



A26-30-10-84



A110M-30-11-84



A110R-30-11-84

UL general purpose current	UL motor switching current	Maximum motor horsepower ratings				Standard Aux. contacts		Non-reversing		Mechanically interlocked		Reversing	
		208V	240V	480V	575/600V	NO	NC	Catalog number	List price	Catalog number	List price	Catalog number	List price
<b>UL rated</b>													
AC1													
21	9	2	2	5	7.5	1 0	0 1	A9-30-10-84 A9-30-01-84	\$ 78	A9M-30-10-84 A9M-30-01-84	\$ 255	A9R-30-10-84 A9R-30-01-84	\$ 315
25	11	3	3	7.5	10	1 0	0 1	A12-30-10-84 A12-30-01-84	84	A12M-30-10-84 A12M-30-01-84	315	A12R-30-10-84 A12R-30-01-84	375
30	17	5	5	10	15	1 0	0 1	A16-30-10-84 A16-30-01-84	102	A16M-30-10-84 A16M-30-01-84	345	A16R-30-10-84 A16R-30-01-84	413
40	28	7.5	10	20	25	1 0	0 1	A26-30-10-84 A26-30-01-84	183	A26M-30-10-84 A26M-30-01-84	405	A26R-30-10-84 A26R-30-01-84	480
50	34	10	10	25	30	1 0	0 1	A30-30-10-84 A30-30-01-84	252	A30M-30-10-84 A30M-30-01-84	548	A30R-30-10-84 A30R-30-01-84	623
60	42	10	15	30	40	1 0	0 1	A40-30-10-84 A40-30-01-84	297	A40M-30-10-84 A40M-30-01-84	639	A40R-30-10-84 A40R-30-01-84	750
80	54	15	20	40	50	1	1	A50-30-11-84	330	A50M-30-11-84	713	A50R-30-11-84	810
90	65	20	25	50	60	1	1	A63-30-11-84	372	A63M-30-11-84	870	A63R-30-11-84	1,013
105	80	25	30	60	75	1	1	A75-30-11-84	413	A75M-30-11-84	1,155	A75R-30-11-84	1,298
125	95	30	30	60	75	1	1	A95-30-11-84	450	A95M-30-11-84	1,230	A95R-30-11-84	1,425
140	110	30	40	75	100	1	1	A110-30-11-84	480	A110M-30-11-84	1,365	A110R-30-11-84	1,628
230	130	40	50	100	125	1	1	A145-30-11-84	825	A145M-30-11-84	2,235	A145R-30-11-84	2,250
250	156	50	60	125	150	1	1	A185-30-11-84	1,290	A185M-30-11-84	3,360	A185R-30-11-84	3,375
300	192	60	75	150	200	1	1	A210-30-11-84	1,635	A210M-30-11-84	4,035	A210R-30-11-84	4,050
350	248	75	100	200	250	1	1	A260-30-11-84	1,815	A260M-30-11-84	4,485	A260R-30-11-84	4,500
400	302	100	100	250	300	1	1	A300-30-11-84	1,875	A300M-30-11-84	5,460	A300R-30-11-84	5,475
550	414	125	150	350	400	1	1						
650	480	150	200	400	500	1	1						
750	602	200	250	500	600	1	1						
900	810	250	300	600	700	1	1						
1350	960	—	400	800	900	1	1						
1650	1080	—	450	900	1000	1	1						

See Type AF contactors, page 1.9

## Coil voltage selection

All AC operated catalog numbers include a 120VAC coil. To select other coil voltages, substitute the code from the Coil Voltage Selection Chart for the two digits after the last dash in the catalog number.

Ex.: A 240V coil is required for an A75 contactor: A75-30-11-80

## Auxiliary contact blocks

For additional auxiliary contact blocks, see catalog number explanation on page 1.2. Add \$ 20 to list price for each additional auxiliary, and see page 1.32 for available combinations. Only side-mounted blocks are allowed to be factory installed. If auxiliary contacts are not required for A50 - A300, subtract \$ 40 from list price and change catalog number to "00" instead of "11."

## Mechanical interlock

Mechanically interlocked contactors are designed for reversing, 2 speed, reduced voltage, etc. type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

Power wiring is not included. The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

## Coil voltage selection chart

Hz	Cntr type	Volts															
		12	24	48	110	120	125	208	220	240	277	380	415	440	480	500	600
60	A	81	83	84	84		34	36	80	42		86	86	51	53	55	
50	A	81	83	84				80				85	86			55	

For other voltages, see page 1.24.

## Reversing

Reversing contactors are designed for reversing type starter applications. The complete assembly consists of two mechanically and electrically interlocked contactors mounted as follows with line and load terminals:

- A9 - A16 — mounted on 35mm DIN rail
- A26 - A300 — mounted on common baseplate

The NC electrical interlock is provided with the mechanical interlock for A9 - A110 contactors.

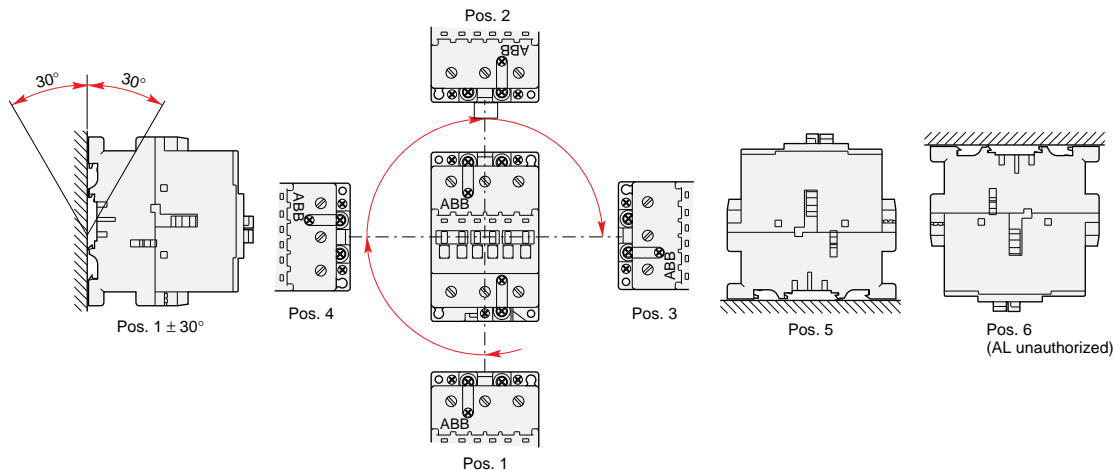
## UL & CSA Technical data

### A/AE9 – A/AE/AF110, AL9 – AL40

#### AC & DC operated

ABB contactor frame size		A/AE/AL 9	A/AE/AL 12	A/AE/AL 16	A/AE/AL 26	A/AE/AL 30	A/AE/AL 40	A/AE/AF 45	A/AE/AF 50	A/AE/AF 63	A/AE/AF 75	A/AE/AF 95	A/AE/AF 110
NEMA size		00	—	0	1	1P	—	—	2	—	3	—	—
Number of poles		3 OR 4	3	3 OR 4	3 OR 4	3	3	4	3 OR 4	3	3 OR 4	3	3
<b>AC rating information</b>													
NEMA cont. amp rating		9	—	18	27	36	—	—	45	—	90	—	—
NEMA maximum H.P. ratings													
115 VAC		1/3	—	1	2	3	—	—	3	—	—	—	—
230 VAC		1	—	2	3	5	—	—	7.5	—	—	—	—
NEMA maximum H.P. ratings													
200 VAC		1.5	—	3	7.5	—	—	—	10	—	25	—	—
230 VAC		1.5	—	3	7.5	—	—	—	15	—	30	—	—
460/575 VAC		2	—	5	10	—	—	—	25	—	50	—	—
U.L. general purpose current		40°C	21	25	30	40	50	60	65	80	90	105	125
Max. 3 Ph Switching motor loads		A	9	11	17	28	34	42	—	54	65	80	95
U.L. maximum H.P. ratings													
115 VAC		1/2	3/4	2HP, 24A	2	3	3	—	3	5	7.5	7.5	10
230 VAC		2	2	3	5	7.5	7.5	—	7.5	10	15	20	25
U.L. maximum H.P. ratings													
200-208 VAC		2	3	5	7.5	10	10	—	15	20	25	30	30
220-240 VAC		2	3	5	10	10	15	—	20	25	30	30	40
440-480 VAC		5	7.5	10	20	25	30	—	40	50	60	60	75
550-600 VAC		7.5	10	15	25	30	40	—	50	60	75	75	100
U.L. maximum H.P. ratings													
120 VDC		1	1.5	2	3	3	5	—	7.5	10	10	—	—
240 VDC		2	3	3	5	7.5	10	—	15	20	25	—	—
Lighting — ballast and incandescent		600VAC	15	15	20 ①	35	50	60	65	65	85	105	120
Resistive heating applications		600VAC	15	15	20	35	50	60	65	65	85	105	—
<b>CSA Elevator ratings</b>													
220 – 240VAC		3 phase	—	—	5	—	—	10	—	15	—	20	20
440 – 480VAC		3 phase	—	—	10	—	—	20	—	30	—	30	40
550 – 600VAC		3 phase	—	—	10	—	—	20	—	30	—	40	50
230VAC		1 phase	—	—	2	—	—	5	—	7.5	—	10	10
<b>Auxiliary contacts</b>													
NEMA rating		AC	A600	A600	A600	A600	A600	—	A600	A600	A600	A600	A600
AC rated voltage		VAC	600	600	600	600	600	—	600	600	600	600	600
AC thermal rated current		A	10	10	10	10	10	—	10	10	10	10	10
AC maximum volt-ampere making		VA	7200	7200	7200	7200	7200	—	7200	7200	7200	7200	7200
AC maximum volt-ampere breaking		VA	720	720	720	720	720	—	720	720	720	720	720
NEMA rating		DC	P600	P600	P600	P600	P600	—	P600	P600	P600	P600	P600
DC rated voltage		VDC	600	600	600	600	600	—	600	600	600	600	600
DC thermal rated current		A	5	5	5	5	5	—	5	5	5	5	5
DC Maximum make-break		A	0.2	0.2	0.2	0.2	0.2	—	0.2	0.2	0.2	0.2	0.2
<b>Approximate weight</b>													
Contactor		lbs.	0.7	0.7	0.7	1.01	1.2	2.25	2.25	2.25	2.25	3.5	5
Starter		lbs.	1.04	1.04	1.04	1.35	1.54	3	—	3	3	6	7
<b>Terminal wire range</b>													
Number of wires per phase		AWG	18-10	18-10	18-10	12-8	8-4	8-4	8-1	8-1	8-1	6-2/0	6-2/0
			2	2	2	2	2	2	1	1	1	1	1
<b>Maximum short circuit ratings</b>													
MCCB, MCP, Amps/kA		480VAC	50/35	50/35	50/35	100/35	150/65	150/65	—	150/85	250/85	250/85	250/85
		600VAC	10/35	10/35	10/35	100/35	150/25	150/25	—	—	—	250/35	250/35
Fuse, Amps — type/kA		600VAC	30J/200	30J/200	30J/200	60J/200	60J/200	100J/200	—	100J/200	200J/200	200J/200	200J/200

### Mounting positions



① 30A Ballast

# UL & CSA Technical data

## A/AF145 – AF750

### AC & DC operated

Across the line  
contactors

1

ABB contactor frame size		A/AF 145	A/AF 185	A/AF 210	A/AF 260	A/AF 300	AF 400	AF 460	AF 580	AF 750
NEMA size		4	—	—	5	—	—	6	—	7
Number of poles		3	3	3	3	3	3	3	3	3
<b>AC rating information</b>										
NEMA maximum H.P. ratings										
200	3 phase VAC	40	—	—	75	—	—	150	—	—
230	VAC	50	—	—	100	—	—	200	—	300
460/575	V	100	—	—	200	—	—	400	—	600
<b>U.L. general purpose current</b>										
40°C		230	250	300	350	400	550	650	750	900
Max. 3 Ph switching motor loads										
	Amps	130	156	192	248	302	414	480	590	720
U.L. maximum H.P. ratings										
115	1 phase VAC	10	15	—	—	—	—	—	—	—
230	VAC	25	30	40	50	—	—	—	—	—
U.L. maximum H.P. ratings										
200–208	3 phase VAC	40	50	60	75	100	125	150	200	250
220–240	VAC	50	60	75	100	100	150	200	250	300
440–480	VAC	100	125	150	200	250	350	400	500	600
550–600	VAC	125	150	200	250	300	400	500	600	700
Lighting – ballast and incandescent										
	600VAC	200	—	300	—	400	—	—	—	—
<b>CSA Elevator ratings</b>										
220 – 240VAC	3 phase			40	50	60	—	—	—	—
240 – 480VAC	3 phase	Consult factory	Consult factory	75	100	125	—	—	—	—
550 - 600VAC	3 phase	factory	factory	100	125	150	—	—	—	—
230VAC	1 phase			—	—	—	—	—	—	—
<b>Auxiliary contacts</b>										
NEMA rating	AC	A600	A600	A600	A600	A600	A600	A600	A600	A600
AC rated voltage	VAC	600	600	600	600	600	600	600	600	600
AC thermal rated current	A	10	10	10	10	10	10	10	10	10
AC maximum volt—ampere making	VA	7200	7200	7200	7200	7200	7200	7200	7200	7200
AC maximum volt—ampere breaking	VA	720	720	720	720	720	720	720	720	720
NEMA rating	DC	P600	P600	P600	P600	P600	P600	P600	P600	P600
DC rated voltage	VDC	600	600	600	600	600	600	600	600	600
DC thermal rated current	A	5	5	5	5	5	5	5	5	5
DC Maximum make—break	A	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<b>Approximate weight</b>										
Contactor	lbs.	7.1	7.1	13	13	13	26	26	33	33
Starter	lbs.	9.11	9.11	17.67	17.67	17.67	35	35	45	45
<b>Terminal wire range</b>										
	AWG	6-250MCM	6-250MCM	4-400MCM	4-400MCM	4-500MCM	250-500MCM	250-500MCM	2/0-500MCM	2/0-500MCM
Number of wires per phase		1	1	1	1	2	2	2	2	3
<b>Maximum short circuit ratings</b>										
MCCB,MCP,amps/kA	480VAC	400/85	400/85	800/85	800/85	800/85	800/80	800/80	1200/42	1200/42
MCCB,MCP,amps/kA	600VAC	400/35	400/35	800/35	800/35	800/35	800/42	800/42	—	—
Fuse, amps—Type/kA	600VAC	400J/200	400J/200	600J/200	600J/200	600J/200	1000L/80	1000L/80	1200L/80	1200L/80

## UL & CSA Technical data

### AF1350 – AF1650

### AC & DC operated

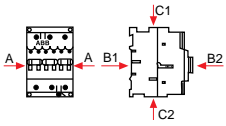
ABB contactor frame size		AF 1350	AF 1650
NEMA size		—	8
Number of poles		3	3
<b>AC rating information</b>			
NEMA maximum H.P. ratings	3 phase		
200	VAC	—	—
230	VAC	—	450
460/575	V	—	900
<b>U.L. general purpose current</b>			
	40°C	1350	1650
Max. 3 Ph switching motor loads	Amps	960	1080
<b>U.L. maximum H.P. ratings</b>			
1 phase			
115	VAC	—	—
230	VAC	—	—
3 phase			
200—208	VAC	—	—
220—240	VAC	400	450
440—480	VAC	800	900
550—600	VAC	900	1000
<b>Auxiliary contacts</b>			
NEMA rating	AC	A600	A600
AC rated voltage	VAC	600	600
AC thermal rated current	A	10	10
AC maximum volt—ampere making	VA	7200	7200
AC maximum volt—ampere breaking	VA	720	720
NEMA rating	DC	P600	P600
DC rated voltage	VDC	600	600
DC thermal rated current	A	5	5
DC Maximum make—break	A	0.2	0.2
<b>Approximate weight</b>			
Contactor	lbs.	75	75
Starter	lbs.	—	—
<b>Terminal wire range</b>			
	AWG	1/0-750 MCM	1/0-750 MCM
Number of wires per phase		4	6
<b>Maximum short circuit ratings</b>			
MCCB, MCP, amps/kA	480VAC	2000/42	2000/42
MCCB, MCP, amps/kA	600VAC	—	—
Fuse, amps—Type/kA	600VAC	1600L/82	2000L/82

# UL/CSA & IEC Technical data

## A/AE9 – A/AE/AF/TAE110

Across the line  
contactors

1

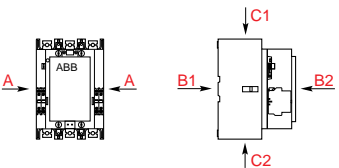
Contactor types: A..., AE... AF..., TAE...	9	12	16	26	30	40	45	50	63	75	95	110																		
Rated insulation voltage $U_i$ according to IEC 60947-4-1	-	-	-	-	-	-	1000	1000	1000	1000	1000	1100																		
according to UL/CSA	-	-	-	-	-	-	600	600	600	600	600	600																		
Rated impulse 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																													
Air temperature close to contactor	see "Conditions for use" page 1.50, for control voltage limits and authorized mounting positions																													
- fitted with thermal O/L relay	-25 to +55																													
- without thermal O/L relay	-40 to +70 (55 max. for TAE... contactors)																													
- for storage	-60 to +80																													
Climatic withstand 68-2-30	acc. to IEC 60068-2-30 and 60068-2-11 - UTE C 63-100 specification II											acc. to IEC																		
Operating altitude	m																													
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27 Mounting position 1 (see page 1.50)	<p>1/2 sinusoidal shock for 11 ms: no change in contact position</p> <table border="1"> <thead> <tr> <th>Shock direction</th> <th>Making position</th> <th>Breaking position</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>20 g</td> <td>20 g</td> </tr> <tr> <td>B1</td> <td>10 g</td> <td>5 g ①</td> </tr> <tr> <td>B2</td> <td>15 g ②</td> <td>15 g ②</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> </tbody> </table>												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
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																												
												Not valid for DIN-rail mounting																		

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.

## UL/CSA & IEC Technical data

### A/AF145 – AF1650

#### A/AF145 – AF750

Contactor types:	A...	145	185	210	260	300	-	-	-	-
	AF...	145	185	210	260	300	400	460	580	750
Rated insulation voltage $U_i$ according to IEC 60947-4-1 according to UL/CSA	V					1000 V600				
Rated impulse withstand voltage $U_{imp}$ . Standards	kV					8	Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1			
Air temperature close to contactor – fitted with thermal O/L relay – without thermal O/L relay – for storage	°C °C °C	see "Conditions for use" page 1.51 , for control voltage limits and authorized mounting positions								
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 (see page 1.51)		1/2 sinusoidal shock for 30 ms: no change in contact position 5 g in all directions (A, B1, B2, C1, C2)								
										

#### AF1350 – AF1650

Contactor types:	AF...	1350	1650
Rated insulation voltage $U_i$ according to IEC 60947-4-1 according to UL/CSA	V		1000 600
Rated impulse withstand voltage $U_{imp}$ . Standards	kV		8
		Devices complying with international standards IEC 60947-1 / 60947-4-1 and European standards EN 60947-1 / 60947-4-1	
Air temperature close to contactor – fitted with thermal O/L relay – without thermal O/L relay – for storage		see "Conditions for use" page 1.51 , for control voltage limits and authorized mounting positions	
		°C-25 to +55 °C-40 to +70 °C-40 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 (See page 1.51)		1/2 sinusoidal shock for 30 ms: no change in contact position 5 g in all directions (A, B1, B2, C1, C2)	
