Technical Information

			CA6-85	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Rated Insulation Voltage U_i										
IEC, AS, BS, SEV, VDE 0660		[V]				1000V				
UL; CSA		[V]				600V				
Rated Impulse Voltage U_{imp}		[kV]				12 kV				
Rated Voltage U_e – Main Contacts										
AC 50/60Hz		[V]				230, 240, 400, 415, 500, 690, 1000V				
DC		[V]				24, 48, 110, 220, 440V				
Operating Frequency for AC Loads		[Hz]				50/60Hz				

Switching Motor Loads

Standard IEC Ratings										
AC-2, AC-3, AC-4	230V	[A]	85	105	140	170	210	250	300	420
DOL & Reversing	240V	[A]	85	105	140	170	210	250	300	420
50Hz	400V	[A]	85	105	140	170	210	250	300	420
	415V	[A]	95	130	155	170	227	258	315	425
	500V	[A]	85	105	115 / 140 ❶	170	210	250	300	420 / 360 ❷
	690V	[A]	85	105	115 / 140 ❶	170	210	250	300	420 / 360 ❷
	1000V	[A]	33	40	55	65	80	95	115	160
	230V	[kW]	26	33	45	55	67	80	97	135
	240V	[kW]	27	34	47	57	70	83	101	141
	400V	[kW]	47	58	78	95	118	140	170	238
	415V	[kW]	55	75	90	100	132	150	185	250
	500V	[kW]	59	75	80 / 98 ❶	118	147	177	213	300 / 255 ❷
	600V	[kW]	81	101	110 / 135 ❶	167	205	245	293	424 / 356 ❷
	1000V	[kW]	45	55	75	90	110	133	163	225
UL/CSA	115V	[A]	80	100	135	~	~	~	~	~
DOL & Reversing 1∅	230V	[A]	68	110	136	176	216	~	~	~
60Hz	115 V	[HP]	7.5	10	15	~	~	~	~	~
	230 V	[HP]	15	25	30	40	50	~	~	~
	200V	[A]	78.2	119.6	119.6	149.5	180	220.8	285.2	414
	230 V	[A]	68	104	130	154	192	248	312	420
	460 V	[A]	77	96	124	180	180	240	302	414
3∅	575 V	[A]	77	99	125	144	192	242	289	382
	200 V	[HP]	25	40	40	50	60	75	100	150
	230 V	[HP]	30	40	50	60	75	100	125	175
	460 V	[HP]	60	75	100	150	150	200	250	350
	575 V	[HP]	75	100	125	150	200	250	300	400
AC4 (200,000 Op. Cycles)	230V	[A]	38	47	60	72	90	105	115	144
50Hz	240V	[A]	38	47	60	72	90	105	115	144
	400V	[A]	38	47	60	72	90	105	115	144
	415V	[A]	38	47	60	72	90	105	115	144
	230V	[kW]	11	15	18	22	28	33	37	47
	240V	[kW]	12	15	19	23	30	34	38	48
	400V	[kW]	20	25	33	40	50	58	64	81
	415V	[kW]	22	26	35	43	52	63	66	85
Max. Operating Rate		[ops/hour]	100	100	100	100	50	50	50	50

❶ Rating CA6-140 / CA6-140-EI.
❷ AC3 rating / AC4 rating.

Electrical Data

			CA6-85	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Switching Motor Loads *(continued)*										
Wye-Delta (Star Delta)	230V	[A]	147	182	242	294	364	433	520	727
50 Hz	240V	[A]	147	182	242	294	364	433	520	727
	400V	[A]	147	182	242	294	364	433	520	727
	415V	[A]	165	225	268	294	393	447	546	736
	500V	[A]	147	182	199 / 242 ❶	294	364	433	520	727
	690V	[A]	147	182	199 / 242 ❶	294	364	433	520	727
	1000V	[A]	55	65	96	112	139	165	200	277
	230V	[kW]	50	63	80	100	117	140	169	237
	240V	[kW]	52	64	85	104	125	150	177	250
	400V	[kW]	90	110	136	167	208	250	300	430
	415V	[kW]	100	132	160	173	231	263	335	452
	500V	[kW]	110	132	150 / 177 ❶	220	258	315	384	538
	690V	[kW]	141	178	200 / 243 ❶	300	356	425	531	759
	1000V	[kW]	75	90	133	160	200	231	280	400
60 Hz	200V	[HP]	40	60	60	75	100	125	175	250
	230V	[HP]	50	60	75	100	125	175	200	250
	460V	[HP]	100	125	175	200	250	350	450	600
	575V	[HP]	125	150	200	250	300	450	500	650
CSA Elevator Duty	230V	[HP]	25	30	40 ❷	50 ❷	~	~	~	~
Full voltage	460V	[HP]	50	60	75 ❷	100 ❷	~	~	~	~
	575V	[HP]	60	75	75 ❷	100 ❷	~	~	~	~
Wye-Delta	230V	[HP]	40	50	60	75	~	~	~	~
	460V	[HP]	75	100	125	150	~	~	~	~
	575V	[HP]	100	125	125	150	~	~	~	~
AC-1 Load, 3∅ Switching	I_{th}	[A]	160	160	250	250	350	350	450	500
Ambient Temperature 40°C	230V	[kW]	64	64	100	100	139	139	179	199
	240V	[kW]	67	67	104	104	145	145	187	208
	400V	[kW]	111	111	173	173	242	242	312	346
	415V	[kW]	115	115	180	180	252	252	323	359
	500V	[kW]	139	139	217	217	303	303	390	433
	690V	[kW]	151	131	299	299	418	418	538	598
	1000V	[kW]	277	277	433	433	606	606	779	866
Ambient Temperature 60°C	I_{th}	[A]	135	135	210	210	300	300	380	425
	230V	[kW]	54	54	84	84	120	120	151	169
	240V	[kW]	56	56	87	87	125	125	158	177
	400V	[kW]	94	94	145	145	208	208	263	294
	415V	[kW]	97	97	151	151	216	216	273	305
	500V	[kW]	117	117	182	182	260	260	329	368
	690V	[kW]	161	161	251	251	359	359	454	508
	1000V	[kW]	234	234	364	364	520	520	658	736

❶ Rating CA6-140 / CA6-140-EI.

❷ In order to achieve the listed CSA elevator duty rating, the CA6-140**W**(-EI) or CA6-170**W**-EI must be ordered. No change in price.

Electrical Data

			CA6-85	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Continuous Current (UL/CSA)										
General Purpose Rating (40°C)	Open	[A]	178	178	250	250	350	350	420	500
	Enclosed	[A]	160	160	220	220	300	300	340	420
Lighting Loads										
Elec.Dischrg.Lamps-AC-5a,	Open	[A]	144	144	225	225	315	315	405	450
single compensated	Enclosed	[A]	121.5	121.5	189	189	270	270	342	383
Incandescent Lamps - AC-5b,		[A]	107	120	140	170	210	250	300	420
Switching power transformers AC-6a										
Inrush										
Rated transformer currrent, P_e										
n = 30	230 VAC	[kVA]	15	19	25	30	38	45	54	75
	240 VAC	[kVA]	16	20	26	32	39	47	56	79
	400 VAC	[kVA]	27	33	44	53	65	78	94	131
	415 VAC	[kVA]	31	42	50	55	73	83	102	137
	500 VAC	[kVA]	33	41	45 / 55	66	82	97	117	164
	690 VAC	[kVA]	46	56	62 / 75	91	113	134	161	226
	1000 VAC	[kVA]	26	31	43	51	62	74	90	125

DC Ratings

DC-1 Rating at 60°C										
Non-inductive or slightly	24VDC	[A]	135	135	210	210	300	300	380	425
inductive loads, resistive	48VDC	[A]	135	135	210	210	300	300	380	425
furnaces	110VDC	[A]	135	135	210	210	300	300	380	425
	220VDC	[A]	3	3	3.3	3.3	4.9	4.9	4.9	5.2
1 Pole	440VDC	[A]	0.6	0.6	0.75	0.75	1	1	1	1.2
	24VDC	[A]	135	135	210	210	300	300	380	425
	48VDC	[A]	135	135	210	210	300	300	380	425
2 Poles in Series	110VDC	[A]	135	135	210	210	300	300	380	425
	220VDC	[A]	135	135	210	210	300	300	380	425
	440VDC	[A]	3	3	4	4	4.9	4.9	4.9	5.2
	24VDC	[A]	135	135	210	210	300	300	300	300
	48VDC	[A]	135	135	210	210	300	300	300	300
3 Poles in Series	110VDC	[A]	135	135	210	210	300	300	300	300
	220VDC	[A]	135	135	210	210	300	300	300	300
	440VDC	[A]	11	11	11	11	4.9	4.9	4.9	5.2
DC-3 Rating at 60°C										
Shunt wound motors -	24VDC	[A]	135	135	210	210	300	300	380	425
Starting, reverse current	48VDC	[A]	135	135	210	210	300	300	380	425
breaking, reversing, stepping	110VDC	[A]	135	135	210	210	300	300	380	425
	220VDC	[A]	135	135	210	210	300	300	380	425
3 Poles in Series	440VDC	[A]	3	3	3.5	3.5	3.5	4.1	4.1	5.8
DC-5 Rating at 60°C										
Series wound motors -	24VDC	[A]	80	80	120	120	170	170	170	240
Starting, reverse current	48VDC	[A]	80	80	120	120	170	170	170	240
breaking, reversing, stepping	110VDC	[A]	80	80	120	120	170	170	170	240
	220VDC	[A]	80	80	120	120	170	170	170	240
3 Poles in Series	440VDC	[A]	1.2	1.2	2.1	2.1	2.1	2.4	2.4	3.0

Electrical Data

			CA6-85	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Capacitor Ratings										
Capacitor Switching - 50Hz										
Single Capacitor - 40°C	230 V	[kVar]	45	45	70	70	98	98	125	139
	240 V	[kVar]	47	47	73	73	102	102	131	145
	400 V	[kVar]	78	78	121	121	170	170	218	242
	415 V	[kVar]	81	81	126	126	176	176	226	252
	500 V	[kVar]	97	97	152	152	212	212	273	303
	690V	[kVar]	134	134	209	209	293	293	376	418
	1000 V	[kVar]	194	194	303	303	424	424	546	606
Single Capacitor - 60°C	230 V	[kVar]	38	38	59	59	84	84	106	119
	240 V	[kVar]	39	39	61	61	87	87	111	124
	400 V	[kVar]	65	65	102	102	145	145	184	206
	415 V	[kVar]	68	68	106	106	151	151	191	214
	500 V	[kVar]	82	82	127	127	182	182	230	258
	690V	[kVar]	113	113	176	176	251	251	318	356
	1000 V	[kVar]	164	164	255	255	364	364	461	515
Capacitor Bank - 40°C	230 V	[kVar]	42	45	70	70	98	98	125	139
	240 V	[kVar]	43	47	73	73	102	102	131	145
	400 V	[kVar]	44	56	76	111	110	170	218	212
	415 V	[kVar]	44	56	76	112	170	176	226	252
	500 V	[kVar]	44	56	76	113	172	212	273	303
	690V	[kVar]	45	57	78	114	174	247	356	418
	1000 V	[kVar]	46	58	79	116	177	251	361	606
Capacitor Bank - 60°C	230 V	[kVar]	38	38	59	59	84	84	106	119
	240 V	[kVar]	39	39	61	61	87	87	111	174
	400 V	[kVar]	44	56	76	102	145	145	184	206
	415 V	[kVar]	44	56	76	106	151	151	191	214
	500 V	[kVar]	44	56	76	113	172	182	230	258
	690V	[kVar]	45	57	78	114	174	247	318	356
	1000 V	[kVar]	46	58	79	116	177	251	361	515
Short-Circuit Coordination										
Contactors without Motor Protection Relays										
DIN Fuses - gG, gL										
Type "1"		[A]	250	250	315	355	500	500	630	630
Type "2" (380/400/415/690V)		[A]	200	200	250	315	400	400	500	500
Type "2" (1000V)		[A]	200	200	250	315	315	315	315	315
UL Class K5, resp. L										
Available Fault Current		[A]	10K	10K	10K	10K	10K	18K	18K	18K
Type "1" (600V)		[A]	225 (K5)	250 (K5)	350 (K5)	450 (K5)	500 (K5)	700 (L)	700 (L)	1000 (L)
UL Circuit Breaker, inverse time										
Available Fault Current		[A]	10K	10K	10K	10K	10K	18K	18K	18K
Type "1" (600V)		[A]	125	150	200	250	300	350	400	500
Short Time Current Withstand Ratings										
I_{cw} 60° C	1 s	[A]	1800	1800	1800 / 2550 ❶	2550	3405	3870	4725	6376
	4 s	[A]	1500	1500	1800 / 1970 ❶	1970	3150	3870	4100	6376
	10 s	[A]	1040	1040	1244 / 1360 ❶	1360	2360	2520	2840	4700
	15 s	[A]	860	860	860 /1130 ❶	1130	2000	2110	2270	3460
	60 s	[A]	650	650	650 / 850 ❶	850	1215	1300	1500	1880
	240 s	[A]	340	340	340 / 600 ❶	600	705	750	840	1280
	900 s	[A]	240	240	250 / 440 ❶	440	460	500	590	840
Off Time Between Operations		[Min.]	20	20	20	20	30	30	30	30
Resistance and Watt Loss I_e AC3										
Resistance per power pole		[mΩ]	0.4	0.4	0.42	0.42	0.22	0.22	0.18	0.15
Watt Loss - 3 power poles		[W]	10.2	10.2 (-EI/10.8)	26.3	26.3	23.2	27.2	36.5	37.5
Coil and 3 power poles	AC	[W]	18.2	22.7 (-EI/17.7)	34.2 (-EI/29.2)	40.9–50.8	33.6–48.7	45.8–58.7	53.1–68.0	83.9–96
(@ I_{AC3})	DC	[W]	16.7	22.2 (-EI/18.0)	32.7 (-EI/29.5)	41.2–42.4	33.9–40.3	46.1–50.3	53.4–59.6	84.2–88

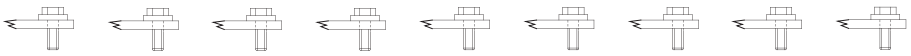
❶ Rating CA6-140 / CA6-140-EI.

Mechanical Data

			CA6-85	CA6-105	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Service Life											
Mechanical	AC	[Mil.]	10	10	10	10	10	10	10	10	10
	DC	[Mil.]	10	10	10	10	10	10	10	10	10
Electrical	AC-3 (400V)	[Mil.]	1	1	1	1	1	1	1	1	1
Shipping Weights											
AC - CA6		[kg]	3.3	3.3	3.8	3.8	3.8	7.5	7.5	7.5	7.5
		[Lbs]	6.9	6.9	8.5	8.5	8.5	15.8	15.8	15.8	15.8
AC - CAU6		[kg]	8.9	8.9	10.3	10.3	10.3	18.5	18.5	18.5	18.5
		[Lbs]	19.9	19.9	23	23	23	41.3	41.3	41.3	41.3
DC - CA6		[kg]	3.3	3.3	3.8	3.8	3.8	7.5	7.5	7.5	7.5
		[Lbs]	6.9	6.9	8.5	8.5	8.5	15.8	15.8	15.8	15.8
DC - CAU6		[kg]	8.9	8.9	10.3	10.3	10.3	18.5	18.5	18.5	18.5
		[Lbs]	19.9	19.9	23	23	23	41.3	41.3	41.3	41.3

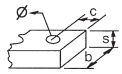
Terminations - Power

Type



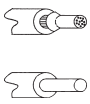
Hexagonal Bolt

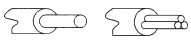
Direct Connection



	b max.	[mm]	20	25	30
	c max.	[mm]	10	12.5	15
	s max.	[mm]	2 x 5	2 x 5	2 x 6
	Ø min.	[mm]	6.1	8.3	10.5
Recommended Torque		[Nm]	8…10	10…12	16
		[Lb-in]	70…90	90…110	130…150

With Main Terminal Set (CA6-HB…)





	sm. opening	[mm²]	16…35	16…35 ❶	25…185 ❷
	lg. opening	[mm²]	16…70	16…95 ❶	25…185 ❷
	sm. opening	[mm²]	16…50	16…50 ❶	25…240
	lg. opening	[mm²]	16…95	16…120 ❶	25…240
	b max.	[mm]	16	20	25
	s sm. opening	[mm]	3…9	3…9	6…20
	s lg. opening	[mm]	3…12	3…14	6…20
Recommended Torque		[Nm]	8…10	10…12	20…25
Wire size per UL/CSA	sm. opening	[AWG]	#6…1 / 0	#6…1 / 0	#4…600MCM
	lg. opening	[AWG]	#6…3 / 0	#6…250MCM	#4…600MCM
Recommended Torque		[Lb-in]	70…90	90…110	180…220

With Screw-type Lugs (CA6-HU…)

Screw-type lugs accept round conductors only

CA6-105-HU		[AWG]	#6…#2 / 0	~	~
Recommended Torque		[Lb-in]	70…90	~	~
CA6-170-HU		[AWG]	~	#6…250MCM	~
Recommended Torque		[Lb-in]	~	90…100	~
CA6-420-HU	sm. opening	[AWG]	~	~	#2…500MCM
	lg. opening	[AWG]	~	~	#2 / 0…600MCM
Recommended Torque		[Lb-in]	~	~	375

❶ Minimum 25mm² (#4 AWG) when using CTA6-150 or 200 thermal overload relay.

❷ CA6-HB3 Main Terminal Set is not suitable for use with CEF1-41, 42 or 52 Electronic Overload Relays or CWE4-630 converter units.

Mechanical Data *(continued)*

			CA6-85	CA6-105	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Terminations - Control											
Description											
			Combination Screw Head: Cross, Slotted, Pozidrive								
Coils											
Wires	1 or 2	[mm2]	1...4								
		[AWG]	16...12								
Torque Requirement		[Nm]	1.4...2.3								
		[Lb-in]	12...20								
Control Modules											
Wires	1	[mm2]	0.08...2.5								
		[AWG]	26...14								
Degree of Protection - contactor			IP00 per IEC 529 and DIN 40 050								
Type of Protection - with accessories											
Single contactor cover			IP1X per IEC 529 and DIN 40 050								
With main terminal set			IP2LX per IEC 529 and DIN 40 050								
Protection against accidental contact			Finger and back-of-hand proof according to VDE 0106, Part 100								

Coil Data

Voltage Range			**Conventional Coil**	**"EI" Coil**	
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[x U_s]	0.85…1.1	0.85 U_s min…1.1 U_s max	
	Dropout	[x U_s]	0.3…0.6	0.3 U_s min…0.5 U_s max	
DC	Pickup	[x U_s]	0.80…1.1	0.85 U_s min…1.1 U_s max	
	Dropout	[x U_s]	0.10…0.6	0.3 U_s min…0.5 U_s max	
Coil Consumption					
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[VA/W]	650/310	268…457 / 133…307	370-588/208-336
	Hold-in	[VA/W]	50/10	8.42…13.7 / 4.31…6.09	11.5-18.4/5.57-7.32
DC	Pickup	[W]	540	142…316	285…469
	Hold-in	[W]	8	4.30…5.96	5.49…7.65
Operating Times					
AC: 50Hz, 60Hz, 50/60 Hz	Pickup	[ms]	20…47	≤ 60	≤ 60
	Dropout	[ms]	6…12	≤ 55	≤ 55
with RC Suppressor	Dropout	[ms]	9…18	~	~
DC	Pickup	[ms]	27…47	≤ 60	≤ 60
with Integ. Suppression	Dropout	[ms]	12…20	≤ 55	≤ 55
Insulation Class			Class "B" according to VDE 0660, Table 22		

CA6 Electronic Coils *(CA6-105-EI…CA6-420-EI)*

CA6-EI contactors are supplied with an electronically controlled mechanism, which has an integrated electronic interface that consists of the following main parts:

- The coil bobbin rated for the control voltage.
- A printed circuit board with components for control and interface functions which is matched to the coil and rated for the control voltage.
- An interconnecting printed circuit board with coil terminals, which is located in the contactor base.
- R/C transient surge suppressors which are installed on the printed circuit board.

The CA6-EI coil bobbin and printed circuit board are a matched set; therefore, both must be changed when replacing the coil or changing out the coil to a different voltage. All replacement coils include both the coil bobbin and printed circuit board.

Commissioning

The CA6-EI contactor is operated in either the "E" mode (normal operation) or the "EI" mode (electronic interface operation) and is programmed by an orange "jumper" located on the bottom side of the contactor (opposite the coil terminals). This orange jumper is directly underneath main terminal T2 and is exposed by removing the small plastic cover that shields the mating space for the CRC/CRV protection element.

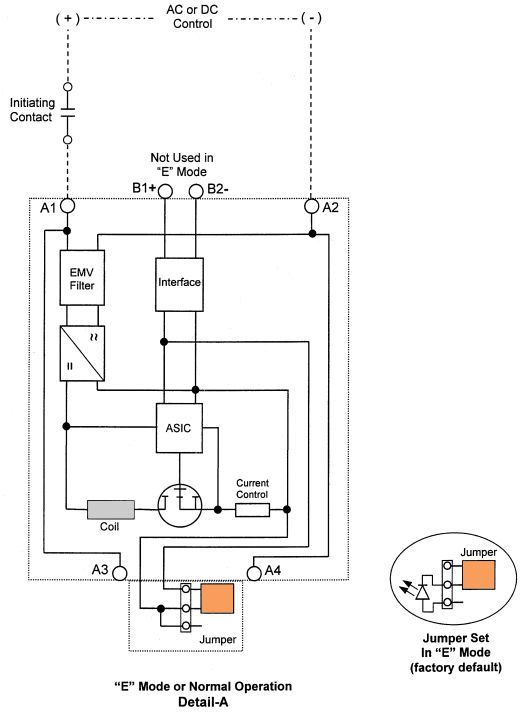
Electronic Operation – "E" Mode

For the "E" mode (factory default setting), the contactor is connected and controlled using terminals A1 & A2 in the same manner as a traditional contactor with an electromechanical coil mechanism. The contactor is programmed from the factory in the "E" mode by means of the orange jumper in the position as shown in Detail A. The "E" mode (or electronic mode) provides electronic control of the coil mechanism, but does not allow coil energization from a low level signal source such as a PLC.

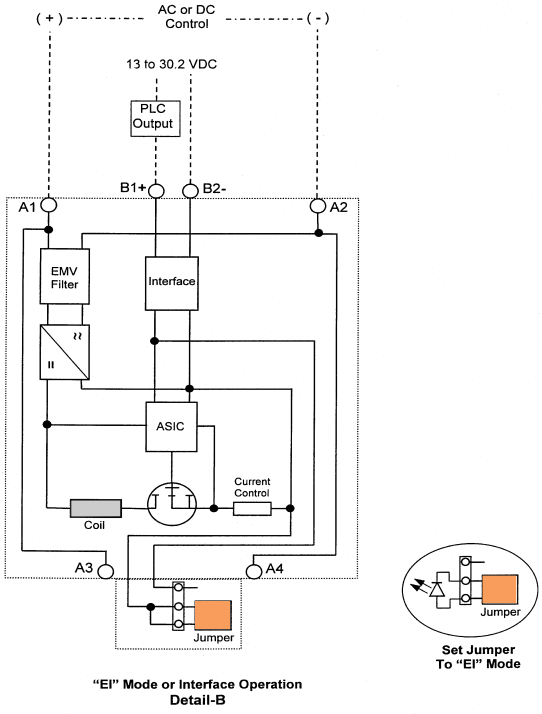
Electronic Interface Operation – "EI" Mode

For the "EI" mode, or optional electronic interface setting, the contactor can be switched from a PLC or other low-level signal source (13…30.2 VDC) without the need for an interposing relay. The contactor is programmed for the "EI" mode by moving the orange jumper to the position as shown in Detail B.

In the "EI" mode, the control voltage (VAC or VDC) must be permanently switched on to terminals A1 & A2 while in operation. The control signal from the PLC or other low-level signal source must be applied to terminals B1 & B2 (orange terminals) of the electronic interface in order to energize the contactor. The current burden of the interface is 15mA maximum.



"E" Mode or Normal Operation
Detail-A



"EI" Mode or Interface Operation
Detail-B

Environmental and General Specifications

	CA6-85	CA6-105	CA6-105(-EI)	CA6-140(-EI)	CA6-170-EI	CA6-210-EI	CA6-250-EI	CA6-300-EI	CA6-420-EI
Ambient Temperature									
Storage	-40...+80° C (-40...176° F)								
Operation at rated current	-25...+60° C (-13...140° F)								
Conditioned 15% current reduction	+70° C (158° F)								
Altitude at installed site	2000 meters above sea level per IEC 947-1								
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, 4g (12g in all three directions)								
Vibration Resistance	IEC 68-2: Static >2g, in normal position								
Operating Position	See Dimensions								
Standards	IEC947-4, BS 5424, VDE 0660								
Approvals	CE, UL, CSA, Lloyd's Reg. of Shipping, SUVA, Germanischer Lloyd								

Auxiliary Contacts

			Conventional auxiliary contacts	Suitable for electronic circuits
Switching, AC & DC Loads				
AC-1 I_{th}	at 40°C	[A]	16	0.1A at 250V
	at 60°C	[A]	12	0.1A at 250V
AC-15 at rated operating voltage of:		[V]	230 240 400 415 500 690	
		[A]	5.5 5 3 2.5 1.6 1	1…100mA at 3…125V
DC-13, switching electromagnets at:		[V]	24 48 110 220 440	
		[A]	5 2 0.7 0.25 0.12	1…100mA at 3…125V
Short-Circuit Protection – gG Fuse				
Type 2 Coordination		[A]	16	0.1
Rated Impulse Voltage U_{imp}		[kV]	8	1.5
Load carrying capacity per UL/CSA				
Rated Voltage	AC	[V]	600 max.	250V max.
Continuous Rating	40°C	[A]	10 general purpose	
Switching Capacity	AC		Heavy pilot duty (A600)	0.1A
Rated Voltage	DC	[V]	600 max.	
Switching Capacity	DC		Standard pilot duty (P600)	
Terminals				
Terminal Type				
Maximum Wire Size per IEC 947-1				
 Flexible with Wire-End Ferrule	1 Conductor	[mm²]	1…2.5	
	2 Conductor	[mm²]	1… 2.5	
 Solid/Stranded-Conductor	1 Conductor	[mm²]	1…4	
	2 Conductor	[mm²]	1…4	
Recommended Tightening Torque		[Nm]	1.4…2.3	
Max. Wire Size per UL/CSA		[AWG]	16…12	
Recommended Tightening Torque		[lb-in]	12…20	
Degree of Protection	IP2LX per IEC 529 and DIN 40 050			

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.

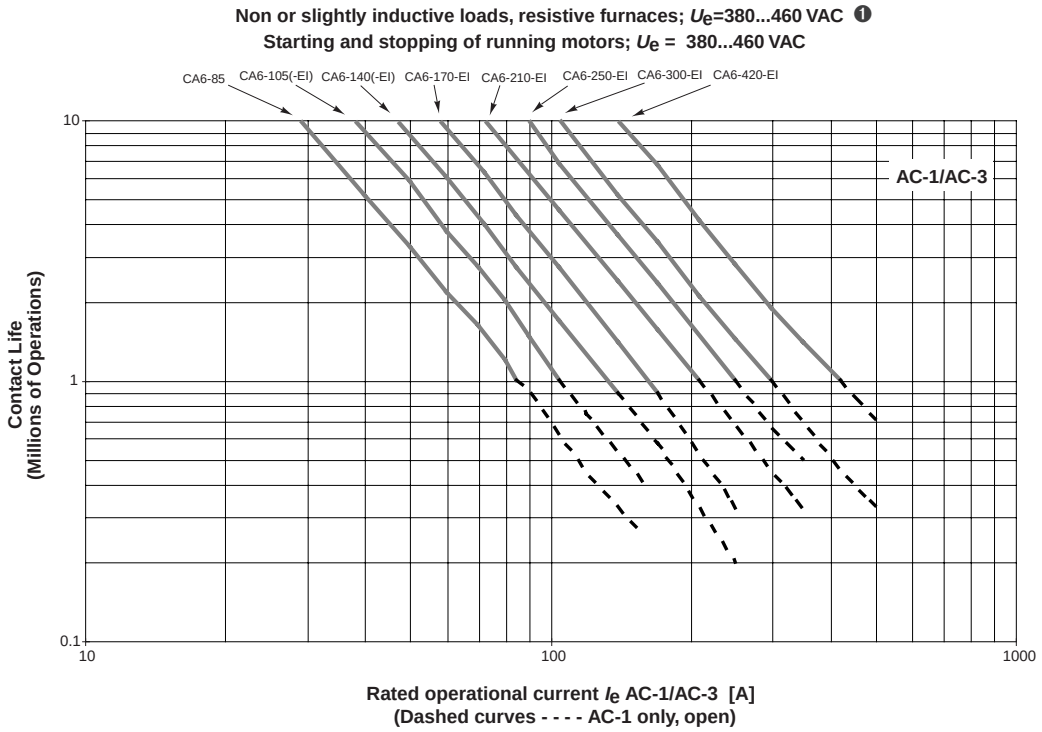
❾ Plugging is understood as stopping or reversing the motor rapidly by reversing the motor primary connections while the motor is running. Inching [or jogging] is understood as energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

Legend

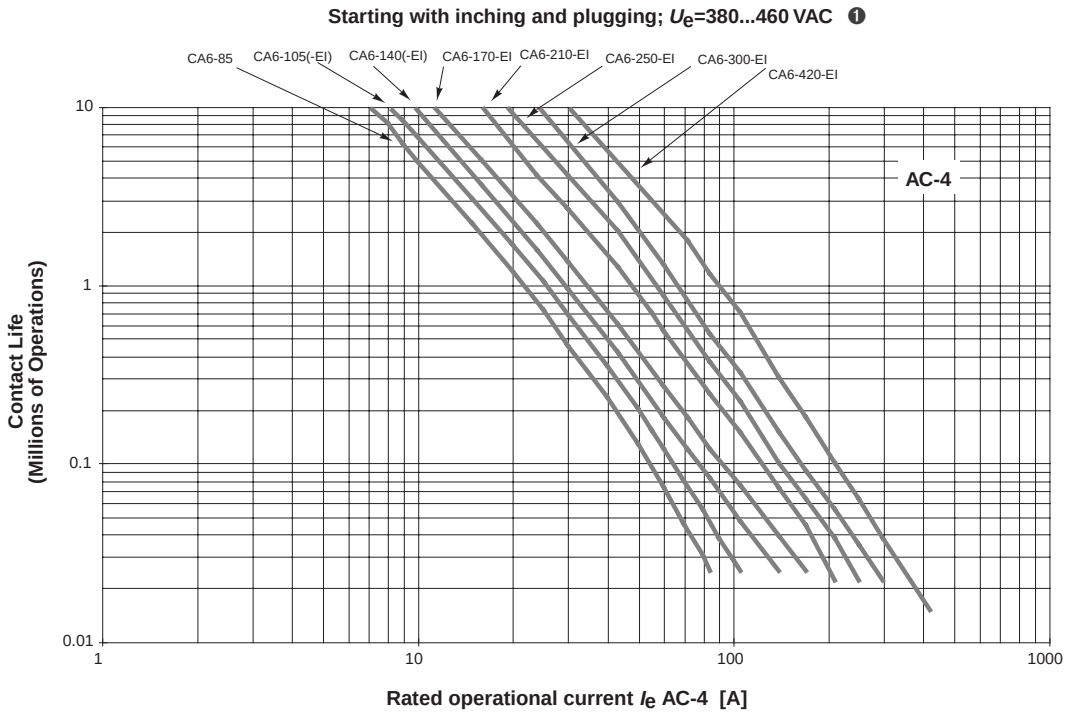
- ***Ue*** Rated operational voltage
- ***U*** Voltage before make
- ***Ur*** Recovery voltage
- ***Ie*** Rated operational current
- ***I*** Making current
- ***Ic*** Breaking current
- **L** Inductance of test circuit
- **R** Resistance of test circuit

Life-Load Curves

AC-1 / AC-3



AC-4

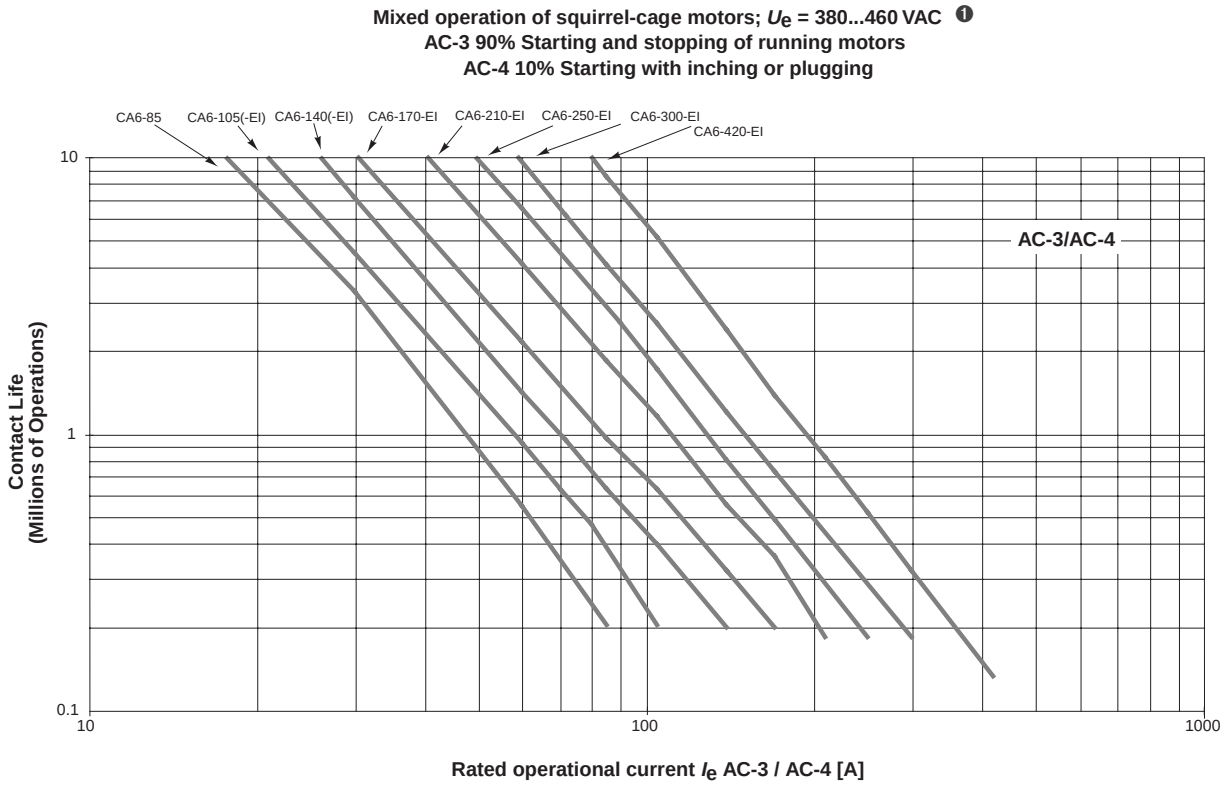


NOTE: The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves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

❶ 460V applications use 90% of curve value.

Life-Load Curves

AC-3 (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} Appoximate 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

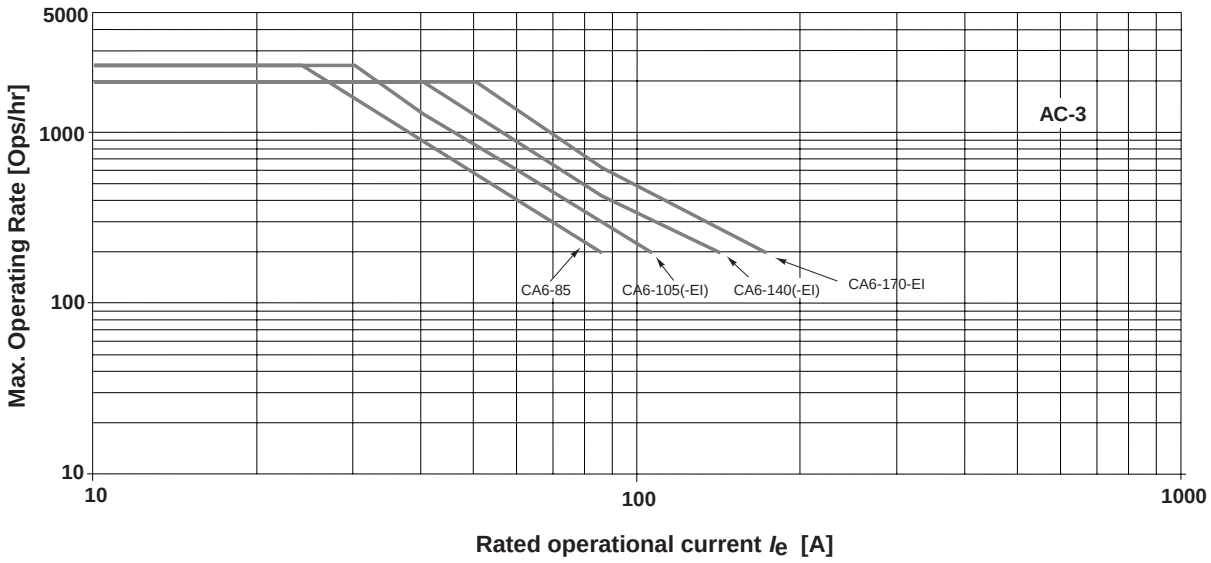
NOTE: The life-load curves shown here are based on Sprecher+Schuh tests according to the requirements defined in IEC 947-4-1. Since contact life in any given application is dependent on environmental conditions and duty cycle, actual application contact life may vary from that indicated by the curves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

❶ 460V applications use 90% of curve value.

Maximum Operating Rates

AC-3
250ms start time

Squirrel cage motors; starting, switching off during running; U_e = 380...460 VAC
250ms start time; 40% duty cycle



AC-3
1 sec. start time

Squirrel cage motors; starting, switching off during running; U_e = 380...460 VAC
1s start time; 40% duty cycle