

Bulletin 700-CF Control Relay



Bulletin 700-CF — Control Relay

- IEC industrial relays
- Mechanically linked contact performance per IEC 60947-5-1
- Gold plated, bifurcated version for low level switching applications
- Master control relay version rated 15 A (AC-15)
- Solid-state and pneumatic timing modules
- 4...10 Poles

Standards Compliance

UL 508
 CSA C22.2 No. 14
 EN/IEC 60947-1, -5-1
 Meets the material restrictions for European Directive 2002/95/EC - EU-RoHS

Certifications

cULus Listed (File No. E14840, Guide NKCR/NKCR7)
 CE Marked
 CCC Certified

4-Pole AC Coil Voltage (Ratings for 700-CF Only)

AC-12		AC-15							Connection Diagrams	Contacts		Standard Contacts Cat. No.‡	Gold Plated Bifurcated Contacts Cat. No.*	Master Contacts Cat. No.*
I _{th} [A]		I _e [A]								N.O.	N.C.			
40 °C	60 °C	24/48V	120V	240V	400V	500V	600V	690V						
20	20	10	10	10	6	2.5	1	1		2	2	700-CF220⊗	700-CFB220⊗	700-CFM220⊗
										3	1	700-CF310⊗	700-CFB310⊗	700-CFM310⊗
										4	0	700-CF400⊗	700-CFB400⊗	700-CFM400⊗
										0	4	700-CF040⊗	700-CFB040⊗	—

* All Cat. Nos. are factory-stocked.

‡ For spring clamp terminals, insert R after 700-C. Example: Cat. No. 700-CRF220D.

⊗ AC Coil Voltage Code

The cat. no. as listed is incomplete. Select a coil voltage code from the table below to complete the cat. no. Example: Cat. No. 700-CF220⊗ becomes Cat. No. 700-CF220D for 120V, 60 Hz

[V]	12	24	32	36	42	48	100	100... 110	110	120	127	200	200... 220	208	208... 240	220... 230	230	230... 240	240	277	347	380	380... 400	400	400... 415	440	480	500	550	600
50 Hz	R	K	V	W	X	Y	KP	—	D	P	S	KG	L	—	—	F	—	VA	T	—	—	—	N	—	G	B	—	M	C	—
60 Hz	Q	J	—	V	—	X	—	KP	—	D	—	—	KG	H	L	—	—	—	A	T	I	E	—	—	—	N	B	—	—	C
50/60 Hz	—	KJ	—	—	—	KY	KP	—	KD	—	—	KG	KL	—	—	KL	KF	—	KA	—	—	—	—	KN	—	KB	—	—	—	—

4-Pole DC Coil Voltage (Ratings for 700-CF Only)

AC-12		AC-15								Connection Diagrams	Contacts		Standard Contacts Cat. No.§	Gold Plated Bifurcated Contacts Cat. No.*	Master Contacts Cat. No.*
I_{th} [A]		I_e [A]									N.O.	N.C.			
40 °C	60 °C	24/48V	120V	240V	400V	500V	600V	690V							
20	20	10	10	10	6	2.5	1	1		2	2	700-CF220⊗	700-CFB220⊗	700-CFM220⊗	
										3	1	700-CF310⊗	700-CFB310⊗	700-CFM310⊗	
										4	0	700-CF400⊗	700-CFB400⊗	700-CFM400⊗	

* All Cat. Nos. are factory-stocked.

§ For spring clamp terminals, insert R after 700-C. Example: Cat. No. 700-CRF220ZJ.

* Ratings for Bulletin 700-CFB and 700-CFM are on Specifications

⊗ DC Coil Voltage Code♣

The cat. no. as listed is incomplete. Select a coil voltage code from the table below to complete the cat. no. example: Cat. No. 700-CF220⊗ becomes Cat. No. 700-CF220ZJ for 24V DC

[V]	9	12	24	36	48	48...72	60	64	72	80	110	110...125	115	125	220	220...250	230	250
Standard	ZR	ZQ	ZJ	ZW	ZY	—	ZZ	ZB	ZG	ZE	ZD	—	ZP	ZS	ZA	—	ZF	ZT
Standard diode	—	—	DJ	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Electronic with diode	—	EQ	EJ	—	—	EY	—	—	—	—	—	ED	—	—	—	EA	—	—

♣ When ordering DJ coil with built-in surge suppression, the DJ is not polarity sensitive. Drop out time: 14...20 ms.

6- and 8-Pole Relays



Cat. No. 700-CFZ1420



Cat. No. 700-CFZ0530

Control Relays with Overlapping Side-Mounted Contacts

AC-12		AC-15								Left Aux.	Relay Arrangement	Right Aux.	Contacts		Overlapping Side-Mounted Contacts		Cat. No.
I_{th} [A]		I_e [A]											N.O.	N.C.	N.O.	N.C.	
40 °C	60 °C	24/48V	120V	240V	400V	500V	600V	690V									
Main Relay	20	20	10	10	10	6	2.5	1	1		4	0	1	1	700-CFZ1510⊗		
											3	1	1	1	700-CFZ1420⊗		
Side Contacts	10	10	6	6	5	3	1.6	1	1		2	2	1	1	700-CFZ1330⊗		
											4	0	2	2	700-CFZ2620⊗		
											3	1	2	2	700-CFZ2530⊗		
											2	2	2	2	700-CFZ2440⊗		

Control Relays with Standard Side-Mounted Contacts

AC-12			AC-15							Left Aux.	Relay Arrangement	Right Aux.	Contacts		Standard Side-Mounted Contacts		Cat. No.
I _{th} [A]			I _e [A]										N.O.	N.C.	N.O.	N.C.	
	40 °C	60 °C	24/48V	120V	240V	400V	500V	600V	690V								
Main Relay	20	20	10	10	10	6	2.5	1	1		4	0	1	1	700-CFZ0510		
											3	1	1	1	700-CFZ0420		
											2	2	1	1	700-CFZ0330		
Side Contacts	10	10	6	6	5	3	1.6	1	1		4	0	2	2	700-CFZ0620		
											3	1	2	2	700-CFZ0530		
											2	2	2	2	700-CFZ0440		

* All Cat. Nos. are factory stocked.

⊗ AC Coil Voltage Code

The cat. no. as listed is incomplete. Select a coil voltage code from the table below to complete the cat. no. Example: **Cat. No. 700-CFZ0510** becomes **Cat. No. 700-CFZ0510F**.

[V]	12	24	32	36	42	48	100	100... 110	110	120	127	200	200... 220	208	208... 240	220... 230	230	230... 240	240	277	347	380	380... 400	400	400... 415	440	480	500	550	600
50 Hz	R	K	V	W	X	Y	KP	—	D	P	S	KG	L	—	—	F	—	VA	T	—	—	—	N	—	G	B	—	M	C	—
60 Hz	Q	J	—	V	—	X	—	KP	—	D	—	—	KG	H	L	—	—	—	A	T	I	E	—	—	—	N	B	—	—	C
50/60 Hz	—	KJ	—	—	—	KY	KP	—	KD	—	—	KG	KL	—	—	KL	KF	—	KA	—	—	—	—	KN	—	KB	—	—	—	

Assignment of Contacts


Device Combinations in Accordance with IEC 60947-1 / -4-1

Auxiliary Contact Blocks		Control Relays 700-CF (AC and DC Control)				
	Circuit Diagram	Control	700-CF⊗220	700-CF⊗310	700-CF⊗400	
Front Mounting *						
100-FA02		AC/DC	22E + 02E = 24Y	31E + 02E = 33Y	40E + 02E = 42Y	
100-FA11		AC/DC	22E + 11E = 33Y	31E + 11E = 42Y	40E + 11E = 51Y	
100-FA20		AC/DC	22E + 20E = 42Y	31E + 20E = 51Y	40E + 20E = 60Y	
100-FA22		AC/DC	22E + 22E = 44Y	31E + 22E = 53Y	40E + 22E = 62Y	
100-FA31		AC/DC	22E + 31E = 53Y	31E + 31E = 62Y	40E + 31E = 71Y	
100-FA40		AC/DC	22E + 40E = 62Y	31E + 40E = 71Y	40E + 40E = 80Y	
100-FAL22		AC/DC	22E + L22E = L44Y	31E + L22E = L53Y	40E + L22E = L62Y	

* Control relay and auxiliary contact block AC/DC max. 4 N. C.





General

		Main Relay Cat. Nos. 700-CF, 700S-CF	Front Mounted Standard Auxiliary Contacts	Main Relay Cat. No. 700-CFB, 700S-CFB	Master Relay Cat. No. 700- CFM	Front Mounted Bifurcated Auxiliary Contacts	Side-mounted Auxiliary Contacts	
Contact Ratings – NEMA		A600, P600	A600, Q600	A600, Q600	2 x A600, P600	A600, Q600	A600, Q600	
Min. Contact Rating		17V, 10 mA	17V, 5 mA	8V, 5 mA	–	5V, 3 mA	17V, 10 mA	
Contact Ratings – IEC AC-15 (solenoids, contactors) at rated voltage IEC 60947-5-1	24V	10 A	6 A	3 A	15 A	3 A	6 A	
	48V	10 A	6 A	3 A	15 A	3 A	6 A	
	120V	10 A	6 A	3 A	15 A	3 A	6 A	
	240V	10 A	5 A	3 A	15 A	3 A	5 A	
	400V	6 A	3 A	2 A	7.5 A	2 A	3 A	
	480V/500V	2.5 A	1.6 A	1.2 A	5 A	1.2 A	1.6 A	
	600V	1 A	1 A	0.7 A	2 A	0.7 A	1 A	
	690V	1 A	1 A	0.7 A	2 A	0.7 A	1 A	
AC-12 (Control of resistive loads) IEC 60947-5-1	40 °C	I_{th}	20 A	10 A	10 A	20 A	10 A	
		230V	8 kW					
		400V	14 kW					
		690V	24 kW					
	60 °C	I_{th}	20 A	6 A	6 A	20 A	6 A	6 A
		230V	8 kW					
		400V	14 kW					
		690V	24 kW					
DC-12 Switching DC Loads L/R < 1ms, Resistive Loads IEC 60947-5-1	24V	15 A	10 A	6 A	20 A	6 A	6 A	
	48V	10 A	9 A	3.2 A	20 A	3.2 A	3.2 A	
	110V	6 A	3.5 A	1 A	8 A	1 A	1 A	
	220V	1 A	0.7 A	0.5 A	1.5 A	0.5 A	0.5 A	
	440V	0.4 A	0.2 A	0.2 A	0.4 A	0.2 A	0.2 A	
DC-13 IEC 60947-5-1, Solenoids and contactors	24V	5 A	5 A	2.5 A	5 A	2.5 A	5 A	
	48V	3 A	3 A	1.5 A	3 A	1.5 A	2.5 A	
	110V	1.2 A	1.2 A	0.6 A	1.2 A	0.6 A	0.68 A	
	220V	0.6 A	0.6 A	0.3 A	0.6 A	0.3 A	0.32 A	
	440V	0.3 A	0.15 A	0.15 A	0.3 A	0.15 A	0.15 A	

	Location of welded N.O. contacts	State of N.C. Contacts if N.O. contact welds		
		Main	Front aux.	Side aux.
	Main	Open	Open	Open*
Mechanically Linked Contacts‡	Front aux.	Open	Open	–

* Side mounted auxiliary contacts provide “mirror contact” performance with main poles only.

‡ Defined in IEC 60947-5-1 annex L. Mechanically linked is a relationship between contacts of opposite types (i.e., N.O. and N.C.).

		Cat. No. 700-CF	Aux./Pneumatic Timer Contact (Front-mounted)		
Mechanical Life	[MI]	15	5		
Electrical Life	AC-15 (240V, 3 A) [MI]	1.5	1.5		
Weight	AC Coil [g]	390	–		
Terminal Cross-Sections					
Terminal Type					
Terminal Size per IEC60 947-1		2 x A4	2 x A4		
	Solid/ Stranded	1 Conductor	[mm ²]	1.5...6	0.5...2.5
		2 Conductor	[mm ²]	1.5...6	0.75...2.5
Max. Wire Size per UL/CSA	[AWG]	16...10	18...14		
Tightening Torque	[lb·in]	13.3...17.7	8.9...13.3		
Tightening Torque	[N·m]	1.5...2.0	1...1.5		

♣ For 16 or more strands, end ferrule is required.

DC Switching Ratings for 700-CF Main Poles in Series (Resistive Load at 60 °C)			
	1 pole	2 poles	3 poles
24/48V	15/10 A	25 A	25 A
125V	6 A	25 A	25 A
220V	1.5 A	8 A	25 A
440V	0.4 A	1 A	3 A

Control Circuit

Cat. No. 700-CF			
Operating Voltage			
AC 50/60 Hz	Pickup	[x U _s]	0.85...1.1
	Dropout	[x U _s]	0.3...0.6
DC (conventional)*	Pickup	[x U _s]	0.8...1.1
	Dropout	[x U _s]	0.1...0.6
DC (electronic - EQ, EW)	Pickup	[x U _s]	0.7...1.25
	Dropout	[x U _s]	0.3...0.4
DC (electronic - EY)	Pickup	[x U _s]	0.8...1.25
	Dropout	[x U _s]	0.3...0.4
DC (electronic - ED)	Pickup	[x U _s]	0.7...1.12 ‡
	Dropout	[x U _s]	0.3...0.4
DC (electronic - EA)	Pickup	[x U _s]	0.8...1.1
	Dropout	[x U _s]	0.3...0.4
Coil Consumption			
AC 50/60 Hz	Inrush	[VA]	75
	Sealed	[VA/W]	9.5/2.7
DC (conventional)	Inrush	[W]	7.7
	Sealed	[W]	6.3
DC (electronic - EQ, EJ)	Inrush (avg./ peak)	[W]	10/17
	Sealed	[W]	1.7
DC (electronic - EY)	Inrush (avg./ peak)	[W]	10/17
	Sealed	[W]	1.9
DC (electronic - ED)	Inrush (avg./ peak)	[W]	12/19
	Sealed	[W]	2.1
DC (electronic - EA)	Inrush (avg./ peak)	[W]	14/22
	Sealed	[W]	3.0
Operating Times			
AC 50/60 Hz	Pickup Time	[ms]	15...30
	Dropout Time	[ms]	10...60
DC (conventional)	Pickup Time	[ms]	40...70
	Dropout Time	[ms]	7...15
With integrated diode	Opening Delay	[ms]	14...20
With external diode	Opening Delay	[ms]	70...125
DC (electronic- EQ, EJ)	Closing Delay	[ms]	25...50
	Opening Delay	[ms]	27...45
Min OFF time		[ms]	50
Max. ripple			± 15%
DC (electronic- EY, ED, EA)	Closing Delay	[ms]	25...50
	Opening Delay	[ms]	23...33
Min OFF time		[ms]	50
Max. ripple			± 15%
Latch Attachment Release, 100-FL			
Coil Consumption	AC	[VA/W]	45/40
	DC	[W]	25
Contact Signal Duration		[min./max]	0.03...15 s
Timing Attachment			
Reset Time, 100-ETA, 100-ETB	at min. time setting	[ms]	10
	at max. time setting	[ms]	70
Repeat Accuracy			± 10%

* For 9V DC, code ZR, use operating voltage 0.65...1.3 x U_s.

For 24V DC, code ZJ, DJ, or EJ use operating voltage 0.7...1.25 x U_s.

‡ At 110V DC, coil code ED has an operating voltage range of 0.7...1.25 x U_s.

General

	Cat. No. 700-CF
Rated Insulation Voltage U_i	
IEC	690V
UL: CSA	600V
Rated Impulse Strength U_{imp}	
	6 kV
High Test Voltage 1 minute (per IEC 60947-4)	2500V
Rated Voltage U_e	
AC	115, 230, 400, 500, 690V
DC	24, 48, 110, 220, 440V
Short-Circuit Protection gG Fuse 20 A	
Rated Frequency	50/60 Hz, DC
Ambient Temperature	
Storage	-55...+80 °C (-67...176 °F)
Operation at nominal current	-25...+60 °C (-13...140 °F)
15% current reduction for AC-12 at > 60 °C	-25...+70 °C (-13...158 °F)
Corrosion Resistance	humid-alternating climate, cyclic, per IEC 60068-2-30 and DIN 50 016, 56 cycles
Altitude	2000 m above mean sea level, per IEC60 947-4
Type of Protection	
IP2X (IEC 60529 and DIN 40050)	in connected state
Shock Resistance	IEC 60068-2: Half sinusoidal shock 11 ms, 30 G (in 3 directions)
Vibration Resistance	IEC 60068-2: Static >2 G, in normal position no malfunction <5 G

Utilization Category Table from EN 60947-5-1

Verification of Making and Breaking Capacities of Switching Elements Under Normal Conditions Corresponding to the Utilization Categories‡									
Utilization Category	Normal Condition of Use								
	Make§			Break§			Number and Rate of Making and Breaking operations		
	I/I_e	U/U_e	$\cos \psi$	I/I_e	U/U_e	$\cos \psi$	No. operating cycles♣	Operating cycles per minute	ON time [s]♦
AC-12♣	1	1	0.9	1	1	0.9	6050	6	0.05
AC-13♣	2	1	0.65	1	1	0.65	6050	6	0.05
AC-14♣	6	1	0.3	1	1	0.3	6050	6	0.05
AC-15♣	10	1	0.3	1	1	0.3	6050	6	0.05
DC	—	—	$T_{0.95}$	—	—	$T_{0.95}$	—	—	—
DC-12	1	1	1 ms	1	1	1 ms	6050	6	0.05♣
DC-13	1	1	$6 \times P\Delta$	1	1	$6 \times P\Delta$	6050	6	0.05♣
DC-14♣	10	1	15 ms	1	1	15 ms	6050	—	0.05♣

I_e Rated operational current, I Current to be made or broken

U_e Rated operational voltage, U Voltage before make

$P_{U_e I_e}$ Steady-state power consumption (W)

$T_{0.95}$ Time to reach 95% of the steady-state current (ms)

‡ See sub-clause 8.3.3.5.2.

§ For tolerances on test quantities, see sub-clause 8.3.2.2.

♣ The first 50 operating cycles shall be run at $U/U_e=1.1$ with the loads set at U_e .

Δ The value " $6 \times P$ " results from an empirical relationship which is found to represent most DC magnetic loads to an upper limit of $P = 50$ W, e.g., $6 \times P = 300$ W.

♦ The ON time shall be at least equal to $T_{0.95}$.

♣ Where the break current differs from the make current value, the ON time refers to the make current value after which the current is reduced to the break current value for a suitable period e.g., 0.05 s.

Contact Rating Table from EN 60947-5-1

Examples of Contact Rating Designation Based on Utilization Categories

NEMA Designation *	IEC Utilization Category	Conventional Thermal Current I_{the} (A)	Rated Operational Current I_e (A) at Rated Operational Voltage U_e							VA Rating	
			120V	240V	380V	480V	500V	600V	Make	Break	
AC			120V	240V	380V	480V	500V	600V	Make	Break	
A150	AC-15	10	6	—	—	—	—	—	7200	720	
A300	AC-15	10	6	3	—	—	—	—	7200	720	
A600	AC-15	10	6	3	1.9	1.5	1.4	1.2	7200	720	
B150	AC-15	5	3	—	—	—	—	—	3600	360	
B300	AC-15	5	3	1.5	—	—	—	—	3600	360	
B600	AC-15	5	3	1.5	0.95	0.75	0.72	0.6	3600	360	
C150	AC-15	2.5	1.5	—	—	—	—	—	1800	180	
C300	AC-15	2.5	1.5	0.75	—	—	—	—	1800	180	
C600	AC-15	2.5	1.5	0.75	0.47	0.375	0.35	0.3	1800	180	
D150	AC-14	1.0	0.6	—	—	—	—	—	432	72	
D300	AC-14	1.0	0.6	0.3	—	—	—	—	432	72	
E150	AC-14	0.5	0.3	—	—	—	—	—	216	36	
DC			125V	250V	440V	500V	600V	—	—	—	
N150	DC-13	10	2.2	—	—	—	—	—	275	275	
N300	DC-13	10	2.2	1.1	—	—	—	—	275	275	
N600	DC-13	10	2.2	1.1	0.63	0.55	0.4	—	275	275	
P150	DC-13	5	1.1	—	—	—	—	—	138	138	
P300	DC-13	5	1.1	0.55	—	—	—	—	138	138	
P600	DC-13	5	1.1	0.55	0.31	0.27	0.2	—	138	138	
Q150	DC-13	2.5	0.55	—	—	—	—	—	69	69	
Q300	DC-13	2.5	0.55	0.27	—	—	—	—	69	69	
Q600	DC-13	2.5	0.55	0.27	0.15	0.13	0.1	—	69	69	
R150	DC-13	1.0	0.22	—	—	—	—	—	28	28	
R300	DC-13	1.0	0.22	0.1	—	—	—	—	28	28	

* This letter stands for the conventional thermal current and identifies AC or DC: e.g., B = 5 A AC. The number that follows is the rated insulation voltage.