

SCHNIER



Operating manual
Residual energy monitoring ESC 03/02
ESC 03/03

Part.N°.:
810348
and
810359

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1. General

1.1. Introduction

These operating instructions must be read, understood and observed in all items by all persons who are responsible for the devices and electrostatic plants. For this reason, the operating instructions should be available for the operating, maintenance and service staff at all times.

Errors can only be avoided and error-free operation warranted with knowledge of these operating instructions. SCHNIER Elektrostatik GmbH does not assume any liability for damage resulting from non-observance of these operating instructions!

1.2. Intended Use

This Product is dedicated only for the use in stationary electrostatic installations which comply with the safety requirements of at least one of this harmonized standards:

EN 50176 "Stationary electrostatic application equipment for ignitable liquid coating material"

EN 50348 "Stationary electrostatic application equipment for non-ignitable liquid coating material"

EN 50177 "Stationary electrostatic application equipment for ignitable coating powders"

EN 50223 "Stationary electrostatic application equipment for ignitable flock material"

It serves as an additional monitoring unit and is not a protective device in the sense of the machinery directive as an individual unit.

2. Safety

2.1. Work Safety Icon



This icon marks all notes where danger results from non-observance. Observe these notes and be particularly careful in these cases.

In addition to the notes in these operating instructions, the generally valid safety provisions must be observed as well.

2.2. Attention Note

ACHTUNG !

This Attention sign is placed at all sections of the BA that contain important notes. They must be observed to avoid damage to or destruction of the device.

2.3. General Safety Notes

The high-voltage control must only be used in automatic coating plants that meet the relevant safety provisions.

Furthermore, the operating instructions of the respective electrostatic coating system must be observed!

2.4. Installation Notes

The residual energy monitor must be installed outside of potentially explosive areas. The analogue signals must be shielded and the length of the measuring lines must not exceed 5m.

ACHTUNG !

The residual energy monitor measures high voltage in relation to earth potential; therefore, a secure earth connection of the PCB must be warranted (e.g. KL X1/1,2,5).



Operation of the energy monitor is only permissible with the corresponding precision resistors of SCHNIER Elektrostatik GmbH. The measuring line from the precision resistor to the residual energy monitor must be intact. If the measuring line is defective or not connected, the residual energy monitor will not receive any measured value and report the condition "safe".

3. Set-up and Overview

3.1. General

Device designation Residual energy monitor
Type ESC 03/02 (negative polarity)
Type ESC 03/03 (positive polarity)
Dimensions H/B/T 3 HE / 42 TE / 175mm

The residual energy monitor essentially comprises the measuring and evaluation electronics, the aluminium die-cast housing, an adjusted HV-precision resistor by SCHNIER Elektrostatik GmbH. The precision resistor is available in various designs adjusted to the local situation.

3.2. Frontal Illustration

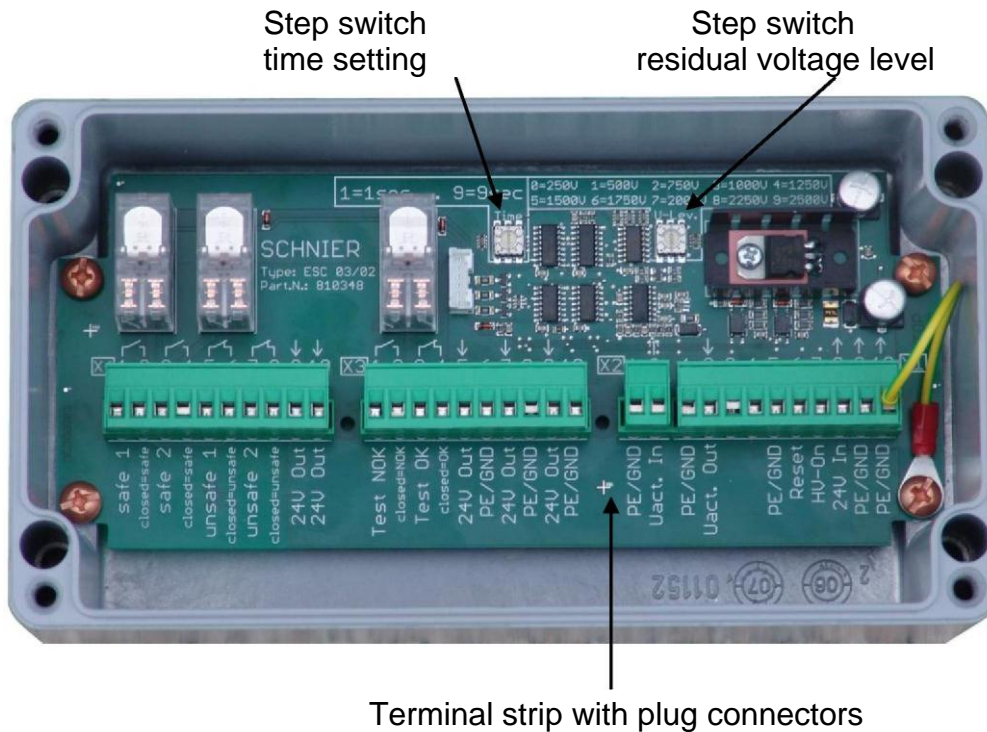


Green = system safe residual voltage below the set level and HV is switched off.

Yellow = residual energy test not passed. Discharging the HS-system takes too long.

Red = system unsafe residual voltage is above the set level or HV is switched on.

3.3. Electronics Illustration



3.4. Technical Data

Power supply	24VDC max. 0,5 A
Digital outputs	6 relay contacts, potential-free
Switching capacity	24 VDC / max. 1A
Ambient conditions	+5°C to 40°C max. 80% rel.F.
Analogue output	U-Ist 0-10 V corr. to 0-100 kV
Dimensions L / B / H	220 / 120 / 80 mm
Weight	2000 g
Measuring input	ESC 03/02 0- (-) 20 μ A corr.to. 0- (-) 100 kV
	ESC 03/03 0- (+) 20 μ A corr.to. 0- (+) 100 kV
Time adjustment range	0-9s adjustable in 9 steps
Adjustment range residual voltage	0.25 kV – 2.5 kV in 0.25 kV steps
Protective rating	IP 65

4. Technical Description

4.1. Function 1 (Residual Energy Level)

The residual energy monitor measures the high voltage at an electrostatic coating system independently of the measurement of the HV-supply. A HV precision resistor of 5GOhm (not included) is used to read the high voltage at any point of the coating system.

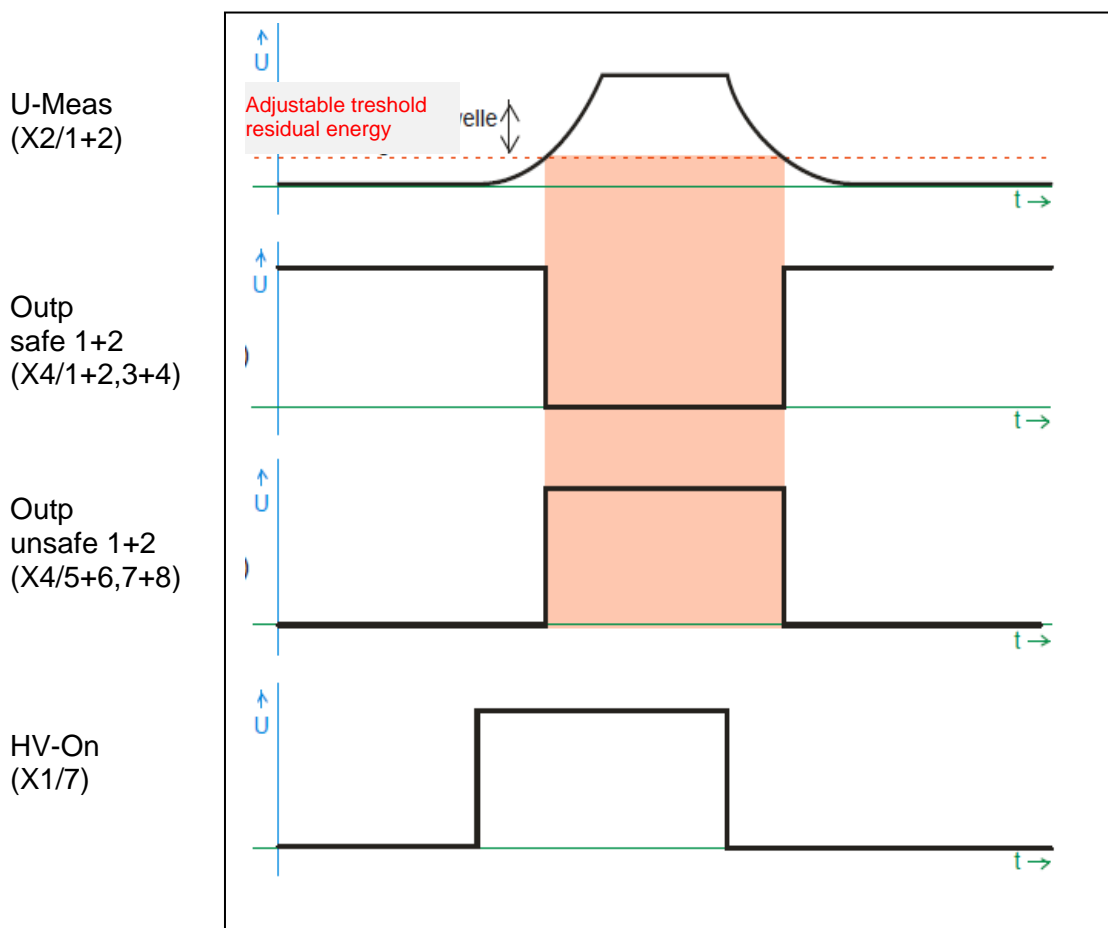
The system capacity and max. permissible residual energy can be used to calculate the safe level of high voltage. ($E = C \cdot 0.5 \cdot U^2$)

The stepping switch "residual voltage level" is used to set the "safe" residual voltage threshold. If the high voltage measured reaches or undercuts the threshold set, the residual energy monitor reports "safe". If the measured value is above it, the output reads "unsafe".

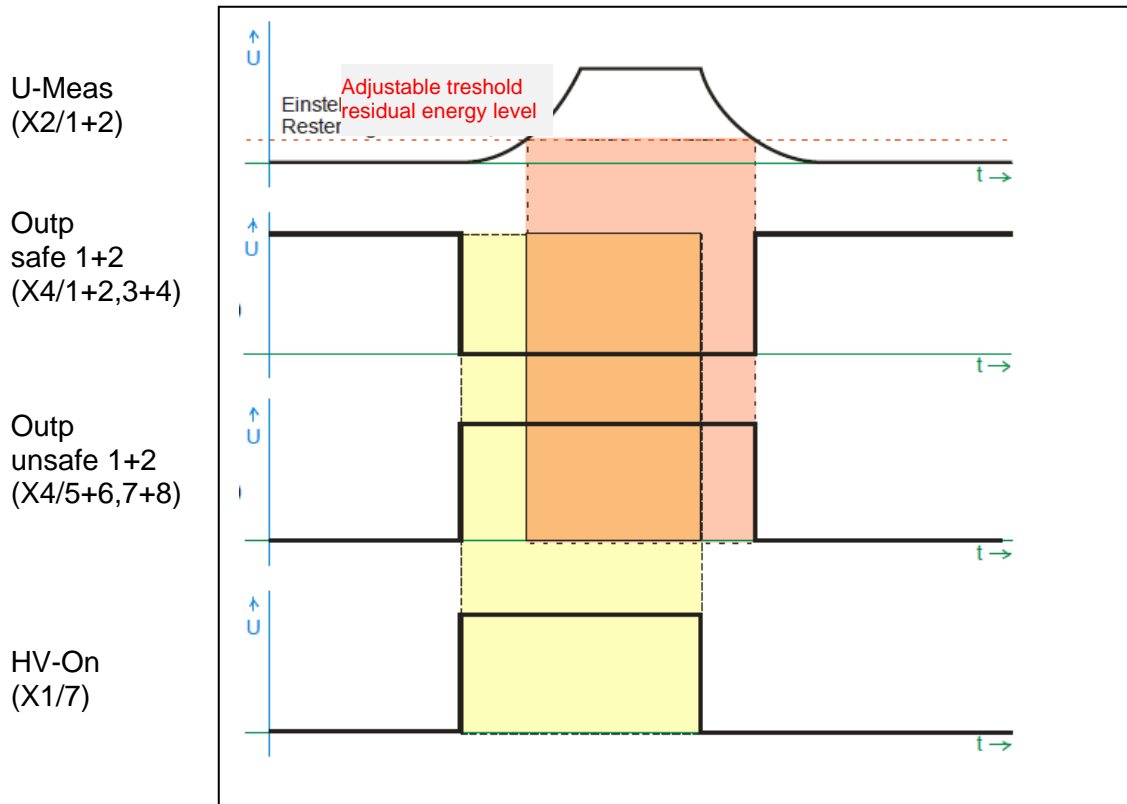
Example:

A coating system with a system capacity of 1 nF has a residual energy of 0.24mJ at 0.69kV (energy threshold when cleaning with ignitable cleaning agents). The system therefore is deemed safe at 0.69 kV and less.

The residual energy monitor reports "System is safe" at the set value and less, and "system is unsafe" at any higher values. There are two potential-free "normally open contacts" for this.



For additional safety, this function can be linked to the "HV-On" signal of the HV supply. The outputs then report "safe" or "unsafe" when system voltages are above/below the set value or the "HV-On" signal is pending.



System capacity	Safe voltage level at 0.24 mJ (ignition protection)	Threshold to be adjusted
250 pF	1.39 kV	1250 V
500 pF	0.98 kV	750 V
1.0 nF	0.69 kV	500 V
1.5 nF	0.57 kV	500 V
2.0 nF	0.49 kV	250 V
3.0 nF	0.40 kV	250 V
4.0 nF	0.35 kV	250 V
5.0 nF	0.31 kV	250 V
Round up capacity!		

4.2. Function 2 (Residual Energy Monitor)

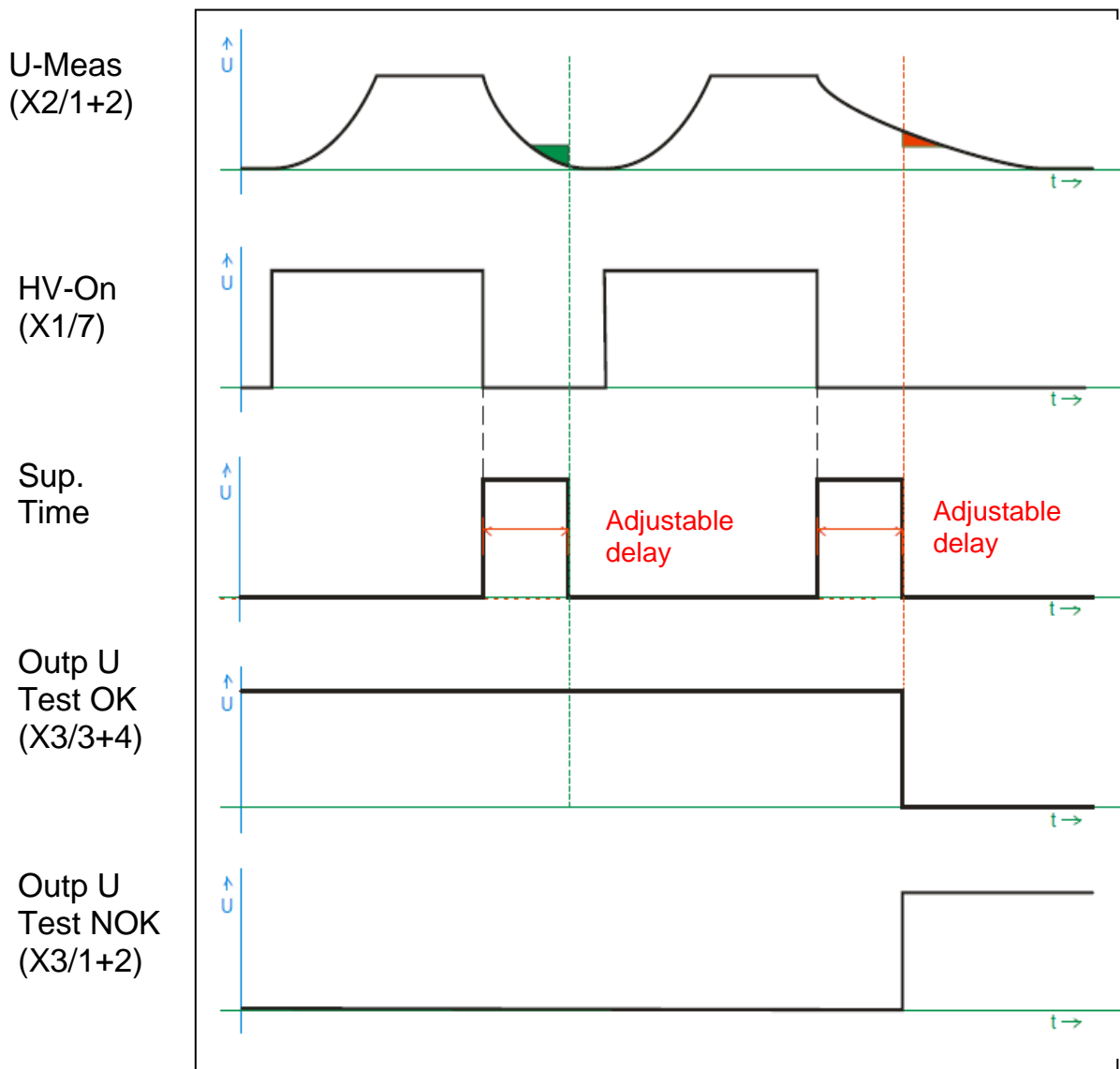
The stepping switch "Time Adjustment" can be used to set the discharge or addition time. The residual energy monitor checks the HV system within the set time after switching off the HV and the safe residual energy level. For this, the "HV-On" signal is mandatory.

During discharge for the set time after every switch-off of the high voltage, the residual energy monitor reports "Safety Check OK".

If not, "Safety Check NOK" is reported. There are a potential-free "normally closed contact" and a potential-free "normally open contact" for this.

This safety check therefore fully automatically assumes the repeated verification of residual energy as required by the standards.

The message "Safety Check NOK" can only be deleted by reset (X1/6). When bridging HV-On (X17) and Reset (X1/6), the interference message is automatically deleted at every activation of the high voltage if required.



4.3. Pin Assignment

Normally open contact "System safe"
(safe 1) closed = safe

Normally open contact "System safe"
(safe 2) closed = safe

Normally closed contact "System unsafe"
(unsafe 2) closed = unsafe

Normally closed contact "System unsafe"
(unsafe 1) closed = unsafe

+24VDC
+24VDC

Residual energy monitor NOK
(Test NOK) closed = NOK

Residual energy monitor OK
(Test OK) closed = OK

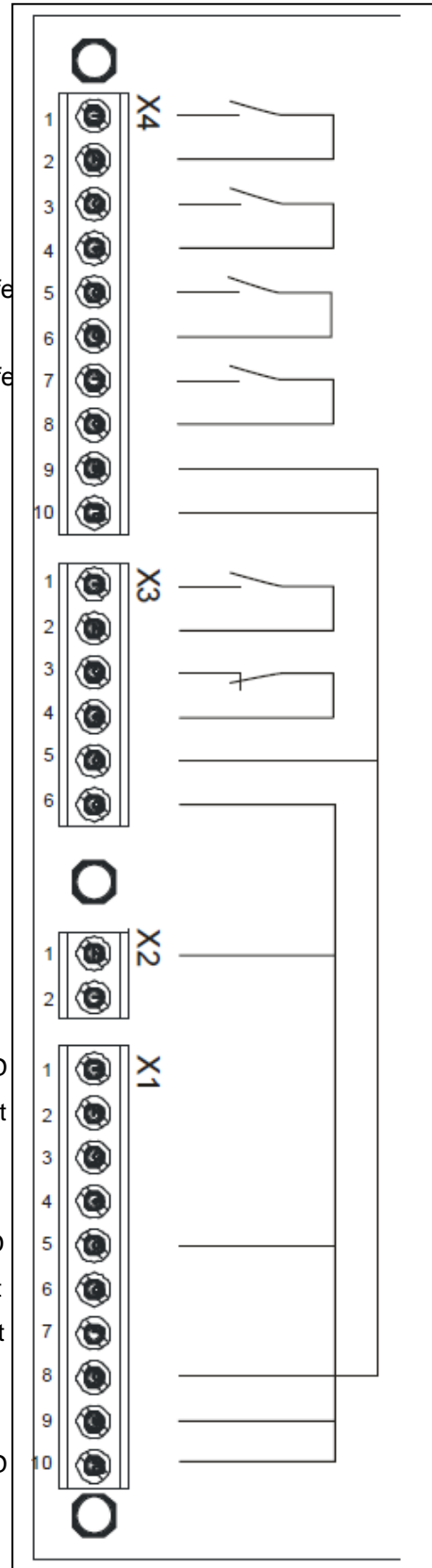
+24VDC
PE/GND

Shield
U-Meas-In

PE/GND
U-Meas-Out

PE/GND
Reset
HV-On Input

+24VDC
PE/GND
PE/GND

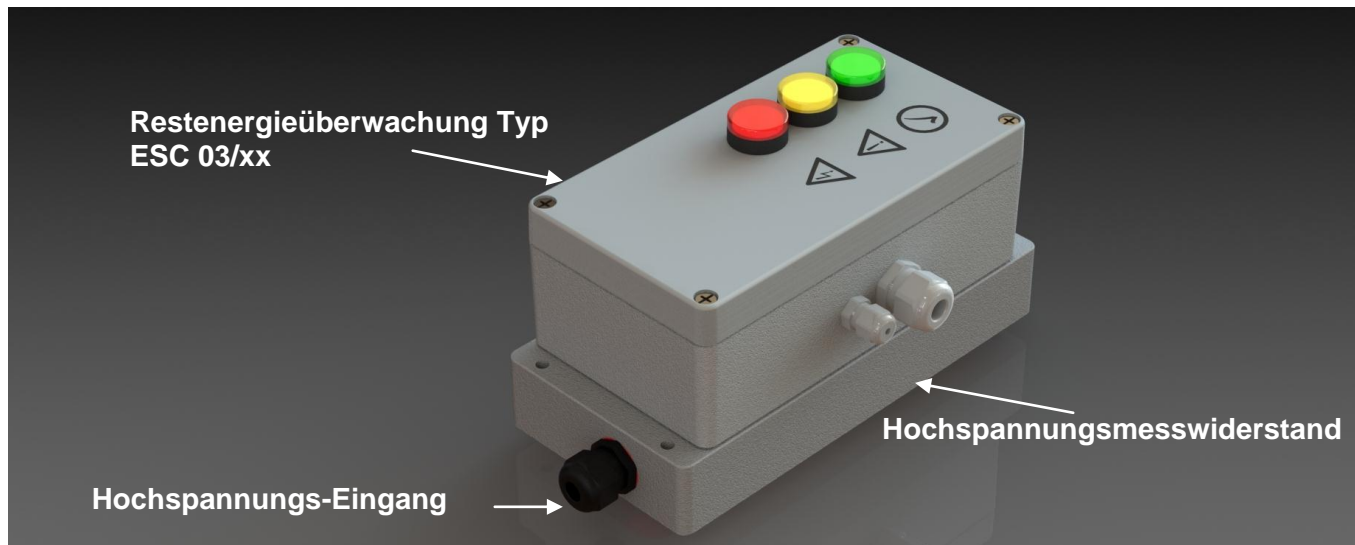


5. Use with integrated measuring resistor (recommended):

The residual energy monitoring Type ESC 03/xx is directly mounted on top of the high voltage measuring resistor.

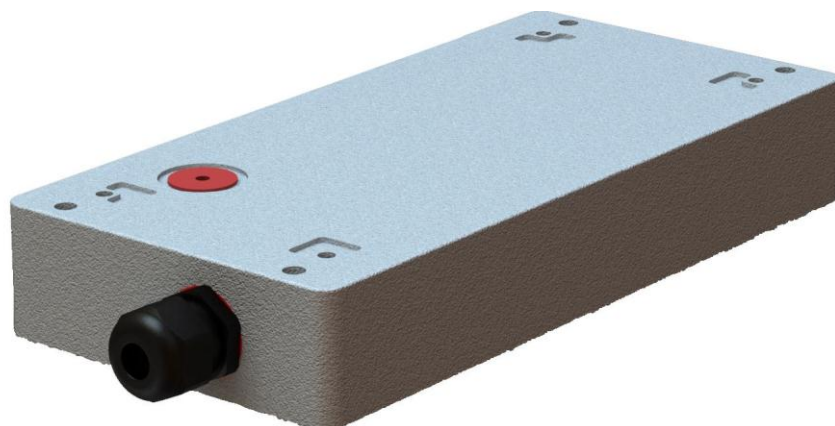
The value of the high voltage measuring resistor is 5 GOhm and it is encapsulated in epoxy inside aluminum housing. The high voltage connection is a 200 mm deep tube with 4 mm bush.

A M20 x1.5 SkinTop screw connection is used to grab the high voltage cable. The output of the measuring resistor is internally connected to the residual energy monitoring electronic.

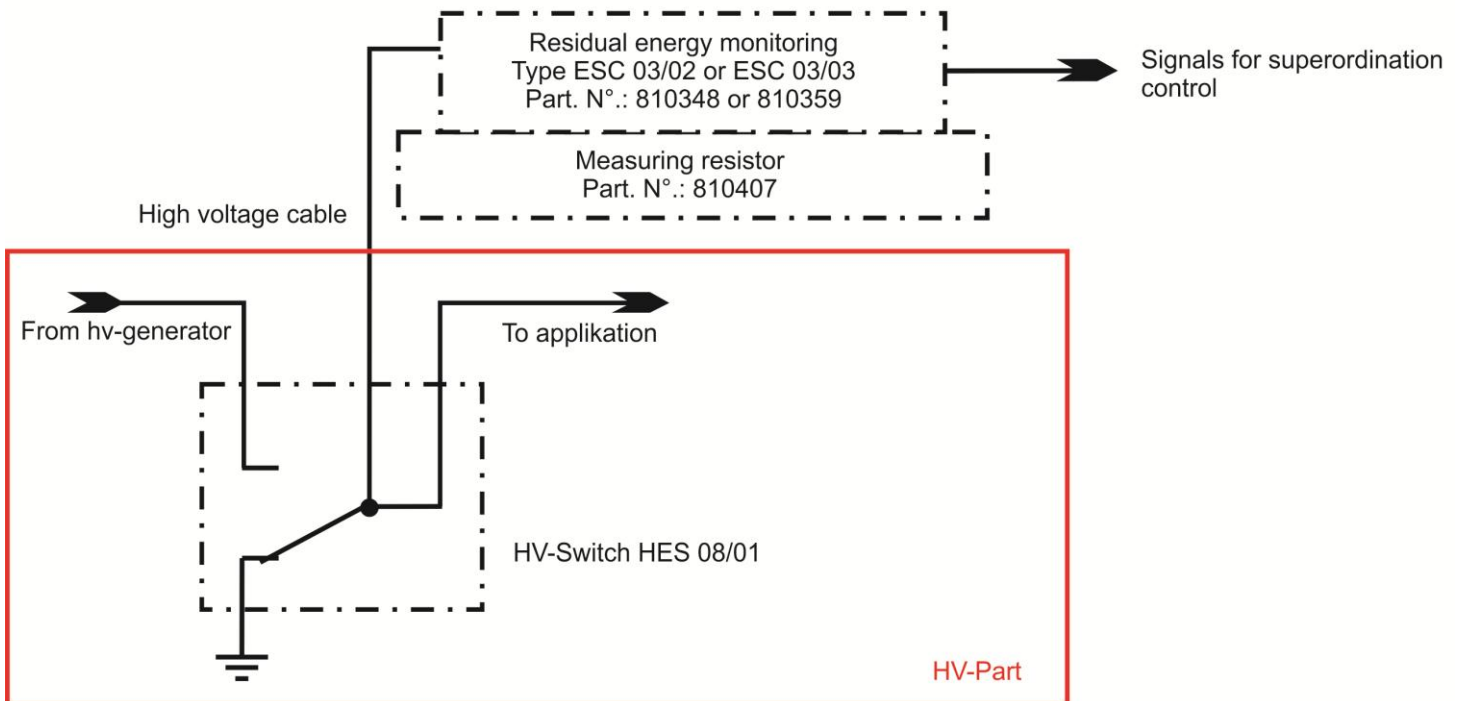
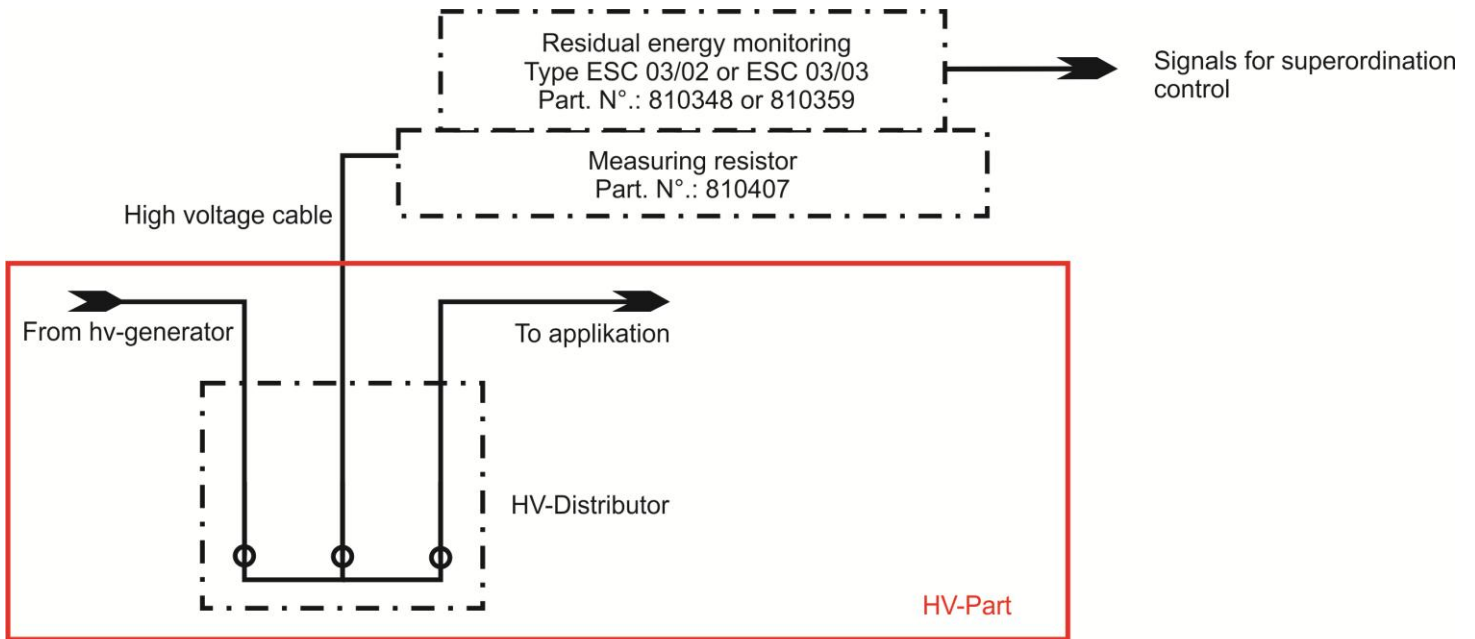


5.1. Measuring resistor (optional):

5GOhm measuring resistor part number: 810407

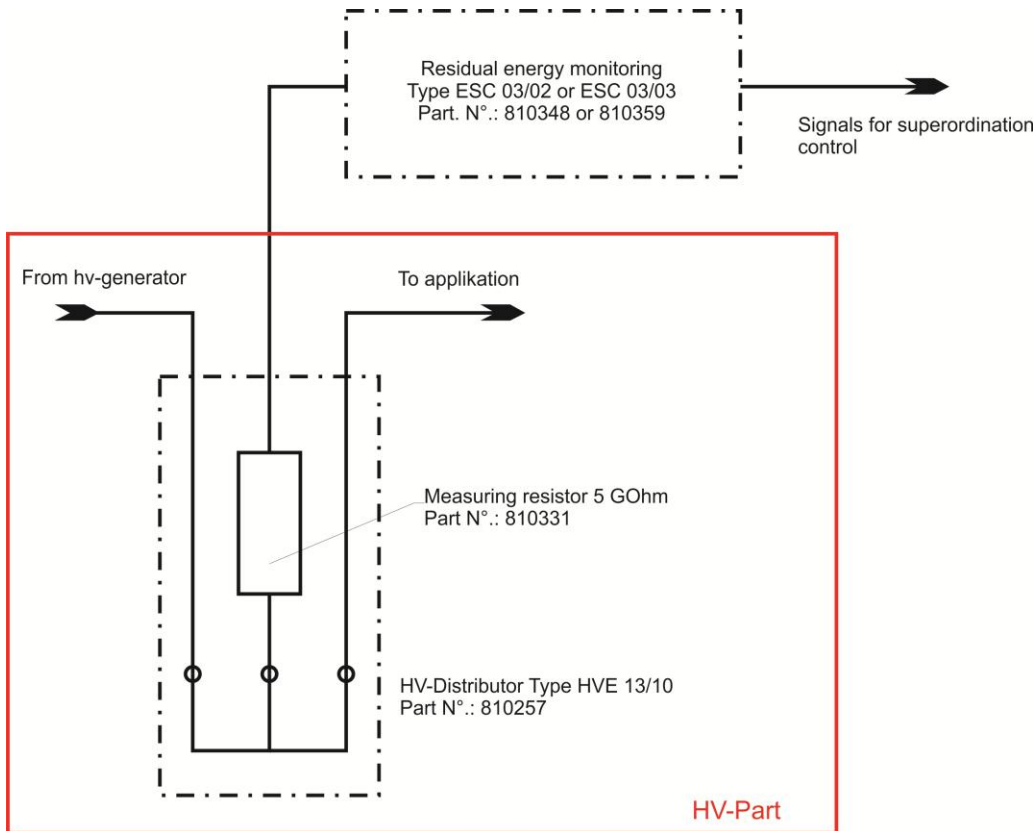


5.2. Connection examples:



6. Use with external measuring resistor:

6.1. Connection examples



6.2. measuring resistors (optional):

- 5GOhm precision resistor, Item number: 810331



- HV-distributor 3-fold in aluminium housing, Item number: 810257



- HV-distributor with precision resistor as complete unit, Item number: 810340

7. Declaration of Conformity

by

SCHNIER
Elektrostatik GmbH
Bayernstraße 13
72768 Reutlingen

for the

residual energy monitor

Type ESC 03/02 and ESC 03/03

Part Number 810348 and 810359

The above product, as delivered, corresponds to the provisions of the following European Directives:

- **EC Machinery Directive 98/37/EC**

Other applied harmonised European standards:

- **DIN EN 60204 -1** Electrical equipment of machines
- **DIN EN 50176** Stationary electrostatic application equipment for ignitable liquid coating material
- **DIN EN 50177** Stationary electrostatic application equipment for ignitable coating powders
- **DIN EN 50223** Stationary electrostatic application equipment for ignitable flock material

The standard **EN ISO 9001:2000** is met as well.

The residual energy monitor, type ESC 03/02 and ESC 03/03, is intended for installation in electrostatic systems and must be installed and operated according to the information of the operating instructions. Commissioning is not permitted before it has been determined that the plant into which it was installed complies with the provisions of the EC Machinery Directive.

The declaration of conformity expires if the product is installed and operated against its intended use. Any safety notes in the operating instructions must be complied with without exception. Reutlingen, February 12th 2013

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