EN Manual

BENDER
The Power in Electrical Safety©

EDS3090

…91, …92, …96

Portable equipment for insulation fault location for energised and deenergised AC and DC systems
Software version: D399 V2.0

EDS309x_D00012_04_M_XXEN/10.2015

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Table of Contents

1. How to get the most out of this manual

1.1 How to use this manual

This operating manual describes the basic principles of insulation fault location as well as connecting and operating an item of portable equipment for insulation fault location. It is designed for qualified electricians, and in particular for those designing, installing and operating electrical equipment.

Please read this detailed operating manual and the enclosed sheet entitled "Important safety instructions for Bender products" prior to using the EDS3090. This document must be kept in easy reach in the case.

If you have any questions, please do not hesitate to contact us. Please contact our Technical Sales Department. We are also happy to provide on-site service. Please contact our Service Department for more information.
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1.2 Explanations of symbols and notes

To make it easier for you to understand and revisit certain sections of text and instructions in the manual, we have used symbols to identify important instructions and information. The meaning of these symbols is explained below:

DANGER	*The signal word indicates that there is a **high** risk danger that **will** result in **electrocution** or **serious injury** if not avoided.*
WARNING	*This signal word means that there is a **medium** risk of danger that can lead to **death** or **serious injury,** if not avoided.*
CAUTION	*This signal word indicates a **low level risk** that can result in minor or **moderate injury** or **damage to property** if not avoided.*
	*This symbol denotes information intended to assist the user to make **optimum use of the product**.*

1.3 Overview of chapters

1. How to get the most out of this manual:
   This chapter provides information about using this documentation.
2. Safety instructions:
   This section provides information about risks affecting installation and operation.
3. System description:
   In this chapter you will find an overview of the system components, a description of their function and the basic principles of insulation fault location.
   The principle of residual current measurement is described in the final section.
4. Considerations prior to use:
   This chapter describes the practical aspects of insulation fault location and provides numerous characteristic curves for assessing the response values to be set.
5. Connecting the locating current injector:
   The connection of the PGH18… to a system to be tested is described here.
6. Operation:
   This chapter contains a description of the graphical user interface on the EDS195P. There is also an illustration of the menu structure as well as illustrations of the various standard displays.
   You will also find information of the supply of power to the EDS195P here.
7. Technical specifications:
   Along with tabular data this chapter contains information on standards and the dimensions of the system components.
8. Frequently Asked Questions:
   Use this chapter to quickly identify and rectify any malfunctions that occur.
9. INDEX:
   Use the index to quickly find the desired keywords.

2. Safety instructions

2.1 Intended use

The portable insulation fault location system EDS309… is used to locate insulation faults in IT systems. All variants are suitable for the measurement of residual currents in TN and TT systems. The EDS3096PG is particularly suitable for insulation fault location in electrically isolated systems.

Please observe the limits on the area of application stated in the technical specifications, as well as the measuring categories for the measuring clamps used. If, in the specific case, measuring current transformers other than the measuring clamps supplied are used with the EDS195P, attention is to be paid to ensuring the connection wires and transformer have an adequate nominal insulation voltage (overvoltage category, see Technical specifications)
Use which deviates from or is beyond the scope of these technical specifications is considered non-compliant.

CAUTION

System interference and high system leakage capacitances can degrade the accuracy of the measurement.

2.2 Device-specific safety instructions

CAUTION

Hazard due to excessively high locating current or excessively high locating voltage!
An excessively high PGH18… locating current may damage sensitive loads (e.g. in control circuits) or trigger unintended switching processes. For this reason select a lower locating current for these systems (1 or 10 mA).
For instance it is only allowed to use the EDS3091 or EDS3091PG in systems with programmable logic controllers (PLCs).

The locating voltage of DC 50 V produced by the locating current injector PGH186 can cause interference at sensitive system components. In case of doubt, contact Bender.

The locating current from the PGH185 or PGH186 can cause residual current devices to trip. The locating current is limited to maximum 25 mA (or 10 mA), however 30 mA residual current devices may trip, for instance, between 15 and 30 mA.

It is necessary to aim for the best possible conductor symmetry in the measuring clamp. Otherwise the measuring clamp may go into saturation due to an excessively high load current and cause an alarm $I_{\Delta n}$ >10A.

2.3 General safety instructions

Along with this operating manual, the enclosed "Important safety instructions for Bender products" form part of the documentation for this device.

2.4 Qualified personnel

Only a qualified electrician is allowed to use the EDS3090 devices. The electrician should be familiar with the assembly, commissioning and operation of the equipment and have undergone appropriate training. The person using the EDS system must have read this manual and understood all the instructions relating to safety.

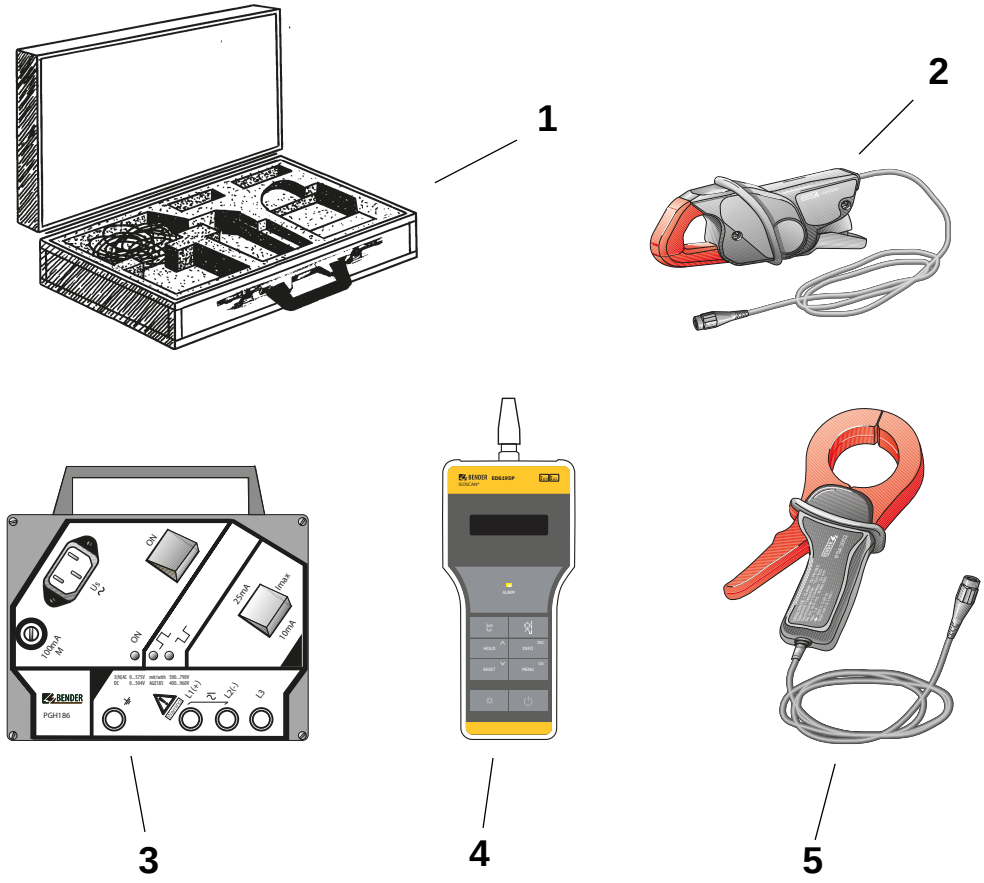
3. System description

3.1 System components

On page 60, you will find a detailed overview of the scope of delivery of the EDS309x versions. The following illustration provides a choice of the possible components.

3.1.1 Overview of system components

The primary task of the EDS309… is insulation fault location in IT systems. For this purpose the individual components of the EDS309… are used in combination.



1	Aluminium case with handle
2	Measuring clamp PSA3020 (main circuits) or PSA3320 (control circuits) Clamp inside diameter 20 mm
3	Locating current injector PGH18… For generating a locating current for insulation fault location
4	Insulation fault locator EDS195P For connecting measuring clamps and for finding insulation faults
5	Measuring clamp PSA3052 (main circuits) or PSA3352 (control circuits) Clamp inside diameter 52 mm

3.1.2 Insulation fault location equipment type list

It is possible to undertake a residual current measurement in TT and TN systems (earthed systems) using all the device variants listed below.
The following overview describes which measuring tasks can be undertaken with which models:

Equipment for insulation fault location in main circuits

1. **Permissible system voltage in the main circuits:**
   - Insulation fault location in IT systems up to AC 42…460 Hz, 20…575 V and DC 20…504 V
   - Insulation fault location using AGE185 up to AC 42…460 Hz, 500…790 V and DC 400…960 V

EDS3090:

- Can be used in IT systems in which a locating current injector PGH471 or an IRDH575 is already installed.

EDS3090PG:

- Can be used in IT systems in which neither a locating current injector PGH471 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH185 supplied:
  AC 50…60 Hz, 230 V

EDS3090PG-13:

- Can be used in IT systems in which neither a locating current injector PGH471 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH185-13 supplied:
  AC 50…60 Hz, 90…132 V

2. **Permissible system voltage in the main circuits:**
   - Insulation fault location in IT systems up to AC 42…460 Hz, 0…575 V and DC 0…504 V
   - Insulation fault location using AGE185 up to AC 42…460, Hz 500…790 V and DC 400…960 V

EDS3096PG:

- Can be used in IT systems in which neither a locating current injector PGH471 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH186 supplied:
  AC 50…60 Hz, 230 V
- Insulation fault location, also in IT systems electrically isolated on all poles

EDS3096PG-13:

- Can be used in IT systems in which neither a locating current injector PGH471 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH186-13 supplied:
  AC 50…60 Hz, 90…132 V
- Insulation fault location, also in IT systems electrically isolated on all poles

EDS3096PV:

- Applicable in PV systems without a locating current injector installed.
- Supply voltage for the delivered locating current injector PGH186: AC 50…60 Hz, 230 V.
- Insulation fault location, also in IT systems disconnected on all poles or in de-energised IT systems.

Equipment for insulation fault location in control circuits
Permissible system voltage in the control circuits:
Insulation fault location in IT systems up to AC 42…460 Hz, 20…265 V and DC 20…308 V.

EDS3091:

- Can be used in IT systems in which a locating current injector PGH473 or an IRDH575 is already installed.

EDS3091PG:

- Can be used in IT systems in which neither a locating current injector PGH473 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH183 supplied:
  AC 50…60 Hz, 230 V

EDS3091PG-13:

- Can be used in IT systems in which neither a locating current injector PGH473 nor an IRDH575 is already installed.
- Supply voltage for the locating current generator PGH183-13 supplied:
  AC 50…60 Hz, 90…132 V

Equipment for insulation fault location in main circuits and control circuits

EDS3092PG:

- Contains the components and combines the features of the EDS3090PG and EDS3091PG

3.1.3 Accessories

You will find information on the standard accessories as well as on optional accessories in the ordering data on page 59 and in the component list on page 60.

Only use the components supplied by us on working with the EDS309…. Commercially available measuring clamps are not allowed to be used! This statement also applies to measuring clamps or measuring current transformers from the Bender range that are not expressly intended to be used with the EDS309…. Along with the measuring clamps supplied, it is allowed to connect to the EDS195P the following measuring current transformers from the Bender series:
WF…
W… /WR… /WS…
W…-8000/WS…-8000
Series W…AB current transformers can ***not*** *be used!*

For series WF… current transformers you will need a BNC to PS2 adapter cable, see page 59.

3.2 Function of the system components

3.2.1 Locating current injector PGH18…

The PGH18… generates a defined locating current. The magnitude of the current is dependent on the insulation fault present and the system voltage.

- The PGH185 or PGH186 limits the locating current to maximum 25 mA or maximum 10 mA depending on the switch setting.
- The PGH183 limits the locating current to maximum 2.5 mA or maximum 1 mA depending on the switch setting.
- The PGH186 applies the locating current in electrically isolated IT systems or in IT systems with a system voltage < 50 V using an integrated voltage source (DC 50 V). In IT systems with a system voltage > 50 V the existing voltage in the system is used to drive the locating current.

3.2.2 Insulation fault locator EDS195P

The insulation fault locator EDS195P has the following measuring functions:

- Insulation fault location $I_{\Delta L}$ (EDS mode) for use in IT AC or DC systems:
  - Either as a component of the portable equipment for insulation fault location EDS309…
  - Or as an additional insulation fault locator in permanently installed equipment for insulation fault location with IRDH575 or PGH1… as well as EDS46…/49….
- Residual current measurement $I_{\Delta n}$ (RCM mode) for usage in TN or TT AC systems. The response value range can be found in table 3.1 on page 14.

Response value

The response value is defined by the sensitivity of the EDS195P. This value can be set in both DC and AC and 3AC IT systems as an arithmetic mean in accordance with Tabelle 3.1 auf Seite 14. System interference and high system leakage capacitances can degrade the accuracy.

3.2.3 Measuring clamps

Measuring clamps measure the locating current or the residual current. They have a test lead approx. 2 m long. The connection to the EDS195P is made using a BNC connection.
The following table summarises the most important data for the usage of the different measuring clamps.

		Main circuit (EDS3090…, 3092…, 3096…)	Control circuit (EDS3091…)
IT system	Measuring clamps	PSA3020, PSA3052, PSA3165	PSA3320, PSA3352
	Measuring range	2…50 mA	0.2…5 mA
	Response value	2…10 mA, ±30% / ±2 mA	0.2…1 mA, ±30 % / ±0.2 mA
TN/TT system	Measuring clamps	PSA3020, PSA3052, PSA3165	PSA3320, PSA3352
	Measuring range	5 mA…10 A	2 mA…2 A
	Response value	10 mA…10 A	5 mA…1 A

Tab. 3.1: Measuring clamps and response values for the EDS195P

If measuring current transformers are used instead of measuring clamps, you will need the adapter supplied: BNC/4-mm connector. See table on page 60.

3.2.4 Coupling device AGE185

The coupling device AGE185 expands the nominal voltage range of the equipment for insulation fault location EDS309…. It enables the equipment to be connected to system nominal voltages up to AC 790 V or DC 960 V.

3.3 Operating principle for insulation fault location ($I_{\Delta L}$)

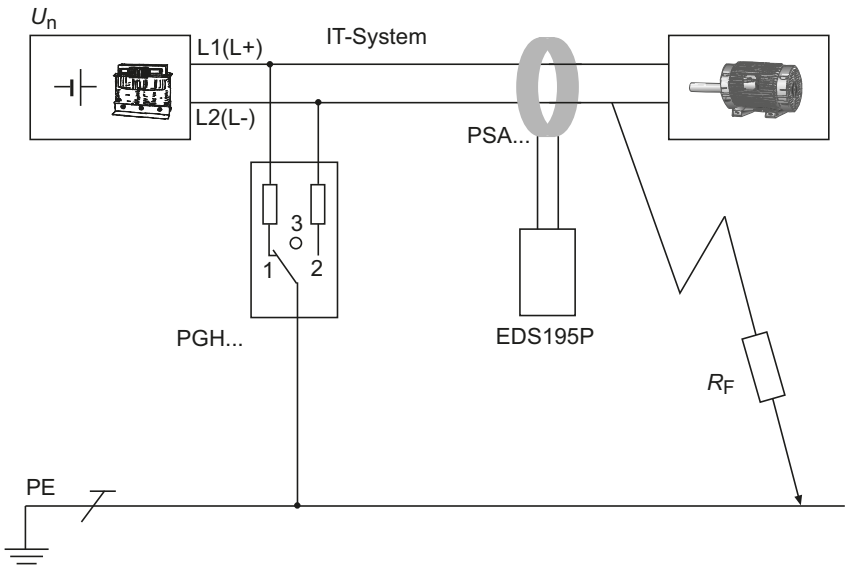
On the occurrence of the first insulation fault in IT systems a residual current flows that is essentially defined by the system leakage capacitances. The basic concept of fault location is therefore to briefly close the fault circuit using a defined resistance. With this principle a locating current is provided by the system voltage and this locating current contains a signal that can be evaluated.

The locating current is generated periodically by the locating current injector PGH18… (part of the EDS309…PG system).
The locating current can also be generated by an IRDH575 or a locating current injector PGH47….
The amplitude and duration of the locating current is limited. During this process the system conductors are alternately
connected to earth via a defined resistance. The locating current produced as a result is dependent on the magnitude of the insulation fault present and the system voltage.
For example the locating current on the EDS3090 is limited to maximum 25 mA; with the setting I_{max} = 10mA it is limited to 10 mA. During planning it is to be ensured that there are no system components in which this locating current could cause a reaction involving damage in unfavourable circumstances.

The locating current pulse flows from the locating current injector through the live conductors to the insulation fault by the shortest route. From there it flows via the insulation fault and the earth cable (PE cable) back to the locating current injector. This locating current pulse is detected by the measuring clamps or measuring current transformers in the insulation fault path and is indicated by the insulation fault locator EDS195P connected.

You must ensure that all live conductors are routed through the measuring clamp. ***Do not route any protective earth conductors or screens on screened cables through the measuring clamp****! Commercial measuring clamps are not suitable for the EDS309… and must not be used.*
Only if these notes are observed will you obtain a correct measurement result.
You will find additional information in our technical information Techinfo08 "Transformer installation".

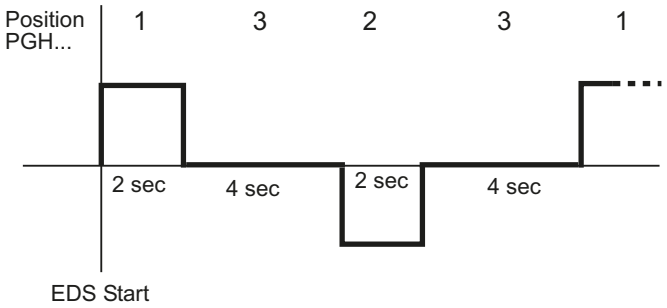
3.3.1 Schematic diagram EDS system



EDS195P	Insulation fault locator
PGH…	Locating current injector
U_n	IT system voltage
PSA…	Measuring clamp
R_F	Insulation fault
PE	Protective earth conductor

3.3.2 Test cycle

The locating current pulse cycle has a duration of 6 seconds. The PGH… sends alternating positive and negative locating current pulses. The sketch below shows the test cycle of the PGH… with the different switch settings (1, 2, 3) on the device, see schematic diagram above.

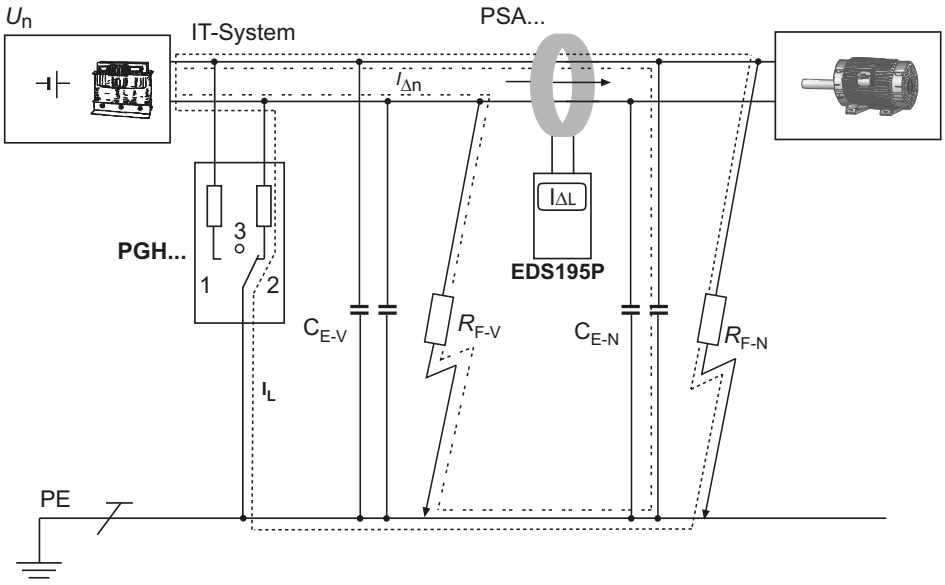


3.3.3 Definitions

I_L = Locating current that flows through the locating current injector while the fault location is running (EDS mode).
$I_{\Delta L}$ = Locating current measured by the insulation fault locator (EDS mode).
$I_{\Delta n}$ = Residual current produced by an insulation fault (RCM mode).

3.3.4 Currents in the EDS system

As an addition to the schematic diagram on page 16, here the path of the residual currents and the locating current is shown:



.....	Locating current circuit due to the insulation fault R_{F-N}
. .. .	Residual currents $I_{\Delta n}$ (example)
$I_{\Delta L}$	Locating current measured by the EDS195P
C_{E-V}	Upstream capacitances, system leakage capacitances upstream of the measuring current transformer
C_{E-N}	Downstream capacitances, system leakage capacitance downstream of the measuring current transformer
R_{F-V}	Insulation fault upstream of measuring current transformer
R_{F-N}	Insulation fault downstream of the measuring current transformer

The following residual currents flow through the measuring current transformer of the EDS195P:

- The locating current caused by the insulation fault R_{F-N}
- The residual currents $I_{\Delta n}$ that flow through the system leakage capacitances C_{E-V} and C_{E-N}, or that are caused by R_{F-V} and R_{F-N}
- Transient leakage currents that are caused by switching and control activities in the system
- Low-frequency leakage currents generated by the use of converters

3.4 Operating principle for residual current measurement ($I_{\Delta n}$)

In the RCM mode the EDS309… operates based on the principle of residual current measurement. In this case only the insulation fault locator EDS195P and a measuring clamp are used, the locating current injector PGH18… is not required.

As per Kirchhoff's law the sum of the currents flowing into any node in a network is equal to the sum of the currents flowing out.

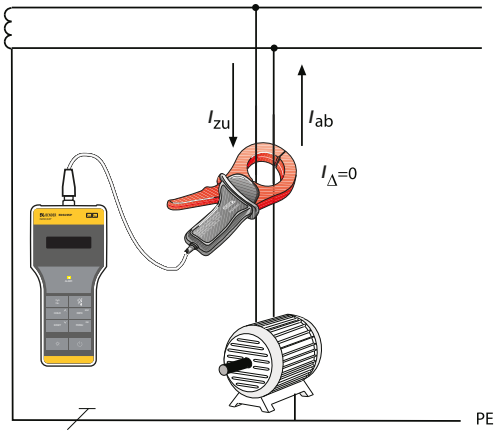


Abb. 3.1: The two currents I_{zu} and I_{ab} have the same magnitude, however their signs are different, such that the sum of the two currents is zero. The EDS195P detects this situation, there is no message.

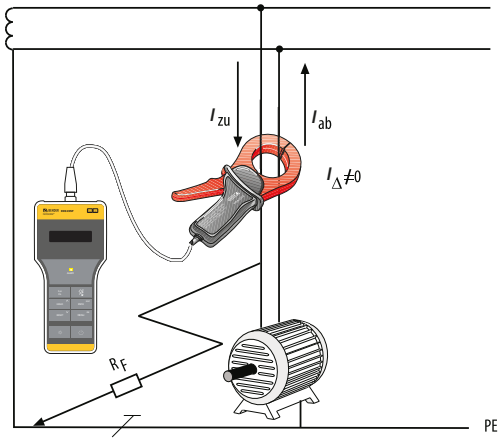


Abb. 3.2: Part of the current flows through an insulation fault R_F. The sum of the two currents is no longer zero. As soon as the residual current reaches or exceeds the response value there is an alarm message on the EDS195P.

In the RCM mode it is possible to measure residual currents in single and three-phase TT or TN systems. If the system leakage capacitance ahead of the measuring clamp is sufficiently high, the EDS195P can also be used for measurements in single and three-phase IT systems. The suitability of the device is to be checked in the specific case.

4. Considerations prior to use

4.1 How does the equipment for insulation fault location work

The equipment comprises a locating current injector PGH18… and an insulation fault locator EDS195P with measuring clamp PSA3… connected.

Functional sequence

- Insulation fault location is started by activating the locating current injector PGH18…
- The locating current injector PGH18… briefly connects the live conductors to earth with current limiting.
- The insulation fault creates a closed circuit in which a locating current I_L dependent on the system voltage flows. The locating current is limited to a maximum value of 25 mA or 10 mA (PGH185/186), 2.5 mA or 1 mA (PGH183).
- The locating current flows from the locating current injector via the live cables, the insulation fault R_F and the earth cable (PE cable) back to the locating current injector.
- The locating current signal can be measured using measuring clamp placed around the cables in the outgoing circuit from the distribution system and evaluated by the insulation fault locator EDS195P.
- The location of the fault can be determined exactly by moving along the cable with the measuring clamp.

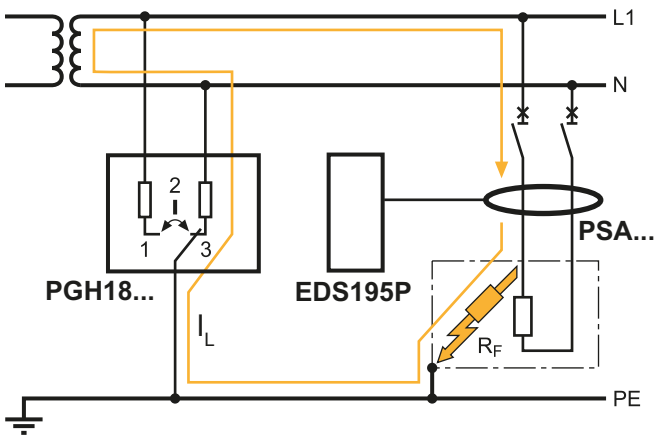


Abb. 4.1: EDS operating principle

4.2 Requirements for reliable insulation fault location

The insulation fault locator has the task of locating the insulation fault R_{F-N} downstream of the measuring clamp. For this purpose, it must reliably detect the locating current caused by the insulation fault.
Requirements:

- The insulation fault must be present for at least 30 s
- The locating current is in the following ranges:
  - Main circuits with EDS3090, EDS3090PG, EDS3090PG-13, EDS3092PG, EDS3096PG-13, EDS3096PV, EDS3096PG: I_L = 2…50 mA
  - Control circuits with EDS3091, EDS3091PG, EDS3091PG-13, EDS3092PG:: I_L = 0.2…5 mA
- The upstream capacitances C_{E-V} must be at least as large as the downstream capacitances C_{E-N}. See also chapter "3.3.4 "
- The total system leakage capacitance must not exceed the maximum values in the characteristics in chapter "4.4 ".
- The sum of the locating current and residual current flowing through the measuring clamp or the measuring current transformer must not exceed the following values:
  - Main circuits with EDS3090, EDS3090PG, EDS3090PG-13, EDS3092PG, EDS3096PG-13, EDS3096PV, EDS3096PG: maximum 10 A
  - Control circuits with EDS3091, EDS3091PG, EDS3091PG-13, EDS3092PG: maximum 1 A
- There must be no connections to other outgoing circuits downstream of a measuring clamp or measuring current transformer, see sketch.

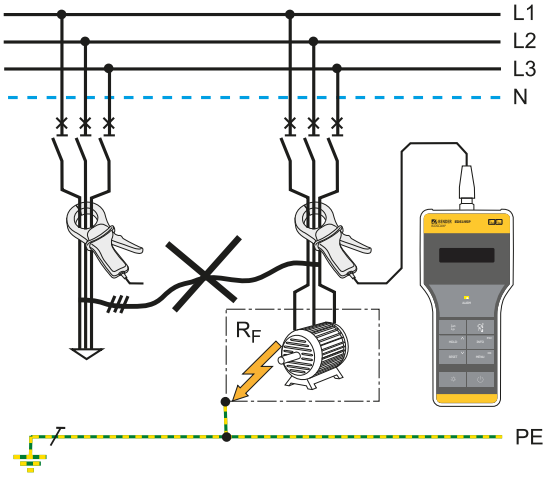


Abb. 4.2: Connections between outgoing circuits will result in measuring errors

- As well as the magnitude of the residual current, the frequency of the residual current also affects the reliable detection of the locating current. Residual currents at frequencies other than the system frequency may, e.g., be caused by the usage of frequency converters. The behaviour of the EDS309… is described by the fault curve shown below:
  - If the residual currents measured in **main circuits** exceed 10 A, the EDS195P outputs the alarm message "$I_{\Delta n}$ >10 A".
    This statement applies to the system frequencies 50/60/400 Hz for the EDS3090, EDS3090PG, EDS3090PG-13, EDS3092PG, EDS3096PG-13, EDS3096PV and EDS3096PG.
  - If the residual currents measured in **control circuits** exceed 1 A, the EDS195P outputs the alarm message "$I_{\Delta n}$ >1 A".
    This statement applies to the system frequencies 50/60/400 Hz for the EDS3091, EDS3091PG, EDS3091PG-13 and EDS3092PG.

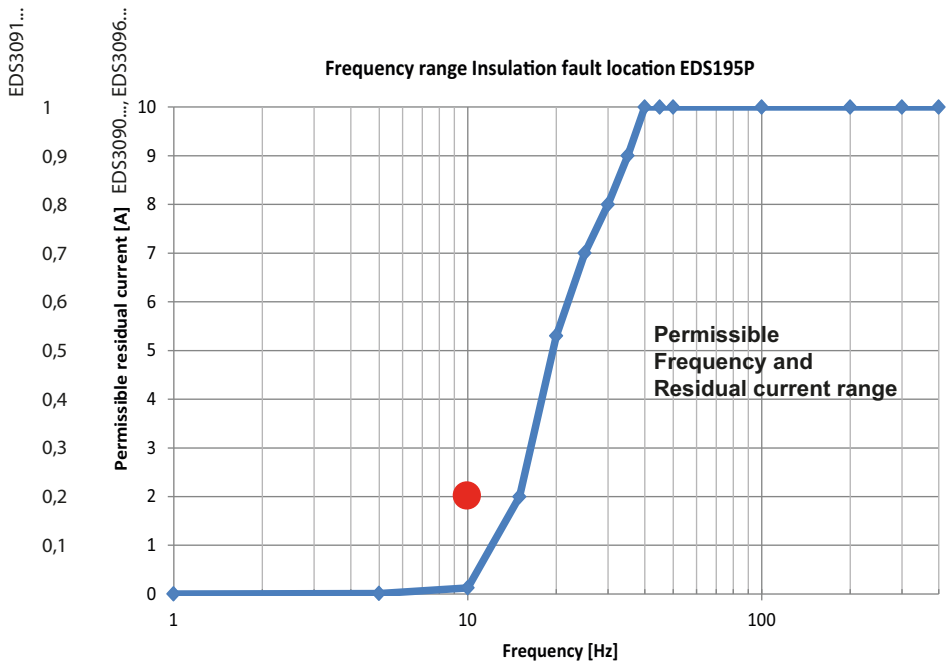


Abb. 4.3: Fault curve:
A residual current of 2 A at 10 Hz is outside the permitted frequency range (red dot) ==> a valid measurement is not possible!

There must be no connections between outgoing circuits downstream of the measuring clamp because such connections will produce interfering residual currents. For example, the message "IΔn>10A" may be output as a consequence.

Symmetrical insulation faults downstream of the measuring current transformer will not be detected in certain circumstances. Low frequency residual currents (e.g. caused by converters) can mean that insulation faults are not found if their frequency is the same as or approximately the same as the frequency of the locating cycle of the PGH18….

Parallel cables routed to the same load are to be routed together through the measuring clamp during the measurement.

4.3 Reduced locating current

Particularly in DC control voltage systems in the power station and public utility sector there may be relays or PLCs installed that switch at relatively low currents. In such a case the I_{max} switch on the PGH18… must be placed in the 10 mA or 1 mA position. The switch's label, e.g. 10 mA or 25 mA, defines the magnitude of the locating current only for DC systems. For AC locating currents see "chapter 4.4".
It must also be checked prior to a measurement with reduced locating current (switch position 10 mA or 1 mA) whether sensitive system components could be triggered unintentionally.

4.4 Response sensitivity characteristics of the EDS195P

The type of system, system voltage, system frequency, system leakage capacitance and locating current all affect the EDS system's response sensitivity. The magnitude of the locating current can be set on the locating current injector PGH18…. A reduced locating current is produced in AC systems depending on the type of system. In comparison to DC systems the related factor in AC systems is 0.5 and in 3AC systems 0.67. For this reason set the response value on the EDS195P for usage in AC and 3AC systems as follows:

Settings	Main circuit	Control circuit	PV system
Equipment for insulation fault location	EDS3090 EDS3090PG EDS3090PG-13 EDS3092PG EDS3096PG	EDS3091 EDS3091PG EDS3091PG-13 EDS3092PG	EDS3096PV
EDS195P setting: select the measuring clamp type using button	PSA**30**20, PSA**30**52, PSA3165 Measuring range 2…50 mA	PSA**33**20, PSA**33**52 Measuring range 0,2…5 mA	PSA**30**52 Measuring range 2…50 mA
PGH18… setting: locating current I_L	25 mA (PGH185/186)	2,5 mA (PGH183)	25 mA (PGH186)
Response range EDS195P Menu item 2.2: IΔL ALM	2…10 mA	0,2…1 mA	2…10 mA
PGH18… setting: reduced locating current I_L	10 mA (PGH185/186)	1 mA (PGH183)	10 mA (PGH186)
Response range EDS195P with reduced locating current Menu item 2.2: IΔL ALM	2…5 mA	0,2…0,5 mA	2…5 mA

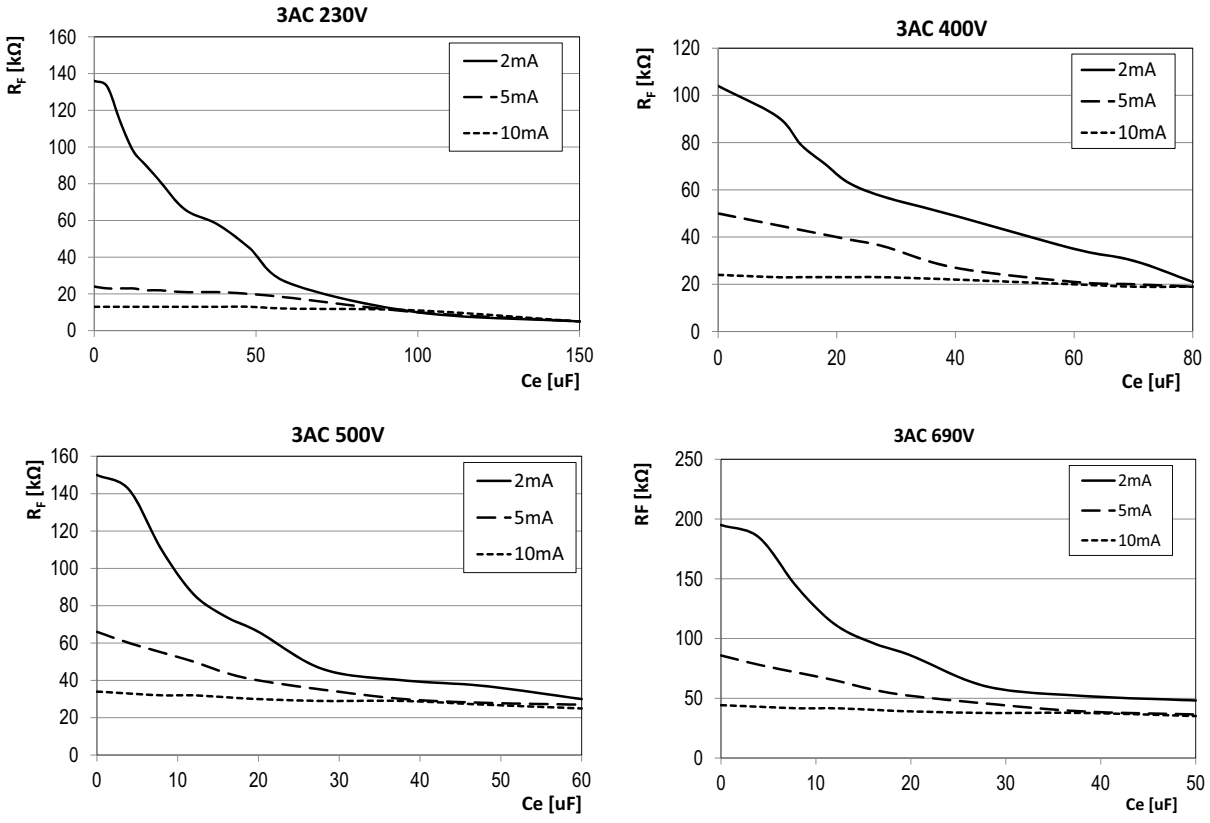
Tab. 4.1: Settings for the EDS195P and the PGH18…

For the response value setting see menu item “2. Settings/ 2. IΔL) on page 39. The response values are given as characteristics that can have a maximum error of ±30 %. Measuring clamp tolerances are included here. The characteristics apply at the related nominal voltage stated.
In case of variation in the nominal voltage, a proportional change in the response values is to be expected. In case of system voltages that change dynamically or in case of superimposed DC currents and AC currents that vary from the system frequency (e.g. due to frequency converters), response values outside the ranges shown may result.

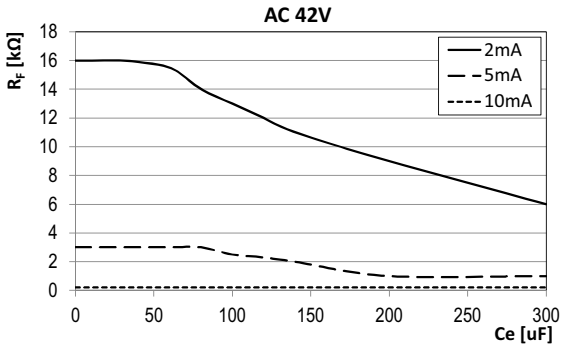
The characteristics below enable you to simply determine a practical response value for the EDS195P. If the insulation monitoring device in a monitored system indicates an alarm message, manual insulation fault location can be started. Proceed as follows:

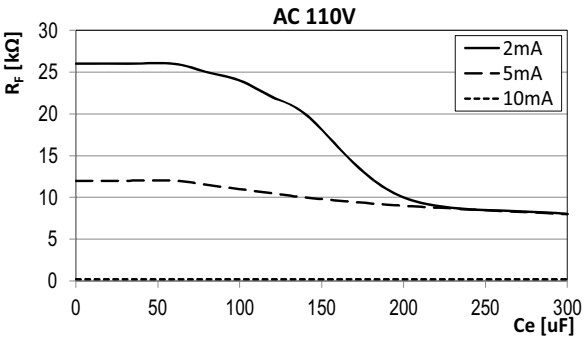
1. Select the characteristics (3AC, AC, DC) that are appropriate for your type of system.
2. From these, select the diagram that best matches the desired system voltage.
3. Calculate the expected leakage capacitance C_e of the system monitored. Insulation monitoring devices in the IRDH… series can indicate the magnitude of the leakage capacitance (press INFO button). Apply this value to the diagram in the form of a vertical line.
   If it is not possible to check the capacitance, the highest capacitance in the related diagram is to be taken.
4. The characteristics shown indicate the response sensitivity of the EDS195P in main circuits for 2 mA, 5 mA and 10 mA and in control circuits for 0.2 mA, 0.5 mA and 1 mA. Values above the related curve cannot be measured. Values and characteristics that lie in the area between the upper and lower characteristic can be estimated approximately using the existing characteristics.
5. Set the required response value, on the left of the line from point 3., on the EDS195P.
6. The characteristics for DC 24 V and AC 42 V do not apply to the EDS3096, as the locating current generator operates with a locating voltage of DC 50 V. For this reason the curves for DC 60 V and AC 110 V apply at these nominal voltages.

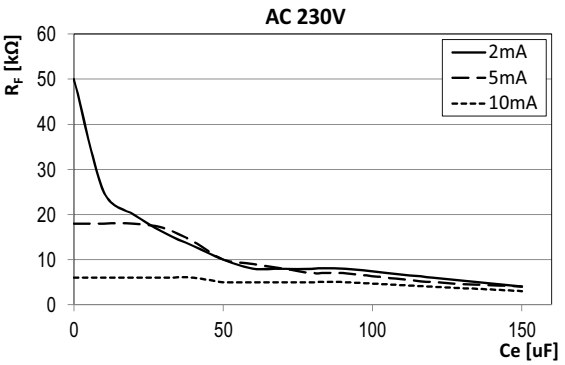
4.4.1 Response characteristics for main circuits in 3AC systems

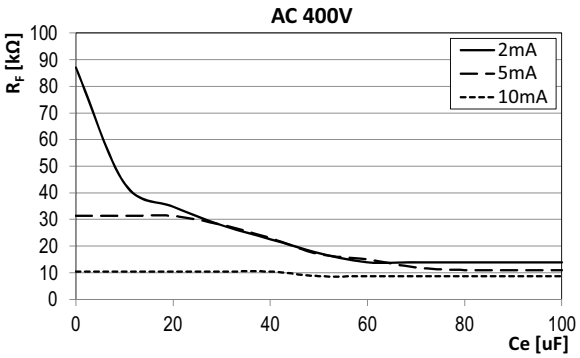


4.4.2 Response characteristics for main circuits in AC systems

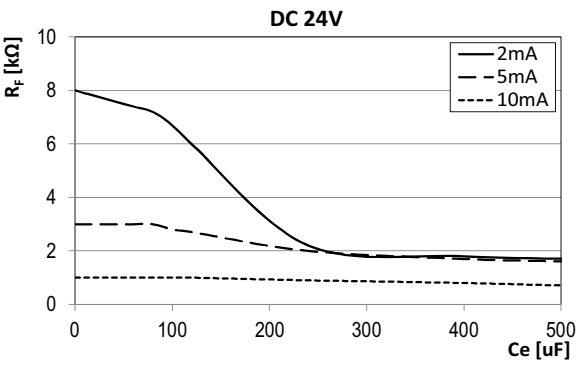


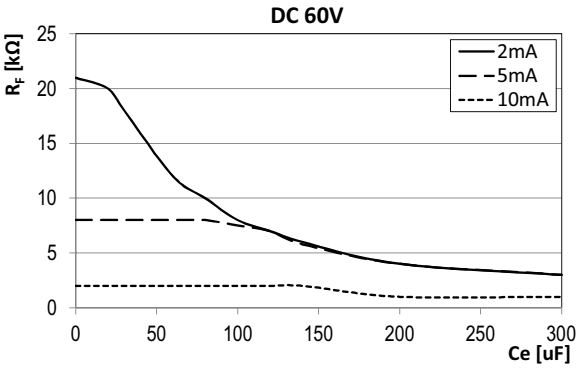


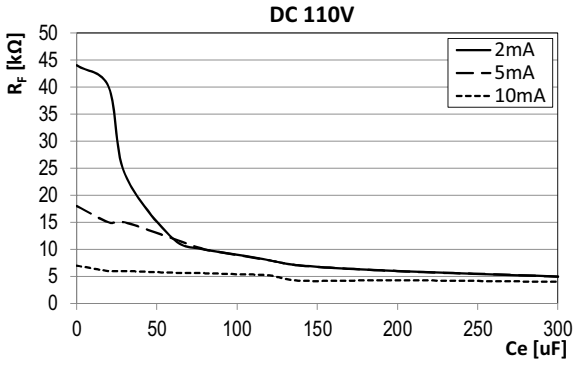


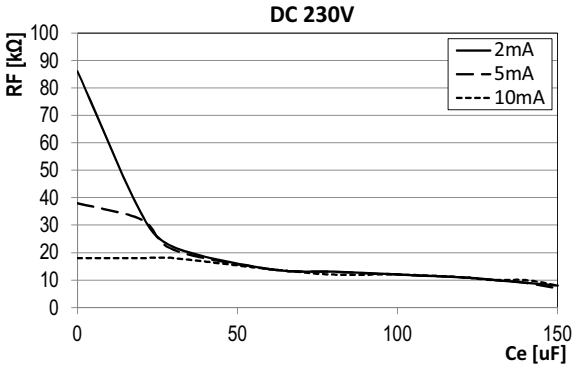


4.4.3 Response characteristics for main circuits in DC systems

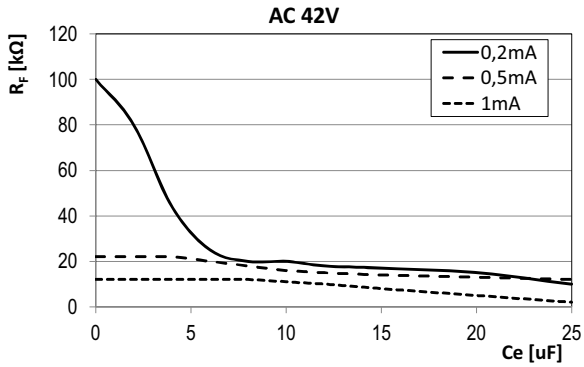


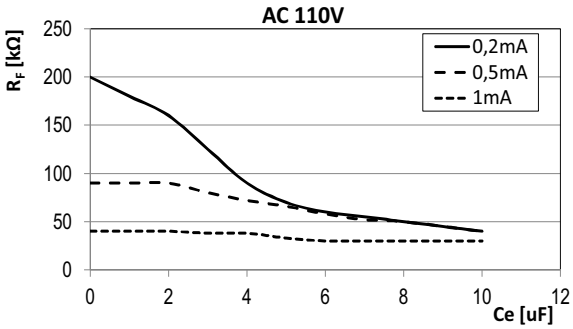


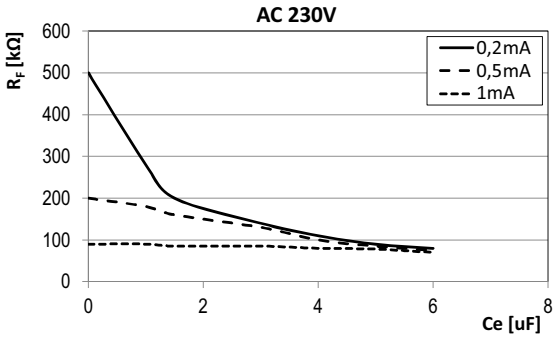




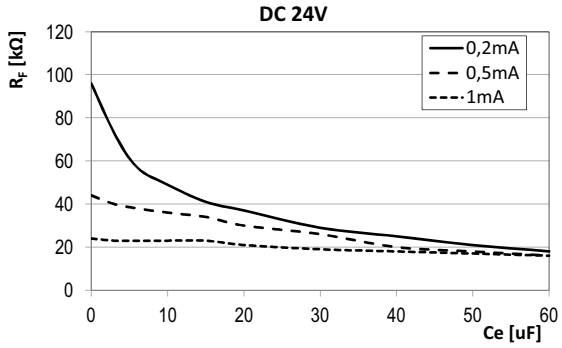
4.4.4 Response characteristics for control circuits in AC systems

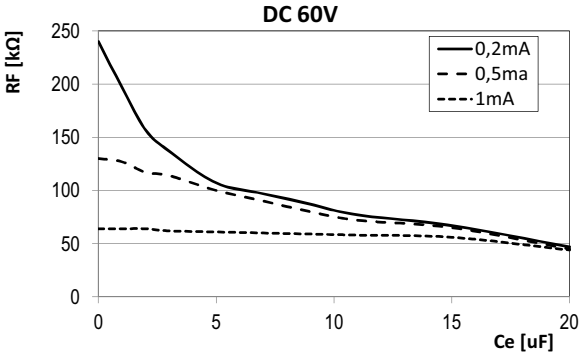


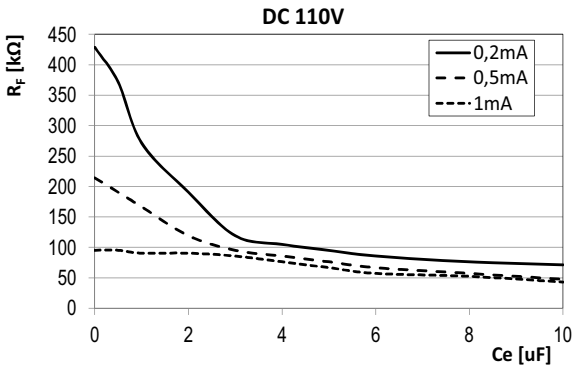


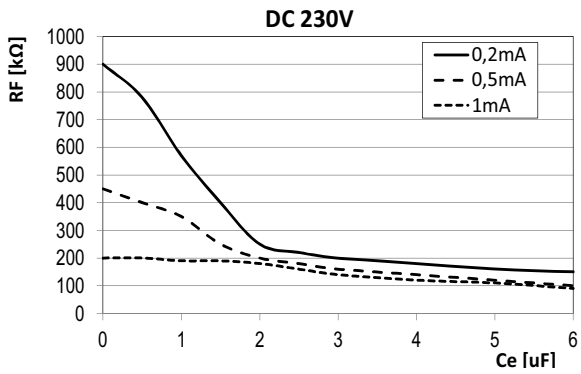


4.4.5 Response characteristics for control circuits in DC systems









5. Connecting the locating current injector

CAUTION

Hazard due to excessively high locating voltage!
Check the information on the nameplate to ensure the devices to be connected are suitable for the supplying system. The operation of the PGH18… and possibly the power supply unit with an incorrect supply voltage can cause irreparable damage to the devices.

Prior to commissioning check whether all system components are correctly connected together.

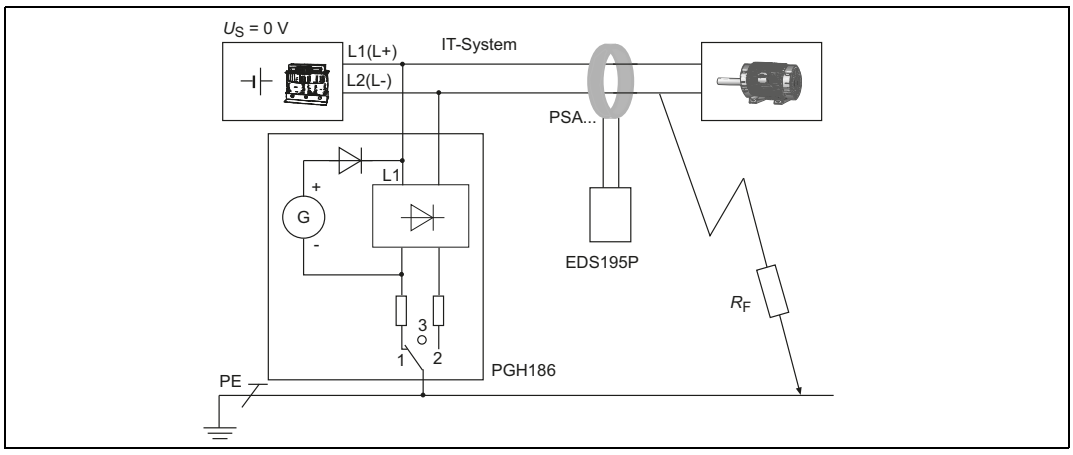
5.1 Disconnecting insulation monitoring device

During insulation fault location using the EDS309… an existing insulation monitoring device must be disconnected from the system for the duration of the fault location if its internal resistance is R_i < 120 kΩ. During this process the connection to the system must be interrupted on all poles, shutting down the supply voltage to the insulation monitoring device is insufficient. On the usage of such a device with $R_i \geq 120$ kΩ the effect is negligible, disconnection is not required in this case. However the PGH18… will affect the measurement made by the insulation monitoring device.

5.2 Locating current injector in an electrically isolated IT system

For insulation fault location in electrically isolated systems using the EDS3096PG, the integrated voltage source G in the PGH186 supplies a locating voltage.
The locating voltage DC 50 V is provided by the PGH186 at the socket L1(+). Make sure that this socket is coupled to the system to be monitored during insulation fault location, only then will the integrated voltage source in the PGH186 be effective.

Note that the active conductors in the system to be checked must be coupled together via loads or the electrically isolated power supply.



5.3 Connection to a live IT system

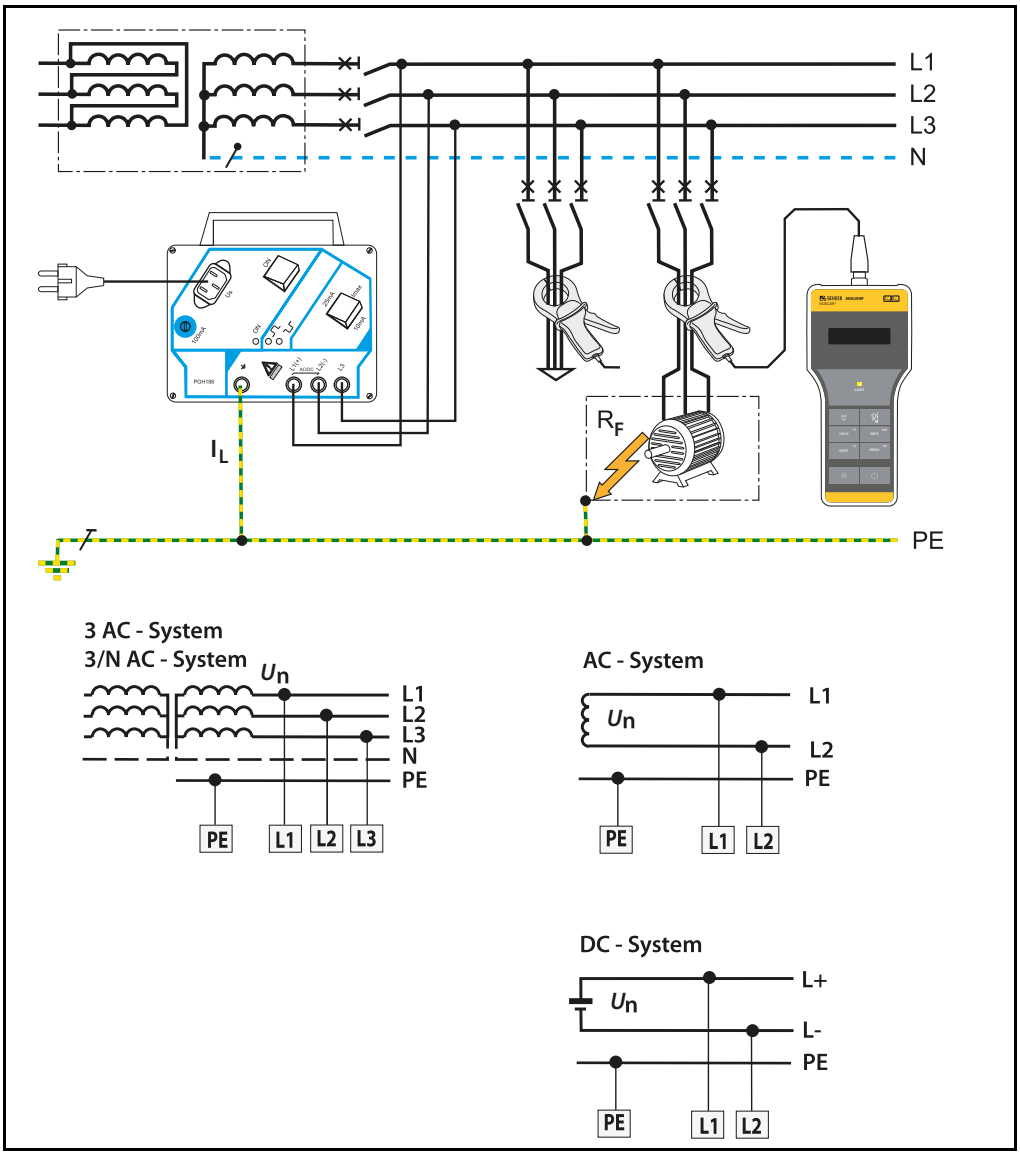
DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason prevent any physical contact with active conductors and follow the rules for working on electrical systems.

DANGER

Risk of electric shock!
If the PGH18… is connected using terminals L1, L2, L3 (or L1, L2) to a system that is live due to its operation, the terminal ⏚ must not be disconnected from the protective earth conductor (PE). Otherwise the terminal will be at the dangerous system voltage!

Connect the locating current injector PGH18… as follows:



5.4 Connection to a PV system

DANGER

Risk of electric shock!

On touching live uninsulated conductors, death or serious injury may be caused. For this reason prevent any physical contact with active conductors and follow the rules for working on electrical systems.

DANGER

Risk of electric shock!

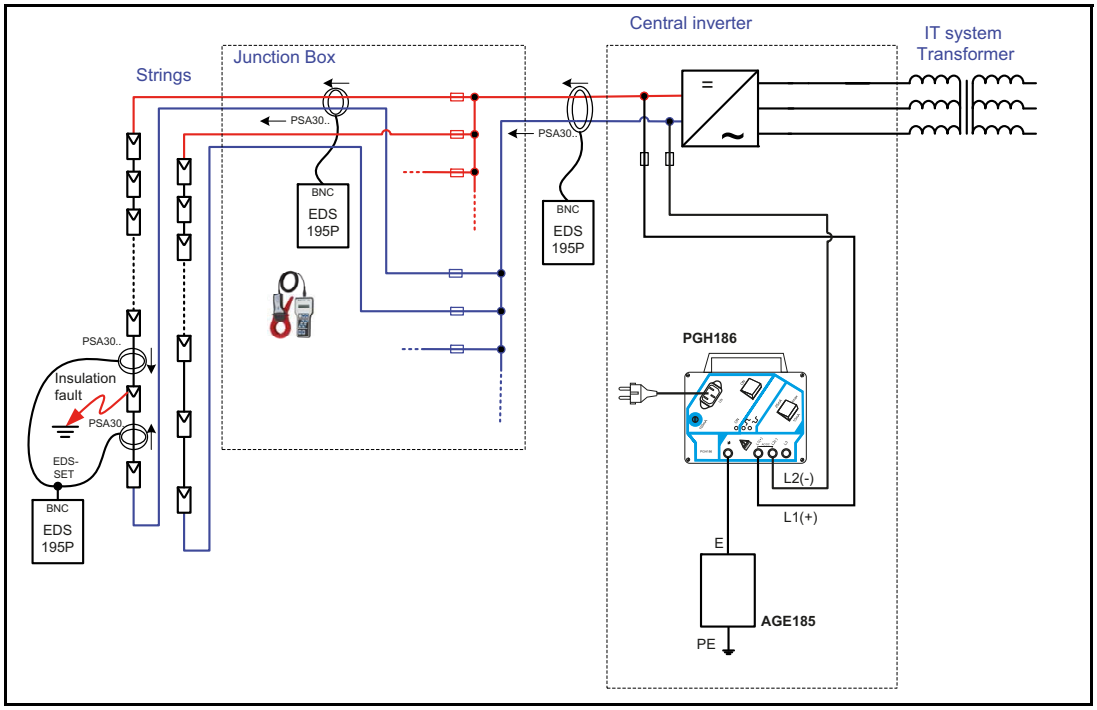
If the PGH186 is connected using terminals L1(+) und L2(–) to a system that is live due to its operation, the terminal ⏚ must not be disconnected from the protective earth conductor (PE). Otherwise the terminal will be at the dangerous system voltage!

CAUTION

Risk of short circuit!

When the EDS3090PV is connected with test leads without integrated fuses a short circuit may occur due to incorrect wiring. Connect the EDS3090PV with the accompanying test lead with integrated fuses to reduce the risk of a short circuit.

Connect the locating current injector PGH186 as follows:



Legend:

PGH186	Locating current injector
AGE185	Coupling device
EDS3096PV	Equipment for insulation fault location
EDS195P	Insulation fault locator
PSA30..	Measuring clamp (locating current sensor)
EDS-SET	BNC Tee connector and 2 BNC cables for fault localisation in diode-decoupled systems

For insulation fault location within the junction box, it is essential that the ± cables of a string are arranged in a way that the measuring clamp PSA30… can be put around the cables.
Insulation faults in the strings can be localised by means of two measuring clamps connected in parallel and an EDS-SET. For this purpose, place the measuring clamps on both sides of the module supply conductors in the direction indicated by the arrows.

6. Operation

6.1 Short description of insulation fault location (EDS mode)

DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason avoid any contact whatsoever with active conductors on positioning the measuring clamp.

6.1.1 Commissioning the PGH18… for locating current injection

1. The PGH18… is to be connected first to PE in the system to be checked, see page 28
2. Then connect the PGH18… to the active conductors
3. Connect device to U_S and switch on

If the locating current I_L is to be supplied by an IRDH575, select the EDS-Setup menu item on this device and set to EDS=On.

6.1.2 Insulation fault location using EDS195P

1. There must be no conductors in the measuring clamp and the measuring clamp must be stationary during commissioning
2. Switch on EDS195P without current transformer using the button
3. Wait for the end of the self test and the message "No CT connected"
4. Set required current transformer type using the button
5. Connect selected current transformer and wait for end of the self-test
6. Fit measuring clamp to PE conductor between PGH18… (IRDH575) and, for example, PE rail to demonstrate that the necessary locating current I_L is flowing.
7. Place measuring clamp around the associated active conductors for the related outgoing circuit. Caution! Do **not** include PE in the cables in the clamp!
8. Read measured value and evaluate.
   If the response value set has been exceeded, the "ALARM" LED flashes.

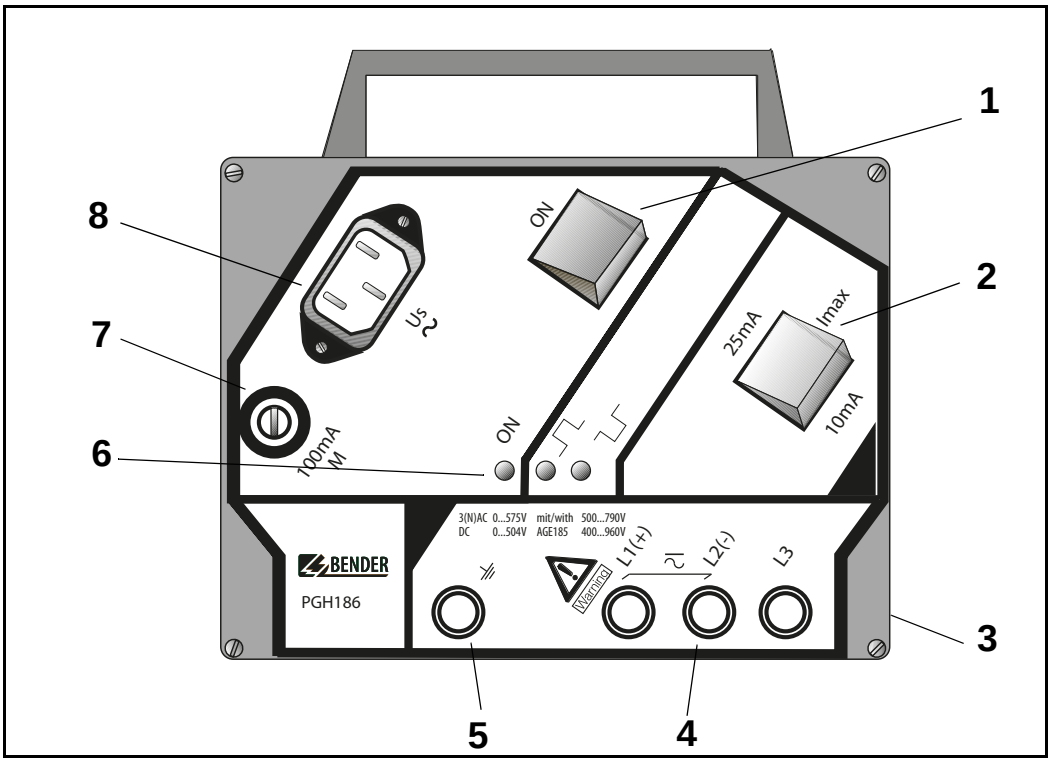
6.2 Detailed description of insulation fault location

- For information on using the EDS309… without a permanently installed EDS system, see page 42
- For information on using the EDS309… in addition to a permanently installed EDS system, see page 45
- For information on using the EDS309… in diode-decoupled DC systems, see page 49

6.3 Description of a residual current measurement

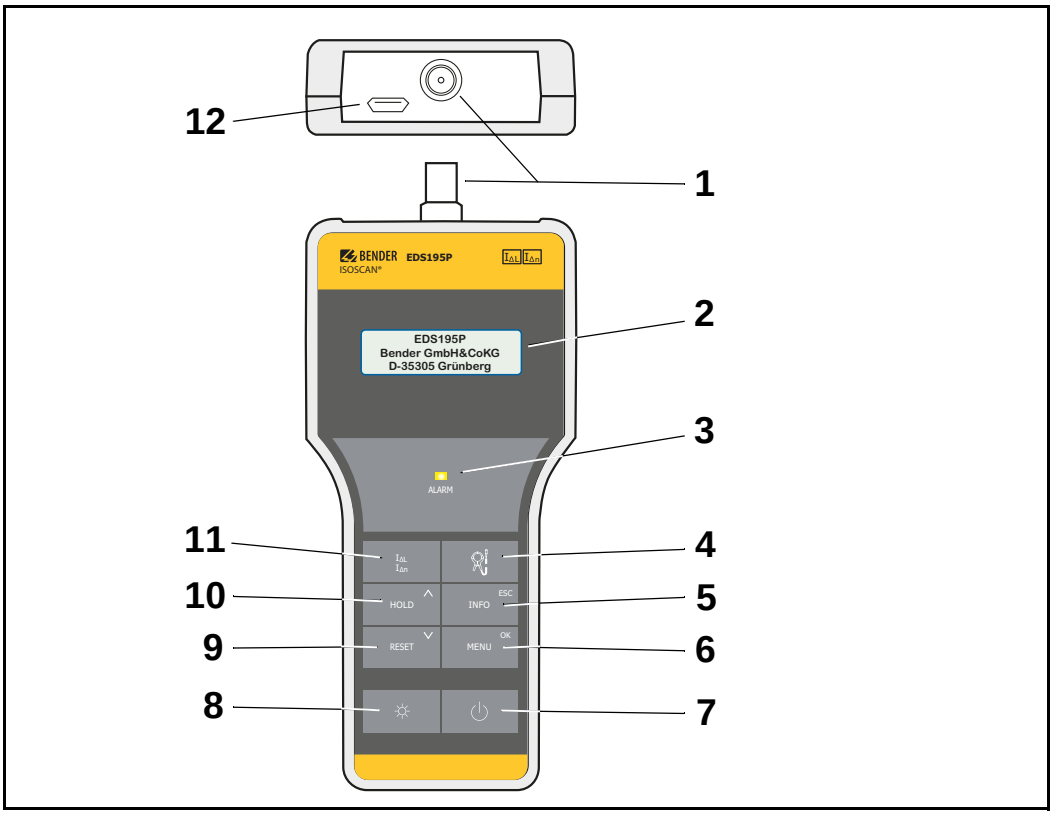
Using the EDS195P it is also possible to undertake residual current measurements up to a value of 10 A, see page 49.

6.4 Displays and controls on the PGH18…



1	ON/OFF switch, switch on or off locating current
2	Changeover switch for maximum locating current values: 25/10 mA or 2.5/1 mA
3	Not shown: magnetic strip on rear of housing for fastening to metal items (e.g. switch cabinet)
4	3 sockets for coupling to system
5	Socket for PE connection
6	Indicator LEDs: ON Operation LED ⎍ Indication of positive locating current cycle ⎍ Indication of negative locating current cycle
7	Fine-wire fuse 100 mA
8	Flush mounted connector for supply voltage

6.5 Displays and controls on the EDS195P



1		BNC connection for measuring clamp
2		LC display, illuminated 3 lines of 16 characters
3		ALARM LED: - Flashes if the response value is exceeded - Illuminates continuously on rectification of the fault, if the fault memory is activated
4		Button for selecting the current transformer: - **PSA30xx** = PSA30… / PSA3165 (suitable for I_{Lmax} = 50 mA) - **W/WR/WS** = W…. / WR…. / WS…. (suitable for I_{Lmax} = 50 mA) - **PSA33xx** = PSA33… (suitable for I_{Lmax} = 5 mA) - **W/WS-8000** = W….-8000 / WS….-8000 (suitable for I_{Lmax} = 5 mA) - **WF** = WF…. (only suitable for $I_{\Delta n}$)
5		INFO button: - Device type, date, time, manufacturer - Software version - Actual response values $I_{\Delta L}$ and $I_{\Delta n}$ - Status word (setup status) ESC button: Leave a menu function without changing parameters
6		MENU button: Open the menu Enter button: Accept modified parameter values or selected menu items

7		On/Off button
8		Button for switching on/off the display lighting
9		RESET button: delete fault memory Down button: move down in the menu, reduce parameter values
10		HOLD button: save the measured value Up button: move up in the menu, increase parameter values
11		Button for selecting the operating mode: $I_{\Delta L}$ = Insulation fault location in IT systems (EDS mode) $I_{\Delta n}$ = Residual current measurement in TN-S systems (RCM mode)
12		Micro USB connection for charging the device's rechargeable battery

6.6 Operating the EDS195P

6.6.1 Switching on and off the device

1. Switch on the device without current transformer using On/Off button.
   The self-test is started after switching on.
   If the self-test is completed normally "No CT connected" appears.
2. You can switch off the device by pressing the On-Off button for around 2 s.

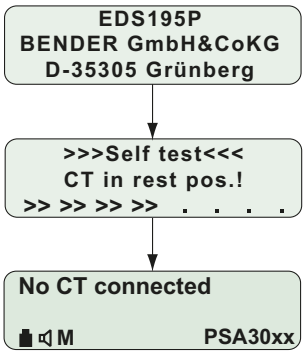


Abb. 6.1: Start sequence for the EDS195P

6.6.2 Changing the measuring clamp

Two methods can be used to change the measuring clamp.

- Changing with EDS195P switched off:
  - Disconnect clamp no longer required
  - Switch on EDS195P
  - Wait for "No CT connected" message
  - Set required clamp type
  - Connect related clamp
  - Wait for end of self-test.

- Changing with the EDS195P in operation:
  - Disconnect clamp from the device
  - Wait for "No CT connected" message
  - Set required clamp type
  - Connect related clamp
  - Wait for end of self-test.

6.6.3 Improved legibility due to display lighting

Press the  button at the bottom left to improve the legibility of text and symbols.
Switch off the lighting by pressing the button again.

6.6.4 Changing between insulation fault location $I_{\Delta L}$ and residual current measurement $I_{\Delta n}$ operating modes

Here you can select the measuring function. $I_{\Delta n}$ for residual current measurement preferably in TN/TT systems. $I_{\Delta L}$ for insulation fault location in IT systems.
Avoid changing the mode during insulation fault location.

6.6.5 Quickly checking the response values for $I_{\Delta L}$ and $I_{\Delta n}$

Press the INFO button three times to display the actual response values.

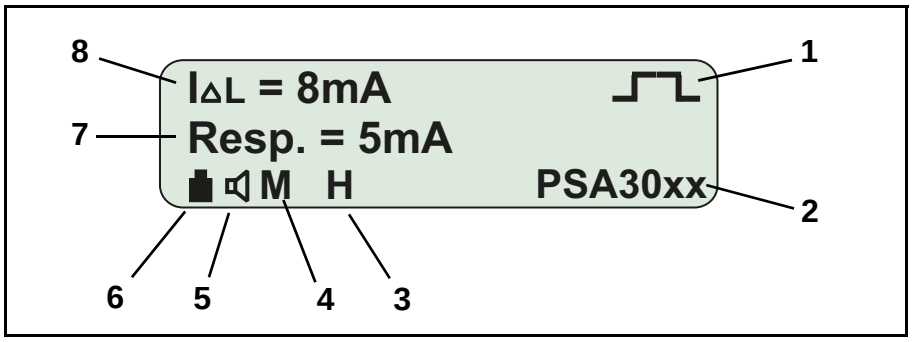
6.6.6 Checking Info menu

The following information appears on the display in succession on pressing the INFO button:

- Device name, time, date and manufacturer
- Software version with date
- Actual response values $I_{\Delta L}$ and $I_{\Delta n}$
- Status information, coded, see page 58

6.6.7 Significance of the display elements

The elements shown relate to the EDS mode ($I_{\Delta L}$). This mode is used for insulation fault location.



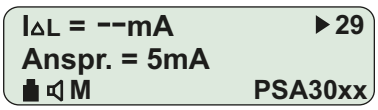
1	Indication of the locating current pulse: ⎍⎍ = Positive pulse, – – – = Pause or no measurement possible when permanently displayed ⎍⎍ = Negative pulse ▶29 = Timer (29…0) shows the duration of a measurement of an outgoing circuit
2	Indication of the selected transformer type: - **PSA30xx** = PSA30… / PSA3165 (suitable for I_{Lmax} = 50 mA) - **W/WR/WS** = W…. / WR…. / WS…. (suitable for I_{Lmax} = 50 mA) - **PSA33xx** = PSA33… (suitable for I_{Lmax} = 5 mA) - **W/WS-8000** = W….-8000 / WS….-8000 (suitable for I_{Lmax} = 5 mA) - **WF** = WF…. (only suitable for $I_{\Delta n}$)
3	H = Hold function is activated; measured value indication "frozen"
4	M = Fault memory is activated
5	Loudspeaker symbol visible: The presence of an alarm is also output audibly
6	Charge state of the rechargeable battery in the steps 0%, 33%, 66%,100%
7	Resp. = Response value IΔL
8	IΔL = Indication of the actual locating current measured

6.7 Standard displays on the EDS195P

6.7.1 EDS measurement ($I_{\Delta L}$)

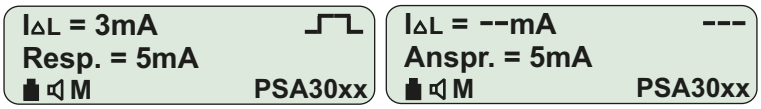
6.7.1.1 Standard display if there is no cable to be measured in the clamp

The device is in the EDS mode ($I_{\Delta L}$).
A measured locating current $I_{\Delta L}$ is not indicated, as there is no conductor in the measuring clamp.
The display shows the timer count (29…0).



6.7.1.2 Standard display for EDS measurement ($I_{\Delta L}$) with cable in the clamp

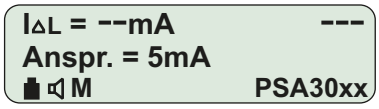
The display is indicating a measured fault current $I_{\Delta L}$ of 3 mA. A measurement in progress is indicated by the change in the polarity of the measuring pulse (⎍⎍ ⎎⎎) with a pause (- - -) in between.



Note that only half the magnitude of the locating current I_L generated by the PGH18… in AC systems is indicated by EDS195P. The half-wave rectification used in the PGH18… reduces the value indicated in AC systems to 50 %, in 3AC systems to 67 %.

6.7.1.3 Standard display for measuring faults or pauses between changes in polarity of the measuring pulse

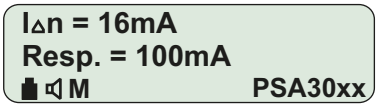
When no measurement is possible due to low frequency residual currents or because the measuring clamp is not being held still, the display permanently indicates a pause (- - -) at the top right corner. During the evaluation of the measurement the display indicates a pause (- - -) for a short time only.



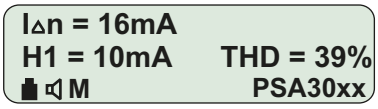
6.7.2 RCM measurement ($I_{\Delta n}$)

6.7.2.1 Standard display for RCM measurement ($I_{\Delta n}$) with cable in the clamp

The display is indicating the measured residual current $I_{\Delta n}$ of 16 mA.
The residual current response value set is 100 mA.

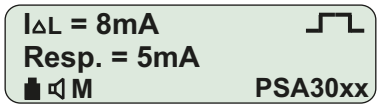
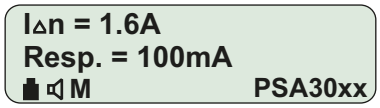


The following display appears if menu item "2.Settings/7.Harmonics: on" is activated. This setting can only be used for 50 Hz or 60 Hz systems.
For the 1st harmonic (fundamental) the display is indicating a measured current of 10 mA as well as a total harmonic distortion THD of 39 %.



6.8 Alarms during EDS measurement or RCM measurement

If one of the response values set $I_{\Delta L}$ or $I_{\Delta n}$ is exceeded, the ALARM LED flashes. If the fault memory M is activated, the ALARM LED continues to illuminate after the removal of the fault.
The alarm saved is cleared using the RESET button.

		Alarm during insulation fault location (EDS): LED flashes
		Alarm during a residual current measurement (RCM): LED flashes

6.9 Indication of device and measuring errors

The following table explains the error messages that may occur.

Self test error PRESS ->RESET M PSA30xx	Can only occur after the end of the self-test: - Incorrect current transformer type set - During the self-test the clamp was: Not stationary Or a residual current was flowing through it Or the PGH locating current was flowing through it - EDS195P hardware faulty Press the "RESET" button to restart a self test.
No CT connected M PSA30xx	No measuring clamp or no measuring current transformer on the measuring input or incorrect transformer type connected Measures: Connect correct measuring clamp or correct measuring current transformer
I∆L = --mA --- Anspr. = 5mA M PSA30xx	A permanent display of pause (- - -) indicates no measurement is possible. Steps: - Hold the measuring clamp still - Avoid low frequency residual currents
Error I∆L M PSA30xx	A malfunction has occurred during insulation fault location Possible causes: - The measuring clamp was not held still. - There is a low frequency residual current flowing through the measuring clamp that is interfering with the EDS measurement - There a magnetic field around the measuring clamp that is interfering with the EDS measurement - EDS195P hardware faulty

If the EDS195 can no longer detect the locating current due to system interference and an existing alarm is therefore cleared, an insulation fault will be detected again at the end of the interference.

6.10 Factory settings EDS195P (state as supplied)

Most of the settings are made on the menu. If this is not the case, the setting is marked with (button).

Operating mode (button):	I∆L (EDS mode = insulation fault location)
Current transformer (button):	Measuring clamp PSA3052 (for EDS3090 and 3096) Measuring clamp PSA3352 (for EDS3091)
Illumination (button):	Off
Fault memory:	On
Buzzer:	On
Response value $I_{\Delta L}$ with PSA30…:	5 mA
Response value $I_{\Delta L}$ with PSA33…:	0.5 mA
Response value $I_{\Delta n}$:	100 mA
System frequency $I_{\Delta n}$:	50 Hz
Measurement of harmonics $I_{\Delta n}$:	Off
User interface language:	English
Time:	CET

6.11 Menu structure

The menu structure is shown schematically in the following.

Level 1	Level 2	Level 3 *or explanation*
1. Exit		
2. Settings	1. Exit 2. I∆L ALM: 0.2…10 mA 3. I∆n ALM: 10 mA…10 A 4. Memory: on/off 5. Buzzer: on/off 6. Frequ.: 50/60Hz/up to 1kHz 7. Harmonics: on/off	*Response value measured locating current I∆L* *Response value residual current I∆n* *Audible alarm* *Frequency of the system monitored* *Indication of harmonics and total harmonic distortion THD in %*
3. System	1. Exit	
	2. Language	1. Exit 2. German 3. English 4. French 5. Russian
	3. Clock	1. Exit 2. Format: D.M.Y 3. Date 4. Time
	4. Contrast: 0…15	*Contrast setting for display*
4. Harmonics	1. Exit 2. H1 < 10 mA 3. H2 < 10 mA ..... 9. H8 < 10 mA	*This menu item is used only for the indication of harmonics from H1 to H8. To display the harmonic with the greatest amplitude in the standard display with the menu closed, the menu item "7. Harmonics: on/off" on the Settings menu is to be activated*
5. I∆L alarms	1. Exit	
	2. Entries	*Alarm No. 001* *No. 002* *No. .....*
	3. Delete	1. Exit 2. Delete Data
6. I∆n logger	1. Exit	
	2. Entries	*Entry No. 001* *No. 002* *No. .....*
	3. Change: 10…100 %	*Percentage change from which logging becomes active*
	4. Overwrite: yes/no	*Overwrite oldest data record*
	5. Delete	1. Exit 2. Delete Data
7. Service		*For service only*

6.11.1 Navigating in the menu

- Open the menu using MENU - Select a menu item or accept a value using OK	
- Navigate up or down in the menu - Increase or reduce values	
ESC: - Return from the last menu item selected - Discard modified setting without saving	

6.11.2 Menu item: Settings

Using this menu item you can access the following parameters for the insulation fault location and for the residual current measurement to:

- Set the response value for the locating current $I_{\Delta L}$ measured with the measuring clamp to between 0.2…10 mA.
  This value range is equally suitable for control circuits (0.2…1 mA) and main circuits (2…10 mA).
  On the usage of the locating current injector note that the permissible locating current defined for control circuits is I_{Lmax} = 5 mA, while for main circuits it is I_{Lmax} = 50 mA.
- Set the response value for the residual current $I_{\Delta n}$ measured with the measuring clamp to between 10 mA and
  10 A
- Activate or deactivate the fault memory
- Activate or deactivate audible signalling of alarms
- Set the frequency of the system monitored
- Enable the indication of the harmonics to display the current for the harmonic with the greatest amplitude in the standard display. All harmonics from H1 to H8 can be checked using menu item "4. Harmonics", see also page 41. Note that with harmonics activated only system frequencies of 50 Hz and 60 Hz can be selected.

Level 1	Level 2	*Meaning*
2. Settings	1. Exit	
	2. IΔL ALM: 0.2…10 mA	*Response value measured locating current $I_{\Delta L}$*
	3. IΔn ALM: 10 mA…10 A	*Response value residual current $I_{\Delta n}$*
	4. Memory: on/off	
	5. Buzzer: on/off	*Audible alarm*
	6. Frequ.: 50/60Hz/up to 1kHz	*Frequency of the system monitored*
	7. Harmonics: on/off	*Indication or harmonics and total harmonic distortion THD*

Alarms are signalled by the Alarm LED and the buzzer (delivery condition).

6.11.3 Menu item: System

Use this menu item to select the language for the user interface and to set the correct date and time. The date format can be changed.
You can adjust the quality of the display by adjusting the contrast.

Level 1	Level 2	Level 3 *or explanation*
3. System	1. Exit	
	2. Language	1. Exit 2. German 3. English 4. French 5. Russian
	3. Clock	1. Exit 2. Format: D.M.Y 3. Date 4. Time
	4. Contrast: 0…15	*Contrast setting for display*

6.11.4 Menu item: Harmonics

This menu item is used only for the indication of harmonics from H1 to H8.

Level 1	Level 2	Meaning
4. Harmonics	1. Exit 2. H1 < 10 mA 3. H2 < 10 mA ..... 9. H8 < 10 mA	*This menu item is used only for the indication of harmonics from H1 to H8. To display the harmonics, activate the menu item "2.Setting/7. Harmonics: on/off"*

6.11.5 Menu item: $I_{\Delta L}$ alarms

Using this menu item you can check the alarms recorded automatically during insulation fault location. The data records are numbered and contain the following information:

- The start of the alarm
- The end of the alarm
- The minimum locating current $I_{\Delta L}$ measured
- The maximum locating current $I_{\Delta L}$ measured

A maximum of 300 data records are saved.
The existing data records can be deleted using the menu.

Level 1	Level 2	Level 3	*Meaning*
5. IΔL alarms	1. Exit		
	2. Entries	Alarm No. 001 No. 002 No.	*Period for the recording and min./ max. values measured for $I_{\Delta L}$*
	3. Delete	1. Exit 2. Data delete	

6.11.6 Menu item: $I_{\Delta n}$ logger

Using this menu item you can check the measured values recorded automatically during a residual current measurement. The data records are numbered and contain the following information:

- The start time for the measurement and the change in the residual current monitored
- The residual current $I_{\Delta n}$ measured

A maximum of 300 data records are saved.
The existing data records can be deleted using the menu.

Level 1	Level 2	Level 3	*Meaning*
6. IΔn logger	1. Exit		
	2. Entries	Entry No. 001 No. 002 No.	*Time of the recording and residual current $I_{\Delta n}$ measured*
	3. Change: 10…100 %		*Percentage change from which logging becomes active*
	4. Overwrite: yes/no		*Overwrite oldest data record*
	5. Delete	1. Exit 2. Data delete	

6.12 Practical usage

6.12.1 Insulation fault location in a system without a permanently installed EDS system

DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason avoid any contact whatsoever with active conductors on connecting the PGH and positioning the measuring clamp.

The EDS309… is primarily used as a portable insulation fault location system in unearthed IT systems. Once all the instructions in chapter “Considerations prior to use” on page 19 have been followed, insulation fault location can be started. Proceed as follows during this process:

1. Check whether the system voltage is within the permissible limits.
   The permissible voltages are stated in the user interface on the PGH18….
2. Connect the locating current injector PGH18… close to the feed, see connection diagram on page 28. During this process follow the general guidelines for working with electrically live systems!
   – First connect the PE socket on the PGH18… to the system's PE using the green-yellow wire.
   – Then connect the PGH18… to the system to be checked using the connection wires provided.

Three-phase system	Connect sockets L1, L2 and L3 to the system
Single-phase AC or DC	Connect sockets L1 and L2 to the system

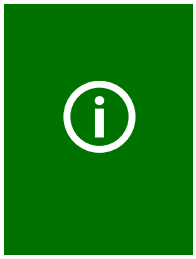
3. Connect the PGH18… to a suitable power supply using the power cable supplied (see nameplate).
4. If there is an insulation monitoring device with an Ohmic internal resistance < 120 kΩ in the IT system to be checked, disconnect it from the system to be checked on all poles. It is not sufficient to switch off the power supply to the insulation monitoring device.
5. Set the maximum locating current using the I_{max} switch on the PGH18…. Follow the instructions in chapter “Reduced locating current” on page 22.
6. Switch on the PGH18…. The "ON" LED illuminates and the two "⎍⎍" and "⎍⎍" LEDs flash alternately in synchronism with the test cycle. If there is no activity indicated on the LEDs, check the supply voltage and the fine-wire fuse that can be accessed from the front panel.
7. Switch on the EDS195P without a current transformer connected by pressing the button. The device undertakes a self-test and outputs the error message "No CT connected" because a current transformer is not connected.
8. Now select the type of measuring clamp or measuring current transformer to be connected using the button. The device undertakes a further self-test and outputs the error message "No CT connected" because a current transformer is not connected
9. Then connect the pre-selected measuring clamp or the pre-selected measuring current transformer to the EDS195P. The device undertakes a further self-test and is then in the EDS mode. "$I_{\Delta L}$" appears in the first line of the display.
10. On **handling the measuring clamp** note:
    - Do not bring measuring clamp into contact with system voltages above the rated insulation voltage (see nameplate on the measuring clamp with information on measuring category, e.g. CAT III)
    - Always keep contact surfaces on measuring clamp's iron core clean.
    - Do not use measuring clamp in the immediate vicinity of devices that produce magnetic fields such as transformers or chokes and also not near adjacent conductors carrying high currents.
    - Never disconnect measuring clamp from the EDS195P while it is placed around electrically live conductors. Otherwise the measuring clamp may be irreparably damaged!
    - Aim for the best possible symmetry of the conductors in the measuring clamp. Otherwise the measuring clamp may go into saturation due to an excessively high load current and cause an alarm $I_{\Delta n}$ >10 A.
    - **Keep the measuring clamp still** during the measurement!
    - During the measurement do not apply any pressure to the clamp limb.
11. Cover the green and yellow lead between PHG18… and earth with the measuring clamp. A measurement process should take no more than 30 seconds. When the EDS195P is ready to take a measurement, the countdown (29…0) at the top right corner of the display starts. If the time has expired and no error has been found, the countdown starts again. During a measurement, the EDS195P shows recognized test current signals with pauses in between:
    i.e. ⎍⎍ - - - ⎍⎍.
    In the case of a measurement fault, the display permanently indicates pause (- - -).
    There are 3 reasons for this:
    - The insulation fault resistance is too high and cannot be measured by the EDS195P.
    - The measuring clamp is not being held still. Hold the clamp still during measurement.
    - Low frequency residual currents or magnetic fields in the environment have been superimposed on the test current pulse. Avoid these disturbances.

12. Start the insulation fault location from the main distribution area of the IT system. Place the measuring clamp around all system conductors, **but not the PE conductor**. During each measurement wait one test cycle (approx. 30 seconds). A flashing alarm LED on the EDS195P signals an insulation fault after (from the point of view of the locating current injector) the measuring clamp. It recommended to have the buzzer activated during the search.

13. Now measure along the cable using the EDS195P until the fault is found. During this process move into sub-distribution systems using a star-shaped approach. The location of the fault is found when the locating current in the measuring clamp generated by the PGH18… exceeds as a minimum the response value set on EDS195P.

Possible error messages

- Self test error:
  - Incorrect current transformer type set
  - EDS195P hardware faulty
  - Clamp moved while the indication ">>>Self test<<<" was displayed
  - An interfering residual current is flowing through the clamp
  - There is a PGH locating pulse acting on the clamp
- No CT connected:
  Measuring clamp or measuring current transformer not connected or faulty.
- Error $I_{\Delta L}$ (can only be indicated while a measurement is in progress):
  - Low frequency interference, measurement not possible
  - EDS195P hardware faulty
- $I_{\Delta n}$ >10 A / >1 A:
  There is a residual current > 10 A or >1 A flowing through the measuring clamp. In this case it is not possible to locate the insulation fault on the related outgoing circuit. Residual currents of this magnitude in an IT system can be caused by large system leakage capacitances or multiple insulation faults. It is therefore possible that there is an insulation fault on this outgoing circuit also with this alarm message.



At operating currents < 10 A a measurement can also be made by placing the clamp around only one conductor. At currents > 10 A it may no longer be possible to open the measuring clamp. This risk is particularly apparent in DC systems. If this effect occurs, under no circumstances apply force; this action would irreparably damage the measuring clamp. Instead the related system must be shut down. It will then be possible to open the measuring clamp without the need to apply force.

6.12.2 Insulation fault location in a system with a permanently installed EDS system

The EDS195P can also be used in a permanently installed EDS system (EDS460/490 or EDS461/491). In a large, complex IT system the main outgoing circuits are often monitored by the permanently installed EDS system. Once the main outgoing circuit affected by an insulation fault is detected, the search is continued from there using the portable EDS195P.
During this process the EDS195P uses the locating current pulse from the permanently installed EDS system (IRDH575, PGH47…). The PGH18… is not required for this application.
The PGH18… is not included in the items supplied with the EDS3090 and EDS3091. Insulation fault location is therefore only possible in electrically live IT systems. Also follow the operating instructions for the permanently installed EDS system.

DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason avoid any contact whatsoever with active conductors on positioning the measuring clamp.

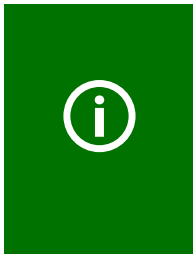
Example: The insulation monitoring device has signalled an insulation fault below its response value and started the permanently installed EDS system. The main outgoing circuit affected by the insulation fault has been detected. Proceed as follows for the further insulation fault location:

1. Set the mode of the EDS system to continuous insulation fault location:
   - IRDH575: On the "EDS Setup" menu set the "EDS on" mode
   - PGH471: Press "Start/Stop" button
2. Switch on the EDS195P without a current transformer connected by pressing the button. The device undertakes a self-test and outputs the error message "No CT connected" because a current transformer is not connected.
3. Now select the type of measuring clamp or measuring current transformer to be connected using the button. The device undertakes a further self-test and outputs the error message "No CT connected" because a current transformer is not connected
4. Then connect the pre-selected measuring clamp or the pre-selected measuring current transformer to the EDS195P. The device undertakes a further self-test and is then in the EDS mode. "$I_{\Delta L}$" appears in the first line of the display.
5. On handling measuring clamps note:
   - Do not bring measuring clamp into contact with system voltages above the nominal insulation voltage. (See nameplate on the measuring clamp with information on measuring category, e.g. CAT III)
   - Always keep contact surfaces on measuring clamp's iron core clean.
   - Do not use measuring clamp in the immediate vicinity of devices that produce magnetic fields such as transformers or chokes and also not near adjacent conductors carrying high currents.
   - Never disconnect measuring clamp from the EDS195P while it is placed around electrically live conductors. Otherwise the measuring clamp may be irreparably damaged!
   - Aim for the best possible symmetry of the conductors in the measuring clamp. Otherwise the measuring clamp may go into saturation due to an excessively high load current and cause an alarm $I_{\Delta n}$ >10 A.
   - **Keep the measuring clamp still** during the measurement!
   - During the measurement do not apply any pressure to the clamp limb.
6. Place the measuring clamp around the green-yellow wire between the IRDH575 or PGH47… and earth. If the EDS195P does not react, the insulation fault has an excessively high impedance and cannot be detected. Locating current pulses detected are indicated using the symbol.

7. Start the insulation fault location in the outgoing circuit of the IT system already detected as faulty. Place the measuring clamp around all system conductors, **but not the PE conductor**. During each measurement wait one test cycle (approx. 30 seconds). A flashing alarm LED on the EDS195P signals an insulation fault after (from the point of view of the locating current injector) the measuring clamp. It recommended to have the buzzer activated during the search.
8. Now measure along the cable using the EDS195P until the insulation fault is found. During this process move into sub-distribution systems using a star-shaped approach. The location of the fault is found when the locating current generated by the IRDH575 or PGH47… in the measuring clamp exceeds as a minimum the response value set on EDS195P.

Possible error messages

- Self test error:
  - Incorrect current transformer type set
  - EDS195P hardware faulty
  - Clamp moved while the indication ">>>Self test<<<" was displayed
  - An interfering residual current is flowing through the clamp
  - There is a PGH locating pulse acting on the clamp
- No CT connected:
  Measuring clamp or measuring current transformer not connected or faulty.
- Error $I_{\Delta L}$ (can only be indicated while a measurement is in progress):
  - Low frequency interference, measurement not possible
  - EDS195P hardware faulty
- $I_{\Delta n}$ >10 A / >1 A:
  There is a residual current > 10 A or > 1 A flowing through the measuring clamp. In this case it is not possible to locate the insulation fault on the related outgoing circuit. Residual currents of this magnitude in an IT system can be caused by large system leakage capacitances or multiple insulation faults. It is therefore possible that there is an insulation fault on this outgoing circuit also with this alarm message.



At operating currents < 10 A a measurement can also be made by placing the clamp around only one conductor. At currents > 10 A it may no longer be possible to open the measuring clamp. This risk is particularly apparent in DC systems. If this effect occurs, under no circumstances apply force; this action would irreparably damage the measuring clamp. Instead the related system must be shut down. It will then be possible to open the measuring clamp without the need to apply force.

6.12.3 Insulation fault location in diode-decoupled DC systems

In diode-decoupled DC systems equalising currents occur in and between the decoupled circuits. The direction and magnitude of these equalising currents is dependent on voltages in the system, the characteristics of the decoupling diodes and the characteristics of the loads.
On the usage of the insulation fault location system EDS309… in such systems these equalising currents make themselves apparent and can degrade the accuracy of the measurement. For this reason we recommend the usage of the EDS309… in diode-decoupled systems as shown in the sketch on the next page.

DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason avoid any contact whatsoever with active conductors on connecting the PGH and positioning the measuring clamp.

During this process please note:

- Always use two measuring clamps of the same type.
  Attention: this clamp type must also be set on the EDS195P.
- For this purpose use the EDS195P set (see ordering data, page 59).
- Take into account the maximum length of the coax cable of 10 m per measuring clamp.
- The usage of two measuring clamps results in a sensitivity loss of around 10 %.
- It is imperative both measuring clamps are used such that the direction of the flow of energy corresponds to the arrow printed on the clamp.

Example: The central insulation monitoring device in a DC system without permanently installed insulation fault location system (EDS) has signalled an insulation fault that is below the insulation value that can be located using the EDS system. Once all the instructions from chapter "4. Considerations prior to use" have been followed, fault location in a modified form can be started. Proceed as follows during this process:

1. Read the actual insulation resistance on the insulation monitoring device. If the value read for the insulation resistance is lower than the maximum insulation fault that can be located by the EDS system, two appropriate identical measuring clamps (e.g. 2 x PSA3020 or 2 x PSA3052) are required for the insulation fault location.
2. Switch on the EDS195P without a current transformer by pressing the button. The device undertakes a self-test and outputs the error message "No CT connected".
3. Now select the type of measuring clamp(s) to be connected using the button. The device undertakes a further self-test and outputs the error message "No CT connected" because a current transformer is not connected
4. Then connect the pre-selected measuring clamp(s) to the EDS195P. The device undertakes a further self-test and is then in the EDS mode. "IΔL" appears in the first line of the display
5. Connect the PGH18… to the locating current injection points are shown on page 48.
6. Start the EDS system:
   Switch on the PGH18…. The "ON" LED illuminates and the two and LEDs flash in synchronism with the test cycle. If there is no activity indicated on the LEDs, check the supply voltage and the fine-wire fuse fitted in the PGH18….
7. Insulation fault location in the system:
   – Place a measuring clamp around each of the supply cables to the redundantly supplied loads. During this process ensure that the clamp is placed around all related load supply cables for a diode-decoupled load.

– Pay attention to identical directions of flow on the two measuring clamps (see connection diagram). For this purpose the measuring clamps are marked with an arrow

Place the two measuring clamps successively and systematically around all parallel outgoing cables for loads. Outgoing cables for loads with an insulation fault are indicated by the flashing alarm LED on the EDS195P. The alarm messages are output in the same way as for an application with a single measuring clamp. For possible error messages see page 44.

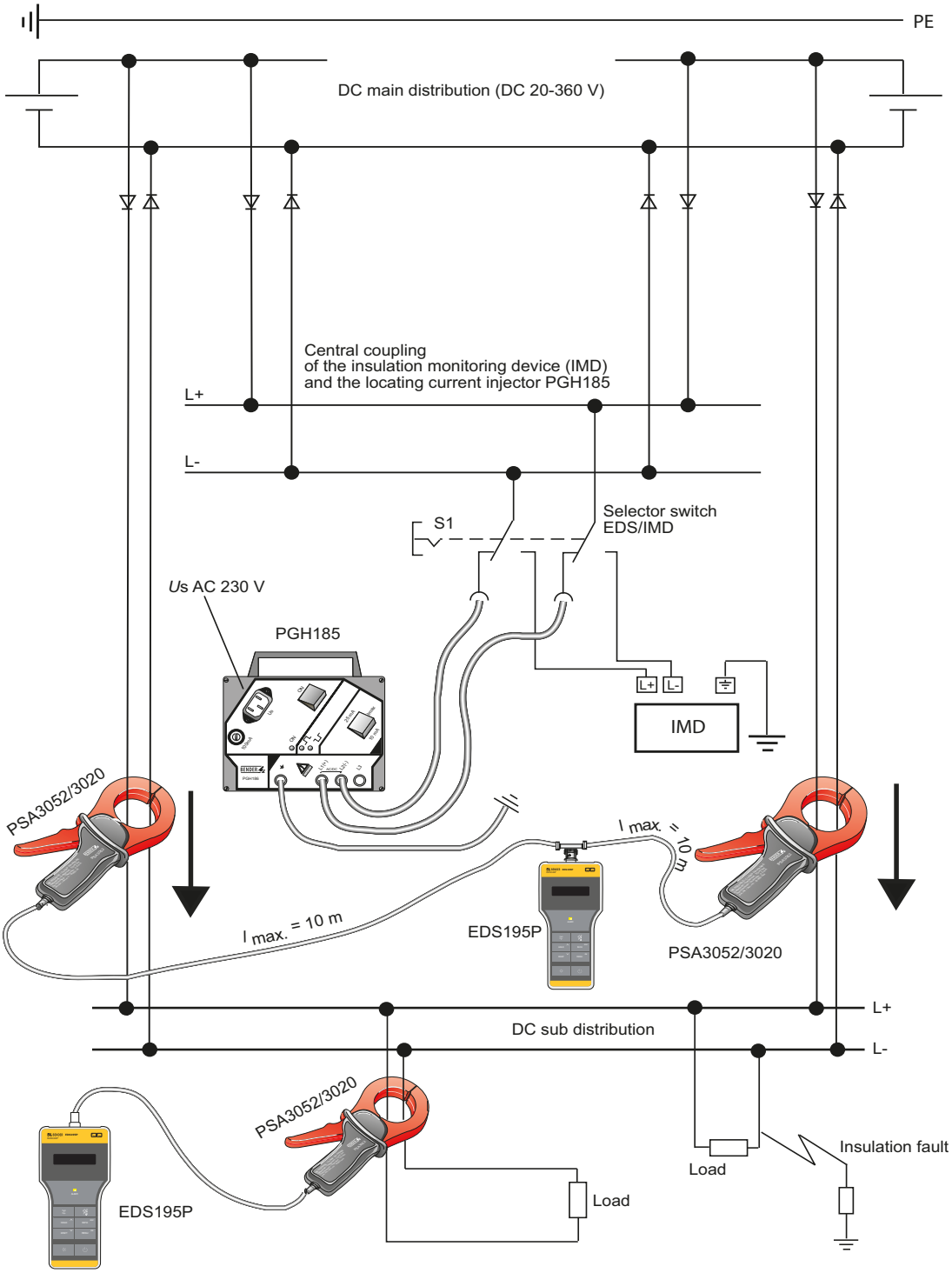


Abb. 6.2: Insulation fault location in diode-decoupled DC systems (connection diagram)

6.12.4 Usage of the EDS195P as a residual current meter

The EDS195P can be used as a residual current meter up to AC 10 A in TN and TT systems. Residual current measurement is only possible in electrically live systems. The locating current injector PGH18… is not required for this application.

1. Check whether the system voltage is within the permissible limits.
2. Switch on the EDS195P without a current transformer connected by pressing the button. The device undertakes a self-test and outputs the error message "No CT connected" because a current transformer is not connected.
3. Now select the type of measuring clamp or measuring current transformer to be connected using the button. The device undertakes a further self-test and outputs the error message "No CT connected" because a current transformer is not connected
4. Then connect the pre-selected measuring clamp or the pre-selected measuring current transformer to the EDS195P. The device undertakes a further self-test and is then in the EDS mode. "IΔL" appears in the first line of the display.
5. Make the following settings:
   - Change to the IΔn (RCM mode) function using the related button
   - Set residual current response value using the menu path "2. Settings /3. IΔn ALM:"
6. On handling measuring clamps note:
   - Do not bring measuring clamp into contact with system voltages above the nominal insulation voltage. (See nameplate on the measuring clamp)
   - During the measurement place the clamp around all system conductors, **but not PE**. Do not place the clamp around screened conductors.
   - Always keep contact surfaces on measuring clamp's iron core clean.
   - Do not use measuring clamp in the immediate vicinity of devices that produce magnetic fields such as transformers or chokes and also not near adjacent conductors carrying high currents.
   - Never disconnect measuring clamp from the EDS195P while it is placed around electrically live conductors. Otherwise the measuring clamp may be irreparably damaged!
   - Aim for the best possible symmetry of the conductors in the measuring clamp. Otherwise the measuring clamp may go into saturation due to an excessively high load current and cause an alarm IΔn >10A.
   - **Keep the measuring clamp still or let go of it** during the measurement!
   - During the measurement do not apply any pressure to the clamp limb.
7. Start the measurement from the main distribution area of the system. Now measure along the cable using the EDS195P until the insulation fault is found. During this process move into sub-distribution systems using a star-shaped approach.
8. EDS195P indicates the residual current at each measuring point. If the residual current is greater than the response value set, the "ALARM" LED illuminates and the measured value is displayed. If the buzzer is activated, there is also an audible signal.
9. For long-term measurements at a point in the system, the fault memory is to be activated in the menu 2.4 (Settings/Memory). In this way it is also possible to find intermittent residual currents provided they are above the response value set. The highest residual current measured is saved.

Possible error messages

- Self test error:
  - Incorrect current transformer type set
  - EDS195P hardware faulty
  - Clamp moved while the indication ">>>Self test<<<" was displayed
  - An interfering residual current is flowing through the clamp
  - There is a PGH locating pulse acting on the clamp
- No CT connected:
  Measuring clamp or measuring current transformer not connected or faulty.
- Error IΔL (can only be indicated while a measurement is in progress):
  - Low frequency interference, measurement not possible
  - EDS195P hardware faulty
- IΔn >10 A / > 1 A:
  There is a residual current > 10 A or >1A flowing through the measuring clamp. In this case it is not possible to locate the insulation fault on the related outgoing circuit. Residual currents of this magnitude in an IT system can be caused by large system leakage capacitances or multiple insulation faults. It is therefore possible that there is an insulation fault on this outgoing circuit also with this alarm message

6.12.5 Indication of the harmonics during residual current measurement

Using the EDS195P it is also possible to measure harmonics of the fundamental frequencies of 50 or 60 Hz.

1. Switch on the EDS195P by pressing the button.
   The device is in the EDS mode. *I*ΔL appears in the first line of the display
2. Check correct setting for the selection of the clamp or current transformer on the display, correct if necessary
3. Now select the measurement type *I*Δn (RCM mode) using the button
4. Then make the following settings:
   - Check response value on menu 2.3 (Settings $I_{\Delta n}$) and change if necessary
   - Check system frequency on menu 2.6 (Settings $I_{\Delta n}$) and change if necessary
   - Activate measurement of the harmonics on menu 2.7 (Settings /Harmonics)
   - Select the required harmonics on menu 4.

The EDS195P indicates the harmonics of a residual current at each measuring point. If the residual current is greater than the response value set, the "ALARM" LED flashes and the measured value is displayed. If the buzzer is activated, there is also an audible signal.
After the activation of the harmonics in menu 2.7, the harmonic with the greatest amplitude and the total harmonic distortion in % can be seen in the standard display with the menu closed.

6.13 Coupling device AGE185 for higher system voltages

This option is available for the variants EDS3090PG, EDS3090PG-13 and EDS3096PG with the locating current injectors PGH185 and PGH186. The coupling device AGE185 expands the nominal voltage range of the insulation fault location system EDS309…
The AGE185 reduces the losses in the locating current injector PGH18… As a result it makes it possible to connect the PGH18… to nominal system voltages up to AC 790 V or DC 960 V.

DANGER

Risk of electric shock!
On touching live uninsulated conductors, death or serious injury may be caused. For this reason avoid any contact whatsoever with active conductors on connecting the PGH or the AGE.

Assembly, connection and placing in operation
Connection and placing in operation only by an electrical technician!
It is imperative the existing safety regulations are followed!
The ends of the wires from the AGE185 can be connected, as necessary and to suit the local situation, to the system's PE terminal and the PE socket on the PGH186; it is not necessary to take into account the polarity.

Connection diagram

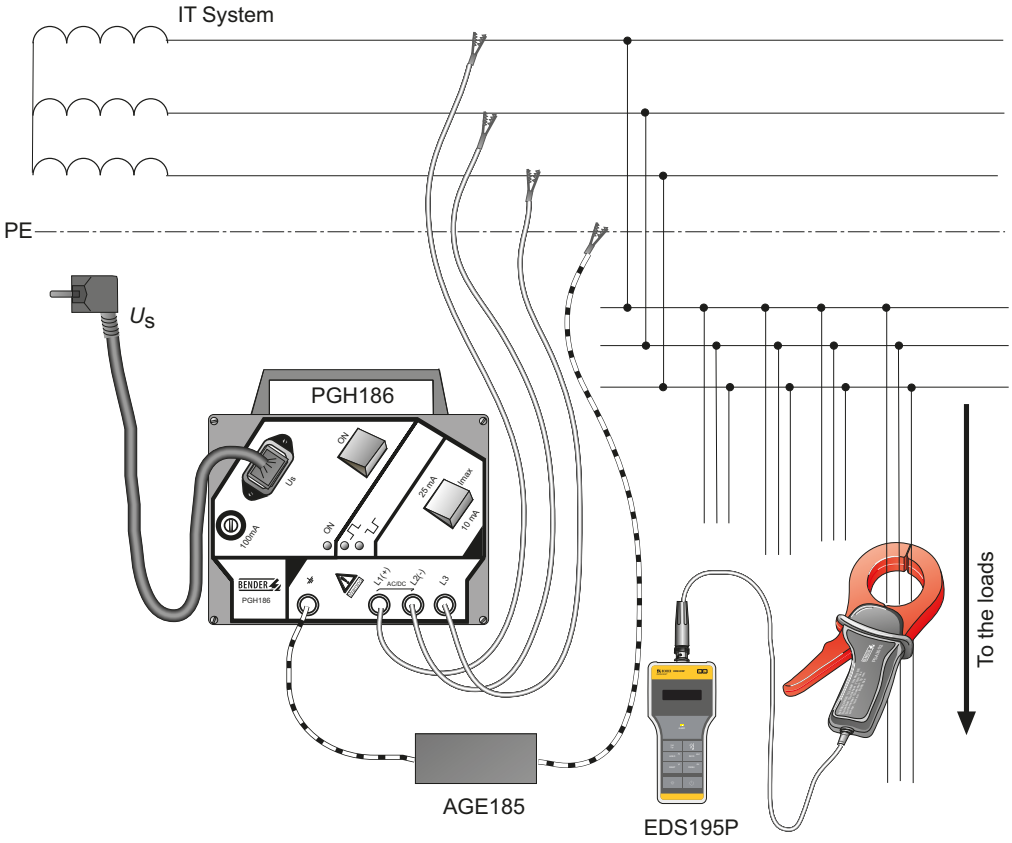


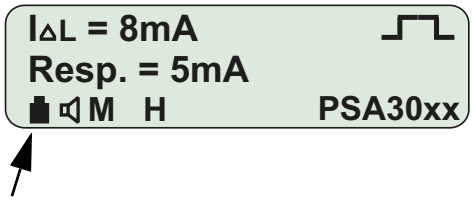
Abb. 6.3: Connection diagram EDS309… with AGE185

6.14 Power supply for the EDS195P

- The device is supplied with power using 3 NiMH cells of 1.2 V each or 3 mignon cells of type LR6 AA of 1.5 V each.
- **The power supply unit is not allowed to be connected with non-rechargeable batteries fitted!**
- On the connection of a power supply unit, there must be 3 correctly functioning **rechargeable batteries** in the battery compartment.
- Rechargeable battery charging time ≤ 5 h.

6.14.1 Displaying charge state

The display can indicate 4 different charge states:
100 %, 66 %, 33 % and a flashing empty battery symbol.



6.14.2 Changing batteries

The battery compartment is on the rear of the EDS195P. The settings in the EDS195P are retained on changing the batteries.

1. Undo 2 screws in the cover on the rear, remove cover.
2. Remove old batteries.
3. Fit new batteries in the battery compartment with correct polarity as indicated by the markings.
4. Close cover.

6.14.3 Power supply unit supplied

CAUTION

Risk of incorrect triggering due to wrong measuring values!
Power supply unit influences the measuring accuracy of EDS195P.
Therefore, do not connect the power supply unit during measurements.

A power supply unit with a USB connector and USB cable is included in the items supplied.
The primary purpose of the power supply unit supplied is to charge the rechargeable batteries in the EDS195P. See the display on the EDS195P for the charge state of the rechargeable batteries.

7. Technical specifications

7.1 Technical specifications for the system EDS309…

The technical specifications stated in this section apply to the components PGH18…, EDS195P, AGE185.

Environment/EMC

EMC ..... IEC 61326-2-4
Operating temperature ..... -10 . . . + 55 °C
Climatic classes acc. to IEC 60721:
Stationary use (IEC 60721-3-3) ..... 3K5 (without condensation or icing)
Transport (IEC 60721-3-2) ..... 2K3 (without condensation or icing)
Long-term storage (IEC 60721-3-1) ..... 1K4 (without condensation or icing)
Classification of mechanical conditions acc. to IEC 60721:
Stationary use (IEC 60721-3-3) 3M4
Transport (IEC 60721-3-2) 2M2
Long-term storage (IEC 60721-3-1) 1M3

Other

Operating mode ..... Continuous duty
Position in normal use ..... Any
Weight EDS309 . . . . ≤ 7000 g
Weight EDS309 . . . with PSA3165 ..... ≤ 8500 g
Weight EDS3092 ..... ≤ 9000 g
Dimensions, case W x H x D ..... 430 x 340 x 155 mm

7.2 Technical specifications PGH18…

Insulation coordination according to IEC 60664-1/IEC 60664-3

Rated voltage ..... 500 V AC
Rated surge voltage / degree of pollution 4 kV/3

Nominal system voltage U_n

PGH183 ..... AC 42 . . . 460 Hz 20 . . . 265 V, DC 20 . . . 308 V
PGH185 ..... 3AC/AC 42 . . . 460 Hz 20 . . . 575 V, DC 20 . . . 504 V
PGH186 ..... 3AC/AC 42 . . . 460 Hz 0 . . . 575 V, DC 0 . . . 504 V

Supply voltage

Supply voltage U_S ..... AC 50 . . . 60 Hz 230 V
Operating range of U_S ..... 0.85 . . . 1.15 x U_S
Supply voltage U_S version -13 ..... AC 50 . . . 60 Hz 90 . . . 132 V
PGH 183, PGH 185:
Power consumption ..... ≤ 3 VA
PGH 186:
Power consumption ..... ≤ 6 VA

Locating current

PGH183:
Locating current max., can be selected ..... 1/2.5 mA
PGH185/186:
Locating current max., can be selected ..... 10/25 mA
PGH183/185/186
Test cycle ..... 2 s
Pause duration ..... 4 s

Locating voltage

PGH186 ..... DC 50 V

Other

Degree of protection of built-in components DIN EN 60529 (VDE 0470-1) IP40
Enclosure material ..... ABS plastic
Flammability class UL94V-0
Weight ..... ≤ 700 g
Dimensions ..... 160 x 148 x 81 mm

7.3 Technical specifications EDS195P

( )* = Factory settings

Insulation coordination according to IEC 60664-1/IEC 60664-3

Rated voltage ..... 50 V
Rated surge voltage/degree of pollution 0.8 kV/3

Supply voltage

Power supply U_S ..... Rechargeable batteries, batteries or USB power supply unit
Rechargeable batteries ..... 3 x NiMH ≥ 2000 mAh
Operating time (without display lighting) ..... ≥ 150 h
Charging time ..... ≤ 5 h
Size ..... AA R6
Batteries ..... 3 x LR6 AA – 1.5 V
USB power supply unit:
Primary ..... 100 . . . 240 V, 50 . . . 60 Hz
Secondary ..... DC 5 V, ± 10 %
Power consumption ..... ≤ 0.5 W

Measuring circuit, insulation fault location

Nominal system voltage ..... With uninsulated conductors with measuring clamp up to 600 V
Rated frequency ..... DC, 42 . . . 2000 Hz
Main circuit (I_{Lmax} = 50 mA):
Measuring range ..... 2 . . . 50 mA
Measuring clamps PSA3020, PSA3052, PSA3165
Response sensitivity $I_{\Delta L}$ adjustable ..... 2 . . . 10 mA (5 mA)*
Operating uncertainty ..... ±30 % / ±2 mA of the nominal value
Control circuit: (I_{Lmax} = 5 mA)
Measuring range ..... 0.2 . . . 5 mA
Measuring clamps PSA3320, PSA3352
Response sensitivity $I_{\Delta L}$ adjustable ..... 0.2 . . . 1.0 mA (0.5 mA)*
Operating uncertainty 0.2 . . . 0.9 mA ..... ±30 % / ± 0.2 mA of the nominal value
Operating uncertainty 1 . . . 5 mA ..... ±30 % / ± 2 mA of the nominal value

Measuring circuit, residual current

With measuring clamps	PSA3020, PSA3052, PSA3165
Measuring range	5 mA . . . 10 A (crest factor up to 3)
Response sensitivity $I_{\Delta n}$ adjustable	10 mA . . . 10 A (100 mA)*
Measuring clamps	PSA3320, PSA3352
Measuring range	2 mA . . . 2 A (crest factor up to 3)
Response sensitivity $I_{\Delta n}$ adjustable	5 mA . . . 1 A (100 mA)*
Frequency range	42 . . . 1000 Hz
Operating uncertainty, 42 . . . 60 Hz	±5 %
Operating uncertainty, 61 . . . 1000 Hz	±20 %
Hysteresis	20 %
Harmonics, indication can be disabled	1st to 8th harmonic

Inputs

Connection for measuring clamp	BNC socket
Connection for power supply unit (DC 5 V)	µUSB socket

Display

LCD	3 x 16 characters, illumination can be enabled
LED	Alarm

Other

Degree of protection of built-in components DIN EN 60529 (VDE 0470-1)	IP40
Protective class according to IEC 60947-1, DIN EN 60947-1 (VDE 0660-100)	Class III
Enclosure material	ABS plastic
Flammability class	UL94V-0
Weight	≤ 350 g
Software version	D399 V2.0
Dimensions WxHxD	84 x 197 x 30 mm

7.4 Technical specifications measuring clamps

Electrical safety

Standard	IEC 61010-2-030
Degree of pollution	2
System class	III
Operating voltage	600 V
Nominal insulation voltage	AC 600 V CAT III or AC 300 V CAT IV

Transformer ratio

PSA30. . .	10 A/10 mA
PSA33. . .	1 A/0.1 mA
PSA3165	10 A/10 mA

Other

Degree of protection of built-in components DIN EN 60529 (VDE 0470-1)	IP40
Protective class according to IEC 60947-1, DIN EN 60947-1 (VDE 0660-100)	Class III
Measurement output	BNC connector
Dimensions PSA3052 / 3352	216 x 111 x 45 mm
Dimensions PSA3020 / 3320	135 x 65 x 30 mm
Dimensions PSA3165	285 x 179 x 45 mm
Permissible cable diameter PSA3052 / 3352	52 mm
Permissible cable diameter PSA3020 / 3320	20 mm
Permissible cable diameter PSA3165	115 mm
Weight PSA3052 / 3352	≤ 700 g
Weight PSA3020 / 3320	≤ 300 g
Weight PSA3165	≤ 1300 g

7.5 Technical specifications AGE185

Insulation co-ordination according to IEC 60664-1

Rated insulation voltage ..... AC 1000 V
Rated impulse voltage/degree of pollution 4 kV/3
Nominal system voltage U_n ..... 3AC/AC 42...460 Hz, 500...790 V, DC 400...960 V

Other

Degree of protection of built-in components DIN EN 60529 (VDE 0470-1) IP30
Connection type/wire: ..... Safety laboratory connectors with green-yellow connection wire 1 mm^2
Weight ..... ≤ 200 g
Dimensions WxHxD: ..... 88.5 x 42 x 21 mm

7.6 Standards and certifications

Observe the applicable national and international standards. The series EDS309…
complies with the standards:

- DIN VDE 0100-410 (VDE 0100-410)
  Low-voltage electrical installations – Part 4-41:
  Protection for safety – Protection against electric shock (IEC 60364-4-41, modified);
  German version HD 60364-4-41
- DIN EN 61557-9
  Electrical safety in low voltage distribution systems up to 1000 V a.c. and 1500 V d.c. –
  Equipment for testing, measuring or monitoring of protective measures - Part 9:
  Equipment for insulation fault location in IT systems (IEC 61557-9);
  German version EN 61557-9
- DIN EN 61010-1; VDE 0411-1
  Safety requirements for electrical equipment for measurement, control and laboratory use –
  Part 1: General requirements (IEC 61010-1);
  German version EN 61010-1

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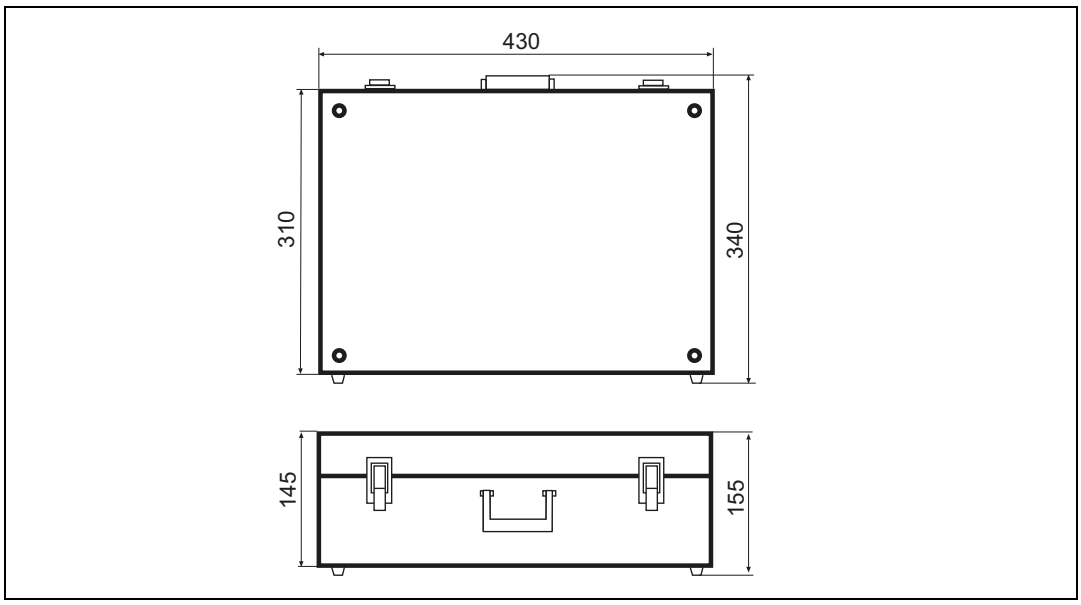
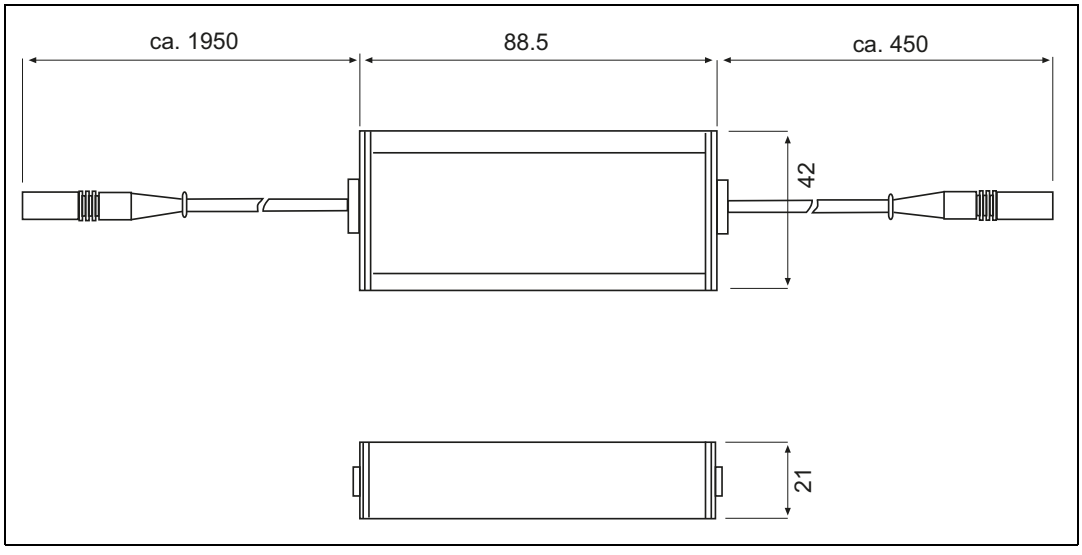
7.7 Dimension diagrams

All dimensions are given in mm.

Aluminium case

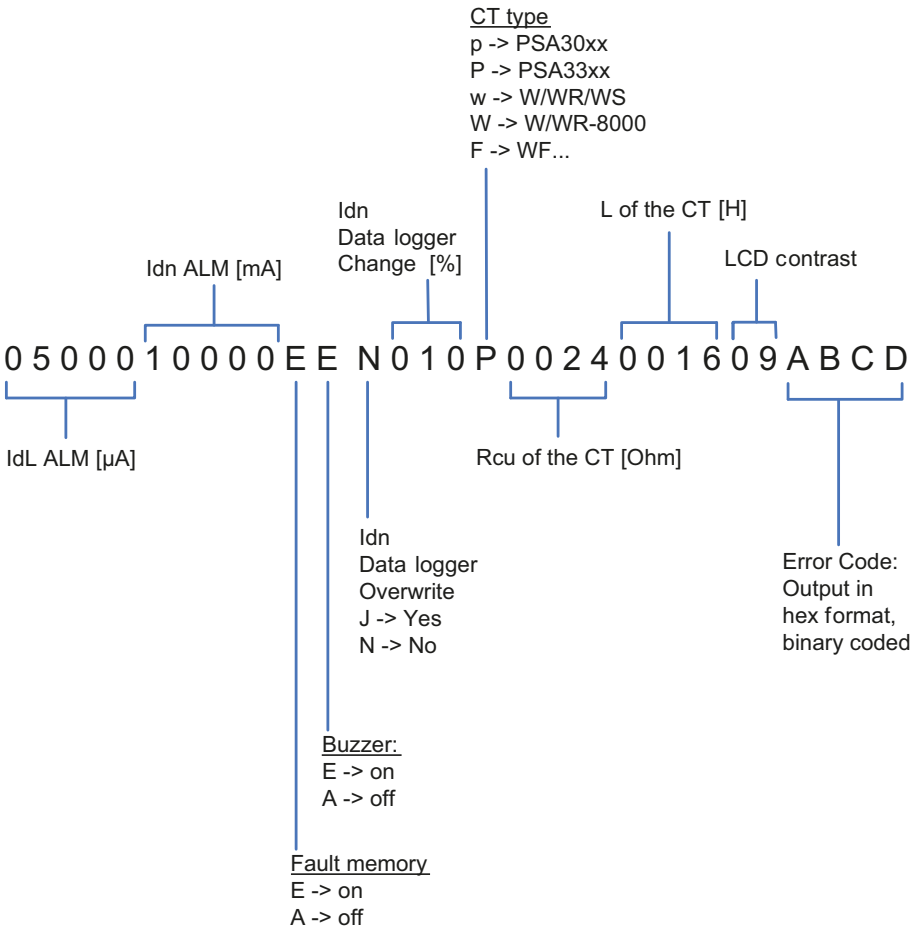


AGE185



7.8 Status word

The status word can be checked by pressing the "INFO" button several times. This word contains the current configuration and provides an error code if there is a device error.



7.9 Ordering data including accessories

Type	Items supplied				Supply voltage	Nominal voltage	Art.-No.
	Insulation fault locator	Locating current injector	Measuring clamps 20 mm	Measuring clamps 52 mm			
EDS3090	EDS195P		PSA3020	PSA3052		AC 42...460 Hz, 20...575 V und DC 20...504 V	B91082026
EDS3090PG	EDS195P	PGH185	PSA3020	PSA3052	AC 50...60 Hz, 230 V		B91082021
EDS3090PG-13	EDS195P	PGH185-13	PSA3020	PSA3052	AC 50...60 Hz, 90...132 V		B91082022
EDS3091	EDS195P		PSA3320	PSA3352		AC 42...460 Hz, 20...265 V und DC 20...308 V	B91082027
EDS3091PG	EDS195P	PGH183	PSA3320	PSA3352	AC 50...60 Hz, 230 V		B91082023
EDS3091PG-13	EDS195P	PGH183-13	PSA3320	PSA3352	AC 50...60 Hz, 90...132 V		B91082024
EDS3092PG	EDS195P	PGH183	PSA3320	PSA3352	AC 50...60 Hz, 230 V	AC 42...460 Hz, 20...265 V und DC 20...308 V	B91082030
		PGH185	PSA3020	PSA3052	AC 50...60 Hz, 230 V	AC 42...460 Hz, 20...575 V und DC 20...504 V	
EDS3096PG	EDS195P	PGH186	PSA3020	PSA3052	AC 50...60 Hz, 230 V	AC 42...460 Hz, 0...575 V und DC 0...504 V	B91082025
EDS3096PG-13	EDS195P	PGH186-13	PSA3020	PSA3052	AC 50...60 Hz, 90...132 V		B91082029
EDS3096PV	EDS195P	PGH186	–	2 x PSA3052	AC 50...60 Hz, 230 V		B91082031
Optional Accessories							
PSA3165	Measuring clamp 115 mm for EDS3090... and EDS3096...						B980852
AGE185	Coupling device for increasing the voltage range of the PGH185/186					AC 42...460 Hz, 500...790 V, DC 400...960 V	B980305
Adapter cable BNC-PS2	Adapter cable for operating a WF current transformer on the EDS195P						B91082045
EDS-SET	BNC Tee connector and 2 BNC cables for fault location in diode-decoupled systems						B91082007
Plug power supply with USB connector	DC 5 V for external supply of the EDS195P via µUSB connector						A167054

7.10 Component list

Components EDS309...			EDS195P with Accessories					PGH18... with accessories for							Measuring clamps			
Device type	Aluminium case with carrying handle	Operating manual	Insulation fault locator	Clamping connector on 4 mm	Adapter BNC/4mm connector for curr. transform.	Adapter BNC-PS2 for WF-CT, **optional**	Plug power supply for EDS195P	Locating current injector	Supply cable for PGH18...	Safety measuring cable, black	Safety measuring cable, green/yellow	Safety claw grip, black	Safety claw grip, green/yellow	Coupling device, **optional** (EDS3096PV only: in the scope of delivery)	Measuring clamps 20 mm	Measuring clamps 52 mm	Measuring clamps 115 mm, **optional**	EDS-Set, **optional**
EDS3090	1	1	EDS195P	1	1	1	1								PSA3020	PSA3052	PSA3165	1
EDS3090PG	1	1	EDS195P	1	1	1	1	PGH185	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3090PG-13	1	1	EDS195P	1	1	1	1	PGH185-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3091	1	1	EDS195P	1	1	1	1								PSA3320	PSA3352		1
EDS3091PG	1	1	EDS195P	1	1	1	1	PGH183	1	3	1	3	1		PSA3320	PSA3352		1
EDS3091PG-13	1	1	EDS195P	1	1	1	1	PGH183-13	1	3	1	3	1		PSA3320	PSA3352		1
EDS3092PG	1	1	EDS195P	1	1	1	1	PGH183 PGH185	2	6	2	6	2		PSA3320 PSA3020	PSA3352 PSA3052		1
EDS3096PG	1	1	EDS195P	1	1	1	1	PGH186	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1
EDS3096PG-13	1	1	EDS195P	1	1	1	1	PGH186-13	1	3	1	3	1	AGE185	PSA3020	PSA3052	PSA3165	1

8. Frequently Asked Questions

- The ISOMETER® indicates an insulation fault but this fault cannot be located using the EDS309…. What could cause this problem?
  - Individual outgoing circuits in the IT system monitored may be earthed. Check all outgoing circuits for unintentional earthing.
    The N conductor for the transformer that supplies the IT system must also not be earthed.
  - There may not be any locating current flowing. Check the earth connection on the locating current injector PGH18…, IRDH575 for correct connection.
  - The PE conductor may have been unintentionally included in the cables in the measuring clamp or the measuring current transformer.

- EDS195P displays the error message "No CT connected". What could cause this problem?
  - A measuring clamp is not connected or it is faulty.
  - A measuring clamp or a measuring current transformer of the incorrect type has been connected to the EDS195P, see table on page 33.
- In case of residual current measurement ($I_{\Delta n}$) the harmonic H… does not appear in the standard display. What could cause this problem?
  - The menu item "2. Settings/ 7. Harmonics:" is not activated.

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