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BELUK GMBH · 2013

BELUK PRODUCT CATALOGUE

Control relays, thyristor switches, active filter, capacitor protection relays,
EMM-5 analyser and miniSCADA

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1956

Beluk's power-factor-relay experience dates back to

ISO 9001:2008

production organisation

15 mA

minimum sensing current of the BLR relays

2nd – 51st

harmonic orders compensated by BEL-AF

1 Beluk GmbH · Schongau, Germany · System components for power factor correction and power quality **EXPERIENCED, RELIABLE, FLEXIBLE**

Beluk is one of the leading manufacturers in the area of power factor control relays. Its experience in this technologically complex field dates back to 1956, and its customers have profited from its forward-looking concepts in the construction of switchgear for more than 30 years. On the basis of this know-how Beluk offers matured standard components as well as tailor-made problem solutions; the production organisation is set up in accordance with DIN EN ISO 9001:2008.

The current generation of BELUK power-factor-control relays is the result of 50 years of development: electromechanical versions to start with, electronics in the seventies, the first microcontroller relays in 1988, and today integrated interfaces for data communication. Specific relays exist for dynamic compensation, induction furnaces, medium-voltage switchgear and wind-power stations. BELUK relays “separate the chaff

from the wheat” – reactive from active energy – regardless of the number of harmonics disturbing the system, and the same measuring technique is found in its power analysers. Monitoring relays for voltage, current and capacitors in medium-voltage grids as well as static switches for capacitors supplement the range.



Power factor control relays

BLR-CX · BLR-CM-R · BLR-CM-T/RT · BLR-CM3phase



Thyristor switches

BEL-TS 15 – 130 kvar, 400 – 690 V



Active harmonic filter

BEL-AF 35 – 120 A



Capacitor protection

KSR1 · KSR · KSR-Z · KSR-V · VSR/VCR



Power analyser

EMM-5 with 32 meters



Web gateway

miniSCADA – SCADA in one DIN-rail device

2 ENERGY EFFICIENCY BY POWER FACTOR CORRECTION

In times of shortage of resources and climate change, conservation of resources is a fundamental objective and increasing energy efficiency a core aim of policy. With the systematic use of power factor correction, energy losses in the transmission and distribution networks can be significantly reduced (with a corresponding reduction in CO₂ emissions), networks can be used more efficiently – for instance for the transmission of regenerative energy – and the reliability of planning for future energy networks can be increased.

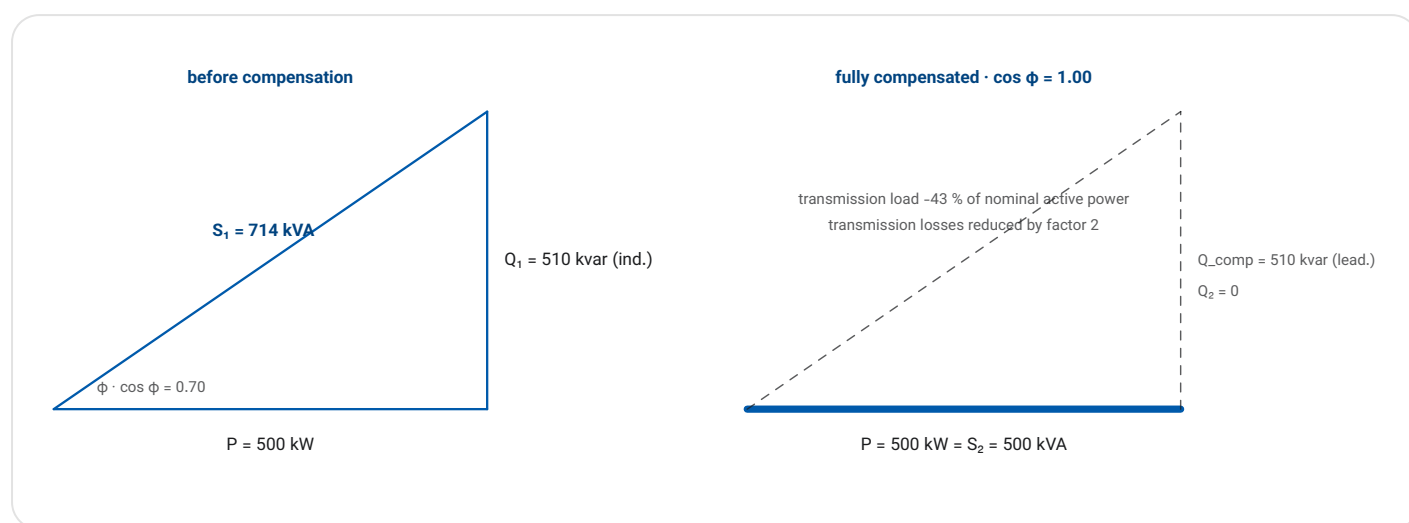
Origin and effects of reactive power

Many electrical devices, e.g. motors, need active and reactive power. Active power is converted into mechanical power or heat losses; reactive power is needed to maintain the magnetic fields and is transferred periodically in both directions between generator and load. Vector addition of active power P and reactive power Q gives the apparent power S , which utilities must make available and transmit – generators, transformers, lines and switchgear must be sized for it. Supply companies therefore charge for reactive power above a threshold; usually a target $\cos \phi$ between 1.0 and 0.9 (lagging) is specified.

Power factor correction

If the lagging power factor is corrected, for example by installing a capacitor at the load, this totally or partially eliminates the reactive power drawn from the supply. The inductive reactive power Q_1 is compensated by the capacitive reactive power Q_{comp} , the apparent power being reduced from S_1 to S_2 . Correction is at its most effective when it is physically near to the load and uses state-of-the-art technology. In Germany, power-factor correction saves energy losses of around one nuclear power plant.

Example: 3-phase motor, 500 kW, $\cos \phi$ 0.70



Transmission is 714 kVA although only 500 kW can be used; network losses are twice those at $\cos \phi = 1.00$. Fully compensated, the supply network needs to transmit an apparent power of 500 kVA; power factor correction reduces the transmission load by 43 % of nominal active power and the transmission losses are reduced by factor 2.

3 POWER FACTOR CONTROL RELAY BLR-CX

The intelligent regulation algorithm of Beluk switches the steps optimised and by this guarantees short compensation times combined with the smallest amount of operations; the operating cycles are shared equally to all steps. All relevant parameters are set ex works so that in nearly all cases no further adjustments are necessary to start the regulation — to start, only the correct nominal voltage is needed. A wrong connection can be corrected by starting the automatic phase correction, and for maintenance each step can be switched manually. Settings sit in two menus: "Start" (commissioning: nominal voltage, CT and VT ratio, automatic connection correction) and "Expert".

Measuring

Voltage and current in any phase – the connection is corrected automatically. Minimum sensing current 15 mA; 5 A or 1 A CTs without any setting; wide-range SMPS for voltage measuring 90 – 550 V. With the temperature sensor the relay measures the panel temperature and switches a fan on one of the control outputs; the second threshold (or external thermostats in parallel) switches the capacitors off.

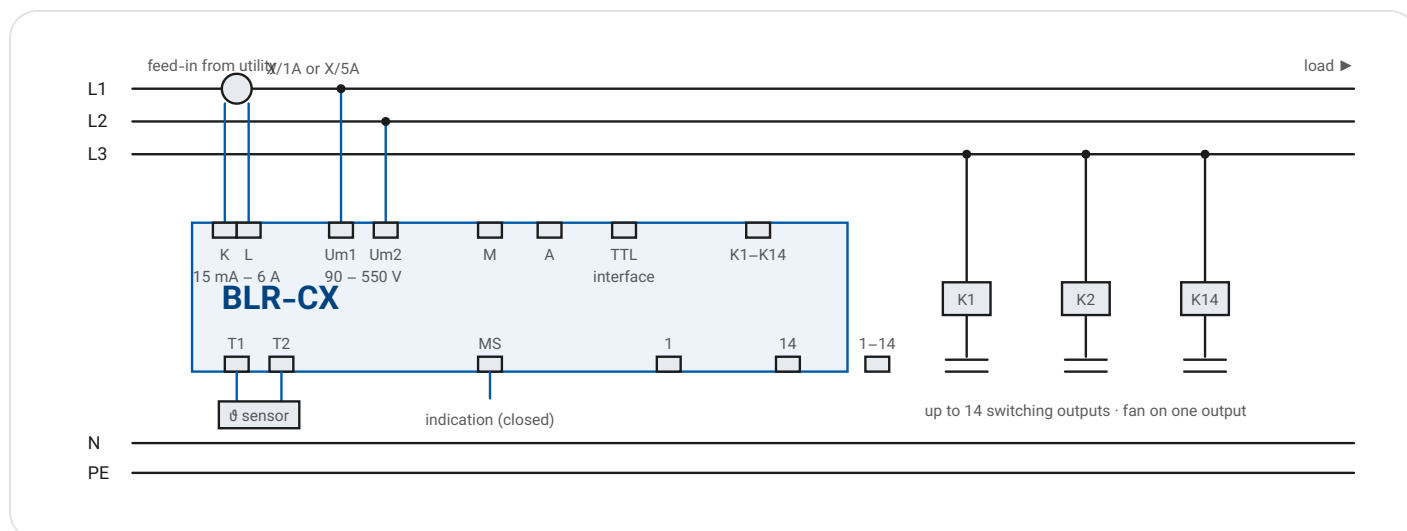
Display of information

Backlit LCD showing mains parameters (V, A, kW, kvar, kVA, kvar to target, THD U, 3rd – 19th voltage harmonic, displacement PF, PF, $\tan \phi$, Hz, temperature) and panel information (power-on hours, operating cycles per step, max. temperature, average PF, rating per step in kvar and in % of nominal). Displacement PF and the status of the outputs are shown permanently.

Monitoring

- Low-voltage switch-off against chattering of contactors
- Over-voltage switch-off for protecting the capacitors
- Overtemperature switch-off
- Monitoring of THD U and switch-off when exceeded
- Recognition of defective capacitors
- Alarm when the target cannot be reached
- Signalling of the need for maintenance
- Fan control

Connection diagram



Order codes

CODE	VERSION
BLR-CX04R ... CX14R	4, 6, 8, 10, 12 or 14 relay outputs
BLR-CX06T / CX12T	6 or 12 transistor outputs
Option -L	pluggable temperature sensor
Option -V	separate plug for supply voltage; measuring voltage 90 – 690 V
Option -MB	RS485 Modbus RTU, USB
Option -VT	transparent cover with lock
3USB · UMS9 · 3ZWC	interface kit for retrofitting RS485/USB · data cable TTL/USB · wall-mounting bracket

Type of device	reactive power regulator; control variable: electrical displacement reactive power
Principle of regulation	gradational regulation – Best-Fit (starting with the biggest suitable capacitor), LIFO, Combifilter (Best-Fit with more reactive power on odd outputs), Progressive (all required outputs switched in short intervals)
Special features	automatic detection and correction of the phase of current and voltage connection; automatic detection of engaged outputs and adaption of capacitor ratings; over/undervoltage monitoring; THD U monitoring; overtemperature switch-off
Measuring and auxiliary voltage	90 – 550 V AC, single phase, 45 – 65 Hz, 5 VA, max. fuse 6 A, VT ratio 1.0 – 350.0
Current measuring	15 mA – 6 A, single phase, burden 20 mΩ, CT ratio 1 – 9600
Sign-of-life contact	relay, volt-free, N/O, max. fuse 4 A, 250 V AC / 5 A, 400 V AC / 2 A
Interface · ambient	TTL, rear · operation –20 ... 70 °C, storage –20 ... 85 °C · humidity 0 – 98 % non-condensing · overvoltage class II, pollution degree 3
Standards	DIN VDE 0110-1 (IEC 60664-1:1992 + A1:2000 + A2:2002) · VDE 0411-1 (DIN EN 61010-1 / IEC 61010-1:2001) · VDE 0843-20-1:2006 (DIN EN 61326-1:2006) · VDE 0843-20-2-2:2006
Control outputs	up to 14 relays, N/O, volt-free with common point, max. fuse 6 A, breaking capacity 250 V AC / 5 A, 400 V AC / 2 A
Terminals · casing	pluggable screw-type terminal blocks, max. 4 mm² · front plastic (UL94-V0), rear metal

4 BLR-CM-R, REAL-TIME BLR-CM-T/RT AND BLR-CM3PHASE

The BLR-CM family adds a graphical backlit LCD, THD I and the 2nd – 30th harmonics of voltage and current, energy counters (kWh import/export, kvarh inductive/capacitive), a programmable digital input for external alarms and a digital output for the fan. Measuring voltage is 50 – 530 V with a separate 230 V auxiliary supply (115 V tapping point). The optional data logger (-DM) has four parts: setup history, alarm history, a logger of measuring values in 1 – 720 min intervals (min / max / mean) and a daily logger of system information (kWh, kvarh, switching operations and step size per step, average PF and average PF of the last 24 h) – downloaded via the TTL–USB cable to a CSV file.

BLR-CM-R

6 or 12 relay outputs (BLR-CM06R / CM12R). Options: -HV for MV and HV application, -MB Modbus RTU, -DM data logger with RTC and 24 V DC digital input, -Q control characteristic Q(U) where the target PF depends on the voltage level, -VT cover.

BLR-CM-T / RT – real time

The real-time algorithm calculates the control deviation directly after measuring one mains period and switches all necessary capacitors in one operation. The hybrid version runs two algorithms: the standard one for contactor-controlled capacitors builds an optimised working point for the real-time one. Versions BLR-CM06T, CM12T (transistor, open collector 8 – 32 V DC / 100 mA) and CM12RT (6 relay + 6 transistor). Dynamic mode has no capacitor-size recognition; sizes can be detected in normal mode at the beginning.

BLR-CM3phase

Three current inputs recognise asymmetric load; the algorithm works with three-phase as well as single-phase capacitors, guaranteeing optimum compensation of unbalanced

loads. Displays all values per phase L1/L2/L3 and total. Versions BLR-CM06R-3A, CM12R-3A, CM06T-3A, CM12T-3A, CM12RT-3A.

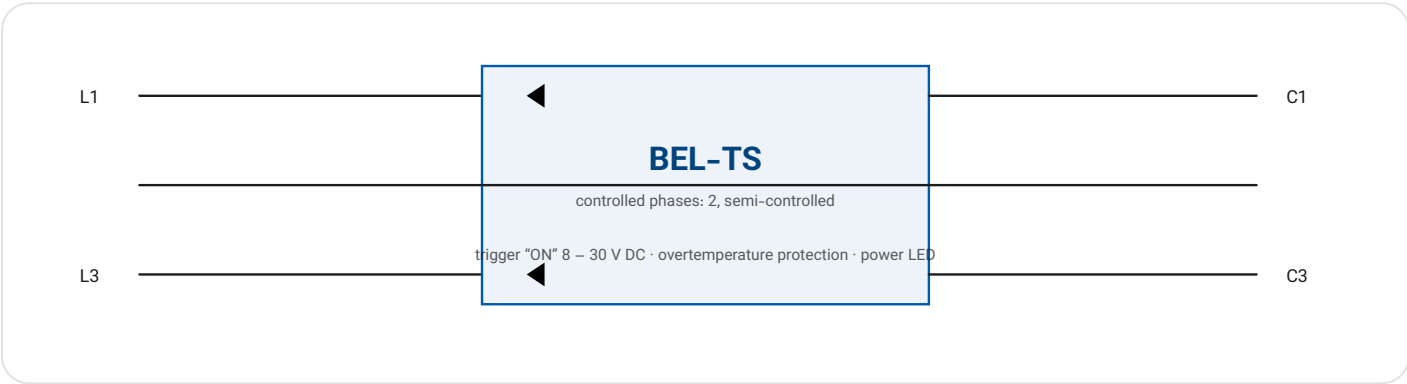
Common technical data of the BLR-CM family

Auxiliary voltage	230 V AC with tapping point 115 V AC ±10 %, 45 – 65 Hz, 10 VA, max. fuse 6 A
Measuring voltage	50 – 530 V AC, single phase, 45 – 65 Hz, < 1 VA, max. fuse 6 A, VT ratio 1.0 – 350.0
Current measuring	15 mA – 6 A, single phase, burden 20 mΩ, CT ratio 1 – 9600 (×3 for BLR-CM3phase)
Alarm contact · digital output	relay C/O, max. fuse 4 A, 250 V AC / 5 A · relay N/O with common point, 250 V AC / 5 A, 400 V AC / 2 A (fan)
Digital inputs	DI1 50 – 250 V AC programmable · DI2 10 – 30 V DC for synchronising the data logger (-DM)
Interfaces	TTL rear · RS485 Modbus RTU slave (-MB, -DM)
Standards	DIN VDE 0110-1 (IEC 60664-1:1992 + A1:2000 + A2:2002) · VDE 0411-1 (DIN EN 61010-1 / IEC 61010-1:2001) · VDE 0843-20-1:2006 (DIN EN 61326-1:2006) · VDE 0843-20-2-2:2006
Control outputs	up to 12 relays N/O volt-free with common point, 250 V AC / 5 A, 400 V AC / 2 A – or transistor open collector 8 – 32 V DC / 100 mA
Terminals · casing	pluggable screw-type terminal blocks, max. 4 mm² · front plastic (UL94-V0), rear metal
Protection · weight · size	front IP50 (IP54 with gasket), rear IP20 · approx. 1.0 kg · 144 × 144 × 58 mm, cut-out 138 (+0.5) × 138 (+0.5) mm

5 THYRISTOR SWITCHES BEL-TS

BEL-TS switches capacitor steps semi-controlled on two phases (terminals L1 → C1 and L3 → C3), triggered by an 8 – 30 V DC signal drawing 2 mA at 12 V. The supply is taken directly from the power connection (a separate supply is optional on the 400 – 480 V units; 230 V 50/60 Hz on the 525 – 690 V units), consumption max. 9 VA. Recovery time is typically one period; overtemperature protection and a power LED are built in.

Principle



**Attention**

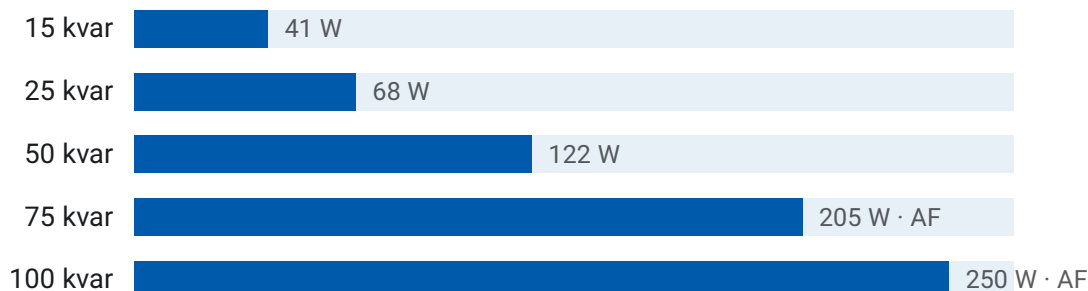
Changing the connection points L → C will damage the system! Using discharge reactors is not allowed – for dimensioning the discharge resistors consider high DC-voltage levels.

BEL-TS 400 – 480 V – nominal current in A at 400 / 440 / 480 V (±10 %)

NOMINAL POWER	400 V	440 V	480 V	LOSSES W (400/440/480)	H × W × D MM	KG	COOLING	IP
15 kvar	22	20	18	41 / 37 / 33	188 × 202 × 200	2.9	AN, natural	IP20
25 kvar	36	33	30	68 / 61 / 52	200 × 160 × 215	4.3	AN, natural	IP10
50 kvar	72	66	60	122 / 111 / 104	200 × 160 × 215	4.3	AN, natural	IP10
75 kvar	109	99	90	205 / 184 / 172	270 × 160 × 215	5.6	AF, forced	IP10
100 kvar	144	131	120	250 / 224 / 244	270 × 160 × 215	5.6	AF, forced	IP10
125 kvar (480 V)	–	–	150	261	270 × 160 × 215	5.6	AF, forced	IP10

BEL-TS 525 – 690 V

NOMINAL POWER	NOMINAL VOLTAGE	NOMINAL CURRENT	LOSSES	H × W × D MM	KG	COOLING
65 kvar	525 V	72 A	122 W	200 × 160 × 215	4.3	AN
130 kvar	525 V	144 A	250 W	270 × 160 × 215	5.6	AF
50 kvar	690 V	42 A	75 W	200 × 160 × 270	4.6	AN
100 kvar	690 V	84 A	145 W	270 × 160 × 270	5.9	AF

Power losses at 400 V by switch size

Losses in watts at the nominal current; forced-air units from 75 kvar upward.

Max. altitude	1000 m NN (higher altitudes possible with reduced current ratings)
Ambient temperature	–10 ... 45 °C (up to +65 °C with reduced current ratings)
Humidity	10 – 95 % without moisture condensation

6 ACTIVE HARMONIC FILTER BEL-AF

Many electrical devices pollute the grid with non-linear load currents: devices disturb each other, the load on the grid is much higher than necessary and, in extreme situations, the supply can fail. Indications are harmonics, unbalanced load, neutral current and a bad power factor. BEL-AF improves voltage quality by filtering the current: it compensates harmonics up to the 51st order, balances the phase currents and improves the power factor, reducing the neutral current. Sized with sufficient reserve it also compensates the phase shift in real time. CT on the source side gives closed-loop control, on the load side open-loop control; up to 8 filters work in parallel with their current inputs connected in series.

Compensation current per type

BEL-AFW435@400C	35 A · < 700 W losses
BEL-AFW460@400C	60 A · < 1350 W
BEL-AFW490@400C	90 A · < 2000 W
BEL-AFW4120@400C	120 A · < 2650 W

Compensation current	3 phase / 3 wires – 35, 60, 90 or 120 A; current limit at full correction; inrush current less than rated current
Compensated harmonic orders	2nd to 51st; response time < 20 ms; power factor correction ind. 0.70 – cap. 0.70
Input voltage · frequency	400 V +15 % / –20 % · 47 – 63 Hz
Current transformers	standard 100 A : 1 A – 10 000 A : 1 A; optional ...: 5 A
Cooling · altitude · ambient	AF air forced · < 1000 m NN · operation 0 ... +40 °C, storage –20 ... +70 °C
Display	LCD – meter parameters, waveform and spectrum, event log up to 300 records (FIFO), all settings, up to 10 languages
Interfaces · I/O	RS232 / USB standard; RS485 / RS422 / Ethernet optional · 5 output dry contacts, 1 input dry contact, 1 EPO

7 UNBALANCE PROTECTION RELAY KSR1

High-voltage capacitors taken into operation must be supervised all the time. Most are manufactured with insulating oil as the dielectric, which could catch fire in case of failure

– with some litres of oil per capacitor there is a fire load not to be disregarded, so the capacitors must be separated from the grid before a failure causes an accident. The KSR1 protects the capacitors against internal failures in a versatile way without generating useless and expensive cut-offs: it monitors current or voltage (selectable), with two threshold levels for Alarm / Trip as absolute or % values, programmed delay times, latching or auto-reset relays, a third relay for Alarm, Trip or both, and a record of the last 5 Alarm and Trip operations. A natural unbalance can be programmed in and is subtracted from the measured value.

 Double-star connection

6 identical capacitors in two stars; the CT sits in the conductor between the two star points – the current indicates the symmetry.

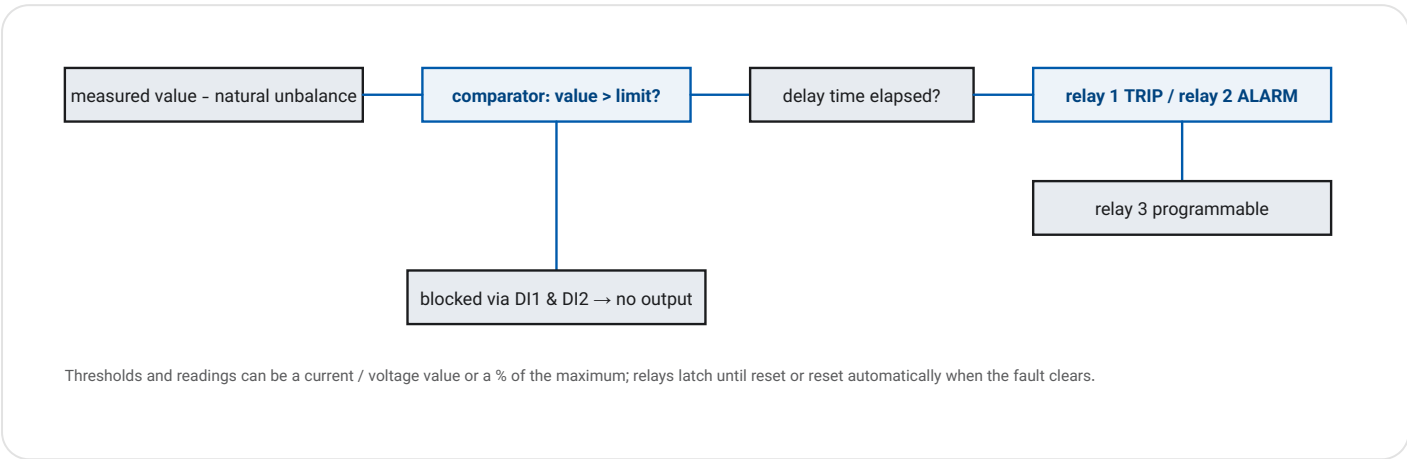
 H-bridge connection

4 identical capacitors form an H; the CT sits in the conductor connecting the middle of the left and right branch.

 Voltage monitoring

3 capacitors in star; three 2-pole insulated VTs with secondaries in series – the voltage indicates the symmetry.

Monitoring system



Supply voltage	40 – 250 V AC, 45 – 65 Hz / 40 – 300 V DC, 5 VA, max. fuse 6 A
Measuring voltage	0.2 – 20 V, burden 284 kΩ, VT ratio 1 – 350, low-pass filter; continuous overload 120 V, 500 V for 10 s; accuracy 0.5 % of upper range value
Current measuring	20 mA – 5 A, burden 20 mΩ, CT ratio 1 – 4000, low-pass filter; continuous overload 25 A, 100 A for 1 s; accuracy 0.5 %
Relay outputs	max. 1250 VA AC, max. switching voltage 440 V AC; DC (ohmic) 30 V / 5 A, 60 V / 1 A, 110 V / 0.5 A, 220 V / 0.3 A
Digital input · interface	blocking Alarm / Trip via DI1 & DI2 · TTL, rear
Ambient · humidity	operation –20 ... 70 °C, storage –40 ... 85 °C · 0 – 95 % non-condensing

Standards	IEC 60255-1 ... -5 (oscillatory waves, ESD, RF fields, fast transients, surge); DIN VDE 0110-1; VDE 0411-1; VDE 0843-20 · CE
Terminals · protection · weight	screw type max. 4 mm ² · front IP50 (IP54 with gasket), rear IP20 · approx. 0.65 kg

8 CAPACITOR PROTECTION RELAYS KSR, KSR-Z AND KSR-V

The KSR measurement system provides 3 voltage and 4 current channels with high-precision input filters (3 dB cut-off 2.5 – 3 kHz). N need not be connected – an internal resistor network provides an artificial N. CTs of 1 A or 5 A depending on the type, CT ratio 1 – 10 000, channel 4 (out-of-balance current) with its own ratio and one-button compensation of the natural unbalance. Nearly all displayed values are true RMS, and a full-range FFT is performed on all channels. A big backlit LCD and four context-sensitive soft-keys give instant usage without the manual.

32 protection settings

FIELD	MEANING
Source	monitored value
Trigger	monitored value < or > the threshold
Limit	threshold
T-ON	delay after violating the threshold
T-OFF	delay for the alarm reset after the value becomes normal
Output	relays activated – 6 relay outputs (2 C/O + 4 N/O), each triggerable from several settings, programmable inverted and latching; latched relays reset only at the device



Without the power supply the relays are not active. The alarm display can be selected as if it were another relay output.

Fault recorder (option -DM)

64 storage cells, each with SOURCE (monitored value), DATE/TIME, LIMIT and EXT-VAL (maximum measured value between violation and trip); start and end of each event stored with date and time and readable on the LCD. Option -DM also provides a Modbus interface and a digital input for blocking alarms.

Order codes — KSR-am-x by supply

CODE	POWER SUPPLY
KSR-am-V / -W	110 V DC / 220 V DC
KSR-am-S / -T	24 V DC / 48 V DC
KSR-am-B / -C	110 V AC / 230 V AC
-E	galvanically insulated current channels, 200 A for 1 s
-DM · -MB · -VT	Modbus + fault recorder + RTC + DI · Modbus only · transparent cover

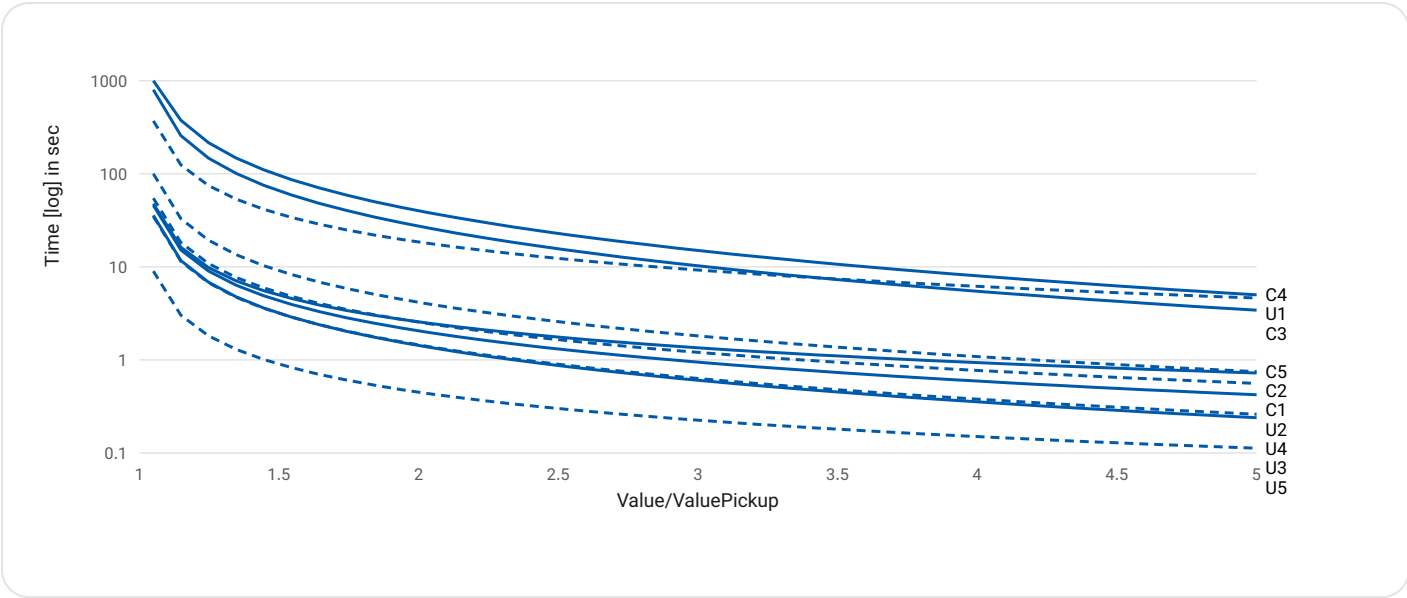
KSR-Z — the next generation

KSR-Z is always equipped with the fault recorder, Modbus interface and blocking input, and comes with factory-set protection settings so that only the threshold needs adjusting. Beyond the standard time delay it can use ANSI / IEC tripping curves, so alarm / trip depend on the height of the violation; calculated values such as earth fault and voltage asymmetry are available, each in two independent steps (alarm / trip), and an additional timer detects repetitive short-time violations (memory effect).

Factory-set protection settings

CODE	MONITORED VALUE	ALARM RELAY	TRIP RELAY
OL	TRMS current L1, L2, L3 (greater than threshold)	1	4
UL	TRMS current (less than threshold)	2	4
OL th	thermally damped current, τ adjustable	1	4
OL f	fundamental current (50 / 60 Hz only)	1	4
UB	unbalance — current channel 4 (double star / H-bridge)	2	4
EF	earth fault — vector sum of the phase currents	8	4
VA	voltage asymmetry between all phases, in % deviation	7	4
OV	TRMS voltage L1-L2, L2-L3, L1-L3 (greater)	7	4
UV	TRMS voltage (less)	7	4

Tripping curves ANSI / IEC



Time to alarm / trip against Value/ValuePickup. The catalogue plots ten curves and labels them only U1 – U5 and C1 – C5, with no formula or constants given, so the shapes are stylised from its plot.

Every setting in the alarm matrix can be shown on the display, stored in the fault recorder, blocked by the digital input, and reset automatically or manually.

Technical data KSR / KSR-Z

Voltage measuring	ULL 95 – 550 V, ULN 55 – 318 V, 45 – 65 Hz, VT ratio 1 – 4000
Current measuring	50 mA – 5 A (type 5) or 20 mA – 1 A (type 1), burden 15 mΩ, external CT required, CT ratio 1 – 10 000, overload 20 % continuous, 200 A for 1 s
Switching outputs	2 C/O + 4 N/O volt-free contacts, 250 V AC / 5 A; 30 V DC / 5 A ohmic; 110 V DC / 0.4 A ohmic, 0.3 A inductive
Fan control · interfaces	temperature sensor on rear, outputs programmable to switch a fan · TTL; RS485 Modbus RTU slave (optional on KSR, standard on KSR-Z)
Ambient · humidity	operation 0 ... 70 °C, storage –20 ... 85 °C · 0 – 95 % non-condensing; overvoltage category II, pollution degree 3
Standards · connection	IEC 60255-1 ... -5, DIN VDE 0110-1, VDE 0411-1, VDE 0843-20 · CE · screw type max. 2.5 mm²
Case · protection · size · weight	instrument case · front IP50 (IP54 with gasket), rear IP20 · 144 × 144 × 59 mm, cut-out 138 × 138 mm · ca. 650 g

⚡ KSR-V – voltage-unbalance protection

The KSR-V provides 7 input channels: grid voltage on L1, L2, L3, (N) with a VT ratio up to 4000, and four special out-of-balance voltage channels V1 – V4 (0 – 20 V AC via VTs with open-delta secondaries, max. overload 120 V) so the unbalance of four capacitor banks can be monitored, each in two steps (Alarm / Trip) with separately adjustable threshold

and delay. The FFT on the voltage channels matters because capacitors can be damaged by voltage harmonics. Order codes KSR-amv-V/W/S/T/B/C by supply (110 V DC, 220 V DC, 24 V DC, 48 V DC, 110 V AC, 230 V AC); options -MB, -VT; accessories UMS9 and 3ZWC.

Auxiliary voltage	230 V $\pm$ 10 %, 45 – 65 Hz, 8 VA, max. fuse 6 A (110 V AC, 110 V DC and further ratings on request)
Voltage measuring	ULL 95 – 550 V, ULN 55 – 318 V, 45 – 65 Hz, VT ratio 1 – 4000
Out-of-balance detection	0 – 20 V, minimum sensitivity 0.5 V, max. 60 V continuous
Relay outputs	4 N/O volt-free 250 V AC / 5 A, 110 V DC / 0.3 A inductive; optional 2 C/O
Display · operating	graphical LCD 128 × 64 pixel with backlight, clear-text menus · membrane keyboard with 4 soft-keys
Ambient	operation –20 ... +70 °C, storage –30 ... +80 °C; 0 – 95 % non-condensing
Connection · case · size	pluggable screw terminals max. 4 mm ² rigid · plastic front (UL94-V0), metal rear · 144 × 144 × 59 mm · approx. 650 g

9 POWER ANALYSER EMM-5

The EMM-5 offers 32 programmable thresholds on a selection of 52 measuring values, monitoring of exceeding and shortfall with alarm and drop-off delays of 0 – 600 s, and programmable alarm announcement by 2 C/O contacts (-m), 4 N/O contacts (-a), text message on the LCD, event logging with date and time (-DM), blocking of alarms in special situations such as a motor start via the digital input (-DM), and read-out over RS485 Modbus (-MB, -DM). Measuring values are recorded in programmable intervals with date, time, minimum, maximum and mean, downloaded to a CSV file through the TTL–USB converter.

Measurement values (display / monitoring / recording)

VALUE	RANGE	ACCURACY
ULN · ULL	55 – 318 V · 95 – 550 V	$\pm$ 0.5 %
I, Ith, IF – L1, L2, L3, N	0.05 – 5 A	$\pm$ 0.5 %
Frequency · rotation field	45 – 65 Hz · right / left	$\pm$ 0.1 Hz
cos ϕ L1, L2, L3 · λ	c 0.00 – i 0.00 · 0.00 – 1.00	$\pm$ 0.01
S, P, Q – L1, L2, L3, total	0 – 35 GVA / GW / Gvar	$\pm$ 0.5 %
THD U · THD I	0 – 100 %	
Harmonics U and I, 2nd – 63rd	0 – 100 %	
Temperature	5 – 80 °C	

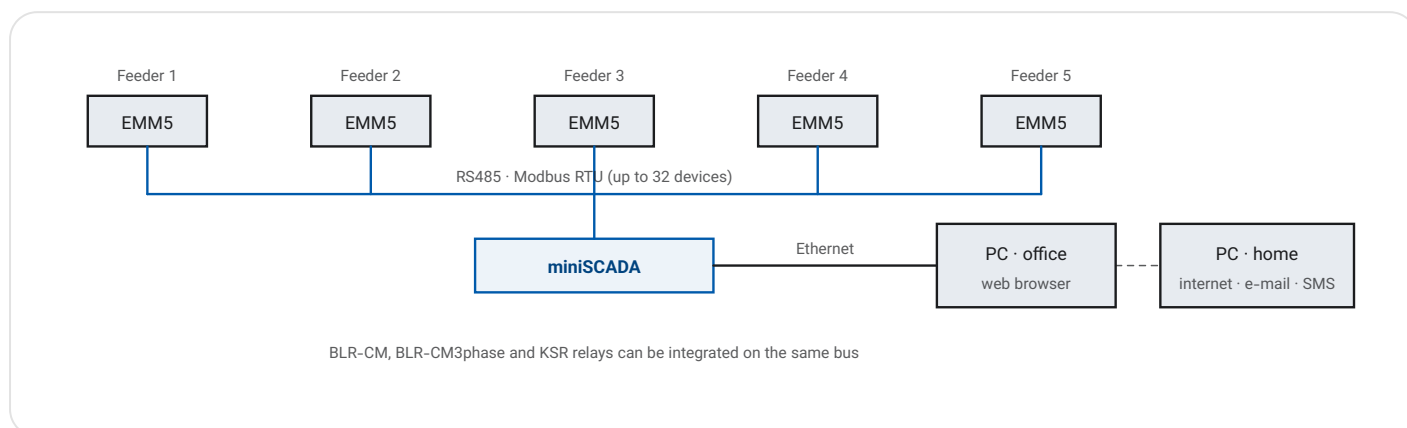
Counters – 32 meters

Tariff 1: active energy import and export, reactive energy inductive and capacitive – each for L1, L2, L3 and total, 0000000.00 kWh – 4 000 000.00 GWh. Tariff 2 (option -DM) repeats the set. With -DM the meters are saved every day for a history; tariff switch-over by an external signal at the digital input or daily at a preset time.

Order codes

CODE	CONTENTS
EMM5	standard
EMM5 -m	2 C/O contacts
EMM5 -am	2 C/O + 4 N/O contacts
EMM5 -Im	2 C/O contacts + 4 impulse outputs
-MB	RS485 Modbus RTU
-DM	Modbus, event recorder, measured data storage 2048 kB, real-time clock, digital input
-E	galvanically insulated current channels, 200 A for 1 s
MiniSCADA · MiniSCADA2 · UMS9	web gateway (Ethernet, e-mail alarms, web server) · + SMS alarms and internal GPRS modem · TTL–USB converter

EMM5 and miniSCADA – the network solution for power applications



Auxiliary voltage	230 V $\pm$ 10 %, 45 – 65 Hz, 8 VA, max. fuse 6 A (110 V AC, 110 V DC on request)
Voltage measuring	ULL 95 – 550 V, ULN 55 – 318 V, 45 – 65 Hz, VT ratio 1 – 4000
Current measuring	50 mA – 6 A, 50 A for 1 s, burden < 1 VA, external CT required, CT ratio 1 – 10 000
Temperature measuring	+5 ... 80 °C, sensor on rear
Switching outputs	-a 4 N/O · -m 2 C/O – volt-free, 250 V AC / 5 A, 110 V DC / 0.3 A inductive · -I 4 pulse outputs solid state max. 250 V DC / 0.1 A
Interfaces · display · operating	TTL serial; optional RS485 Modbus RTU · graphical LCD 128 × 64 with backlight · membrane keyboard, 4 soft-keys

Ambient · humidity	operation –20 ... +70 °C, storage –30 ... +80 °C · 0 – 95 % non-condensing; overvoltage category II, pollution degree 3
Connection · case · protection · size	pluggable screw terminals max. 4 mm ² · plastic front (UL94-V0), metal rear · front IP50 (IP54 with gasket), rear IP20 · 144 × 144 × 59 mm, cut-out 138 × 138 mm, approx. 650 g

10 VOLTAGE CONTROL RELAY VSR / VCR

The VSR (three-phase) and VCR (single-phase) monitor grids and detect dangerous situations for connected capacitors or other electronic devices. Capacitors in compensation panels can be damaged by overloading or voltage peaks, so monitoring the voltage including harmonics is recommended: on violation of a threshold the display shows it and a relay can switch the capacitors off. True-RMS values and a full-range FFT on the 3 / 1 voltage channels; big backlit LCD with four soft-keys.

Voltage measuring	55/95 – 318/550 V, 45 – 65 Hz, ratio 1 – 4000
Switching outputs	2 C/O + 4 N/O volt-free contacts, max. fuse gL 6 A; breaking capacity 250 V AC / 5 A, 30 V DC / 5 A ohmic, 110 V DC / 0.4 A ohmic, 0.3 A inductive
Fan control · interfaces	rear temperature sensor, outputs programmable for a fan · TTL; optional RS485 Modbus RTU slave
Order codes	VCR-am-V/W/S/T/B/C (single phase) · VSR-am-V/W/S/T/B/C (three phase) – supply 110 V DC, 220 V DC, 24 V DC, 48 V DC, 110 V AC, 230 V AC; options -MB, -VT (IP54); accessories UMS9, 3ZWC
Ambient · standards · size	operation 0 ... +70 °C, storage –20 ... +85 °C · DIN VDE 0110-1, VDE 0411-1, VDE 0843-20, CE · 144 × 144 × 59 mm, ca. 650 g

11 CONFIGURABLE WEB GATEWAY MINISCADA

The miniSCADA is an easy-to-use web-based SCADA system for local and remote monitoring and control over Ethernet, internet, LANs, telephone modems, GSM (external modem) and GPRS. Its built-in web server is used to customise the graphical interface: connect the Modbus devices, select the desired data – up to 400 Modbus registers – and it appears on the onboard web pages without HTML programming, Windows tools, licences or royalties. Up to 64 alarms are sent by e-mail or SMS with user-defined text and stored in an alarm history; up to 64 parameters are logged at 10 s – 60 min sample rates with trend graphs and CSV download. As a Modbus TCP gateway it acts as a transparent bridge between serial Modbus RTU devices and SCADA systems or PLCs. Security: user name and password assigned by the administrator; the database is kept consistent on power loss.

✓ **Simple installation**
complete SCADA system in one DIN-rail device,
no software on the PC

🌐 **Web server with up to 30 pages**
display and parametrising in any browser, also
via internet

✉ **64 programmable alarms**
by e-mail, or SMS with MiniSCADA2 (internal
GPRS modem)

🔗 **Modbus master for up to 32 devices**
BLR-CM, BLR-CM3phase, KSR and any RS485
Modbus RTU slave

Ethernet protocols · baud rate	Modbus TCP, HTTP, SMTP, FTP, SNMP · 10 / 100 Mbit/s
Serial interfaces	#1 RS232 / RS485 for Modbus RTU / ASCII · #2 RS232 with full modem support · network baud rate up to 57.6 kbit/s
Power supply · consumption	9 – 32 V AC/DC · 50 mA at 24 V
Operating temperature · humidity	0 ... +60 °C · 5 – 93 % RH non-condensing
Certifications	EN 50081-2:1993 and EN 61000-6-2:1999
Housing	grey plastic, Lexan 940, self-extinguishing UL94-V0; DIN-rail mounting, 4 modules, IP20; 90 × 70 × 58 mm

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① This page is a re-typeset edition of the original document; where they differ, the
manufacturer's file prevails. For technical questions,



SABA KHAZEN MANUFACTURING & INDUSTRIAL CO.

Saba Khazen Industrial Company, established in 1994, is the first and only manufacturer of gas capacitors MKK and resin capacitors MKP under Siemens Germany license in Iran. With the slogan of superior quality and customer satisfaction, the company provides regular after-sales services. It is also the official representative of EPCOS and BELUK Germany, offering a wide range of power

factor correction equipment and harmonic elimination solutions to industries.

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