Iskra®

POWER FACTOR CORRECTION EQUIPMENT

MADE IN SLOVENIA EUROPE

ENERGY SECTOR

BRACE YOUR POWER.

IMPROVE YOUR ENERGY USE.

Authorized Distributor

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PFC Capacitors for low voltage
Type KNK

APPLICATIONS

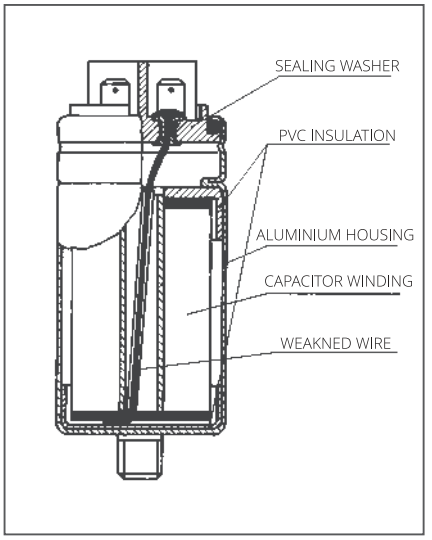
KNK คาปาซิเตอร์ เหมาะสำหรับการใช้งานปรับปรุงค่า Power factor ซึ่งอาจใช้ติดตั้งแบบอิสระ หรือผ่านการควบคุมอุปกรณ์ควบคุมค่า PF อัตโนมัติ (PF controller relay)

DESIGN

Iskra คาปาซิเตอร์ ใช้วัสดุ Lowloss Metalized Polypropylene ที่มีการทำ Metalization ชนิดพิเศษทำให้มีคุณลักษณะ ซ่อมแซมตัวเองได้ และยังลดค่า Dielectric Losses ด้วย นอกจากนี้ยังมีการเคลือบ Zinc เพื่อเพิ่มความต่อเนื่องทางไฟฟ้า หลังจากนั้นจึงบรรจุลงแบบปิดสนิท (Hermetically Sealed) ลงในกระบอกอลูมิเนียม

DISCHARGE RESISTOR

คาปาซิเตอร์ ควรที่จะถูกดิสชาร์ตลงให้เหลือแรงดันน้อยกว่าหรือเท่ากับ 10% ก่อนที่จะถูกใช้งานอีกครั้ง KNK คาปาซิเตอร์ได้ติดตั้งความต้านทานที่สามารถลดแรงดันลงเหลือ 75V ภายใน 3 นาที

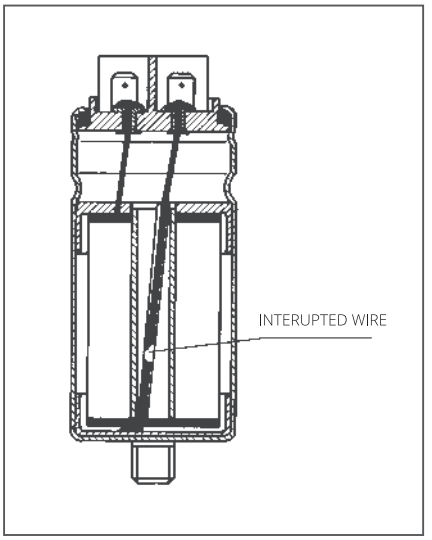


OVER-PRESSURE DISCONNECTOR

คาปาซิเตอร์ ทุกตัวถูกติดตั้งอุปกรณ์ตัดการทำงานด้วยความดันเกินในกระบอก ซึ่งจะทำให้มั่นใจถึงความปลอดภัยตลอดอายุการใช้งาน

INSTALLATION

โดยทั่วไปจะต้องติดตั้งตัวเก็บประจุภายในอาคาร สำหรับรุ่น KNK105X, KNK305X, KNK405X สามารถติดตั้งได้ทั้งแนวตั้งและแนวนอน แต่สำหรับรุ่น KNK50XX KNK905X ต้องติดตั้งในแนวตั้งเท่านั้น ในลักษณะให้ขั้วตั้งตรงขึ้น และขณะติดตั้งต้องตรวจสอบให้แน่ใจว่าควรมีระยะห่างสำหรับการวางคาปาซิเตอร์อย่างน้อย 20 มม. และระยะห่างด้านบนอย่างน้อย 25 มม. โดยพื้นที่ด้านบนมีไว้สำหรับการขยายตัวสำหรับเคสอะลูมิเนียม (ในกรณีที่คาปาซิเตอร์ทำงานผิดปกติ) ส่งผลให้มีการตัดการเชื่อมต่อแรงดันเกิน ที่ด้านล่างของเคสตัวเก็บประจุแต่ละตัวมีสกรูตัวผู้ M12 ซึ่งมีไว้สำหรับยึดตัวอุปกรณ์ลงบนโครงตู้ที่เชื่อมต่อลงดิน สามารถขันสกรูที่แรงบิดได้ไม่เกิน 10 Nm.



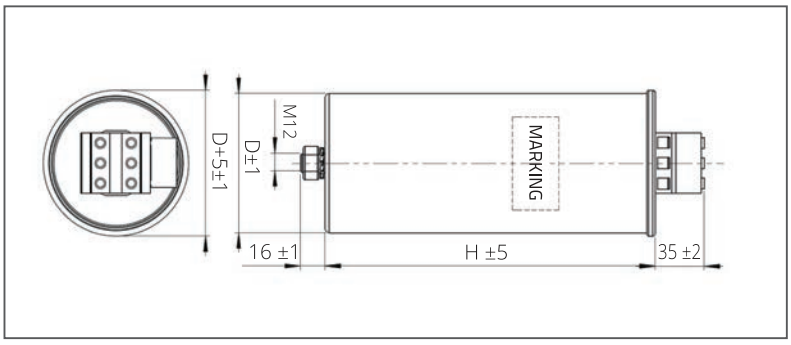
PFC Capacitors for low voltage (Three-phase)
KNK3053, KNK4053-Cylindrical Aluminium Housing

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 40	
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 X U_n (8 h/DAY)	
			1.15 X U_n (30 min/DAY)	
			1.2 X U_n (5 min - 200 TIMES PER LIFE TIME)	
			1.3 X U_n (1 min - 200 TIMES PER LIFE TIME)	
MAX. OVERCURRENT			1.5 x I_n (NORMAL DUTY) OR 2 x I_n (HEAVY DUTY) (INCLUDING COMBINED EFFECTS OF OVERVOLTAGES, HARMONICS AND CAPACITANCE TOLERANCE)	
INRUSH CURRENT			200 x I_n	
EXPECTED LIFE TIME			> 120000 h (NORMAL DUTY)	
			> 150000 h (HEAVY DUTY)	
DISCHARGE RESISTOR			TO 75 V ≤ 3 min	
ALTITUDE			UP TO 4000 m	
INSULATION LEVEL		kV	4/-	
ROUTINE TESTS				
TERMINAL TO TERMINAL			2.15 x 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. CURRENT			2 x 25 mm^2 / 35 mm / 3 Nm / 60 A for D >_90 mm	
			2 x 16 mm^2 / 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 DISCONNECTOR (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	

PFC Capacitors for low voltage (Three-phase)
KNK3053, KNK4053-Cylindrical Aluminium Housing

220 ... 800 V, 5 ... 40 kVar



f_n = 50 Hz - NORMAL DUTY

C_n (µF)	Q_n (kVar)	I_n (A)	Q_n (kVar)	I_n (A)	Q_n (kVar)	I_n (A)	D (mm)	H (mm)	Weight (kg)		Packing unit (pcs)
	U_n = 400 V		U_n = 380 V						KNK3053	KNK4053	
3 x 33.2	5	7.2	4.5	6.8			75	165	0.9	0.8	16
3 x 49.7	7.5	10.8	6.7	10.2			75	210	1.1	1.0	16
3 x 66.3	10	14.4	9	13.7			75	210	1.1	1.0	16
3 x 82.9	12.5	18	11.3	17.2			75	245	1.4	1.2	16
3 x 99.5	15	21.7	13.5	20.5			90	210	1.5	1.3	16
3 x 132.5	20	28.9	18	27.3			90	245	1.8	1.5	16
3 x 165.8	25	36.1	22.5	34.2			90	285	2.1	1.8	16
3 x 198.9	30	43.1	27	41			116	245	3.0	2.6	9
3 x 265.3	40	57.7	36.1	54.8			116	285	3.6	3.2	9
3 x 331.6	50	72.2	45.1	68.6			136	245	4	3.6	2
	U_n = 440 V		U_n = 400 V		U_n = 380 V				KNK3053	KNK4053	
3 x 27.4	5	6.6	4.1	5.9	3.7	5.6	75	165	0.9	0.8	16
3 x 41.1	7.5	9.8	6.2	8.9	5.6	8.5	75	210	1.1	1.0	16
3 x 54.8	10	13.1	8.3	12	7.4	11.2	75	245	1.4	1.2	16
3 x 68.5	12.5	16.4	10.4	15	9.3	14.1	90	210	1.5	1.3	16
3 x 82.2	15	19.7	12.4	17.9	11.2	17	90	245	1.8	1.5	16
3 x 109.6	20	26.2	16.6	24	15	22.8	90	285	2.1	1.8	16
3 x 137	25	32.8	20.7	29.9	18.6	28.3	116	210	2.5	2.2	9
3 x 164.4	30	39.4	24.8	35.8	22.4	34	116	245	3.0	2.6	9
3 x 219.2	40	52.5	33.1	47.6	29.8	45.3	116	285	3.6	3.2	9
3 x 274	50	65.5	41.3	59.6	37.3	56.7	136	245	4	3.6	2
	U_n = 480 V		U_n = 440 V		U_n = 400 V				KNK3053	KNK4053	
3 x 23	5	6	4.2	5.5	3.5	5.1	75	165	0.9	0.8	16
3 x 34.5	7.5	9	6.3	8.3	5.2	7.5	75	210	1.1	1.0	16
3 x 46.1	10	12	8.4	11	7	10.1	75	210	1.1	1.0	16
3 x 57.6	12.5	15	10.5	13.8	8.6	12.4	75	245	1.4	1.2	16
3 x 69.1	15	18	12.7	16.7	10.5	15.2	90	210	1.5	1.3	16
3 x 92.1	20	24.1	16.9	22.2	13.9	20.1	90	245	1.8	1.5	16
3 x 115.1	25	30.1	21	27.6	17.4	25.1	90	285	2.1	1.8	16
3 x 138.2	30	36.1	25.2	33.1	20.8	30	116	210	2.5	2.2	9
3 x 184.2	40	48.1	33.5	44	27.7	40.1	116	285	3.6	3.2	9
3 x 230.3	50	60.1	42	55.1	34.7	50.1	136	245	4	3.6	2
	U_n = 525 V		U_n = 480 V		U_n = 440 V				KNK3053	KNK4053	
3 x 19.3	5	5.5	4.4	5.1	3.5	4.6	75	165	0.9	0.8	16
3 x 28.9	7.5	8.2	6.2	7.5	5.3	7	75	210	1.1	1.0	16
3 x 38.5	10	11	8.4	10	7	9.2	75	245	1.4	1.2	16
3 x 48.1	12.5	13.7	10.5	12.6	8.8	11.5	75	245	1.4	1.2	16
3 x 57.7	15	16.5	12.5	15	10.5	13.8	90	210	1.5	1.3	16
3 x 77	20	22	16.7	20.1	14	18.4	90	285	2.1	1.8	16
3 x 96.2	25	27.5	20.9	25.1	17.6	23.1	116	210	2.5	2.2	9
3 x 115.5	30	33	25	30.1	21.1	27.7	116	245	3.0	2.6	9
3 x 154	40	44	33.4	40.2	28.1	36.9	116	285	3.6	3.2	9
3 x 192.5	50	55	41.8	50.3	35.1	46.1	136	245	4	3.6	2

PFC Capacitors for low voltage (Three-phase)
KNK3053, KNK4053-Cylindrical Aluminium Housing

f_n = 50 Hz - HEAVY DUTY

C_n (µF)	Q_n (kVar)	I_n (A)	Q_n (kVar)	I_n (A)	Q_n (kVar)	I_n (A)	D (mm)	H (mm)	Weight (kg)		Packing unit (pcs)
	U_n = 400 V		U_n = 380 V						KNK3053	KNK4053	
3 x 33.2	5	7.2	4.5	6.8			75	165	0.9	0.8	16
3 x 49.7	7.5	10.8	6.7	10.2			75	210	1.1	1.0	16
3 x 66.3	10	14.4	9	13.7			90	210	1.5	1.3	16
3 x 82.9	12.5	18	11.3	17.2			90	245	1.8	1.5	16
3 x 99.5	15	21.7	13.5	20.5			90	245	1.8	1.5	16
3 x 132.5	20	28.9	18	27.3			116	210	2.5	2.2	9
3 x 165.8	25	36.1	22.5	34.2			116	245	3.0	2.6	9
3 x 198.9	30	43.1	27	41			116	285	3.6	3.2	9
3 x 265.3	40	57.7	36.1	54.8			136	285	4.6	4.1	9
3 x 331.6	50	72.2	45.1	68.6			136	310	5	4.5	1
	U_n = 440 V		U_n = 400 V		U_n = 380 V				KNK3053	KNK4053	
3 x 27.4	5	6.6	4.1	5.9	3.7	5.6	75	210	1.1	1.0	16
3 x 41.1	7.5	9.8	6.2	8.9	5.6	8.5	75	245	1.4	1.2	16
3 x 54.8	10	13.1	8.3	12	7.4	11.2	90	210	1.5	1.3	16
3 x 68.5	12.5	16.4	10.4	15	9.3	14.1	90	245	1.8	1.5	16
3 x 82.2	15	19.7	12.4	17.9	11.2	17	90	285	2.1	1.8	16
3 x 109.6	20	26.2	16.6	24	15	22.8	116	245	3.0	2.6	9
3 x 137	25	32.8	20.7	29.9	18.6	28.3	116	245	3.0	2.6	9
3 x 164.4	30	39.4	24.8	35.8	22.4	34	116	285	3.6	3.2	9
3 x 219.2	40	52.5	33.1	47.6	29.8	45.3	136	285	4.6	4.1	1
3 x 274	50	65.6	41.3	59.6	37.3	56.7	136	310	5	4.5	1
	U_n = 480 V		U_n = 440 V		U_n = 400 V				KNK3053	KNK4053	
3 x 23	5	6	4.2	5.5	3.5	5.1	75	165	0.9	0.8	16
3 x 34.5	7.5	9	6.3	8.3	5.2	7.5	75	210	1.1	1.0	16
3 x 46.1	10	12	8.4	11	7	10.1	75	245	1.4	1.2	16
3 x 57.6	12.5	15	10.5	13.8	8.6	12.4	90	210	1.5	1.3	16
3 x 69.1	15	18	12.7	16.7	10.5	15.2	90	245	1.8	1.5	16
3 x 92.1	20	24.1	16.9	22.2	13.9	20.1	90	285	2.1	1.8	16
3 x 115.1	25	30.1	21	27.6	17.4	25.1	116	245	3.0	2.6	9
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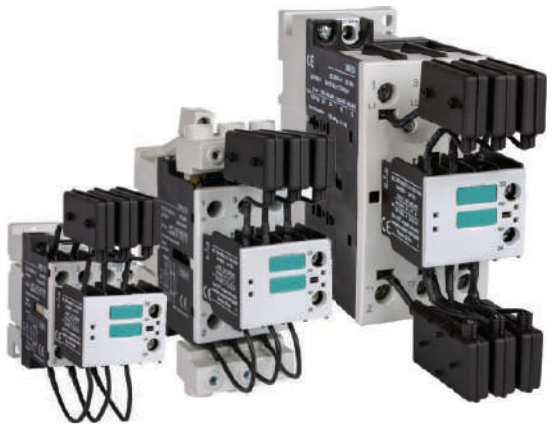
3 x 184.2	40	48.1	33.5	44	27.7	40.1	136	245	4.0	3.6	1
3 x 331.6	50	60.1	42	55.1	34.7	50.1	136	285	4.6	4.1	2
	U_n = 525 V		U_n = 480 V		U_n = 440 V				KNK3053	KNK4053	
3 x 19.3	5	5.5	4.4	5.1	3.5	4.6	75	165	0.9	0.8	16
3 x 28.9	7.5	8.2	6.2	7.5	5.3	7	75	210	1.2	1.1	16
3 x 38.5	10	11	8.4	10	7	9.2	90	210	1.5	1.3	16
3 x 48.1	12.5	13.7	10.5	12.6	8.8	11.5	90	245	1.8	1.5	16
3 x 57.7	15	16.5	12.5	15	10.5	13.8	90	245	2.1	1.8	16
3 x 77	20	22	16.7	20.1	14	18.4	116	210	2.5	2.2	9
3 x 96.2	25	27.5	20.9	25.1	17.6	23.1	116	245	3.0	2.6	9
3 x 115.5	30	33	25	30.1	21.1	27.7	116	285	3.6	3.2	9
3 x 154	40	44	33.4	40.2	28.1	36.9	136	245	4.6	4.1	1
3 x 192.5	50	55	41.8	50.3	35.1	46.1	136	285	4.6	4.1	2

Capacitor Duty Contactors

KCK20, KCK25, KCK25E, KCK33, KCK40, KCK50, KCK60



SWITCHING OF CAPACITORS IN SYSTEMS FOR COMPENSATION OF REACTIVE ENERGY (CLASSIC AUTOMATION DEVICES).

FEATURES

- **IN CONFORMITY WITH** IEC 60947-1, IEC 60947-4-1
- **SWITCHING OF** 3 PHASE CAPACITORS
  STANDARD CONTROL VOLTAGE
- 24 V AC, 48 V AC, 110 V AC, 230 V AC 400 V AC
- **MAXIMUM PERMISSIBLE PEAK CURRENT** I < 200 I_e
  FOR CONTACTORS WITHOUT RESISTORS
- **MAXIMUM PERMISSIBLE PEAK CURRENT** I < 100 I_e
- **AMBIENT TEMPERATURE** OF 55 °C
- **UP TO 2 EXTENDED AUXILIARY CONTACTS** (0NO + 1NC or 1NO + 1NC)
  INSTALLATION ON DIN RAIL AND MOUNTING PLATE

TECHNICAL DATA

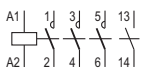
	RATING AT 50/60 Hz	CURRENT CARRYING CAPACITY				RATED CURRENT	INSULATION RATING	AMBIENT TEMPERATURE	RATED IMPULSE WITHSTAND	ELECTRICAL ENDURANCE (min.)	FREQUENCY OF SWITCHING OPERATIONS
		230 V	400 - 440 V	500 - 550 V	660 - 690 V	400 V					
KCK 20	20 kVar	11 kVar	20 kVar	24 kVar	30 kVar	29 A	690 A	-25 to +55 °C	8 kV	175.000	120 s/h
KCK 25E *	25 kVar	14 kVar	25 kVar	30 kVar	35 kVar	36 A	690 A	-25 to +55 °C	8 kV	125.000	120 s/h
KCK 25	25 kVar	14 kVar	25 kVar	30 kVar	35 kVar	36 A	690 A	-25 to +55 °C	8 kV	125.000	120 s/h
KCK 33	33 kVar	20 kVar	33 kVar	35 kVar	40 kVar	44 A	690 A	-25 to +55 °C	8 kV	125.000	120 s/h
KCK 40	40 kVar	25 kVar	40 kVar	50 kVar	58 kVar	58 A	1000 A	-25 to +55 °C	8 kV	125.000	100 s/h
KCK 50	50 kVar	29 kVar	50 kVar	60 kVar	70 kVar	72 A	1000 A	-25 to +55 °C	8 kV	125.000	100 s/h
KCK 60	60 kVar	32 kVar	60 kVar	70 kVar	80 kVar	87 A	1000 A	-25 to +55 °C	8 kV	125.000	100 s/h

* INTEGRATED AUXILIARY CONTACT 1NO OR 1NC; WITHOUT TERMINAL BLOCKS

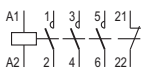
	SIZE OF CONNECTING CONDUCTORS (MAIN CIRCUIT - MULTI-WIRE CONNECTION)	TERMINAL SCREW (MAIN CIRCUIT)	SCREW HEAD (MAIN CIRCUIT)	TIGHTENING TORQUE (MAIN CIRCUIT)	SIZE OF CONNECTING CONDUCTORS (AUXILIARY CIRCUIT-MULTI-WIRE CONNECTION)	SIZE OF CONNECTING CONDUCTORS (AUXILIARY CIRCUIT-WITH CABLE SCREW)	TERMINAL SCREW (AUXILIARY CIRCUIT)	SCREW HEAD (AUXILIARY CIRCUIT)	TIGHTENING TORQUE (AUXILIARY CIRCUIT)	COIL (VOLTAGE TOLERANCE)	DEGREE OF PROTECTION
KCK 20	2.5 - 10 mm^2	M4	PZ2	1.4 Nm	1 - 2.5 mm^2	0.75 - 1.5 mm^2	M3.5	PZ2	0.8 Nm	0.85-1.1xU_n	IP20
KCK 25E *	2.5 - 10 mm^2	M4	PZ2	1.6 Nm							
KCK 25	6 - 25 mm^2	M5	Hexagon socket 2.5	2 Nm							
KCK 33	6 - 25 mm^2	M5		2 Nm							
KCK 40	16 - 35 mm^2	M6	PZ2	3 - 4 Nm							
KCK 50	16 - 35 mm^2	M6	PZ2	3 - 4 Nm							
KCK 60	16 - 35 mm^2	M6	PZ2	3 - 4 Nm							

WIRING DIAGRAM

TYPE:
KCK 20 **10** 230V 50/60 Hz
KCK 25E **10** 230V 50/60 Hz
KCK 33 **10** 230V 50/60 Hz
KCK 40 **10** 230V 50/60 Hz
KCK 50 **10** 230V 50/60 Hz
KCK 60 **10** 230V 50/60 Hz



TYPE:
KCK 20 **01** 230V 50/60 Hz
KCK 25E **01** 230V 50/60 Hz
KCK 33 **01** 230V 50/60 Hz
KCK 40 **01** 230V 50/60 Hz
KCK 50 **01** 230V 50/60 Hz
KCK 60 **01** 230V 50/60 Hz



WEIGHT

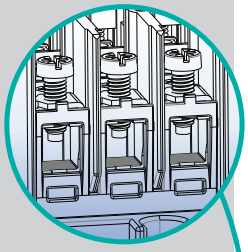
TYPE:

KCK 20 ..... 333 g
KCK 25E ..... 450 g
KCK 25 ..... 520 g
KCK 33 ..... 520 g
KCK 40 ..... 940 g
KCK 50 ..... 940 g
KCK 60 ..... 970 g

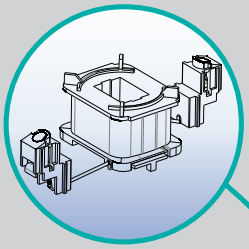
Capacitor Duty Contactors

KCK20, KCK25, KCK25E, KCK33, KCK40, KCK50, KCK60

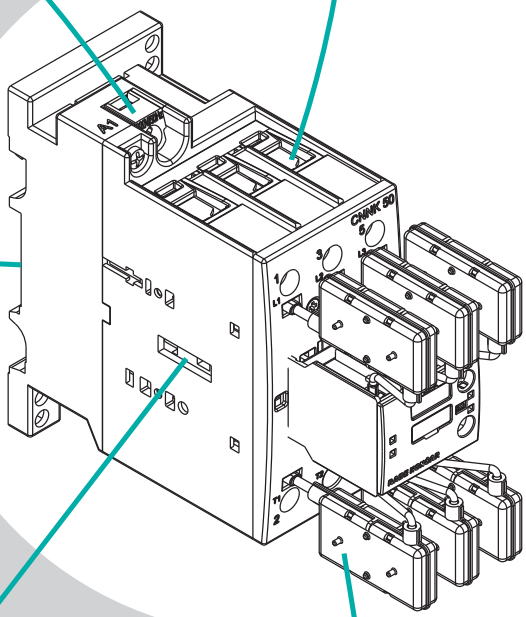
POSSIBILITIES

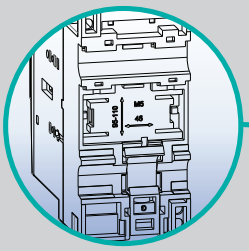


Special clamp terminals are provided for reliable connection of conductors for KCK 40 - KCK 60

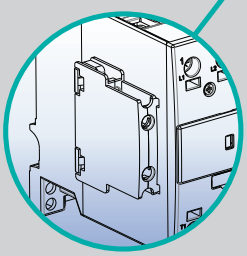


Wide range of coil voltages are provided. The users can change the coil by themselves.

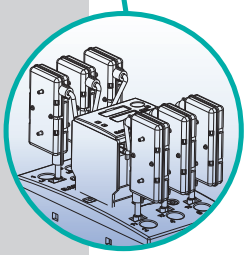




Contactors type KCK can be mounted on DIN rail or directly on the mounting plate. Type KSC 20, KCK 25 and KCK 33 only DIN rail 35 mmand type KCK 40 and KCK 60 DIN rail 35 mm or 75 mm.



Auxiliary contacts - side mounting



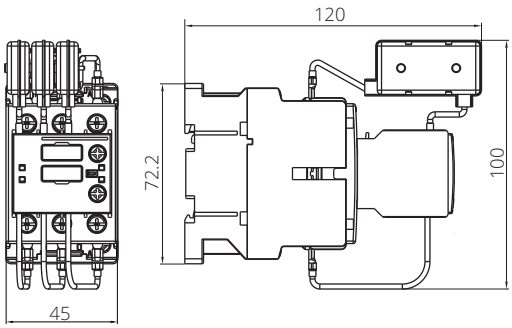
Precharging resistors with special type of contacts has the purpose of connecting for a very brief interval, up to 5 ms, during the contactor closing, resistors limit the connecting current of the capacitors.

Capacitor Duty Contactors

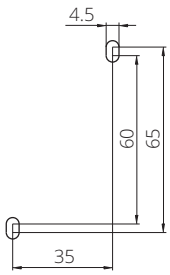
KCK20, KCK25, KCK25E, KCK33, KCK40, KCK50, KCK60

DIMENSIONS

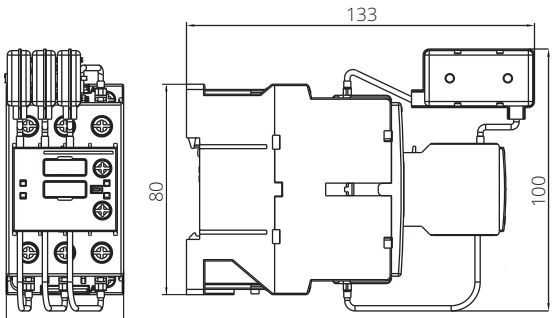
KCK 20



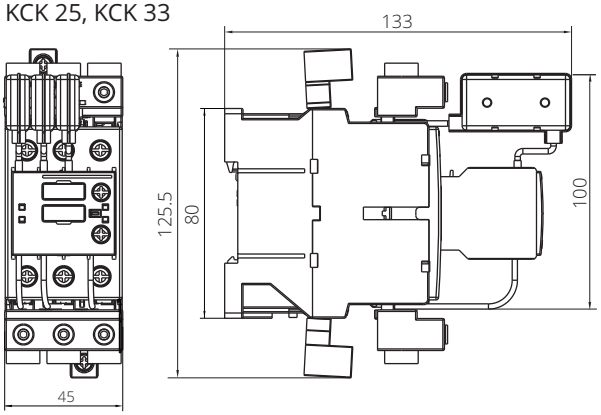
DRILLING PLAN (mm)
KCK 20



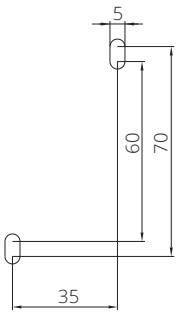
KCK 25E



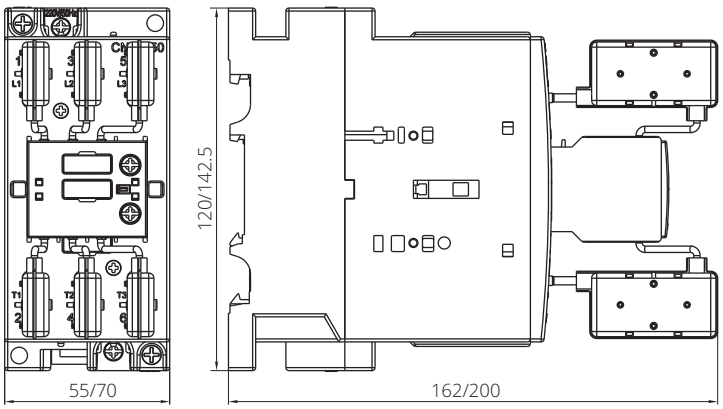
KCK 25, KCK 33



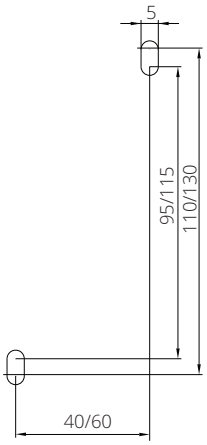
DRILLING PLAN (mm)
KCK 25 E, KCK 33



KCK 40, KCK 60



DRILLING PLAN (mm)
KCK 40, KCK 60



ORDERING DATA

THE TYPE DESIGNATION AND CONTROL VOLTAGE ARE STATED WHEN ORDERING THE CONTACTORS.

KCK 30 1 0 230 V 50/60 Hz

- 50/60 Hz — FREQUENCY (Hz)
- 230 V — CONTROL VOLTAGE (V)
- 0 — NUMBER OF **NC** AUXILIARY CONTACTS
- 1 — NUMBER OF **NO** AUXILIARY CONTACTS
- 30 — kVar in (AC-6b, 400 V/50 Hz)
- KCK — TYPE

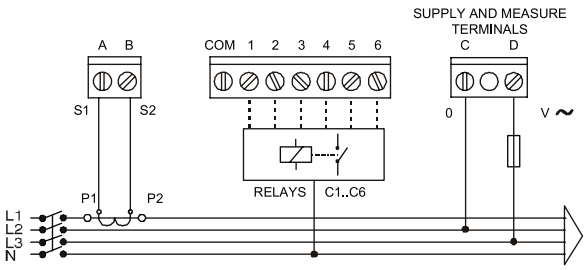
Power factor control relay
PFCmax6, PFCmax12

The power factor regulators, (PFCmax6 and PFCmax12) will measure the **cosφ** in a supply network and control the connection and disconnection of power capacitors in order to regulate such parameter.

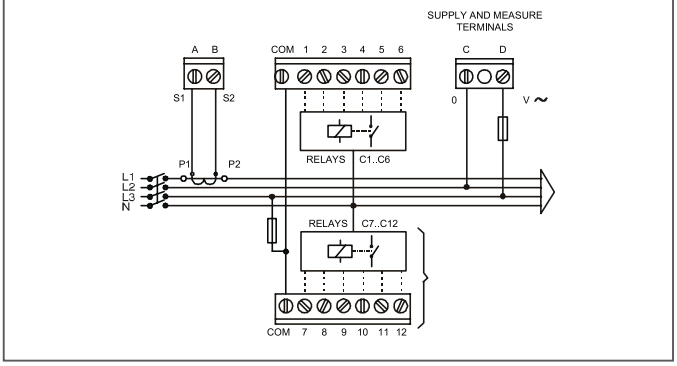
FEATURES

- FCP regulation system, which minimizes the number of switching operations. using FIFo criterion
- Four quadrants control
- LCD display screen with three seven segments characters plus 20 icons to sign up the different possible working conditions.
- Easy panel mounting, without the need of tools.
- Main electrical parameters displayed during RUN mode.

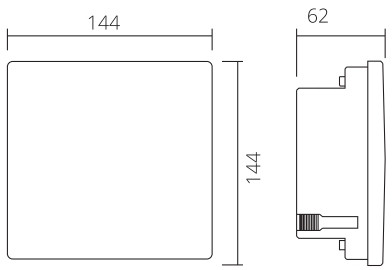
PFCMAX 6



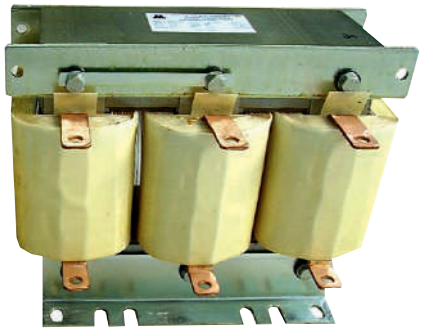
PFCMAX 12



DIMENSIONS



Harmonic filter reactors 3UI



Electrical power supply to industrial networks is nowadays polluted to the same degree as the air we breathe in the major conurbations and large cities of our planet. This is due to increasing application of non-linear loads, such as variable speed drives, frequency converters and rectifiers, as well as the astronomically high number of electrical energy consumers. The outcome is unusually high levels of harmonic distortion not only resulting in unnecessary losses from transmission lines, but also in non-calculable resonances between network inductances and power factor correction capacitors.

This was previously not a major problem, because the design of capacitors for power factor correction (mixed dielectric and liquid impregnation containing PCBS) meant that such capacitors were relatively insensitive to line distortion. Following the worldwide banning of electrical components containing pcbs, this kind of capacitor had to be replaced. Over the last twenty years, capacitors made of metalized polypropylene film have found in the application.

This new capacitor design provides many advantages, chiefly very low loss dissipation and small volume combined with low weight. However, advantages often go hand-in-hand with disadvantages and this also applies to metalized film capacitors: a distinct sensitivity to harmonic distortion, currently a familiar and increasing problem in industrial networks.

Several phenomena associated with this problem can produce substantial premature aging in film capacitors:

- Harmonic distortion in extended networks induce resonance between inductances of the network and power capacitors, resulting in excessive capacitor heating.
- Harmonic currents over and above the fundamental load result in voltage drops across the capacitor elements which may exceed the max voltage of the capacitor. This causes partial discharge and results in extreme self-healing events within the capacitor elements, liable to shorten capacitor life considerably.
- Excessive harmonic currents can overload the internal connections between the cables and capacitor film, causing the arc-sprayed zinc layer to be stripped off from the surface of the capacitor coil.

DESIGN CRITERIA

Since it is impossible to predict conditions prevailing in the network where the reactor will do its job, all reactors have to be designed for a defined worst case scenario, meeting all tolerances laid down by the international standard IEC 60076. In the absence of an appropriate standard relating to network quality, this worst case scenario had to be agreed between leading power factor capacitor suppliers.
These are the design criteria of proven reliability over a period of many years:

• Tolerance for inductance fundamental current I_1	- 2 % ... + 3 % of L_N
• Assumed harmonic voltage distortion	1.06 x I_{CN} or1.10 x I_{CN} (for 6% or 10 % overvoltage respectively)
• Thermal current I_{th}	UH3= 0,5 %; UH5 = UH7 = 5,0 %; based on U_N
• limit of core linearity I_{lin}	1.05 x I_{rms} (Relative to worst case tolerances and capacitor aging) 1.20 x I1...7 (Relative to switching procedures at full harmonic load)
• Assumed ambient temperature	40°C

Harmonic filter reactors 3UI

TECHNICAL DATA

HARMONIC FILTER REACTORS 400 V

Item	ph	TYPE OF CORE	U_n (V)	f_n (Hz)	p (%)	Nc (kVar)	L_N (mH)	I_{rms} (A)	I_{Lin} (A)	Nv (I_{rms}) (A)
1	3	**3UI60/30**	400	50	5.67 (210 Hz)	1.5	3 x 20.409	2.6	4	30
2	3	**3UI75/25**	400	50	5.67 (210 Hz)	2.5	3 x 12.245	4.4	7	30
3	3	**3UI75/40**	400	50	5.67 (210 Hz)	5	3 x 6.123	8.8	15	50
4	3	**3UI90/50**	400	50	5.67 (210 Hz)	7.5	3 x 4.082	13.2	23	70
5	3	**3UI114/62V**	400	50	5.67 (210 Hz)	10	3 x 3.061	17.5	31	90
6	3	**3UI114/62V**	400	50	5.67 (210 Hz)	12.5	3 x 2.449	21.9	39	110
7	3	**3UI114/62V**	400	50	5.67 (210 Hz)	15	3 x 2.041	26.3	47	130
8	3	**3UI114/62**	400	50	5.67 (210 Hz)	20	3 x 1.531	35.1	63	150
9	3	**3UI114/62**	400	50	5.67 (210 Hz)	25	3 x 1.225	43.9	79	180
10	3	**3UI132/72V**	400	50	5.67 (210 Hz)	30	3 x 1.020	52.6	95	190
11	3	**3UI132/72**	400	50	5.67 (210 Hz)	40	3 x 0.765	70.2	127	260
12	3	**3UI132/72**	400	50	5.67 (210 Hz)	50	3 x 0.612	87.7	159	280
13	3	**3UI60/30**	400	50	7 (189 Hz)	1.5	3 x 25.556	2.4	4	20
14	3	**3UI75/25**	400	50	7 (189 Hz)	2.5	3 x 15.334	4	6	30
15	3	**3UI75/40**	400	50	7 (189 Hz)	5	3 x 7.667	8	13	50
16	3	**3UI90/30**	400	50	7 (189 Hz)	7.5	3 x 5.111	12.1	20	70
17	3	**3UI90/50**	400	50	7 (189 Hz)	10	3 x 3.833	16.1	26	70
18	3	**3UI114/62V**	400	50	7 (189 Hz)	12.5	3 x 3.067	20.1	33	80
19	3	**3UI114/62V**	400	50	7 (189 Hz)	15	3 x 2.556	24.1	40	90
20	3	**3UI114/62**	400	50	7 (189 Hz)	20	3 x 1.917	32.1	53	140
21	3	**3UI114/62**	400	50	7 (189 Hz)	25	3 x 1.533	40.2	66	170
22	3	**3UI114/62**	400	50	7 (189 Hz)	30	3 x 1.278	48.2	80	190
23	3	**3UI120/75**	400	50	7 (189 Hz)	40	3 x 0.958	64.3	106	220
24	3	**3UI132/72**	400	50	7 (189 Hz)	50	3 x 0.767	80.3	133	240
25	3	**3UI75/25**	400	50	14 (134 Hz)	1.5	3 x 55.272	2.3	3	30
26	3	**3UI75/40**	400	50	14 (134 Hz)	2.5	3 x 33.163	3.8	5	40
27	3	**3UI90/30**	400	50	14 (134 Hz)	5	3 x 16.582	7.7	10	80
28	3	**3UI90/50**	400	50	14 (134 Hz)	7.5	3 x 11.054	11.5	16	80
29	3	**3UI132/72V**	400	50	14 (134 Hz)	10	3 x 8.291	15.4	21	80
30	3	**3UI132/72V**	400	50	14 (134 Hz)	12.5	3 x 6.633	19.2	27	90
31	3	**3UI132/72V**	400	50	14 (134 Hz)	15	3 x 5.527	23.1	32	110
32	3	**3UI132/72V**	400	50	14 (134 Hz)	20	3 x 4.145	30.8	43	150
33	3	**3UI132/72**	400	50	14 (134 Hz)	25	3 x 3.316	38.5	53	190
34	3	**3UI150/75V**	400	50	14 (134 Hz)	30	3 x 2.764	46.2	64	210
35	3	**3UI150/90V**	400	50	14 (134 Hz)	40	3 x 2.073	61.5	86	270
36	3	**3UI150/90V**	400	50	14 (134 Hz)	50	3 x 1.658	76.9	107	290

Project Reference

สำนักงานเทศบาลอ้อมน้อย
จ.สมุทรสาคร (2561)

Wood Chip Dryer
แกรนด์อเวนิว พัทยา (2561)

มหาวิทยาลัยราชภัฏสวนสุนันทา
กรุงเทพฯ (2562)

Montatip Hall
จ.อุดรธานี (2562)

โชว์รูมอีซูซุ ราชพฤกษ์
จ.นนทบุรี (2562)

Ekceed บ่อวิน
จ.ชลบุรี (2562)

SAVVI
พหลโยธิน (2563)

สำนักงานนครหลวงแคปปิตอล
(2564)

- สำนักงานเทศบาลอ้อมน้อย จ.สมุทรสาคร (2561)
- Wood Chip Dryer แกรนด์อเวนิว จ.พัทยา (2561)
- มหาวิทยาลัยราชภัฏสวนสุนันทา จ.กรุงเทพ (2562)
- โชว์รูมอีซูซุ ราชพฤกษ์ จ.นนทบุรี (2562)
- โรงงาน Lar Glodal จ.สมุทรปราการ (2562)
- Montatip Hall จ.อุดรธานี (2562)
- Ekceed บ่อวิน จ.ชลบุรี (2562)
- Footniks เทพารักษ์ (2562)
- ลำปางอะโกร จ.ลำปาง (2562)
- สกายฮิลล์ คอนโด จ.ระยอง (2562)
- 7-Square food mall Ubon จ.อุบลราชธานี (2562)
- โรงเรียนสองภาษาวายุภักษ์นารา จ.ชลบุรี (2562)
- Bigland จ.ปทุมธานี (2562)
- อพาร์ทเม้นท์ 6 ชั้น ท่าอิฐ จ.นนทบุรี (2562)
- ฟาร์มปักธงชัย จ.นครราชสีมา (2562)
- Since 24 Factory (2562)
- โรงไม้ Precious จ.อยุธยา (2562)
- โครงการอพาร์ทเม้นท์ ส.วัฒนา จ.ปทุมธานี (2562)
- ก่อสร้างพัฒนาแหล่งท่องเที่ยวสวนพุทธอุทยาน (2563)
- สมภพพลาซ่า อ้อมใหญ่ (2563)
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- โรงไม้แสวงหา (Main ACB) (2563)
- I Condo (2563)
- Thai Summit Automotive (2563)
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- บริษัท เค.ที เพาเวอร์ (2563)
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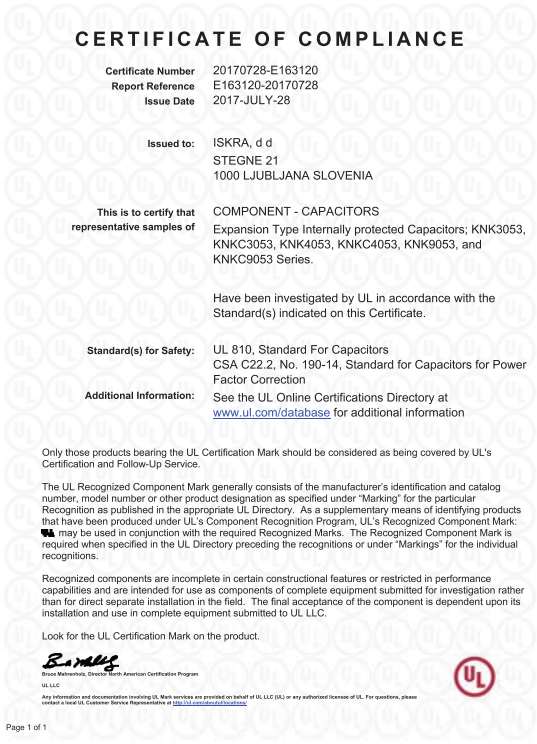
- GKT New Factory - M (2563)
- AQVELLA A1 (2563)
- บริษัท เอ เอส จำกัด จ.ชลบุรี (2563)
- บริษัท เอ็ม อี แพลนท์ จำกัด (2563)
- อาคารโรงงานอุตสาหกรรมอาหาร (MDI) (2563)
- ไทรงามพืชผล (2563)
- ส.วัฒนา อพาร์ทเม้นท์ (2563)
- โรงงาน Fullfill Packing จำกัด (2564)
- อาคารเรือนเลี้ยงไก่ ปักธงชัย (2564)
- มณฑาทิพย์ โฮเทล (2564)
- The MATT2 ตลาดพลู (2564)
- อาคารสำนักงานนครหลวงแคปปิตอล (2564)
- Ritrattana (2564)
- โรงน้ำมัน บจก. เค.ที. เพาเวอร์โซลูชั่น เอ็นจิเนียริ่ง (2564)
- บริษัท ไทยมารุเคน จำกัด (2564)
- โรงงานโยโกเมนูแฟคเจอริ่ง จำกัด (2564)
- State Concrete (2564)

Project Reference



CERTIFICATE OF COMPLIANCE

Certificate Number	20170728-E163120
Report Reference	E163120-20170728
Issue Date	2017-JULY-28
Issued to:	ISKRA, d d STEGNE 21 1000 LJUBLJANA SLOVENIA
This is to certify that representative samples of	COMPONENT - CAPACITORS Expansion Type Internally protected Capacitors; KNK3053, KNKC3053, KNK4053, KNKC4053, KNK9053, and KNKC9053 Series. Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 810, Standard For Capacitors CSA C22.2, No. 190-14, Standard for Capacitors for Power Factor Correction
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

The UL Recognized Component Mark generally consists of the manufacturer's identification and catalog number, model number or other product designation as specified under "Marking" for the particular Recognition as published in the appropriate UL Directory. As a supplementary means of identifying products that have been produced under UL's Component Recognition Program, UL's Recognized Component Mark: may be used in conjunction with the required Recognized Marks. The Recognized Component Mark is required when specified in the UL Directory preceding the recognitions or under "Markings" for the individual recognitions.

Recognized components are incomplete in certain constructional features or restricted in performance capabilities and are intended for use as components of complete equipment submitted for investigation rather than for direct separate installation in the field. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to UL LLC.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

Page 1 of 1

SGS

Certificate CH17/0193.00

The management system of

Iskra d.d.

Stegne 21, Ljubljana, Slovenia

has been assessed and certified as meeting the requirements of

ISO 9001:2015

For the following activities

Development, production and sale of products, services and innovative system solutions. Main products groups: Capacitors, low voltage switchgear, eletrical measuring instruments, batteries, potentiometers, services of electroplating and process automation.

This certificate is valid from 14 February 2017 until 13 February 2020
and remains valid subject to satisfactory surveillance audits
Recertification audit due before 14 December 2019
Issue 1. Certified since May 2011

Authorised by

SGS Société Générale de Surveillance SA
Technoparkstrasse 1 8005 Zurich Switzerland
t +41 (0)44 445-16-80 f +41 (0)44 445-16-88 www.sgs.com

Page 1of 2

SGS

Certificate CH17/0194.00

The management system of

Iskra d.d.

Stegne 21, Ljubljana, Slovenia

has been assessed and certified as meeting the requirements of

ISO 14001:2015

For the following activities

Development, production and sale of products, services and innovative system solutions. Main products groups: capacitors, low voltage switchgear, electrical measuring instruments, batteries, potentiometers, services of electroplating and process automation.

This certificate is valid from 14 February 2017 until 13 February 2020
and remains valid subject to satisfactory surveillance audits
Recertification audit due before 14 December 2019
Issue 1. Certified since May 2011

Authorised by

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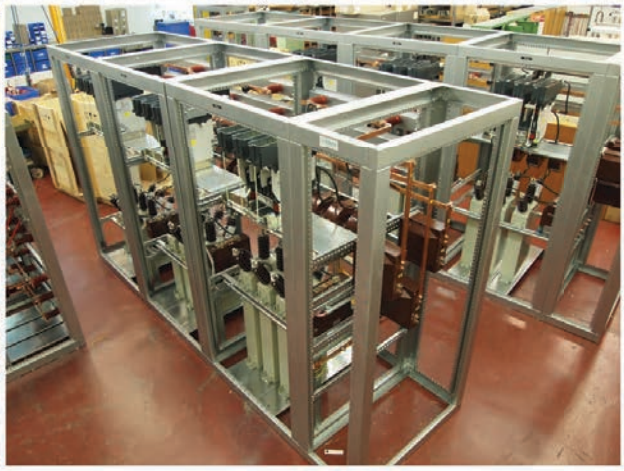

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