Power Factor Correction Equipment

Iskra®
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Content

KNK Power Capacitors for Low Voltage

KNK Three-phase Capacitors

KLV High Voltage Power Capacitors

KLS Induction Heating Capacitors

Capacitor Duty Contactors

Power Factor Control Relay

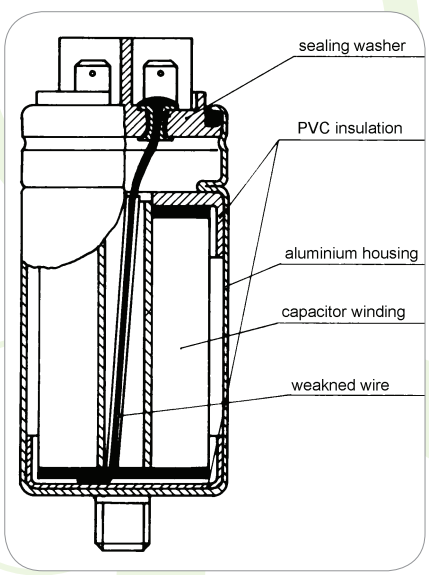
KNK5015, KNK5065, KNK1053, KNK2053, KNK9053, KNK9101, KNK9103, KNK9141, KNK9143

Applications

The KNK capacitors are used for power factor correction of inductive consumers (transformers, electric motors, rectifi in industrial networks for voltages of up to 660 V.

Design

Cylindrical aluminium housing with metallized three-layer polypropylene film dielectric, especially treated for better contact. the capacitors are:
impregnated with polymerized a vegetable oil which is PCB-free and biologically degradable, DRY type - patented

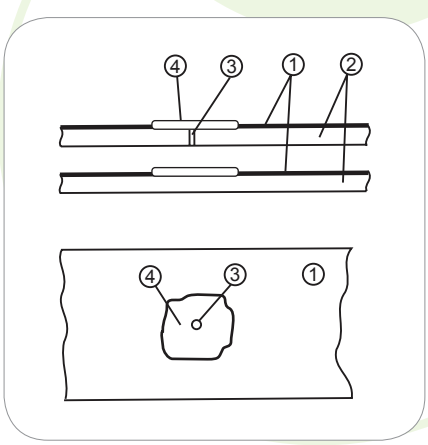


Self-Healing Capacity

Damage may occur on the dielectric due to fatigue which results in local breakdowns on certain points. the resultant electric current devaporises the thin metallized 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.

Self-healing of KNK capacitors

1. metallized layer
2. polypropylene film
3. breakdown point
4. devaporised metallized layer



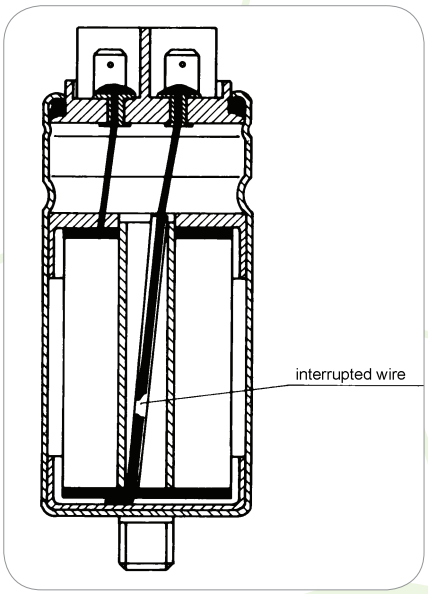
KNK5015, KNK5065, KNK1053, KNK2053, KNK9053, KNK9101, KNK9103, KNK9141, KNK9143

Discharge Resistor

Every capacitor incorporates a resistor which serves for capacitor discharging after network disconnection to 75 V in 3 minutes.

Over-Pressure Disconnector

Every capacitor incorporates a mechanical over-pressure disconnector which disconnects the capacitor in case of overloading or other internal damages.



Routine Testing of Capacitors

Capacitors are subjected to the following tests during the production process:

- sealing test (70 °C, 6 hrs)
- voltage tests between layers with AC voltage equal to 2.15 × Un, 2 s
- voltage test between layers and the housing with AC voltage 3600 V, 2 s
- measurement of loss angle tan at a rated voltage, frequency of 100 Hz, and room temperature
- measurement of capacitance at a rated voltage, frequency of 100 Hz, and room temperature

Available Versions of KNK Capacitors

Indoor mounting:

KNK5015 - single-phase in cylindrical housing
KNK5065 - three-phase in cylindrical housing
KNK1053 - three-phase in cylindrical housing - DRY type
KNK2053 - three-phase in cylindrical housing - DRY type
KNK9053 - three-phase in cylindrical housing
KNK9101 - single-phase in a prism shaped housing
KNK9103 - three-phase in a prism shaped housing
KNK9141 - single-phase with cap in a prism shaped housing (IP 55)
KNK9143 - three-phase with cap in a prism shaped housing (IP 55)

KNK5015, KNK5065, KNK1053, KNK2053, KNK9053, KNK9101, KNK9103, KNK9141, KNK9143

Technical data											
Type			KNK5015	KNK5065	KNK1053	KNK2053	KNK9053	KNK9101	KNK9103	KNK9141	KNK9143
Standards			IEC Publ. 60 831 - 1/2								
Rated voltage	U_n	V	see table								
Rated frequency	f	Hz	50 or 60								
Max. allowable operating voltage			1.1 x Un (8 h per day)								
Max. allowable operating current			1.5 x In (including combined effects of overvoltages, harmonics and capacitance tolerance) 1.3 x In (effects of overvoltages, harmonics and capacitance tolerance) only for KNK2053								
In-rush current (max.)			150 x I_n		200 x I_n	100 x I_n	150 x I_n	200 x I_n			
Protection degree			IP00		IP20			IP00		IP55	
Losses dielectric	max	W/ kvar	0.2								
Losses total	max	W/ kvar	0.4					0.5			
Capacitance tolerance			-5 % to +10 %								
Temperature class/ temperature limits			-25/D								
Permitted ambient temperature		°C	-25 to +55 other on request								
Permitted storage temperature		°C	-40 to +70								
Discharge time			≤ 3 min. to 75 V or less by discharge resistors, other on request								
Safety			self-healing, overpressure disconnector								
Dielectric			metallized polypropylene film								
Filling			Sealed with plant oil; PCB-free			Dry		sealed with plant oil; (PCB-free)			
Test conditions			between layers 2.15 x Un AC 2 s ; layers-housing 3.6 kV AC 2 s								
Expected life time			> 100.000 hours class D > 130.000 hours class C								

Notes:

On request, capacitors with other power and voltage ratings, shapes, and connections are available.

- all rights reserved for any possible changes.
- In-rush current must be limited to maximal permitted value.

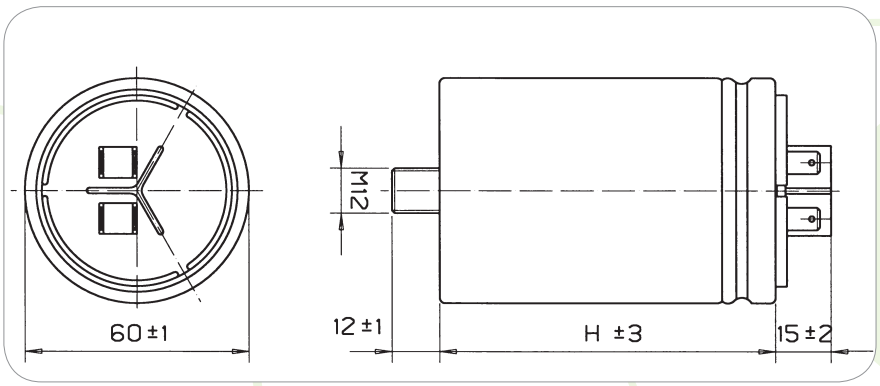
Ordering:

- capacitor type
- capacitor power
- rated voltage
- rated frequency
- quantity and delivery terms

Ordering example for three-phase 25 kvar capacitor of 400 V:
KNK1053, 25 kvar, 400 V, 50 Hz.

KNK5015 - CYLINDRICAL ALUMINIUM HOUSING

230...550 V, 1.67...5 kvar



f_n = 50 Hz

Resin filled

Un (V)	Qn (kvar)	Cn (µF)	In (A)	H (mm)	Weight (kg)	Packing unit (pcs)
400	1.67	33.2	4.2	75	0.22	36
400	2.1	41.6	5.2	87	0.27	36
400	2.5	49.7	6.2	87	0.27	36
400	3.33	66.3	8.3	110	0.32	36
400	4.17	82.9	10.4	125	0.40	36
400	5	99.5	12.5	150	0.45	36
440	1.67	27	3.8	75	0.22	36
440	2.5	41.1	5.7	110	0.32	36
440	3.33	54.8	7.6	110	0.32	36
440	4.17	68.5	9.5	150	0.45	30
440	5	82.2	11.4	150	0.45	36
480	1.67	23.1	3.5	75	0.22	36
480	2.1	29	4.4	75	0.22	36
480	2.5	34.5	5.2	87	0.27	36
480	3.33	46	6.9	100	0.3	36
480	4.17	57.6	8.7	125	0.4	36
480	5	69.1	10.4	150	0.45	36
525	1.67	19.3	3.1	75	0.22	36
525	26	28.0	48	100	0.30	36
525	333	38.5	63	125	0.40	36
525	4.17	48.2	73	150	0.45	36

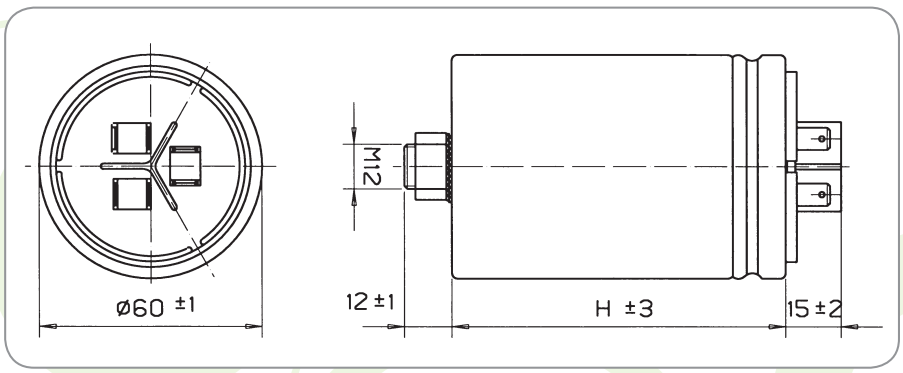
f_n = 60 Hz

Resin filled

Un (V)	Qn (kvar)	Cn (µF)	In (A)	H (mm)	Weight (kg)	Packing unit (pcs)
400	1.67	27.2	4.2	75	0.22	36
400	3.33	55.2	8.3	100	0.3	36
400	4.17	69.1	10.4	110	0.32	36
400	5	82.9	12.5	125	0.4	36
440	1.67	22.8	3.8	75	0.22	36
440	3.33	45.4	7.5	110	0.32	36
440	4.17	56.9	9.4	125	0.4	36
440	5	68.4	11.3	150	0.45	36
480	1.67	19.2	3.5	75	0.22	36
480	3.33	38.3	6.9	87	0.27	36
480	4.17	48	8.7	100	0.3	36
480	5	57.6	10.4	125	0.4	36
525	1.67	16.1	3.2	75	0.22	36
525	3.33	32	6.3	100	0.3	36
525	4.17	40.1	7.9	110	0.32	36
525	5	48.1	9.5	125	0.4	36
525	6.25	60.2	11.9	150	0.45	36

KNK5065 - CYLINDRICAL ALUMINIUM HOUSING, DELTA CONNECTION

400…525 V, 2.5…7.5 kvar



Rated voltage 400 V, f_n = 50 Hz — Resin filled

Rated power (kvar)	Rated capacitance (µF)	Rated current (A)	H (mm)	Weight (kg)	Packing unit (pcs)
2.5	3 x 16.6	3.6	145	0.45	36
3	3 x 19.9	4.3	145	0.45	36
4	3 x 26.5	5.8	185	0.55	36
5	3 x 33.2	7.2	185	0.55	36
7.5	3 x 49.7	10.8	185	0.55	36

Rated voltage 440 V, 50 Hz

Rated power (kvar)	Rated capacitance (µF)	Rated current (A)	H (mm)	Weight (kg)	Packing unit (pcs)
2.5	3 x 13.7	3.3	145	0.45	36
3	3 x 16.5	3.9	145	0.45	36
4	3 x 21.9	5.3	185	0.55	36
5	3 x 27.4	6.6	185	0.55	36

Rated voltage 480 V, 50 Hz

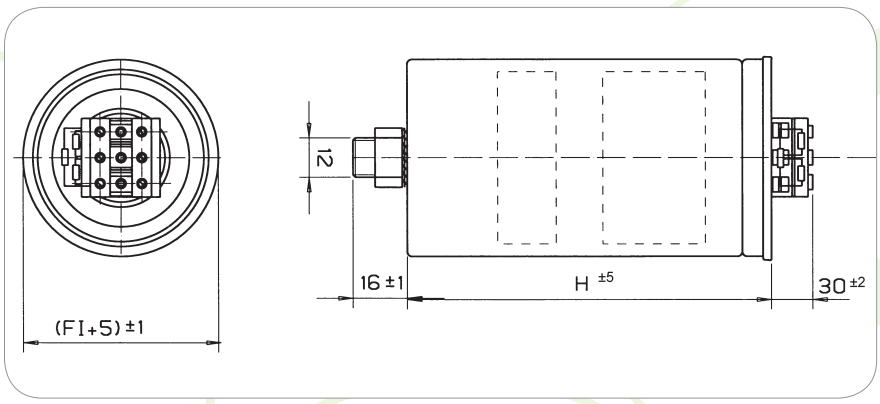
Rated power (kvar)	Rated capacitance (µF)	Rated current (µF)	H (mm)	Weight (kg)	Packing unit (pcs)
2.5	3 × 11.5	3	145	0.45	36
3	3 × 13.8	3.6	145	0.45	36
4	3 × 18.4	4.8	145	0.45	36
5	3 × 23	6	185	0.55	36
6.25	3 × 28.8	7.5	185	0.55	36

Rated voltage 525 V, 50 Hz

Rated power (kvar)	Rated capacitance (µF)	Rated current (A)	H (mm)	Weight (kg)	Packing unit (pcs)
2.5	3 x 9.6	2.7	145	0.45	36
3	3 x 11.5	3.3	145	0.45	36
4	3 x 15.4	4.4	185	0.55	36
5	3 x 19.3	5.5	185	0.55	36
7.5	3 x 28.9	8.2	185	0.55	36

KNK1053 - CYLINDRICAL ALUMINIUM HOUSING

400 … 690 V, 10 … 50 kvar



f_n = 50 Hz - Delta Connection

Dry

C_n (µF)	Q_n (kvar)	I_n (A)	Qn (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	FI (mm)	Weight (kg)	Packing unit (pcs)
U_n = 400 V	U_n = 400 V		U_n = 380 V							
3 × 66.3	10	14.4	9	13.7			205	90	1.2	16
3 × 83.3	12.5	18	11.3	17.2			205	90	1.2	16
3 × 100	15	21.7	13.6	20.7			240	90	1.4	16
3 × 133	20	28.9	18.1	27.5			205	116	1.6	9
3 × 165.8	25	36.1	22.6	34.3			240	116	1.9	9
3 × 198.9	30	43.3	27.1	41.2			240	116	1.9	9
3 × 265	40	57.8	36.2	55			305	136	3.1	1
3 × 331.6	50	72.2	45.2	68.6			370	136	4	1
U_n = 440 V	Un = 440 V		U_n = 420 V		U_n = 400 V					
3 × 54.9	10	13.1	9.1	12.5	8.3	12	205	90	1.2	16
3 × 68.6	12.5	16.4	11.5	15.8	10.4	15	205	90	1.2	16
3 × 82.3	15	19.7	13.7	18.8	12.4	17.9	240	90	1.4	16
3 × 110	20	26.2	18.3	25.2	16.6	24	205	116	1.6	9
3 × 137.1	25	32.8	22.8	31.3	20.7	29.9	240	116	1.9	9
3 × 146.4	30	39.4	27.3	37.5	24.8	35.8	280	116	2.3	9
3 × 219	40	52.4	36.6	50.4	33.2	48	305	136	3.1	1
3 × 274	50	65.6	45.6	62.6	41.4	60	305	136	3.1	1
U_n = 480 V	Un = 480 V		U_n = 440 V		U_n = 400 V					
3 × 46.1	10	12	8.4	11	7	10.1	160	90	0.9	16
3 × 57.6	12.5	15	10.5	13.8	8.6	12.4	205	90	1.2	16
3 × 69.1	15	18	12.7	16.7	10.5	15.2	205	90	1.2	16
3 × 92.1	20	24	16.9	22.2	13.9	20.1	205	116	1.6	9
3 × 115.1	25	30.1	21	27.6	17.4	25.1	205	116	1.6	9
3 × 138.2	30	36.1	25.2	33.1	20.8	30	240	116	1.9	9
3 × 184.2	40	48	33.5	44	27.7	4	305	136	3.1	1
3 × 230.3	50	60	42	55	34.8	50	370	136	4	1
U_n = 525 V	Un = 525 V		U_n = 460 V		U_n = 440 V					
3 × 38.5	10	11	7.7	9.7	7	9.2	205	90	1.2	16
3 × 48.2	12.5	13.8	9.6	12	8.8	11.5	240	90	1.4	16
3 × 57.8	15	16.5	11.5	14.4	10.5	13.8	240	90	1.4	16
3 × 77	20	22	15.3	19.2	14	18.4	205	116	1.6	9
3 × 96.3	25	27.5	19.2	24.1	17.6	23.1	240	116	1.9	9
3 × 115.5	30	33	23	28.9	21.1	27.7	240	116	1.9	9
3 × 154	40	44	30.6	38.4	28	36.8	305	136	3.1	1
3 × 192.5	50	55	38.4	48.2	35.2	46.2	370	136	4	1

KNK1053 - CYLINDRICAL ALUMINIUM HOUSING

400 … 690 V, 10 … 50 kvar

C_n (µF)	Q_n (kvar)	I_n (A)	Qn (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	Fl (mm)	Weight (kg)	Packing unit (pcs)
U_n = 690 V										
3 × 11	5	4.2					160	90	1.1	16
3 ×16	7.5	6.3					160	90	1.1	16
3 × 23	10	8.4					240	90	1.6	16
3 × 28	12.5	10.5					240	90	1.6	16
3 × 46	20	17					240	116	1.9	9
3 × 56	25	21					240	116	1.9	9
3 × 74	33	27.7					280	116	2.5	9

f_n = 60 Hz

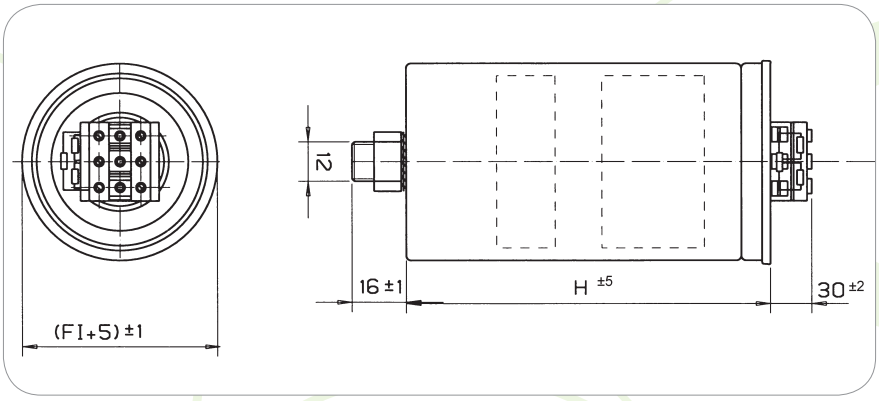
Dry

C_n (µF)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	Fl (mm)	Weight (kg)	Packing unit (pcs)
U_n = 400 V	U_n = 400 V		U_n = 380 V							
3 × 55.3	10	14.4	9	13.7			160	90	0.9	16
3 × 69.7	12.5	18	11.3	17.2			205	90	1.2	16
3 × 82.9	15	21.7	13.6	20.7			205	90	1.2	16
3 × 110.5	20	28.9	18.1	27.5			240	90	1.4	16
3 × 138.2	25	36.1	22.6	34.3			205	116	1.6	9
3 × 165.8	30	43.3	27.1	41.2			240	116	1.9	9
3 × 221	40	57.8	36.2	55			305	136	3.1	1
3 × 276	50	72.2	45.2	68.6			370	136	4	1
U_n = 440 V	U_n = 440 V		U_n = 420 V		U_n = 400 V					
3 × 45.7	10	13.1	9.1	12.5	8.3	12	160	90	0.9	16
3 × 57.1	12.5	16.4	11.5	15.8	10.4	15	205	90	1.2	16
3 × 68.5	15	19.7	13.7	18.8	12.4	17.9	205	90	1.2	16
3 × 91.3	20	26.2	18.3	25.2	16.6	24	240	90	1.4	16
3 × 114.2	25	32.8	22.8	31.3	20.7	29.9	205	116	1.6	9
3 × 137	30	39.4	27.3	37.5	24.8	35.8	240	116	1.9	9
3 × 182.7	40	52.4	36.6	50.4	33.2	48	305	136	3.1	1
3 × 228.4	50	65.6	45.6	62.6	41.4	59.8	305	136	4	1
U_n = 480 V	U_n = 480 V		U_n = 440 V		U_n = 400 V					
3 × 38.4	10	12	8.5	11.1	7	10	160	90	0.9	16
3 × 48	12.5	15	10.7	14	8.8	12.7	205	90	1.2	16
3 × 57.6	15	18	12.8	16.7	10.3	14.9	205	90	1.2	16
3 × 76.7	20	24	17	22.3	14	20.2	240	90	1.4	16
3 × 96	25	30	21	27.6	17.3	25	205	116	1.6	9
3 × 115.1	30	36	25	33	21	30	205	116	1.6	9
3 × 153.5	40	48.1	33.5	44	27.6	40	240	116	1.9	9
3 × 192	50	60	42	55	35	50	305	136	3.1	1
U_n = 525 V	U_n = 525 V		U_n = 460 V		U_n = 440 V					
3 × 32.1	10	11	7.7	9.7	7	9.2	205	90	1.2	16
3 × 40.1	12.5	13.8	9.6	12	8.8	11.5	205	90	1.2	16
3 × 48.1	15	16.5	11.5	14.4	10.5	13.8	240	90	1.4	16
3 × 64.2	20	22	15.3	19.2	14	18.4	205	116	1.6	9
3 × 80.2	25	27.5	19.2	24.1	17.6	23.1	240	116	1.9	9
3 × 96.2	30	33	23	28.9	21.1	27.7	240	116	1.9	9
3 × 128.3	40	44	30.6	38.4	28	36.8	305	136	3.1	1
3 × 160.4	50	55	38.4	48.2	35.2	46.2	305	136	4	1

KNK2053 - CYLINDRICAL ALUMINIUM HOUSING, DELTA CONNECTION

400 … 690 V, 10 … 30 kvar

Investing in your future
Operation Part Financed By The European Union
European Regional Development Fund



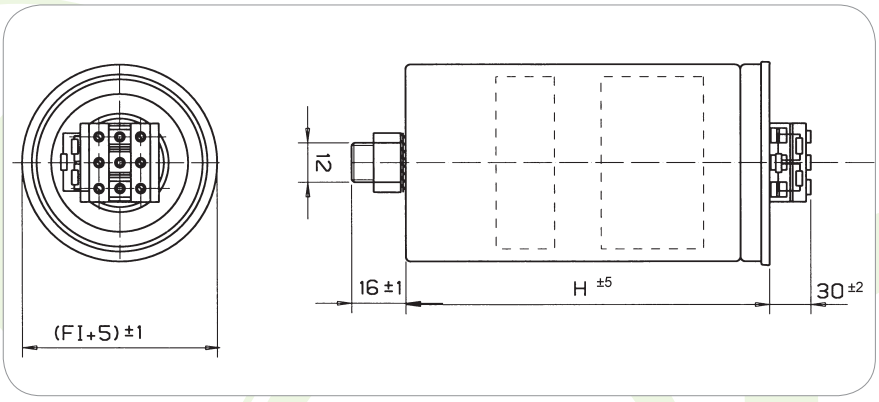
f_n = 50 Hz

Dry

C_n (µF)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	FI (mm)	Weight (kg)	Packing unit (pcs)
U_n = 400 V	U_n = 400 V		U_n = 380 V							
3 × 66.1	10	14.4	9.0	13.7			160	90	1.10	16
3 × 83.3	12.5	18	11.3	17.2			205	90	1.35	16
3 × 100	15	21.7	13.6	20.7			205	90	1.35	16
3 × 133	20	28.9	18.1	27.5			240	90	1.60	16
3 × 165.8	25	36.1	22.6	34.3			205	116	1.90	9
3 × 198.9	30	43.3	27.1	41.2			205	116	1.90	9
U_n = 440 V	U_n = 440 V		U_n = 420 V		U_n = 400 V					
3 × 54.9	10	13.1	9.1	12.5	8.3	12.	160	90	1.10	16
3 × 68.6	12.5	16.4	11.5	15.8	10.4	15	205	90	1.35	16
3 × 82.3	15	19.7	13.7	18.8	12.4	17.9	205	90	1.35	16
3 × 110.0	20	26.2	18.3	25.2	16.6	24	240	90	1.60	16
3 × 137.1	25	32.8	22.8	31.3	20.7	29.9	205	116	1.90	9
3 × 164.4	30	39.4	27.3	37.5	24.8	35.8	240	116	2.20	9
U_n = 480 V	U_n = 480 V		U_n = 440 V		U_n = 400 V					
3 × 46.1	10	12	8.4	11	7	10.1	160	90	1.1	16
3 × 57.6	12.5	15	10.5	13.8	8.6	12.4	160	90	1.1	16
3 × 69.1	15	18	12.7	16.7	10.5	15.2	205	90	1.35	16
3 × 92.1	20	24	16.9	22.2	13.9	20.1	240	90	1.6	16
3 × 115.1	25	30.1	21	27.6	17.4	25.1	205	116	1.9	9
3 × 138.2	30	36.1	25.2	33.1	20.8	30	205	116	1.9	9
U_n = 480 V	U_n = 480 V		U_n = 440 V		U_n = 400 V					
3 × 46.1	10	12	8.4	11	7	10.1	160	90	1.1	16
3 × 57.6	12.5	15	10.5	13.8	8.6	12.4	160	90	1.1	16
3 × 69.1	15	18	12.7	16.7	10.5	15.2	205	90	1.35	16
3 × 92.1	20	24	16.9	22.2	13.9	20.1	240	90	1.6	16
3 × 115.1	25	30.1	21	27.6	17.4	25.1	205	116	1.9	9
3 × 138.2	30	36.1	25.2	33.1	20.8	30	205	116	1.9	9

KNK9053 - CYLINDRICAL ALUMINIUM HOUSING

400 … 690 V, 10 … 30 kvar



f_n = 50 Hz

Resin filled

C_n (µF)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	Fl (mm)	Weight (kg)	Packing unit (pcs)
U_n = 400 V	U_n = 400 V		U_n = 380 V							
3 × 66.3	10	14.4	9.0	13.7			205	90	1.35	16
3 × 83.3	12.5	18	11.3	17.2			205	90	1.35	16
3 × 100	15	21.7	13.6	20.7			240	90	1.60	16
3 × 133	20	28.9	18.1	27.5			205	116	1.90	9
3 × 165.8	25	36.1	22.6	34.3			240	116	2.20	9
3 × 198.9	30	43.3	27.1	41.2			240	116	2.20	9
U_n = 440 V	U_n = 440 V		U_n = 420 V		U_n = 400 V					
3 × 54.9	10	13.1	9.1	12.5	8.3	12	205	90	1.35	16
3 × 68.6	12.5	16.4	11.5	15.8	10.4	15	205	90	1.35	16
3 × 82.3	15	19.7	13.7	18.8	12.4	17.9	240	90	1.60	16
3 × 110.0	20	26.2	18.3	25.2	16.6	24	205	116	1.90	9
3 × 137.1	25	32.8	22.8	31.3	20.7	29.9	240	116	2.20	9
3 × 164.4	30	39.4	27.3	37.5	24.8	35.8	280	116	2.60	9
U_n = 480 V	U_n = 440 V				U_n = 400 V					
3 × 46.1	10	12	8.4	11	7	10.1	205	90	1.35	16
3 × 57.6	12.5	15	10.5	13.8	8.6	12.4	205	90	1.35	16
3 × 69.1	15	18	12.7	16.7	10.5	15.2	240	90	1.6	16
3 × 92.1	20	24	16.9	22.2	13.9	20.1	205	116	1.9	9
3 × 115.1	25	30.1	21	27.6	17.4	25.1	205	116	1.9	9
3 × 138.2	30	36.1	25.2	33.1	20.8	30	240	116	2.2	9
U_n = 525V	U_n = 525 V		U_n = 460 V		U_n = 400 V					
3 × 38.5	10	11	7.7	9.7	7.0	9.2	205	90	1.35	16
3 × 48.2	12.5	13.8	9.6	12	8.8	11.5	240	90	1.60	16
3 × 57.8	15	16.5	11.5	14.4	10.5	13.8	240	90	1.60	16
3 × 77.0	20	22	15.3	19.2	14.0	18.4	205	116	1.90	9
3 × 96.3	25	27.5	19.2	24.1	17.6	23.1	240	116	2.20	9
3 × 115.5	30	33	23	28.9	21.1	27.7	240	116	2.20	9
U_n = 690 V										
3 × 11	5	4.2					160	90	1.1	16
3 ×16	7.5	6.3					160	90	1.1	16
3 × 23	10	8.4					240	90	1.6	16
3 × 28	12.5	10.5					240	90	1.6	16
3 × 46	20	17					240	116	1.9	9
3 × 56	25	21					240	116	1.9	9
3 × 74	33	27.7					280	116	2.5	9

KNK9053 - CYLINDRICAL ALUMINIUM HOUSING, DELTA CONNECTION

400 … 690 V, 10 … 30 kvar

f_n = 60 Hz

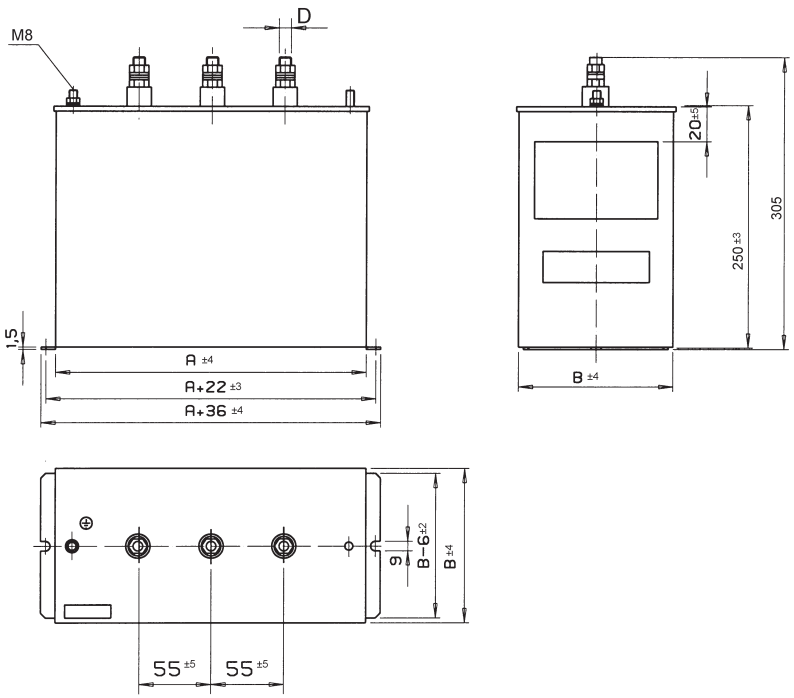
Resin filled

C_n (µF)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	Q_n (kvar)	I_n (A)	H (mm)	Fl (mm)	Weight (kg)	Packing unit (pcs)
U_n = 400 V	Un = 400 V		Un = 380 V							
3 × 55.3	10	14.4	9.0	13.7			160	90	1.05	16
3 × 69.7	12.5	18	11.3	17.2			205	90	1.35	16
3 × 82.9	15	21.7	13.6	20.7			205	90	1.35	16
3 × 110.5	20	28.9	18.1	27.5			240	90	1.60	16
3 × 138.2	25	36.1	22.6	34.3			205	116	1.90	9
3 × 165.8	30	43.3	27.1	41.2			240	116	2.20	9
Un = 440 V	Un = 440 V		Un = 420 V		Un = 400 V					
3 × 45.7	10	13.1	9.1	12.5	8.3	12	160	90	1.05	16
3 × 57.1	12.5	16.4	11.5	15.8	10.4	15	205	90	1.35	16
3 × 68.5	15	19.7	13.7	18.8	12.4	17.9	205	90	1.35	16
3 × 91.3	20	26.2	18.3	25.2	16.6	24	240	90	1.60	16
3 × 114.2	25	32.8	22.8	31.3	20.7	29.9	205	116	1.90	9
3 × 137	30	39.4	27.3	37.5	24.8	35.8	240	116	2.20	9
Un = 480 V	Un = 440 V		Un = 400 V							
3 × 38.4	10	12	8.5	11.1	7	10	160	90	0.9	16
3 × 48	12.5	15	10.7	14	8.8	12.7	205	90	1.2	16
3 × 57.6	15	18	12.8	16.7	10.3	14.9	205	90	1.2	16
3 × 76.7	20	24	17	22.3	14	20.2	240	90	1.4	16
3 × 96	25	30	21	27.6	17.3	25	205	116	1.6	9
3 × 115.1	30	36	25	33	21	30	205	116	1.6	9
Un = 525 V	Un = 525 V		Un = 460 V		Un = 440 V					
3 × 32.1	10	11	7.7	9.7	7.0	9.2	205	90	1.35	16
3 × 40.1	12.5	13.8	9.6	12	8.8	11.5	205	90	1.35	16
3 × 48.1	15	16.5	11.5	14.4	10.5	13.8	240	90	1.60	16
3 × 64.2	20	22	15.3	19.2	14.0	18.4	205	116	1.90	9
3 × 80.2	25	27.5	19.2	24.1	17.6	23.1	240	116	2.20	9
3 × 96.2	30	33	23	28.9	21.1	27.7	240	116	2.20	9
Un = 690 V										
3 × 25	10	8.4					240	90	1.60	16
3 × 31	12.5	10.5					240	90	1.360	16
3 × 49	20	17					240	116	1.90	9
3 × 61	25	21					280	116	2.30	9
3 × 74	33	27.7					280	116	2.30	9

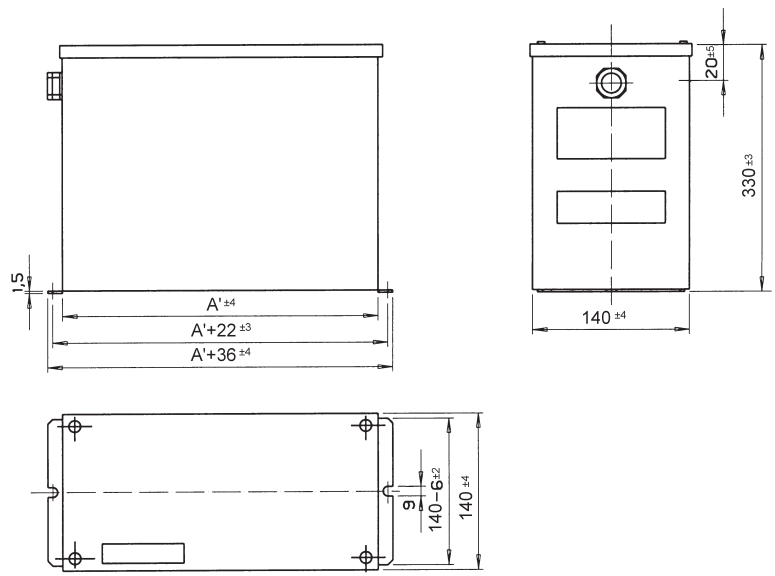
KNK9103, KNK9143 - PRISMATIC

230 … 525 V, 5 … 100 kvar

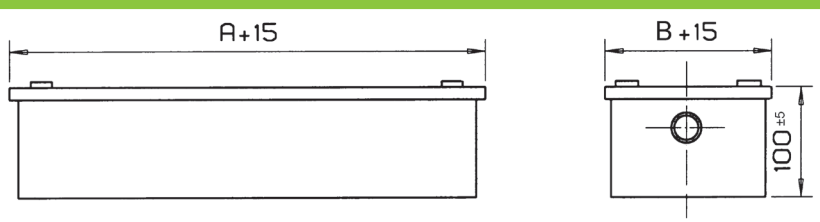
KNK9103



KNK9143



The cap for KNK9103 (type KNK9153)



KNK9103, KNK9143 - PRISMATIC

230 … 525 V, 5 … 100 kvar

f_n = 50 Hz

Resin filled

U_n (V)	Q_n (kvar)	C_n (µF)	I_n (A)	A (mm)	A' (mm)	B (mm)	D	Weight KNK9103 (kg)	Weight KNK9143 (kg)
230	5	3 x 100.3	12.5	190	190	70	M 8	3.65	6.40
230	10	3 x 200.7	25.1	380	190	70	M 8	5.65	7.30
230	12.5	3 x 250.7	31.1	380	190	70	M 8	5.95	7.80
230	15	3 x 301.0	37.6	380	380	140	M 12	8.30	12.40
230	20	3 x 401.2	50.2	380	380	140	M 12	9.65	13.20
230	25	3 x 501.5	62.7	380	380	140	M 12	10.25	13.80
400	5	3 x 33.2	7.2	190	190	70	M 8	2.95	6.00
400	7.5	3 x 49.7	10.8	190	190	70	M 8	3.05	6.10
400	10	3 x 66.3	14.4	190	190	70	M 8	3.25	6.25
400	12.5	3 x 82.9	18	190	190	70	M 8	3.30	6.30
400	15	3 x 99.5	21.7	190	190	70	M 8	3.65	6.45
400	20	3 x 132.6	28.9	380	190	70	M 8	5.65	7.30
400	25	3 x 165.8	36.1	380	190	70	M 8	5.95	7.80
400	30	3 x 198.9	43.3	380	190	70	M 8	6.25	8.10
400	40	3 x 265.3	57.7	380	380	140	M 12	8.30	12.20
400	50	3 x 331.6	72.2	380	380	140	M 12	9.65	13.20
400	60	3 x 397.9	86.6	380	380	140	M 12	10.25	13.80
400	100	3 x 663	144	380	380	140	M 12	18.50	22.0
440	5	3 x 27.4	6.5	190	190	70	M 8	2.95	6.00
440	7.5	3 x 41.1	9.8	190	190	70	M 8	3.05	6.10
440	10	3 x 54.8	13.1	190	190	70	M 8	3.25	6.25
440	12.5	3 x 68.5	16.4	190	190	70	M 8	3.30	6.30
440	15	3 x 82.2	19.7	190	190	70	M 8	3.65	6.45
440	20	3 x 109.6	26.3	380	190	70	M 8	5.65	7.30
440	25	3 x 137.0	32.8	380	190	70	M 8	5.95	7.80
440	30	3 x 164.4	39.4	380	190	70	M 8	6.25	8.10
440	40	3 x 219.2	52.6	380	380	140	M 12	8.30	12.20
440	50	3 x 272.0	65.6	380	380	140	M 12	9.65	13.20
440	60	3 x 328.8	78.8	380	380	140	M 12	10.25	13.80
440	100	3 x 548	131	380	380	140	M 12	18.50	22.0
480	5	3 x 23	6	190	190	70	M 8	2.95	6.10
480	7.5	3 x 34.5	9	190	190	70	M 8	3.05	6.10
480	10	3 x 46	12	190	190	70	M 8	3.25	6.30
480	12.5	3 x 57.6	15	190	190	70	M 8	3.30	6.40
480	15	3 x 69.1	18	190	190	70	M 8	3.65	7.30
480	20	3 x 92.1	24.1	380	190	70	M 8	5.65	7.30
480	25	3 x 115.1	30.1	380	190	70	M 8	5.95	7.80
480	30	3 x 138.2	36.1	380	190	70	M 8	6.25	8.10
480	40	3 x 184.2	48.1	380	380	140	M 12	8.30	12.20
480	50	3 x 230.3	60.1	380	380	140	M 12	9.65	13.20
480	60	3 x 276.3	72.2	380	380	140	M 12	10.25	13.80
480	100	3 x 460.5	120.3	380	380	140	M 12	18.50	22.0
525	5	3 x 19.3	5.5	190	190	70	M 8	2.95	6.10
525	7.5	3 x 28.9	8.2	190	190	70	M 8	3.05	6.25
525	10	3 x 39.0	11	190	190	70	M 8	3.25	6.30
525	12.5	3 x 48.1	13.8	190	190	70	M 8	3.30	6.45
525	15	3 x 57.7	16.5	190	190	70	M 8	3.65	7.30
525	20	3 x 77.0	22	380	190	70	M 8	5.65	7.80
525	25	3 x 92.2	27.5	380	190	70	M 8	5.95	8.10
525	30	3 x 115.5	33	380	380	140	M 12	6.25	12.20
525	40	3 x 154.0	44	380	380	140	M 12	8.30	13.20
525	50	3 x 192.5	55	380	380	140	M 12	9.65	13.80
525	100	3 x 385	110	380	380	140	M 12	18.50	22.0

KNK9103, KNK9143 - PRISMATIC

230 … 525 V, 5 … 100 kvar

f_n = 60 Hz

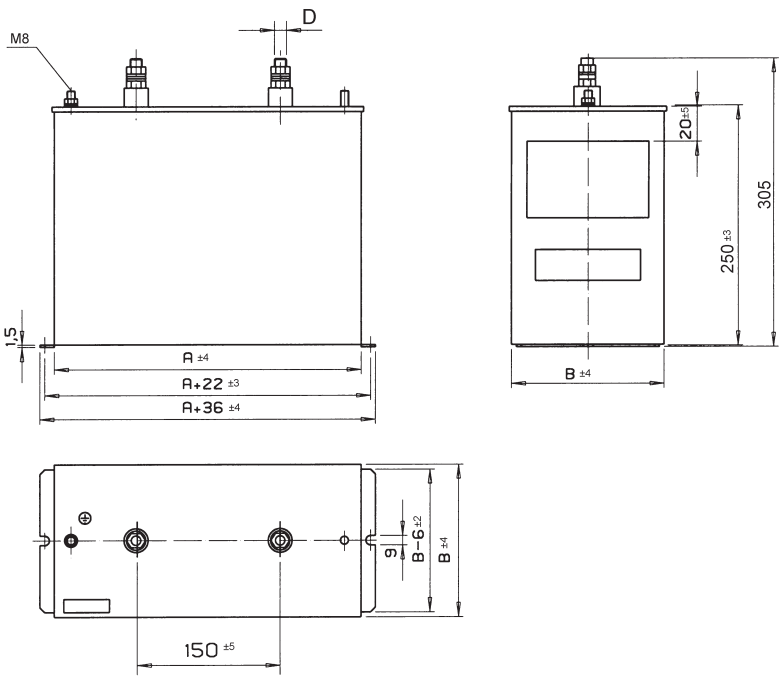
Resin filled

U_n (V)	Q_n (kvar)	C_n (µF)	I_n (A)	A (mm)	A' (mm)	B (mm)	D	Weight KNK9103 (kg)	Weight KNK9143 (kg)
220	5	3 x 91.3	13.13	190	190	70	M 8	3.65	6.40
220	10	3 x 182.6	26.27	380	190	70	M 8	5.95	7.30
220	15	3 x 273.9	39.41	380	190	70	M 8	6.25	7.75
220	20	3 x 365.2	52.54	380	380	140	M 12	8.30	12.10
220	25	3 x 456.5	65.68	380	380	140	M 12	9.65	13.10
220	30	3 x 547.8	78.82	380	380	140	M 12	10.25	13.70
420	5	3 x 25.0	6.88	190	190	70	M 8	2.95	6.10
420	10	3 x 50.1	13.7	190	190	70	M 8	3.25	6.20
420	15	3 x 75.2	20.64	190	190	70	M 8	3.65	6.40
420	20	3 x 100.2	27.5	380	190	70	M 8	5.65	7.25
420	25	3 x 125.3	34.4	380	190	70	M 8	5.95	7.70
420	30	3 x 150.4	41.28	380	190	70	M 8	6.25	8.00
420	50	3 x 250.6	68.8	380	380	140	M 12	9.65	13.10
420	60	3 x 300.8	82.57	380	380	140	M 12	10.25	13.70
440	5	3 x 22.8	6.5	190	190	70	M 8	2.95	6.10
440	10	3 x 45.7	13.1	190	190	70	M 8	3.25	6.20
440	15	3 x 68.5	19.6	190	190	70	M 8	3.65	6.40
440	20	3 x 91.3	26	380	190	70	M 8	5.65	7.25
440	25	3 x 114.2	32.8	380	190	70	M 8	5.95	7.70
440	30	3 x 137.0	39.4	380	190	70	M 8	6.25	8.00
440	50	3 x 228.4	65.6	380	380	140	M 12	9.65	13.10
440	60	3 x 274.0	78.7	380	380	140	M 12	10.25	13.70
440	100	3 x 456.7	131.2	380	380	140	M 12	18.50	22.0
480	5	3 x 19.2	6	190	190	70	M 8	2.95	6.10
480	10	3 x 38.4	12	190	190	70	M 8	3.25	6.20
480	15	3 x 57.6	18	190	190	70	M 8	3.65	6.40
480	20	3 x 76.8	24.1	380	190	70	M 8	5.65	7.25
480	25	3 x 99	30.1	380	190	70	M 8	5.95	7.70
480	30	3 x 115.1	36.1	380	190	70	M 8	6.25	8.00
480	40	3 x 153.5	48.1	380	380	140	M 12	8.30	13.20
480	50	3 x 192	60.1	380	380	140	M 12	9.65	13.50
480	60	3 x 230.3	72.2	380	380	140	M 12	10.25	13.80
480	100	3 x 384	120.3	380	380	140	M 12	18.50	22.00

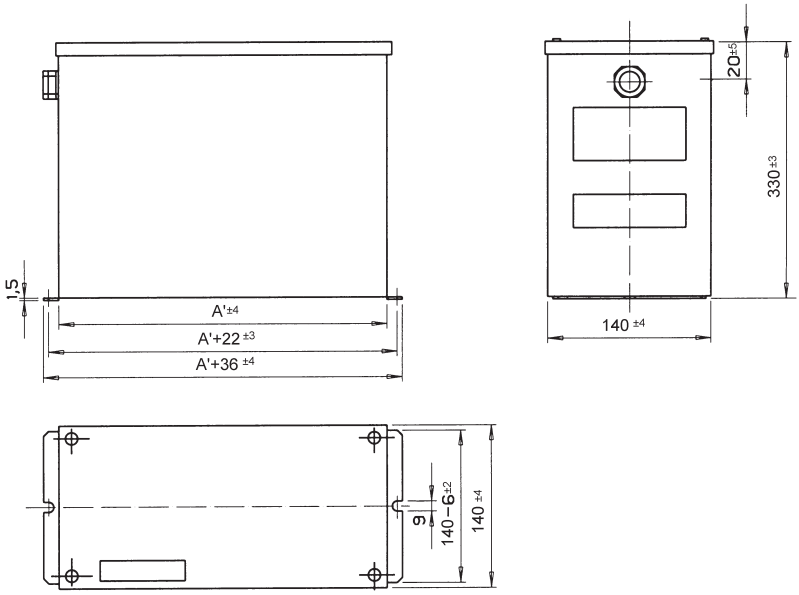
KNK9101, KNK9141 - PRISMATIC

230 … 525 V, 5 … 60 kvar

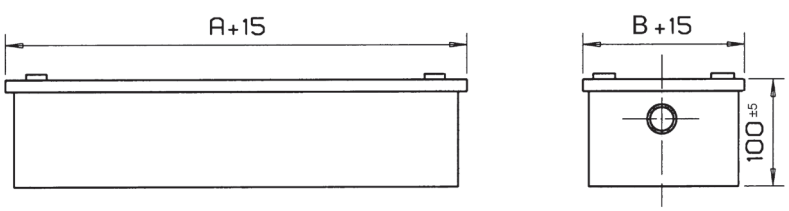
KNK9101



KNK9141



The cap for KNK9101 (type KNK9151)



KNK9101, KNK9141 - PRISMATIC

230 … 525 V, 5 … 60 kvar

f_n = 50 Hz

Resin filled

U_n (V)	Q_n (kvar)	C_n (µF)	I_n (A)	A (mm)	A' (mm)	B (mm)	D	Weight KNK9101 (kg)	Weight KNK9141 (kg)
230	5	300.9	21.7	190	190	70	M 8	3.60	6.40
230	7.5	450.6	32.6	380	190	70	M 8	5.30	7.25
230	10	602.1	43.4	380	190	70	M 8	5.60	7.70
230	12.5	752.1	54.3	380	190	70	M 8	5.90	8.00
230	15	903	65.2	380	380	140	M 12	8.25	12.10
230	20	1203.6	86.9	380	380	140	M 12	9.60	13.10
230	25	1504.4	108.6	380	380	140	M 12	10.20	13.70
400	5	99.5	12.5	190	190	70	M 8	2.90	5.90
400	7.5	149.1	18.7	190	190	70	M 8	3.00	6.00
400	10	198.8	25	190	190	70	M 8	3.20	6.10
400	12.5	248.5	31.2	190	190	70	M 8	3.25	6.20
400	15	298.2	37.5	190	190	70	M 8	3.60	6.40
400	20	397.6	50	380	190	70	M 8	5.60	7.25
400	25	497	62.5	380	190	70	M 8	5.90	7.70
400	30	596.4	75	380	190	70	M 8	6.25	8.00
400	40	795.2	100	380	380	140	M 12	8.25	12.10
400	50	994	125	380	380	140	M 12	9.60	13.10
440	5	82.2	11.4	190	190	70	M 8	2.90	5.30
440	7.5	123.3	17.1	190	190	70	M 8	3	6
440	10	164.4	22.7	190	190	70	M 8	3.20	6.10
440	12.5	205.5	28.4	190	190	70	M 8	3.25	6.20
440	15	246.6	34.1	190	190	70	M 8	3.60	6.40
440	20	328.8	45.5	380	190	70	M 8	5	6
440	25	411	56.8	380	190	70	M 8	5.90	7.70
440	30	493.2	68.2	380	190	70	M 8	6.25	8
440	40	657.7	90.9	380	380	140	M 12	8.25	12.10
440	50	822.1	113.6	380	380	140	M 12	9.60	13.10
440	60	986.5	136.4	380	380	140	M 12	10.20	13.70
480	5	69.1	10.4	190	190	70	M 8	2.90	5.30
480	7.5	103.6	15.6	190	190	70	M 8	3	6
480	10	138.1	20.8	190	190	70	M 8	3.20	6.10
480	12.5	172.7	26	190	190	70	M 8	3.25	6.20
480	15	207.2	31.2	190	190	70	M 8	3.60	6.40
480	20	276.3	41.6	380	190	70	M 8	5	6
480	25	345.4	52.1	380	190	70	M 8	5.90	7.70
480	30	414.5	62.5	380	190	140	M 8	6.25	8
480	40	552.6	83.3	380	190	140	M 12	8.25	12.10
480	50	690.8	104.1	380	190	140	M 12	9.60	13.10
480	60	830	125	380	380	140	M 12	10.20	13.70
525	5	57.7	9.5	190	190	70	M 8	2.90	5.30
525	7.5	86.6	14.3	190	190	70	M 8	3	6
525	10	115.5	19	190	190	70	M 8	3.20	6.10
525	12.5	144.4	23	190	190	70	M 8	3.25	6.20
525	15	173.2	28.6	190	190	70	M 8	3.60	6.40
525	20	231	38.1	190	190	70	M 8	5	6
525	25	288.7	47.6	190	190	70	M 8	5.90	7.70
525	30	346.5	57.5	380	190	70	M 8	6.25	8
525	40	462	72.2	380	190	70	M 12	8.25	12.10
525	50	577.4	95.2	380	380	140	M 12	9.60	13.10
525	60	692.9	114.3	380	380	140	M 12	10.20	13.70

High Voltage Power Capacitors

SINGLE PHASE CAPACITORS

General
Advanced technology of KLV capacitors is based on construction of all-film capacitor sections, folding foil edge design, improved electrical and mechanical connections between sections and impregnation with environmentally compatible insulating oil. KLV capacitors have very low dielectric losses and are designed for long service life.

KLV 3xxx
Internally fused capacitors. Each capacitor element has a separate internal fuse.

KLV1xxx
Capacitors without internal fuses

KLVxxx4
Single phase capacitors with two outputs (twin). Capacitors are supplied in sets of three to provide an economical unbalance detection scheme. This is particularly advantageous in low output capacitor banks.

Technical data

Rated power (max.)
600 kvar, 50 Hz
720 kvar, 60 Hz

Rated voltage
1,0 - 20 kV

Rated frequency
50 or 60 Hz

Losses
Total losses lower than 0,15 W/kvar
Dielectric losses 0,07 W/kvar

Dielectric
All-film (hazy polypropylene)

Impregnating fluid
Environmentally compatible impregnating oil based on M/DBT (NON - PCB)

THREE-PHASE CAPACITORS

Discharge resistor
Built in discharge resistor reduces the voltage on a de-energised capacitor from the crest of rated voltage to 75V in 10 minutes or less (discharge to 50V in 5 minutes on demand).

Permissible overloads

Maximum permissible current
1,3 x In continuously
Maximum permissible voltage
1,1 x Un continuously, 12h per day

Routine tests
Sealing test

Voltage test between terminals
2,15 x rated voltage AC, 10 s
or
4,3 x rated voltage DC, 10 s

AC voltage test between terminals and container
According to IEC 60871-1, Table 3, 10 s

Discharge resistor test

Measurement of losses (tan δ)

Service conditions

Temperature categories up to -40 /D

Upper temperature category limit	C	D
Maximum	50	55
Highest mean over 24 h	40	45
Highest mean over 1 year	30	35
Low temperature limit during oparation	-25°C or -40 °C	

Installation
Outdoor or indoor

Installation altitude (above sea level)
1000 m standard, up to 4000m on demand

SINGLE PHASE WITH TWO OUTPUTS - TWIN CAPACITORS

Case material:
Stainless steel plate 1,5 mm thick

Finish / Colour
Two-component durable painting RAL 7032 (light grey) on treated surfaces.

Fixing
Depending on the height of capacitor, container is equiped with one or two mounting brackets on the narower sides. Brackets have mounting slots 11 x 20 mm.

Terminals and connections

Bushings
Brown or gray porcelain bushings, welded to the container.

Thread of terminal stud
M14

Current
110A max.

Connections
Terminal clamps with provision to accommodate any combination of 2 conductors from 4 mm^2 solid to 50 mm^2 stranded wire are available on demand.
The capacitor unit grounding is provided by unpainted surface of mounting brackets.

Pressure switch with terminal cap
Supplied on demand.

Nameplate
Durable plastic label with permanent printing

Quality
Iskra MIS is certified according to ISO 9001(quality) and ISO 14001 (environment)

Standards
IEC 60871-1
ANSI / IEEE 18
NEMA CP 1

KLV 1xx1 (1xx0) AND 3xx1 (3xx0), SINGLE-PHASE CAPACITORS, TYPICAL DIMENSIONS

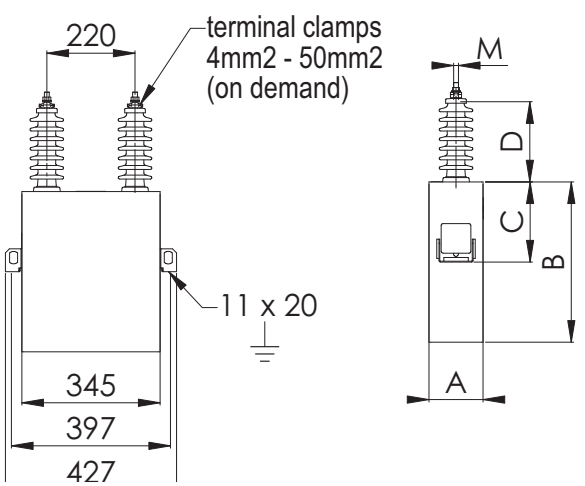
Q_n at 50 Hz	U_n KLV 1xxx (without internal fuses)			U_n KLV 3xxx (internally fused)			Dimensions (mm)						Weight	Weight*
											D			
(kvar)	(kV)			(kV)			A	B	B*	C	BIL 75 - 95 kV	BIL 125 kV	(kg)	(kg)
100	2,00	-	16,5 (20)	2,00	-	2,4	135	310	340	120^{2R}	240	315	26	28
150	2,00	-	16,5 (20)	2,00	-	4,8	135	400	430	200^{2R}	240	315	32	34
200	2,00	-	16,5 (20)	2,00	-	4,8	135	520	560	200^{2R}	240	315	39	42
250	2,27	-	16,5 (20)	2,27	-	7,2	135	640	680	200^{2R}	240	315	47	50
300	2,72	-	16,5 (20)	2,72	-	7,2	135	740	780	200^{2R}	240	315	53	56
350	3,18	-	16,5 (20)	3,18	-	9,6	135	840	920	200^{2R}	240	315	60	65
400	3,64	-	16,5 (20)	3,64	-	9,6	135	940	1000	200^{2R}	240	315	66	70
450	4,1	-	16,5 (20)	4,1	-	12	145	1000	1050	100^{4R}	240	315	75	78
500	4,56	-	16,5 (20)	4,56	-	14,4	175	920	1000	100^{4R}	240	315	82	89
550	5,00	-	16,5 (20)	5,00	-	14,4	190	960	1025	100^{4R}	240	315	93	98
600	5,46	-	16,5 (20)	5,46	-	14,4	190	960	1025	100^{4R}	240	315	93	98

Notes:

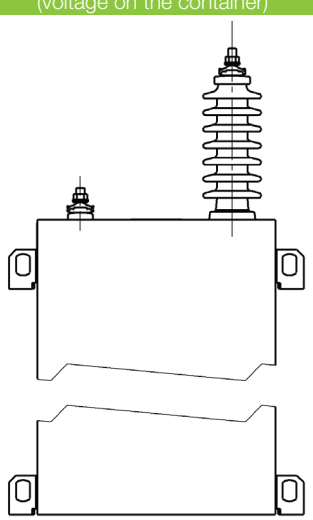
* Dimensions with an asterisk (*) refer to internally fused capacitors

1) Voltage in parenthesis ( ) refer to one-bushing capacitors only
2) For output and voltage outside this range, please contact factory
3) Case sizes are typical and actual sizes will be confirmed at the time of order
4) Capacitor container could have 2 or 4 brackets (1 or 2 brackets on narrower side)
   Dimension C - 2R means 1 bracket from each side (capacitor type KLVxx1x); 4R means 2 brackets on each side, one on the top and one on the bottom, except where the height is 310mm or below, where brackets are on the bottom only (type KLVxx2x).
5) Dim A may expand up to 115% due to thermal flexure
6) Power at 60Hz = 1,2 x power at 50Hz

Picture 1: Two - bushing capacitor KLVxxx1 (insulated container)



Picture 2: Single - bushing capacitor KLVxxx0 (voltage on the container)



KLV 1xx3 AND 3xx3, THREE-PHASE CAPACITORS, BIL 20/60 kV, TYPICAL DIMENSIONS (Picture 3)

U_n	Q_n	Dimensions (mm)					Weight	Weight*
	at 50 Hz	A	B	B*	D	E		
(kV)	(kvar)						(kg)	(kg)
3,3 - 7,2	50	145	180	200	250	240	16	20
	100	145	275	290	250	240	23	26
	150	145	370	400	250	240	30	33
	200	145	470	520	250	240	37	42
	250	145	570	620	250	240	44	49
	300	145	670	720	250	240	51	55
	350	145	770	825	250	240	60	63
	400	145	870	940	250	240	66	71
	450	145	970	1050	250	240	73	78

KLV 1xx3 AND 3xx3, THREE-PHASE CAPACITORS, BIL 28/75 kV, TYPICAL DIMENSIONS (Picture 4)

U_n	Q_n	Dimensions (mm)					Weight	Weight*
	at 50 Hz	A	B	B*	D	E		
(kV)	(kvar)						(kg)	(kg)
up to 12	50	145	180	200	300	510	22	23
	100	145	275	290	300	510	28	29
	150	145	370	400	300	510	35	37
	200	145	470	520	300	510	42	44
	250	145	570	620	300	510	49	51
	300	145	670	720	300	510	55	60
	350	145	770	825	300	510	63	66
	400	145	870	940	300	510	69	75
	450	145	970	1050	300	510	76	82

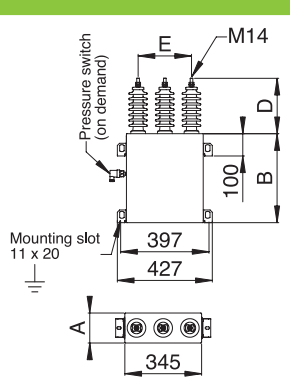
Notes:

* Dimensions with an asterisk (*) refer to internally fused capacitors

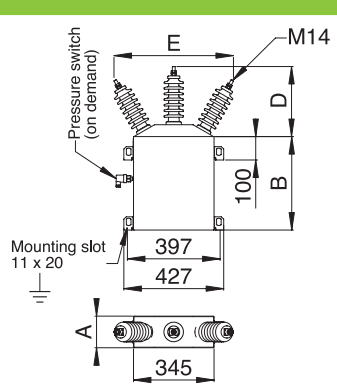
1) For output and voltage outside this range, please contact factory
2) Case sizes are typical and actual sizes will be confirmed at the time of order
3) Pressure switch on demand
4) Either 2 or 4 fixing brackets are used, depending on the height of the unit. Special bracket positions can be provided if required. Please specify at the enquiry stage.
5) Dim A may expand up to 115% due to thermal flexure
6) Power at 60Hz = 1,2 x power at 50Hz

THREE - PHASE CAPACITORS

Picture 3



Picture 4



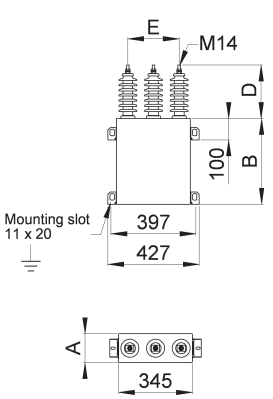
KLV 1xx4 AND 3xx4, SINGLE-PHASE CAPACITORS WITH TWO OUTPUTS (TWIN), BIL 20/60 kV, TYPICAL DIMENSIONS (Picture 5)

U_n	Q_n	Dimensions (mm)					Weight	Weight*
	at 50 Hz	A	B	B*	D	E		
(kV)	(kvar)						(kg)	(kg)
2,0 - 4,16	50 (2x25)	135	200	220	250	240	22	23
	100 (2x50)	135	310	340	250	240	28	29
	150 (2x75)	135	400	430	250	240	35	37
	200 (2x100)	135	520	560	250	240	42	44
	250 (2x125)	135	640	680	250	240	49	51
	300 (2x150)	135	740	780	250	240	51	55
	400 (2x200)	135	940	1000	250	240	66	71

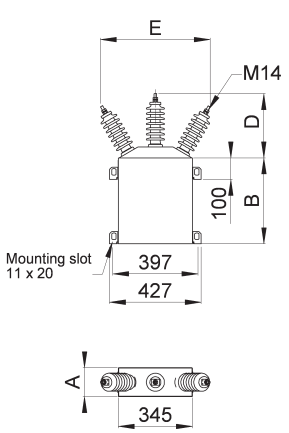
KLV 1xx4 AND 3xx4, SINGLE-PHASE CAPACITORS WITH TWO OUTPUTS (TWIN), BIL 28/75 kV, TYPICAL DIMENSIONS (Picture 6)

U_n	Q_n	Dimensions (mm)					Weight	Weight*
	at 50 Hz	A	B	B*	D	E		
(kV)	(kvar)						(kg)	(kg)
up to 6,93	50 (2x25)	135	200	220	300	510	22	23
	100 (2x50)	135	310	340	300	510	28	29
	150 (2x75)	135	400	430	300	510	35	37
	200 (2x100)	135	520	560	300	510	42	44
	250 (2x125)	135	640	680	300	510	49	51
	300 (2x150)	135	740	780	300	510	55	60
	400 (2x200)	135	940	1000	300	510	69	75

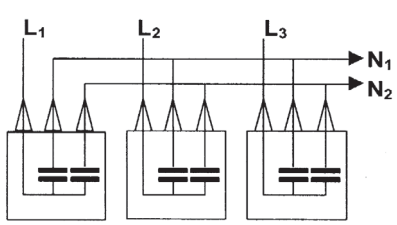
Picture 5



Picture 6



Connection



Notes:

* Dimensions with an asterisk (*) refer to internally fused capacitors

1) For output and voltage outside this range, please contact factory
2) Case sizes are typical and actual sizes will be confirmed at the time of order
3) Either 2 or 4 fixing brackets are used, depending on the height of the unit. Special bracket positions can be provided if required. Please specify at the enquiry stage.
4) Dim A may expand up to 115% due to thermal flexure
5) Power at 60Hz = 1,2 x power at 50Hz

KLS

Advanced technology of low loss KLS capacitor units is based on construction of ALL-FILM capacitor sections and impregnation with environmentally compatible insulating oil (NON-PCB).Applications

Applications

KLS capacitors are especially designed for inductive heat generating plants operating at frequencies between 50 and 10000 Hz. Manufactured by request, these capacitors are designed to comply with the specific requirements of each customer. Most of these capacitors provide for step changes in kvar by virtue of terminated sections within each unit. This allows for the tuning of the circuit for changing inductive loads.

Construction

KLS capacitors utilize a polypropylene film and aluminum foil construction with NON-PCB liquid impregnant. The impregnating fluid M/DBT and textured polypropylene film have exceptional dielectric properties over the entire operating temperature range of induction heating capacitors.

The extended foil design of capacitor elements makes nearly continuous connection to the foils, so capacitor overcurrent and cooling capabilities are increased.

KLS capacitors designed for operating at lower frequencies are air cooled. Medium frequency capacitors utilize internal tubes for cooling. Bushings and connection for cooling water are placed on capacitor case cover.

Safety Requirements

The standard capacitor does not have internal discharge devices - all capacitor units should be connected directly with a discharge device, this may be other electrical equipment connected directly across the capacitor (i.e. furnace coil). The discharge path must not have a disconnecting switch or fuses.

When the capacitors is switched off and re-energized at short intervals, arrangements should be made so that, at the time of re-application of the voltage, the capacitor terminal voltage shall not be more than 10% of the rated voltage of the capacitor.

Before working on a capacitor ensure that the capacitor bank is properly isolated, wait to ensure the capacitor is discharged and short circuit the capacitor terminals before handling.

Quality Assurances

All capacitors are subjected to the following routine tests:
Sealing test on container
short circuit discharge test 1.7 × rated voltage DC, one discharge, for internally fused capacitors
Capacitance measurements
Loss measurements at 50 Hz
Voltage test between terminals at 2.0 × rated voltage AC, 10 sec or 4.0 × rated voltage DC, 10 sec.
Voltage test terminals to container where applicable

Capacitors comply with IEC 60110-1 and VDE 0560 Part 9.

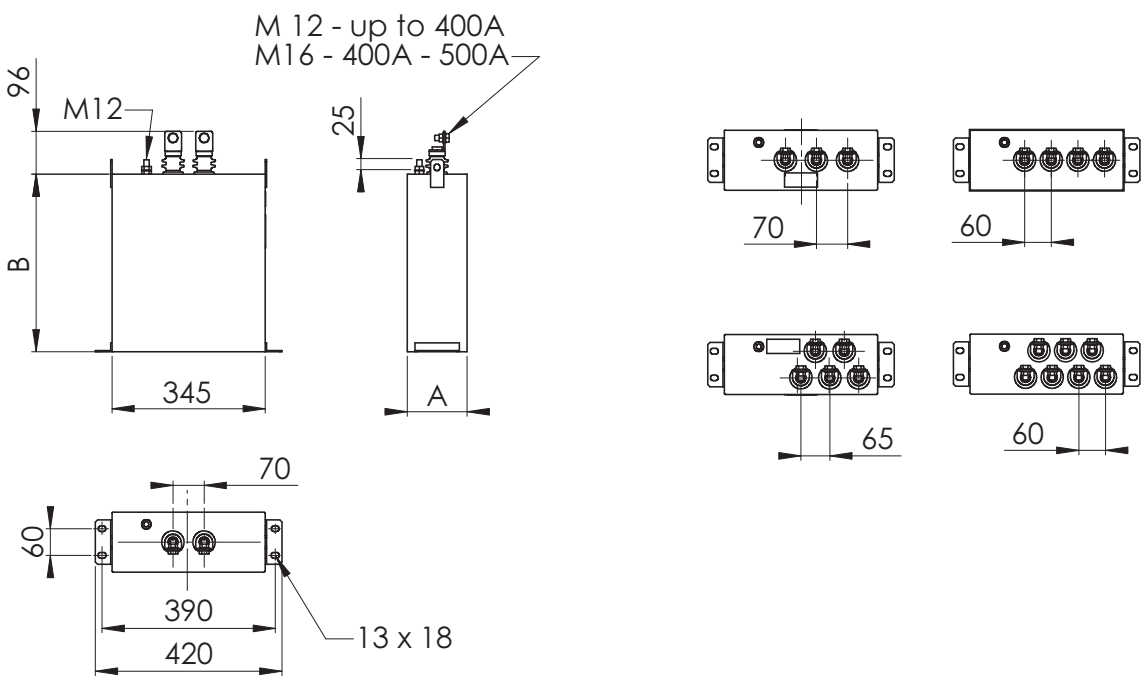
KLS x0xx, KLS x1xx , AIR-COOLED

50 / 60 Hz

TECHNICAL DATA			
Voltage range	U_n	V	500 - 3000
Output range	Q_n	kvar	up to 600
Rated frequency	f_n	Hz	50 / 60
Tolerance of capacity			-5% . . . +10% (narrower tolerances on request)
Losses (typical)		W/kvar	0.15 - 0.3
Temperature category (ambient temperature)		°C	-25 / +45% (air-cooled capacitors)
Impregnating fluid			Biodegradable NON-PCB dielectric oil based on M/DBT
Discharge resistors			On demand
Internal fuses			Built in, without fuses on demand
Temperature monitoring			Temperature sensors can be built-in upon request
Pressure monitoring			Pressure switches can be built-in upon request
Case material			Mild steel or stainless steel
Case finish			One layer of top coat on one layer of primer. Standard colour RAL 7032.
Dimensions			Dim A : 110 - 165 mm, dim B : up to 1000 mm Actual sizes will be confirmed at the time of order.

KLS x0xx, KLS x1xx - AIR COOLED CAPACITORS 50/60 Hz

Picture 1 - KLS x12x Air Cooled Capacitors 50/60 Hz



KLS x2xx, x3xx, x4xx , WATER COOLED

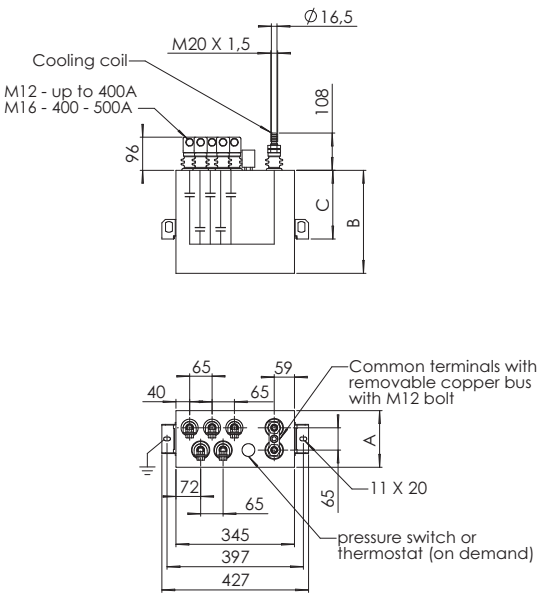
180 … 10000 Hz

TECHNICAL DATA			
Voltage range	U_n	V	100 - 3000
Output range (fn > 60 Hz)	Q_n	kvar	up to 3000
Rated frequency	f_n	Hz	150 … 10000
Tolerance of capacity			-10% . . . +10% (narrower tolerances on request)
Losses (typical)		W/kvar	0.2 - 0.7
Temperature category (ambient temperature)		°C	+1 / +45% (water cooled capacitors)
Outlet water temperature		°C	45 max
Max. pressure of incoming cooling water		bar	8
Cooling water flow		l/min	4.5 - 12.5
Impregnating fluid			Biodegradable NON-PCB dielectric oil based on M/DBT
Discharge resistors			NO
Internal fuses			NO
Temperature monitoring			Temperature sensors can be built-in upon request
Pressure monitoring			Pressure switches can be built-in upon request
Case material			Brass or aluminium containers for medium frequency capacitors
Case finish			One layer of top coat on one layer of primer. Standard colour RAL 7032.
Dimensions			Dim A : 110 - 165 mm, dim B : up to 1000 mm Actual sizes will be confirmed at the time of order.
Number of taps			up to 8

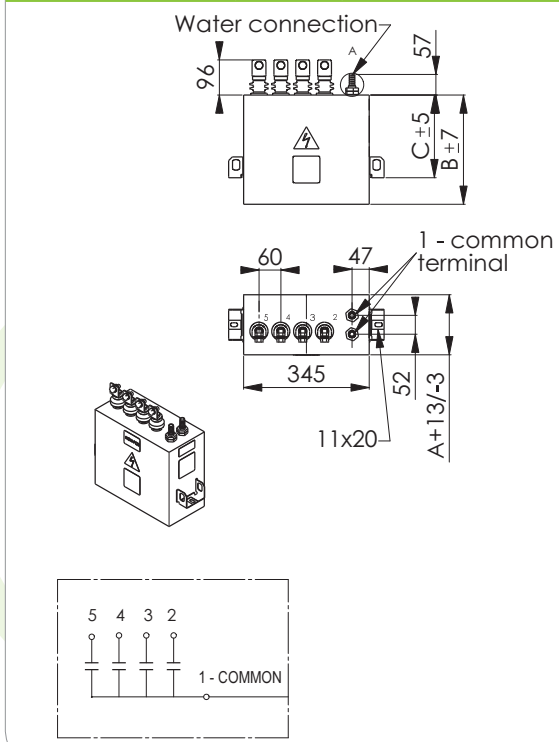
KLS x2xx, x3xx, x4xx, WATER COOLED

180 … 10000 Hz

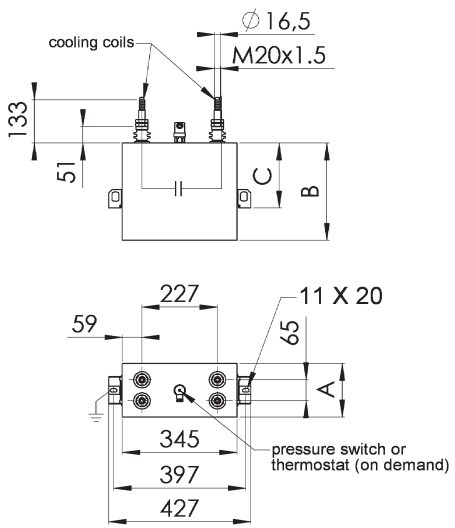
Picture 2 - KLS x3xx Single Cooling Coil Capacitor (Insulated Poles, "Dead"Case)



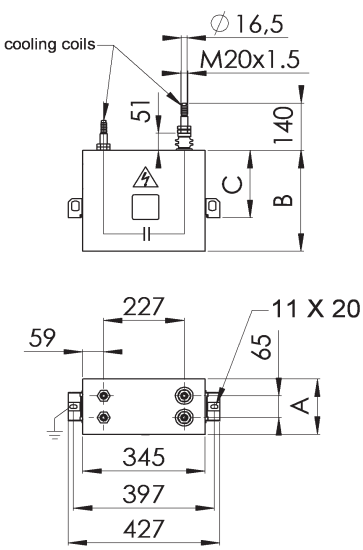
Picture 3 - KLS x2xx Single Cooling Coil Capacitor ("Live" Case)Hz



Picture 4 - KLS x400 Double Cooling Coils Capacitor - "dead"

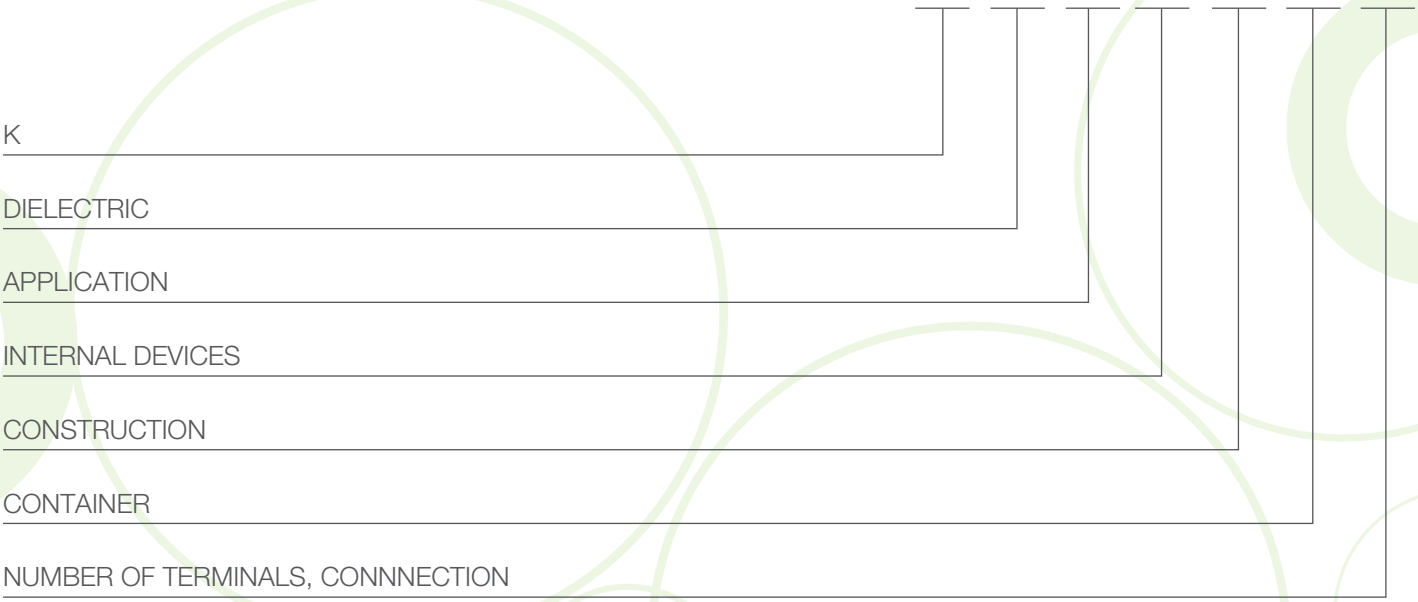


Picture 5 -KLS x200 Double Cooling Coils Capacitor - "live" case



KLS

Type designation data:



A1	K	capacitor
A2	L	dielectric polypropylene (all-film)
A3	S	induction heating capacitor
A4	1	discharge resistors built in
	2	without discharge resistors
	3	internal fuses and discharge resistors built in
	4	internal fuses built in
	5	discharge resistors and thermostat or pressure switch built-in
	6	thermostat or pressure switch built-in
	7	internal fuses, discharge resistors and thermostat or pressure switch built-in
	8	internal fuses, and thermostat or pressure switch built-in
A5	0	air cooled, common terminal on the case (Člive case«)
	1	air cooled, isolated terminals
	2	water cooled, common terminal on the case (Člive case«)
	3	water cooled, isolated terminals
	4	water cooled, two cooling coils, isolated terminals
A6	0	case side mounting
	2	case bottom mounting
A7	0	number of terminals

Ordering data:

When ordering, please state:

Rated output	kvar
Rated voltage	V
Rated frequency	Hz
Tolerance of capacitance	-...% / +...%
Cooling	air / water
Terminal connection	one terminal connected to the case (“live”) / isolated (“dead”)
Number of bushings	
Internal fuses	Yes/No
Discharge resistors	Yes/No
Thermostat	Yes/No
Pressure switch	Yes/No
Special conditions	
Standards and regulations	

Capacitor Duty Contactors

KC12, KC16, KC20, KC25, KC33, KC40, KC60

USE

Switching of capacitors in systems for compensation of reactive energy (classic automation devices).

Features:

- Conforms to utilization category AC-6b
- Saves costs of expensive replacement
- Long electrical life
- Reduces watt losses during “ON” condition, saves energy
- High safety
- No risk of dangerous voltage
- Switching of capacitor bank in parallel without de-rating
- Less maintenance and downtime
- Approvals: CSA

TECHNICAL DATA

Type	Rating at 50/60 Hz (kvar)	Current carrying capacity							Power dissipation per pole	Mechanical life		Electrical life
	≤ 55°C *	220 - 240 V		400 440 V		kvar / current rating as per UL (kvar/A)				50 or 60 Hz	50 / 60 Hz	
		kvar	Current at 230 V (A)	kvar	Current at 400 V (A)	240 V	480 V	600 V	W	million		operations
KC12	12.5	6.7	17.6	12.5	18.1	6 / 15	12.5 / 15	15 / 15	0.36	17	15	200.000
KC16	16.7	8.5	22.3	16.7	24.1	8 / 20	16.7 / 20	20 / 20	0.8	20	15	200.000
KC20	20	10	26.2	20	28.9	10 / 24	20 / 24	25 / 24	1.25	16	12	100.000
KC25	25	15	39.4	25	36.1	12.5 / 30	25 / 30	33.3 / 30	2	16	12	100.000
KC33	33.3	20	52.5	33.3	48.1	16.5 / 40	33.3 / 40	40 / 40	4.2	16	6	100.000
KC40	40	25	65.6	40	57.7	20 / 48	40 / 48	50 / 48	4.2	16	6	100.000
KC60	50	40	104.9	60	86.6	30 / 72	60 / 72	80 / 77	5.1	10	4	100.000

Note:
KC12 to KC25; clip-on mounting on 35 mm wide rail
KC33 to KC60; clip-on mounting on 75 mm wide rail

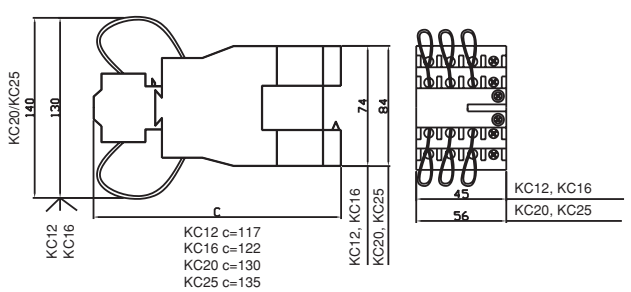
* Average ambient temperature should not exceed 45 °C within the 24-hour period in acc. with IEC 60 070 and IEC 60 831

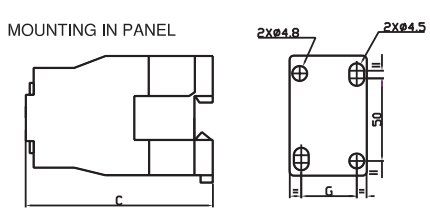
KC12, KC16, KC20, KC25, KC33, KC40, KC60

TECHNICAL DATA												
Type	Rating at 50/60 Hz (kvar)	Upper block		Wire details						Coil consumption		
	≤ 55°C	Time lag between make contacts of Aux. block and contactor	Holding time of main contacts of Aux. block	Cross-sectional area	Lenght	Material	Lugs - at contactor end	Lugs at Aux. block end	Tightening torque	50 Hz	60 Hz	50 / 60 Hz
		ms	ms	mm^2	mm				Nmm^2	VA	VA	VA
KC12	12.5	2 - 10	5 - 12	0.292	174	PTFE coated Resis-tance wire	Ring type lug	Pin type lug	1.2	7	7.5	8
KC16	16.7	2 - 10	5 - 12	0.292	174				1.7	7	7.5	8
KC20	20	2 - 10	5 - 12	0.292	174				1.85	7.5	7.5	8.5
KC25	25	2 - 10	5 - 12	0.292	174				2.5	7.5	7.5	8.5
KC33	33.3	2 - 10	5 - 12	0.196	245				5	20	22	26
KC40	40	2 - 10	5 - 12	0.196	245				5	20	22	26
KC60	50	2 - 10	5 - 12	0.196	245				5	20	22	26

Dimension:

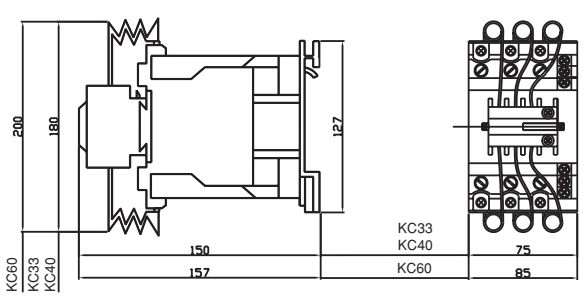
KC12, KC16, KC20, KC25

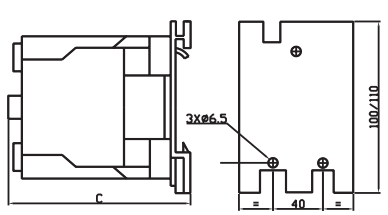




	KC12	KC16	KC20	KC25
C	80	85	93	98
G	35	35	40	40

KC33, KC40, KC60





	KC33	KC40	KC60
C	114	114	125

Ordering data:

The type designation and control voltage are stated when ordering the contactors.

KC - 11 -230 -50/60

- -50/60 — Frequency
- -230 — Control voltage
- - 11 — Version of contacts
- KC — Type

PFCmax 6 & PFCmax 12

USE

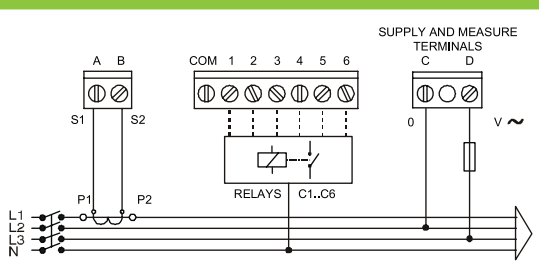
Power factor regulators PFCmax6 (6 steps) and PFCmax12 (12 steps) measure cos φ of a supply system and control the automatic connection and disconnection of compensation capacitors according to desired cos φ.

Features:

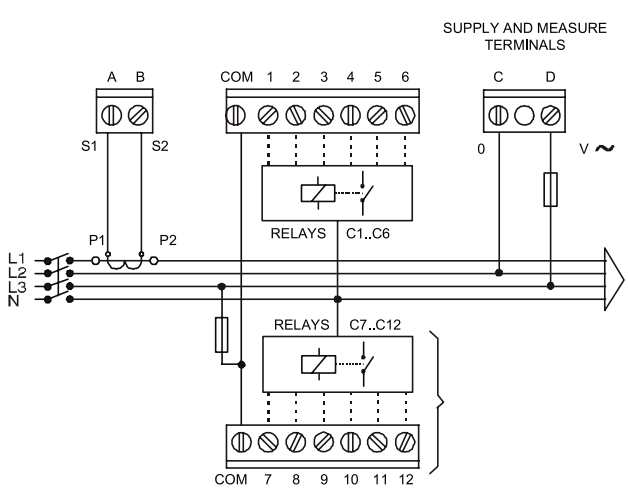
- FCP (Fast Computerized Program) System minimizing the number of capacitor connections and disconnections
- 6 and 12 relay regulators according to the type
- Connected step display, a digital display for cos φ and differentiation of a sign for reactive power L (inductive) and C (capacitive)
- Three-digit LCD with seven segments
- Setting of parameters without the need for disconnecting the regulator power supply
- Option to configure the regulator even when it is still in the process of regulating the capacitors
- Option for using 50 or 60 Hz frequencies
- All measurements displayed on one single display
- Easy to mount with no need for tools
- Programming from keypad on the front: (3 keys)
- Size 144 x 144 mm according to DIN 43 700
- Measurement and power supply in one single input

Connection Diagrams:

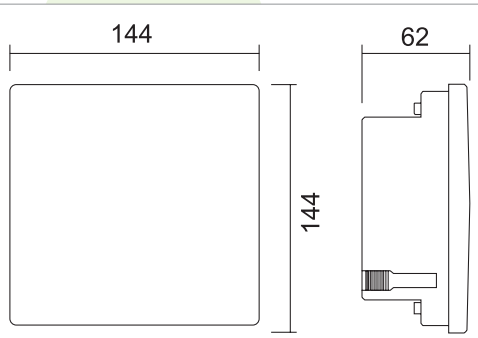
PFC MAX6



PFC MAX9



Dimension:



Power Factor Control Relay

PFC-CX

USE

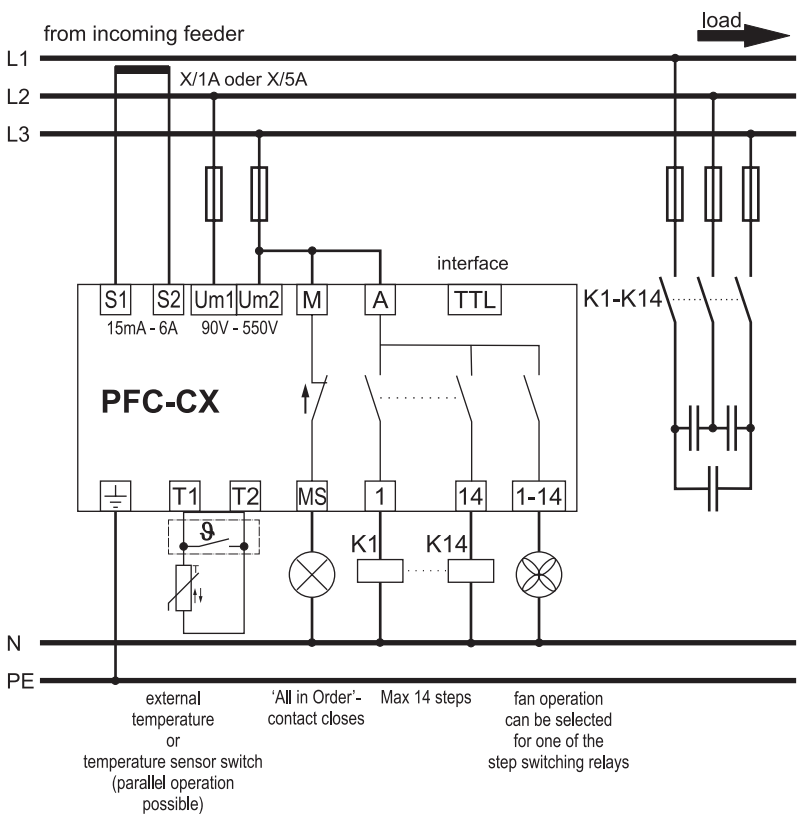
Power factor control relay PFC-CX measure cos φ of a supply system and control the automatic connection and disconnection of compensation capacitors according to desired cos φ. Microprocessor controlled power factor controller with 1-phase measurement system.

Features:

- Start menu for easy commissioning
- Automatic detection and correction of the phase of current and voltage connection
- Fully-automatic c/k-value setting, self adapting, connection of different capacitor step sizes possible
- Automatic detection and usage of the optimum capacitor step
- Switching programs: Best Fit, LIFO, manual mode, combifilter, progressive
- Capable for 4-quadrant operation
- 1-phase measurement system also suitable for non-sinusodial currents and voltages
- Supply voltage taken from measuring voltage
- Voltage measuring 90 - 550 V, 45 - 65 Hz
- Current measuring 15 mA - 5 A, suitable for CT x/1 A und x/5 A
- Connection with plugable screw terminals
- LCD with backlit
- Display of all important grid and system parameters
- Display of THD U and voltage harmonics from 3rd to 15th order
- Input for temperature sensor or thermostate (n/o)
  (this input can be used to switch-over the tarif by n/o contact)
- Alarm relay with voltfree n/o contact (operated at normal function)
- TTL-interface on rear
- Instrument casing for cutout 144 x 144 mm, depth 49 mm
- Protection class IP20 (casing), IP50 (front)

PFC-CX

Connection Diagrams:



Dimension: