Technical Information

Rated Insulation Voltage U_i			
to IEC 947-1		[V]	500V
UL/CSA		[V]	600V
Rated Impulse Voltage U_{imp}		[kV]	8
Rated Voltage U_e – Main Contacts			
AC 50/60Hz		[V]	230, 240, 400, 415, 500
DC		[V]	24, 48, 110, 220, 440
Operating Frequency for AC Loads		[Hz]	50/60Hz

Switching Motor Loads

Standard IEC Ratings				
AC-2, AC-3, AC-4		230V	[A]	12
DOL & Reversing		240V	[A]	12
50Hz/60˚ C		400V	[A]	9
		415V	[A]	9
		500V	[A]	7
		230V	[kW]	1.7
		240V	[kW]	1.8
		400V	[kW]	2.5
		415V	[kW]	2.6
		500V	[kW]	2.3
UL/CSA		115V	[A]	13.8
DOL & Reversing	1∅	230V	[A]	10
60Hz/60˚C		115V	[HP]	0.75
		230V	[HP]	1.5
		200V	[A]	11
		230V	[A]	9.6
		460 V	[A]	7.6
	3∅	575 V	[A]	6.1
		200 V	[HP]	3
		230 V	[HP]	3
		460 V	[HP]	5
		575 V	[HP]	5
Maximum Operating Rate		AC2	[ops/hr]	300
At 9A for AC3; 20A for AC2/4		AC3	[ops/hr]	600
Starting time t_A = 0.25s		AC4	[ops/hr]	300
AC4 (200,000 Op. Cycles)		230V	[A]	3.9
50Hz		240V	[A]	3.9
		400V	[A]	3.3
		415V	[A]	3.3
		230V	[kW]	0.92
		240V	[kW]	0.96
		400V	[kW]	1.5
		415V	[kW]	1.6
Max. Operating Rate			[ops/hour]	250

Wye-Delta (Star Delta)		230V	[A]	21
50 Hz		240V	[A]	21
		400V	[A]	16
		415V	[A]	16
		500V	[A]	12
		230V	[kW]	5.8
		240V	[kW]	6.3
		400V	[kW]	7.9
		415V	[kW]	8.2
		500V	[kW]	7.7
AC-1 Load, 3∅ Switching		I_e	[A]	20
Ambient Temperature 40°C		230V	[kW]	8
		240V	[kW]	8.3
		400V	[kW]	14
		415V	[kW]	14
		500V	[kW]	17
Ambient Temperature 60°C		I_e	[A]	16
		230V	[kW]	6.4
		240V	[kW]	6.7
		400V	[kW]	11
		415V	[kW]	12
		500V	[kW]	14
Continuous Current (UL/CSA)				
General Purpose Rating (40°C)		Open	[A]	12
		Enclosed	[A]	12

Lighting Loads

Elec.Dischrg.Lamps-AC-5a,	Open	[A]	18
single compensated	Enclosed	[A]	18
Max. capacitance at	10kA	[µF]	750
prospective short circuit	20kA	[µF]	400
current available at the	50kA	[µF]	~
contactor.			
Incandescent Lamps - AC-5b,			
Electrical endurance ~100,000 operations		[A]	9.3

Electrical Data

Switching power transformers AC-6a

Inrush / Rated transformer currrent	= n		
	230V	[A]	5.4
	240V	[A]	5.4
	400V	[A]	4.1
	415V	[A]	4.1
	500V	[A]	~
	230 VAC	[kVA]	2.2
	240 VAC	[kVA]	2.2
	400 VAC	[kVA]	2.8
	415 VAC	[kVA]	2.9
	500 VAC	[kVA]	2.7

DC Ratings

DC-1 Rating at 60°C		[kW]	x
1 Pole	24VDC	[A]	9
	48VDC	[A]	6
	110VDC	[A]	1
	220VDC	[A]	0.3
	440VDC	[A]	0.1
2 Pole in Series	24VDC	[A]	9
	48VDC	[A]	8
	110VDC	[A]	6
	220VDC	[A]	1.2
	440VDC	[A]	0.3
3 Pole in Series	24VDC	[A]	9
	48VDC	[A]	9
	110VDC	[A]	9
	220VDC	[A]	4
	440VDC	[A]	0.6

Short Time Current Withstand Ratings

I_{cw} 60° C	1 s	[A]	110
	4 s	[A]	85
	10 s	[A]	60
	15 s	[A]	50
	60 s	[A]	30
	240 s	[A]	20
	900 s	[A]	20
Off Time Between Operations		[Min.]	3

Resistance and Watt Loss I_e AC3			
Resistance per power pole		[mΩ]	5.5
Watt Loss - 3 power poles		[W]	1.3
Coil and 3 power poles	AC	[W]	2.7
	DC	[W]	3.8

Coil Data

Voltage Range			
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	`[x U_s]	0.85…1.1
	Dropout	[x U_s]	0.3…0.65
DC	Pickup	[x U_s]	0.85…1.1
	Dropout	[x U_s]	0.1…0.25
Coil Consumption			
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[VA/W]	22/20
	Hold-in	[VA/W]	4/1.4
DC	Pickup	[W]	2.5
	Hold-in	[W]	2.5
Operating Times			
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[ms]	15…40
	Dropout	[ms]	15…25
with RC Suppressor	Dropout	[ms]	15…25
DC	Pickup	[ms]	18…40
	Dropout	[ms]	6…12
with Integ. Suppression	Dropout	[ms]	8…12
with Diode Suppression	Dropout	[ms]	35…50

Mechanical Data

Service Life			
Mechanical	AC	[Mil.]	10
	DC	[Mil.]	20
Electrical	AC-3 (400V)	[Mil.]	0.7
Shipping Weights			
AC - CA4		[kg]	0.16
		[Lbs]	0.35
AC - CAU4		[kg]	0.35
		[Lbs]	0.77
DC - CA4		[kg]	0.16
		[Lbs]	0.35
DC - CAU4		[kg]	0.35
		[Lbs]	0.77
Terminations - Power			
Terminal Type			
			Combination Screw Head: Cross, Slotted, Posidrive
	1 Wire	[mm^2]	0.75...2.5
	2 Wires	[mm^2]	0.75...2.5
	1 Wire	[mm^2]	0.75...2.5
	2 Wires	[mm^2]	0.75...2.5
	1 Wire	[AWG]	18...14
	2 Wires	[AWG]	18...14
Torque Requirement		[Nm]	1...1.5
		[Lb-in]	7...15
Terminations - Control			
Terminal Type			
			Combination Screw Head: Cross, Slotted, Pozidrive
Coils	1 or 2	[mm^2]	0.75...2.5
Wires		[AWG]	18...14
Control Modules	1 or 2	[mm^2]	0.75...2.5
Wires		[AWG]	18...14
Torque Requirement		[Nm]	1...1.5
		[Lb-in]	7...15
Degree of Protection - contactor	IP 2LX per IEC 529 and DIN 40 050 (with wires installed)		
Protection Against Accidental Contact	Safe from touch by fingers and back-of-hand per VDE 0106; Part 100		

Environmental and General Specifications

Ambient Temperature	
Storage	-55...+80° C (-67...176° F)
Operation	-25...+60° C (-13...140° F)
Conditioned 15% current reduction after AC-1 at >60° C	-25...+70° C (-13...158° F)
Altitude at installed site	2000 meters above sea level per IEC 947-4
Resistance to Corrosion / Humidity	Damp-alternating climate: cyclic to IEC 68-2, 56 cycles. Dry heat: IEC 68-2, +100° C (212° F), relative humidity <50%, 7 days. Damp tropical: IEC 68-2, +40° C (104°F), relative humidity <92%, 56 days.
Shock Resistance	IEC 68-2: Half sinusoidal shock 11ms, 30g (in all three directions)
Vibration Resistance	IEC 68-2: Static >2g, in normal position no malfunction <5g
Operating Position	Refer to Dimension Pages
Standards	IEC947-1/4, EN 60947; UL 508; CSA 22.2, No. 14, SEV1025
Approvals	CE, UL, CSA, SEV, SUVA, Lloyd's Registry of Shipping, Bureau Veritas, Maritime Register of Shipping, Elektrizitats-Inspektorat Finland

Auxiliary Contacts

			Built-in Auxiliary Contacts	Auxiliary Contact Blocks
Current Switching				
AC-1 Ith	at 40°C	[A]	10	16
	at 60°C	[A]	6	12
AC-15, switching electromagnetic loads at:		[V]	230 240 400 415 500	230 240 400 415 500
		[A]	2 2 1 1 0.6	6 5 2.5 2 1.25
DC-13, switching DC electromagnets at:		[V]	24 48 110 220 440	24 48 110 220 440
		[A]	2 0.6 0.45 0.1 0.04	5 0.6 0.45 0.25 0.04
Short-Circuit Protection - gG Fuse				
Type 2 Coordination		[A]	10	16
Load carrying capacity per UL/CSA				
Rated Voltage	AC	[V]	600 max.	600 max.
Continuous Rating	40°C	[A]	10 general purpose	10 general purpose
Switching Capacity	AC		Heavy pilot duty (A600)	Heavy pilot duty (A600)
Rated Voltage	DC	[V]	600 max.	600 max.
Switching Capacity	DC		Standard pilot duty (Q600)	Standard pilot duty (Q600)
Terminals				
Terminal Type				
Maximum Wire Size per IEC 947-1				
 Flexible with Wire-End Ferrule	1 Conductor	[mm²]	0.75…2.5	0.75…2.5
	2 Conductor	[mm²]	0.75…2.5	0.75…2.5
 Solid/Stranded-Conductor	1 Conductor	[mm²]	0.75…2.5	0.75…2.5
	2 Conductor	[mm²]	0.75…2.5	0.75…2.5
Recommended Tightening Torque		[Nm]	1…1.5	1…1.5
Max. Wire Size per UL/CSA		[AWG]	18…14	18…14
Recommended Tightening Torque		[lb-in]	7…15	7…15

CRZE4/CRZY4 Electronic Timers

Permissible voltage	
CRZE4 (AC or DC)	110V (-23%) - 250V (+10%)
CRZY4 (AC only)	110V (-23%) - 120V (+10%)
	220V (-20%) - 250V (+10%)
Voltage drop	5V max
Load current for reliable operation	10mA min
Load current	
20°C	600mA
40°C	440mA
55°C	320mA
Leakage current at 220V	
CRZE4	5mA
CRZY4	"Y" 17mA, "D" 6mA
Reset time	200ms
Voltage failure duration having no influence on timing sequence	
CRZE4	15ms
CRZY4	20ms
Repeat accuracy	±5%
Time interval for start commands	
CRZE4	1.4 x set time
CRZY4	2 x set time
Ambient temperature	
Storage	-40°C to +80°C
Operation	-20°C to +55°C

Determining Contact Life

To determine the contactor's estimated electrical life, follow these guidelines:

1. Identify the appropriate Utilization Category from Table A.
2. On the following pages, choose the graph for the Utilization Category selected.
3. Locate the Rated Operational Current (I_e) along the bottom of the chart and follow the graph lines up to the intersection of the appropriate contactor's life-load curve.
4. Read the estimated contact life along the vertical axis.

Table A – IEC Special Utilization Categories *(Number of operations under load)* ❶

Category	Typical Applications	Rated Current	Conditions for testing electrical life						Conditions for testing making and breaking capacity					
			Make			Break			Make			Break		
			I/Ie	*U/Ue*	cos	*Ic/Ie*	*Ur/Ue*	cos	*I/Ie*	*U/Ue*	cos	*Ic/Ie*	*Ur/Ue*	cos
AC-1	Non-inductive or slightly inductive loads, resistance furnaces	All values	1	1	0.95	1	1	0.95	1.5	1.05	0.8	1.5	1.05	0.8
AC-2	Slip-ring motors: Starting, plugging	All values	2	1.05	0.65	2	1.05	0.65	4	1.05	0.65	4	1.05	0.65
AC-3	Squirrel-cage motors: Starting, switching off motors during running	*Ie* 17Amp 17Amp < *Ie* 100Amp *Ie* > 100Amp	6 6 6	1 1 1	0.65 0.35 0.35	1 1 1	0.17 0.17 0.17	0.65 0.35 0.35	10 10 8❸	1.1 1.1 1.1	0.65 0.35 0.35	8 8 6❹	1.1 1.1 1.1	0.65 0.35 0.35
AC-4	Squirrel-cage motors: Starting, plugging, inching ❾	*Ie* 17Amp 17Amp < *Ie* 100Amp *Ie* > 100Amp	6 6 6	1 1 1	0.65 0.35 0.35	6 6 6	1 1 1	0.65 0.35 0.35	12 12 10❺	1.1 1.1 1.1	0.65 0.35 0.35	10 10 8❸	1.1 1.1 1.1	0.65 0.35 0.35
AC-5a	Switching of electric discharge lamp control		2	1.05	0.45	2	1.05	0.45	3	1.05	0.45	3	1.05	0.45
AC-5b	Switching of incandescent lamps		1	1.05		1	1.05		1.5	1.05		1.5	1.05	
AC-13	Control of solid state loads with transformer isolation		2	1	0.65	1	1	0.65	10	1.1	0.65	1.1	1.1	0.65
AC-15	Electromagnets for contactors, valves, solenoid actuators		10	1	0.3	1	1	0.3	10	1.1	0.3	10	1.1	0.3
			Make			Break			Make			Break		
			I/Ie	*U/Ue*	L/R ❻ [ms]	*Ic/Ie*	*Ur/Ue*	L/R❻ [ms]	*I/Ie*	*U/Ue*	L/R❻ [ms]	*Ic/Ie*	*Ur/Ue*	L/R❻ [ms]
DC-1	Non-inductive or slightly inductive loads, resistance furnaces	All values	1	1	1	1	1	1	1.5❽	1.1❽	1❽	1.5❽	1.1❽	1❽
DC-2	Shunt-motors: Starting, switching off motors during running	All values	2.5	1	2	1	0.1	7.5	4	1.1	2.5	4	1.1	2.5
DC-3	Shunt-motors: Starting, plugging, inching	All values	2.5	1	2	2.5	1	2	4	1.1	2.5	4	1.1	2.5
DC-4	Series-motors: Starting, switching off motors during running	All values	2.5	1	7.5	1	0.3	10	4	1.1	15	4	1.1	15
DC-5	Series-motors: Starting, plugging, inching	All values	2.5	1	7.5	2.5	1	7.5	4	1.1	15	4	1.1	15
DC-15	Electromagnets for contactors, valves, solenoid actuators		1	1	6 x P❼	1	1	6 x P❼	1.1	1.1	6 x P❼	1.1	1.1	6 x P❼

❶ Utilization categories and test conditions for AC & DC. For contactors according to IEC 158-1, starters according to IEC 292-1 ... 4 and control switches according to IEC 337-1 and IEC 337-1A.

❸ With a minimum value of 1000A for *I* or *Ic*.

❹ With a minimum value of 800A for *Ic*.

❺ With a minimum value of 1200A for *I*.

❻ $T_{0.95}$ for DC-15: Time in milliseconds for reaching 95% of steady-state current *Ie* x $T_{0.95}$ is 300% of the time constant $T = L/R$ of the circuit.

❼ $P = Ue \times Ie$ rated power [W]. The value "6 x P" has been derived from an empiric relationship which covers most magnetic loads for DC up to an upper limit of P = 50W.

❽ Only according to VDE.

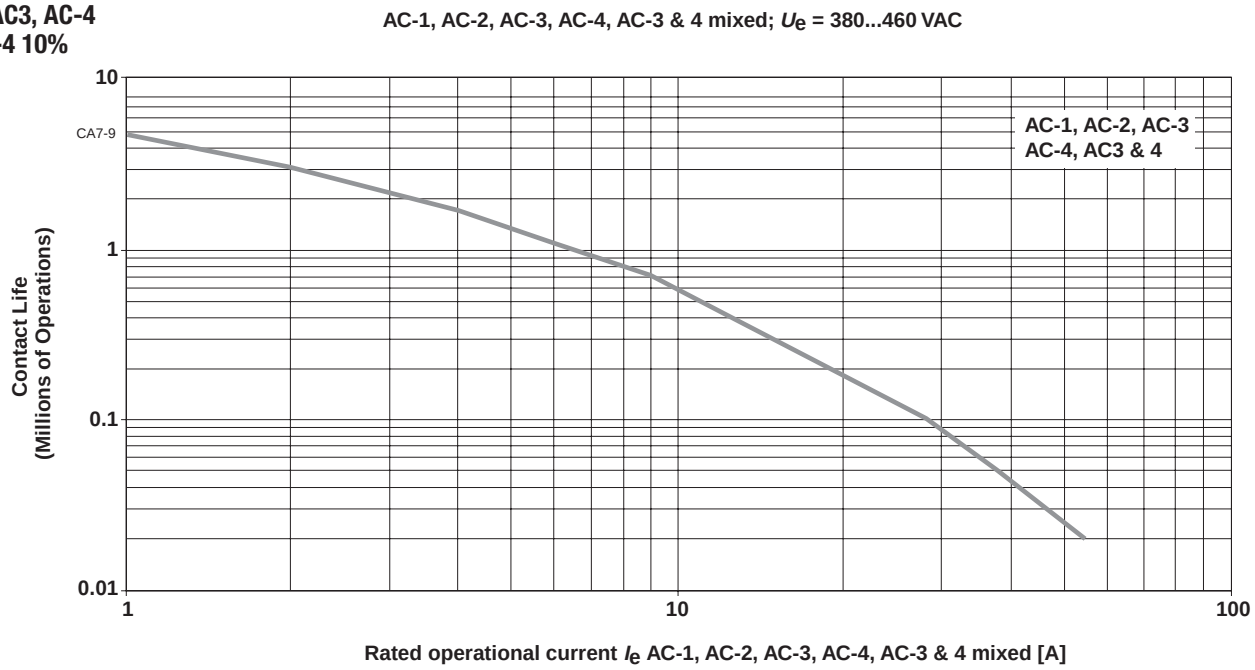
❾ Plugging is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running. Inching [or jogging] is understood as energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

Legend

Ue	Rated operational voltage
U	Voltage before make
Ur	Recovery voltage
Ie	Rated operational current
I	Making current
Ic	Breaking current
L	Inductance of test circuit
R	Resistance of test circuit

Life-Load Curves

AC-1, AC-2, AC3, AC-4
AC3 90%/AC-4 10%



Contact Life for Mixed Utilization Categories AC-3 and AC-4

In many applications, the utilization category cannot be defined as either purely AC-3 or AC-4. In those applications, the electrical life of the contactor can be estimated with the following equation:

$$L_{mixed} = L_{ac3} / [1+P_{ac4} \times (L_{ac3}/L_{ac4}-1)]$$, where:

L_{mixed} Approximate contact life in operations for a mixed AC-3/AC-4 utilization category application.

L_{ac3} Approximate contact life in operations for a pure AC-3 utilization category (from the AC-3 life-load curve).

L_{ac4} Approximate contact life in operations for a pure AC-4 utilization category (from the AC-4 life-load curve).

P_{ac4} Percentage of AC-4 operations

NOTE: The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves shown here.