

AF09 ... AF30 3-pole Contactors

Technical Data



Main Pole - Utilization Characteristics according to UL / NEMA / CSA

Contactor types	AF09	AF12	AF16	AF26	AF30
Standards	UL 508, CSA C22.2 N°14				
Rated operational voltage U_e max.	600 V				
NEMA size	00	0	-	1	-
NEMA continuous amp rating	thermal current 9 A	18 A		27 A	
NEMA maximum H.P. ratings 1-phase, 60 Hz	115 V AC	1/3 hp	1 hp	2 hp	
	230 V AC	1 hp	2 hp	3 hp	
NEMA maximum H.P. ratings 3-phase, 60 Hz	200 V AC	1-1/2 hp	3 hp	7-1/2 hp	
	230 V AC	1-1/2 hp	3 hp	7-1/2 hp	
	460 V AC	2 hp	5 hp	10 hp	
	575 V AC	2 hp	5 hp	10 hp	
CSA/UL General use rating					
600 V AC	25 A	28 A	30 A	45 A	50 A
With conductor cross-sectional area	AWG 10	AWG 10	AWG 10	AWG 8	AWG 8
80 V DC - 1-pole, 160 V DC - 2-pole, 240 V DC - 3-pole	25 A	28 A	30 A	45 A	50 A
With conductor cross-sectional area	AWG 10	AWG 10	AWG 10	AWG 8	AWG 8
CSA/UL maximum 1-phase motor rating					
Amp-rating	120 V AC	13.8 A	16 A	20 A	24 A
	240 V AC	10 A	12 A	17 A	28 A
Motor power	120 V AC	3/4 hp	1 hp	1-1/2 hp	2 hp
	240 V AC	1-1/2 hp	2 hp	3 hp	5 hp
CSA/UL maximum 3-phase motor rating					
Amp-rating	200-208 V AC	7.8 A	11 A	17.5 A	25.3 A
	220-240 V AC	6.8 A	9.6 A	15.2 A	22 A
	440-480 V AC	7.6 A	11 A	14 A	21 A
	550-600 V AC	9 A	11 A	17 A	22 A
Motor power (for 1500 r.p.m., 50 Hz or 1800 r.p.m., 60 Hz 3-phase motors)	200-208 V AC	2 hp	3 hp	5 hp	7.5 hp
	220-240 V AC	2 hp	3 hp	5 hp	7.5 hp
	440-480 V AC	5 hp	7.5 hp	10 hp	15 hp
	550-600 V AC	7.5 hp	10 hp	15 hp	20 hp
					-
Short-circuit protection					
for contactors without thermal O/L relay - Motor protection excluded					
Fuse rating	Max. 60 A	60 A	60 A	150 A	150 A
Fuse type, 600 V	J				
Short-circuit current rating	100 kA				
Max. electrical switching frequency					
for general use	600 cycles/h				
for motor use	1200 cycles/h				
Mechanical durability					
Number of operating cycles	10 millions operating cycles				
Max. switching frequency	3600 cycles/h				

(1) On request

Built-in Auxiliary Contacts according to UL / CSA

Contactor types	AF09	AF12	AF16	AF26	AF30
Max. rated operational voltage U_e max.	600 V AC, 600 V DC				
Pilot duty	A600, Q600				
AC thermal rated current	10 A				
AC maximum volt-ampere making	7200 VA				
AC maximum volt-ampere breaking	720 VA				
DC thermal rated current	2.5 A				
DC maximum volt-ampere making-breaking	69 VA				

AF09 ... AF30 3-pole Contactors

Technical Data



Main Pole - Utilization Characteristics according to IEC

Contactor types	AF09	AF12	AF16	AF26	AF30
Standards	IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1				
Rated operational voltage U_n max.	690 V				
Rated frequency limits	25 ... 400 Hz				
Conventional free-air thermal current I_{th} acc. to IEC 60947-4-1, open contactors, $\theta \leq 40^\circ\text{C}$	35 A	35 A	35 A	50 A	50 A
with conductor cross-sectional area	6 mm ²	6 mm ²	6 mm ²	10 mm ²	10 mm ²
AC-1 Utilization category for air temperature close to contactor					
I_n / AC-1 rated operational current U_n max. ≤ 690 V, 50/60 Hz	$\theta \leq 40^\circ\text{C}$: 25 A	: 28 A	: 30 A	: 45 A	: 50 A
	$\theta \leq 60^\circ\text{C}$: 25 A	: 28 A	: 30 A	: 40 A	: 42 A
	$\theta \leq 70^\circ\text{C}$: 22 A	: 24 A	: 26 A	: 32 A	: 37 A
with conductor cross-sectional area	4 mm ²	6 mm ²	6 mm ²	10 mm ²	10 mm ²
AC-3 Utilization category for air temperature close to contactor $\theta \leq 60^\circ\text{C}$ (for 1500 r.p.m., 50 Hz or 1800 r.p.m., 60 Hz, 3-phase motors)					
I_n / AC-3 max. rated operational current 3-phase motors	220-230-240 V : 9 A	: 12 A	: 18 A	: 26 A	: 33 A
	380-400 V : 9 A	: 12 A	: 18 A	: 26 A	: 32 A
	415 V : 9 A	: 12 A	: 18 A	: 26 A	: 32 A
	440 V : 9 A	: 12 A	: 18 A	: 26 A	: 32 A
	500 V : 9.5 A	: 12.5 A	: 15 A	: 23 A	: 28 A
	690 V : 7 A	: 9 A	: 10.5 A	: 17 A	: 21 A
AC-3 rated operational power 1500 r.p.m. 50 Hz 1800 r.p.m. 60 Hz 3-phase motors	220-230-240 V : 2.2 kW	: 3 kW	: 4 kW	: 6.5 kW	: 9 kW
	380-400 V : 4 kW	: 5.5 kW	: 7.5 kW	: 11 kW	: 15 kW
	415 V : 4 kW	: 5.5 kW	: 9 kW	: 11 kW	: 15 kW
	440 V : 4 kW	: 5.5 kW	: 9 kW	: 15 kW	: 18.5 kW
	500 V : 5.5 kW	: 7.5 kW	: 9 kW	: 15 kW	: 18.5 kW
	690 V : 5.5 kW	: 7.5 kW	: 9 kW	: 15 kW	: 18.5 kW
Rated making capacity AC-3	10 x I_n AC-3 acc. to IEC 60947-4-1				
Rated breaking capacity AC-3	8 x I_n AC-3 acc. to IEC 60947-4-1				
AC-8a Utilization category (without thermal overload relay - U_n 400 V - $\theta \leq 40^\circ\text{C}$)					
I_n / AC-8a rated operational current	12 A	16 A	22 A	30 A	40 A
AC-8a rated operational power	5.5 kW	7.5 kW	11 kW	15 kW	20 kW
Short-circuit protection for contactors without thermal O/L relay - Motor protection excluded $U_n \leq 500$ V AC - gG type fuse	25 A	32 A	32 A	50 A	63 A
Rated short-time withstand current I_{cw} at 40 °C ambient temperature, in free air from a cold state	1 s : 300 A	: 300 A	: 300 A	: 700 A	: 700 A
	10 s : 150 A	: 150 A	: 150 A	: 350 A	: 350 A
	30 s : 80 A	: 80 A	: 80 A	: 225 A	: 225 A
	1 min : 60 A	: 60 A	: 60 A	: 150 A	: 150 A
	15 min : 35 A	: 35 A	: 35 A	: 50 A	: 50 A
Maximum breaking capacity $\cos \varphi = 0.45$	at 440 V : 250 A	: 250 A	: 250 A	: 500 A	: 500 A
	at 690 V : 106 A	: 106 A	: 106 A	: 200 A	: 200 A
Heat dissipation per pole	I_n / AC-1 : 0.8 W	: 1 W	: 1.2 W	: 1.8 W	: 2.4 W
	I_n / AC-3 : 0.1 W	: 0.2 W	: 0.35 W	: 0.6 W	: 0.9 W
Max. electrical switching frequency	AC-1 : 600 cycles/h				
	AC-3 : 1200 cycles/h				
	AC-2, AC-4 : 300 cycles/h			: 150 cycles/h	

AF09 ... AF30 3-pole Contactors

Technical Data



Built-in Auxiliary Contacts according to IEC

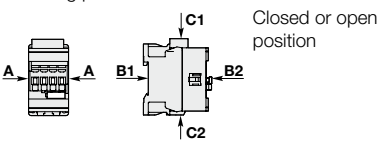
Contactor types	AF09	AF12	AF16	AF26	AF30
Rated operational voltage U_e max.	690 V				
Conventional free air thermal current I_{th} - $\theta \leq 40$ °C	16 A				
Rated frequency limits	25 ... 400 Hz				
Rated operational current I_e / AC-15					
acc. to IEC 60947-5-1	24-127 V 50/60 Hz	6 A			
	220-240 V 50/60 Hz	4 A			
	400-440 V 50/60 Hz	3 A			
	500 V 50/60 Hz	2 A			
	690 V 50/60 Hz	2 A			
Making capacity AC-15	10 x I_e AC-15 acc. to IEC 60947-5-1				
Breaking capacity AC-15	10 x I_e AC-15 acc. to IEC 60947-5-1				
Rated operational current I_e / DC-13					
acc. to IEC 60947-5-1	24 V DC	6 A / 144 W			
	48 V DC	2.8 A / 134 W			
	72 V DC	1 A / 72 W			
	110 V DC	0.55 A / 60 W			
	125 V DC	0.55 A / 69 W			
	220 V DC	0.27 A / 60 W			
	250 V DC	0.27 A / 68 W			
	400 V DC	0.15 A / 60 W			
	500 V DC	0.13 A / 65 W			
	600 V DC	0.1 A / 60 W			
Short-circuit protection gG type fuse	10 A				
Rated short-time withstand current I_{cw}	for 1.0 s	100 A			
	for 0.1 s	140 A			
Minimum switching capacity	12 V / 3 mA				
with failure rate acc. to IEC 60947-5-4	10 ⁻⁷				
Non-overlapping time between N.O. and N.C. contacts	≥ 2 ms				
Heat dissipation per pole at 6 A	0.1 W				
Max. electrical switching frequency	AC-15	1200 cycles/h			
	DC-13	900 cycles/h			

AF09 ... AF30 3-pole Contactors

Technical Data



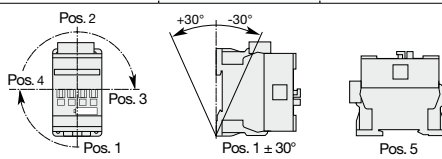
General Technical Data

Contactor types	AF09	AF12	AF16	AF26	AF30
Rated insulation voltage U_i acc. to IEC 60947-4-1	690 V				
acc. to UL / CSA	600 V				
Rated impulse withstand voltage U_{imp}	6 kV				
Electromagnetic compatibility	Devices complying with IEC 60947-1 / EN 60947-1 - Environment A				
Ambient air temperature close to contactor					
Operation fitted with thermal overload relay	-				
without thermal overload relay	-40 ... +70 °C				
Storage	-60 ... +80 °C				
Climatic withstand	Category B according to IEC 60947-1 Annex Q				
Operating altitude	≤ 3000 m				
Mechanical durability					
Number of operating cycles	10 millions operating cycles				
Max. switching frequency	3600 cycles/h				
Shock withstand acc. IEC 60068-2-27 and EN 60068-2-27					
Mounting position 1					
					
Shock direction	1/2 sinusoidal shock for 11 ms: no change in contact position				
A	30 g				
B1	25 g Closed position / 5 g Open position				
B2	15 g				
C1	25 g				
C2	25 g				
Vibration withstand acc. to IEC 60068-2-6	5 ... 300 Hz				
	4 g Closed position / 2 g Open position				

Magnet System Characteristics

Contactor types	AF09	AF12	AF16	AF26	AF30
Coil operating limits acc. to IEC 60947-4-1					
AC supply	at $\theta \leq 60$ °C $0.85 \times U_c$ min ... $1.1 \times U_c$ max				
	at $\theta \leq 70$ °C $0.85 \times U_c$ min ... U_c max				
DC supply	at $\theta \leq 60$ °C $0.85 \times U_c$ min ... $1.1 \times U_c$ max				
	at $\theta \leq 70$ °C (AF) $0.85 \times U_c$ min ... U_c max - (AF.Z) $0.85 \times U_c$ min ... $1.1 \times U_c$ max				
AC control voltage 50/60 Hz	Rated control circuit voltage U_c	24 ... 500 V AC			
Coil consumption	Average pull-in value	(AF) 50 VA - (AF.Z) 16 VA			
	Average holding value	(AF) 2.2 VA / 2 W - (AF.Z) 1.7 VA / 1.5 W			
DC control voltage	Rated control circuit voltage U_c	12 ... 500 V DC			
Coil consumption	Average pull-in value	(AF) 50 W - (AF.Z) 12 ... 16 W			
	Average holding value	(AF) 2 W - (AF.Z) 1.7 W			
PLC-Output control		(AF.Z) ≥ 500 mA 24 V DC			
Drop-out voltage in % of U_c min.		≤ 60 % U_c min			
Voltage sag immunity according to SEMI F47-0706		(AF.Z) conditions of use on request			
Dips withstand (level 0% according to IEC 61000-4-11) -20 °C ≤ θ ≤ +60 °C		(AF.Z) 22 ms average for $U_c = 24 ... 250$ V 50/60Hz			
Operating time					
between coil energization and:	N.O. contact closing	40 ... 95 ms			
	N.C. contact opening	38 ... 90 ms			
between coil de-energization and:	N.O. contact opening	11 ... 95 ms			
	N.C. contact closing	13 ... 98 ms			

Mounting Characteristics
















Contactor types	AF09	AF12	AF16	AF26	AF30
Mounting positions					
Mounting distances	Max. N.C. built-in and add-on N.C. auxiliary contacts: see accessory fitting details for a 3-pole contactor AF09 ... AF30				
Fixing	The contactors can be assembled side by side.				
on rail according to IEC 60715, EN 60715	35 x 7.5 mm or 35 x 15 mm				
by screws (not supplied)	2 x M4 screws placed diagonally				

AF09 ... AF30 3-pole Contactors

Technical Data



Connecting Characteristics

Contactor types	AF09	AF12	AF16	AF26	AF30
Main terminals	 Screw terminals with cable clamp				
Connecting capacity (min. ... max.)					
Main conductors (poles)					
 Rigid	solid ($\leq 4 \text{ mm}^2$)	1 x	1 ... 6 mm ²	2.5 ... 10 mm ²	
 Flexible with non insulated ferrule	stranded ($\geq 6 \text{ mm}^2$)	2 x	1 ... 6 mm ²	2.5 ... 10 mm ²	
 Flexible with non insulated ferrule		1 x	0.75 ... 6 mm ²	1.5 ... 10 mm ²	
 Flexible with insulated ferrule		2 x	0.75 ... 6 mm ²	1.5 ... 10 mm ²	
 Flexible with insulated ferrule		1 x	0.75 ... 4 mm ²	1.5 ... 10 mm ²	
 Flexible with insulated ferrule		2 x	0.75 ... 2.5 mm ²	1.5 ... 4 mm ²	
 Bars or lugs		L <	9.6 mm	12.5 mm	
Capacity according to UL/CSA		1 or 2 x	AWG 16 ... 10	AWG 14 ... 8	
Stripping length			10 mm	14 mm	
Auxiliary conductors (built-in auxiliary terminals + coil terminals)					
 Rigid solid		1 x	1 ... 2.5 mm ²		
 Rigid solid		2 x	1 ... 2.5 mm ²		
 Flexible with non insulated ferrule		1 x	0.75 ... 2.5 mm ²		
 Flexible with non insulated ferrule		2 x	0.75 ... 2.5 mm ²		
 Flexible with insulated ferrule		1 x	0.75 ... 2.5 mm ²		
 Flexible with insulated ferrule		2 x	0.75 ... 1.5 mm ²		
 Bars or lugs		L <	8 mm		
Capacity according to UL/CSA		1 or 2 x	AWG 18 ... 14		
Stripping length			10 mm		
Degree of protection acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529					
Main terminals	IP20				
Coil terminals	IP20				
Built-in auxiliary terminals	IP20				
Screw terminals (delivered in open position, screws of unused terminals must be tightened)					
Main terminals	M3.5				
Coil terminals	M3.5				
Built-in auxiliary terminals	M3.5				
Screwdriver type Flat Ø5.5 / Pozidriv 2					
Tightening torque					
Main pole terminals	1.5 Nm / 13 lb.in			2.5 Nm / 22 lb.in	
Coil terminals	1.2 Nm / 11 lb.in				
Built-in auxiliary terminals	1.2 Nm / 11 lb.in				

AF09 ... AF38 Contactors

DC Circuit Switching

General


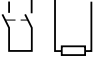
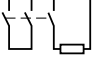
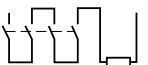

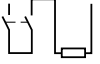
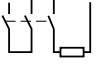

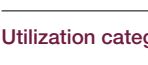

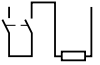

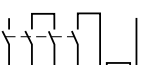
The arc switching on DC is more difficult than on AC.

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

Technical Data

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

Selection Table

Contactor types	AF09	AF12	AF16	AF26		AF30	AF38		
	3 or 4-pole			3-pole	4-pole	3-pole	3-pole	4-pole	
Utilization category DC-1, L/R ≤ 1 ms									
	≤ 72 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	110 V	10 A	15 A	20 A	—	—	—	—	—
	220 V	—	—	—	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	110 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	220 V	10 A	15 A	20 A	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	110 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	220 V	25 A	27 A	30 A	45 A	45 A	50 A	50 A	55 A
	≤ 72 V	25 A	—	30 A	—	45 A	—	—	55 A
	110 V	25 A	—	30 A	—	45 A	—	—	55 A
	220 V	25 A	—	30 A	—	45 A	—	—	55 A
	440 V	10 A	—	20 A	—	—	—	—	—
Utilization category DC-3, L/R ≤ 2 ms									
	≤ 72 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	110 V	6 A	7 A	8 A	—	—	—	—	—
	220 V	—	—	—	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	110 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	220 V	6 A	7 A	8 A	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	110 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	220 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	≤ 72 V	25 A	—	30 A	—	—	—	—	—
	110 V	25 A	—	30 A	—	—	—	—	—
	220 V	25 A	—	30 A	—	—	—	—	—
	440 V	6 A	—	8 A	—	—	—	—	—
Utilization category DC-5, L/R ≤ 7.5 ms									
	≤ 72 V	9 A	12 A	16 A	20 A	—	25 A	25 A	—
	110 V	4 A	4 A	4 A	—	—	—	—	—
	220 V	—	—	—	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	110 V	10 A	15 A	20 A	45 A	—	50 A	50 A	—
	220 V	4 A	4 A	4 A	—	—	—	—	—
	≤ 72 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	110 V	25 A	27 A	30 A	45 A	—	50 A	50 A	—
	220 V	9 A	12 A	16 A	20 A	—	25 A	25 A	—
	≤ 72 V	25 A	—	30 A	—	—	—	—	—
	110 V	25 A	—	30 A	—	—	—	—	—
	220 V	10 A	—	20 A	—	—	—	—	—
	440 V	4 A	—	4 A	—	—	—	—	—

Motor Rated Operational Powers and Currents

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

IEC Motor power kW	Motor nominal current: standardized values in orange-violet colour (according to IEC 60947-4-1 Annex G)										UL / CSA Motor power hp	Motor nominal current: standardized values (according to IEC 60947-4-1 Annex G and UL 508)				
	220 V	230 V	240 V	380V	400 V	415 V	440 V	500 V	660 V	690 V		208 V	220-240 V	380-415 V	440-480 V	550-600 V
	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
0.06	0.37	0.35	0.34	0.21	0.2	0.19	0.18	0.16	0.13	0.12	1/2	2.4	2.2	1.3	1.1	0.9
0.09	0.54	0.52	0.50	0.32	0.3	0.29	0.26	0.24	0.18	0.17	3/4	3.5	3.2	1.8	1.6	1.3
0.12	0.73	0.7	0.67	0.46	0.44	0.42	0.39	0.32	0.24	0.23	1	4.6	4.2	2.3	2.1	1.7
0.18	1	1	1	0.63	0.6	0.58	0.53	0.48	0.37	0.35	1-1/2	6.6	6	3.3	3	2.4
0.25	1.6	1.5	1.4	0.9	0.85	0.82	0.74	0.68	0.51	0.49	2	7.5	6.8	4.3	3.4	2.7
0.37	2.0	1.9	1.8	1.2	1.1	1.1	1.0	0.88	0.67	0.64	3	10.6	9.6	6.1	4.8	3.9
0.55	2.7	2.6	2.5	1.6	1.5	1.4	1.3	1.2	0.91	0.87	5	16.7	15.2	9.7	7.6	6.1
0.75	3.5	3.3	3.2	2.0	1.9	1.8	1.7	1.5	1.15	1.1	7-1/2	24.2	22	14	11	9
1.1	4.9	4.7	4.5	2.8	2.7	2.6	2.4	2.2	1.7	1.6	10	30.8	28	18	14	11
1.5	6.6	6.3	6.0	3.8	3.6	3.5	3.2	2.9	2.2	2.1	15	46.2	42	27	21	17
2.2	8.9	8.5	8.1	5.2	4.9	4.7	4.3	3.9	2.9	2.8	20	59.4	54	34	27	22
3	11.8	11.3	10.8	6.8	6.5	6.3	5.7	5.2	4.0	3.8	25	74.8	68	44	34	27
4	15.7	15	14.4	8.9	8.5	8.2	7.4	6.8	5.1	4.9	30	88	80	51	40	32
5.5	20.9	20	19.2	12.1	11.5	11.1	10.1	9.2	7.0	6.7	40	114	104	66	52	41
7.5	28.2	27	25.9	16.3	15.5	14.9	13.6	12.4	9.3	8.9	50	143	130	83	65	52
11	39.7	38	36.4	23.2	22	21.2	19.3	17.6	13.4	12.8	60	169	154	103	77	62
15	53.3	51	48.9	30.5	29	28.0	25.4	23	17.8	17	75	211	192	128	96	77
18.5	63.8	61	58.5	36.8	35	33.7	30.7	28	22.0	21	100	273	248	165	124	99
22	75.3	72	69	43.2	41	39.5	35.9	33	25.1	24	125	343	312	208	156	125
30	100	96	92	57.9	55	53	48.2	44	33.5	32	150	396	360	240	180	144
37	120	115	110	69	66	64	58	53	40.8	39	200	528	480	320	240	192
45	146	140	134	84	80	77	70	64	49.1	47	250	-	604	403	302	242
55	177	169	162	102	97	93	85	78	59.6	57	300	-	722	482	361	289
75	240	230	220	139	132	127	116	106	81	77	350	-	828	560	414	336
90	291	278	266	168	160	154	140	128	97	93	400	-	954	636	477	382
110	355	340	326	205	195	188	171	156	118	113	450	-	1030	-	515	412
132	418	400	383	242	230	222	202	184	140	134	500	-	1180	786	590	472
160	509	487	467	295	280	270	245	224	169	162						
200	637	609	584	368	350	337	307	280	212	203						
250	782	748	717	453	430	414	377	344	261	250						
315	983	940	901	568	540	520	473	432	327	313						
355	1109	1061	1017	642	610	588	535	488	370	354						
400	1255	1200	1150	726	690	665	605	552	418	400						
500	1545	1478	1416	895	850	819	745	680	515	493						
560	1727	1652	1583	1000	950	916	832	760	576	551						
630	1928	1844	1767	1116	1060	1022	929	848	643	615						
710	2164	2070	1984	1253	1190	1147	1043	952	721	690						
800	2446	2340	2243	1417	1346	1297	1179	1076	815	780						
900	2760	2640	2530	1598	1518	1463	1330	1214	920	880						
1000	3042	2910	2789	1761	1673	1613	1466	1339	1014	970						

AF09 ... AF38 3-pole Contactors

Contactors Electrical Durability and Utilization Categories

General

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

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

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

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

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

Electrical durability is expressed in millions of operating cycles.

Curve Utilization Mode

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

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

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

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

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

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

Case of uninterrupted duty

For uninterrupted duty, some verifications of preventing maintenance are necessary to check the functionality of the concerned product (consult us). The combined effect of environmental conditions and the proper temperature of the product may require some disposals. As a matter of fact, for this duty, the use duration prevails over the number of operating cycles.

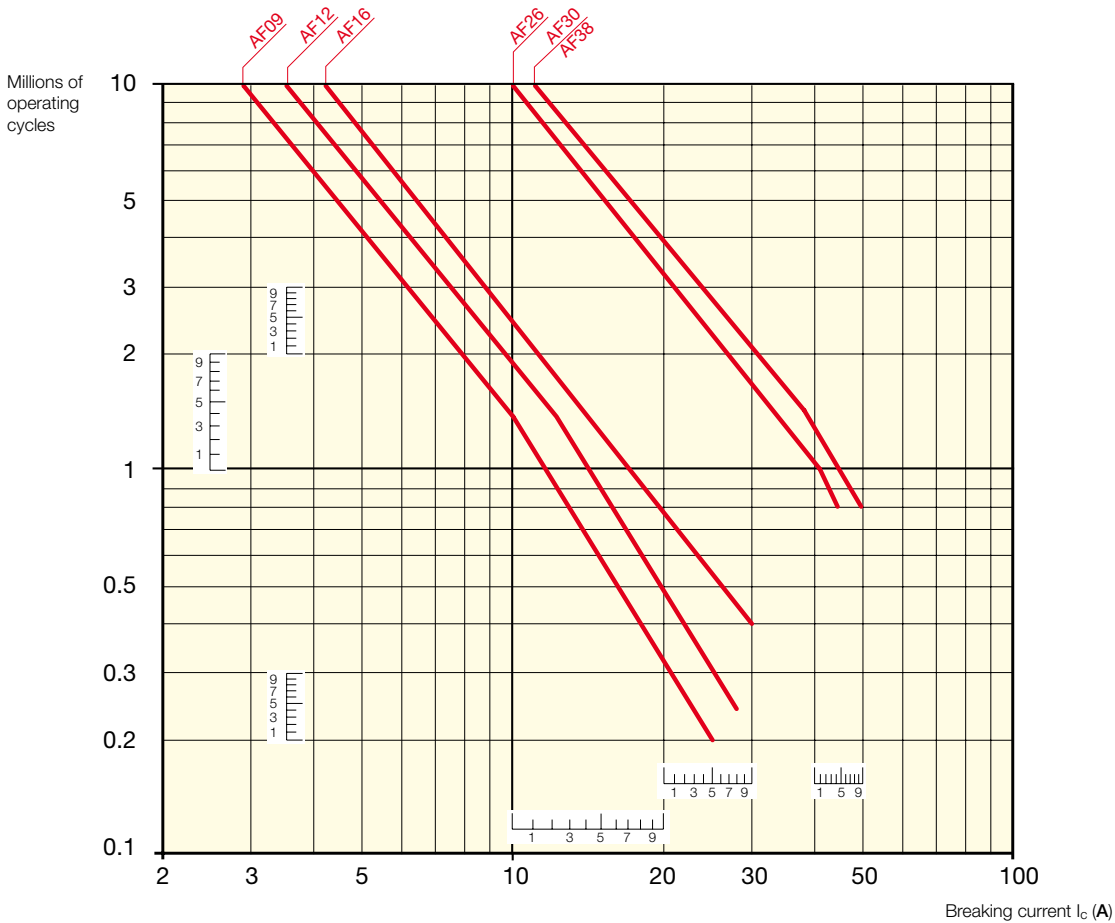
AF09 ... AF38 3-pole Contactors

Electrical Durability

Electrical Durability for AC-1 Utilization Category - $U_e \leq 690$ V. Ambient Temperature ≤ 60 °C

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

Maximum electrical switching frequency: see "Technical Data".



AF09 ... AF38 3-pole contactors AC-1 electrical durability

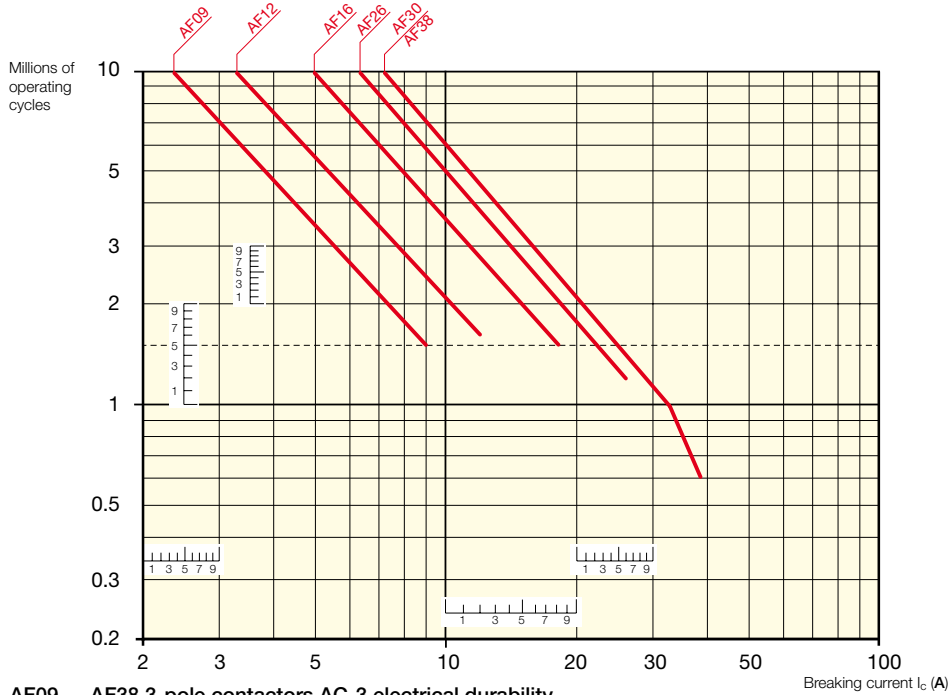
AF09 ... AF38 3-pole Contactors

Electrical Durability

Electrical Durability for AC-3 Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 60 °C

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

Maximum electrical switching frequency: see "Technical Data".



Electrical Durability for AC-2 or AC-4 Utilization Category - $U_e \leq 440$ V. Ambient Temperature ≤ 60 °C

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).

Maximum electrical switching frequency: see "Technical Data".

