



SPG 5-1000

Test and Fault Locating System

USER GUIDE

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Consultation with Megger

The present system manual has been designed as an operating guide and for reference. It is meant to answer your questions and solve your problems in as fast and easy a way as possible. Please start with referring to this manual should any trouble occur.

In doing so, make use of the table of contents and read the relevant paragraph with great attention. Furthermore, check all terminals and connections of the instruments involved.

Should any question remain unanswered or should you need the help of an authorized service station, please contact:

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1 Introduction

The SPG 5-1000 has been developed for fault locating in low voltage networks. Its functions are:

- ↪ DC-Testing,
- ↪ Breakdown recognition,
- ↪ Measuring leakage resistance
- ↪ Prelocating ICEplus,
- ↪ Pinpoint locating with step voltage or sound field method,
- ↪ Burning.

No need to use a TDR. ICEplus makes excellent prelocation possible - even with branched networks. Operation is done solely with the rotary encoder. For safety reasons the high voltage setting must be activated with a separate hardware button.

2 Technical Description

2.1 Technical Data

Display	5.7" display (640 x 480) for operating, status-information, input and test results; "one button operation"
Testing	0 ... 5000 V DC; timer
Leakage current display	0 ... 1 mA; 0 ... 10 mA; 0 ... 100 mA
Insulation resistance measuring	1kΩ ... 250 MΩ
automatic breakdown recognition	0 ... 5000 V DC
Prelocating	ICEplus technique (Patent pending) with 0 ... 4 kV surge
Burning	0 ... 500 V ; 1,0 A 0 ... 2000 V ; 0,25 A 0 ... 5000 V ; 0,1 A
Surge	0 ... 2000 V ; max. 1000 J 0 ... 4000 V ; max. 1000 J
Surge rate	single pulse or automatic 3 ... 10 sec.
Sheath fault locating	0 ... 500 V / 2000 V / 5000 V
Pulse ratio /sec.	DC / 1:3 / 1:4 / 1:6
Operating temperature	-10 ... + 50 °C

Mains supply	230 V; 50 / 60 Hz (also available as 115 V)
AC mains fuses	2 x 6,3 A medium time-lag (for 230 V) 2 x 10 A medium time-lag (for 115 V)
Power consumption	750 VA max.
Protection category	IP20 (according to EN 60529)
Dimensions	500 x 545 x 650 mm (L x W x H)
Weight	50 kg (device without access.) 6,5 kg (accessories)

2.2 Scope of delivery and Options

Test and fault locating device	SPG 5-1000
Set of cables consisting of:	
AC mains connection	
Earthing line (5, 10 or 20 m)	
High voltage cable (5, 10 or 20 m)	
Earth spike (with hammer and connection cable)	
MC connection adapter	
Operating manual	

Options :

External safety device	with emergency off-switch and signal lights	820003206
HKZ T9-BE	Clamping tongs, black	2013147
ERDOFLEX	Earth connection clamp	502021795
NH adapter		700100437
digiPHONE+2	Surge wave receiver	1013124
ESG NT2	Step voltage indicator	1004629-S

3 Safety

3.1 General Notes

Safety precautions

This manual contains basic instructions for the commissioning and operation of the device / system. For this reason, it is important to ensure that the manual is always available to the authorised and trained operator. He needs to read the manual thoroughly. The manufacturer is not liable for damage to material or humans due to non-observance of the instructions and safety advices provided by this manual. Locally applying regulations have to be observed!

Intended application

The operating safety is only guaranteed if the delivered system is used as intended (see page 1). Incorrect use may result in danger to the operator, to the system and the connected equipment.

The thresholds listed in the technical data may not be exceeded under any circumstances.

Operating staff

The system may only be installed and operated by an authorised electrician. DIN VDE 0104 (EN 50191), DIN VDE 0105 (EN 50110) and the German accident prevention regulations (UVV) define an electrician as someone whose knowledge, experience and familiarity with the applicable regulations enables him to recognise potential hazards.

Anyone else must be kept away!

Labelling of safety instructions

The following signal words and symbols are used in this manual and on the product itself:

WARNING Indicates a potential hazard which may result in death or serious injury if not avoided.

CAUTION Indicates a potential hazard which may result in moderate or minor injury if not avoided.

NOTICE Indicates a potential hazard which may result in material damage if not avoided.



Serves to highlight warnings and safety instructions.

As a warning label on the product it is used to draw attention to potential hazards which have to be avoided by reading the manual.



Serves to highlight warnings and safety instructions that explicitly indicate the risk of an electric shock.



Using cardiac pacemaker

Physical processes during operation of high voltage may endanger persons wearing a cardiac pacemaker when near these high voltage facilities.

**WARNING!****Dangers when working with high voltage**

Working on high voltage systems and equipment – especially in non-stationary operation – requires particular care and safety-conscious action on the part of test personnel. VDE regulations 0104 on setting up and operating electrical test systems, as well as EN 50191 and national standards and regulations must be strictly adhered to.

- The SPG 5-1000 generates a dangerous voltage of up to 5 kV during measurement operation. This is supplied to the test object via a high-voltage cable.
- The test system may not be operated without supervision.
- Never fail to use safety equipment or put it out of operation.
- Operation requires minimum two people whereas the second person must be able to activate the emergency switch in case of danger.



Due to the increased formation of ozone, sufficient fresh air must be supplied to the operating room during operation.

3.2 Safety devices

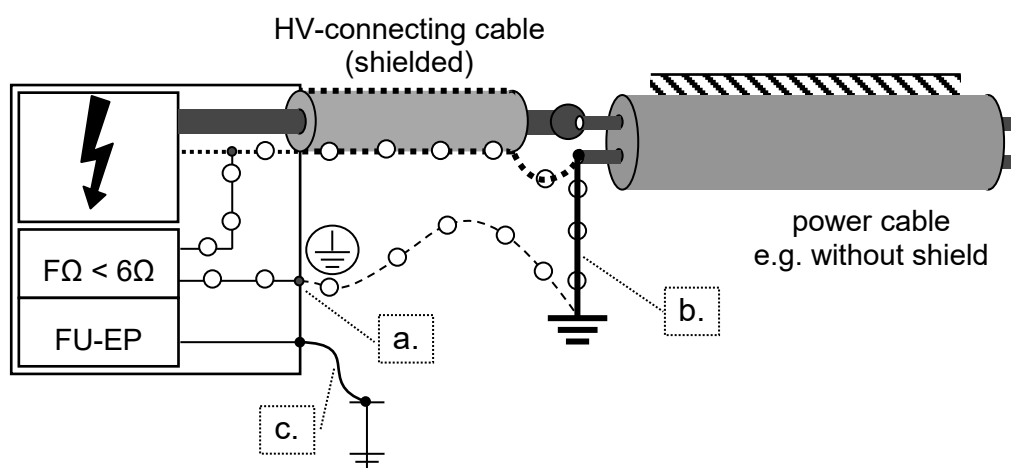
3.2.1 F Ω / FU-EP protective device



WARNING!

The F Ω / FU-EP protective device is used to monitor the resistance between the connection points, but not the connection to earth itself. As described in section 4.3.3, a good connection to all of the earthing points shown in the image is an important prerequisite for safe operation. A potential existing earth connection via the mains power supply or a single earthing connection via the earth spike is not sufficient for reliable protective earthing!

Creating a good protective earth connection [a] ensures that the housing and the reference point of the high-voltage output are on earth potential. The system earth connection [b] directs the normal current that occurs in the test/load circuit.



Illustr. 1 : F Ω / FU-EP protective device

To ensure that the two connections provide good metallic contact, the system earth/protective earth loop [o] is monitored by the F Ω protective device (F Ω monitoring).

The resistance between the system and protective earth must not exceed 6Ω , otherwise the device will not switch to the 'operational readiness' state. The 'Safety circuit' menu appears on the display with the message 'FOHM loop resistance - error'. In some cases, a connection must be established between the protective earth [a] and the system earth [b] to meet this requirement (see chapter 4.3.4).

The connection to the earth spike [c] is used as a reference point for potential monitoring (FU-EP monitoring) and protects the operator and other individuals from step voltage potentials. If a dangerous contact voltage (33 V AC / -40 V DC) or a resistance greater than $150 \text{ k}\Omega$ is measured during potential monitoring, 'HV stand-by' is either deactivated or cannot be activated in the first place. The 'Safety circuit' menu appears on the display with the 'FU-EP' error.c

3.2.2 Reverse voltage detection

The SPG 5-1000 is equipped with a reverse voltage detection, which triggers as soon as the HV connecting cable is connected to a live (low voltage) cable.

The reverse voltage detection is active only when the device is in the "stand-by" operating state (green push-button [4] is illuminated). From operating state "HV-stand-by" (red push-button [5] is illuminated) on, the reverse voltage detection is no longer active.

If the reverse voltage detection recognizes an AC voltage between 40 and 230 V_{RMS} (50 / 60 Hz) at the HV output, the horn of the SPG 5-1000 sounds. In this case the cable under test needs to be disconnected from the grid as fast as possible! Meanwhile, the SPG 5 1000 must not be put in the "HV stand-by" operating state to prevent damage or destruction!

3.2.3 Key Switch

For product liability reasons measuring devices emitting hazardous voltages must be safeguarded against accidental activation by unauthorised users. For this purpose, the SPG 5-1000 has a key switch which the person in charge has to keep safe (see page 14, Illustr. 2).

3.3 VDE 0104 (EN 50191) clauses

3.3.1 Mobile (non-stationary) test unit

VDE 0104 (EN 50191) standard states that the set-up of the instrument, including the beginning of the cable to be measured, represents a non-stationary test installation and is classed as a test site without protection against touching. The same also applies to the end(s) of the cable to be tested.

3.3.2 Danger Area

Test sites without necessary contact protection are classed as 'danger areas with various zones of danger levels' and have to be cordoned off, secured and marked accordingly.

3.3.3 Emergency OFF button

Test sites in general have to be equipped with an emergency OFF button. The SPG 5-1000 has a red emergency OFF button on the face plate (see page 14, Illustr. 2). An optional external emergency OFF button, called 'external safety device', is available. It can be connected to the jack [6] on the connector panel at the back (see page 15, Illustr. 3) When using the SPG 5-1000 without the external emergency OFF button, the standard dummy plug has to be placed in jack [6] so that the device can be switched on.

4 Operating

4.1 Setting up the Instrument

The guidelines for implementation of occupational safety when operating a test system / test van often differ between one network operator and another and it is not uncommon for national regulations (like, i.e. the German BGI 5191) to be used as well.

Inform yourself of the guidelines applicable in the area of operation beforehand, and comply with the specified rules for work organization and for implementing the test system / test van.

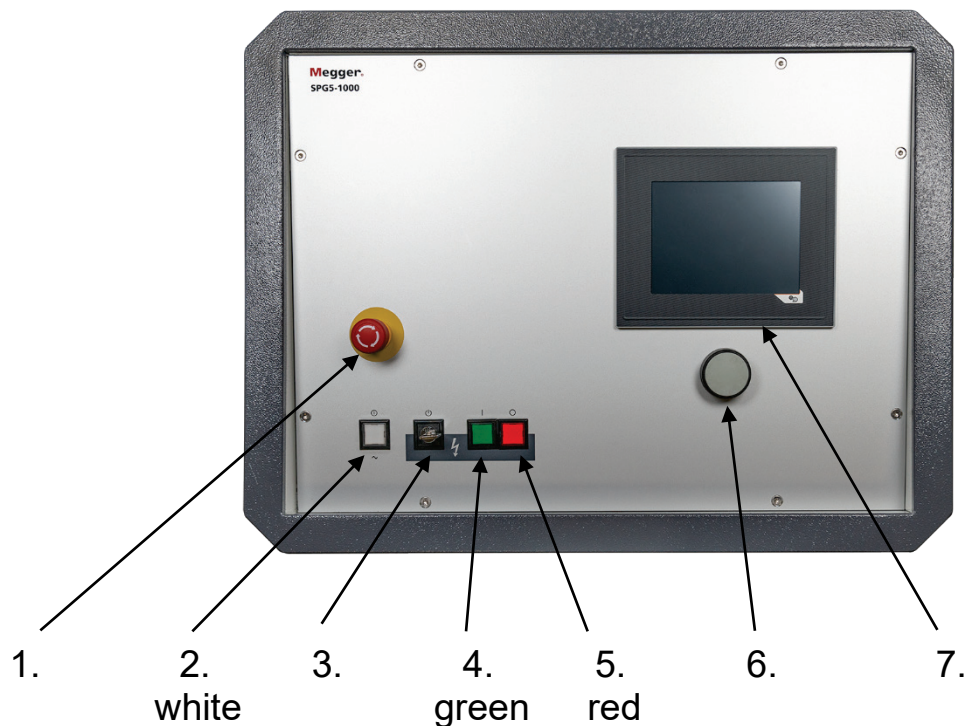


Caution!

DO NOT TRANSPORT OR OPERATE THE SPG 5-1000 WHEN LYING DOWN

because this will lead to safety hazards and damage to the instrument.

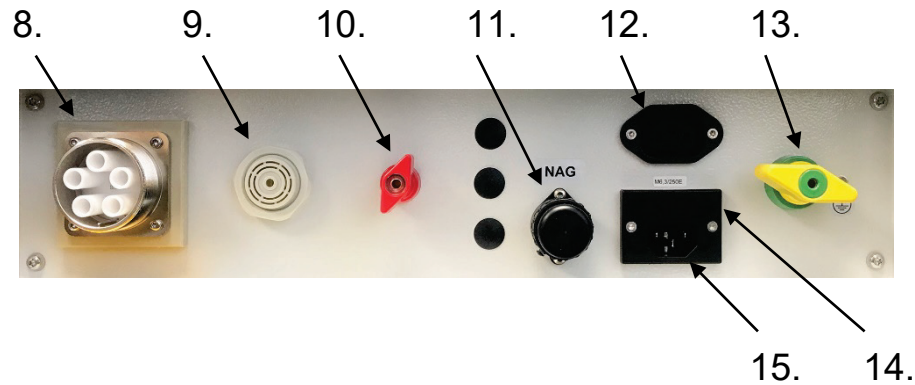
4.2 Connections and controls



Illustr. 2 : Controls

1. emergency OFF button
2. push-button – white : on/off power switch
 - ↵ press : switches the device on, activates system controls
 - ↵ lit : device is switched on
3. key switch
4. push-button – **green**: HV-ON key
 - ↵ lit : stand-by
 - ↵ press : go to HV stand-by
5. push-button - **red** : HV-OFF key
 - ↵ lit : high voltage is switched on (HV-stand-by)
High voltage active (HV-operation)
 - ↵ press : switches high voltage off
6. rotary selector with enter function
7. display

Connections on the back - in the transport pouch



Illustr. 3 : Connections - back

- 8. HV-cable connection
- 9. buzzer (external voltage alarm)
- 10. connection to earth spike (FU-EP monitoring)
- 11. connection for external emergency OFF button
- 12. power output for peripherals (max. 200 watts)
- 13. connection safe earth
- 14. main fuse (6,3 A medium delay at 230 V)
- 15. power supply

4.3 Connecting

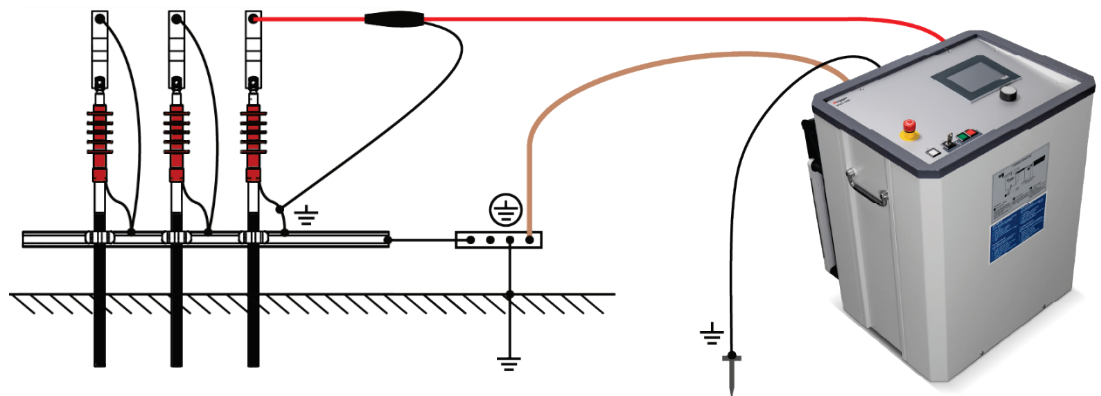
Please observe the following procedures for safe operating:

4.3.1 5 Safety Rules

Please note the 5 safety rules (or the rules applying to the operator) before connecting the SPG 5-1000 to a test object:

1. turn power off
2. secure against reconnecting
3. check that no voltage is present
4. earthing and shorting
5. covering neighbouring parts which could carry voltage

4.3.2 Connection diagramm



Illustr. 4 : Connection diagram

4.3.3 Earthing the SPG 5-1000

The SPG 5-1000 has to be earthed before use. To do so connect the protective earth connection [13] to a good safety earth of low resistance (for example, station earth, lighting protection system or other suitable foundation earth electrode) using the earth lead EK1 supplied.

Note that the earthing clamp should only be attached to clean metallic contacts.

In addition, the supplied earth spike must be inserted in the ground as close as possible to the device and connected to the connection socket [10] on the device using the red connection cable. If the 'Safety circuit' menu appears along with the 'FU-EP' error after the system has been switched on despite the connected earth spike, the following instructions may help:

- Try inserting the earth spike in other locations that may be more suitable. In heavily built-up areas, locations such as joints between concrete slabs may be used.
- Moisten the location where the earth spike was inserted with water.
- Attach the auxiliary earth to a foundation earth (e.g. a lightning protection system). However, do not use the same foundation earth to which the main earth cable has already been connected.



WARNING!

The device must not be operated without the earth lead being connected. The earth lead establishes the connection between the system and protective earth and ensures that the entire system is safe in case of accidental contact.

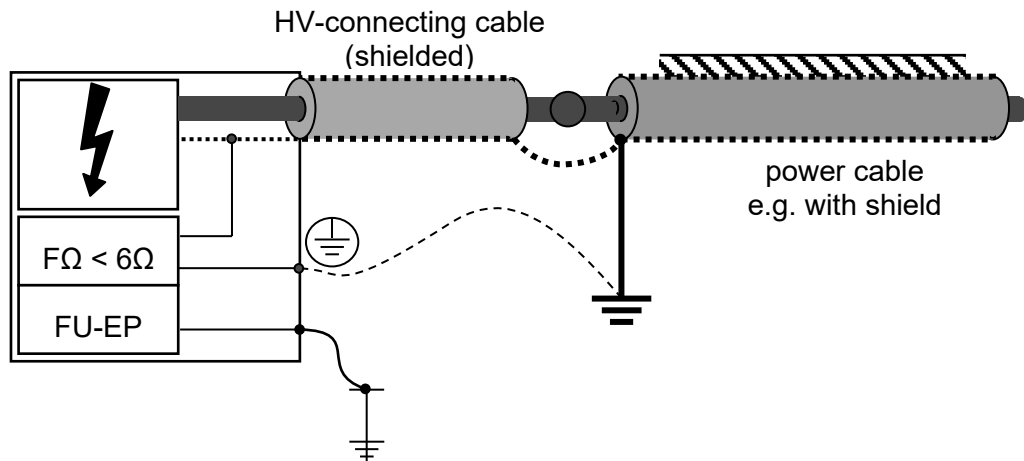
Earthing only via the safety earth of the power supply or with a earth spike is not sufficient!

Unless reliable earthing can be guaranteed, the entire measurement setup must be considered live. In this case, follow the instructions of the sections related to live working in EN 50110-1.

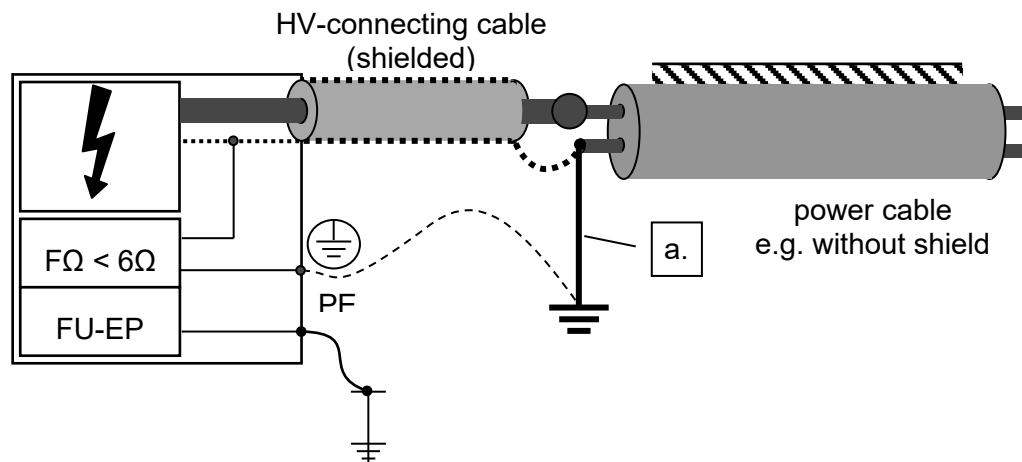
An earthing tester can be used to check the protective earthing.

If no reliable earthing can be ensured, the entire measurement system must be considered live. In this case, it is necessary to proceed in accordance with the guidelines set out in EN 50110-1, Section 'Live working'. When working under these operating conditions, it is mandatory to wear Class 1 (or higher) insulating protective gloves in accordance with EN 60903!

4.3.4 Connecting the HV-line to a faulty cable



Illustr. 5 : Connecting to LV cable with sheath



Illustr. 6 : connecting to a 4- or 5-conductor cable without sheath



WARNING!

All test object phases that are not being tested must be short-circuited and earthed.

a) Testing, sound field pinpoint locating, prelocation (ICEplus option)

If possible the operating earth of the HV connection line should be connected to the earthed shield of the faulty cable (Illustr. 5).

If no sheath is available, or in case of a 'phase – phase fault', the operating earth should be connected to one of the two faulty conductors. This core now has to be connected to earth using an earth bridge a. (Illustr. 6).



WARNING!

When pinpointing earth faults on cables without a shield or metal sheath in surge mode, dangerous step voltage can occur at the fault location (due to the step potential) and at the earth connection. Surging against earth must not be performed! In these cases, the step voltage method should be used instead.

The centre conductor of the HV connecting cable is connected to one of the faulty phase conductors. If, by accident, there is voltage between the screen and the phase conductor of the measuring cable, the external voltage detector buzzer [9] sounds.

b) Step voltage pinpoint locating

Sheathed cables: the shield of the object to be tested has to be separated from the earth on both ends and connected to the main conductor of the HV connecting cable.

Unsheathed cables: the main conductor of the HV feed line is connected to the faulty phase. The operating earth (shield) of the HV connecting cable has to be connected to the operating earth of the station.

4.3.5 Seuring the site and open cable ends

Secure the area according to regional regulations using barricades, warning signs and cable bridges.

As the high voltage pulses applied to the faulty cable are hazardous on contact, the cable ends have to be cordoned off in accordance with local safety regulations (e.g. VDE 0104 regulations). The user has to make sure that also the ends of branches (tees) are cordoned off and protected.

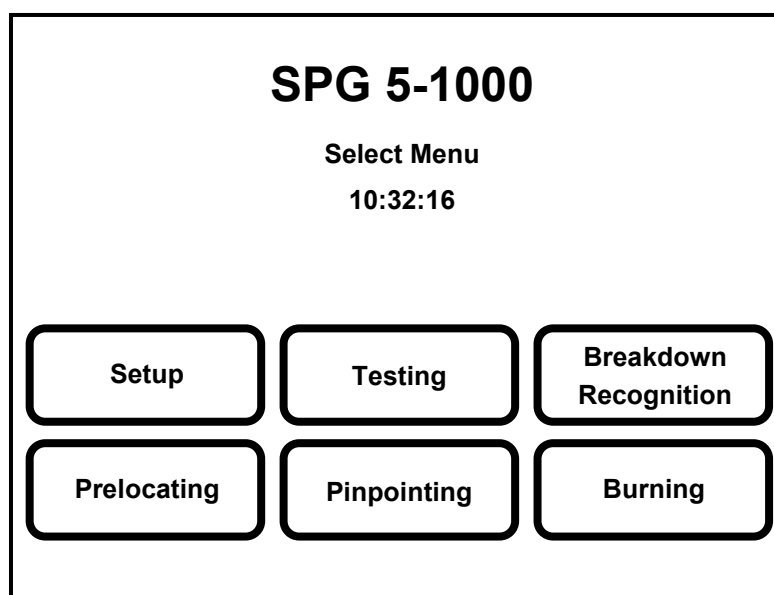
4.3.6 Connecting the SPG 5-1000 to the mains

Now the SPG 5-1000 can be connected to the mains. Make sure that the mains voltage is the same as the supply voltage of the SPG 5-1000 (230 V AC or 115 V AC).

5 Operation

5.1 Switching On

Press the white push button [2] to start the SPG 5-1000. The white push-button lights up. The control and safety circuits are activated and system controls switches the operating menu on. The device will automatically go on 'stand-by', the green push-button lights up [4]. There is no high voltage at this point as the HV outlet is earthed.



Illustr. 7 : Main menu

For a more detailed explanation of the main menu see chapter 6.

5.2 Rotary Selector

Turn = select
Press = confirm (enter function)

Modes are selected in the menu by turning, and activated by pressing the rotary selector [6].

Within a function values are changed by turning. To confirm the selected settings the rotary selector [6] has to be pressed again (ENTER).

The main menu operating modes are explained in chapter 6, page 24.

5.3 High Voltage HV on

Once the test type has been selected the stand-by mode is established by the HV function. The command 'push green button' appears in the status line once HV – ON has been entered. The key must be pushed within 5 seconds, otherwise the function "HV-ON" has to be pushed again to avoid switching on by mistake.

Now the SPG 5 – 1000 is in "HV stand-by" mode: the red button [5] lights up as the light in the green button [4] goes off and HV is activated. This configuration means High Voltage, shown in the display as the high voltage arrow-symbol. Only after that the required values can be entered.

Note: If the green button [4] goes off without the red button [5] lighting up the device is also on 'High voltage activated' and **High voltage** could be on!

5.4 High voltage is active

In the test, breakdown recognition, ICEplus and pinpoint locating (sound field method) modes the desired value of the voltage is first pre-set by turning the rotary selector. High voltage is started after the enter button has been pushed.

The red push-button [5] will start to blink.

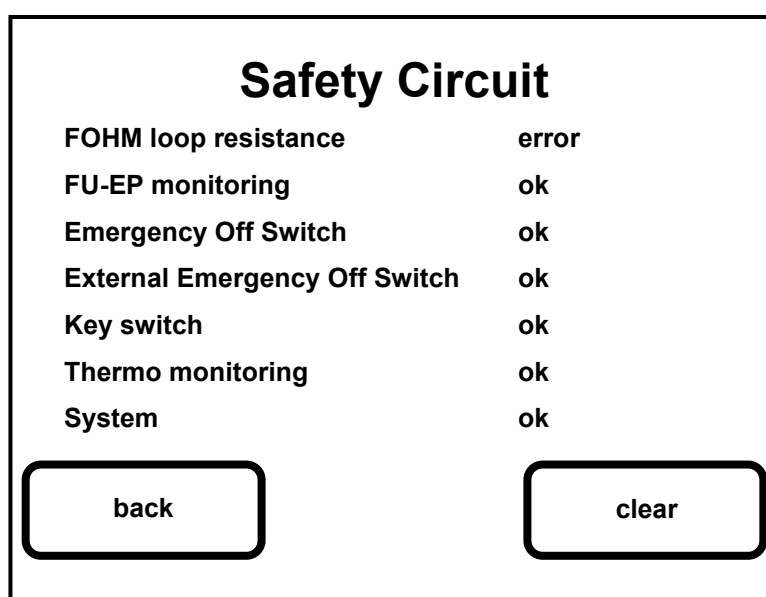
In the burn and pinpoint locating (step voltage) modes the voltage does not have to be entered specially, but is immediately active at the output.

6 Functions

6.1 Setup- Menu

In the setup-menu the menu language can be changed.

6.2 Safety Menu

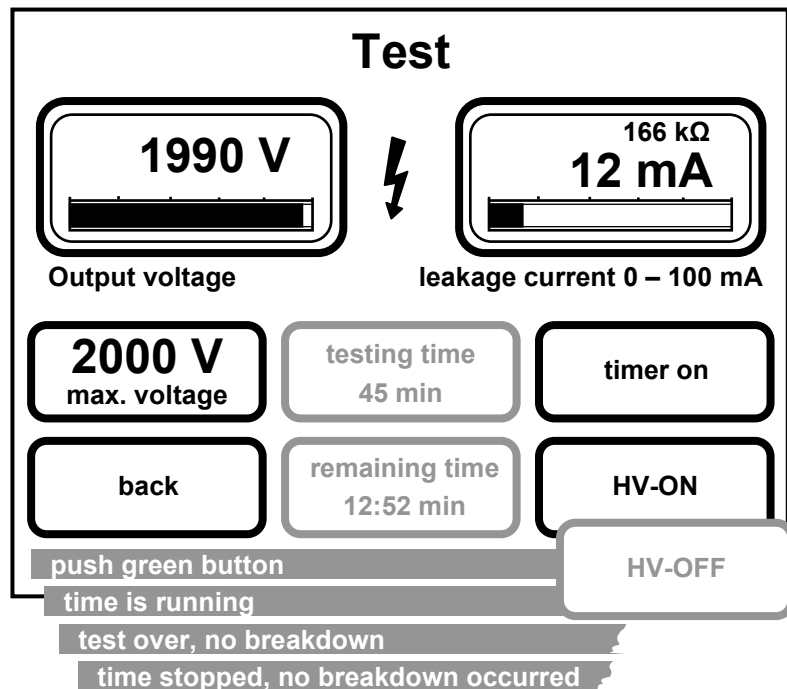


Illustr. 8 : Menu safety circuit

The Safety Menu will appear automatically if there is some sort of error.

To return to the normal operating mode the error must be eliminated and conformed with "clear".

6.3 Test Mode



Illustr. 9 : Menu testing

Operation :

Precondition: Light in green push-button [4] on.

1. Select operating mode 'testing' in main menu.
2. activate field "HV-ON".
3. Press green button (within 5 sec.).
4. Set maximum voltage (set value)

If the clock is activated the voltage setting cannot be changed

5. Set clock (only if wanted).
Total testing time and remaining test time are shown.
Testing with clock: breakdown recognition active
Testing without clock: insulation resistance measuring
6. Turn off with the field "HV-OFF" or by pushing the red button [5].

If a breakdown occurs during testing the SPG 5-1000 will not switch off automatically but will continue to show the insulation resistance. See following paragraph for conditions.

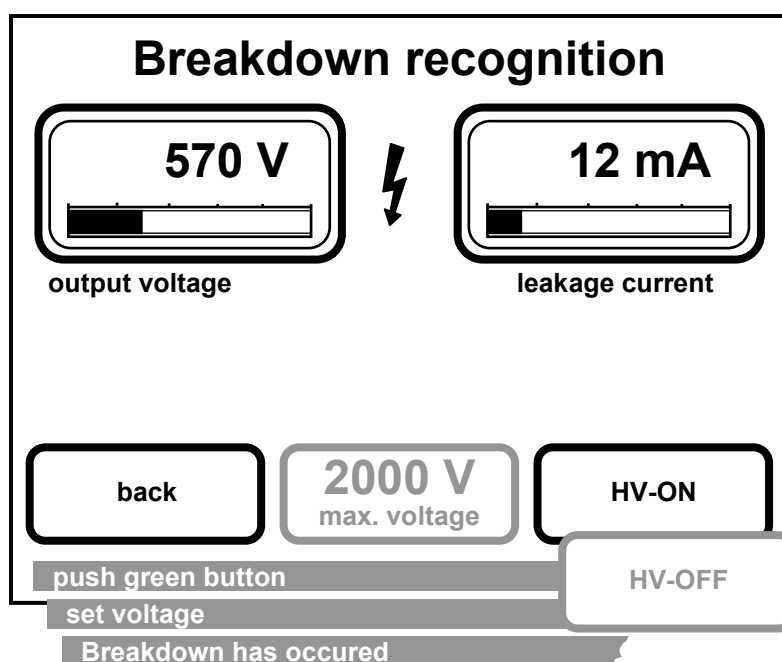
6.3.1 Insulation resistance

Insulation resistance is shown on the top right corner of the display as soon as a minimum voltage of 100 V and a minimum current of 10 μ A are measured.

6.4 Operation mode breakdown recognition

Breakdown recognition is the simplest way of finding the breakdown voltage. The maximum voltage entered by the operator is adjusted automatically. The SPG 5-1000 raises the output voltage slower than in testing mode with a time ramp of 250 V/sec until breakdown occurs. After a breakdown the breakdown voltage is shown.

This mode does not have a timer function as in testing, but the SPG 5-1000 will automatically turn off the high voltage after the breakdown has occurred.



Illustr. 10 : Menu breakdown recognition

Operating :

Precondition: Light in green button [4] on.

1. Select “breakdown recognition” in main menu.
2. Activate field “HV-ON”.
3. Push green button (within 5 sec.)
4. Select maximum voltage (set value)

If a breakdown occurs, the breakdown voltage is shown at the top left. The information line at the bottom of the display will show “breakdown has occurred” and the SPG 5-1000 will turn off the high voltage. If no breakdown occurs the high voltage remains on.

5. Turn off with the field “HV-OFF” or by pushing the red button [5]

6.5 Prelocating function



Wear ear protection

Surge operation can cause high and sudden noise levels. It is strongly recommended to wear hearing protection during surge operation. Keep in mind that this will limit the operators awareness for ambient dangers.

- ! The ICEplus locating function was calibrated at the factory using the provided HV connection cable. Using a
 - HV cable of a different length can negatively impact the accuracy of the measurement result.

The ICEplus method (patent pending) is used for prelocating. This method is not influenced by branches (tees) in LV networks.

Prelocating

ICEplus



cable input : enter new cable data

No. of sections : 1

Section : 1 section length : 500 m

conductor diameter : 150 qmm

cable type : connection :

back

cable data

continue

Illustr. 11 : Menu Prelocating cable data

Operating :

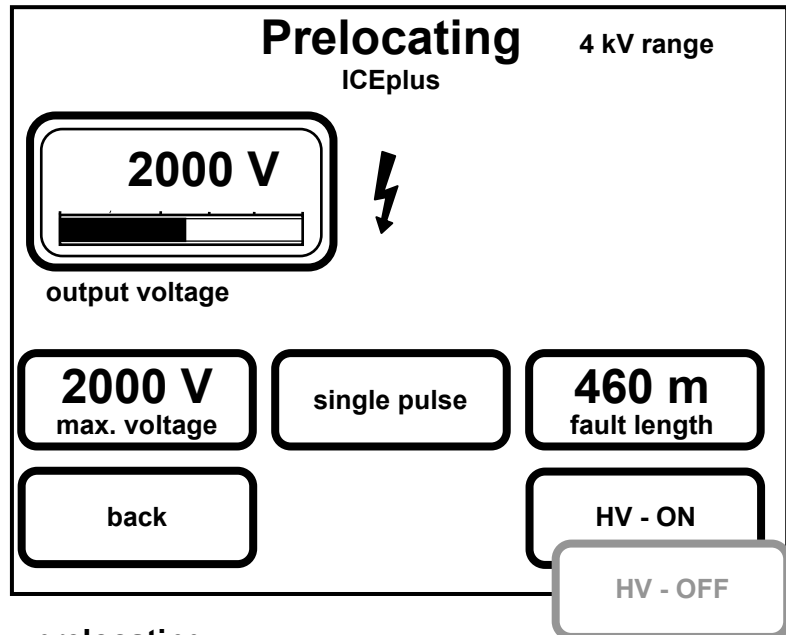
Precondition: Light in green button [4] on.

1. Select “prelocating” in main menu.
2. Choose field “cable data” on the display as shown
Illustr. 11 : Menu Prelocating cable data
3. Under “cable input” (at the top) select one of the following:
 - “accept old cable data” (no changes, continue with step 9)
 - “modify cable data” (change previous data)
 - and “set new cable data” (enter a completely new set of data)
4. Enter the number of sections with mixed lengths (max. 5 parts)
5. Enter lengths of sections. When dealing with mixed sections the exactness of the result depends on how exact the input is. With single sections the length just has to be changed if the object to be measured is longer than the pre-set value.

If the length entered is too short and the fault is behind the stated cable end, this is shown at the bottom of the display with “fault distance > cable length”.
6. Select the conductor diameter from the provided values.
7. Select the cable type and how the cable is connected (see appendix on page 38).

! The input of the cable data (steps 4-7) is a fundamental requirement for accurate distance indication and must therefore be made carefully!

8. Confirm the cable data input by pressing “continue”.
9. Another menu opens, as shown in Illustr. 12.



Illustr. 12 : Menu prelocating

10. Press field “HV – ON”.
11. Push green button (within 5 sec.).
12. Enter max. voltage (set value). This value should be at least 3500 V for good results (check maximum test voltage of the cable !) and always a good amount higher than the fault breakdown voltage.
13. Press the field ‘single pulse’. The impulse capacitor is now discharged into the faulty cable and the fault length shown on the display.
14. Turn off with the field “HV-OFF” or by pushing the red button [5].

6.6 Pinpointing Mode

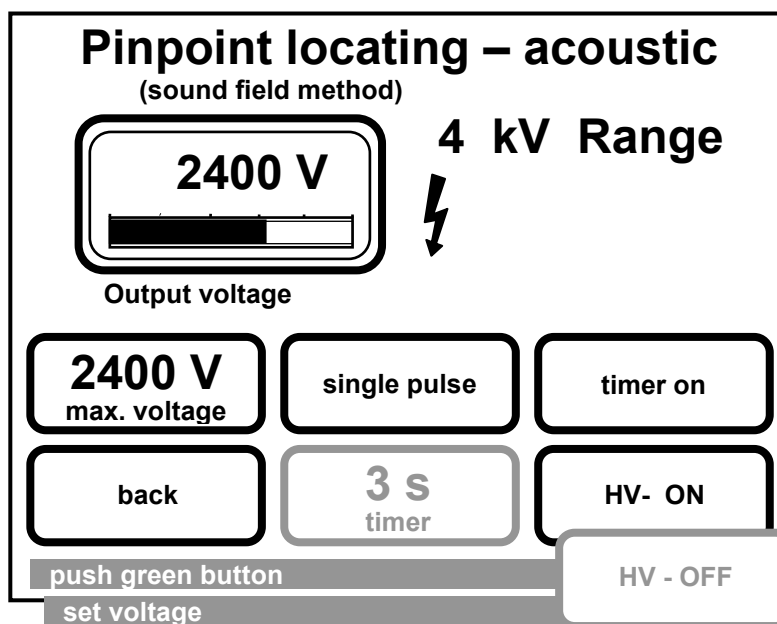


Wear ear protection

Surge operation can cause high and sudden noise levels. It is strongly recommended to wear hearing protection during surge operation. Keep in mind that this will limit the operators awareness for ambient dangers.

There are two kinds of pinpoint locating to choose from:
The sound field method with a surge wave generator with voltage ranges 0 ... 2 kV and 0 ... 4 kV.
The step voltage method with a DC output voltage 0 ... 5 kV, which can be pulsed.

6.6.1 Sound Field method



Illustr. 13 : Menu pinpointing - acoustic

Operating :

Precondition: Light in green push-button [4] on.

1. Select 'pinpointing' in main menu.
2. Activate field 'sound field'.
3. After pre-selecting voltage range 2 / 4 kV the above menu (Illustr. 13 : Menu pinpointing - acoustic) appears.

Note: The impulse energy is 1000 J at full voltage in the respective selected range. When using half the voltage of the selected range only a quarter of the energy is available.

This means that:

<u>2 kV-range</u>		<u>4 kV-range</u>	
2000 V	→	1000 J	
1000 V	→	250 J	
		4000 V	→
		1000 J	
		2000 V	→
		250 J	

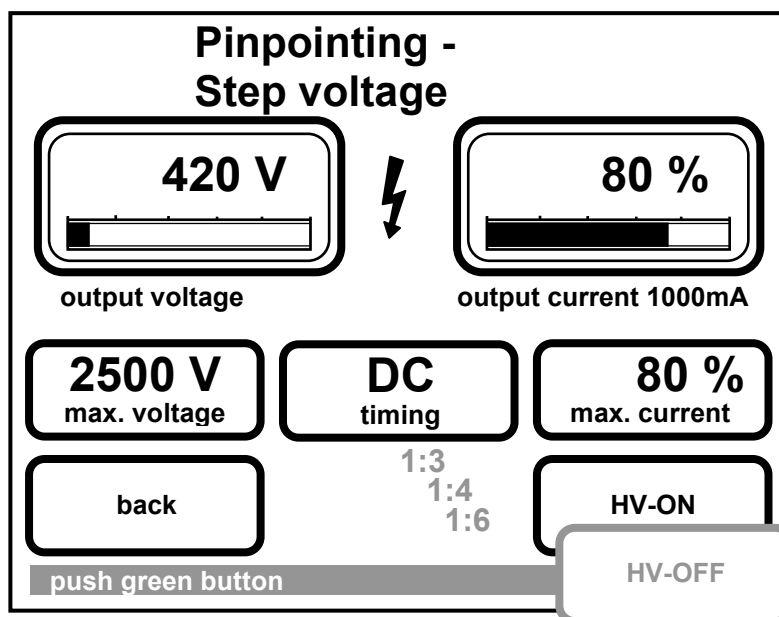
4. Activate field "HV-ON".
5. Push green button (within 5 sec.)
6. Select max. voltage (set value).
7. Single pulse or timing:

By activating the field "single pulses" only one single pulse is released straight into the faulty cable.

After the field 'clock on' has been activated, another field appears. Here a pulse rate ranging from 3 to 10 seconds can be entered.

8. Turn off with the field "HV-OFF" or by pushing the red button [5].

6.6.2 Step Voltage Method



Illustr. 14 : pinpoint locating - Step voltage

Operation :

Precondition: Light in Green button on [4].

1. Select 'pinpointing' in main menu
2. Activate field 'step voltage'. The above menu Illustr. 14 : pinpoint locating - will appear.
3. Activate field "HV-ON".
4. Push green button (within 5 sec.)
5. Set voltage, but watch output current.

Important! In this operating mode the set voltage is immediately active at the output.

Voltage range and maximum output currents are changed automatically:

500 V → 1000 mA 2000 V → 250 mA

5000 V → 100 mA

6. Setting pulse rate. Available are DC and pulse rates 1:3 / 1:4 / 1:6

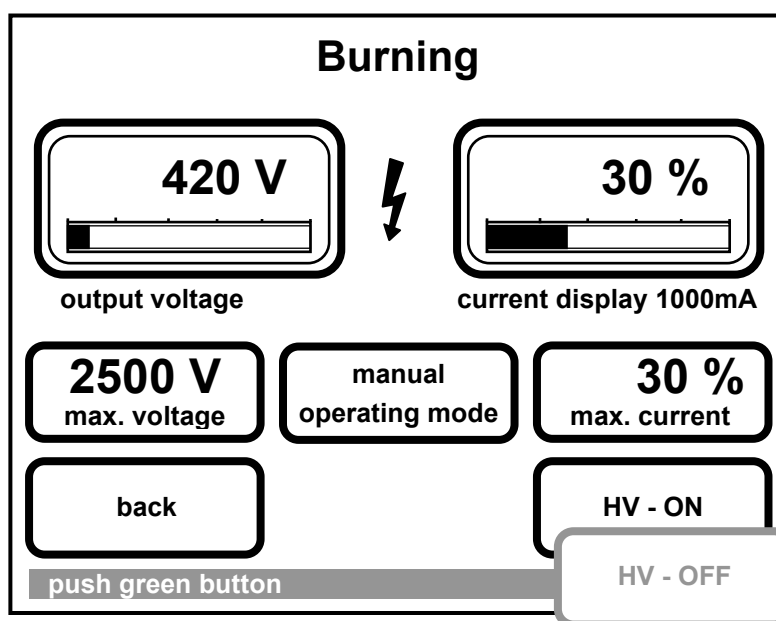
7. Set max. current. When menu is called up the max. current is automatically set at 10% but can be changed manually.

In case of automatic change to a different voltage range the percentage value remains unchanged, which means that a lower voltage range will produce a higher current and the percentage value of the max. output current will remain constant.

The current range is shown below the scale, at the top right.

8. Turn off with the field “HV-OFF” or by pushing the red button [5].

6.7 Burn Mode



Illustr. 15 : Menu Burn

Operating :

Precondition: Light in green button [4] on.

1. Select 'burning' in main menu.
2. Activate field “HV-ON”.
3. Press green button (within 5 sec.)

4. operating modes – manual / automatic

Manual burn is set as standard where the operator has to enter voltage and burn current himself.

If the SPG 5-1000 is in automatic burn mode it automatically switches from the pre-set maximum voltage to the next smallest voltage range as soon as the burn voltage is lower than the next lower range for two seconds. If now the burn current goes to zero the device will automatically switch back to the higher voltage range. This will be attempted up to five times. If no burn current can be reached in the low voltage area of 500 V the SPG 5-1000 will continue t burning with the pre-set max. voltage.

5. Setting the max. current. When this menu is called up the max. current is automatically pre-set at 30 %. The setting can be changed manually. If the max. current is set to a different voltage range, the percentage value of the current remains unchanged. The current range is shown under the scale at the top right.

6. Setting the voltage. Observe the output current.

Important: in the burn mode voltage is immediately active at the output, which makes it easier to set the wanted output current via the voltage adjustment

Voltage ranges and maximum output currents change automatically.

500 V → 1000 mA

2000 V → 250 mA

5000 V → 100 mA

7. Turn off by using field 'HV-OFF' or by pressing red push-button [5].

7 Disconnecting electrical connections



WARNING!

When disconnecting the test system, proceed in reverse sequence to the manner in which the connection (see page 16) was made. The following safety instructions must be strictly adhered to:

- Follow the five safety rules.
- Even if switched off properly and discharged using the discharge device, the system components that were under voltage should only be touched once they have been discharged using a suitable discharge rod as well as having been earthed and shorted.
- Only undo the earthing and short circuiting measures when the test object is to be operated again.

8 Care, Maintenance






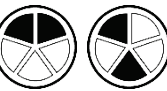

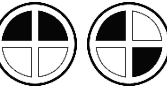




The lithium battery in the SPS control unit of the SPG 5-1000 saves the RAM data and should be changed after approx. five years at a Megger service centre.




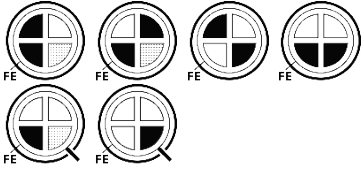



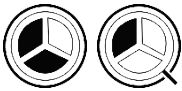



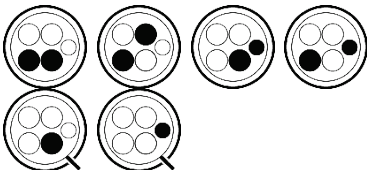

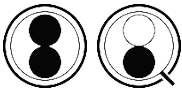
If the battery is discharged the SPG 5-1000 will only run in the demonstration mode without high voltage.

Do not bend the HV cable when stored in the pouch at the back of the SPG 5-1000.

In case of malfunction the SPG 5-1000 should be turned off immediately and operation should not be continued. In this case please contact the Megger service.

Appendix: Available cable data

Type	Description	Connection options
1	 <p>Three-wire cable with copper or aluminium conductors; shield also made of copper or aluminium (no steel sheath)</p> <p>Cross-section (in mm²): 6, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300</p>	
2	 <p>Four-wire cable with copper or aluminium conductors; shield also made of copper or aluminium (no steel sheath)</p> <p>Cross-section (in mm²): 6, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300</p>	
3	 <p>Five-wire cable with copper or aluminium conductors; no shield</p> <p>Cross-section (in mm²): 6, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300</p>	
4	 <p>Four-wire cable with copper or aluminium conductors; no shield</p> <p>Cross-section (in mm²): 6, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300</p>	
5	 <p>Four-wire cable with copper conductors and steel sheath shield</p> <p>Cross-section (in mm²): 4x25+75 (shield), 4x50+125 (shield), 4x95+160 (shield)</p>	
6	 <p>Coaxial conductor (no steel sheath as shield) — UG7CR and RG7CR</p> <p>Cross-section (in mm²): 1x6+6C, 1x10+10C, 1x16+16C, 1x 25+25C, 1x500+35C</p>	

Type	Description	Connection options
7	 <p>Street lighting cable (twin cable without shield and without sheath)</p> <p>Cross-section (in mm²): 2x10, 2x16</p>	
8	 <p>Four-wire cable with copper or aluminium conductors (neutral conductor with smaller cross-section)</p> <p>FE... steel sheath shield</p> <p>Cross-section (in mm²): 3x95+1x50, 3x150+1x95, 3x240+1x95</p>	
9	 <p>Four-wire cable with copper or aluminium conductors</p> <p>FE... steel sheath shield</p> <p>Cross-section (in mm²): 4x16, 4x25, 4x35, 4x50</p>	
10	 <p>Three-wire cable with aluminium conductors and copper shield</p> <p>Cross-section (in mm²): 43x35, 3x70, 3x185, 3x300</p>	
11	 <p>Four-wire cable with copper conductors and lead sheath shield</p> <p>Cross-section (in mm²): 4x185</p>	
12	 <p>Four-wire cable (+ 1 conductor for street lighting) with copper conductors and lead sheath shield</p> <p>Cross-section (in mm²): 4x120+1x16</p>	
13	 <p>Two-wire cable with aluminium conductors and aluminium shield (shield cross-section not known)</p> <p>Cross-section (in mm²): 2x16, 2x25</p>	



Tento symbol indikuje, že výrobek nesoucí takovéto označení nelze likvidovat společně s běžným domovním odpadem. Jelikož se jedná o produkt obchodovaný mezi podnikatelskými subjekty (B2B), nelze jej likvidovat ani ve veřejných sběrných dvorech. Pokud se potřebujete tohoto výrobku zbavit, obraťte se na organizaci specializující se na likvidaci starých elektrických spotřebičů v blízkosti svého působiště.



Dit symbool duidt aan dat het product met dit symbool niet verwijderd mag worden als gewoon huishoudelijk afval. Dit is een product voor industrieel gebruik, wat betekent dat het ook niet afgeleverd mag worden aan afvalcentra voor huishoudelijk afval. Als u dit product wilt verwijderen, gelieve dit op de juiste manier te doen en het naar een nabij gelegen organisatie te brengen gespecialiseerd in de verwijdering van oud elektrisch materiaal.



This symbol indicates that the product which is marked in this way should not be disposed of as normal household waste. As it is a B2B product, it may also not be disposed of at civic disposal centres. If you wish to dispose of this product, please do so properly by taking it to an organisation specialising in the disposal of old electrical equipment near you.



Този знак означава, че продуктът, обозначен по този начин, не трябва да се изхвърля като битов отпадък. Тъй като е B2B продукт, не бива да се изхвърля и в градски пунктове за отпадъци. Ако желаете да изхвърлите продукта, го занесете в пункт, специализиран в изхвърлянето на старо електрическо оборудване.



Dette symbol viser, at det produkt, der er markeret på denne måde, ikke må kasseres som almindeligt husholdningsaffald. Eftersom det er et B2B produkt, må det heller ikke bortskaffes på offentlige genbrugsstationer. Skal dette produkt kasseres, skal det gøres ordentligt ved at bringe det til en nærliggende organisation, der er specialiseret i at bortskaffe gammelt el-udstyr.



Sellise sümboliga tähistatud toodet ei tohi käidelda tavalise olmejäätmena. Kuna tegemist on B2B-klassi kuuluva tootega, siis ei tohi seda viia kohalikku jäätmekäitluspunkti. Kui soovite selle toote ära visata, siis viige see lähimasse vanade elektriseadmete käitlemisele spetsialiseerunud ettevõttesse.



Tällä merkinnällä ilmoitetaan, että kyseisellä merkinnällä varustettua tuotetta ei saa hävittää tavallisen kotitalousjätteen seassa. Koska kyseessä on yritysten välisen kaupan tuote, sitä ei saa myöskään viiedä kuluttajien käyttöön tarkoitettuihin keräyspisteisiin. Jos haluatte hävittää tämän tuotteen, ottakaa yhteys lähimpään vanhojen sähkölaitteiden hävittämiseen erikoistuneeseen organisaatioon.



Ce symbole indique que le produit sur lequel il figure ne peut pas être éliminé comme un déchet ménager ordinaire. Comme il s'agit d'un produit B2B, il ne peut pas non plus être déposé dans une déchetterie municipale. Pour éliminer ce produit, amenez-le à l'organisation spécialisée dans l'élimination d'anciens équipements électriques la plus proche de chez vous.



Cuireann an siombail seo in iúl nár cheart an tairgeadh atá marcáilte sa tsíl seo a dhíúscairt sa chóras fuíoll teaghlaigh. Os rud é gur tairgeadh ghnó le gnó (B2B) é, ní féidir é a dhíúscairt ach oiread in ionaid dhíúscartha phobail. Más mian leat an tairgeadh seo a dhíúscairt, déan é a thógáil ag eagraíocht gar duit a sainfheidhmiú in ndíúscairt sean-thearas leictrigh.



Dieses Symbol zeigt an, dass das damit gekennzeichnete Produkt nicht als normaler Haushaltsabfall entsorgt werden soll. Da es sich um ein B2B-Gerät handelt, darf es auch nicht bei kommunalen Wertstoffhöfen abgegeben werden. Wenn Sie dieses Gerät entsorgen möchten, bringen Sie es bitte sachgemäß zu einem Entsorger für Elektroaltgeräte in Ihrer Nähe.



Αυτό το σύμβολο υποδεικνύει ότι το προϊόν που φέρει τη σήμανση αυτή δεν πρέπει να απορρίπτεται μαζί με τα οικιακά απορρίμματα. Καθώς πρόκειται για προϊόν B2B, δεν πρέπει να απορρίπτεται σε δημοτικά σημεία απόρριψης. Εάν θέλετε να απορρίψετε το προϊόν αυτό, παρακαλούμε όπως να το παραδώσετε σε μια υπηρεσία συλλογής ηλεκτρικού εξοπλισμού της περιοχής σας.



Ez a jelzés azt jelenti, hogy az ilyen jelzéssel ellátott terméket tilos a háztartási hulladékokkal együtt kidobni. Mivel ez vállalati felhasználású termék, tilos a lakosság számára fenntartott hulladékgyűjtőbe dobni. Ha a terméket ki szeretné dobni, akkor vigye azt el a lakóhelyéhez közel működő, elhasznált elektromos berendezések begyűjtésével foglalkozó hulladékkezelő központhoz.



Questo simbolo indica che il prodotto non deve essere smaltito come un normale rifiuto domestico. In quanto prodotto B2B, può anche non essere smaltito in centri di smaltimento cittadino. Se si desidera smaltire il prodotto, consegnarlo a un organismo specializzato in smaltimento di apparecchiature elettriche vecchie.



Št zíme noráda, ka izstrādājumu, uz kura tā atrodas, nedrīkst izmest kopā ar parastiem mājsaimniecības atkritumiem. Tā kā tas ir izstrādājums, ko cits citam pārdod un lieto tikai uzņēmumi, tad to nedrīkst arī izmest atkritumos tādās izgāztuvēs un atkritumu savāktuvēs, kas paredzētas vietējiem iedzīvotājiem. Ja būs vajadzīgs šo izstrādājumu izmest atkritumos, tad rīkojieties pēc noteikumiem un nogādājiet to tuvākajā vietā, kur īpaši nodarbojas ar vecu elektrisku ierīču savākšanu.



Šis simbols rodo, kad juo paženklinto gaminio negalima išmesti kaip paprastų buitinių atliekų. Kadangi tai B2B (verslas verslui) produktas, jo negalima atiduoti ir buitinių atliekų tvarkymo įmonėms. Jei norite išmesti šį gaminį, atlikite tai tinkamai, atiduodami jį arti jūsų esančiai specializuotai senos elektrinės įrangos utilizavimo organizacijai.



Dan is-simbolu jindika li l-prodott li huwa mmarkat b'dan il-mod m'ghandux jintrema bħal skart normali tad-djar. Minhabba li huwa prodott B2B , ma jistax jintrema wkoll f'centri ċiviċi għar-rimi ta' liskart. Jekk tkun tixtieq tarmi dan il-prodott, jekk jogħġbok għamel dan kif suppost billi tiegħu għand organizzazzjoni fil-qrib li tispeċjalizza fir-rimi ta' tagħmir qadim ta' l-eletriku.



Dette symbolet indikerer at produktet som er merket på denne måten ikke skal kastes som vanlig husholdningsavfall. Siden dette er et bedriftsprodukt, kan det heller ikke kastes ved en vanlig miljøstasjon. Hvis du ønsker å kaste dette produktet, er den riktige måten å gi det til en organisasjon i nærheten som spesialiserer seg på kassering av gammelt elektrisk utstyr.



Ten symbol oznacza, że produktu nim opatrzonego nie należy usuwać z typowymi odpadami z gospodarstwa domowego. Jest to produkt typu B2B, nie należy go więc przekazywać na komunalne składowiska odpadów. Aby we właściwy sposób usunąć ten produkt, należy przekazać go do najbliższej placówki specjalizującej się w usuwaniu starych urządzeń elektrycznych.



Este símbolo indica que o produto com esta marcação não deve ser deixado fora juntamente com o lixo doméstico normal. Como se trata de um produto B2B, também não pode ser deixado fora em centros cívicos de recolha de lixo. Se quiser desfazer-se deste produto, faça-o correctamente entregando-o a uma organização especializada na eliminação de equipamento eléctrico antigo, próxima de si.



Acest simbol indică faptul că produsul marcat în acest fel nu trebuie aruncat ca și un gunoi menajer obișnuit. Deoarece acesta este un produs B2B, el nu trebuie aruncat nici la centrele de colectare urbane. Dacă vreți să aruncați acest produs, vă rugăm s-o faceți într-un mod adecvat, ducând-ul la cea mai apropiată firmă specializată în colectarea echipamentelor electrice uzate.



Tento symbol znamená, že takto označený výrobek sa nesmie likvidovať ako bežný komunálny odpad. Keďže sa jedná o výrobok triedy B2B, nesmie sa likvidovať ani na mestských skládkach odpadu. Ak chcete tento výrobok likvidovať, odneste ho do najbližšej organizácie, ktorá sa špecializuje na likvidáciu starých elektrických zariadení.



Ta simbol pomeni, da izdelka, ki je z njim označen, ne smete zavreči kot običajne gospodinske odpadke. Ker je to izdelek, namenjen za druge proizvajalce, ga ni dovoljeno odlagati v centrih za civilno odlaganje odpadkov. Če želite izdelek zavreči, prosimo, da to storite v skladu s predpisi, tako da ga odpeljete v bližnjo organizacijo, ki je specializirana za odlaganje stare električne opreme.



Este símbolo indica que el producto así señalado no debe desecharse como los residuos domésticos normales. Dado que es un producto de consumo profesional, tampoco debe llevarse a centros de recogida selectiva municipales. Si desea desechar este producto, hágalo debidamente acudiendo a una organización de su zona que esté especializada en el tratamiento de residuos de aparatos eléctricos usados.



Den här symbolen indikerar att produkten inte får blandas med normalt hushållsavfall då den är förbrukad. Eftersom produkten är en så kallad B2B-produkt är den inte avsedd för privata konsumenter, den får således inte avfallshanteras på allmänna miljö- eller återvinningsstationer då den är förbrukad. Om ni vill avfallshandera den här produkten på rätt sätt, ska ni lämna den till myndighet eller företag, specialiserad på avfallshandling av förbrukad elektrisk utrustning i ert närområde.