

Electrical Life in Utilization Category

Load-Life Curves

Bulletin 300 Line starters are designed to provide superior performance in a variety of applications. These load-life curves are based on Allen-Bradley tests according to the requirements defined in IEC 947-4. Actual contact life may vary based on the application, duty cycle and environmental conditions from that indicated by the curves.

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

1. Choose the appropriate graph that most closely approximates the utilization category of the application.
2. Locate the intersection of the life-load curve of the appropriate contactor with the application's operational current (I_{θ}) found on the horizontal axis.
3. Read the estimated contact life in millions of operations along the vertical axis.

Contact Life for Mixed Utilization Categories AC3 and AC4

In many applications, the utilization category cannot be defined as either purely AC3 or AC4. In those applications, the electrical life of the contactor can be estimated from the following equation:

$$L_{\text{mixed}} = \frac{L_{\text{AC3}}}{1 + P_{\text{AC4}} \left(\frac{L_{\text{AC3}}}{L_{\text{AC4}}} - 1 \right)} \quad \text{Where}$$

L_{mixed} Approximate contact life for a mixed AC3/AC4 utilization category application.

L_{AC3} Approximate contact life in operations for AC3 utilization category (from AC3 life-load curves below).

L_{AC4} Approximate contact life in operations for AC4 utilization category (from AC4 life-load curves below).

P_{AC4} Percentage of AC4 operations.

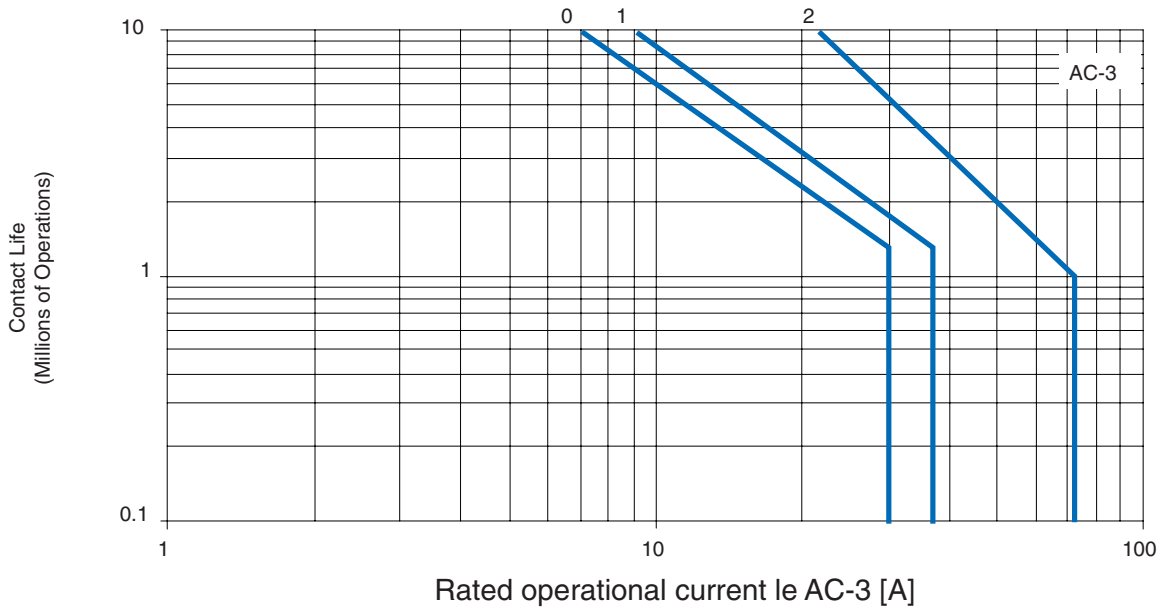
Utilization Categories

Category	Typical Duty
AC3	Starting of squirrel-cage motors and switching only after the motor is up to speed.
AC4	Starting of squirrel-cage motors with inching and plugging duty.

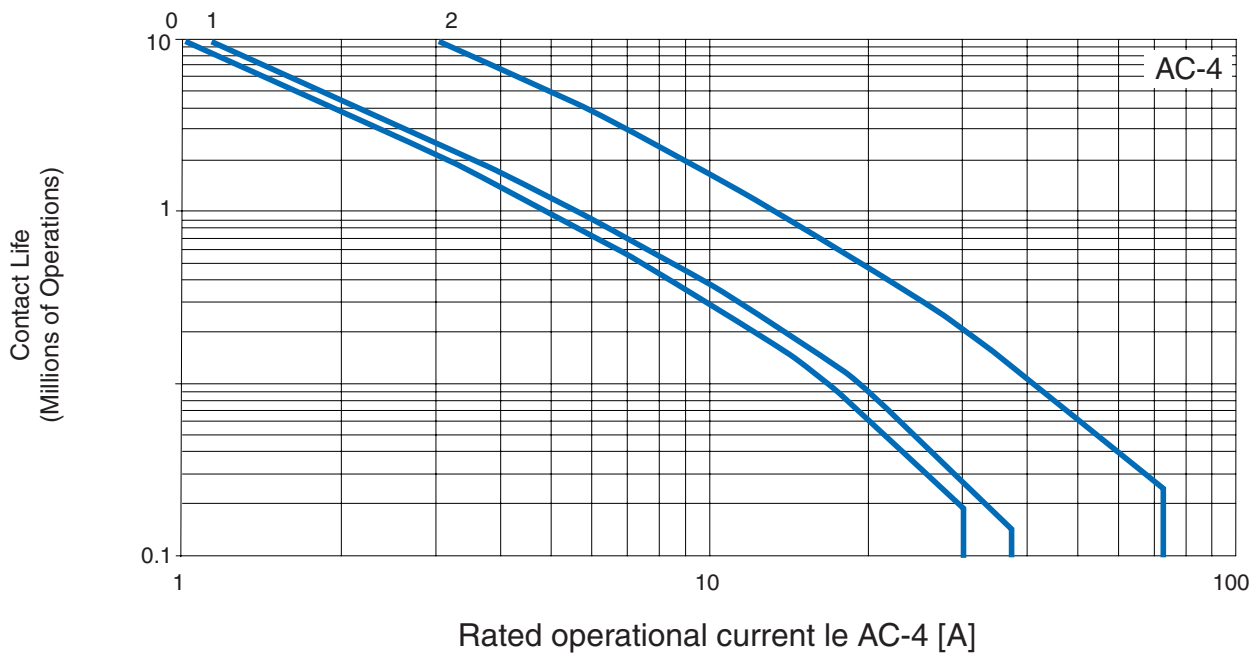
Bulletin 300 Load/Life Curves — AC3 and AC4

NEMA Size 0...2

Starting and stopping of running motors: $U_e = 230...460V$ AC



Starting and inching and plugging: $U_e = 230...460V$ AC



Bulletin 300 Load/Life Curves

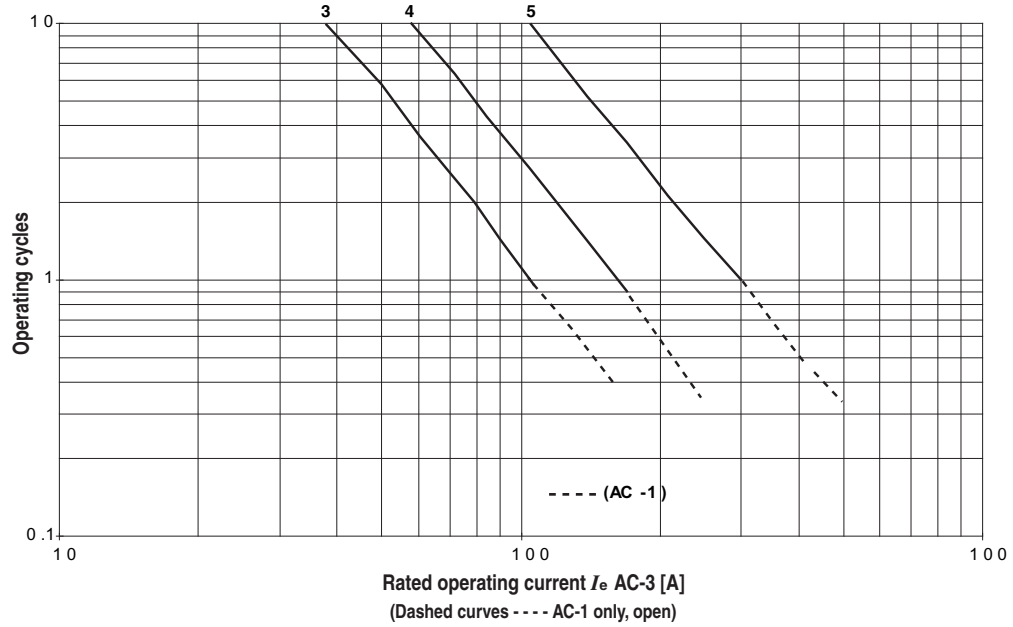
NEMA Size 3...5

AC-1

Non- or slightly-inductive loads, resistance furnaces; $U_e = 400V$

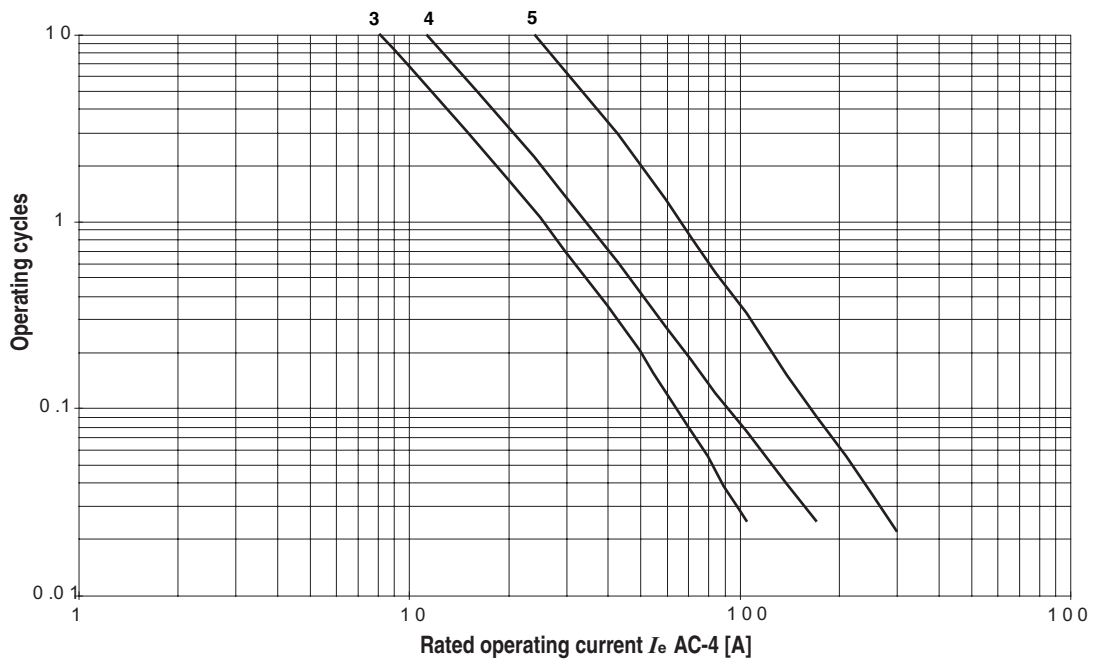
AC-3

Switching of squirrel-cage motors while starting Bulletin 300



AC-4

Stepping of squirrel-cage motors; $U_e = 400V$



Bulletin 300
NEMA AC Starters
Specifications, Continued




Electrical

NEMA Size		0	1	2	3	4	5
Rated insulation voltage		V 660/600					
Ratings: AC3, AC4 60 Hz	<i>I_e</i>	18	27	45	90	135	270
	200V HP	3	7-1/2	10	25	40	75
	230V HP	3	7-1/2	15	30	50	100
	460V HP	5	10	25	50	100	200
	575V HP	5	10	25	50	100	200

AC Coil Data

Coil consumption								
AC: 50 Hz, 60 Hz, 50/60 Hz	Inrush	VA/W	70/50	80/60	200/110	—	—	—
	Sealed	VA/W	9/3	9/3	16/4.5	—	—	—
Coil consumption ±10%	50 Hz Inrush	VA	—	—	—	537	825	1562
	50 Hz Sealed	VA	—	—	—	72	85	125
	60 Hz Inrush	VA	—	—	—	552	840	1596
	60 Hz Sealed	VA	—	—	—	64	75	113
Heat dissipation		Watts	—	—	—	12.5	19.0	35.4
Coil operating limits			85...110% of rated voltage					

Auxiliary Contacts

NEMA Size 0...2		Auxiliary Contacts in Accessories — Cat. No. 100-S, 100-F, 100-MC								
Current Switching										
AC-1 <i>I_{th}</i>	at 40°C	[A]	10							
	at 60°C	[A]	6							
AC-15 at Rated Operating Voltage		[V]	24	48	120	240	400	500	600	690
		[A]	6	6	6	3	2	1.5	1.2	0.7
DC-13 at Rated Operating Voltage		[V]	24	48	125	220	440			
		[A]	3	1.5	0.6	0.3	0.2			
Short-Circuit Protection										
gG Fuse	Type 2 Coordination	[A]	10							
		[kV]	6							
Rated Impulse Voltage <i>U_{imp}</i>		[kV]	6							
Insulation Voltage (between control and load circuit) per DIN, VDE 0106, Part 101 (NAMUR recommendation)		[V]	Between auxiliary circuits: 250 V, Between load and direct-connected aux. circuits: 690 V							
Contact reliability per DIN19240 without contamination, normal industrial atmosphere			17V, 5 mA, >10 ⁸ operations per error							
Positively Guided Contacts			Yes, N.O. and N.C. mutually unrestricted, including N.C. in relation to N.O. Main contacts of contactor do not provide positive guidance with Cat. Nos. 100-FL & 100-FPT							
Terminals										
Terminal Type			2 x A4							
Wire Size per IEC 947-1										
	Flexible with Wire-End Ferrule	1 Conductor	[mm ²]	0.5...2.5						
		2 Conductor	[mm ²]	0.75...2.5						
	Solid/Stranded Conductor	1 Conductor	[mm ²]	0.5...2.5						
		2 Conductor	[mm ²]	0.75...2.5						
Recommended Tightening Torque (min...max)		[N•m]	1...1.5							
Wire Size per UL/CSA		[AWG]	18...14							
Recommended Tightening Torque (min...max)		[lb-in]	8.9...13.3							
NEMA Size 3...5										
Rated thermal current <i>I_{th}</i>			10 A							
Rated insulation voltage IEC (<i>U_i</i>)/UL			660/600V							
Terminal size			—							
Ratings: AC-15	12...120V		6 A							
	220...240V		3 A							
	380...480V		1.5 A							
	500...660V		1.0 A							
Ratings: DC-13	28		5.0 A							
	110		0.7 A							
	220		0.25 A							
	440		0.12 A							




Mechanical

NEMA Size	0	1	2	3	4	5
Degree of protection (Open Type) IEC 529	IP20	IP20	IP20	IP00	IP00	IP00
Mechanical life, operations in millions	13	13	10	10	10	5
Max. number of auxiliary circuits	6	6	6	8	8	8
Operating times at normal voltage at 20°C in milliseconds	Pick-up AC	15...30	15...30	18.5...30	20...45	20...45
	Drop-out AC	10...60	10...60	10...60	25...110	25...110
Maximum operating rates all contactors (operations/hr)	AC3	600	600	500	400	300
	AC4	80	70	60	Contact your local Allen-Bradley distributor	

Construction

Contact material: Main contacts	Silver Alloy					
Auxiliary contacts	Silver					
Terminal markings	NEMA and CENELEC EN50 012.					
Terminal sizes	M4.0 (#8-32)	M5.0 (#10-32)	M6.0 (1/4-20)	M8.0 (5/16-18)	M10.0 (3/8-16)	M12.0 (1/2-13)

Terminations — Power

NEMA Size	0	1	2	3	4	5
Description				—	—	—
	Combination: Cross, Slotted, Pozidrive			Allen Head: 4 mm, 5/32 in.	—	—
Fine-Stranded w/ Ferrule	1 Wire [mm ²]	2.5...10	2.5...10	2.5...35	—	—
	2 Wires [mm ²]	2.5...10	2.5...10	2.5...25	—	—
Coarse-Stranded/Solid	1 Wire [mm ²]	2.5...16	2.5...16	2.5...50	—	—
	2 Wires [mm ²]	2.5...16	2.5...16	2.5...35	—	—
Stranded/Solid (UL/CSA)	1 Wire [AWG]	14...6	14...6	14...2	(1-#8-2/0 AWG)	(1-#6-300 MCM)
	2 Wires [AWG]	14...6	14...6	14...2	(2x) 4...350 MCM	
Torque Requirement	[N•m]	1.5...3.5	1.5...5	2...6	70...90	90...110
	[Lb-in]	13...31	13...31	18...52		375

Terminations — Control

Description	Combination: Cross, Slotted, Pozidrive					
Coils	1 or 2 Wires	[mm ²]	1.5...6			
		[AWG]	16...10			
Control Modules	1 or 2 Wires	[mm ²]	1.5...6			
		[AWG]	16...10			
Torque Requirement		[N•m]	1...2.5			
		[Lb-in]	8.9...22			

Type of Protection

IP 2LX per IEC 529 and DIN 40 050 (with wires installed)

Finger Protection

Safe from touch by fingers and back-of-hand per VDE 0106; Part 100

Environmental (Common Data)

		0...2	3...5
Temperature	Operation	-25...+60°C (-13...+140°F)	-25...+60°C (-13...+140°F)
	Storage	-55...+80°C (-67...+176°F)	-40...+80°C (-40...+176°F)
Altitude	2000 m per IEC 947-4		