System-Components for Power-Factor-Correction and Powerquality

Product Catalogue

erfahren, zuverlässig, flexibel

BELUK

experienced, reliable, flexible

Experienced, reliable, flexible.

Beluk is one of the leading manufacturers in the area of power factor control relays. Our experience in this technologically complex field dates back to 1956. And our customers have also profited from our forward-looking concepts in the construction of switchgear for more than 30 years.

On the basis of this extensive know-how, we offer you not only matured standard components, but also problem solutions tailor-made to fit your specific requirements. Experienced specialists support you with word and deed in your planning.

The production organisation has been set up in accordance with DIN EN ISO 9001:2008, thus guaranteeing a uniformly high quality level. In addition, we are always on the latest technological level thanks to well-founded research and development. A large number of renowned customers all over the world documents our reliability.

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and
DQS GmbH Deutsche Gesellschaft zur Zertifizierung von Managementsystemen
hereby certify that the company

BELUK GmbH
Betriebseinrichtungen für Licht- und Kraftanlagen
Taubenstraße 1
86956 Schongau

has implemented and maintains a Quality Management System.

Scope:
Manufacturing of Switchgear, Power Factor Control Relay,
Energy Multimeter and Power Factor Meter

Through an audit, documented in a report, it was verified that the management system
fulfills the requirements of the following standard:

ISO 9001 : 2008

Date of certification 2010-04-16
Valid until 2013-04-15

Registration Number: DE-004676 QM08

Regé Wasmer
President of IQNet

Ass. iur. M. Drechsel
Managing Directors of DQS GmbH

T.J. Bögel

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Controlling everything!

The current generation of BELUK power-factor-control relays is the result of 50 years of technological development. To start with, the production was done in electromechanical versions. In the seventies electronics became the order of the day until 1988, where the first power-factor-control relays with microcontrollers were built. By now you can get the current interfaces for data communcations integrated in our devices.

Naturally, we also produce specific power factor control relays for special applications, such as dynamic compensation, compensation of induction furnaces, mediumvoltage switchgear and wind-power stations. BELUK power factor controll relays “separate the chaff from the wheat”, that is to say reactive from active energy, regardless of the number of “harmonics” disturbing the system! Thanks to this highly sophisticate measuring technique, our POWER-ANALYZERS are to be found all over the world.

Further devices, such as monitoring relays for voltage, current and capacitors in medium-voltage grids as well as static switch for capacitors supplement our range of products.

Energy Efficiency by Power Factor Correction

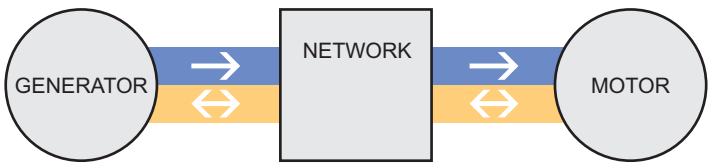
In times of shortage of resources and climate change, conservation of resources is a fundamental objective, and increasing energy efficiency a core aim of policy.

With the systematic use of power factor correction,

- energy losses in the electrical transmission and distribution networks can be significantly reduced, with a corresponding reduction in the CO_2 emissions involved in generating that lost energy;
- energy transmission and distribution networks can be used more efficiently, for instance for the transmission of regenerative energy;
- 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 power and reactive power. Active power is converted into mechanical power or heatlosses, reactive power is needed to maintain the magnetic fields of the devices. This reactive power is transferred periodically in both directions between the generator and the load.

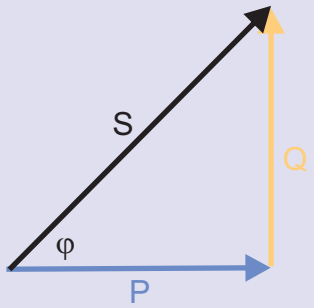


Vector addition of active power P and reactive power Q gives the apparent power S. Power generation utilities and network operators must make this apparent power available and transmit it. This means, that generators, transformers, power lines, switchgear, etc. must be sized for greater power ratings than if load only drew active power. Power supply companies are therefore faced with extra expenditure on equipment and additional power losses. They therefore make additional charges for reactive power if this exceeds a certain threshold. Usually a certain target power factor cos of between 1.0 and 0.9 (lagging) is specified.

Apparent power
$S^2 = P^2 + Q^2$

Active power
$P = S \cdot \cos\varphi$

Reactive power
$Q = S \cdot \sin\varphi$



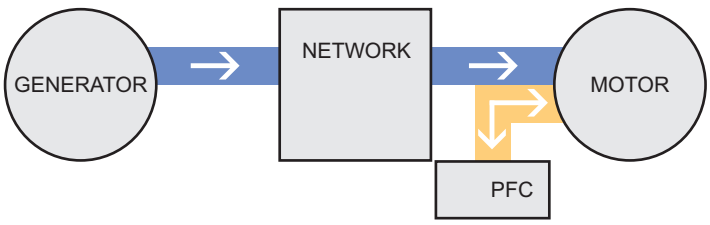
Example: 3-phase motor

Active power	500kW
Reactive Power:	510kvar (ind)
Resulting apparent power:	714kVA
cosφ	ind. 0,70

Transmission in is 714kVA, although only 500kW can be used. Power losses in network are two times of the power losses with cosφ=1.00

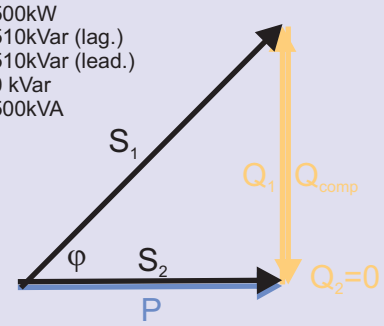
Power factor correction

If the lagging power factor is corrected, for example by installing a capacitor at the load, this totally or partially eliminates the reactive power draw at the power supply company. Power factor correction is at its most effective when it is physically near to the load and uses state-of-the-art technology.



The inductive reactive power Q_1 is compensated for totally or partially by the capacitive reactive power Q_{comp}, the apparent power thus being reduced from S_1 to S_2.

Active power	500kW
Reactive power	510kVar (lag.)
Power-factor-correction	510kVar (lead.)
Resultant reactive power	0 kVar
giving apparent power	500kVA



The motor draws an active power of 500kW as before, but ist reactive power is fully compensated.The supply network needs to transmit an apparent power of 500kVA. Power factor correction reduces the transmission load by 43% of nominal active power. The transmission losses are reduced by factor 2.
In Germany, due to power-factor correction it's possible to save energy losses of around 1 nuclear power plant (compared with no power-factor correction).

Power Factor Control Relay BLR-CX

Description

The intelligent regulation algorithm of Beluk switches the steps optimized and by this it guarantees short compensation times combined with the smallest amount of operations. The operating cycles are shared equally to all steps.
All relevant parameters for the regulation are set ex works in the way that in nearly all cases for BLR-CX no further adjustments are necessary to start the regulation. An optimization of the control mode of the compensation panel to the local conditions is still possible. Parameters can easily be changed, also during operation.
These settings can be done in two separate user menues. The "Start" menue contains only the settings, which can be necessary for commissioning, like nominal voltage, CT and VT ratio and the automatic correction of current and voltage connection.
These and furthers settings of the "Expert" menue are:

Measuring: nominal voltage, CT ratio, VT ratio, tolerance of voltage, connection Ph-Ph/Ph-N, phase-correction, autom. correction of connection, synchronisation, reset operating hours, reset average PF, reset max. temperature, temperature offset

Regulation: sensitivity, target-cosphi 1 and 2, switch interval, delay step exchange, step exchange, autom. capacitorsize detection, blocking of defective steps, Regul.progr.: Best-Fit, LIFO, combi, progressiv, Offset reactive power, asym.-switch interval, avoid leading power factor

Steps: discharging time, step size in kvar, steptype (e.g. Fix-steps), reset step database

Alarming: regulation alarm, defective step alarm, power loss of capacitors, THD U Alarm, overtemperature, limit switching operations, limit OPH of panel, limit temp1/temp2 I=0 alarm (failure in current path), etc.

To start regulation, only the correct setting of nominal voltage is necessary. Differing voltage is blocking control function for protecting the capacitors. If CT ratio is not set, then measurement readings which depend on current are blanked. A wrong connection can be corrected by starting the automatic phase correction. For maintenance work, each individual step can be switched manually.

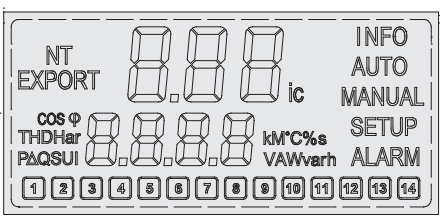
Display of Information

BLR-CX is equipped with LCD with backlit. It shows information about the panel and about the mains parameters. It's also necessary for setting the parameters of BLR-CX:

Mains paramters: voltage, current, kW, kvar, kVA, kvar to target, THD U, 3rd to 19th harmonic of voltage, displacement power-factor, power-factor, tan phi, frequency, temperature

Panel informations: power-on hours of panel, operating cycles per step, max. temperature of panel, average power factor, rating per step in kvar, percentage of the rating per step compared with the nominal rating.

Displacement power-factor and status of the control-outputs are shown permanently.



High-contrast LCD with backlit
and temperature range between -20°C and 70°C.
(Original size)

Measuring

BLR-CX is calculating by the measuring of current and voltage the power conditions in electrical network. Generally, it's not important, in which phase voltage and current are connected, because the connection is corrected by BLR-CX after starting the automatic phase correction. The min. sensing current is 15mAmp, which ensures a reliable and exact regulation.
There is no manual changing of any settings necessary, to use either 5Amp or 1Amp CT.
The wide range SMPS allows to realize voltage measuring in a range between 90V and 550V.

By using the temperature sensor, BLR-CX can measure the internal temperature of the compensation panel and can switch by using one of the control outputs a fan. The switch-off of the capacitor steps due to excess temperature can be triggered by reaching the second excess temperature threshold or can be triggered by N/O contacts of external thermostats, which are connected in parallel to the temperature sensor.

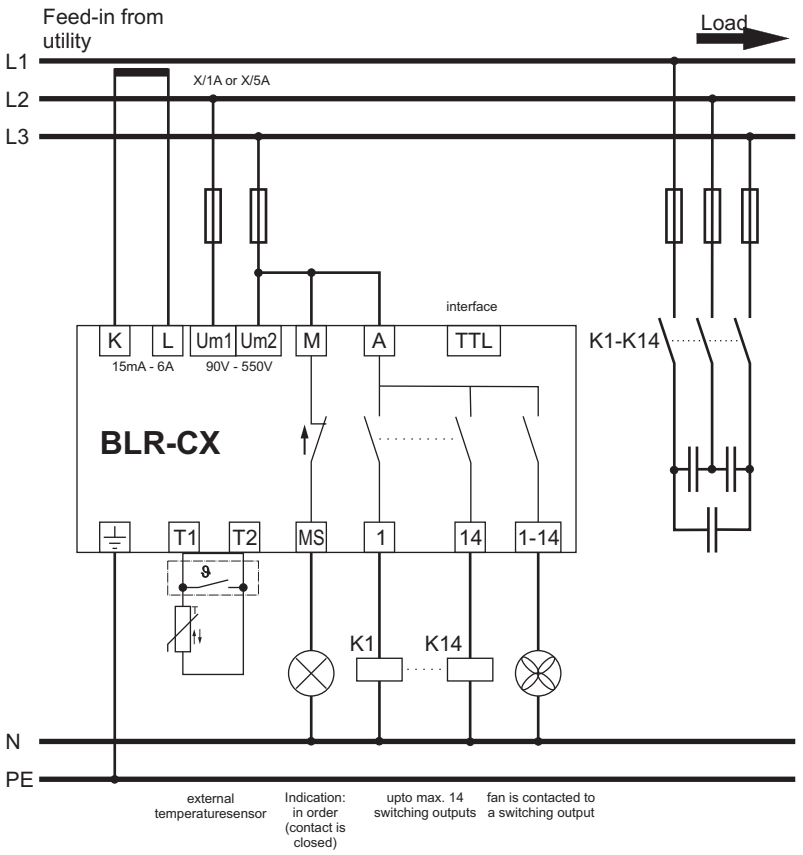
Monitoring

The monitoring features of BLR-CX guarantee a reliable operation and a long life of the compensation panel:

- 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 by exceeding THD U
- Recognition of defective capacitors
- Alarming, when target of regulation cannot be reached
- Signaling of the need for maintenance
- Fan control

Failures and announcements of the panel are shown in LCD. Failures can also be forwarded by the volt free alarm-contact (sign-of-life signal)
For switching the fan, one of the control-outputs has to be used.

Connection Diagram



Order Codes

Available versions:

BLR-CX04R:	BLR-CX with 4 relay outputs
BLR-CX06R:	BLR-CX with 6 relay outputs
BLR-CX08R:	BLR-CX with 8 relay outputs
BLR-CX10R:	BLR-CX with 10 relay outputs
BLR-CX12R:	BLR-CX with 12 relay outputs
BLR-CX14R:	BLR-CX with 14 relay outputs
BLR-CX06T:	BLR-CX with 6 transisitor outputs
BLR-CX12T:	BLR-CX with 12 transisitor outputs

Options:

-L:	Pluggable temperature-sensor
-V:	Separate plug for supply voltage Measuring voltage 90-690V
-MB:	RS485 Modbus RTU, USB
-VT	Transparent cover with lock

Accessories:

3USB	Interface kit for retrofitting RS485 Modbus, USB
UMS9	Data cable TTL/USB
3ZWC	Wall mountig bracket

Technical Data

Type of Device:	Reactive power regulator
Control Variable:	Electrical displacement reactive power
Priciple of Regulation:	Gradational regulation with the following modes: - Best-Fit: starting with the biggest suitable capacitor - LIFO: last in-first out - Combifilter: Best-Fit, with more connected reactive power of odd outputs - Progressive: all required outputs are switched in short intervals
Special Features:	- Automatic detection and correction of the phase of current and voltage connection - Automatic detection of the engaged outputs - Automatic detection and adaption of the capacitor ratings - Over- and undervoltage monitoring - Monitoring of THD U - Overtemperature switch-off
Measuring Display:	V, A, kVA, kW, kvar, cosphi, PF, Δkvar, THD U, 3rd to 19th harmonic of voltage
Information Display:	Switch cycles per step, capacitor rating, status of the exits, operating hours of the panel, max.temperature, average PF
Measuring- and Auxiliary Voltage:	90- 550V AC, single phase, 45-65HZ, 5VA, max. fuse 6A, VT ratio from 1,0 to 350,0
Current Measuring:	15mA -6A, single phase, burden 20mOhm, CT ratio from 1 to 9600
Control Outputs:	Up to 14 relay, N/O, voltfree with common point, max. fuse 6A, breaking capacity: 250V AC / 5A, 400V AC / 2A
Temperature measuring:	By NTC
Sign-Of-Life contact:	Relay, voltfree, N/O, max. fuse 4A, breaking capacity: 250V AC / 5A, 400V AC / 2A
Fan Control:	By using a control output
Interface:	TTL, rear
Ambient Temperature:	Operation: -20°C - 70°C, storage: -20°C - 85°C
Humidity:	0% - 98%, without moisture condensation
Overvoltage class:	II, pollution degree 3 (DIN VDE 0110, part 1 / IEC60664-1)
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 / IEC 61326-1: 2005) VDE 0843-20-2-2:2006 (DIN EN 61326-2-2:2006 / IEC 61326-2-2: 2005)
Conformity and Listing:	CE cULus PG
Terminals:	Plugable terminal blocks, screw type, max. 4qmm
Casing:	Front: instrument casing plastic (UL94-VO), Rear: metal
Protection Class:	Front: IP50, (IP54 by using a gasket between relay and panel) Rear: IP20
Weight:	approx. 0,6kg
Dimensions:	144x144x58mm hxwxd, cutout 138 (+0,5) x 138 (+0,5)mm

BELUK