

# *Rico-Werk*

High-Voltage Technology

Leading manufacturer of  
high-voltage DC conversion  
equipment in

**Three-Phase Technology**  
for electrostatic precipitators.

Environmental technology for a clean future



# Basics of single-phase and three-phase high voltage supplies

## Single-phase technology, the standard version of the High voltage supply for ESP's:

- Single-phase high-voltage direct current conversion equipment,
- Available with different control systems, as well as
- Ripple DC voltage for continuous and pulse operation.

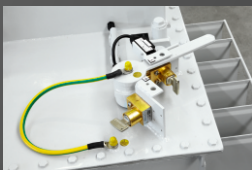


## Three-phase technology as high-end version for high-voltage supply systems, based on robust 50/60 Hz supply:

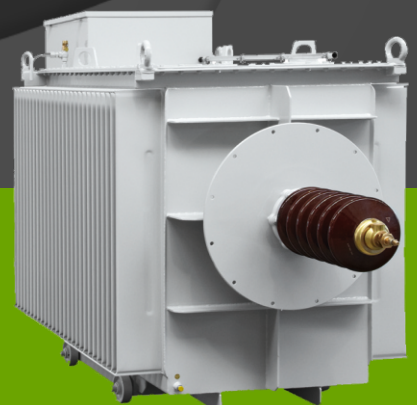
- Three-phase high voltage direct current converter,
- Available with high-end control for high demands,
- Very smooth DC voltage (less than 3 percent ripple in ESP load condition), as well as
- Pulse mode and continuous mode.

## Our transformer-rectifier units are specified, among others, according to the following attributes:

- Output voltage / output current / output power,
- Input voltage / input frequency,
- Installation location (temperature, altitude above zero), protection class,
- Mechanical structure of the transformer-rectifier unit,
- monitoring devices: Level, pressure, temperature,
- Additional equipment: internal/external grounding switch.



**More than 40 years of experience in the field of high-voltage supply put us in a position to provide optimum support for your filter systems. in the best possible way.**



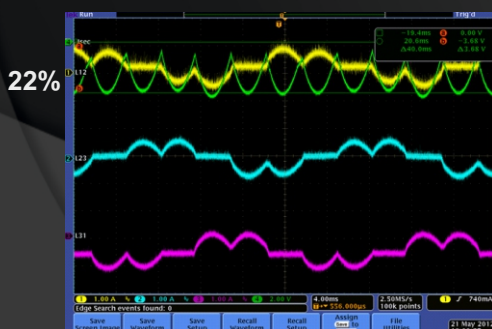




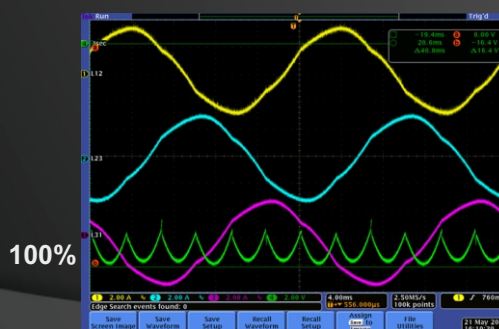
# The high voltage DC devices

## Overview:

- Intrinsically safe input current limitation by means of precisely adjusted current limiting reactor,
- Power factor  $> 0.9$ )\*.
- Customizable geometry of the transformer- Rectifier unit (especially for replacement and upgrade actions):
  - Trolley width,
  - foundation dimensions,
  - Stitch dimension of the high-voltage bushing.
- Environmentally compatible insulating fluid with long service life):\*\*
  - Mineral oil / silicone oil,
  - Ester oil (optional, e.g. MIDEL® 7131, BecFluid® 9902).
- Compact grounding switch under oil,
- Corrosion protection according to customer specification:
  - Specified corrosion protection class, e.g. C4M or C5H, 15 years,
  - Final coat selectable in terms of color and gloss level.
- No time limit on rated load operation in pulse and continuous modes.



yellow, blue, red: input current; green: output voltage



yellow, blue, red: input current; green: output voltage

Three-phase fed high voltage DC units from Rico-Werk combine robust 50/60 Hz technology with a high quality DC high voltage with low ripple over a wide voltage range.

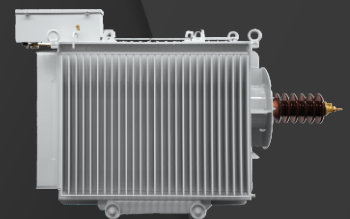
)\* The power factor of high-voltage DC converters is load dependent

)\*\* For hermetically sealed shaft boilers

# The high voltage direct current devices

## Features:

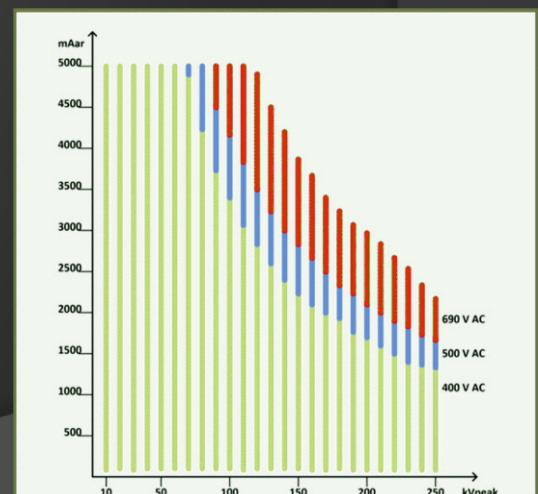
- **Symmetrical load for all three phases** of the power system.
- **Compact design** with transformer, rectifier and choke inside the hermetically sealed tank.
- **Maintenance-free** hermetically sealed container with elastic expansion ribs.
- HV output with **horizontal or vertical** feedthrough.
- **Lightweight** due to HV winding in aluminum technology.
- **Use of conventional power cables** between control cabinet and transformer-rectifier unit.



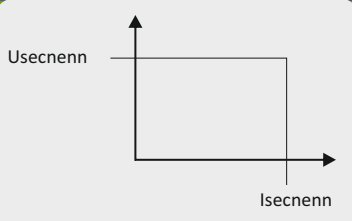
## Nominal values adjustable within wide limits:

- Input voltage from 110 V AC to 690 V AC for,
- 50 Hz and 60 Hz.
- Input current up to 1000 A,
- output voltage from 5 kV to 250 kV, freely selectable,
- output current from 10 mA to 5 A, freely selectable.

Large voltage, current and power ranges:



Graph with voltage-current overview



**Load-indifferent output voltage, the nominal output voltage is available over the entire load current range**  
--> high voltage circuit must be dimensioned for load voltage only.



# Die Hochspannungsgleichstromgeräte



## Construction:

- Our three-phase systems are designed to safely withstand both the electrical and mechanical stresses of pulsed operation at all times.
- The short-circuit voltage is 30% with simultaneous **high stability of the output voltage over a wide load range**. Rico-Werk's controller technology enables safe operation even during flashovers.

## Mechanical options:



Oil pans / chassis mountings

Sun roofs / enclosures

High-voltage earthing switch hoods ( IEC 61508; SIL 2 certified)

The production of robust and low-maintenance equipment, combined with a high level of customer satisfaction, is our main focus. To achieve this, we rely on the careful development and production of all components.

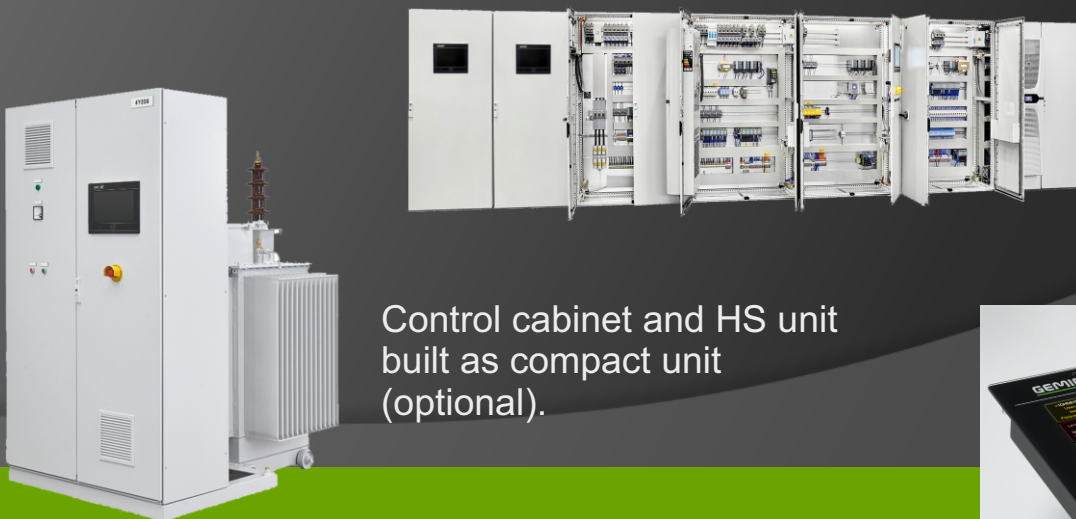
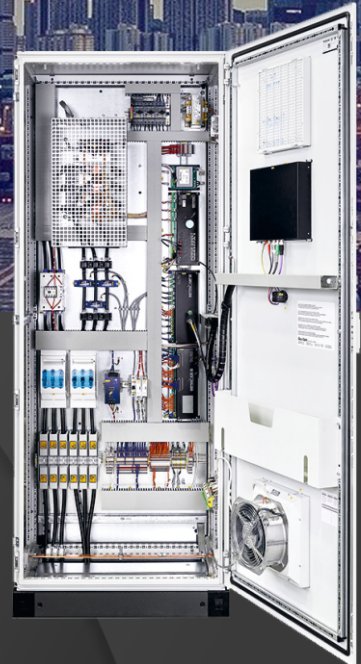


# The control cabinet

Our high voltage/low voltage control cabinets are mainly specified according to the following attributes:

- Different equipment variants,
- Short-circuit resistance classes,
- Connection power classes,
- IP standards and ambient temperatures,
- Safety requirements and availability demands,
- Flexibility and reserve planning,
- Standards or approvals (e.g. CE, UL/CSA, EAC),
- Conventional PLC or exclusive relay technology,
- Feed-in systems.

Our high voltage control cabinets are equipped with a flashover, voltage and current controller, as well as with wide function variants through freely adjustable parameter sets, capable of communication via diverse protocol interfaces, e.g. Profibus or Modbus.



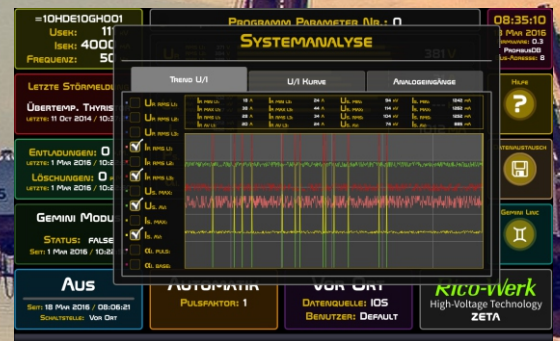
Control cabinet and HS unit built as compact unit (optional).

We have many years of experience in optimization of electrostatic precipitator systems the use of the latest controller technology.



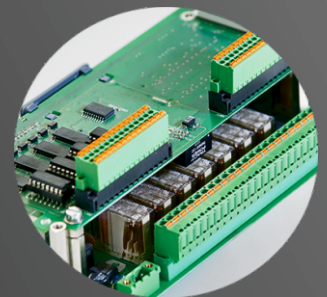


# The controller



## Functions:

- The evaluation and processing of the measurement signals is exclusively by software. Additional hardware components are not required.
- All measured values correspond exactly to the actual values with an accuracy of class 2, with
- Full dynamic range over the entire measuring range. All limitations are permanently 100% active.
- Automatic recognition and individual treatment of different flashover classes, guarantee an optimal extinction behavior.
- Separate power supply is possible.
- Completely new definition of pulse operation.
- High safety standard in the operation, due to a graphical operating concept and extensive rights management by means of NFC transponder chips.



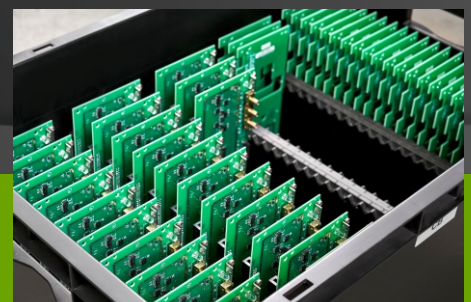
OPENRTOS®

QNX®  
QNX SOFTWARE SYSTEMS

## Our system

ensures the permanent monitoring of the target values:

- Primary voltage (rms values of all 3 phases),
- Primary currents (rms values of all 3 phases),
- Secondary voltage (peak value),
- Secondary voltage (arithmetic mean value),
- Secondary current (arithmetic mean),
- filter power.



Rico-Werk products are used worldwide in a wide variety of industries, where they protect the environment from dust pollution.

## Certificates

### ISO 9001:2015

01 100 110258

01 100 110258 / 01

01 100 110258 / 02

### EAC

EAЭC N RU Д-DE.HA27.B.07112/18

EAЭC N RU Д-DE.HA27.B.05836/18

### SCC\*\*

01 013 110258

### UL/CSA

U8 17 11 97828 002

U8 17 03 97828 001

U8 17 11 97828 003



Management  
System  
ISO 9001:2015  
SCC\*\*

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**Quality can be measured!**

