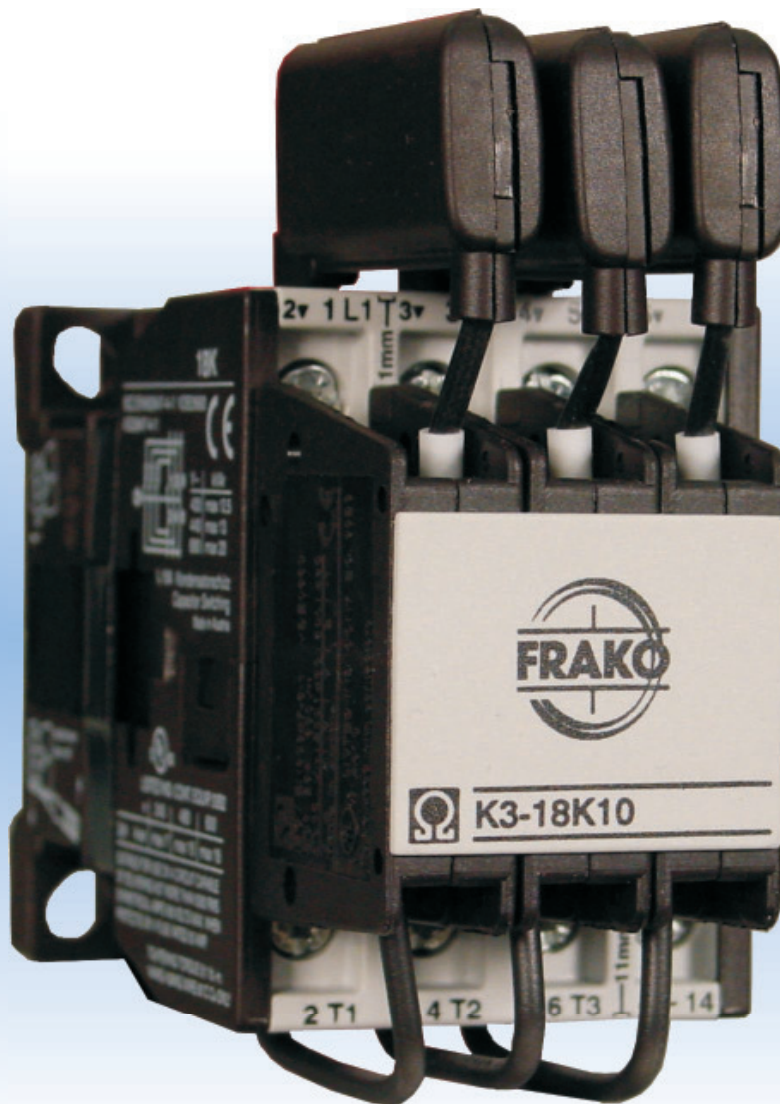


Capacitor Switching Contactors

Type K3...-A, K3...-K



// Features that matter:

- Patented design with significant damping on inrush-current
- Long-life contactors tested by FRAKO up to 100,000 switching operations
- Suitable for unchoked and choked Power Factor Correction Systems
- Very high operational reliability

Capacitor Switching Contactors

for unchoked and choked PFC Systems



// Description

Capacitor contactors for unchoked power factor correction systems

During the switching of unchoked power factor correction capacitors a peak-switching current of 200 times of the nominal current can occur. This load is stressing the capacitors and the switching contacts of the contactors immensely. This can lead to welded main contacts of contactors.

Therefore modern power factor correction systems are currently equipped with special capacitor contactors switching the capacitors first with leading contacts and additionally with resistance wires. The in-rush current will be damped strongly by the resistors. After approximately 5 ms the main contacts of the contactor are switching in and taking over the current supply to the capacitors. Further to this the leading contacts open up and no current can flow during permanent operation. This is also to avoid an additional power loss.

Capacitor contactors with leading transition contact and additional resistance wires offer the following advantages to power factor correction system applications:

- Significant damping of in-rush current
- Improvement of the voltage quality during the switching process
- Long life of the contactors
- High operational reliability of the power factor correction system
- Extension of the maintenance periods of the power factor correction systems
- Suitable for choked and unchoked power factor correction systems due to leading transition contacts opening during permanent operation.

Capacitor contactors for choked power factor correction systems

When choked power factor correction systems are switched, the peak-switching current is essentially lower because of the high inductivity of the harmonic filter reactor as with unchoked power factor correction systems.

By using special wear-resistant contact material for these applications it is possible to use capacitor contactors without series resistors.

These special capacitor contactors offer the following advantages for choked power factor correction systems:

- Safe switching on and off of choked capacitor steps
- Improved voltage quality through chatter-proofed switching operations
- Long-life of the contactors (> 100,000 switching operations)
- High operational reliability of the power factor correction system



Capacitor Switching Contactors for unchoked and choked PFC Systems



Technical Data

Rated operational power at 50/60 Hz Ambient temperature:						Aux. contacts built-in add.			Type	Article-No.	Weight
50° C		60° C						Coil voltage 220–240 V 50 Hz			
380 V	415 V	660 V	380 V	415 V	660 V	NO	NC	pcs.		kg/pc.	
400 V	440 V	690 V	400 V	440 V	690 V						
kvar	kvar	kvar	kvar	kvar	kvar						
0-12.5	0-13	0-20	0-12.5	0-13	0-20	1	–	1 ¹⁾	K3-18K10 230	89-00280	0.34
10-20	10.5-22	17-33	10-20	10.5-22	17-33	–	–	3 ²⁾	K3-24K00 230	89-00279	0.62
10-25	10.5-27	17-41	10-25	10.5-27	17-41	–	–	3 ²⁾	K3-32K00 230	89-00278	0.62
20-33.3	23-36	36-55	20-33.3	23-36	36-55	–	–	3 ²⁾	K3-50K00 230	89-00277	1.0
20-50	23-53	36-82	20-50	23-53	36-82	–	–	3 ²⁾	K3-62K00 230	89-00276	1.0
20-75 ³⁾	23-75 ³⁾	36-120 ³⁾	20-60	23-64	36-100	–	–	3 ²⁾	K3-74K00 230	89-00286	1.0
33-80	36-82	57-120	33-75	36-77	57-120	–	–	6 ⁴⁾	K3-90K00230	89-00356	2.3
33-100 ⁵⁾	36-103 ⁵⁾	57-148 ⁵⁾	33-90 ⁵⁾	36-93 ⁵⁾	57-148 ⁵⁾	–	–	6 ⁴⁾	K3-115K00230	89-00357	2.3

¹⁾ 1HN.. or HA.. snap-on

²⁾ 2HB.. for side mounting and 1HN.. or HA.. snap-on

³⁾ Consider the max. thermal current of the contactor K3-74 A: $I_{th} 130 A$

⁴⁾ 2HB.. on the left or right side and 4 HN.. or HA.. snap-on

⁵⁾ Consider the min. cross-section of conductor at max. load

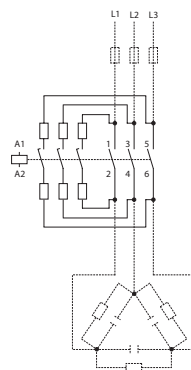
Specification: Contactors K3-..K are suitable for switching low-inductive and low loss capacitors in capacitor banks (IEC70 and 831, VDE 0560) without and with reactors. Capacitor switching contactors are fitted with early make contacts and damping resistors, to reduce the value of make current $<70 \times I_e$.

Operating Conditions: Capacitor switching contactors are protected against contact welding for a prospective making current of $200 \times I_e$.

Technical Data acc. to IEC 947-4-1, IEC 947-5-1, EN 60947-4-1, EN 60947-5-1, VDE 0660

Type		K3-18K	K3-24K	K3-32K	K3-50K	K3-62K	K3-74K	K3-90K	K3-115K	
Max. frequency of operations z	1/h	120	120	120	120	120	80	80	80	
Contact life: unchoked capacitor banks	$S \times 10^3$	250	150	150	150	150	120	100	75	
Contact life: choked banks	$S \times 10^3$	400	300	300	300	300	200	200	200	
Rated operational current I_e	at 50 °C	A	0-18	14-28	14-36	30-48	30-72	30-108	50-115	50-144
	at 60 °C	A	0-18	14-28	14-36	30-48	30-72	30-87	50-108	50-130
Fuses gL (gG)	from/to	A	35/63	50/80	63/100	80/160	125/160	160/200	160/200	160/250

Typical Circuit Diagram



Mounting Instructions

In the area of capacitor switching contactors, difficulty inflammable and self-extinguishing materials may be used only, because abnormal temperatures within the area of the resistor spirals cannot be excluded.

Auxiliary Contact Blocks

Rated operational current			Contacts	Type	Article-No.	Weight	
AC15	AC1						
230 V	400 V	690 V	NO	NC		kg/pc.	
A	A	A					
3	2	10	1	1	HB11	89-00294	0.02
			For contactors for side mounting				
3	2	10	1	–	HN10	89-00281	0.02
			K3-24... to K3-115...				
			K3-18... to K3-115...				

Capacitor Switching Contactors

for unchoked and choked PFC Systems



Technical Data

Rated operational power at 50/60 Hz						Aux. contacts built-in add.			Type	Article-No.	Weight	
Ambient temperature:									Coil voltage			
50° C			60° C						220–240 V 50 Hz		kg/pc.	
380 V	415 V	660 V	380 V	415 V	660 V	NO	NC	pcs.	–			
400 V	440 V	690 V	400 V	440 V	690 V							
kvar	kvar	kvar	kvar	kvar	kvar							
12.5	13	20	12.5	13	20	1	–	4 ¹⁾	K3-18A10 230	89-00288	0.23	
20	22	33	20	22	33	–	–	6 ²⁾	K3-24A00 230	89-00289	0.48	
25	27	41	25	27	41	–	–	6 ²⁾	K3-32A00 230	89-00290	0.48	
33.3	36	55	33.3	36	55	–	–	6 ²⁾	K3-50A00 230	89-00291	0.85	
50	53	82	50	53	82	–	–	6 ²⁾	K3-62A00 230	89-00292	0.85	
75 ³⁾	75 ³⁾	100	60	64	100	–	–	6 ²⁾	K3-74A00 230	89-00293	0.85	
80	82	120	75	77	120				9 ⁴⁾	K3-90A00 230	89-00358	2.2
100 ⁵⁾	103 ⁵⁾	148 ⁵⁾	90 ⁵⁾	93 ⁵⁾	148 ⁵⁾				9 ⁴⁾	K3-115A00 230	89-00359	2.2

¹⁾ 4HN.. or HA.. snap-on

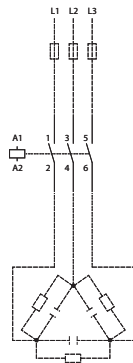
²⁾ 2HB11 on the left or right side and 4HN.. or HA.. snap-on

³⁾ Consider the max. thermal current: I_{th} 130 A

⁴⁾ 2HB.. on the left or right side and 7 HN.. or HA.. snap-on

⁵⁾ Consider the min. cross-section of conductor at max. load

Typical Circuit Diagram



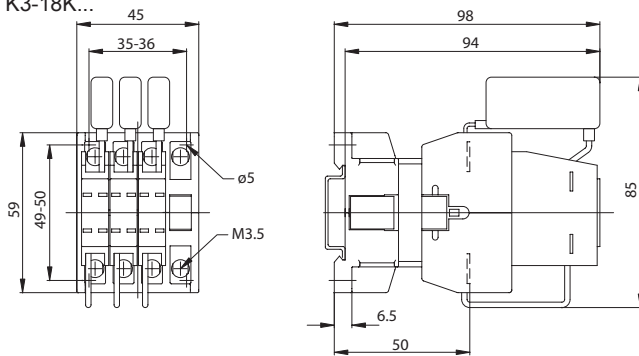
Mounting Instructions

In the area of capacitor switching contactors, difficulty inflammable and self-extinguishing materials may be used only, because abnormal temperatures within the area of the resistor spirals cannot be excluded.

Dimensions

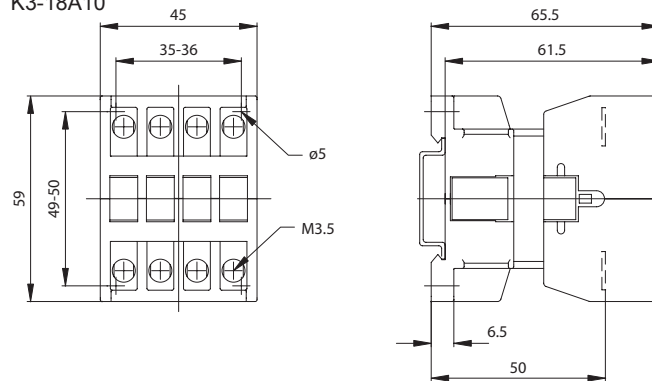
Capacitor switching contactors, AC-operated

K3-18K...

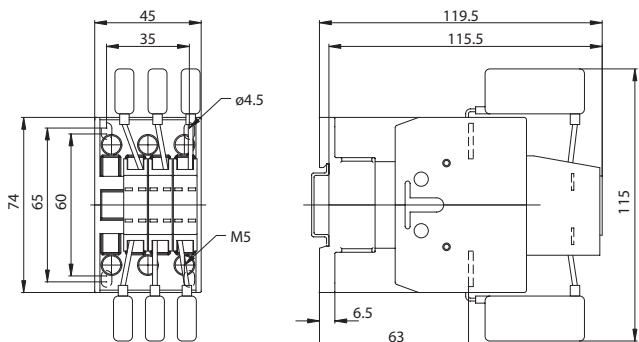


Contactors, AC-operated

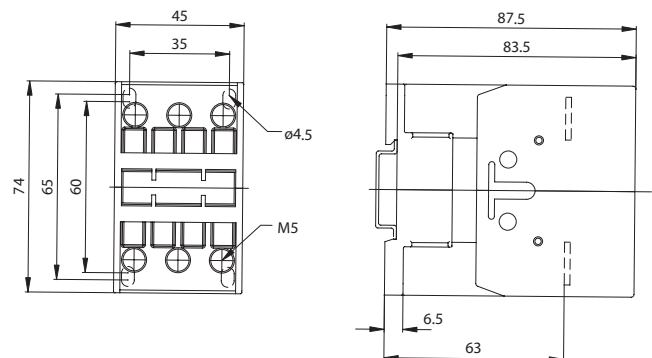
K3-18A10



K3-24K00
K3-32K00



K3-24A00
K3-32A00



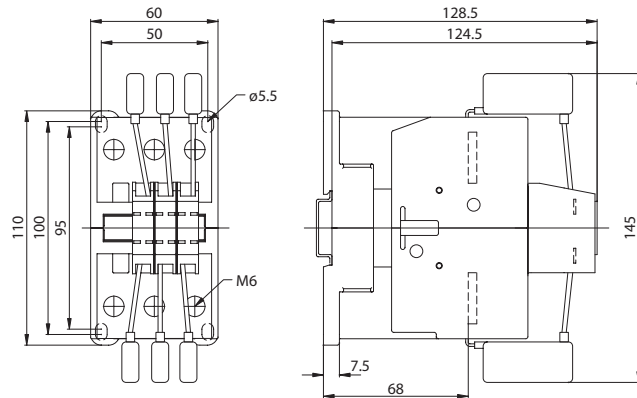
Capacitor Switching Contactors for unchoked and choked PFC Systems



Dimensions

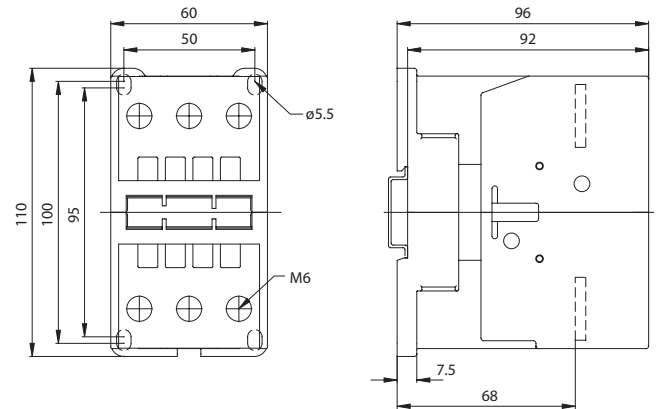
Capacitor switching contactors, AC-operated

K3-50K00
K3-62K00
K3-74K00

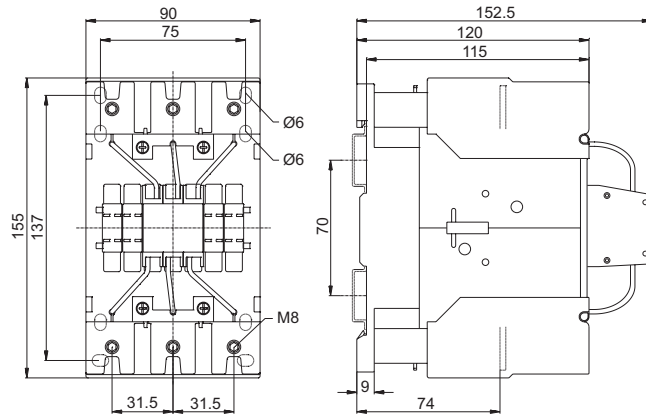


Contactors, AC-operated

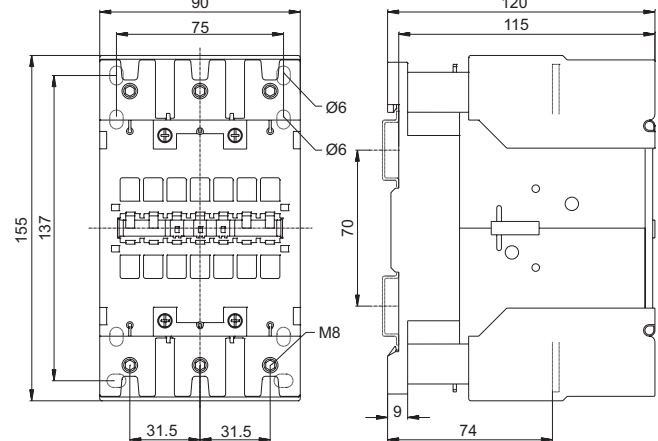
K3-50A00
K3-62A00
K3-74A00



K3-90K00
K3-115K00



K3-90A00
K3-115A00



Technical Data

Main Contacts	Type	K3-18K	K3-24K	K3-32K	K3-50K	K3-62K	K3-74K	K3-90K	K3-115K	
Switching of three-phase current pfc-systems										
Ambient temperature $\leq 50^\circ\text{C}$										
Rated operational current I_e	690 V	A	0–18	14–28	14–36	30–48	30–72	30–108 ¹⁾	50–115	50–144 ²⁾
Rated operational power	220–240V	kvar	0–7	5–11	5–14	12–20	12–28	12–33	20–45	20–55 ²⁾
	380–400 V	kvar	0–12.5	10–20	10–25	20–33.3	20–50	20–75 ¹⁾	33–80	33–100 ²⁾
	415–440 V	kvar	0–13	10.5–22	10.5–27	23–36	23–53	23–75 ¹⁾	36–82	36–103 ²⁾
Rated operational power	500 V	kvar	0–15	12–25	12–30	26–40	26–60	26–75	43–100	43–120 ²⁾
	525 V	kvar	0–15	12–25	12–32	26–43	26–64	26–80	45–105	45–125 ²⁾
	660–690 V	kvar	0–20	17–33	17–41	36–55	36–82	36–120	57–120	57–148 ²⁾
	1000 V	kvar	–	–	–	–	–	–	85–160	85–200 ²⁾
Ambient temperature $\leq 60^\circ\text{C}$										
Rated operational current I_e	690 V	A	0–18	14–28	14–36	30–48	30–72	30–87	50–108	50–130 ²⁾
Rated operational power	220–240 V	kvar	0–7	5–11	5–14	12–20	12–28	12–30	20–40	20–50 ²⁾
	380–400 V	kvar	0–12.5	10–20	10–25	20–33.3	20–50	20–60	33–75	33–90 ²⁾
	415–440 V	kvar	0–13	10.5–22	10.5–27	23–36	23–53	23–64	36–77	36–93 ²⁾
Rated operational power	500 V	kvar	0–15	12–25	12–30	26–40	26–60	26–70	43–90	43–110 ²⁾
	525 V	kvar	0–15	12–25	12–32	26–43	26–64	26–75	45–95	45–115 ²⁾
	660–690 V	kvar	0–20	17–33	17–41	36–55	36–82	36–100	57–120	57–148 ²⁾
	1000 V	kvar	–	–	–	–	–	–	85–150	85–180 ²⁾

¹⁾ Consider the max. thermal current: I_{th} 130 A

²⁾ Consider the min. cross-section of conductor at max. load

Capacitor Switching Contactors

Data according to IEC 947-4-1, EN 60947-4-1, VDE 0660



Technical Data

Main Contacts		Type	K3-18A	K3-24A	K3-32A	K3-50A	K3-62A	K3-74A	K3-90A	K3-115A
Switching of three-phase current pfc-systems										
Ambient temperature ≤ 50 °C										
Rated operational current I_e	690 V	A	18	28	36	48	72	108 ¹⁾	115	144 ²⁾
Rated operational power	220–240V	kvar	7	11	14	20	28	33	45	55 ²⁾
	380–400 V	kvar	12.5	20	25	33.3	50	75 ¹⁾	80	100 ²⁾
	415–440 V	kvar	13	22	27	36	53	75 ¹⁾	82	103 ²⁾
	500 V	kvar	15	25	30	40	60	75	100	120 ²⁾
	525 V	kvar	15	25	32	43	64	80	105	125 ²⁾
	660–690 V	kvar	20	33	41	55	82	120	120	148 ²⁾
	1000 V	kvar	–	–	–	–	–	–	160	200 ²⁾
Ambient temperature ≤ 60 °C										
Rated operational current I_e	690 V	A	18	28	36	48	72	87	108	130 ²⁾
Rated operational power	220–240 V	kvar	7	11	14	20	28	30	40	50 ²⁾
	380–400 V	kvar	12.5	20	25	33.3	50	60	75	90 ²⁾
	415–440 V	kvar	13	22	27	36	53	64	77	93 ²⁾
	500 V	kvar	15	25	30	40	60	70	90	110 ²⁾
	525 V	kvar	15	25	32	43	64	75	95	115 ²⁾
	660–690 V	kvar	20	33	41	55	82	100	120	148 ²⁾
	1000 V	kvar	–	–	–	–	–	–	150	180 ²⁾

¹⁾ Consider the max. thermal current: I_{th} 130 A

²⁾ Consider the min. cross-section of conductor at max. load

Main Contacts		Type	K3-18	K3-24	K3-32	K3-50	K3-62	K3-74	K3-90	K3-115
Maximum ambient temperature										
Operation	open	°C	–40 to +60 (+90) ¹⁾							
	enclosed	°C	–40 to +40							
Storage		°C	–50 to +90							
Short circuit protection										
for contactors without thermal overload relay										
Coordination-type "1" according to IEC 947-4-1										
Contact welding without Hazard of persons										
Max. fuse size	gL (gG)	A	100	100	100	160	160	160	200	250
Mechanical life										
AC-operated	S x 10 ⁶		10	10	10	10	10	10	5	5
DC-operated	S x 10 ⁶		10	10	10	10	10	10	5	5
Short time current	10s-current	A	144	184	240	360	504	592	680	880
Power loss per pole	At $I_e/AC3$ 400 V	W	0.5	0.7	1.3	2.2	3.9	5.5	4.3	6.0

¹⁾ With reduced control voltage range 0.9 up to 1.0 x U_c and with reduced rated current $I_e/AC1$ according to $I_e/AC3$