2023/24
PRODUCT CATALOGUE

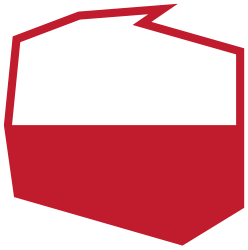
NEW!

- **LKD PRO dynamic compensators,** p. 4-5
- **LKO lighting compensator,** p. 9-11
- **LRM 002/0 power factor controller for LED lighting,** s. 20

REACTIVE POWER COMPENSATION

VOLTAGE CONDITIONING

QUALITY OF ELECTRIC ENERGY



produkt
polski

For over a quarter of a century, we have been supporting entrepreneurs, by designing and **implementing comprehensive technological solutions** in the area of reactive power compensation.

In planning the implementation of our systems, we choose **Polish intermediates**. Some of them are our own, **original solutions.**

The team of engineers at Lopi constantly aims at ensuring the highest quality of provided services and professionalism.

We are proud of Polish solutions, of our solutions.

Reactive power compensation

The use of a reactive power compensation system enables the reduction of reactive energy charges at the level of 95-100%, increases the service life of devices and machines connected to the power grid and has positively influence on the condition of the power grid, by improving its transmission capacity and extending its life. It translates directly into the optimisation of expenses for the investor. The estimated average return on investment time for the installation of the reactive power compensation system is 6 months.

Proper management of reactive power in the power grid comes down to its compensation to the desired value at the customer's connection point, which enables reducing the flow of reactive power through distribution and transmission networks. In addition to positive technical aspects, effective reactive power compensation allows for significant savings on electricity distribution bills, making the investment in reactive power compensation pay for itself very quickly. The transmission of reactive energy in the network causes drops or increases in network voltage, active power losses in transmission and distribution networks and transformers, and distortions of the voltage waveform.

This catalogue is an overview of valued solutions in the area of dynamic reactive power compensation, active filters and static reactive power compensation as well as of the related components offered by the Lopi Group.

Contents

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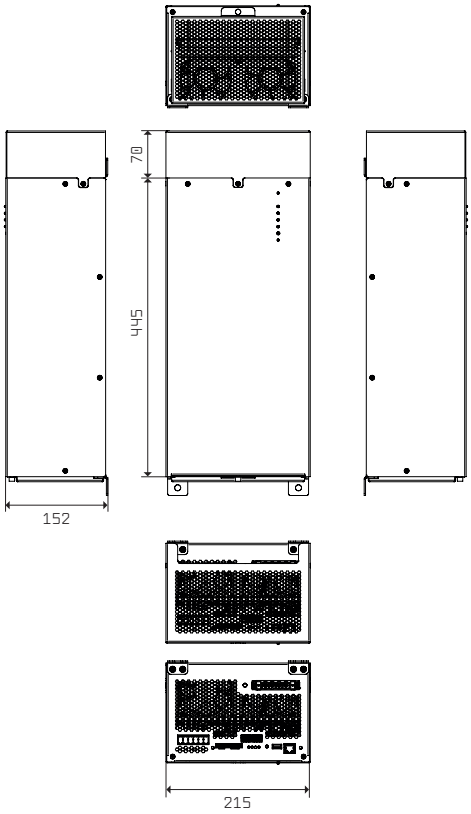
LKD dynamic compensators

LKD PRO is family of the improved dynamic LKD compensators designed for inductive and capacitive reactive power compensation with an additional distortion power compensation function, which is a response to the current power quality needs. The presented solution gives the possibility of low-loss reactive power compensation, and through the appropriate selection of options, it enables the compensation for the selected harmonic component. The compensators have found wide application, for example replacing traditional shunt capacitor banks and raising the standard through filtering higher harmonics. We have achieved a significant reduction in the own losses of the compensation system, and at the same time we have reduced the apparent power, reducing the electricity bills even more.

With the use of a dynamic compensator, we will improve the power quality, active reactive power compensation and load balancing and we will extend the service life of devices connected to the network with a filter. The use of a dynamic compensator is directly associated with a significant reduction in reactive energy charges. Dynamic compensator is a very efficient device, easy to install and operate. With the use of innovative technologies, we managed to minimise the size of the device and place it in a compact housing, which allows it to be installed even in the most demanding places.

LKD 5, LKD 10 and LKD 15 dynamic compensators

NEW



Scope of use

- converter drive systems
- office buildings and warehouses
- hospitals
- light and heavy industry
- server rooms
- UPS energy storage systems
- small and medium enterprises
- LED lighting
- vehicle charging stations

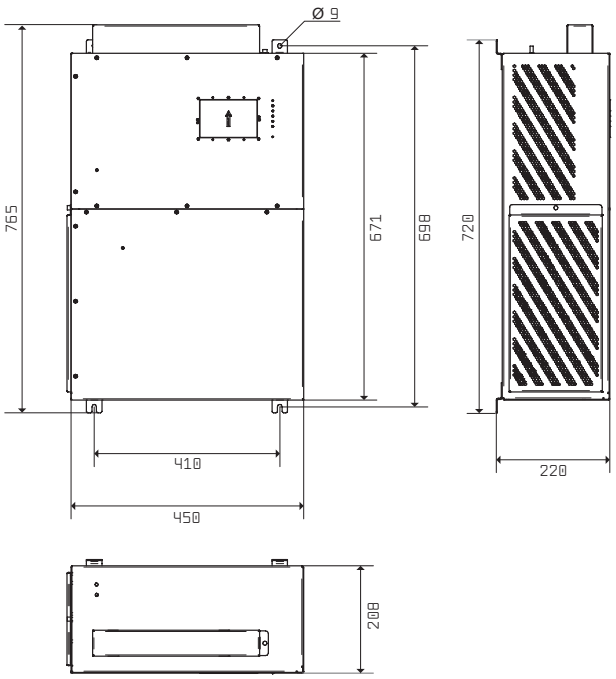
Functions

- infinitely variable indicative / capacitive reactive power compensation
- compensation of higher harmonics up to the 25th one
- load symmetrisation
- generation of set reactive power Q/L
- selective choice of work functions
- low own losses
- visualisation of the operation of the device and the power grid
- possible implementations: wall-mounted / street lighting module
- multiple communication protocols
- easy configuration

Technical data:

Model	LKD 5	LKD 10	LKD 15	LKD 20
compensation power	± 5 kVar	± 10 kVar	± 15 kVar	± 20 kvar
maximum compensation current (RMS)	8 A	16 A	24 A	32 A
working voltage	3x400 VAC +/- 10%	3x400 VAC +/- 10%	3x400 VAC +/- 10%	3x400 VAC +/- 10%
voltage frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
current transformer (CT)	5/5 、600/5	5/5 、2000/5	5/5 、2000/5	5/5 、2000/5
power grid parameters measurement – Digital	≥ 99.5%	≥ 99.5%	≥ 99.5%	≥ 99,5 %
power factor (PF)	from -1 to 1	from -1 to 1	from -1 to 1	from -1 to 1
shift keying frequency	62,5 kHz	62,5 kHz	40 kHz	31,25 kHz
harmonic compensation	up to the 25th one	up to the 25th one	up to the 25th one	up to the 25th one
Load symmetrisation	YES	YES	YES	YES
Technology	MOSFET SiC	MOSFET SiC	MOSFET SiC	MOSFET SiC
Adjustment time	< 20 ms	< 20 ms	< 20 ms	< 20 ms
power grid installation	four-wire	four-wire	four-wire	four-wire
power loss	< 70 W	< 140 W	< 210 W	< 280 W
noise level	< 60 dB	< 60 dB	< 60 dB	< 60 dB
weight	14 kg	17 kg	17 kg	19 kg
degree of protection	IP 20	IP 20	IP 20	IP 20
working temperature	-20 °C +55 °C	-20 °C +55 °C	-20 °C +55 °C	-20 °C...+55 °C
cooling	forced	forced	forced	forced
working altitude m a.s.l.	< 1500	< 1500	< 1500	< 1500
Expandability	parallel connection	parallel connection	parallel connection	parallel connection
communication protocol	WI-Fi, Ethernet, RS485	WI-Fi, Ethernet, RS485	WI-Fi, Ethernet, RS485	WiFi, Ethernet, RS485
HMI display	Modbus (RTU), SMNP, CAN	Modbus (RTU), SMNP, CAN	Modbus (RTU), SMNP, CAN	Modbus (RTU), SMNP, CAN

LKD 25 dynamic compensator



Scope of use

- converter drive systems
- office buildings and warehouses
- hospitals
- light and heavy industry
- server rooms
- UPS energy storage systems
- small and medium enterprises
- LED lighting

Functions

- infinitely variable indicative / capacitive reactive power compensation
- compensation of higher harmonics up to the 25th one
- load symmetrisation
- generation of set reactive power Q/L
- selective choice of work functions
- low own losses
- visualisation of the operation of the device and the power grid
- possible implementations: wall

Technical data:

Model	**LKD 25**
compensation power	± 25 kVar
maximum compensation current (RMS)	40 A
maximum compensation current (Peak)	72 A
working voltage	3 x 400 V AC +/- 10%
voltage frequency	50/60 Hz
current transformer (CT)	5/5 、3000/5
compensation effectiveness	≥ 99.5%
power factor (PF)	from -1 to 1
operating frequency	32 kHz
harmonic compensation	up to the 49th one
transistor technology	SiC
response time	option
power grid installation	100 ms
power loss	20 ms
power grid installation	four-wire
power loss	< 300 W
noise level	< 65 dB
weight	30 kg
degree of protection	IP 20
working temperature	-20 °C...+50 °C
cooling	forced
working altitude m a.s.l.	< 1500
communication	up to 100 kVar
communication protocol	RS 485, LAN
HMI display	Modbus (RTU)
HMI display	yes

FUNCTIONALITY

Lopi products are distinguished by high usability and efficiency confirmed by tests.

ORDER ONLINE

LKO lighting compensator

The LKO lighting compensator is designed to compensate for capacitive reactive energy in energy-saving LED lighting circuits.

Compact size allow the LKO lighting compensator to be installed in street lighting cabinets.

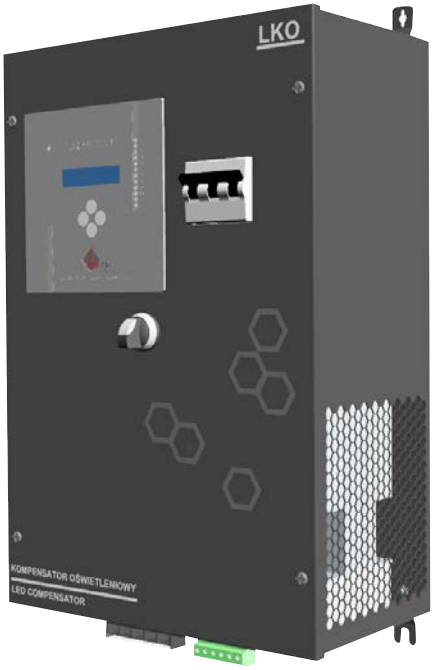
LKO are manufactured in versions for operation in single-phase and three-phase installations. The compensator has up to six automatic adjustment levels.

The maximum power of a single-phase compensator is up to 1.0 kVar.
The maximum power of three-phase compensator is up to 3 kVar.

LKO compensators can also be used to compensate for capacitive reactive energy in three-phase installations, where changes in reactive power are small and the maximum power does not exceed 3 kVar.

LKO lighting compensator

NEW



Scope of use

- compensation of capacitive reactive power in lighting circuits in single-phase and three-phase installations
- option of mounting in street lighting cabinets
- possible use in other installations with low variability of capacitive reactive power
- devices can be designed and adapted to specific circuits

Functions

- automatic reactive power compensation based on the LRM001 or LRM002 regulator
- compact size
- simple design based on a reactive compensating element
- excellent price/performance ratio
- possibility of using single-phase modules in three-phase applications
- possibility of remote reading and supervision

Technical data:

Model	LKO 1F	LKO 3F
compensator power	0.1-1.0 kVar	0.3-3 kVar
number of adjustment levels	up to 6	up to 3
regulation type	multi-level	multi-level
range of power levels	40 – 100%	40 – 100%
rated voltage	230 V	400 V
frequency	50 Hz	50 Hz
ambient temperature	-25 °C... 55 °C	-25 °C... 55 °C
degree of protection	IP20*	IP20 *
ventilation	passive or forced*	passive or forced*
housing	200 x 350 x 190*	300 x 450 x 190
current measurement	number of inputs: 1	number of inputs: 3
	input type: current transformer	input type: current transformer
	rated current [In]: 5 A	rated current [In]: 5 A
	measurement range: (0.005.1..2) In	measurement range: (0.005.1..2) In
	rating of the current circuit: < 0.5 VA	rating of the current circuit: < 0.5 VA
	measurement accuracy: 1% In	measurement accuracy: 1% In
communication	channel type: RS485 parameters: 9600, n, 8, 1 protocol: MODBUS RTU	channel type: RS485 parameters: 9600, n, 8, 1 protocol: MODBUS RTU

*possibility of configuration changes

Selected configurations:

Model LKO 1F	Model LKO 3F
	3,0/2,5/2,0
1,0/0,8/0,6/0,4	2/1,5/1
1,0/0,75/0,5	1,75/1,5/1,25
0,8/0,6/0,4	1,0/0,75/0,5

The power and number of power levels of the LKO compensators can be selected individually to the needs.

QUALITY

We measure, analyse and specify the needs of the facility.

ORDER ONLINE

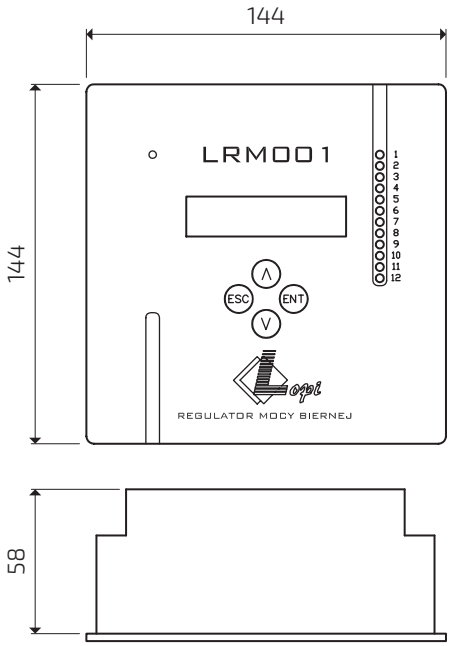
Power factor controllers

Friendly and functional software even for the most demanding users.

Lopi microprocessor reactive power factor controller are the result of the work and experience of Lopi engineers and a response to current market needs. The regulator with effective algorithms ensures optimum operation of the reactive power compensation system, and thus effective minimisation of reactive energy costs. Power factor controllers are used to control capacitor banks and shunt reactor banks within the reactive power compensation processes. This process consists in measuring the power grid parameters, and then, by using thyristor switches or contactors, switching on the appropriate element of the compensation system in order to ensure the set cosφ. Lopi power factor controllers have a wide range of applications, as they are designed to work in both inductive and capacitive automatic reactive power compensation systems. The device is available in 6- and 12-level versions with measurement of power grid parameters in one or three phases. This enables optimum adjustment – depending on the number of stages, design power of the bank and balance load.

LRM001 power factor controller

Control of stages of single- and three-phase capacitors and shunts in one controller



Scope of use

- inductive reactive power compensation: compatible with capacitive stages
- capacitive reactive power compensation – compatible with inductive stages
- reactive power compensation in the case of its variable capacitive and inductive character
- compensation in power grids with balanced and unbalanced loads – single- or three-phase measurement and control of single- and/or three-phase elements
- operation in the 4 quadrants

Functions

- displaying **cosφ** and **Power Factor** values
- **idle compensation** function
- **reactive power offset function**
- **even stage consumption algorithm**
- ability to freely program the type and power of individual outputs (no ranges imposed)
- **fast algorithms** for reaching the given cosφ factor
- **individually adjustable stage discharge** (lock) times
- ability to **control the ventilation** of the housing based on the temperature measurement and the set hysteresis
- **disconnection of stages** in case of exceeding the set threshold temperature
- ability of **remote readout**

Technical data:

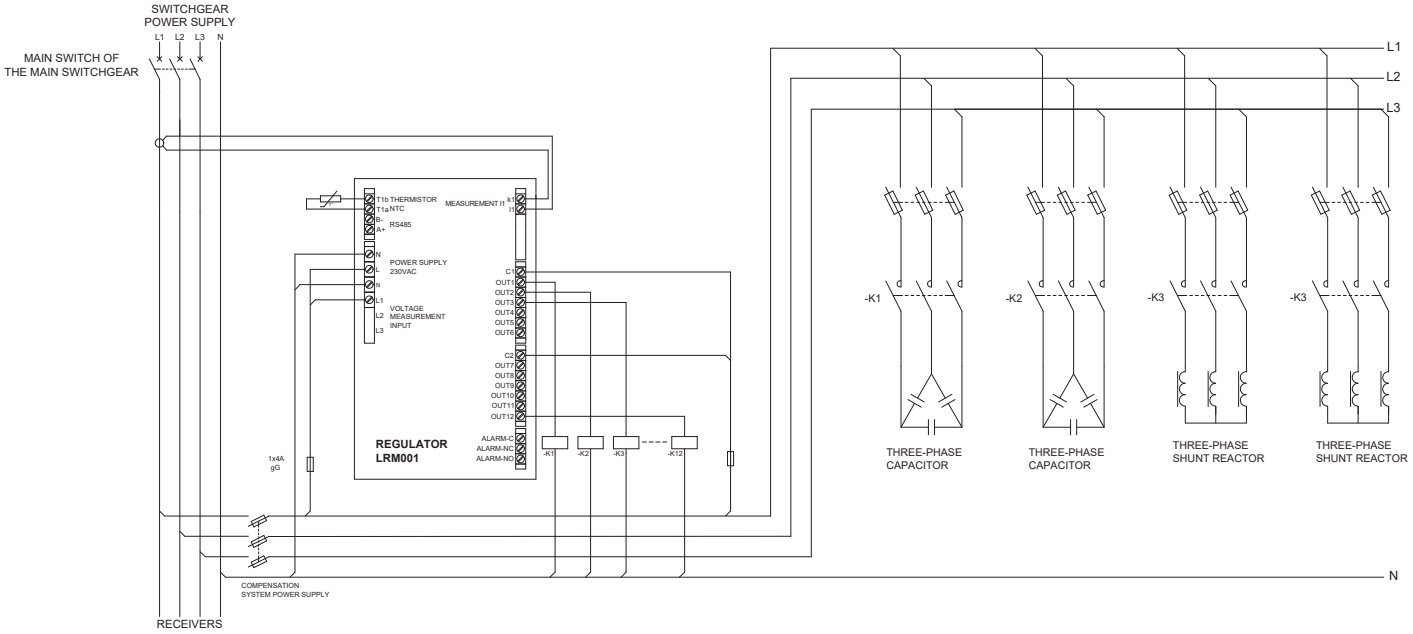
	Parameter	Value
power supply	Voltage	230 V-±10% 0..50 Hz
	Power consumption	< 10 VA
voltage measurement	Measurement input	L1-L2-L3-N
	Rated voltage	230 V
	Measurement range	10..260 V
	Frequency	50 Hz
	Measurement accuracy	1% Un
current measurement	Number of inputs	3
	Input type	current transformer
	Rated current [In]	5 A
	Measurement range	(0.005..1.2) In
	Rating of the current circuit	< 0.5 VA
	Measurement accuracy	1% In
analysis of harmonics		up to the 15th one
temperature measurement	Range	-40 °C..80 °C
	Accuracy	±1 °C
outputs	Stage control outputs	12 relay outputs 250 Vac/5 A
	Alarm outputs	relay 250 Vac/5 A NO/NC
	Actuators	single/three-phase compensating capacitor or shunt
front panel	Display	2x16 characters LCD
	Buttons	4
	Signalling of connected stages	LEDs
environmental conditions	Ambient temperature	-20 °C +60 °C
	Relative humidity	50% for +40 °C, 90% for 60 °C
mechanics	Dimensions	144 x 144 x 70 mm
	Weight	0.9 kg
	Mounting	panel
	Degree of protection	IP54 front/ IP20 rear
	Clamps	Screw clamps for wires with diameter of max. 1.5/2.5 mm2
time parameters	Switch-on time	1..300 s
	Switch-off time	1..300 s
	Overcompensation switch-off time	1..300 s
communication	Channel type	RS485
	Parameters	9600, n, 8, 1
	Protocol	MODBUS RTU

Accessories

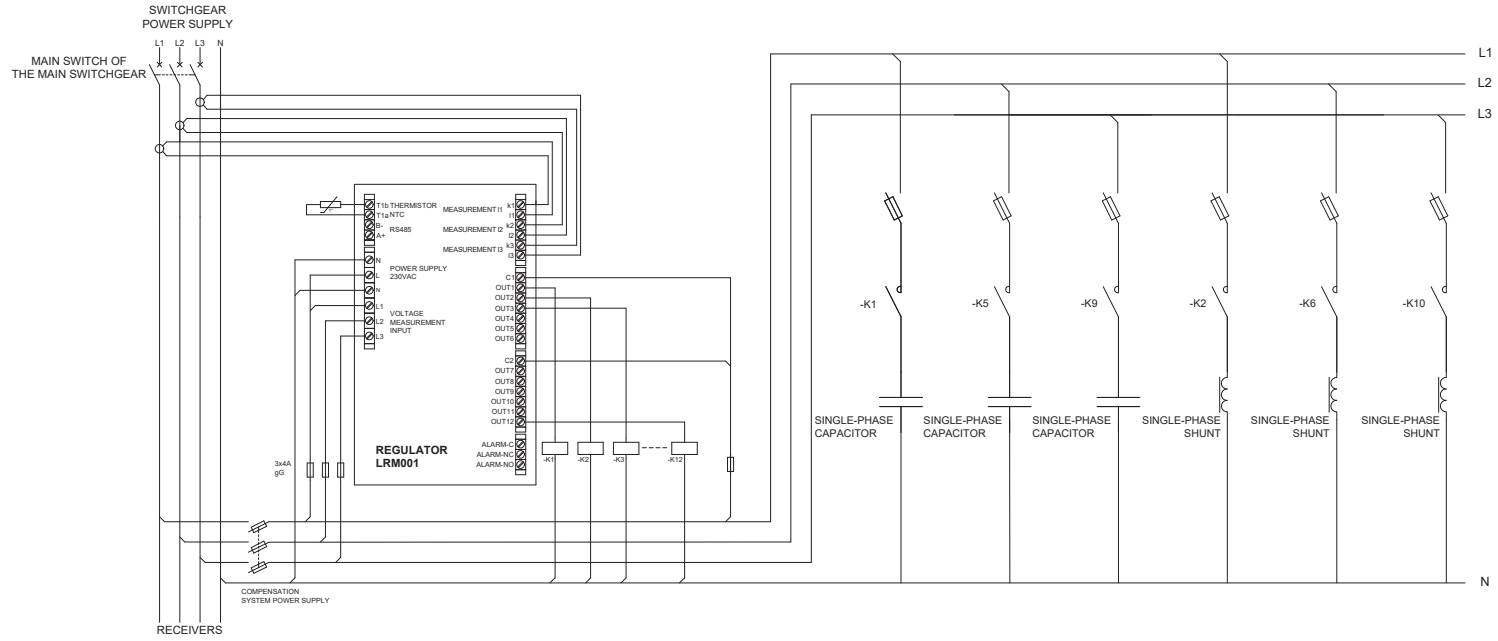
- LRM4I0 expansion module – p. 46

Configurations of connections of the LRM001 power factor controller – examples

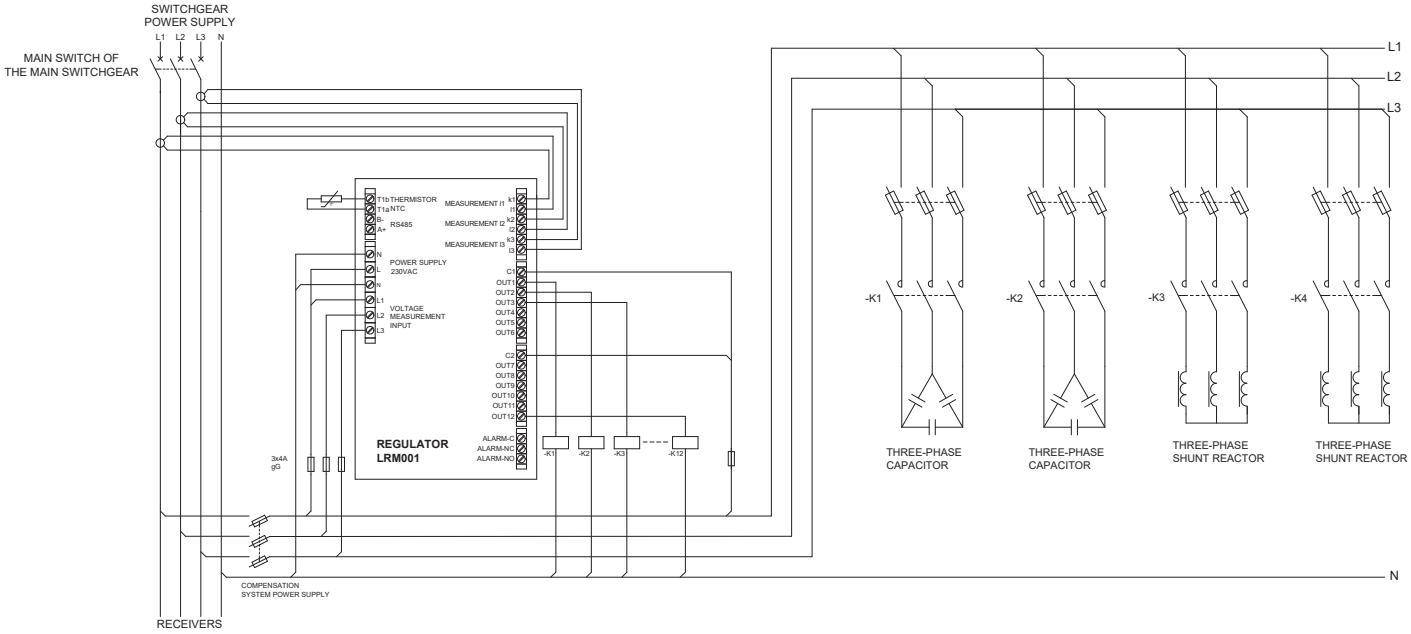
Example connection configuration of the LRM001 power factor controller for operating mode 1F, control of 3F blocks



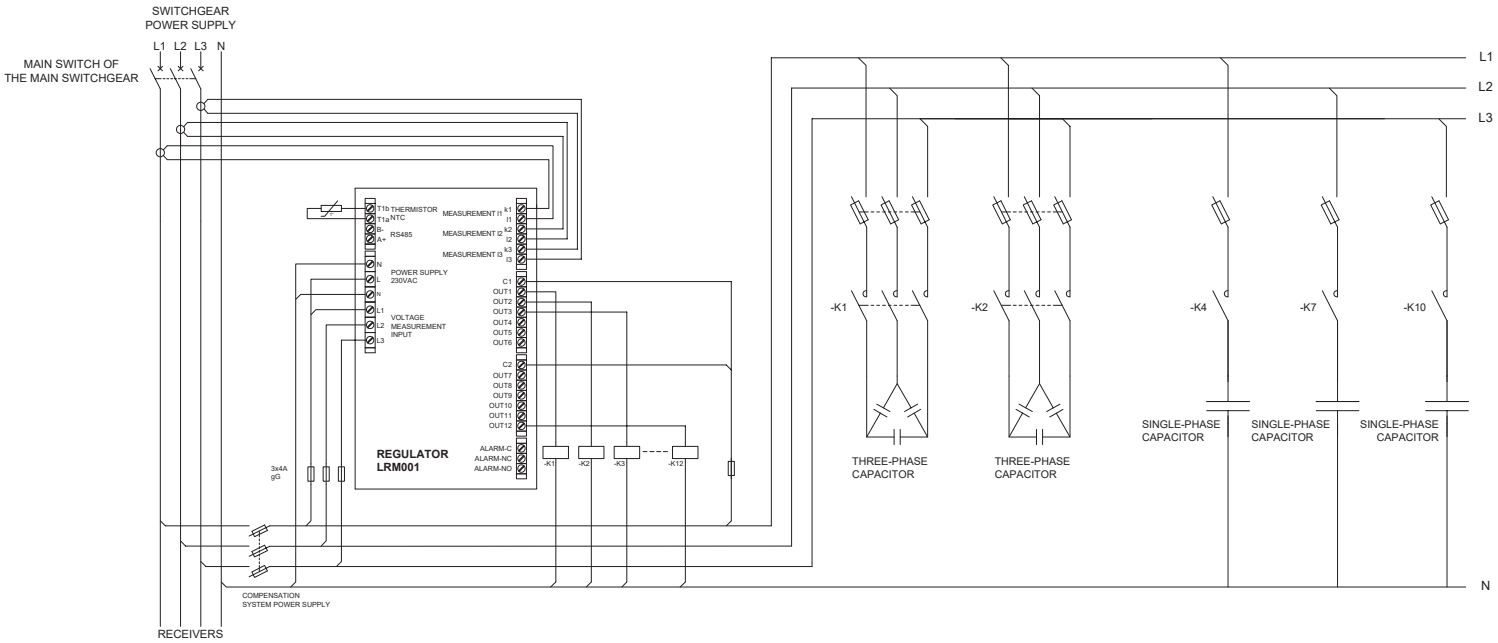
Example connection configuration of the LRM001 power factor controller for operating mode 1F, control of 1F blocks



Example connection configuration of the LRM001 power factor controller for operating mode 3F, control of 3F blocks

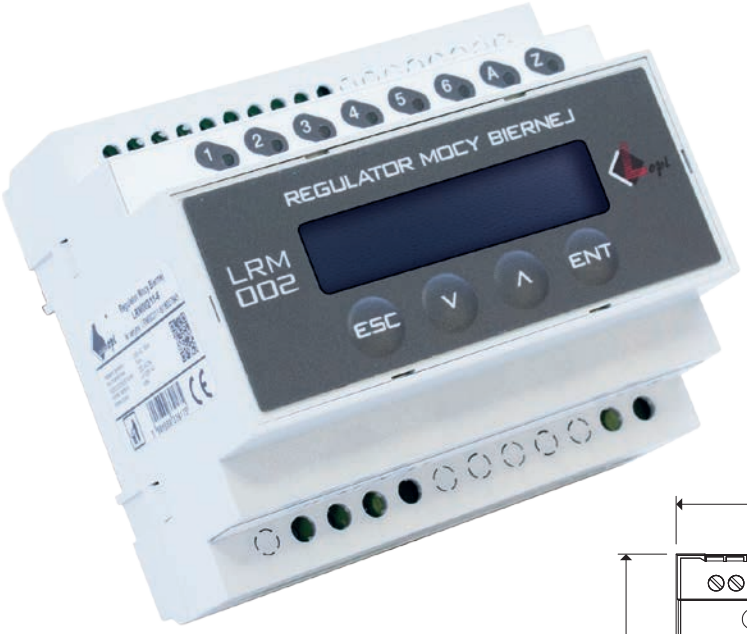


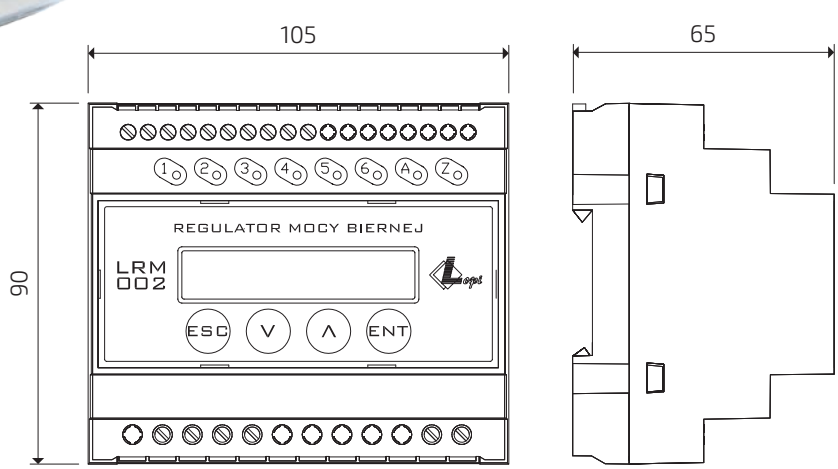
Example connection configuration of the LRM001 power factor controller for the operating mode 3F, MIX control



LRM002 power factor controller

Control of stages of three-phase capacitors and shunts





Scope of use

- inductive reactive power compensation: compatible with capacitive stages
- capacitive reactive power compensation – compatible with inductive stages
- reactive power compensation in the case of its variable capacitive and inductive character
- compensation in power grids with balanced loads – single-phase measurement, control of three-phase elements

Functions

- displaying **cosφ** and Power **Factor values**
- **idle compensation** function
- **reactive power offset function**
- ability to **freely program the type and power of individual outputs** (no ranges imposed)
- fast algorithms for reaching the given cosφ factor
- individually adjustable stage discharge (lock) times

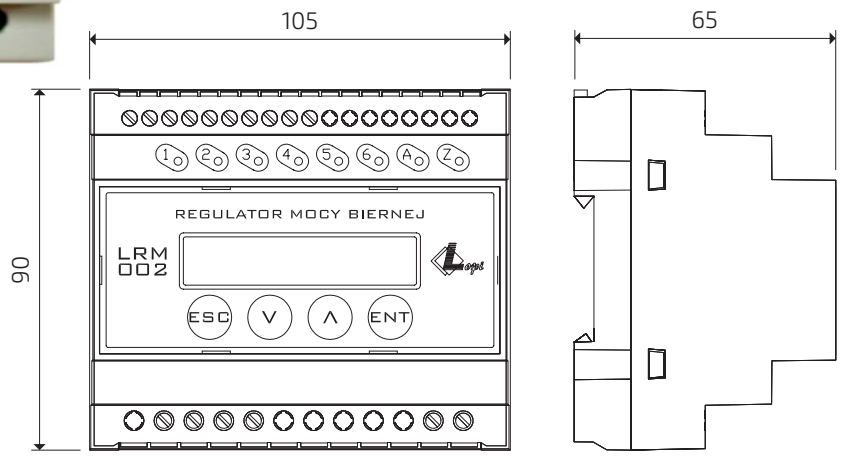
Technical data:

	Parameter	Value
power supply	Voltage	230 V-±10% 0..50 Hz
	Power consumption	< 3 VA
voltage measurement	Measurement input	L-N
	Rated voltage	230 V
	Measurement range	10..260 V
	Frequency	50 Hz
	Measurement accuracy	1% Un
current measurement	Number of inputs	1
	Input type	current transformer
	Rated current [In]	5 A
	Measurement range	(0.005..1.2) In
	Rating of the current circuit	< 0.5 VA
	Measurement accuracy	1% In
analysis of harmonics		up to the 15th one
outputs	Stage control outputs	6 relay outputs 250 Vac/5 A
	Alarm outputs	relay 250 Vac/5 A NO/NC
	Actuators	three-phase compensating capacitor or shunt
front panel	Display	2x16 characters LCD
	Buttons	4
	Signalling of connected stages	LEDs
environmental conditions	Ambient temperature	-20 °C +60 °C
	Relative humidity	50% for +40 °C, 90% for 60 °C
mechanics	Dimensions	105 x 90 x 65 mm
	Weight	0.3 kg
	Mounting	TH35 rail
	Degree of protection	IP20
	Clamps	Screw clamps for wires with diameter of max. 2.5 mm^2
time parameters	Switch-on time	1..300 s
	Switch-off time	1..300 s
	Overcompensation switch-off time	1..300 s

LRM002/0 power factor controller

Optimised for LED lighting compensation

NEW



Scope of use

- capacitive reactive power compensation in LED lighting circuits
- option of mounting in street lighting cabinets
- other installations with low variability of capacitive reactive power

Functions

- **direct connection of the taps of a single-phase shunt reactor without the need to use contactors**
- **other functionalities of the standard LRM002**
- displaying the cosϕ coefficient, Power Factor and grid parameters
- reactive power offset function
- fast algorithms for reaching the given cosφ coefficient

Technical data:

	Parameter	Value
power supply	Voltage	230 V-±10% 0..50 Hz
	Power consumption	< 3 VA
voltage measurement	Measurement input	L-N
	Rated voltage	230 V
	Measurement range	10..260 V
	Frequency	50 Hz
	Measurement accuracy	1% Un
current measurement	Number of inputs	1
	Input type	current transformer
	Rated current [In]	5 A
	Measurement range	(0.005..1.2) In
	Rating of the current circuit	< 0.5 VA
	Measurement accuracy	1% In
analysis of harmonics		up to the 15th one
outputs	Stage control outputs	4 relay outputs 250 VAC/16 A (750 Var/230 VAC)
	Alarm outputs	relay 250 Vac/5 A NO/NC
	Actuators	three-phase compensating capacitor or shunt
front panel	Display	2x16 characters LCD
	Buttons	4
	Signalling of connected stages	LEDs
environmental conditions	Ambient temperature	-20 °C +60 °C
	Relative humidity	50% for +40 °C, 90% for 60 °C
mechanics	Dimensions	105 x 90 x 65 mm
	Weight	0.3 kg
	Mounting	TH35 rail
	Degree of protection	IP20
	Clamps	Screw clamps for wires with diameter of max. 2.5 mm^2
time parameters	Switch-on time	1..300 s
	Switch-off time	1..300 s
	Overcompensation switch-off time	1..300 s

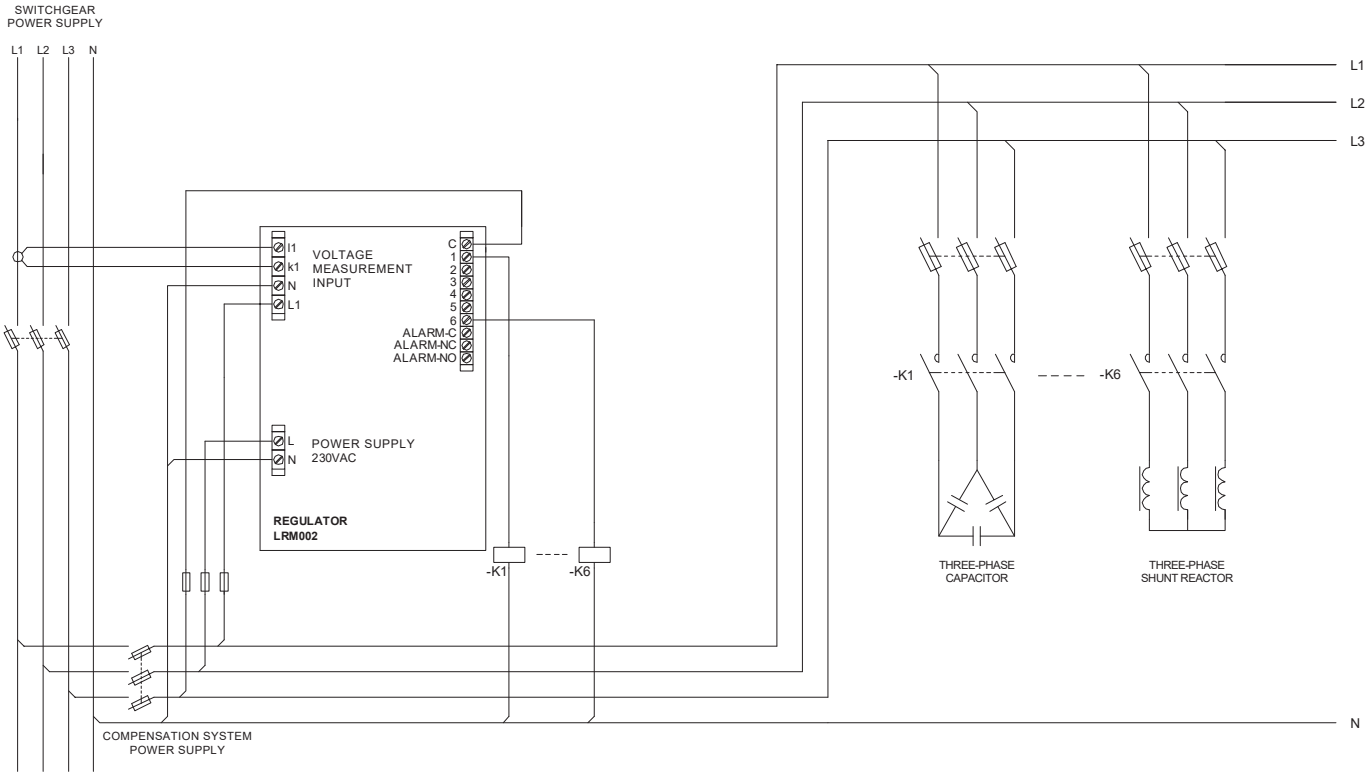
Description

The controller uses four reinforced relays with a higher rated current and a control algorithm for switching on the taps of a single-phase shunt reactor has been introduced.

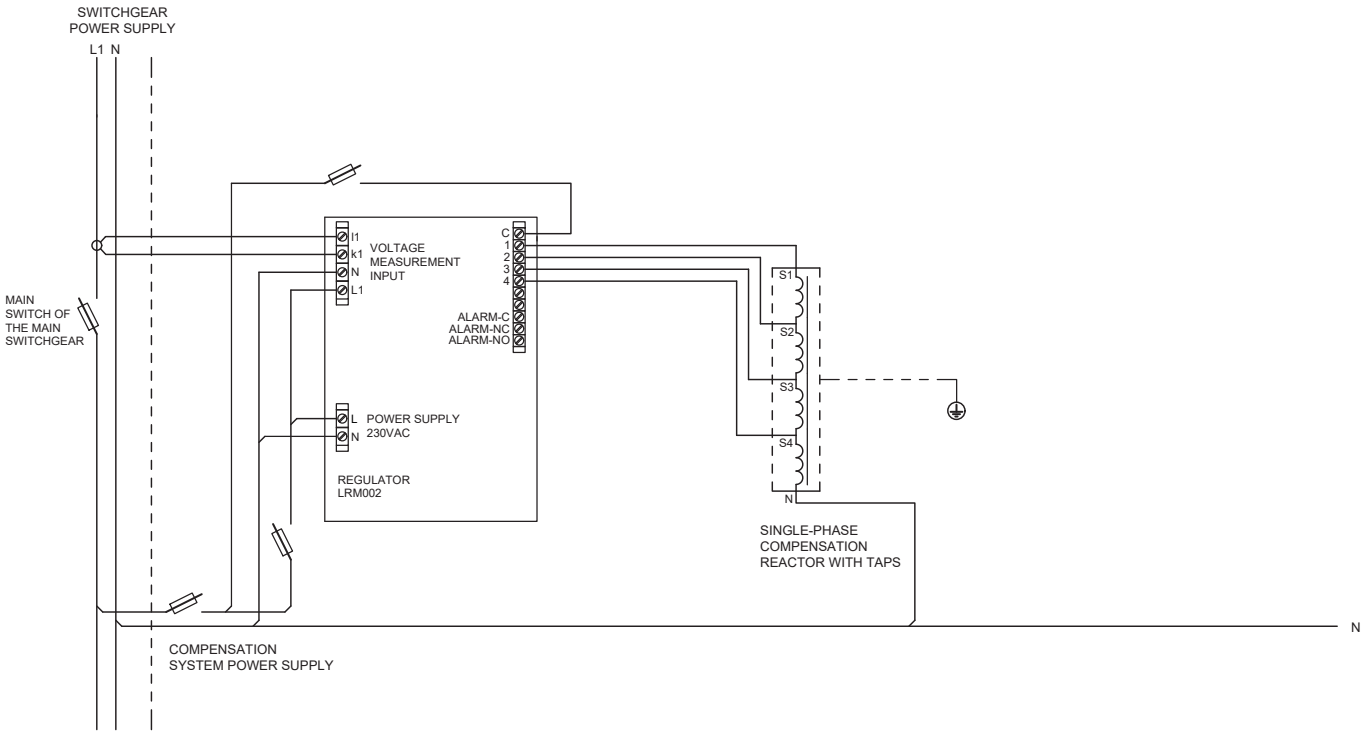
The use of LRM002/0 allows direct switching of the reactor with taps with a power of up to 750 Var/230 V without the need to use contactors. This allows for the construction of economical automatic compensation systems, which are ideal for street lighting compensation. Despite the additional features introduced, a LRM002/0 controller can still be used like a standard LRM002.

Configurations of connection of the LRM002 power factor controller and table of controller types

Example connection configuration of the LRM002 power factor controller



Example connection configuration of the LRM002/O power factor controller



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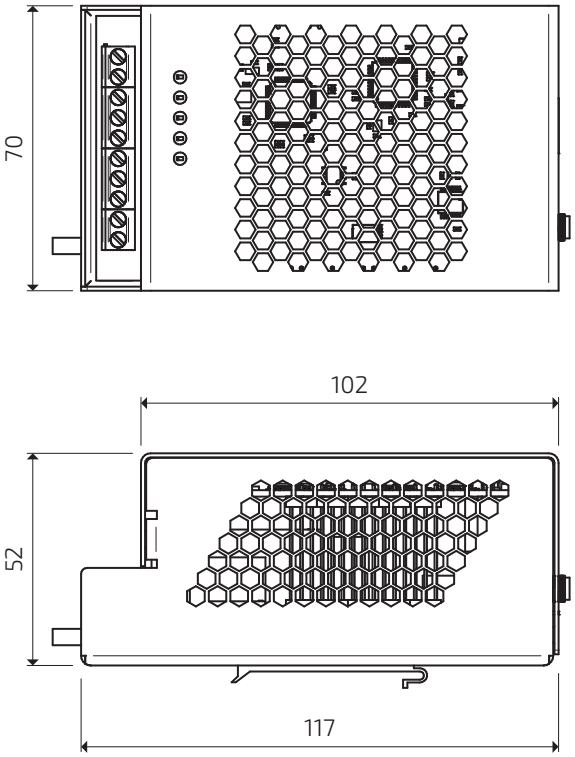
Remote communication

Remote communication is based on cooperation between the LRMCtrl modem with the LRMnet portal. The modem sends power parameters, inter alia current, voltage and power, measured by the LRM001 reactive power regulator to the server; and the LRMnet portal makes it possible to view and analyse these data.

The user of the LRMnet portal can directly view the compensation system operation data, including: active power, reactive power, power of the connected stages, voltages, currents and calculated tgφ. These data are presented transparently and parameters can be set freely in the selected period. The portal makes it possible to control the number of relay output activations on an ongoing basis and to operate the compensation system on a daily, weekly or monthly basis. The user does not need to install any additional software on the computer to use the portal, because the access to measurement data is possible from anywhere with a web browser. Ongoing monitoring of the ongoing changes allows for remote control over the correct operation of the compensation systems by the Lopi technical support team. This enables a quick response and avoiding possible charges for reactive energy.

GSM LRMCtrl modem

Communication of reactive power compensation devices with the server



Scope of use

- communication of the reactive power controller LRM001 with the LRMnet portal

Functions

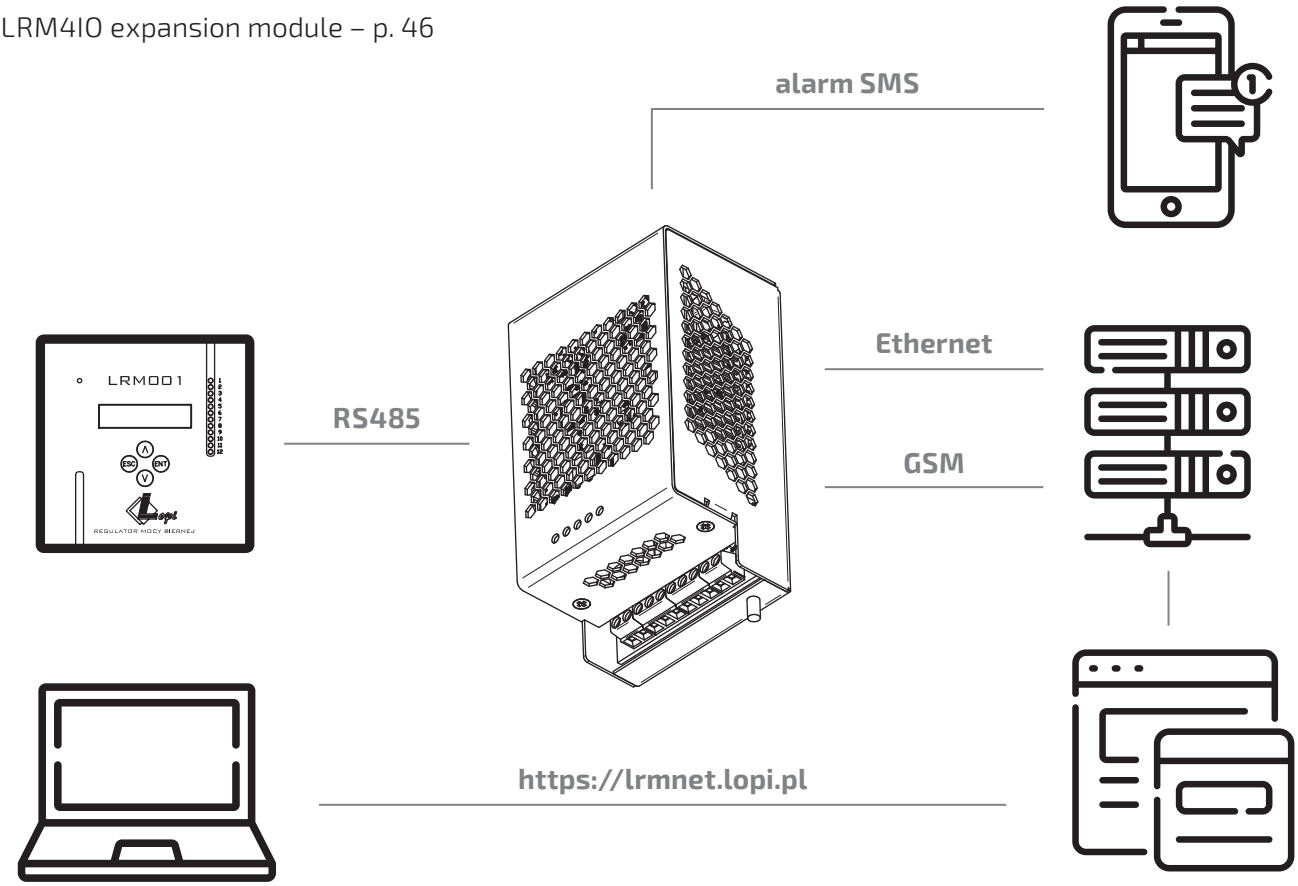
- ordered **power guard**
- **communication with the** LRM001 regulator **via RS485, MODBUS protocol**
- **data transmission via a GSM modem or an Ethernet link** connected to a router with Internet access
- **sending alarm SMS** to max. 4 numbers when the set tg φ and the set capacitive energy are exceeded
- **analysis of tg φ and capacitive energy meter** in a given period
- **automatic communication with the server**

Technical data:

Parameter	Value
supply voltage	230 V AC ± 10%, 50 Hz
power consumption	up to 4 VA
ambient temperature	-20 °C...+60 °C
relative humidity	50% for +40 °C, 90% for 60 °C
degree of protection	IP20
weight	0.3 kg
dimensions	117 × 70 × 52 mm
installation	TH35 rail
clamps	up to 1.5 mm2
alarm	SMS alarms / portal alarming alarm contact - 2 × relay output 250 V/5 A NO/NC
frequency	50 Hz
communication with the device	RS485 Modbus/RTU
communication with the server	Ethernet (RJ45), GSM
communication and configuration with PC	RS232

Accessories

- LRM4IO expansion module – p. 46



LRMnet portal

Remote communication

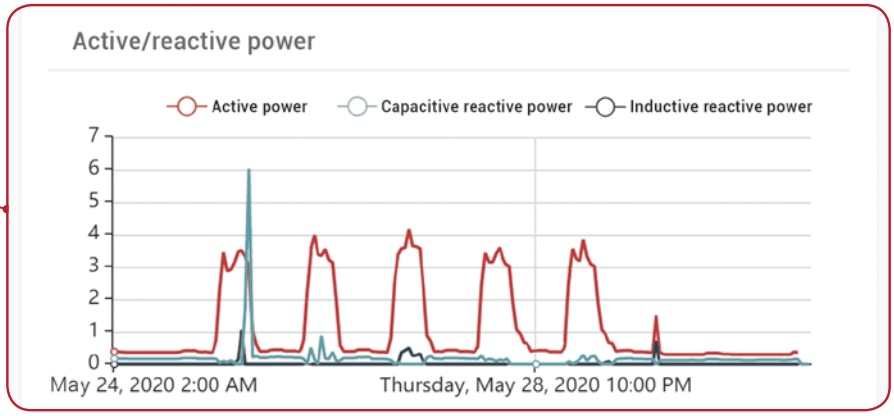
Scope of use

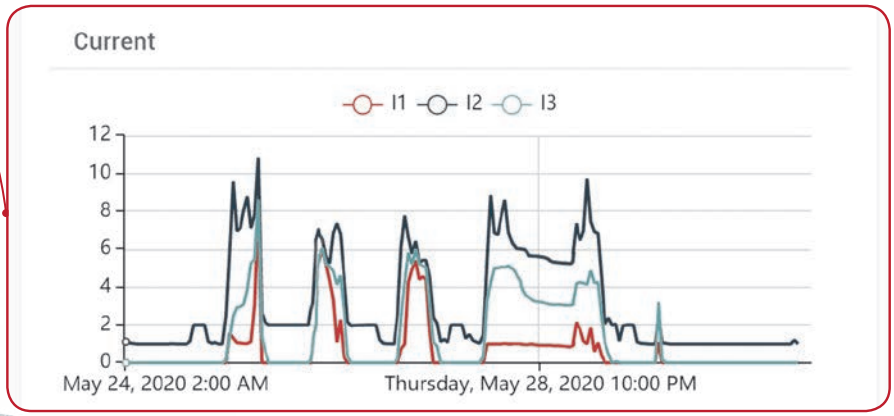
- preview and analysis of data sent from LRM001 reactive power regulators with the LRMCtrl modem

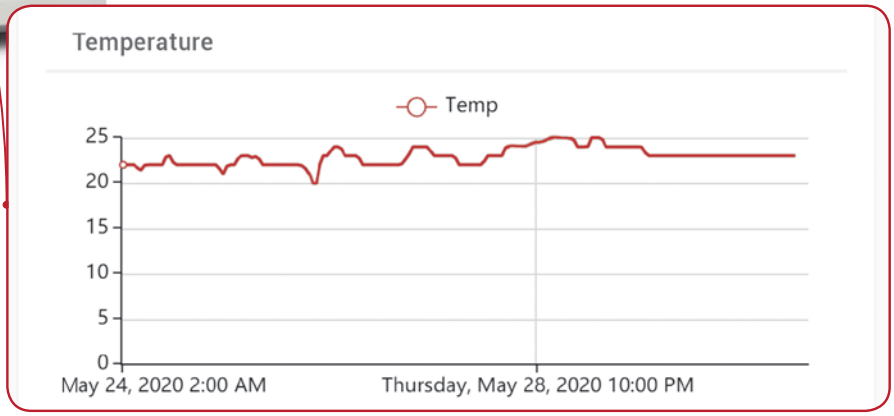
Functions

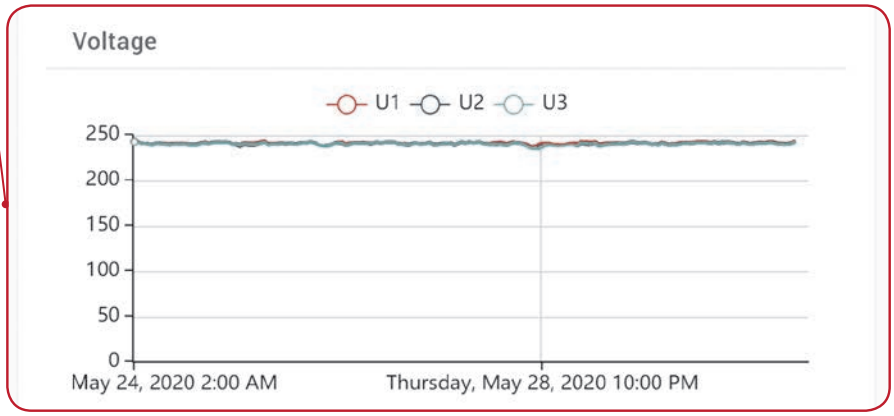
- ordered power guard
- live view of measurement data
- remote control of the compensation system by Lopi technical support
- capability of rapid response to failures
- clear menus and pivot charts
- view and optimization of electricity consumption
- export of data to an .xls file

Portal design





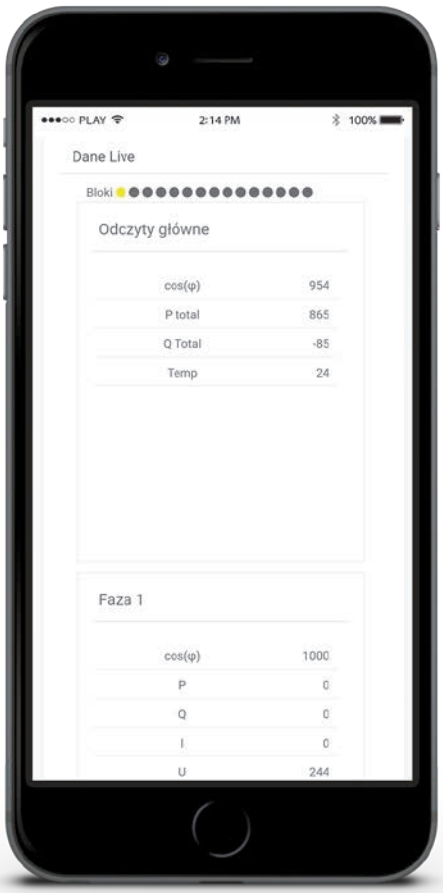




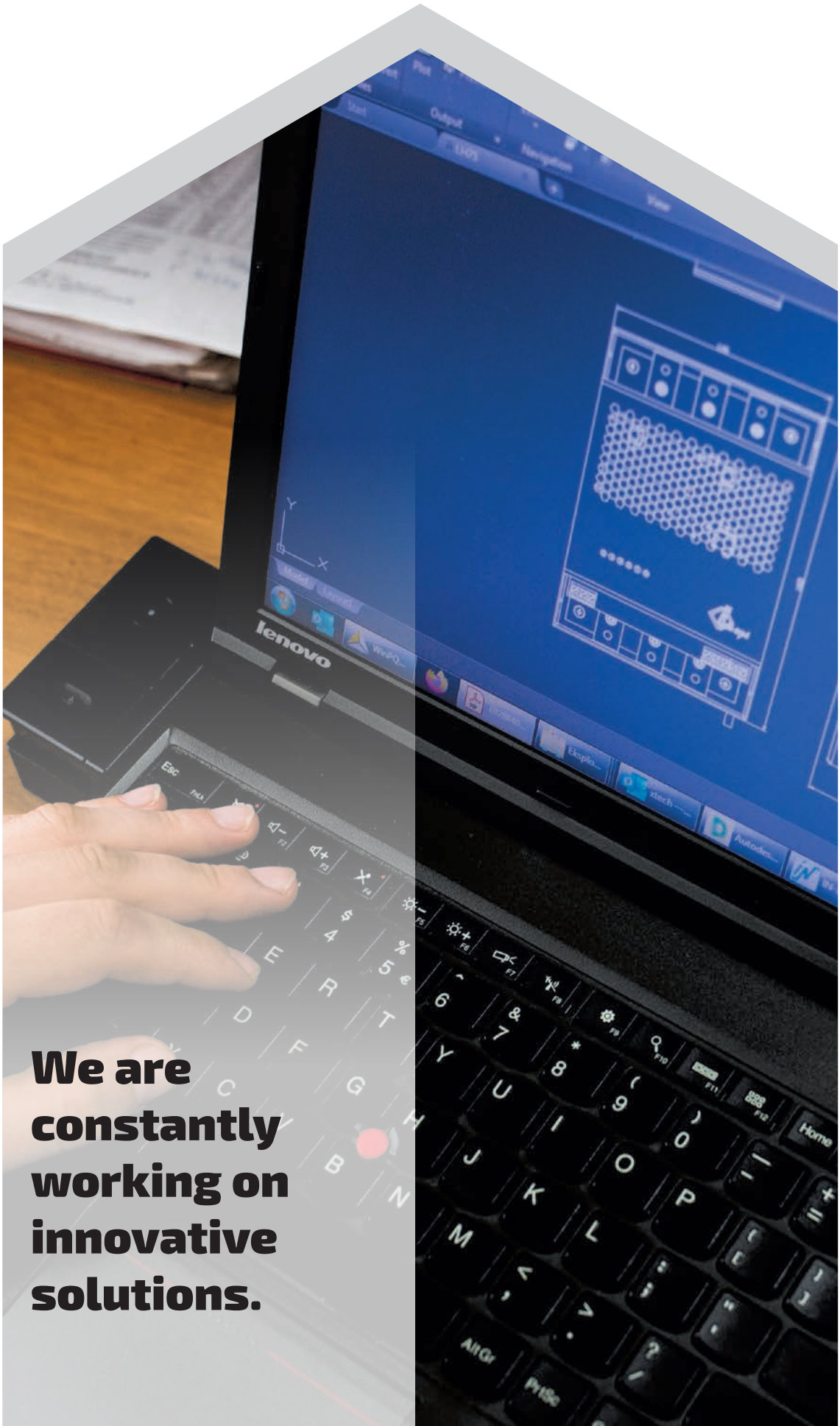
The LRMCtrl device transmits data to the portal and can send SMS alerts to up to 4 phone numbers.

The data are collected and visualised in real time

The portal's responsive interface enables tracking online the readouts from any mobile device.



TECHNOLOGY



We are constantly working on innovative solutions.

ORDER ONLINE

Automatic capacitor banks

The (S)BKL-M and (S)BKL-D capacitor banks are designed for compensation of inductive reactive power in LV networks, assuming even phase load and low content of higher harmonics. They are most often used in production plants with a large number of direct-powered motors.

The (S)BKL-MHr and (S)BKL-DHr capacitor banks are designed for compensation of inductive reactive power in three-phase LV networks containing higher harmonics, assuming even phase load. They are usually used in industrial plants, in which non-linear receivers, for example frequency converters and DC drives, constitute a significant share, as well as in larger office and commercial facilities. The use of properly selected protective shunt reactors prevents the appearance of resonance phenomena and permanent overloading of capacitors with currents of higher harmonics.

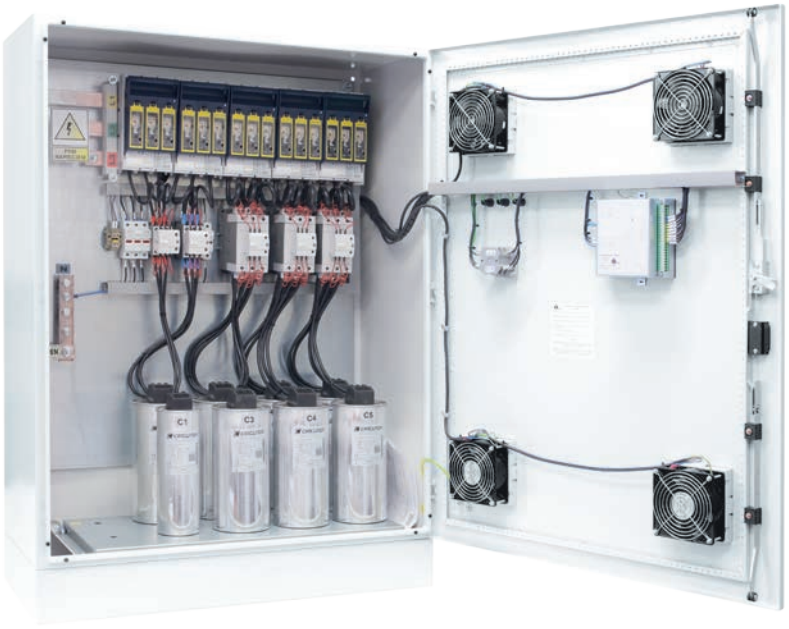
The bank usually consists of a few of / several stages. The electronic reactive power regulator measures the inductive load and connects the appropriate capacitor stages with different powers to follow the changes in the inductive load as efficiently as possible.

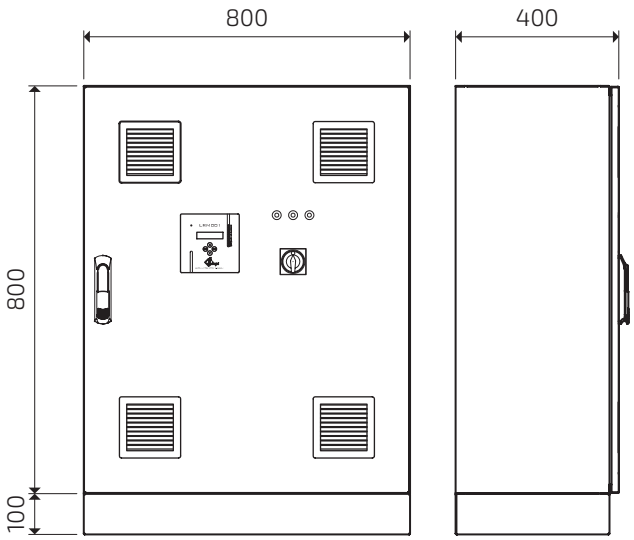
The device is designed for both indoor and outdoor installation, it can operate without interference in the temperature range -25 °C...40 °C.

A properly selected capacitor bank effectively minimises charges for inductive reactive energy.

(S)BKL-M and (S)BKL-D capacitor banks without protective shunts

Compensation of inductive reactive power in LV networks





Scope of use

- compensation of inductive reactive power in LV networks, assuming even phase load and low content of higher harmonics
- production plants with a large number of direct-drive motors

Functions

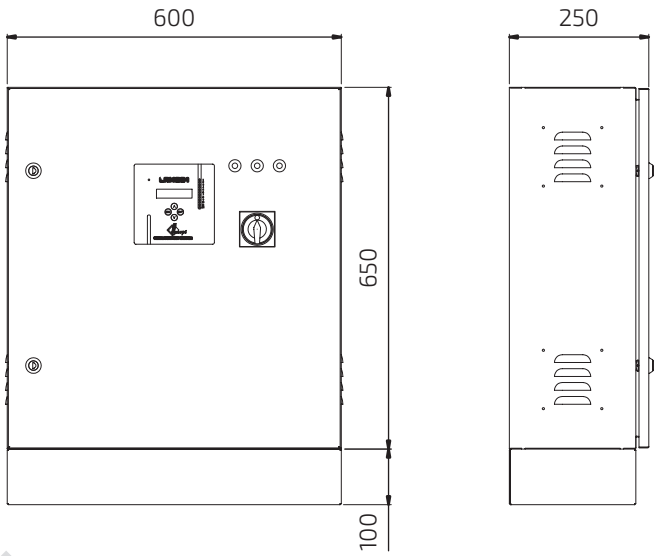
- **reduction of energy losses** in the power grid
- **reduction of active energy consumption** by reducing active power loss
- automatic adjustment to **the momentary consumption of reactive energy**
- switching on of **capacitor stages** by the regulator **with appropriate power values**
- CO_2 **reduction**
- **minimising charges** for inductive reactive energy

Technical data:

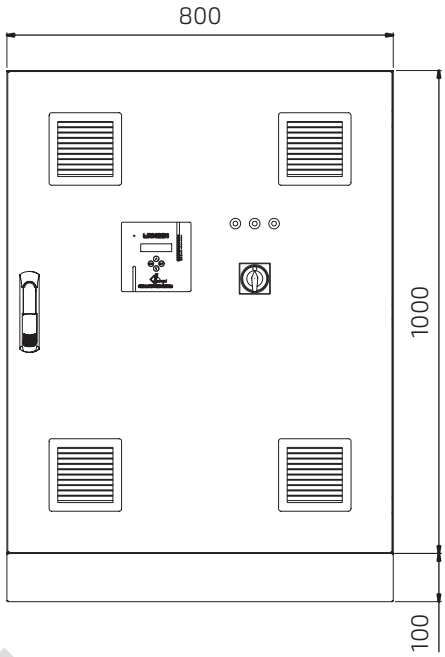
parameter	value
bank capacity	from 7.5 kVar to 600 kVar
rated voltage	400 V, 525 V, 690 V
frequency	50 Hz
ambient temperature	-25 °C...40 °C
capacitor bank housing	
housing	metal
colour	RAL 7035
degree of protection	IP20 ÷ IP66
plinth	100 mm
ventilation	for power above 60 kVar, a forced ventilation system with a temperature controller
dimensions depending on power width\height\depth [mm]:	600 \ 650 \ 250
	800 \ 1000 \ 400
	1000 \ 1000 \ 400
	800 \ 1000 \ 400 + 800 \ 1000 \ 400
	800 \ 1000 \ 400 + 1000 \ 1000 \ 400
component parts	
reactive power regulator	LRM001 – panel version, door mounting
	LRM002 – mounting inside the housing
dry capacitors in a cylindrical housing	low losses, not exceeding 0.4 W/kVar
	high-performance self-healing polypropylene film
	overpressure protection applied
optional	
reactive power regulator	any regulator type
thyristor switches	switching the capacitors on with thyristors response time and blocking time before next switching on from 1 s
housing	any size and material

Possible types of (S)BKL-M and (S)BKL-D capacitor banks without protective shunts

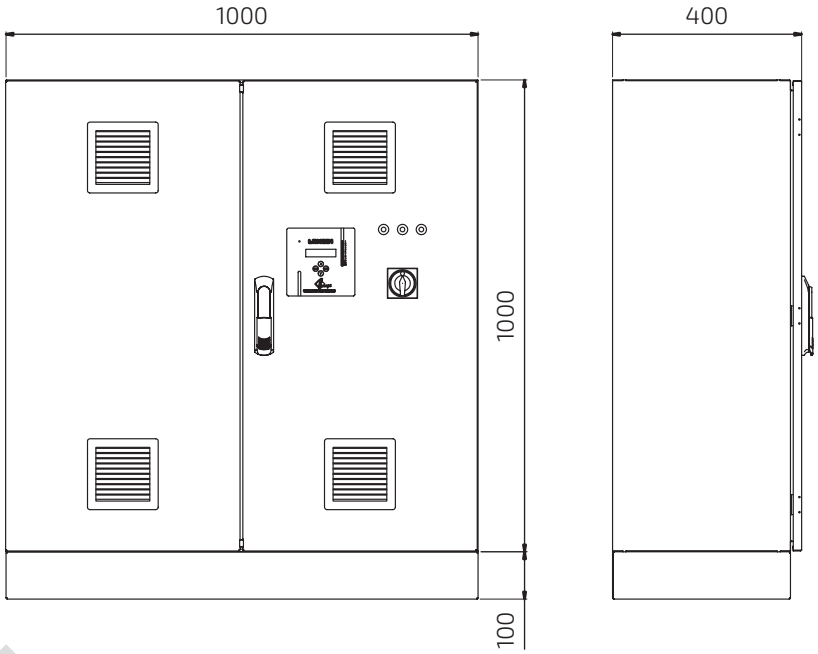
Compensation of inductive reactive power in LV networks



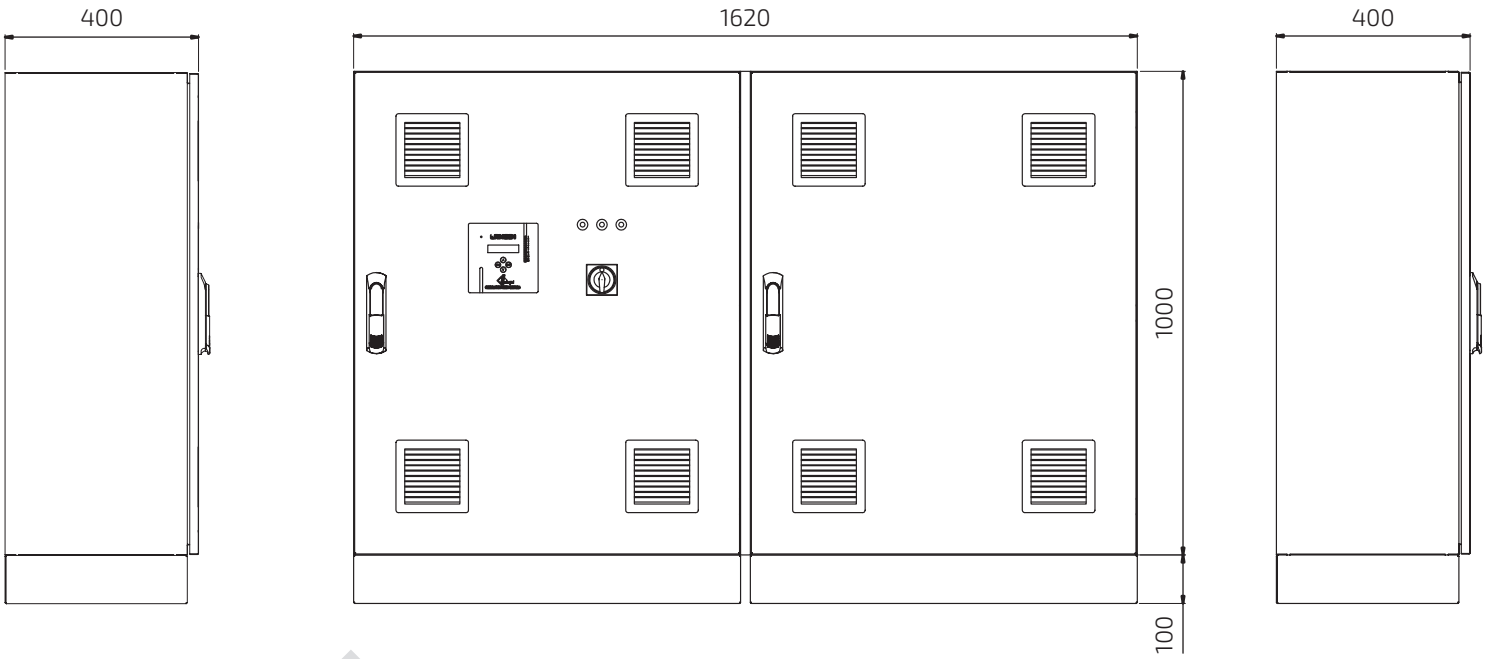
(S)BKL-M – banks
up to 55 kVar /400 V,
max. 5 capacitor stages



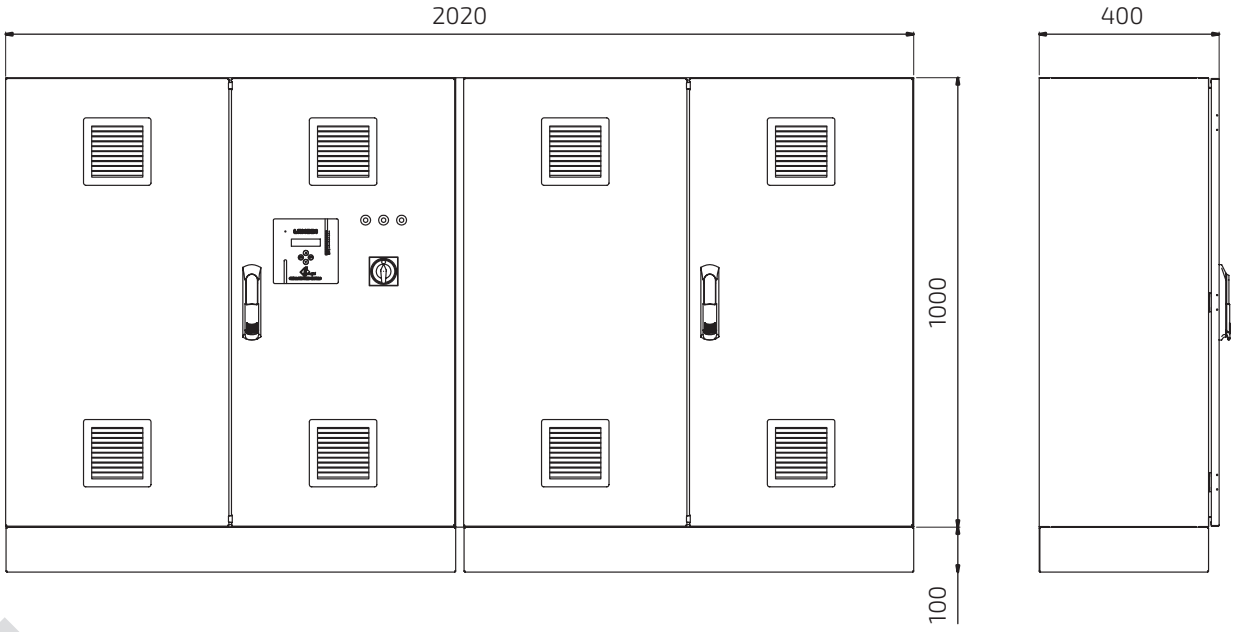
(S)BKL-M – banks
up to 250 kVar /400 V,
max. 5 capacitor stages



(S)BKL-M – banks
up to 350 kVar /400 V,
max. 7 capacitor stages



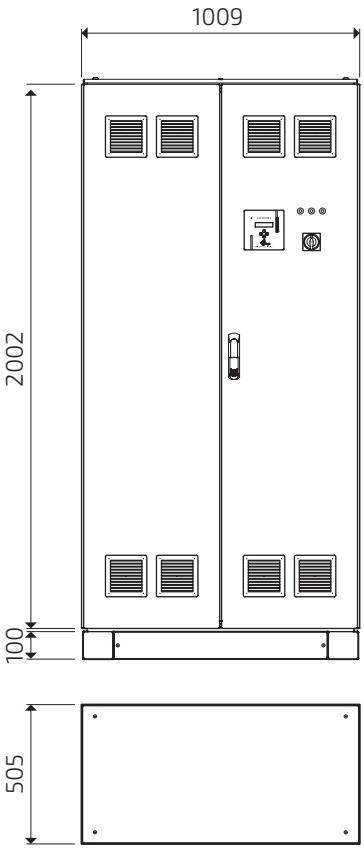
(S)BKL-M – banks
up to 500 kVar /400 V,
max. 10 capacitor stages



(S)BKL-M – banks
up to 600 kVar /400 V,
max. 12 capacitor stages

(S)BKL-MHr and (S)BKL-DHr capacitor banks with protective shunts

Compensation of inductive reactive power in LV networks containing higher harmonics



Scope of use

- compensation of inductive reactive power in three-phase LV networks containing higher harmonics, assuming an even phase load
- larger office and commercial buildings and industrial plants, in which non-linear receivers, that is frequency converters and DC drives, have a significant share

Functions

- **reduction of energy losses** in the power grid
- **reduction of active energy consumption** by reducing active power loss
- automatic adjustment to the **momentary consumption of reactive energy**
- switching on of capacitor stages by the **regulator with appropriate powers**
- **preventing resonance phenomena**
- **protection against permanent overload of capacitors** with higher harmonic currents
- CO_2 r**eduction**
- **minimising charges** for inductive reactive energy

Technical data:

parameter	value
bank capacity	from 7.5 kVar to 600 kVar
rated voltage	400 V, 525 V, 690 V
frequency	50 Hz
ambient temperature	-25 °C...40 °C
capacitor bank housing	
housing	metal
colour	RAL 7035
degree of protection	IP22 ÷ IP55
plinth	100 mm
ventilation	for power above 60 kVar, a forced ventilation system with a temperature controller
dimensions depending on power width\height\depth [mm]:	1000 \ 1000 \ 400
	800 \ 2000 \ 500
	1000 \ 2000 \ 500
	1600 \ 2000 \ 500
	1800 \ 2000 \ 500
	2000 \ 2000 \ 500
component parts	
reactive power regulator	LRM001 – panel version, door mounting
	LRM002 – mounting inside the housing on a TH35 rail
dry capacitors in a cylindrical housing	low losses, not exceeding 0.4 W/kVar
	high-performance self-healing polypropylene film
	overpressure protection applied
capacitor protection	cover fuse switches, for power > 60 kVar, mounted on a busbar
protective shunts	7% or 14% damping factor
	reversible thermal protection
optional	
reactive power regulator	any regulator type
thyristor switches	switching the capacitors on with thyristors response time and blocking time before next switching on from 1 s
housing	any size and material

EXPERIENCE

We implement projects, which reduce reactive power losses for investors from various industries.

ORDER ONLINE

Shunt reactor banks

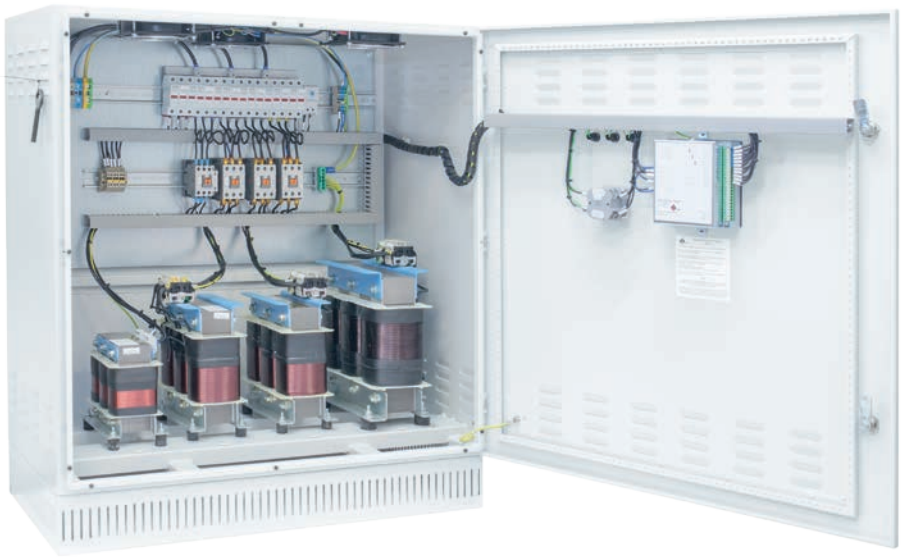
Automatic shunt reactor banks are designed for compensation of capacitive reactive power in LV networks and MV cables.

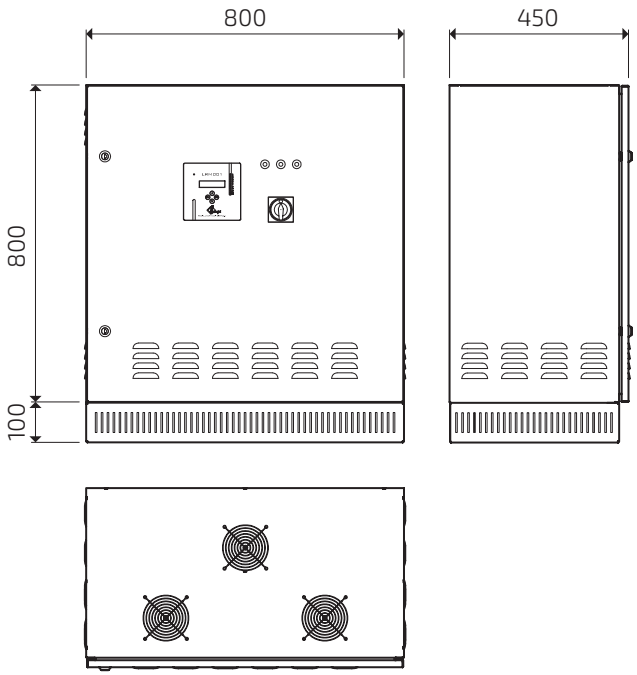
Capacitive reactive power is most common in facilities fitted with extensive cable networks, server rooms, UPS power supplies and facilities with many LED light sources. For consumed capacitive reactive energy (called also reactive negative energy), power grid operators charge additional penalty fees, which in extreme cases may be higher than the fees resulting from the consumption of active energy.

A bank usually consists of several stages created by protection, contactor and shunt reactor. Based on measurements, the LRM001 electronic reactive power regulator connects the combination of steps necessary to ensure the set cosφ coefficient to the network. This solution minimises active power losses, because only the shunts necessary to avoid additional charges for reactive energy are operating.

BDKL shunt reactor banks

Compensation of capacitive reactive power in LV networks





Scope of use

- compensation of capacitive reactive power in LV networks
- facilities with an extensive cable network, server rooms, facilities with many UPS power supplies, facilities with many LED light sources

Functions

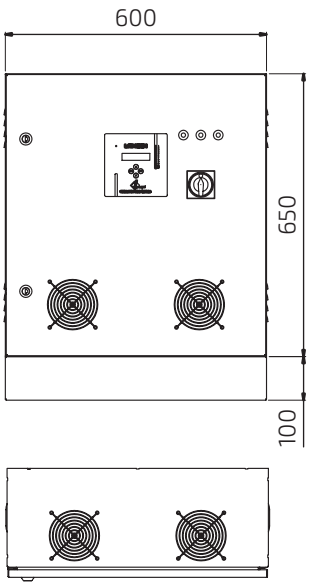
- **minimisation of active power losses**
- switching on the stages necessary to **ensure the set cosφ coefficient** by the regulator
- **reduction of active energy consumption** by reducing active power loss
- minimising charges for capacitive reactive energy

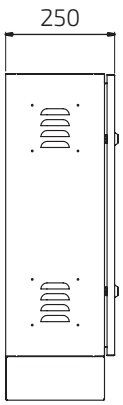
Technical data:

parameter	value
bank capacity	from 1 kVar to 120 kVar
number of stages	from 2 to 8
rated voltage	400 V
frequency	50 Hz
ambient temperature	-25 °C...40 °C
capacitor bank housing	
housing	metal
colour	RAL 7035
degree of protection	IP20 ÷ IP54
plinth	100 mm
ventilation	forced
housing dimensions width\height\depth [mm]:	600 \ 650 \ 250
	600 \ 800 \ 450
	800 \ 800 \ 450
	800 \ 1500 \ 450
	800 \ 1700 \ 500
	1000 \ 1700 \ 500
component parts	
reactive power regulator	LRM001 – panel version, door mounting
	LRM002 – mounting inside the housing
shunt reactors	equipped with reversible thermal protection
	individual stage protection
	contactors designed for switching on shunt reactors in the AC-4 switching class
optional	
reactive power regulator	any regulator type
housing	any size and material

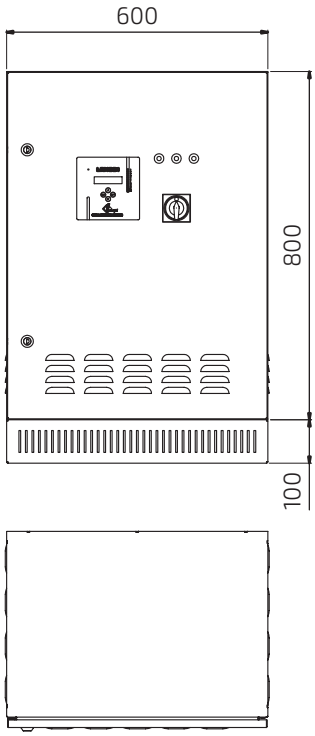
Possible types of BDKL shunt reactor banks

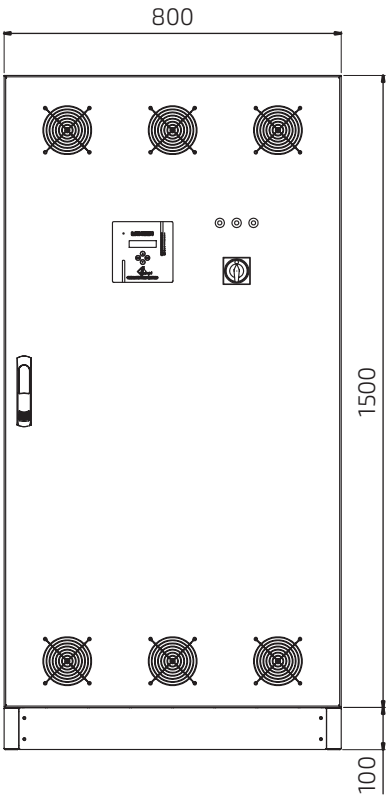
Compensation of capacitive reactive power in LV networks

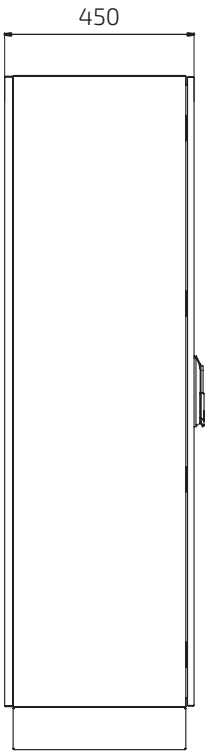




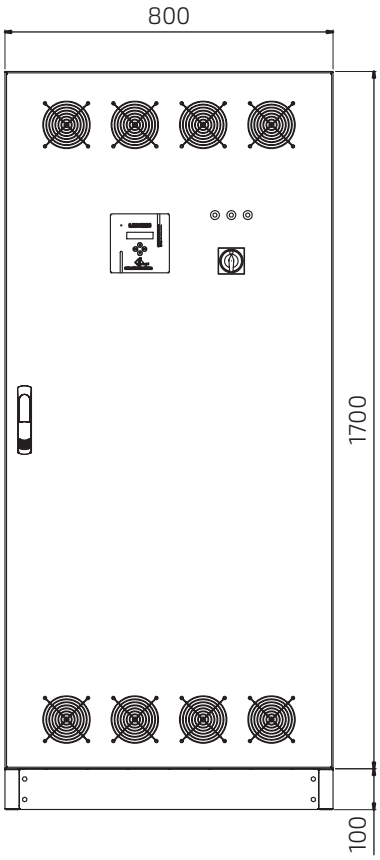
BDKL – banks
up to 7.5 kVar /400 V,
max. 3 reactor stages

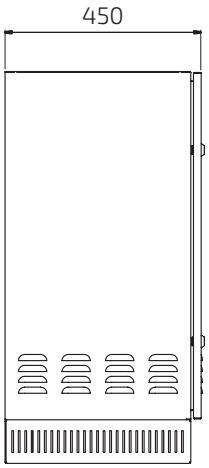




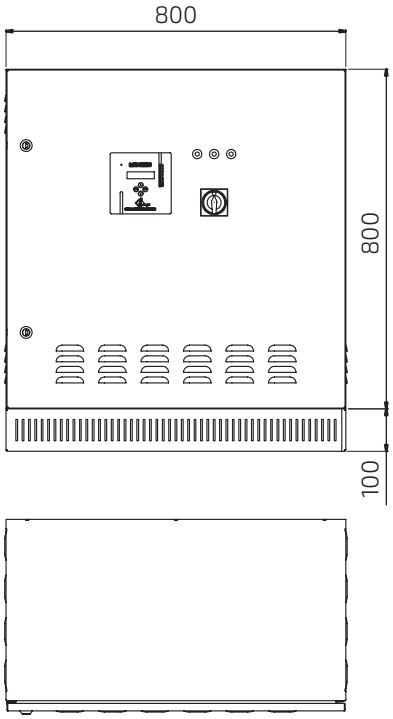


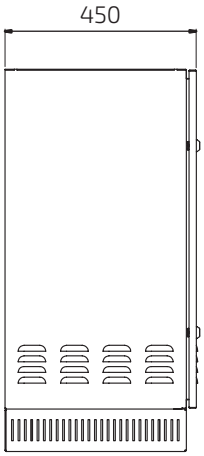
BDKL – banks
up to 90 kVar /400 V,
max. 6 reactor stages



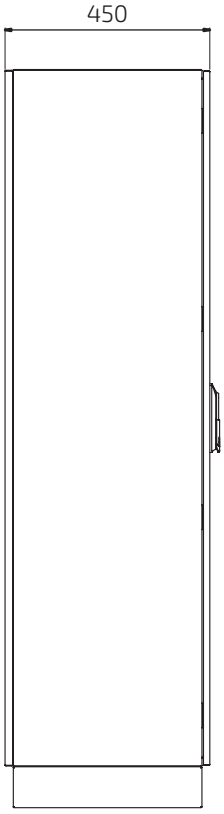


BDKL – banks
up to 17.5 kVar /400 V,
max. 3 reactor stages

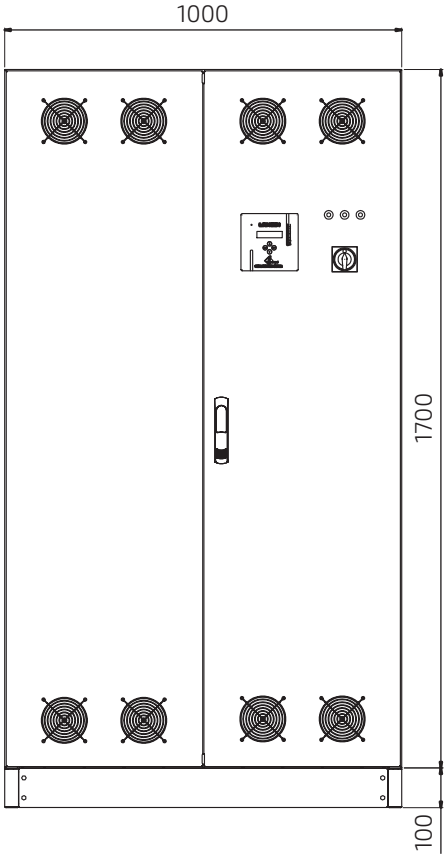


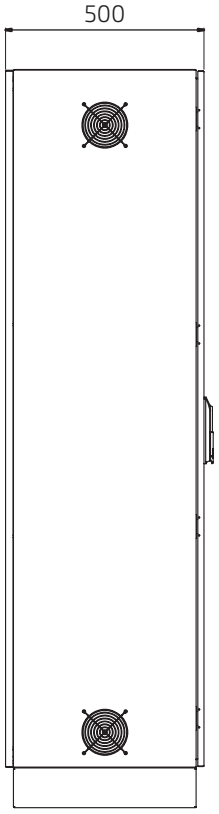


BDKL – banks
up to 27.5 kVar /400 V,
max. 4 reactor stages



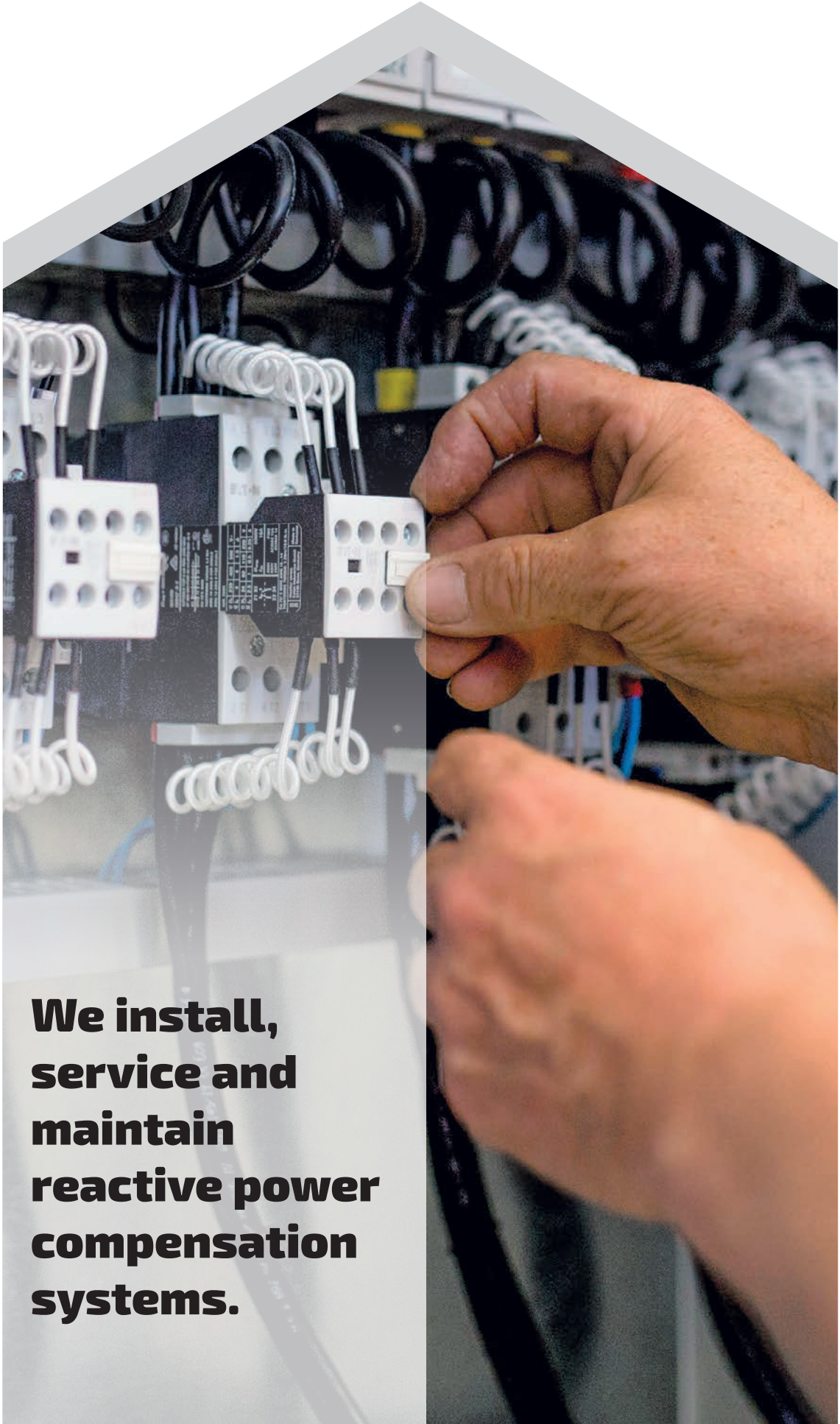
BDKL – banks
up to 120 kVar /400 V,
max. 6 reactor stages





BDKL – banks
up to 120 kVar /400 V,
max. 8 reactor stages

PROFESSIONALISM



We install, service and maintain reactive power compensation systems.

CHECK ONLINE

Hybrid banks

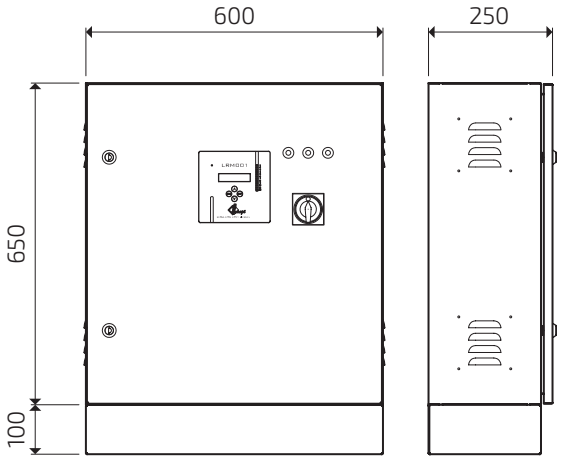
Automatic hybrid batteries are designed for compensation of inductive and capacitive reactive power in LV networks and are a combination of capacitor banks and shunt reactor banks.

They are used in facilities, where the nature of the load changes due to different types of receivers. Such a situation may occur, for example, in office buildings, where, during hot periods, the operation of the ventilation and air-conditioning unit causes the tgφ coefficient to be exceeded, and in colder months, in the absence of inductive loads, capacitive reactive energy consumption occurs.

Based on measurements, the LRM001 electronic reactive power regulator connects the combination of steps necessary to ensure the set cosφ coefficient to the network, and this solution minimizes active power losses.

BHL hybrid banks

Compensation of inductive and capacitive reactive power in LV networks



Scope of use

- compensation of inductive and capacitive reactive power in LV networks
- variable facilities, including offices, where, during hot periods, the operation of the ventilation and air-conditioning unit causes the tgφ coefficient to be exceeded, and in colder months, in the absence of inductive loads, capacitive reactive energy consumption occurs

Functions

- **minimisation of active power losses**
- switching on the stages necessary to ensure the **set cosφ coefficient by the regulator**
- **reduction of active energy consumption** by reducing active power loss
- minimisation of charges for inductive and capacitive reactive energy

Technical data:

parameter	value
shunt power	from 1 kVar to 100 kVar
capacitor power	from 1 kVar to 400 kVar
number of stages	2 – 12
rated voltage	400 V
frequency	50 Hz
ambient temperature	-25 °C...40 °C
capacitor bank housing	
housing	metal
colour	RAL 7035
degree of protection	IP20 ÷ IP54
plinth	100 mm
ventilation	forced
housing dimensions	adapted to the power
component parts	
reactive power regulator	LRM001 – panel version, door mounting
	LRM002 – mounting inside the housing
dry capacitors in a cylindrical housing	low losses, not exceeding 0.4 W/kVar
	high-performance self-healing polypropylene film
	individual stage protection
	contactors designed to switch on the capacitors equipped with modules limiting the initial charging current
shunt reactors	equipped with reversible thermal protection
	individual stage protection
	contactors designed for switching on shunt reactors in the AC-4 switching class
optional	
reactive power regulator	any regulator type
thyristor switches	switching the capacitors on with thyristors
	response time and blocking time before next switching on from 1 s
housing	any size and material

COOPERATION

Join the Lopi Group Affiliate Programme!

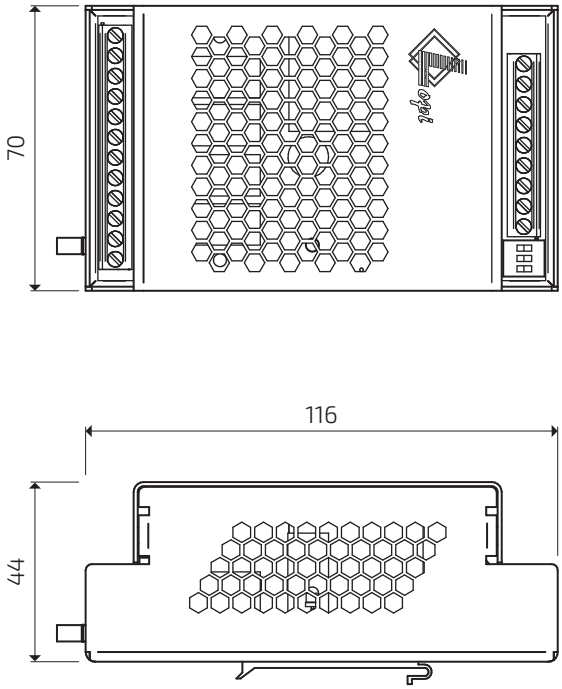
Find out more by writing to:
program.partnerski@lopi.pl

ORDER ONLINE

Accessories

Our product range is constantly expanding. In addition to the basic product line, we also provide our customers with accessories, which extend the capabilities of our products with new functionalities and offer a wider range of operations for more demanding operating conditions in complex reactive power compensation systems.

LRM4IO expansion module



Scope of use

- expansion of inductive and capacitive reactive power compensation systems by increasing their capabilities and functionality
- data transmission systems of the selected areas
- management through the power guard

Functions

- **registration of changes on signalling inputs** with an option of reading them
- **control of access** to rooms and devices
- **open door signalling**
- **smoke detector**
- **measurement of water**, electricity and CO_2 consumption
- **possibility of permanently switching on the relay outputs** or by means of a control impulse
- control via RS 485, **MODBUS protocol**
- device addresses set by **a three-position DIP SWITCH**
- device address range from **100 to 107**

Technical data:

parameter	value
supply voltage	230 V AC ± 10%, 50 Hz
power consumption	up to 2 VA
ambient temperature	-20 °C...60 °C
degree of protection	IP20
control voltage	24 V DC ± 10%
clamps	up to 2.5 mm2
weight	0.3 kg
dimensions	70 ⍀ 116 ⍀ 44 mm
installation	TH35 rail
communication	RS485 Modbus/RTU
Signalling	
number of inputs	4
voltage	24 V
input current	10 mA
response time	100 ms
address	100...103
meters	
number of inputs	2
voltage	24 V
input current	10 mA
minimum pulse duration	10 ms
address	104...107
control outputs:	
number of outputs	4
type	change-over relays
maximum contact voltage	230 V AC
maximum current	5 A / 250 V AC, 5A / 24 VDC

NOTES

Lopi Group

We have been active on the market since 1995. Our activity includes, above all, creating solutions in the field of reactive power compensation, designing power electronic products and of the production process automation solutions. As a result of the intensive development of the company, in 2019, we decided to spin-off three different highly specialised units from its structures:

LOPI SP. Z O.O.

Design, production and assembly of systems for reactive power compensation, data transmission and visualisation, optimisation of electricity consumption, filtering of higher harmonics, dedicated (LED) lighting compensation devices, analysis and improvement of electricity quality, energy audits.

Contact:

05-119 Legionowo, ul. Długa 3,
phone: +48 22 732 07 82
e-mail: biuro@lopi.pl

LOPI ELEKTRONIKA SP. Z O.O.

Research and development office. Design, production and implementation innovative electronic and power-electronic solutions.

Contact:

92-104 Łódź, ul. Taternicza 1,
phone: +48 600 075 103
e-mail: biuro@lopi-elektronika.pl

LOPI AUTOMATYKA SP. Z O. O.

Design and construction of industrial automation systems, prefabrication of control cabinets, construction of machinery and equipment, prefabrication and assembly of low voltage switchgear.

Contact:

production facility:
05-119 Legionowo, ul. Zegrzyńska 4 (2nd staircase, 4th floor),
phone: +48 22 766 37 00
e-mail: biuro@lopi-automatyka.pl

September 1995 — Launch of PPHU Lopi Andrzej Anuszkiewicz

2001 — Introduction of hybrid banks to the market

2006 — First independent foreign contracts of the Automation Department

2010 — New office in Legionowo, at ul. Długa 3

2015 — Our first reactive power regulator: LRM001

2015-2016 — Awards for LRM001: in Krakow and in Paris

2016 — Launch of unbalanced banks

September 2017 — New regulator: LRM002

November 2018 — Remote communication: a new branch of our products

February 2019 — Spin-off of Lopi Elektronika Sp. z o.o.

March 2019 — Spin-off of Lopi Anuszkiewicz i Trzecińscy Sp.J.

May 2019 — Spin-off of Lopi Automatyka Sp. z o.o.

August 2019 — A new series of LH thyristor switches

January 2020 — Launch of the LRMnet portal

July 2020 — Design of the family of dynamic compensators LKD5, LKD 10, LKD 15

September 2020 — LRM410 expansion module

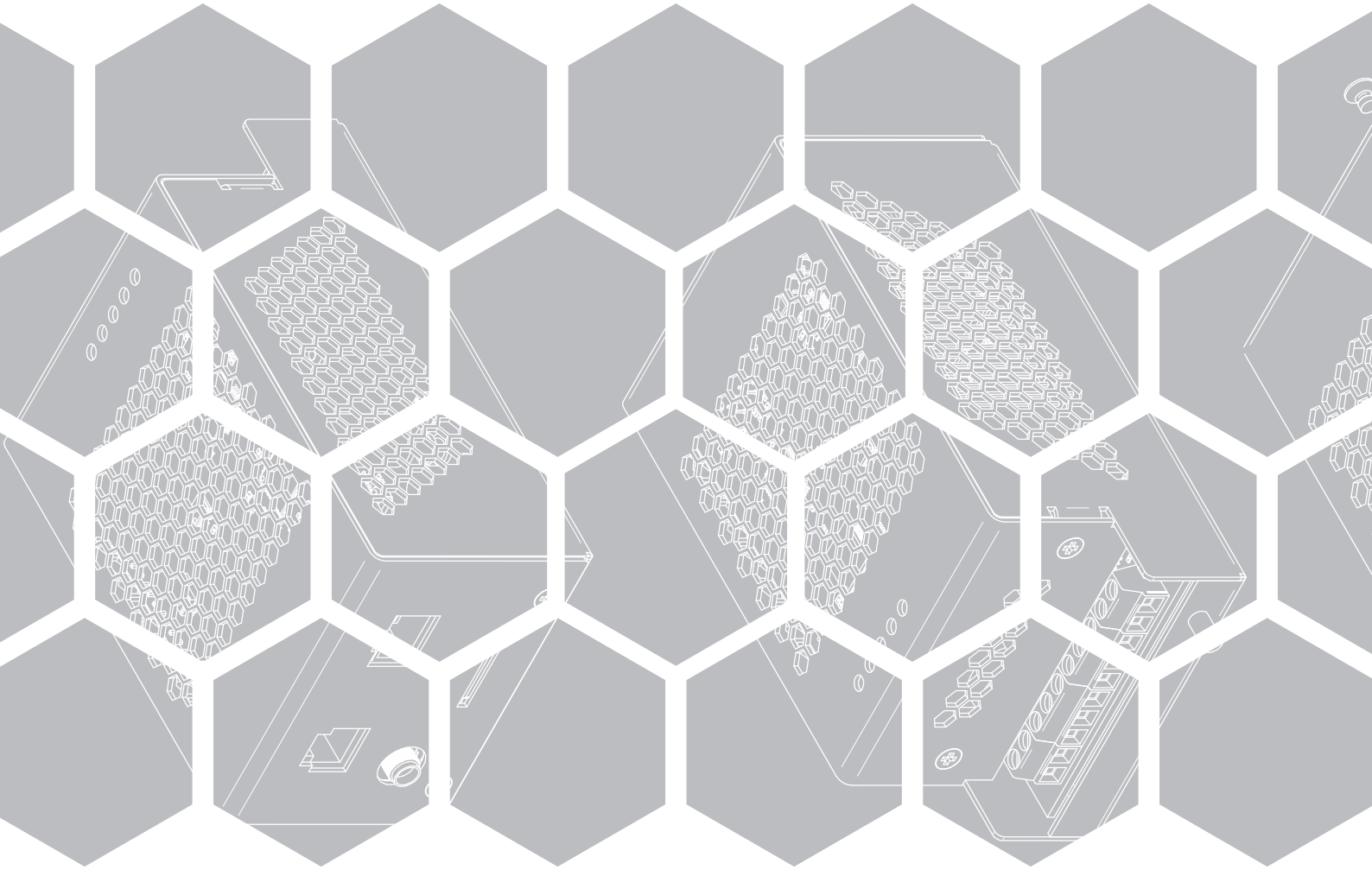
February 2023 — Launch of the first LKD 25 compensator

March 2023 — Introduction of the LKO lighting compensator to the market

November 2023 — Introduction of the LKD PRO 5-20 kvar to the market

2023-2024 — Introduction of the LRM002/O lighting compensator to the market

ONLINE
CATALOGUE



LOPI SP. Z O.O.
ul. Długa 3 05-119 Legionowo, Poland | NIP: 5361939557 | KRS: 0001055333
Sąd Rejonowy dla m.st. Warszawy XIV Wydział Gospodarczy KRS | Kapitał zakładowy: 5 000 000,00 zł

biuro@lopi.pl
+48 22 732 07 87
+48 22 772 95 08
+48 697 481 635

+48 22 772 95 09 (FAX)
dzial.handlowy@lopi.pl
+48 22 732 07 87 wew. 103
+48 22 772 95 08 wew. 103

+48 697 481 635 wew. 103
+48 22 772 95 09 (FAX)
dzial.techniczny@lopi.pl
+48 22 732 07 87 wew. 107