

Low Voltage Regulation System LVRSys™ - PM (Pole-Mount)

- Power range(single- Phase): 7.5 kVA up to 35 kVA
- Power range(single- Phase): 22 kVA up to 70 kVA
- Regulation ranges: $\pm 6\% \dots \pm 16\%$
- Number of steps: 9
- Efficiency: 99.4 % to 99.8 %
- Phase independent regulation
- Balancing of the three-phase voltage
- No grid interference

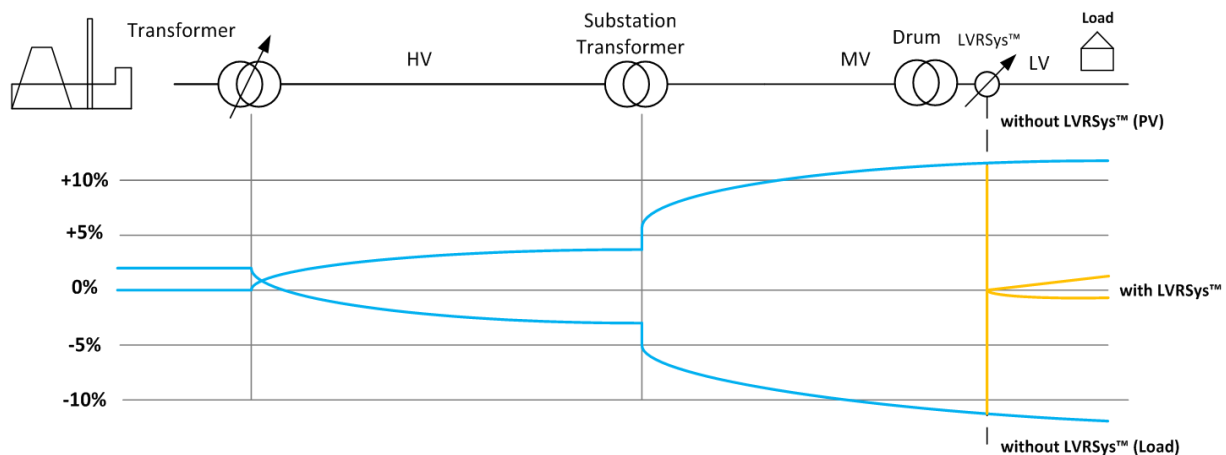


Application

LVRSys™ - PM is a low voltage regulation system that provides a cost-effective alternative to re-conductoring or installing additional line capacity to deal with voltage issues. It can be used on all low voltage Distribution Networks where voltage problems exist.

Voltage problems can occur locally (on single lines) or at the level of an entire low voltage Distribution Network. LVRSys™ - PM can be used with flexibility as a line regulator or as a regulator at a local LV Substation.

Power Generation



Voltage profile, with and without LVRSys™ - PM

Regulation of the line voltage

If single lines are affected by voltage issues, it is cost effective to use LVRSys™ - PM as a line regulator. The power levels to be regulated are low and therefore the use of the system is cost-effective.

A classic application for example is a circuit with multiple roof top (PV) photovoltaic installations or loads connected.

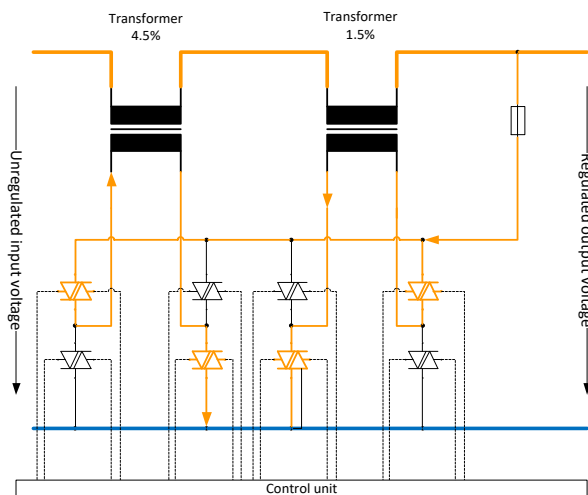
Higher rated LVRSys are available - up to 2500 kVA

This datasheet details single & three phase pole mount LVRSys. A. Eberle also manufacture higher capacity, three-phase pad mount systems. These are described in a separate datasheet.

We take care of it.

Operation

The principle of the LVRSys™ control is similar to a linear regulator. By coupling and uncoupling two transformers with selected transfer ratios, it is possible to regulate the output voltage in 9 steps. The thyristors switch intelligently and avoid any current surges, voltage dips and harmonics.



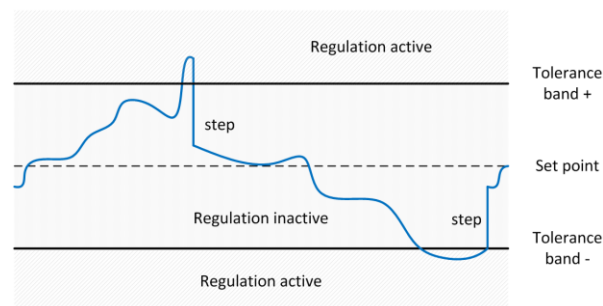
Example for 3 % voltage reduction

Step	Transformer 1,5%	Transformer 4,5%
+6 %	+1,5 %	+4,5 %
+4,5 %	0 %	+4,5 %
+3 %	-1,5 %	+4,5 %
+1,5 %	+1,5 %	0 %
0 %	0 %	0 %
-1,5 %	-1,5 %	0 %
-3 %	+1,5 %	-4,5 %
-4,5 %	0 %	-4,5 %
-6 %	-1,5 %	-4,5 %

Generation of voltage levels; E.g. system ±6 %

Regulation parameters

- Set point (voltage value, 3-phase)
- Tolerance band +
(Upper limit value of the tolerance area)
- Tolerance band -
(Lower limit value of the tolerance area)
- Reaction time
- Balancing of the 3-phase voltages within the tolerance area

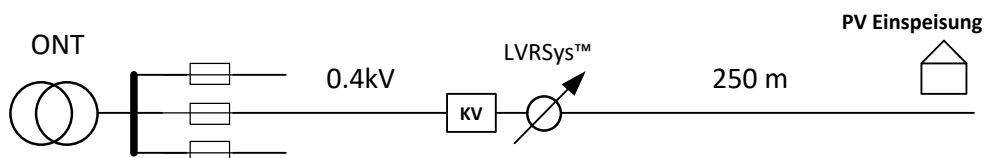


Regulation range

Line drop compensation

The reference voltage value is calculated from the current measurement and the grid impedance. The regulation can thereby be optimized without additional communication devices.

In the load scenario the calculated voltage value is reduced. In the feed-in scenario, the calculated voltage value is increased.



Example: LVRSys™ and PV-system with a line distance of 250m

In this line a PV-system feeds current into the grid. The grid impedance regulation calculates the voltage drop of the cable in addition to the measured voltage. The LVRSys™ regulates now the voltage at the end of the

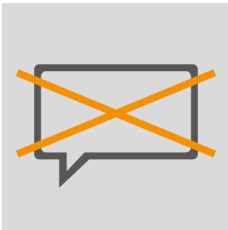
cable into the tolerance band. The regulation area is extended and the voltage at the selected point in the grid is regulated.

LVRSys™ - PM flexible and robust for every application



Robust

- Twenty billion switch operations
- Short circuit proof, up to 50 kA
- High resistance to over voltages, direct and indirect lightning strikes
- Overloading (as NH-Fuse)



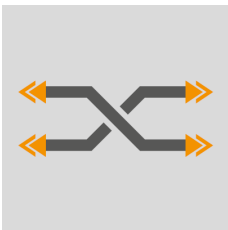
Grid compatibility

- No grid interference, does not cause flicker or generate harmonics
- Balancing of the voltage via phase-independent regulation
- Existing fuse concept can be maintained
- Interruption-free power supply guaranteed (*Automatic Bypass*)



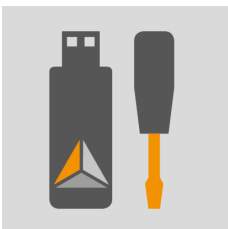
Reliable and economical

- High efficiency
- No air exchange with the environment even in direct sunlight
- Operation temperature -40 °C up to +50 °C ambient temperature



Flexible and fast

- Adjustable response time of the controller < 30 ms up to 100 s
- Adaption of the control algorithms to different applications
- Line drop compensation, without additional communication



Easy

- Data export via USB-Stick into e. g. MS Excel
- Firmware update via USB-Stick or SCADA Systems
- Common communication interfaces *Modbus TCP, IEC 60870-5-104*
- Drag indicator in the Display

Technical data

Rated data											
Rated voltage U_N	400 V / 230 V ± 20 % (P-P/P-N)										
Rated current I_N	<table border="0"> <tr> <td>Single – Phase Systems</td> <td>Three – Phase Systems</td> </tr> <tr> <td>32 A (7.5 kVA System)</td> <td>32 A (22 kVA System)</td> </tr> <tr> <td>63 A (15 kVA System)</td> <td>63 A (44 kVA System)</td> </tr> <tr> <td>160 A (35 kVA System)</td> <td>87 A (60 kVA System)</td> </tr> <tr> <td></td> <td>100 A (70 kVA System)</td> </tr> </table>	Single – Phase Systems	Three – Phase Systems	32 A (7.5 kVA System)	32 A (22 kVA System)	63 A (15 kVA System)	63 A (44 kVA System)	160 A (35 kVA System)	87 A (60 kVA System)		100 A (70 kVA System)
Single – Phase Systems	Three – Phase Systems										
32 A (7.5 kVA System)	32 A (22 kVA System)										
63 A (15 kVA System)	63 A (44 kVA System)										
160 A (35 kVA System)	87 A (60 kVA System)										
	100 A (70 kVA System)										
Rated frequency f_N	50 Hz / 60 Hz										
Efficiency	99.2 % – 99.5 %										
Maximum switching duration	< 1s (Standard), < 30 ms (Option)										
Regulation ranges	<ul style="list-style-type: none"> ± 6 % from U_N in 9 steps á 1.5 % ± 8 % from U_N in 9 steps á 2.0 % ± 10 % from U_N in 9 steps á 2.5 % ± 12 % from U_N in 9 steps á 3.0 % (extended) ± 14 % from U_N in 9 steps á 3.5 % (extended) ± 16 % from U_N in 9 steps á 4.0 % (extended) up to ± 24 % from U_N (Special design) 										
Operating temperature	- 40 °C up to + 40 °C (up to + 50 °C special design)										
Maximum permitted air temperature in the switch cabinet	70 °C										
Altitude of the installation (NN)	< 2000 m										
Safety class	IP55										
Max. power consumption of secondary electronics	200 mA (230 V)										
Short-circuit impedance u_k	ca. 0.3 %										
Cooling	Passive, no direct air exchange with environment										

Limits	
Rated impulse voltage U_{Imp}	6 kV
Short time current resistance I_{cw} (1 s)	<ul style="list-style-type: none"> 5 kA (up to 100 A phase current) 15 kA (up to 160 A phase current)
Rated conditional short-circuit current I_{cc}	<ul style="list-style-type: none"> 20 kA (up to 100 A phase current) 50 kA (up to 160 A phase current)
Rated conditional short-circuit current I_{cf} protected with fuses	<ul style="list-style-type: none"> 3 kA (up to 32 A phase current) 5 kA (up to 63 A phase current) 10 kA (up to 160 A phase current)
High rated peak withstand currents I_{pk}	<ul style="list-style-type: none"> 20 kA (up to 100 A phase current) 50 kA (up to 160 A phase current)

Dimensions and weight		
Switch cabinet dimensions W/D/H	Single – Phase Systems 800 mm/300 mm/1000 mm	Three – Phase Systems 800 mm/300 mm/1200 mm (till 87 A 12% / 100 A 10%)
Switch cabinet weight	Single – Phase Systems 45 kg (32 A System) 50 kg (63 A System) 70 kg (160 A System)	Three – Phase Systems 120 kg (32 A System) 140 kg (63 A System) 160 kg (87 A System) 190 kg (100 A System)

Directives	
EMC stability	DIN EN 61000-6-1
EMC interference emission	DIN EN 61000-6-3
Assembly instructions	DIN EN 61439-1/5
Low voltage directive	2014/35/EU
Noise emissions	< 37 dB(A)

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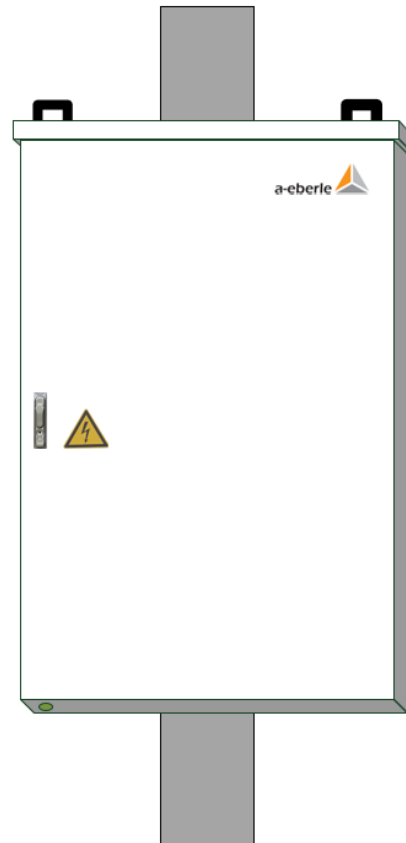
Simple Installation on the pole

LVRSys™ - Pole mount connection will be done from below through cable bushings.

The lifting of the cabinet can be done via crane lugs on the back of the cabinet.



Mounting and Installation scheme LVRSys™ -PM
1-phase 32 A to 160 A ratings



Mounting and Installation scheme LVRSys™ -PM
3-phase 32 A to 100 A ratings

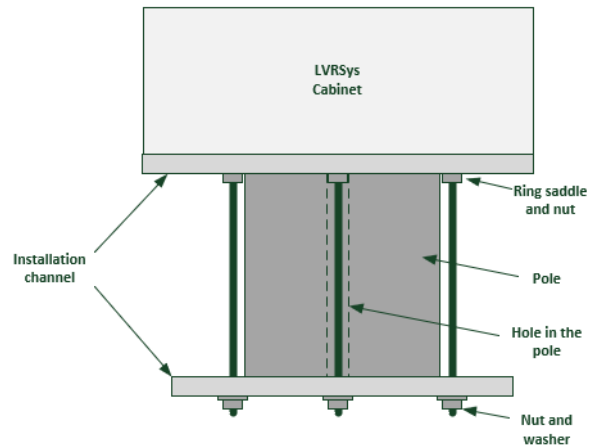
The operation light is clearly visible from the ground beneath the LVRSys™ - PM and indicates that the system is in operation (healthy state).

Mounting

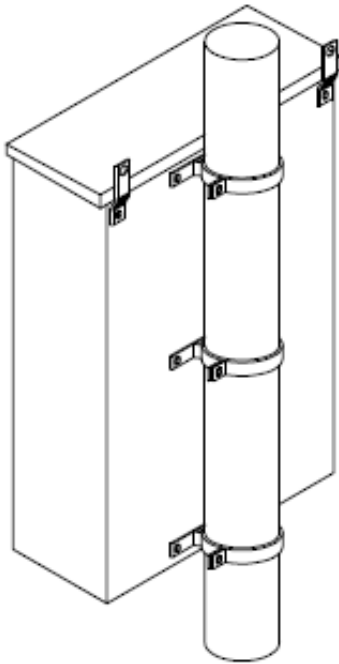
The mounting on a pole is available for rectangle or round pole.

For rectangle poles the cabinet will be fixed via DIN-rails and metal bolts.

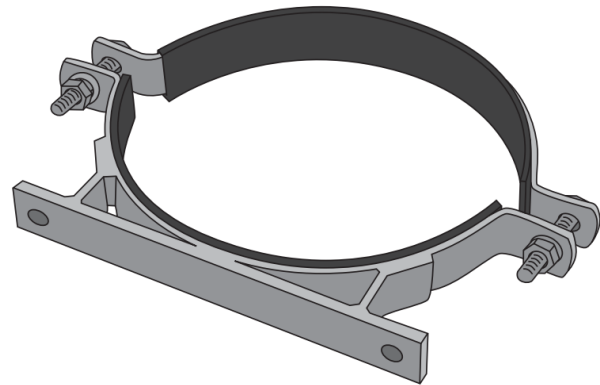
For a round pole without holes the mounting can be done by pole clamps.



Mounting frame for rectangle poles



Mounting for round poles



Mounting and Installation scheme LVRSys™ - PM 1-phase 7.5 kVA to 50 kVA and PM 3-phase to 70 kVA

For the mounting clamps the data of the pole is required. The clamps are manufactured according to the specification of the pole. Systems without bushings on side are connected direct in the cabinet. The cables are carried out by cable glands.

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