

PFC CAPACITORS FOR LOW VOLTAGE Type KNK

Applications

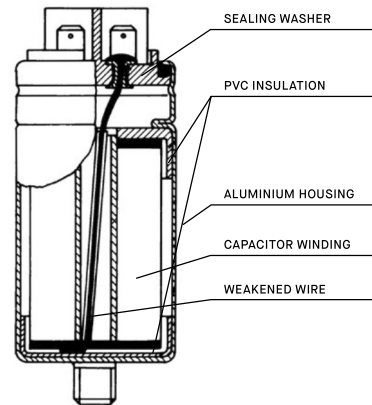
The KNK capacitors are used for power factor correction of inductive consumers (transformers, electric motors, rectifiers in industrial networks for voltages of up to 1000 V.



Design

Iskra KNK capacitors are constructed by the MKP system of low-loss, metalized polypropylene films with a special metalization, whose purpose is to favor the self-healing process and reduce dielectric losses.

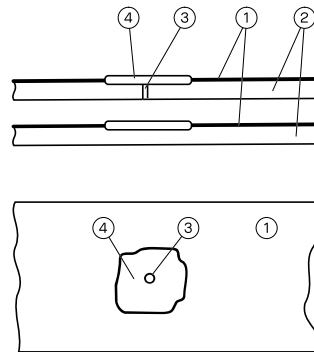
On the end of the element is zinc metal sprayed to make continuous good electrical contact with electrode metalization on the electric. Three single-phase element are delta connected. Afterwards are hermetically sealed in all cases. Capacitors are filled with vegetable oil based, non toxic, PCB free, biodegradable, environmentally friendly or/and dry type.



Self-healing capacity

Damage may occur on the dielectric due to fatigue which results in local breakdowns on certain points. The resultant electric current devaporizes the thin metalized layer and isolates the damaged spot from the rest of the capacitor.

Capacitance loss is almost negligible (some pF) during this process. This self-healing property guarantees operating reliability and long life expectancy of the capacitor.

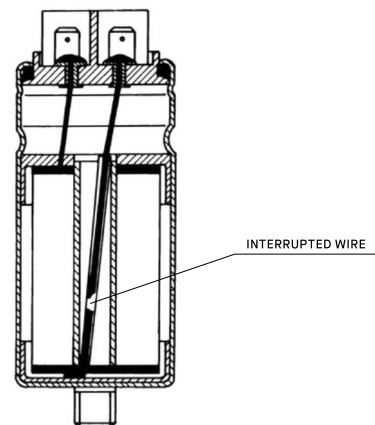


Discharge resistor

Capacitors should be discharged to $\leq 10\%$ of the rated voltage prior to being re-energized. KNK capacitors are equipped with a resistor that discharges the capacitor to 75 V under 3 min.

Over-pressure disconnecter

Every capacitor is protected against breaking by the overpressure disconnecter, which ensures safe disconnection of the capacitor from the network in the event of overloading and at the end of its operational life.





Terms and definitions

Rated capacitance of a capacitor	C_n	Capacitance value for which the capacitor has been designed.
Rated output of a capacitor	Q_n	Reactive power derived from the rated values of capacitance, frequency and voltage.
Rated voltage of a capacitor	U_n	Mean of the max. permissible value of sinusoidal AC voltage in continuous operation.
Rated frequency of a capacitor	f_n	Frequency for which the capacitor has been designed.
Rated current of a capacitor	I_n	RMS value of the current at rated voltage and frequency, excluding harmonic distortion, capacitance tolerance and switching transients.
Maximum permissible AC voltage of a capacitor	U_{max}	Maximum RMS voltage, which the capacitor can be exposed to permanently.
Maximum permissible AC current of a capacitor	I_{max}	Maximum RMS value of permissible current in continuous operating. The exact value for each capacitor can be found in the data charts. — Higher RMS value than stated in the data charts require adjustments in construction and are available on request.

Ambient air temperature Temperature of the air at the proposed location of the capacitor. The lowest ambient temperature at which a capacitor may operate, for all KNK capacitors, is -40 °C. The upper limit temperature is indicated by the letter:

Temperature class	Ambient temperature °C		
	Maximum	Maximum mean for 24 h	Maximum mean for 1 year
A	40 °C	30 °C	20 °C
B	45 °C	35 °C	25 °C
C	50 °C	40 °C	30 °C
D	55 °C	45 °C	35 °C

Temperature classes (according to IEC 60831-1)

Instruction for installation, maintenance and safe handling of capacitors type KNK

Capacitors can operate safely during its life time only if all electrical and thermal conditions are in compliance with the label, data sheet or catalogue.

Receiving

When you receive capacitor, make sure that no mechanical damage occurred during transport. Small damages, such as scratches will have no effect on quality and performance of capacitor. If you receive capacitors with large dents or broken parts, please inform the nearest sales office for instructions regarding the disposition before installation.

Check the capacitor nameplate to make sure that the specifications are in accordance with the contract.

Installation

In general capacitors must be installed indoors. Type KNK105x, KNK305x, can be mounted in vertical or horizontal position. Type KNK50xx, KNK405x, KNK905x must be mounted vertically with terminals upright. While installing make sure that the minimum space between capacitors is 20 mm and there is minimum 25 mm above upper side of capacitor to enable the extension of aluminum case (in case of abnormal operation) and consequential normal operation of the overpressure disconnecter. At the bottom of each capacitor case is a male screw M12, which is intended for mounting and protection earth. Maximum allowed torque at tightening a screw is 10 Nm.

Inrush current

Switching capacitors, especially when they are in parallel with others can cause high inrush currents of up to 200 times of nominal current. These shocks cause additional stress to capacitor and have bad influence on useful life. It is necessary to limit inrush currents.

Electrical connection

Connections to the capacitor terminals must be made with insulated flexible copper conductors. Conductors must have a proper cross section for expected capacitor currents including overloads. Conductors have to be equipped with end sleeves or cable lugs in case of screw terminals. When coupling the capacitors in parallel do not exceed the maximal current per contact.

Do not solder leads to the terminals. Check connections periodically to avoid weak connections and overheating of the connecting points. With our 16 and 25 mm² terminals use only PH1 screwdrivers.

Ambient temperature

The capacitors are designed to operate continuously in a temperature range -25 °C to 55 °C. Capacitors can also operate continuously at lower temperature, down to -40 °C. If the temperature drops to less than -40 °C the capacitors should not be energized, because there is possibility of damage. Maintain proper ambient temperatures and take care of sufficient heat dissipation.

Discharge of capacitors

Because of the residual voltage always discharge and short circuit

the capacitor before touching the terminals. Our capacitors are discharged to 75 V under 3 min and they must be discharged to 10 % of the rated voltage before re-energizing. Discharge resistor may become very hot during operation.

In case the required time between switching off and repeated switching on have to be shorter than 3 minutes (mostly application in automatic capacitor banks), capacitors must be additionally discharged by other measures, example fast discharge reactors or fast discharge resistors.

Harmonics

Higher harmonics may be present in some applications and can affect the useful life of a capacitor. In such cases capacitors or capacitor devices must be connected with suitable reactors.

Protection against shock

Before maintenance or any contact of the capacitors make sure that capacitors or capacitor device are physically disconnected from the power source. Capacitors have an internal or external discharge resistors to reduce voltage to 75 V or less in three minutes, after the power is switched off.

Wait five minutes, then the capacitors must be shorted and grounded by using a short stick with insulated handle. Make sure that all safety precautions are made before handling the capacitor.

Fire hazard

Capacitors are not flammable, but there is a possibility of ignition in a case of explosion, if the electrical current is present.

It must be considered, that the capacitors and capacitor devices are located in such position that possible damage of capacitor will not damage the surrounding area.

Explosion hazard

All capacitors have internal overpressure disconnectors on all three terminals. In extreme situations it is possible to get an explosive case rupture, even with proper fusing.

These facts should be considered when locating the capacitors and capacitor devices.

Handling of failed capacitors

Failed capacitors should be short circuited before handling.

Capacitors which are visually damaged must be carefully removed from the place of installation. Capacitors do not contain ecologically harmful substances and can be deposited to an industrial dump.

Warranty

In case of a claim in an in-warranty period, the user should provide all information in accordance with the terms of the warranty, to the seller.

This information are:
manufacturing date, description of the failure, time of the operation, date and time of the failure, whether the capacitor was operating continuously or there were multiple switching conditions at the time of the failure.

Do not dispose of an in-warranty capacitor before getting an approval from a person authorized by the manufacturer.

Technical data

Type	Symbol	Unit	KNK3053	KNK4053
Standards			IEC/EN 60831-1/2	
Connection			Delta (three-phase)	
Rated reactive power	Q _n	kVar	Up to 50	
Rated voltage	U _n	V	220 ~ 800	
Rated frequency	f _n	Hz	50 or 60	
Capacitance tolerance			-5/10 % (other on request)	
Dielectric loses		W/kVar	< 0.2	
Total loses		W/kVar	< 0.45	
Temperature category			-40/d	
Max. humidity			95 %	
Cooling			Forced ventilation or natural air cooled	
Max. overvoltage			1.1 × U _n (8 h/day)	
			1.15 × U _n (30 min/day)	
			1.2 × U _n (5 min - 200 times per life time)	
			1.3 × U _n (1 min - 200 times per life time)	
			1.5 × I _n (normal duty) or 2 × I _n (heavy duty) (including combined effects of overvoltages, harmonics and capacitance tolerance)	
Max. overcurrent				
Inrush current			200 × I _n	
Expected life time			> 120000 h (normal duty) > 150000 h (heavy duty)	
Discharge resistor			to 75 V < 3 min	
Altitude		kV	up to 4000 m	
Insulation level			4/-	
Routine tests				
Terminal to terminal			2.15 × U _n , 2 s	
Terminal to case			4000 V, 10 s	
Sealing test			n/a	75 °C, 6 h
Mechanical Parameters				
Terminal per phase / terminal height (th) / max. torque / max. hurrent			2 × 25 mm² / 35 mm / 3 Nm / 60 A for D > 90 mm	
			2 × 16 mm² / 30 mm / 2 Nm / 35 A for D = 75 mm	
Mounting and grounding / max. Torque			Threaded M12 bolt /10 Nm	
Mountining position			Vertical with terminal pointing upwards or horizontal	Vertical with terminal pointing upwards
Protection			IP20	
Clearance distance			> 16 mm	
Creepage distance			> 16 mm	
Safety device			Overpressure disconnecter (all phases)	
Material Parameters				
Dielectric			Self healing metallized polypropylene film	
Filling			Dry (filled with non-PCB polyurethane resin)	Non-PCB biodegradable vegetable oil
Case			Aluminium	
Reference Standard				
 C22-2 No. 190 PROTECTED, 80 000 A/C			UL-CSA approved (file no. 163120)	
 Reg.-No. FT10			VDE approved (Cerificate No. 40052154)	

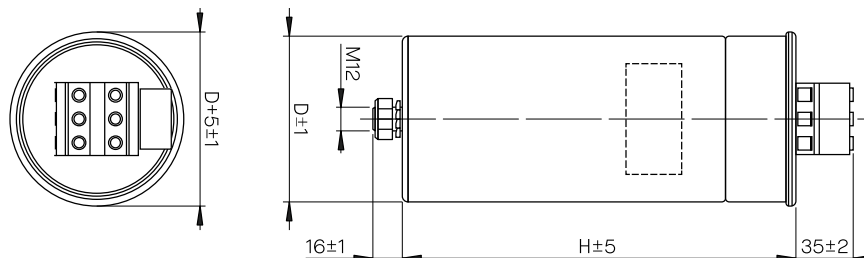


PFC CAPACITORS FOR LOW VOLTAGE

THREE
PHASE

KNK 3053, KNK4053
CYLINDRICAL ALUMINIUM HOUSING

220 ... 800 V 5 ... 50 kVar



Iskra®

15

$f_n = 50 \text{ Hz}$ - Normal Duty

Cn (μF)	Qn (kVar)	In (A)	Qn (kVar)	In (A)	Qn (kVar)	In (A)	D (mm)	H (mm)	Weight (kg)		Packing unit (pcs)	UL US C222 No. 146	RoHS
Un = 400 V		Un = 380 V		Un = 380 V		Un = 380 V		KNK3053		KNK4053			
3 × 33.2	5	7.2	4.5	6.8			75	165	0.9	0.8	16	•	
3 × 49.7	7.5	10.8	6.7	10.2			75	210	1.1	1.0	16	•	
3 × 66.3	10	14.4	9	13.7			75	210	1.1	1.0	16	•	
3 × 82.9	12.5	18	11.3	17.2			75	245	1.4	1.2	16	•	
3 × 99.5	15	21.7	13.5	20.5			90	210	1.5	1.3	16	•	
3 × 132.5	20	28.9	18	27.3			90	245	1.8	1.5	16	•	
3 × 165.8	25	36.1	22.5	34.2			90	285	2.1	1.8	16	•	
3 × 198.9	30	43.1	27	41			116	245	3.0	2.6	9	•	
3 × 265.3	40	57.7	36.1	54.8			116	285	3.6	3.2	9	•	
3 × 331.6	50	72.2	45.1	68.6			136	245	4	3.6	2	•	
Un = 440 V		Un = 400 V		Un = 380 V		Un = 380 V		KNK3053		KNK4053			
3 × 27.4	5	6.6	4.1	5.9	3.7	5.6	75	165	0.9	0.8	16	•	•
3 × 41.1	7.5	9.8	6.2	8.9	5.6	8.5	75	210	1.1	1.0	16	•	•
3 × 54.8	10	13.1	8.3	12	7.4	11.2	75	245	1.4	1.2	16	•	•
3 × 68.5	12.5	16.4	10.4	15	9.3	14.1	90	210	1.5	1.3	16	•	•
3 × 82.2	15	19.7	12.4	17.9	11.2	17	90	245	1.8	1.5	16	•	•
3 × 109.6	20	26.2	16.6	24	15	22.8	90	285	2.1	1.8	16	•	•
3 × 137	25	32.8	20.7	29.9	18.6	28.3	116	210	2.5	2.2	9	•	•
3 × 164.4	30	39.4	24.8	35.8	22.4	34	116	245	3.0	2.6	9	•	•
3 × 219.2	40	52.5	33.1	47.6	29.8	45.3	116	285	3.6	3.2	9	•	•
3 × 274	50	65.6	41.3	59.6	37.3	56.7	136	245	4	3.6	2	•	•
Un = 480 V		Un = 440 V		Un = 400 V		Un = 400 V		KNK3053		KNK4053			
3 × 23	5	6	4.2	5.5	3.5	5.1	75	165	0.9	0.8	16	•	
3 × 34.5	7.5	9	6.3	8.3	5.2	7.5	75	210	1.1	1.0	16	•	
3 × 46.1	10	12	8.4	11	7	10.1	75	210	1.1	1.0	16	•	
3 × 57.6	12.5	15	10.5	13.8	8.6	12.4	75	245	1.4	1.2	16	•	
3 × 69.1	15	18	12.7	16.7	10.5	15.2	90	210	1.5	1.3	16	•	
3 × 92.1	20	24.1	16.9	22.2	13.9	20.1	90	245	1.8	1.5	16	•	
3 × 115.1	25	30.1	21	27.6	17.4	25.1	90	285	2.1	1.8	16	•	
3 × 138.2	30	36.1	25.2	33.1	20.8	30	116	210	2.5	2.2	9	•	
3 × 184.2	40	48.1	33.5	44	27.7	40.1	116	285	3.6	3.2	9	•	
3 × 230.3	50	60.1	42	55.1	34.7	50.1	136	245	4	3.6	2	•	
Un = 525 V		Un = 480 V		Un = 440 V		Un = 440 V		KNK3053		KNK4053			
3 × 19.3	5	5.5	4.4	5.1	3.5	4.6	75	165	0.9	0.8	16	•	
3 × 28.9	7.5	8.2	6.2	7.5	5.3	7	75	210	1.1	1.0	16	•	
3 × 38.5	10	11	8.4	10	7	9.2	75	245	1.4	1.2	16	•	
3 × 48.1	12.5	13.7	10.5	12.6	8.8	11.5	75	245	1.4	1.2	16	•	
3 × 57.7	15	16.5	12.5	15	10.5	13.8	90	210	1.5	1.3	16	•	
3 × 77	20	22	16.7	20.1	14	18.4	90	285	2.1	1.8	16	•	
3 × 96.2	25	27.5	20.9	25.1	17.6	23.1	116	210	2.5	2.2	9	•	
3 × 115.5	30	33	25	30.1	21.1	27.7	116	245	3.0	2.6	9	•	
3 × 154	40	44	33.4	40.2	28.1	36.9	116	285	3.6	3.2	9	•	
3 × 192.5	50	55	41.8	50.3	35.1	46.1	136	245	4	3.6	2	•	