User manual

# Sheath test and fault location device

## shirla


B A U R G m b H ▪ R a i f f e i s e n s t r . 8 ▪ 6 8 3 2 S u l z , A u s t r i a
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# 1 ABOUT THIS MANUAL

## 1.1 Using this manual

This user manual contains all necessary information that is needed for the commissioning and operation of the described product.

▸ Read this user manual completely before operating the product for the first time.

▸ Consider this user manual to be a part of the product and store it in an easily accessible location.

▸ If this user manual is lost, please contact BAUR GmbH or your nearest BAUR representative.

## 1.2 View settings

| Symbol | Meaning |
|---|---|
| ▸ | You are prompted for an action. |
| 1.<br>2. ... | Perform the actions in this sequence. |
| a.<br>b. ... | If an operation consists of several operating steps, these are specified with "a, b, c".<br>Perform the operating steps in this sequence. |
| 1<br>2 ... | Numbering in the legend |
| ▪ | List |
|  | Indicates further information on the topic in the corresponding user manuals. |

## 1.3 Structure of safety instructions

The safety instructions in this user manual are presented as follows:

| Danger symbol | ⚠ SIGNAL WORD |
|---|---|
| ⚠ | **Type of danger and its source**<br>Possible consequences of violation.<br>▸ Measure to prevent the danger. |

If a dangerous situation could arise at a specific step, the safety instruction is displayed immediately before this dangerous step and is shown as follows:

⚠ **SIGNAL WORD**

**Type of danger and its source.** Possible consequences of violation.

1. Measure to prevent the danger.

**Danger levels**

Signal words in the safety instructions specify the danger levels.

| | |
|---|---|
| ⚠ **DANGER** | Will lead to severe injuries or death. |
| ⚠ **WARNING** | May lead to severe injuries or death. |
| ⚠ **CAUTION** | May lead to light to moderate injuries. |
| ***NOTICE*** | May lead to material damage. |

**Danger symbols**

| | |
|---|---|
| ⚠ | **General danger** |
| ⚡ | **Risk of electric shock** |

## 1.4 Note on the screenshots and graphics used

The screenshots and graphics used are intended to illustrate the procedure and may differ from the actual state.

# 2 For your safety

All BAUR devices and systems are manufactured according to the state of the art and are safe to operate. The individual parts and the finished devices are subject to continuous testing by our qualified personnel as part of our quality assurance system. Each device and system is tested before delivery.

However, the operational safety and reliability in practice can be achieved only when all necessary measures have been taken. The responsible body[1] and operator[2] of the device or system are responsible for planning these measures and monitoring their implementation.

Make sure that the responsible body and persons working with the device or system have carefully read through and understood the user manual for the device or system, as well as the user manuals for all associated devices, before starting work.

The responsible body and operator of the device or system are responsible for any injuries or damage resulting from non-compliance with this user manual.

## 2.1 Intended use

The BAUR shirla sheath test and fault location device is used for cable and cable sheath testing, and for the pre-location and pin-pointing of cable sheath faults and cable faults due to earth contact.

If the device is used without observing this condition, safe operation cannot be guaranteed. The operator or user is liable for any damage to persons and property resulting from incorrect operation.

Proper use also includes

- Compliance with all instructions in this user manual,
- Compliance with the technical data and connection requirements given on the rating plate and in the user manual,
- Compliance with the inspection and maintenance tasks.

## 2.2 Instructions for the operator

The product may be operated only by authorised and trained electrical engineers. An electrical engineer is a person who, owing to his professional education (electrical engineering), knowledge, experience and familiarity with the applicable standards and regulations, can assess the tasks assigned to him and detect possible dangers.

In addition, the operator must have:

- Knowledge of the technical equipment and operation of the product
- Knowledge of the testing and measurement procedures
- Knowledge of plant engineering (cable types, switchgear, etc.).

[1] Responsible body is the person or group that is responsible for the safe operation of the device and its maintenance (EN 61010-1, 3.5.12).

[2] Operator is the person who uses the device for its intended purpose (according to the definition of user in compliance with EN 61010-1, 3.5.11).

## 2.3 Avoiding dangers, taking safety measures

- When installing the testing system and operating the shirla observe the following regulations and guidelines:
  - Accident prevention and environmental protection regulations applicable for your country
  - Safety instructions and regulations of the country where shirla is being used (according to the latest version)
  - EU/CENELEC countries: EN 50191 *Erection and operation of electrical test equipment*

    Other countries: The standard for erection and operation of electric test equipment applicable for your country
  - EU/CENELEC countries: EN 50110 *Operation of electrical installations*

    Other countries: The standards for operating electrical installations applicable in your country
  - If necessary, other national and international standards and guidelines in the latest applicable version
  - Local safety and accident prevention regulations
  - Employers' liability insurance association regulations (if any)

### 2.3.1 Operation of the device only if it is in a technically safe condition

Safety, function and availability depend on the proper condition of the device.

- Operate the device only in a technically perfect condition.
- In case of damage and malfunction, immediately stop the device, mark it accordingly and have the faults rectified by appropriately qualified and authorised personnel without delay.
- Comply with the inspection and maintenance conditions.
- Use only accessories and original spare parts recommended by BAUR. The use of spare parts, accessories and special fittings that have not been tested and approved by BAUR could adversely affect the safety, function and characteristics of the device.

### 2.3.2 Checking and maintaining the safety devices and accessories

The safety devices and accessories must be inspected regularly for proper condition and function. The device must not be operated in the case of defects or non-functional safety devices and accessories.

The safety devices and accessories must not be changed, bridged or switched off.

### 2.3.3 No operation during condensation

Condensation can form in devices and systems due to temperature fluctuations and high air humidity, which in some components can result in leakage currents, flashovers and short-circuits.

Maximum danger arises when relatively high air humidity and temperature fluctuations occur in a device consecutively, which is the case when storing the system or device in an unheated room or when placed outdoors, for example. When the system or device is then exposed to a high ambient temperature, the cold device surfaces cool the air in the immediate vicinity, which leads to formation of condensation even inside the device.

During this process, two factors are crucial:

- The higher the relative air humidity, the faster the dew point is reached and water is condensed.
- The higher the temperature difference between the surfaces and the ambient air, the stronger the tendency for condensation.
- ▸ Always prevent condensation in devices. Temper the device and system before and during the measurements so that no condensation occurs.

### 2.3.4 No operation in areas with risk of explosion and fire

Measurements in direct contact with water, in environments with explosive gases and in areas with fire risks are not permitted. Possible danger areas include e.g. chemical factories, refineries, paint factories, paint shops, cleaning plants, mills and stores of milled products, tank and loading plants for combustible gases, liquids and solid matter.

### 2.3.5 Dangers when working with high voltage

When performing tests and measurements with the device, dangerous and at times very high voltage is generated, which is fed into the test object via an HV connection cable.

Personnel need to pay special attention and must be very careful while working with high electric voltage.

Commissioning and operation of the device is only permitted in compliance with EN 50110 and EN 50191 (EU/CENELEC countries) or the relevant standards applicable in your country.

**Observe 5 safety rules**

- ▸ Comply with the following safety rules before beginning tasks in and on the electrical plant:

1. Disconnect the test object.
2. Secure against re-connection.
3. Verify absence of operating voltage.
4. Earth and short all phases.
5. Provide protection against adjacent live parts.

## DANGER

**High electrical voltage**

Danger to life or risk of injury due to electric shock.

- Before commencing work, the responsible body must assess the risks for the specific working conditions. Protective measures are based on the risk assessment and must be followed at the workplace.
- Connect the device as described in this user manual.
- In particular, make sure that the test object and device are earthed properly.
- Observe the warning and safety signs on the device. Always check whether the warning and information signs are present and readable.
- Never put the safety devices and accessories out of operation. It is forbidden to bypass the safety devices and accessories.
- Ensure that adjacent live parts are secured against accidental contact and flashovers with suitable covers (insulation mats, insulating safety plates).
- Cordon off all metal parts in the area of the test object terminals (connection point and far end). Insulate and earth the metal parts to avoid dangerous charges.

The test object may still be live and carry dangerous voltage after a measurement, even after the device has been switched off.

- Before removing the safety measures, discharge, earth and short circuit all live parts.

## DANGER

**Arcing fault when establishing a connection**

Risk of burn injuries and electro-ophthalmia due to arcing faults.

- Use suitable personal protective equipment to protect against arcing faults.
- Cover or cordon off adjacent live parts with insulating covering material.
- Use only undamaged connection cables.
- Secure the connection points and the far end of the test object.
- Use special locking devices to lock connection points.

### 2.3.6 Guaranteeing immediate measures in an emergency

The device may be operated only if a second person with visual and audio contact to the tester is present and is in the position to detect possible dangers and to act immediately and properly.

With an external emergency off unit (option), it is possible to install the trigger for the emergency off outside the test installations so that it can be reached rapidly in case of danger.

## 2.4 Special personal protective equipment

Personal protective equipment based on the risk assessment for the relevant working conditions is part of the shirla safety concept.

- Observe the national safety regulations and your company's working and operating instructions.

Dependent on the conditions of the work place, use the following protective equipment:

| | |
|---|---|
| Protection against electrostatic charging, crushing, slipping and other accidents: | ▪ Safety footwear |
| Protection against electrical hazards (arcing fault): | ▪ Certified safety clothing<br>▪ Hard hat with visor<br>▪ Insulating protective gloves<br>▪ LV HRC fuse handle with sleeve |
| Protection against noise: | ▪ Ear protection |
| Protection against dangers from road traffic: | ▪ High visibility vest according to EN 471 (Protection class 2) or according to the applicable standards in your country for high visibility clothing for commercial use.<br>**Important:** No high visibility vest during tasks with risk of arcs! |
| Hand protection: | ▪ Safety gloves |

# 3 PRODUCT INFORMATION

Information on the technical data as well as standard delivery, accessories and options can be found in Chapter *Data sheet* (on page 60).

## 3.1 Available methods

The following methods are available with shirla:

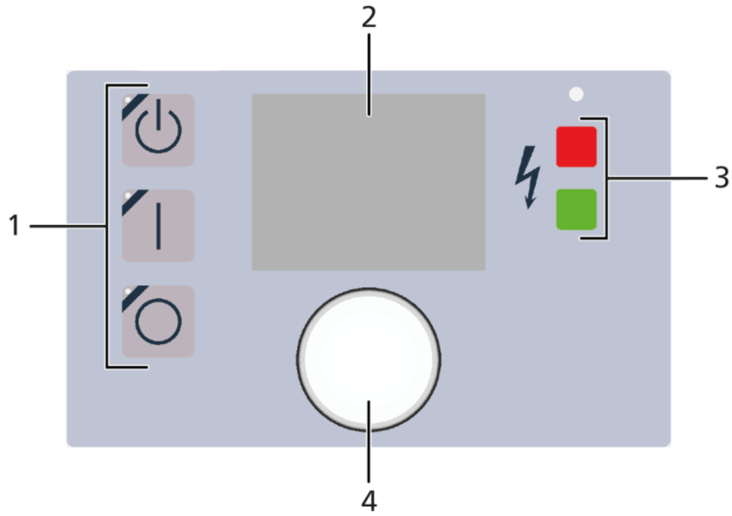
- Cable testing and cable sheath testing
- Fault pre-location with measuring bridge
- Pin-pointing of cable sheath faults with the step voltage method

## 3.2 Full illustration


| No. | Element | Function |
|---|---|---|
| 1 | Port for the external emergency off unit (option) | Is used to connect the external emergency off unit<br>The external emergency off unit can be installed outside the test area and in the event of an emergency quickly puts the system into the safe *Ready for operation* operating state. |
| 2 | On/Off switch | Is used to switch the device on and off |
| 3 | Mains connection | Is used to connect the device to the mains voltage |
| 4 | USB connection | Is used to connect a USB drive |
| 5 | Rotary knob and control panel | Are used for menu navigation and controlling the device<br>Further information: Chapter *Operating and display elements* (on page 15) |
| 6 | Connection panel | Is used to connect the device for testing and fault location |
| 7 | Protective earthing connection | Is used to connect the protective earthing |

| No. | Element | Function |
|---|---|---|
| 8 | Emergency off button | Moves the system to the *Ready for operation* operating state.<br>The emergency off button is equipped with a key lock to protect against restart, unauthorised start-up, and unauthorised or unintentional operation. |

## 3.3 Operating and display elements




| No. | Element | Function |
|---|---|---|
| 1 | ⏻ key | Puts the device into the *Ready to switch on* operating state. |
| | \| key | Puts the device into the *In operation* operating state. |
| | O key | Deactivates the high voltage release and puts the device into the *Ready for operation* operating state |
| 2 | Display | Show the menu of the device |
| 3 | Indicator lights | Display the operating state of the device:<br>▪ Green: *Ready for operation*<br>▪ Red: *Ready to switch on*, *In operation* |
| 4 | Rotary knob | Is used for menu navigation:<br>▸ Select menu item: Turn rotary knob.<br>▸ Confirm selection or input: Press rotary knob.<br>▸ Enter values: Turn rotary knob.<br>▸ Change settings: Press rotary knob. |

## 3.4 Safety devices and accessories

### Discharge unit

The device has an integrated discharge unit with a discharge capacitance of 25 µF at 10 kV.

### Emergency off button

The emergency off button is located on the control unit and is equipped with a key lock for protection against unauthorised or unintentional operation.

## 3.5 Power supply

The power supply can be provided either via an on-site mains supply or independently of the mains via the built-in lead-acid battery.

### Operation with mains voltage

Permissible mains voltage: 100 - 240 V

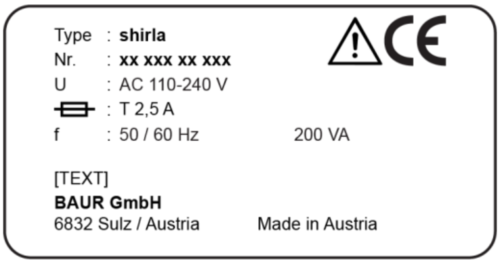
Permissible mains frequency: 50/60 Hz

### Rechargeable battery mode

If a mains voltage supply is not available, the internal lead-acid battery automatically supplies power to the device. In this case, the operating life is approx. 45 minutes (in HV mode).

Further information: Chapter *Data sheet* (on page 60)

# 3.6 Rating plate




| Element | Description |
|---|---|
| Type | Device designation |
| Nr. | Serial number |
| U | Supply voltage<br>If several supply voltages are possible, these are given consecutively one after another. |
| | Time characteristics and nominal current of the device fuse<br>Time characteristics:<br>▪ Very Quick Acting (FF)<br>▪ Quick Acting (F)<br>▪ Medium (M)<br>▪ Slow Blow (T)<br>▪ Very Slow Blow (TT) |
| f | Mains frequency |
| VA | Max. recorded apparent output |
| [TEXT] | Additional information on the device (optional) |
| ⚠ | General warning sign<br>Indicates that there is a potential risk of danger when using the product and hence the user manual must be observed |
| CE | CE mark<br>Indicates that the device or system conforms to CE. |
| BAUR GmbH<br>6832 Sulz / Austria | Name and address of the manufacturer |
| Made in Austria | Indicates the country in which the device was manufactured.<br>Austria: Austria |

## 3.7 Operating states

### *Out of operation*

Prerequisites: All safety measures necessary before stepping into the test area have been met.

- All power supplies, signal and control electric circuits are switched off.

### *Ready for operation*

Prerequisites: The safety measures of the *Out of operation* operating state that are necessary before stepping into the danger area are still in place.

- The power supplies for the signal and control current circuits of the switching devices are switched on.
- The test voltage supply is switched off and secured against accidental start.
- The green indicator light comes on.

### *Ready to switch on*

Prerequisites: All accesses to the test area are closed. The safety measures of the *Out of operation* operating state that are necessary before stepping into the danger area are lifted.

- The test voltage supply is switched off.
- The red indicator light comes on.

### *In operation*

Prerequisites: All accesses to the test area are closed.

- One or more test voltage supplies are switched on.
- The red indicator light comes on.

## 3.8 External emergency off unit (option)

The BAUR external emergency off unit is designed in compliance with EN 13849 according to Category 3. This means that the occurrence of a single fault in the safety circuit does not lead to a loss of the safety function. For example, it is not possible to bypass the emergency off button because the connection cable is jammed, compressed or damaged.

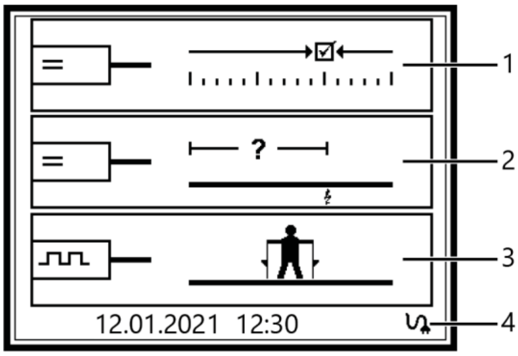
As the connection cable is 25 or 50 metres long, the emergency off unit can be installed outside the barrier and thus safely actuated at any time in the event of danger.


| No. | Element | Function |
|---|---|---|
| 1 | Emergency off button | In the event of an emergency, moves the system to the safe *Ready for operation* operating state |
| 2 | Green indicator light | Displays the *Ready for operation* operating state |
| 3 | Red indicator light | Indicates the system operating state:<br>▪ *Ready to switch on*<br>▪ *In operation* |

# 4 OPERATION OF THE DEVICE

### Main menu

When shirla is switched on, the software starts and the main menu appears. Depending on how shirla is connected, the corresponding method is selected automatically.

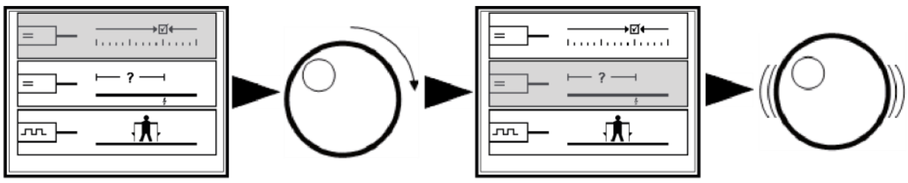



| No. | Function |
|---|---|
| 1 | Changes to the menu for cable and cable sheath testing<br>Further information: Chapter *Menu for cable and cable sheath testing* (on page 29) |
| 2 | Changes to the menu for fault pre-location<br>Further information: Chapter *Menu for fault pre-location* (on page 39) |
| 3 | Changes to the menu for fault pin-pointing<br>Further information: Chapter *Menu for fault pin-pointing* (on page 45) |
| 4 | Displays the date and time and whether shirla is in mains operation or battery mode<br>The date is displayed in DD.MM.YYYY format. |

### Operate menu

Selection and setting is effected by means of the rotary knob.

- To select a menu item or setting, turn the rotary knob clockwise until the field is highlighted, then press the rotary knob.



# 5 COMMISSIONING

- Observe the safety instructions in chapter *For your safety* (on page 8).

## 5.1 Inspection before operation

1. Check the device and mechanical connections for damage.
2. Check electrical connections and cables for damage.
   Use only undamaged connection cable.

## 5.2 Ensure there is no voltage at the work place

1. Disconnect the test object from all phases.
2. Secure the test object against re-energisation.
3. Ensure that there is no voltage.
4. In the station, connect all conductors of the test object with the station earth and short-circuit it.
5. Secure adjacent live parts against accidental contact and flashovers with suitable covers.

## 5.3 Preparing the test object terminals

The test object terminals are **the connection point and the far end** of the test object.

1. Disconnect all operating resources that are connected to the test object and are not designed for the stipulated test voltage.
2. Cordon off all metal parts, e.g. lighting masts at the test object terminals or insulate them with insulating safety plates.
3. Earth all metal parts at the terminals to avoid dangerous charging.
4. All cables that are used in danger zones can also carry high voltage potential outwards. Therefore, remove these cables from the danger zone or ensure low-resistive earthing and short-circuit.
5. Follow the cable route and ensure that no work is being carried out underground on gas lines and that there are no other danger points.

**For cable sheath tests or cable sheath fault locations:**

- Disconnect the screen of the test object from the station earth on both sides.

## 5.4 Connecting the device

**WARNING**

**Danger due to electric voltage, flashovers at the connection point, or arcing fault on connection**

Electric shock on touching live and active parts and due to residual charges and induction voltages;

Burns, electro-ophthalmia, and hearing damage.

- Use suitable personal protective equipment against electric shocks and arcing faults.
- Observe the isolating distances.
- Ensure that adjacent live parts are secured against accidental contact and flashovers with suitable covers (insulation mats, insulating safety plates).
- You may touch the parts that were under voltage only if they are visibly earthed and short-circuited.

**WARNING**

**High electric voltage through potential increase**

A fault can cause flashovers in the device. In this case, a potential increase of the housing is possible due to high short-circuit currents.

Danger due to the potential increase is reduced when a protective earthing is connected properly.

- Connect the protective earthing carefully. The protective earthing cable should be as short as possible and of low impedance.

### 5.4.1 Installing the device

- Select the place of installation for the device in such a way that
  - a stable base is guaranteed,
  - the device and the test object are easy to access for the connections and operation.
  - sufficient safety distances are maintained. You must comply with EN 50110 for the operation of electrical installations (EU/CENELEC countries) or the relevant standards applicable in your country.

### 5.4.2 Connecting for testing and fault pin-pointing

1. Earth the device: Use the earth cable to connect the protective earthing connection of shirla to the station earth.
2. Connect the protective earthing cable of the discharge and earth rod to the station earth.

   **Connecting for cable test**

   a. Connect the HV connection cable of shirla to the test object phase to be tested.
   b. Remove the earthing and short-circuit connection from the phase to be tested: at the connection point and at the far end

   **Connecting for cable sheath testing and fault pin-pointing**

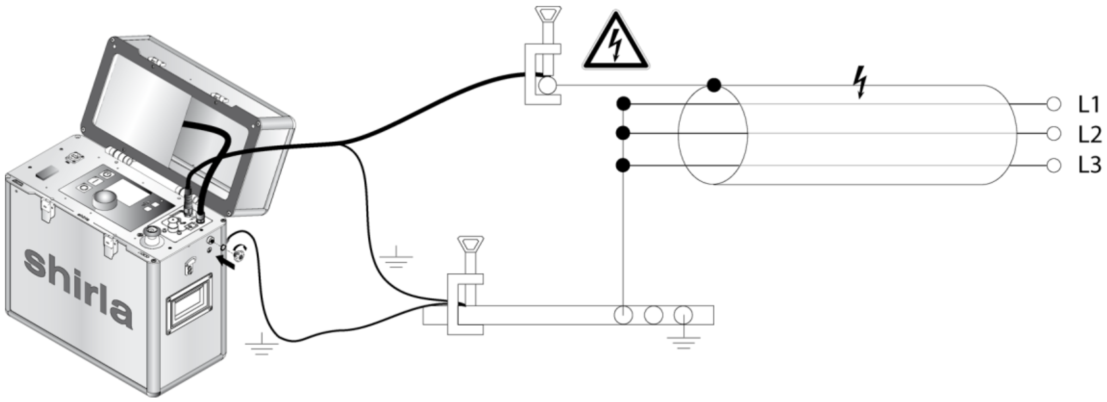
   c. Make sure that the test object screen is disconnected from the station earth at both ends: at the connection point and at the far end.
   d. Connect the HV connection cable of shirla to the sheath of the cable to be tested. Follow the connection examples given.
3. Make sure that the phases not being tested are earthed and shorted.
4. If you are not connecting an external emergency off unit (option), ensure that the jumper plug is inserted in the port for the external emergency off unit.

   If you are using an external emergency off unit, connect it as follows:

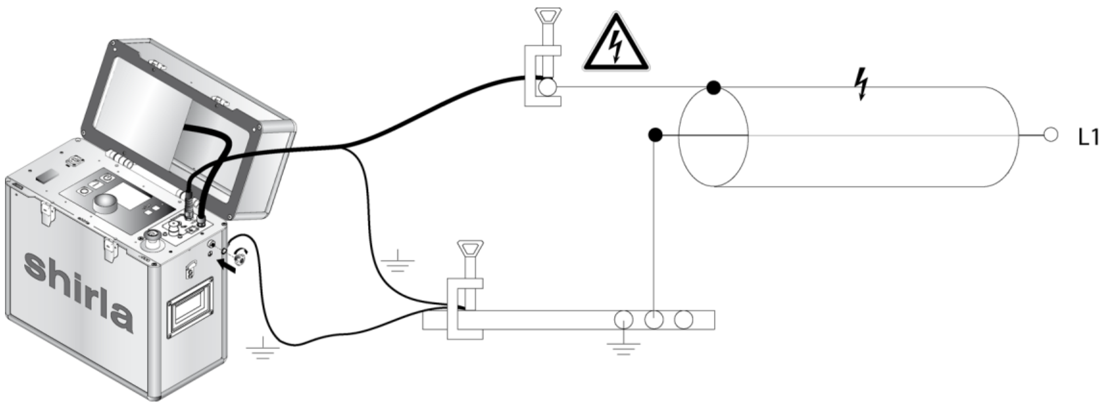
   a. Mount the external emergency off unit so that it is easy to reach.
   b. Remove the jumper plug from the port for the external emergency off unit.
   c. Connect the external emergency off unit to the port for the external emergency off unit.

### Connection examples for cable sheath testing and fault pin-pointing

**3-phase shielded cable**




**1-phase shielded cable**




## 5.4.3 Connecting for fault pre-location

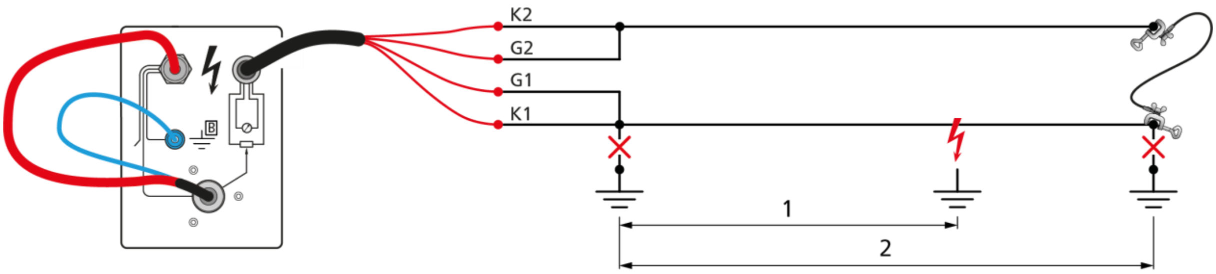
For all measuring bridge technologies, the following factors are important for meaningful measurement results:

- Quality of the contacting of the short-circuit bridge at the cable end
- Quality of the test lead at the cable start

▸ To keep measurement errors to a minimum, always observe the following points:

  - Ensure the cross sections of all used cables are as large as possible.
  - Ensure good metal contacting is achieved for connections.
  - Ensure the connection points are free of paint and oxidation.

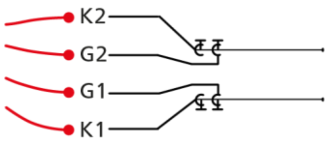
### Measuring bridge according to Murray



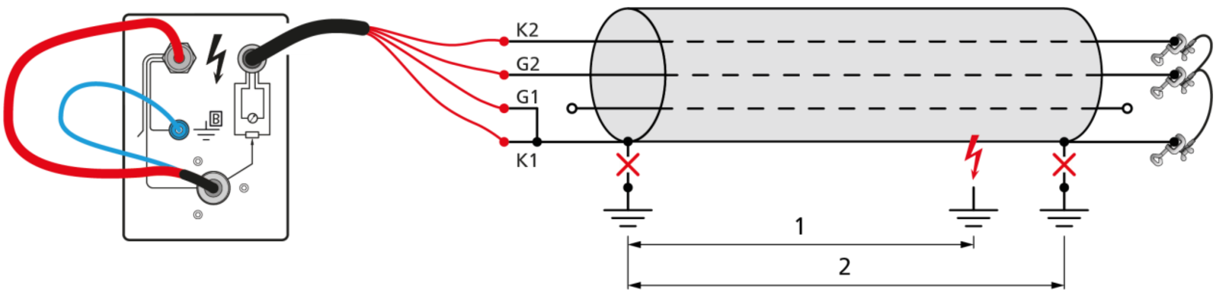

1 Distance to the fault ($l_x$)
2 Cable length (l)

1. Short circuit the faulty phase and the healthy auxiliary line at the far end with a G-clamp.

   The resistance of the short-circuit bridge is incorporated in the measurement result. To achieve high measuring accuracy, the short-circuit bridge must be as low-resistive as possible.
2. Connect G1, G2, K1, and K2 of the 4-wire bridge connection cable with the G-clamps as per the connection diagram. Make sure that connection clips G1 and G2 of the device are located after terminals K1 and K2 of the potentiometer, as seen from the device.

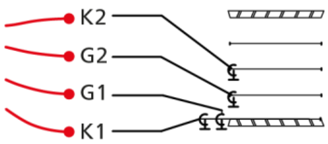



### Measuring bridge according to Glaser




1 Distance to the fault ($l_x$)
2 Cable length (l)

1. Short circuit the faulty phase and the healthy auxiliary lines at the far end with a G-clamp.
2. Connect G1, G2, K1, and K2 of the 4-wire bridge connection cable with the G-clamps as per the connection diagram. Make sure that connection clip G1 of the device is located after terminal K1 of the potentiometer, as seen from the device.




3. If the measurement results are not meaningful: Check the quality of the contacting of the short-circuit bridge at the cable end, the test leads at the cable start, and the value of $R_H$.

   Further information: Chapter *Measuring bridge according to Glaser* (on page 35)

### 5.4.4 Connecting to the supply voltage

| ***NOTICE*** |
|---|
| **Too high or too low mains voltage**<br>A low mains voltage adversely affects the function of the system, a high mains voltage can cause damage.<br>▸ Ensure that the supply voltage matches the specifications on the rating plate. |

1. Measure the mains voltage with a voltmeter.
2. Compare the mains voltage with the specifications on the rating plate.
3. Make sure that the mains supply earth is not isolated from the station earth.

   ⚠ **CAUTION**

   **High electric voltage through potential increase.** Risk of personal injury due to electric shock. Damage to property due to potential differences from mains input to the housing.
4. Connect the system to the mains voltage. If necessary, use a country-specific adapter.

## 5.5 Securing the test area

1. Mark out the path for pedestrians.
2. Secure the connection cables, e.g. with cable bridges or rubber mats. The connection cables must be protected against damage and there must be no danger of people tripping.
3. If the connection of the device obstructs test personnel and pedestrians, these obstructions must be clearly marked.
4. The area around the test assembly (test area) must be demarcated from workplaces and traffic in such a way that
   - *except for the tester, no other person can remain in the test area,*
   - *except for the tester, no other person can access the prohibition zone,*
   - *Persons standing outside the boundary cannot reach the operating elements of the test installations located inside the boundary.* (EN 50191)

   The minimum height of individual boundaries must be 1 m.
5. If the device is cordoned off from generally accessible areas only with ropes, chains or bars, the entire test assembly must be monitored during the test in compliance with EN 50191. If the test assembly includes several local test areas, security guards must be appointed for each test area. But it is important that the testing personnel and the security guards understand each other well.
6. Mark the test area and terminals clearly. It should be immediately apparent that cable testing is being performed.
7. Make sure that unauthorised persons cannot access the local mains stations.

## 5.6 Switching on and setting the device

1. Press the On/Off switch to switch the device on.
2. Select the  button.
3. To set the date and time, select the  button.
   The date is specified in DD.MM.YYYY format.
4. To set the max. permissible output voltage and the max. permissible output current for testing, pre-location, and pin-pointing, select the  button.

# 6 SWITCHING OFF THE SYSTEM IN THE EVENT OF AN EMERGENCY

1. In the event of a fault or an emergency, immediately press the emergency off button.
   - This puts the device into the safe *Ready for operation* operating state.
   - The I key goes out, the red indicator light goes out and the green indicator light comes on.
   - The ***1009*** message is displayed.
2. To protect the device against unauthorised operation, remove the key.
3. To operate the device again after pressing the emergency off button, acknowledge the message on the display and unlock the emergency off button.

# 7 CABLE AND CABLE SHEATH TESTING

## 7.1 About cable and cable sheath testing

During the cable testing, a voltage is applied between phase and screen for a specific period to test the insulation. The test is considered successful if no breakdown occurs.

The measurements taken during cable testing include current, voltage, and fault resistance.

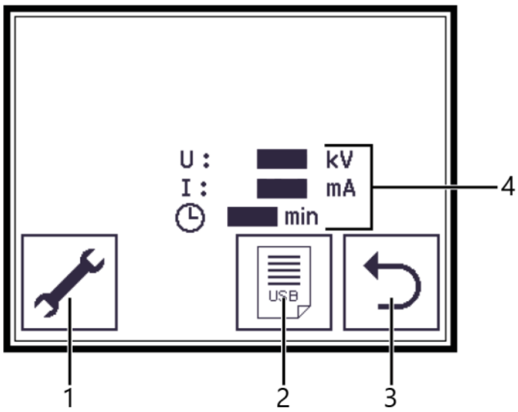
The cable sheath testing is used to look for outer cable damage (sheath faults) and is recommended for new systems, after repairs and for periodic checks.

While checking for mechanical faults, a DC voltage is applied between cable sheath and earth. This testing determines whether the leakage currents that occur are within permissible limits or whether they deviate significantly from standard values due to a sheath fault.

Information on the test voltages for cable sheath testing can be found in the current versions of the following standards:

- IEC 60229
- IEC 60502
- DIN VDE 0276-620/621 (CENELEC HD 620/621)

## 7.2 Menu for cable and cable sheath testing




| No. | Element | Function |
|---|---|---|
| 1 | button | Is used to set the following parameters:<br>▪ Date and time<br>▪ Max. permissible voltage and max. permissible current<br>Further information: Chapter *Switching on and setting the device* (on page 27) |

| No. | Element | Function |
|---|---|---|
| 2 | button | Is used to export a report<br>A USB drive must be connected in order to export a report. |
| 3 | button | Changes to the higher-level menu |
| 4 | Settings for the test | Are used to set the test voltage, test current, and test duration used for cable and cable sheath testing<br>Further information: Chapter *Settings for the test* (on page 30)<br>The current measured values are displayed above these settings during the test. |

## 7.3 Settings for the test

| Parameters | Function |
|---|---|
| ***U*** | Is used to set the test voltage |
| ***I*** | Is used to set the test current |
| ◷ | Is used to set the test duration |

**Change setting**

1. To change a setting, select the desired parameter with the rotary knob.
2. Turn the rotary knob to set the parameter, then press the rotary knob.
   The new setting is applied.

## 7.4 Performing a test

**Required equipment**

- During measurement, always wear ear protection to protect your hearing from loud banging noises.

**Procedure**

1. Secure the test area and connect the test object properly.
   Further information: Chapter *Commissioning* (on page 21)
2. Switch the shirla on.
   This puts the device into the *Ready for operation* operating state. The green indicator light comes on. The menu for cable and cable sheath testing is automatically selected on the display.
3. Set the parameters for the test.
   Further information: Chapter *Settings for the test* (on page 30)
4. Release the high voltage. Press the key for at least one second.
   This puts the device into the *Ready to switch on* operating state. The red indicator light flashes for approx. 6 seconds.

5. Press the key whilst the red indicator light is flashing.

   This puts the device into the *In operation* operating state. The red indicator light comes on. The test begins automatically. The measured values appear on the display.

6. If you would like to save the measured values in a report, select the button.

   The time, leakage current, and test voltage are saved in the report.

7. Observe the actual current displayed during measurement. If the actual current is too high, the target voltage cannot be reached.

   The cable test is considered successful if the target voltage has been reached and no breakdown has occurred within the preset time.

   Cable sheath testing is considered successful if the test voltage is reached and remains constant, no breakdown takes place, and the leakage current does not exceed a defined value. This defined value depends on the sheath material, cable length and number of joints.

   As soon as the test duration has elapsed, the test automatically finishes and the report is displayed.

   This puts the device into the *Ready for operation* operating state. The green indicator light comes on.

   **DANGER**

   **Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

8. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.

   You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

## 7.5 Exporting reports

1. Connect a USB drive to the USB port of shirla.
2. Select the button.

   The report is saved to the USB drive as a bilingual text file (German, English).

# 8 PRE-LOCATION OF CABLE SHEATH FAULTS

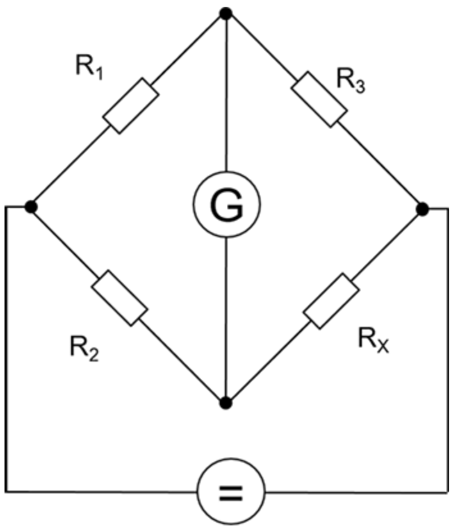
## 8.1 About fault pre-location

shirla has an integrated measuring bridge, which enables it to pre-locate insulation faults in plastic-insulated cable sheaths and faults due to earth contact (including high-resistive) in unscreened plastic low-voltage cables.

The bridge measurements with shirla are based on the basic principle of the Wheatstone bridge and are performed according to the Murray or Glaser method.

The fault distance can be read directly in metres or as a percentage of the total cable length. For cables in a number of different sections, all the sections can be allowed for in terms of the conductor cross-section and material.

### 8.1.1 Principle of the Wheatstone circuit




A Wheatstone bridge consists of two voltage dividers whose ratio corresponds to the following ratio in the balanced state:

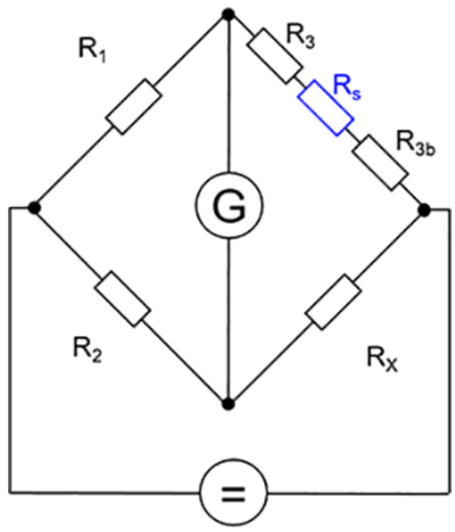
$$\frac{R_1}{R_2} = \frac{R_3}{R_x}$$

For comparison, $R_2$ is modified until measuring device G displays zero. When $R_1$ to $R_3$ are known, the value of $R_X$ is determined by the resistance ratios:

$$R_x = \frac{R_2}{R_1} \times R_3$$

$R_X$ or $R_F$ represents a faulty cable and $R_3$ represents another "auxiliary cable".

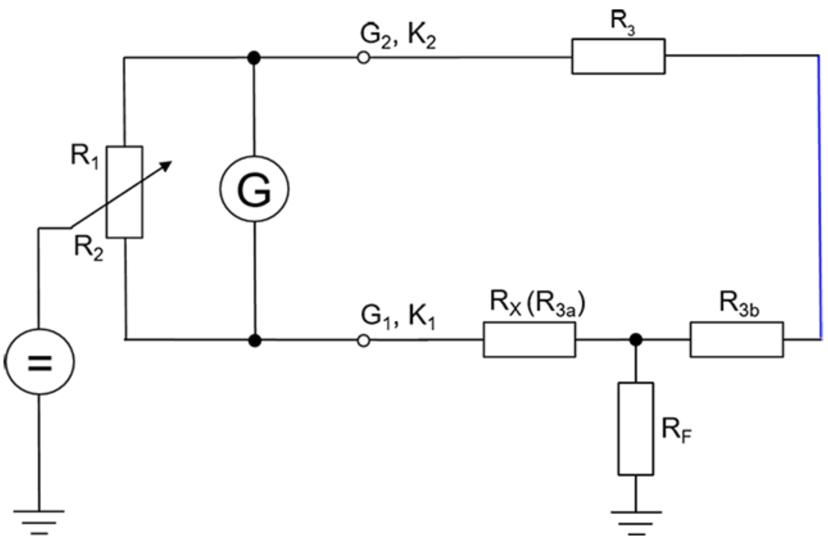
### 8.1.2 Measuring bridge according to Murray

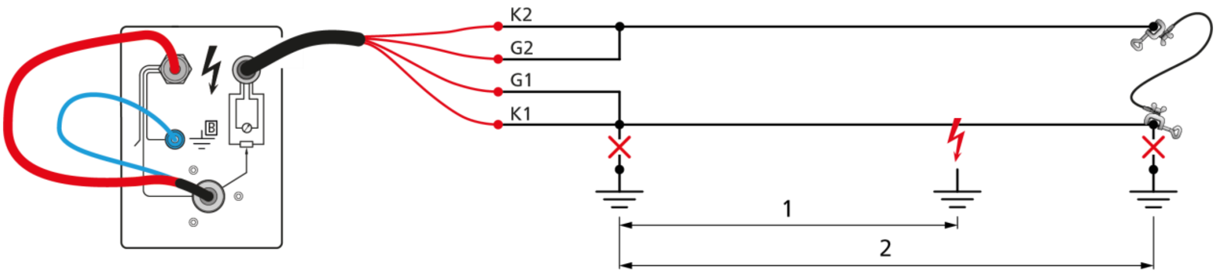



$R_s$: Resistance of the short-circuit bridge (loop resistance)
$R_x$: Resistance of the faulty phase

Bridge measurement according to Murray can be used for low- and high-resistive faults and is used when, in addition to the faulty phase, another similar and healthy phase is available.

The bridge is connected as per the illustrated measuring arrangement below, and the faulty phase is short-circuited with the healthy phase at the far end of the cable. To ensure a high level of measurement accuracy, the resistance of this connection should be as low as possible.






1 Distance to the fault ($l_x$)
2 Cable length (l)

The fault position is calculated automatically based on the following equation:

$$l_x = \frac{R_2}{R_1 + R_2} \times 2l$$

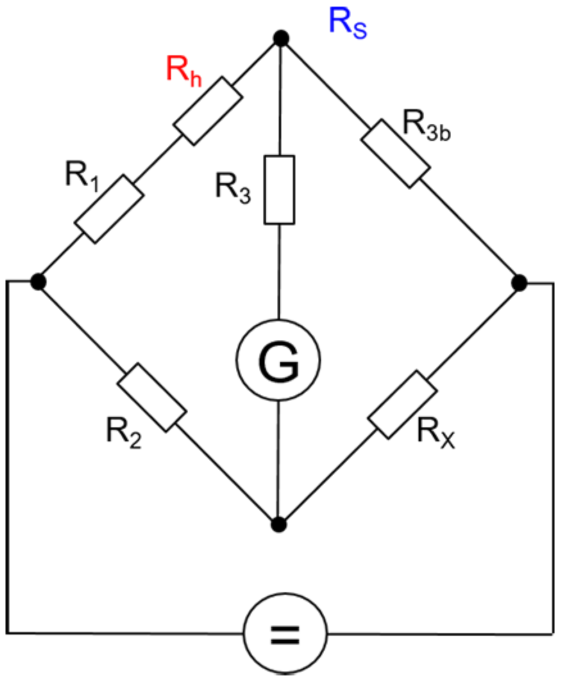
Ideally, the faulty phase and auxiliary line have identical parameters, i.e. they are 2 phases of a cable. If the conductor cross-sections and conductor materials are not constant along the cable route, the parameters of the sub-sections (cable sections) in question must be entered before the measurement is performed. The device calculates the fault position automatically based on this information.

The measuring accuracy of the Murray measuring bridge depends on the following factors:

- Bridge current
- Loop resistance
- Power adjustment of the internal impedance of the galvanometer to the bridge resistance values
- Sensitivity of the galvanometer
- linearity of measuring potentiometer

Further information: Chapter *Measurement errors depending on the loop resistance und current* (on page 38)

### 8.1.3 Measuring bridge according to Glaser

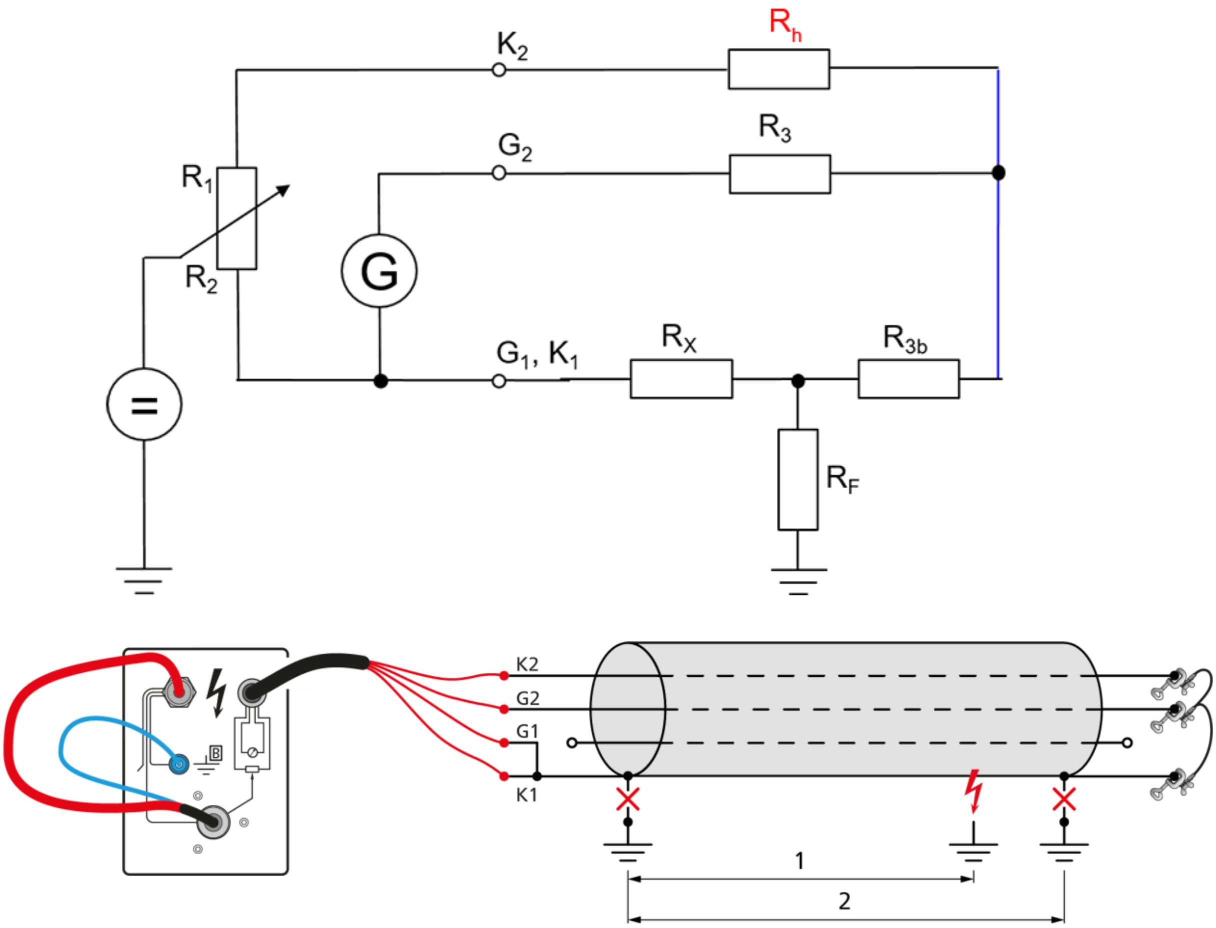



If there are at least two healthy phases available in a screened cable that can act as auxiliary lines, the Glaser measuring bridge can be used.

In this arrangement, the two auxiliary lines are connected to the faulty phase. The advantage of this is that the use of two auxiliary lines gives rise to compensation, and the remaining external electric circuit can be clearly assigned to the fault.

With the Glaser measuring bridge, the phases, screen, and auxiliary lines can have different parameters. However, it is important that the resistance of auxiliary core $R_h$ is very low in relation to voltage divider $R_1/R_2$.

The measurement points are shifted by the measuring arrangement in such a way that the influence of resistance $R_3$ (auxiliary line) is eliminated. The bridge measurement only looks at the ratio of the voltage divider in the cable. The resistance values of the phases and short-circuit bridge have no influence on the measurement. Since $R_1/R_2$ are very high-resistive in comparison, $R_h$ also has no influence on the measurement results.



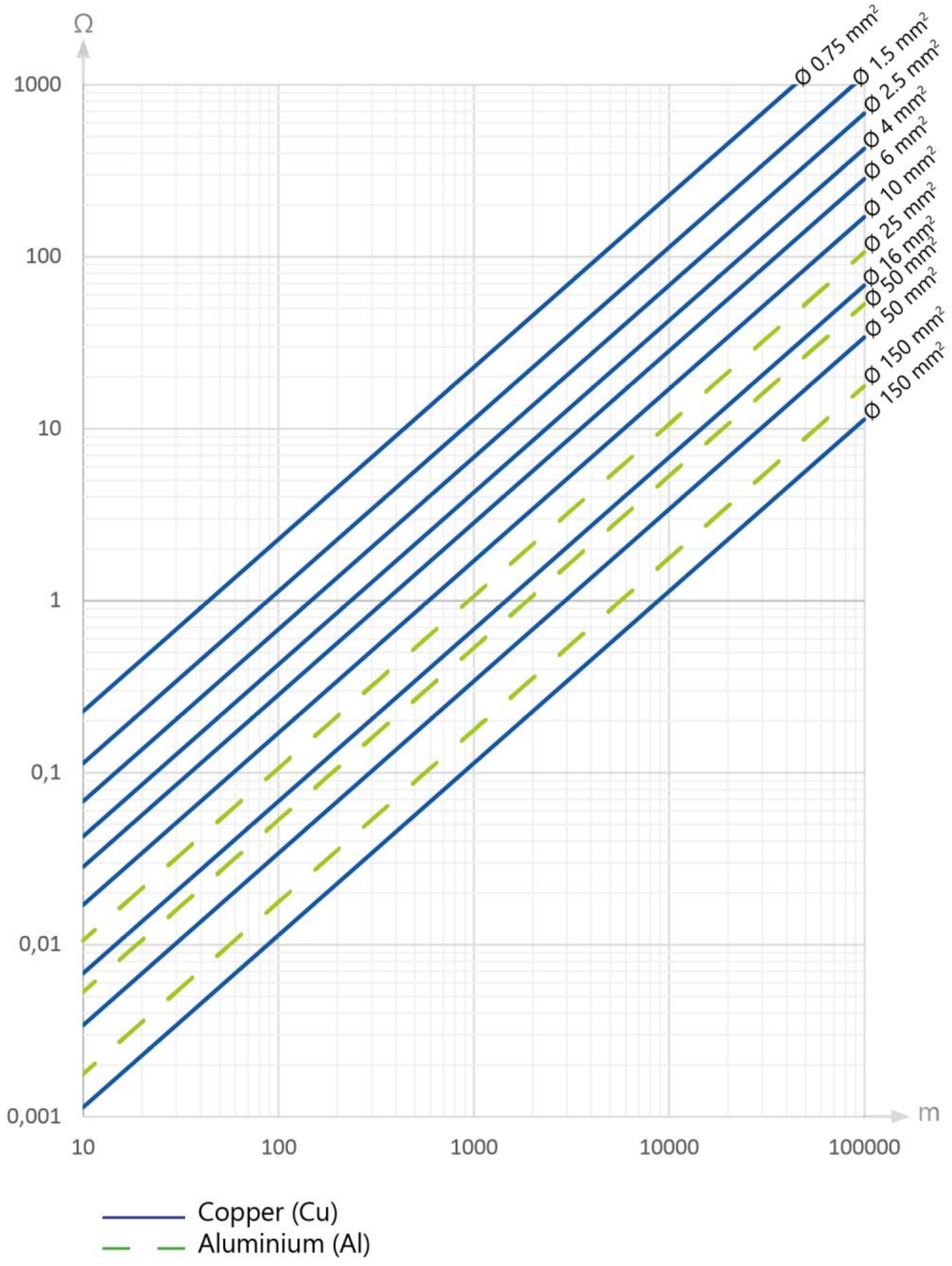

1 Distance to the fault ($l_x$)
2 Cable length (l)

For fault pre-location, it is not necessary to know the individual resistance values of the measuring bridge. According to the measurement principle used in shirla, the percentage voltage divider ratio α of the two halves of the potentiometer is measured and offset against the known, entered cable length. If the cable length is not known, a percentage value is displayed.

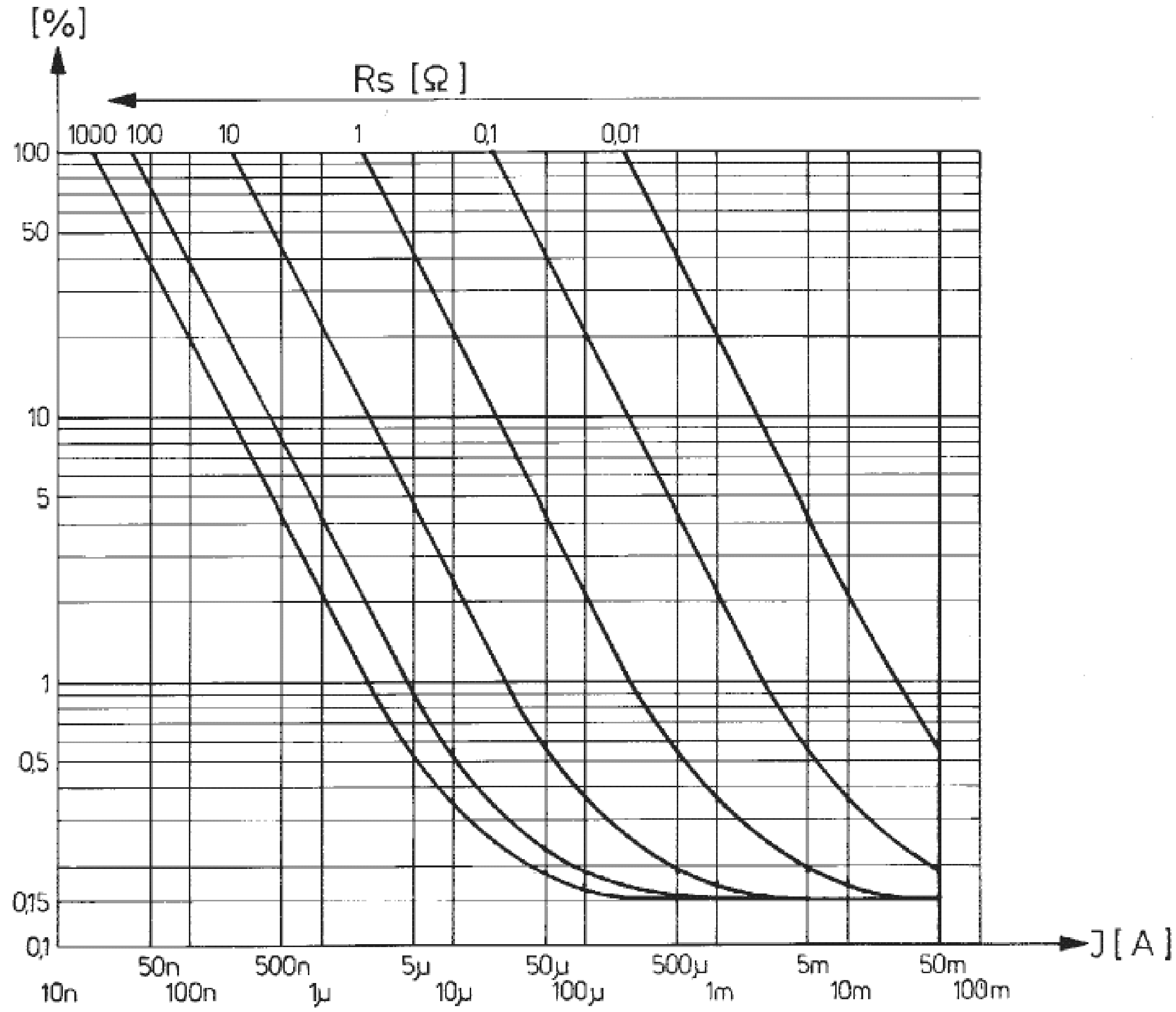
With the Glaser measuring bridge, the fault position is calculated based on the following equation:

$$l_x = \frac{R_2}{R_1 + R_2 + R_h} \times l$$

### 8.1.4 Resistance values of various phases



### 8.1.5 Measurement errors depending on the loop resistance und current




$R_s$: Loop resistance
I: Bridge current

Due to impermissibly high transition resistance values at terminal connections, stray DC currents, non-constant line cross sections, and other interference, the fault may be even higher than shown. The higher the loop resistance, the lower the current and the greater the measurement error.

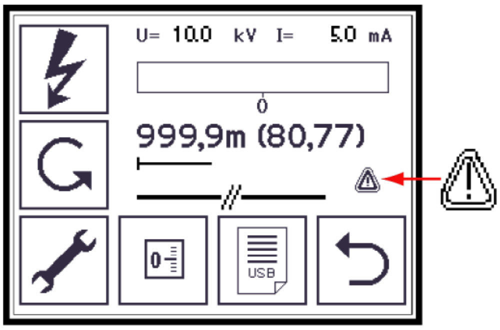
It is clear from the figure how the current and voltage limitation needs to be adjusted. In principle, shirla sets the bridge voltage in such a way that the current required for high accuracy is able to flow.

If only a very low residual current is achieved, the measurement accuracy can be improved through linear interpolation.

**Interference voltages**

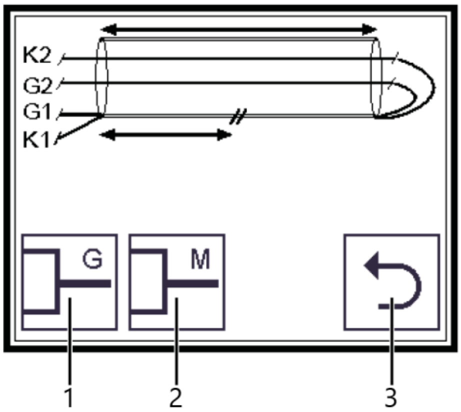
Induced voltages in the measuring circuit due to nearby cables can affect the measurement results. In the event of interference signals below 75 mV (at 16 Hz) or 250 mV (at 50 Hz), the accuracy of the measurement results is not affected.

If the interference signals exceed 75 mV (at 16 Hz) or 250 mV (at 50 Hz), a greater tolerance of the measurement result must be considered. A larger deviation of the measurement result is indicated in the display by a warning symbol:




If the zero balance is affected by interference voltages, after a certain time shirla calculates the arithmetic mean value from the fluctuating values.

## 8.2 Menu for fault pre-location




| No. | Element | Function |
|---|---|---|
| 1 | button | Is used to select the Glaser measuring bridge |
| 2 | button | Is used to select the Murray measuring bridge |
| 3 | button | Changes to the higher-level menu |

## 8.3 Entering the cable length and cable section

A cable section is a cable segment between two joints or between a joint and the termination. Different conductor cross-sections and materials influence the magnitude of the specific phase resistance values.

Further information: Chapter *Resistance values of various phases* (on page 37)

As the measurement result is defined as the mean value of the total length, this can lead to results that deviate from the actual fault distance. For such cases, up to 50 cable sections can be created in shirla.

1. Choose whether you would like to perform the measurement according to Glaser ( button) or Murray ( button).
2. Use the rotary knob to select the ***L:*** field and set the desired cable length (in metres).
3. If you would like to enter a cable section, select the button.
4. Set the conductor cross-section of this cable section.
5. Select the material:
   - ***Al***: Aluminium
   - ***Cu***: Copper
6. Select the button to save the cable section.
7. If you would like to enter further cable sections, select the button and set the conductor cross-section and material for each cable section.

## 8.4 Perform measurement

1. Secure the test area and connect the test object properly.

   Further information: Chapter *Commissioning* (on page 21)
2. Switch the shirla on.

   This puts the device into the *Ready for operation* operating state. The green indicator light comes on. The menu for fault pre-location is automatically selected on the display.
3. Choose whether you would like to perform the measurement according to Glaser ( button) or Murray ( button).

   Zero balancing starts automatically ( symbol is displayed). The device calibrates the galvanometer circuit, meaning that the potentiometer circuit is calibrated in terms of its position and temperature. If the zero balance is affected by interference voltages, after a certain time shirla calculates the arithmetic mean value from the fluctuating values.

   The symbol is no longer displayed once zero balancing is complete.
4. Release the high voltage. Press the key for at least one second.

   This puts the device into the *Ready to switch on* operating state. The red indicator light flashes for approx. 6 seconds.
5. Press the key whilst the red indicator light is flashing.

   This puts the device into the *In operation* operating state. The red indicator light comes on. The measurement is started and the measurement result is displayed in metres and as a percentage of the cable length.

   If the interference signals exceed 75 mV (at 16 Hz) or 250 mV (at 50 Hz), a greater tolerance of the measurement result must be considered. A larger deviation of the measurement result is indicated in the display by a warning symbol:
6. If you would like to repeat the measurement, select the button.

   Zero balancing and the measurement are performed.

7. If you would like to export a report, connect a USB drive to the USB port and select the button.
8. To stop the current measurement, press the key.

   This puts the device into the *Ready for operation* operating state. The green indicator light comes on.

   **DANGER**

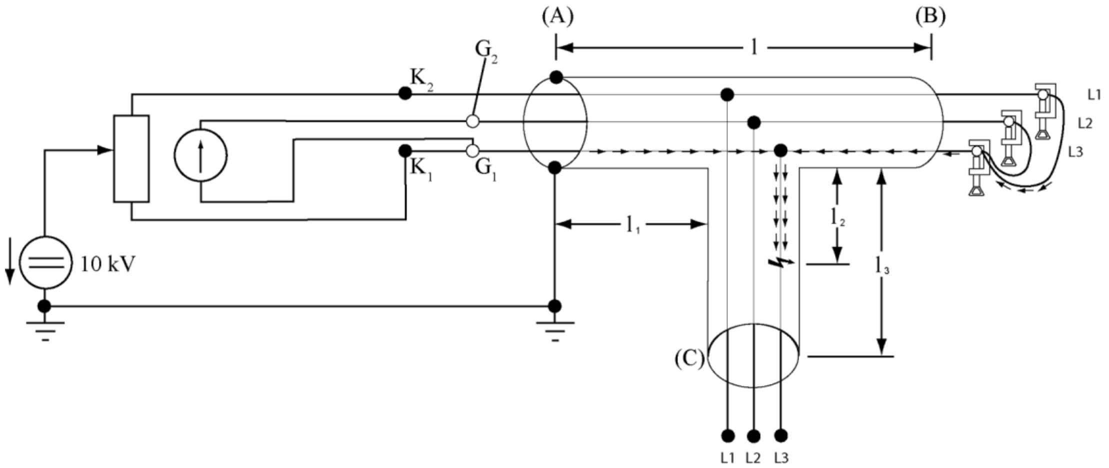
   **Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.
9. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.

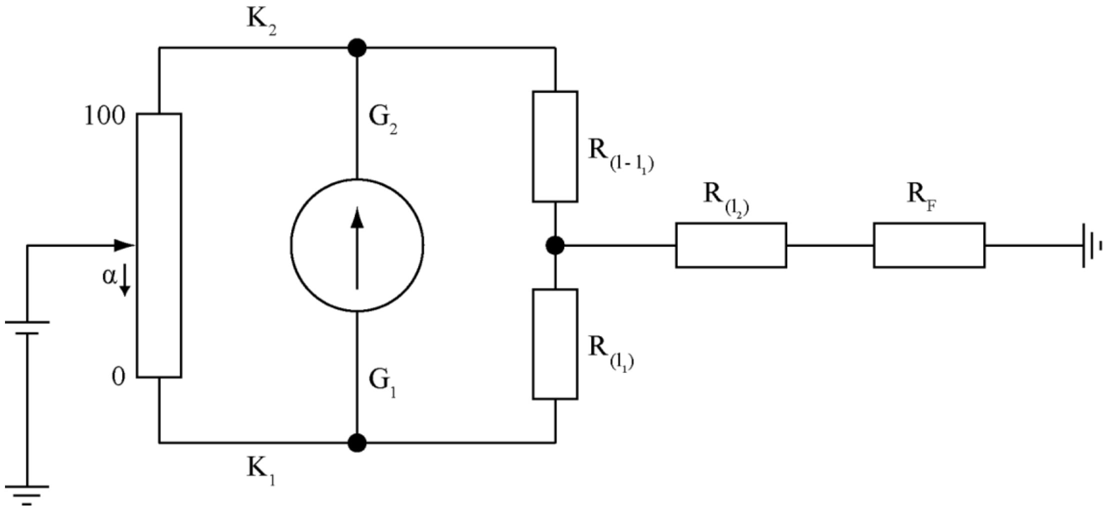
   You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

## 8.5 Fault pre-location on cable with branch joint

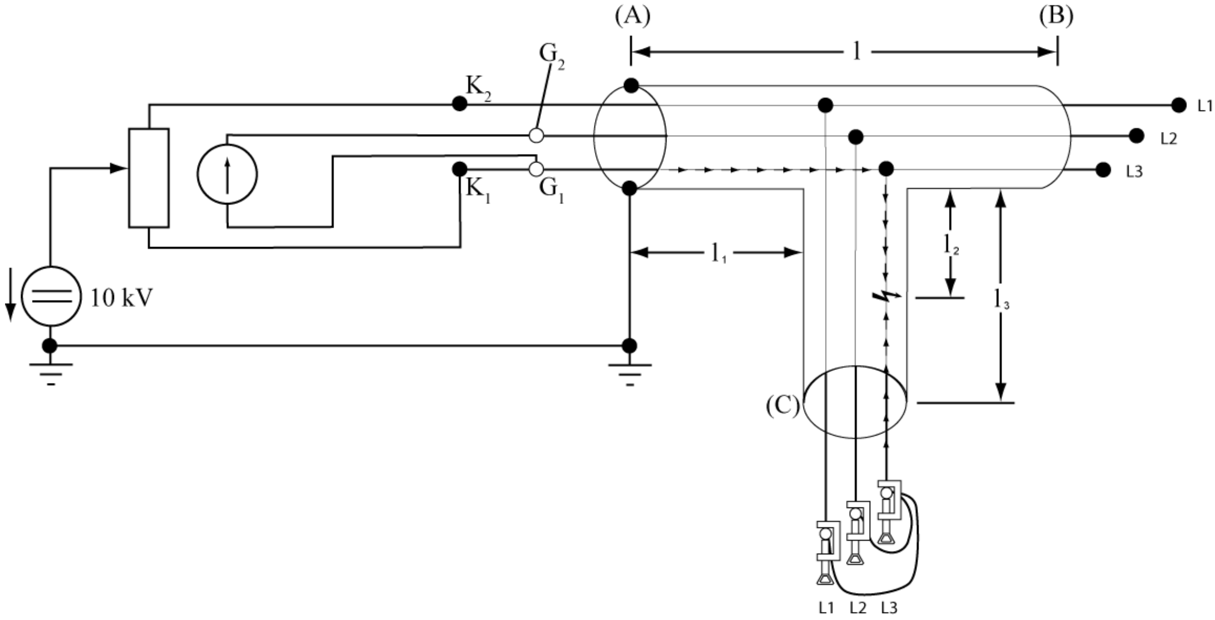
A measurement at point (A) shows an insulation fault between L3 and the screen.

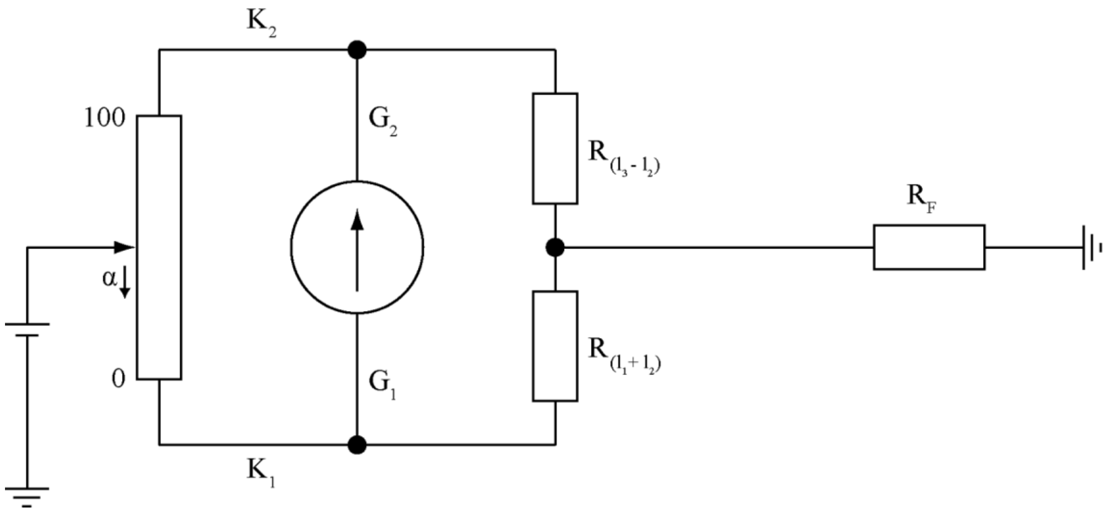
A good conducting connection is established at end (B) between L1, L2, and L3. If the fault is not located between the branch joint and end (B), then a bridge measurement is first used to determine the distance between the cable start (A) and the branch joint.



For a second measurement, the short-circuiting bridge is removed between the phases at end (B) and is placed at end (C).



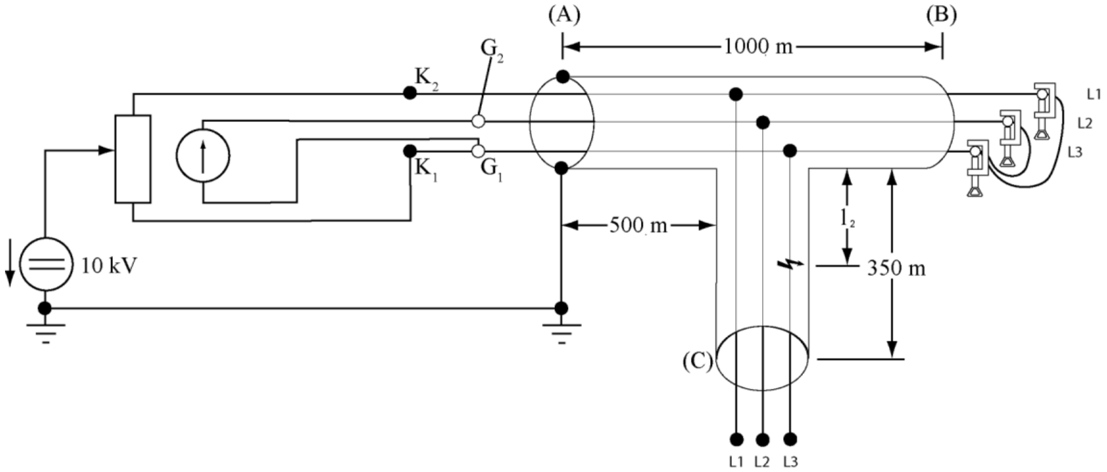

$$\frac{\alpha}{100} = \frac{R_{(l_1 + l_2)}}{R_{(l_1 + l_3)}} = \frac{l_1 + l_2}{l_1 + l_3}$$

The equation gives the distance between the cable start (A) and the cable sheath fault. The distance is given in percentage of the distance between (A) and (C).

## 8.5.1 Example

**First measurement**

A cable with a branch joint at 500 m with a fault between phase L3 and the cable sheath. At end (B), a short-circuiting bridge is placed over each phase (L1, L2, and L3).



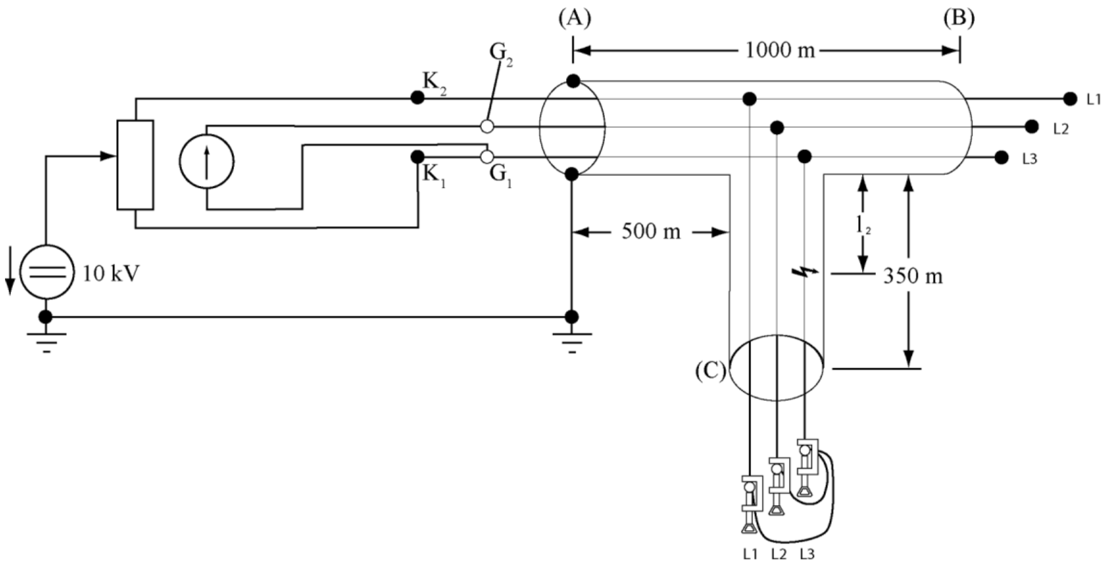

Bridge balancing gives the value 50 %.

$$l_x = \frac{\alpha}{100} \times l$$

The distance between the cable start (A) and the branch joint was measured. Therefore it can be concluded that the cable sheath fault lies between the branch joint and end (C).

**Second measurement**

The short-circuiting bridge is removed between the phases at end (B) and is mounted at end (C).

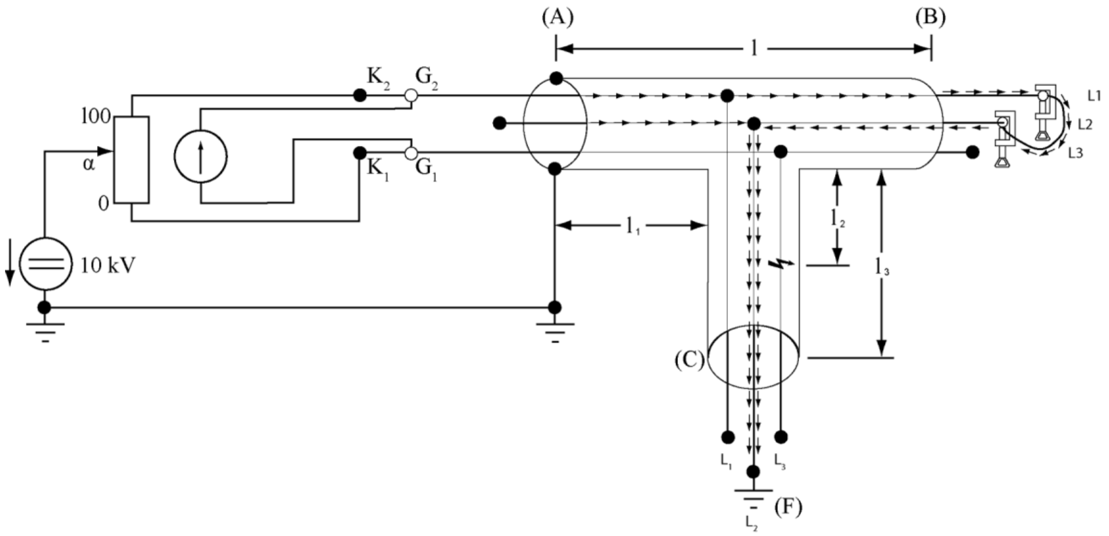


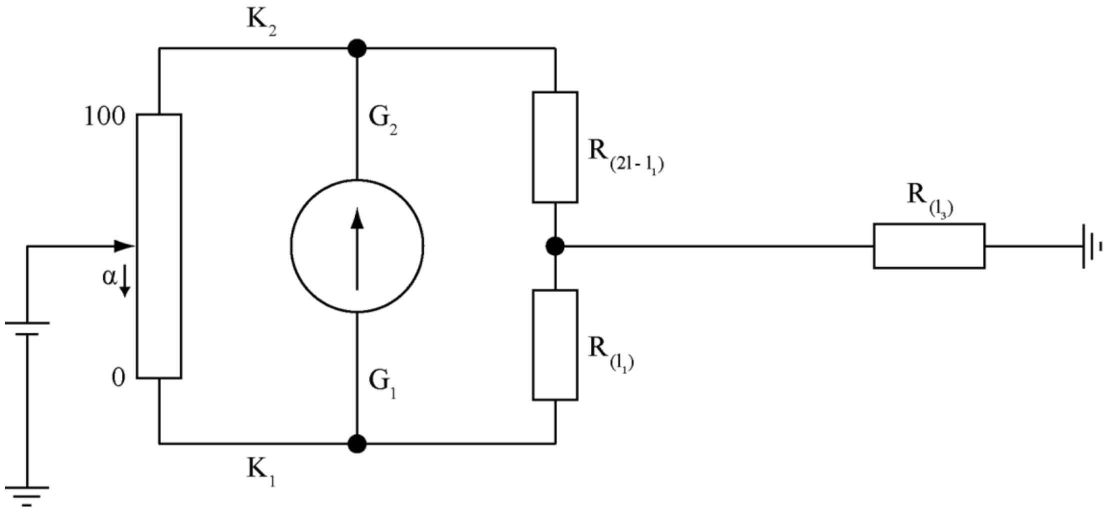

The second bridge balancing gives the value 70.6 %.

$$l_x = \frac{\alpha}{100} \times l$$

### 8.5.2 Unknown distance to branch joint

The distance between the cable start (A) and the branch joint can be determined by a further measurement. The measurement is performed according to Murray, whereby only the healthy phases are connected and a fault (F) is simulated at end (C).




## 8.6 Exporting reports

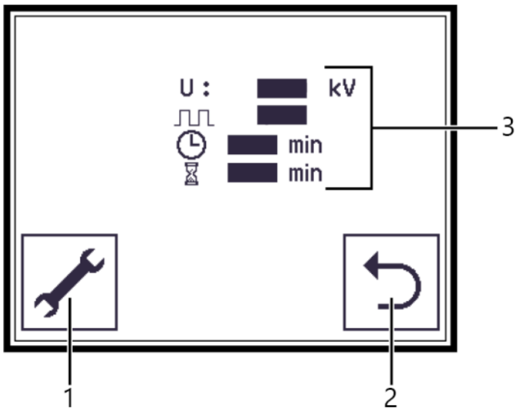
1. Connect a USB drive to the USB port of shirla.
2. Select the  button.
   The report is saved to the USB drive as a bilingual text file (German, English).

# 9 FAULT PIN-POINTING

## 9.1 About fault pin-pointing

The pin-pointing of cable sheath faults is based on the principle of the step voltage method. With the step voltage method, a series of HV surge pulses are fed into the defective cable. At the fault, the voltage pulses discharge into the surrounding ground due to the fault resistance and form a voltage gradient on the earth surface. The step voltage that can be measured on the earth surface, rises in the direction of the fault and changes the polarity directly over the fault.

## 9.2 Menu for fault pin-pointing




| No. | Element | Function |
|---|---|---|
| 1 | button | Is used to set the following parameters:<br>▪ Date and time<br>▪ Max. permissible voltage and max. permissible current<br>Further information: Chapter *Switching on and setting the device* (on page 27) |
| 2 | button | Changes to the higher-level menu |
| 3 | Settings for fault pin-pointing | Is used to set the test voltage, pulse pattern, duration of pulse mode, and the delay time until the start of pulse mode<br>Further information: Chapter *Settings for pulse mode* (on page 46) |

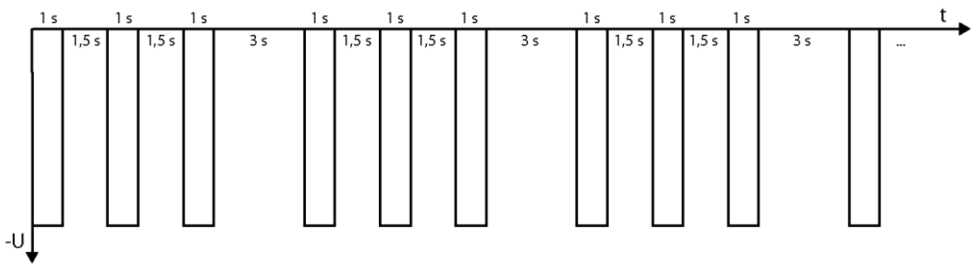
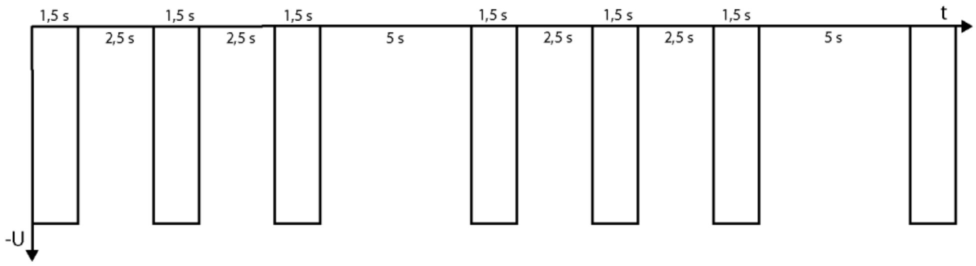
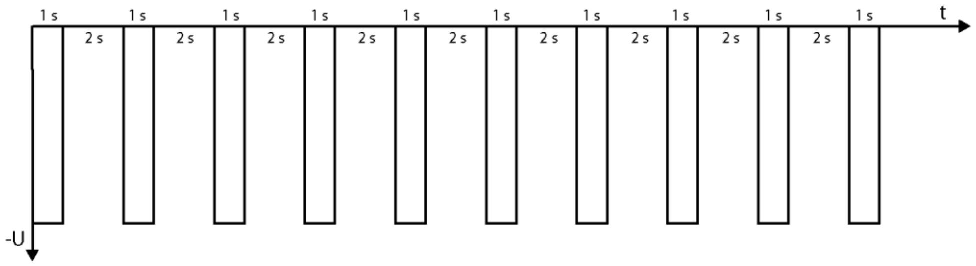
## 9.3 Settings for pulse mode

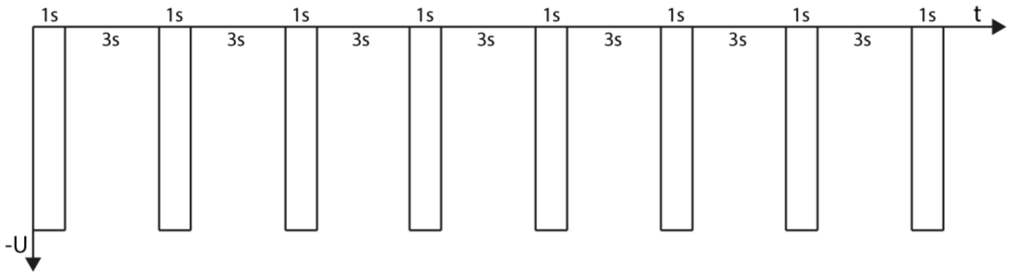
| Parameters | Function |
|---|---|
| ***U*** | Is used to set the pulse voltage |
| ⎍⎍ | Is used to select the pulse pattern<br>In order to reliably identify the cable sheath fault, four pulse patterns are available (see below). |
| 🕓 | Is used to set the duration of pulse mode |
| ⌛ | Is used to set the time that elapses between switching on the high voltage and starting pulse mode |

**Change setting**

1. To change a setting, select the desired parameter with the rotary knob.
2. Turn the rotary knob to set the parameter, then press the rotary knob.
   The new setting is applied.

**Available pulse patterns**

| No. | Pulse pattern |
|---|---|
| 1 |   |
| 2 |   |
| 3 |   |

| No. | Pulse pattern |
|---|---|
| 4 |  |

## 9.4 Performing fault pin-pointing

1. Secure the test area and connect the test object properly.

   Further information: Chapter *Commissioning* (on page 21)

2. Switch the shirla on.

   This puts the device into the *Ready for operation* operating state. The green indicator light comes on.

3. Select the menu for fault pin-pointing.
4. Set the parameters for fault pin-pointing.

   Further information: Chapter *Settings for pulse mode* (on page 46)

5. Release the high voltage. Press the key for at least one second.

   This puts the device into the *Ready to switch on* operating state. The red indicator light flashes for approx. 6 seconds.

6. Press the key whilst the red indicator light is flashing.

   This puts the device into the *In operation* operating state. The red indicator light comes on.

7. Carry out sheath fault location with the appropriate pin-pointing system. Refer to the user manual for the pin-pointing system.

   Pulse mode ends automatically as soon as the pulse duration has elapsed.

   This puts the device into the *Ready for operation* operating state. The green indicator light comes on.

   **DANGER**

   **Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

8. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.

   You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

# 10 ENDING A TEST OR A FAULT LOCATION

## 10.1 Ending the process manually

You can end the test or fault location manually at any time.

1. To do this, press the ○ button.

   This puts the device into the *Ready for operation* operating state.

   **DANGER**

   **Dangerous voltage on the test object and other live machine parts.** Danger to life, risk of injury from high electric voltage.

2. Before touching test object, discharge, earth and short-circuit the same: at the connection point and at the far end.

   You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.

## 10.2 Discharging and earthing the test object

**DANGER**

**Dangerous voltage in test object.**

Danger of electric shock or risk of injury

- **Before touching, discharge, earth and short-circuit:** The test object at the connection point and at the far end.
- You may touch the plant parts that were under voltage only if they are visibly earthed and short-circuited.
- Connect the discharge and earth rod correctly to the station earth.
- Only use the discharge and earth rod if its surface is clean and dry.
- Hold the discharge and earth rod only at the handles!
- Observe the minimum discharge period in accordance with the capacitance of the test object.

### 10.2.1 Discharging

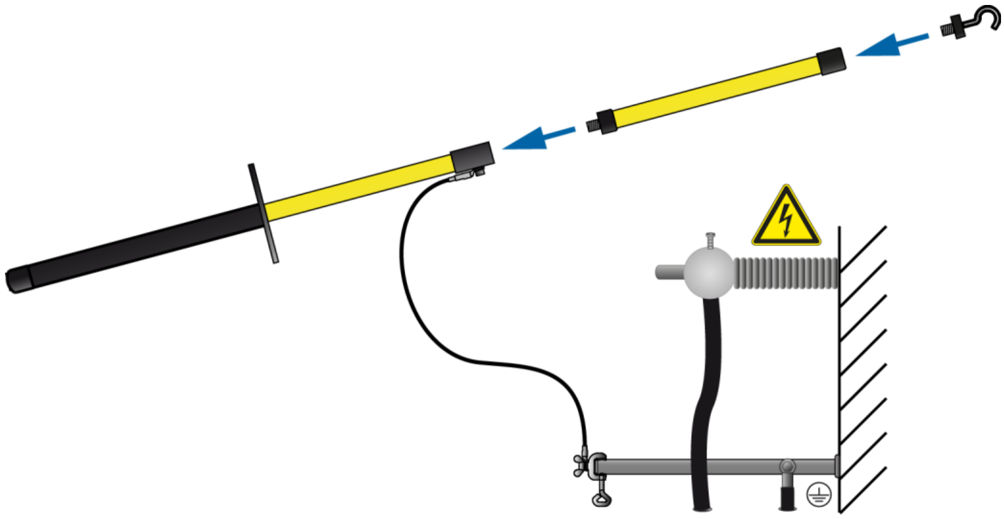
**DANGER**

**Dangerous voltage in test object**

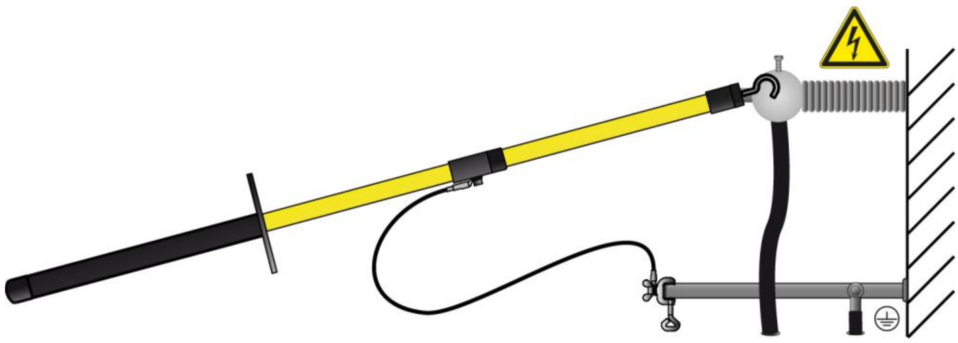
Danger to life or risk of injury due to electric shock or electric arcs.

- Use suitable personal protective equipment against electric shocks and arcing faults.
- Keep a distance of at least 50 cm from the protective earthing cable of the discharge and earth rod.

1. If not yet connected, connect the earth cable of the protective earthing cable of the discharge and earth rod to the station earth.
2. Assemble the discharge rod:
    a. Screw the hook onto the discharge part.
    b. Screw the discharge part onto the handle.



3. Use the black handle to hold the discharge and earth rod and make contact with the test object by touching it with the tip of the discharge and earth rod.



4. Observe the minimum discharge period in accordance with the capacitance of the test object.

### 10.2.2 Earthing

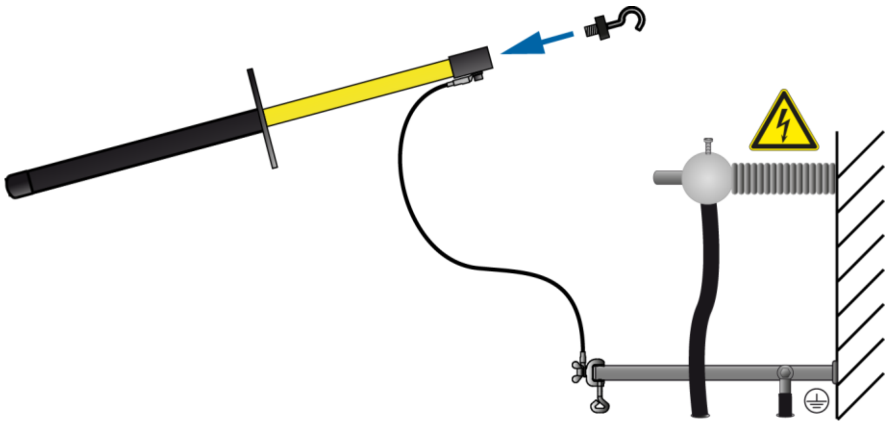
**DANGER**

**Dangerous voltage in test object**

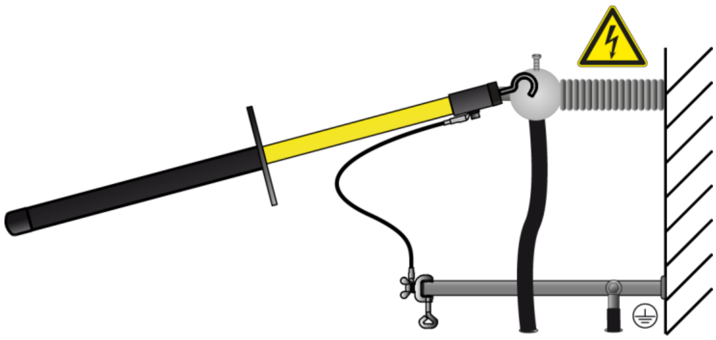
Danger to life or risk of injury due to electric shock or electric arcs.

- Use suitable personal protective equipment against electric shocks and arcing faults.
- Keep a distance of at least 50 cm from the protective earthing cable of the discharge and earth rod.

1. If not yet connected, connect the earth cable of the protective earthing cable of the discharge and earth rod to the station earth.
2. Assemble the earth rod: Screw the hook into the handle.



3. Contact the test object with the tip of the earth rod.



4. Immediately after earthing, connect the earthing and short-circuit equipment to the test object.

## 10.3 Taking test installations out of operation

⚠ **WARNING**

**High electrical voltage**

Electric shock on touching live and active parts and due to residual charges if earthing is removed too early

- Disconnect the earth connections as the last connection of the test assembly.
- Never disconnect the earth connections as long as power and other periphery connections are still connected.

***NOTICE***

Damage to devices due to improper use.

- Do not switch off the device under load.
- Before switching off the device, put it in the *Ready for operation* operating state.

1. Switch shirla off.
2. To disconnect the device completely from the mains voltage, pull out the mains plug.
3. Disconnect the connection cables from the test object.
4. Finally, disconnect the earth cable.
5. If the cables are dirty, clean them and store them in the designated place.
6. If necessary, remove the cordoning.
7. Remove the earthing and the short-circuit on the test object only if no subsequent work is required and if the test object is to be put back into operation.
8. Remove the barriers and marking of the test area.

# 11 MAINTENANCE AND CARE

| NOTICE |
|---|
| **Damage to device due to improper handling** |
| The user is liable for damages caused due to improper maintenance or care. |
| ▸ Never take apart the device. This can lead to device damages. Inside the device there are no components that could be serviced or repaired by the user. |
| ▸ Maintenance tasks must be carried out only by personnel trained and authorised by BAUR |

## 11.1 Cleaning

| NOTICE |
|---|
| **Damage to the device may be caused by using the wrong cleaning agents** |
| ▸ Do not use any abrasive, corrosive cleaning agents or strong solvents. |
| ▸ Ensure material compatibility. |
| ▸ Do not clean the product with acetone or thinner. |
| ▸ Never clean electrical devices with water. |

**Cleaning the display**

- Clean the display with a dry or slightly damp lint-free cloth.

**Cleaning the device surfaces and connection cable**

1. Clean the device surfaces and connection cable with mild detergent and a lint-free cloth.
2. *NOTICE!* Damage to device due to leaking fluids. Do not allow liquids to leak into devices.

## 11.2 Charging the rechargeable battery

Deep discharge can cause irreversible damage to the device battery. To prevent deep discharge of the battery, fully charge the device battery every 3 months.

The device and battery warranty is void in the event of deep discharge of the battery.

**Procedure**

1. Connect the device to the mains voltage via the mains supply cord. If necessary, use a country-specific adapter.
2. Switch the device on to check whether it is being supplied with mains voltage.
   When the device is supplied with mains voltage, the symbol appears on the display.
   The device can be switched off while the battery is charging.
3. When the battery is fully charged, disconnect the device from the mains voltage.
4. Check the battery charge status.
   The charge status is displayed on the device.

# 12 Error messages

The following error codes may be displayed:

| No. | Type of error | Corrective measure |
|---|---|---|
| 1001 | High voltage error | Restart device |
| 1005 | Internal USB error | Restart device |
| 1006 | Internal EEPROM error | Restart device |
| 1007 | Real-time clock error | Set date/time and restart device |
| 1008 | Memory error | Restart device |
| 1009 | Emergency Off active | Deactivate emergency off |
| 1010 | Memory error | Restart device |
| 1011 | Memory error | Restart device |
| 1012 | Internal EEPROM error | Restart device |
| 1013 | No calibration data | Prepare calibration data |
| 1014 | Invalid calibration data | Prepare valid calibration data |
| 1015 | Overvoltage | Restart device |
| 2001 | Communication errors in digital measuring bridge | Restart device |
| 2002 | Timeout of digital measuring bridge | Restart device |
| 2003 | Command error in digital measuring bridge | Restart device |
| 2004 | Digital measuring bridge not ready | Restart device |
| 2005 | Self-test error in digital measuring bridge | Restart device |
| 2006 | Zero balance error in digital measuring bridge | Check connection |
| 2007 | Communication errors in digital measuring bridge | Restart device |
| 2008 | Communication errors in digital measuring bridge | Restart device |
| 2009 | Communication errors in digital measuring bridge | Restart device |
| 2010 | Communication errors in digital measuring bridge | Restart device |
| 2011 | Communication errors in digital measuring bridge | Restart device |
| 2012 | Communication errors in digital measuring bridge | Restart device |
| 2013 | Communication errors in digital measuring bridge | Restart device |
| 4001 | Power module fault | Restart device |

| No. | Type of error | Corrective measure |
|---|---|---|
| 4002 | Power module fault | Restart device |
| 4003 | Power module fault | Restart device |
| 4004 | Power module fault | Restart device |
| 4005 | Power module fault | Restart device |
| 4006 | Digital-Analogue converter error | Restart device |
| 4007 | Power module communication error | Restart device |
| 4008 | Power module communication error | Restart device |
| 4009 | Power module communication error | Restart device |
| 4010 | Power module communication error | Restart device |
| 4011 | Power module communication error | Restart device |
| 4012 | Power module communication error | Restart device |
| 4013 | Power module communication error | Restart device |
| 4014 | Power module overtemperature | Allow device to cool and restart |
| 4021 | Power module communication error | Restart device |
| 4022 | Power-Module-Error, error when setting the digital-analogue converter | Restart device |
| 4023 | Power-Module-Error, error when reading the analogue-digital converter | Restart device |
| 9002 | Balance potentiometer at lower end | Check connection |
| 9003 | Balance potentiometer at upper end | Check connection |
| 9004 | Timeout during balancing | Check connection |
| 9005 | Polarity change | Check connection |
| 9006 | No fine balance possible | Check connection |

When an error message appears repeatedly, proceed as follows:

1. Check the supply voltage and the connection and earth cables.
2. Note down the error text and the procedure that caused the error to occur.
3. Contact BAUR GmbH or your BAUR representative.

# 13 WARRANTY AND AFTER SALES

### Warranty

For warranty claims, please contact BAUR GmbH or your local BAUR representative. Warranty is cancelled in case of misuse. Wear parts are excluded from the warranty.

### After Sales

For questions contact BAUR GmbH or your BAUR representative.

ensuring the flow

BAUR GmbH

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6832 Sulz / Austria
service@baur.at
https://www.baur.eu

# 14 DISPOSAL

The final decommissioning and disposal of the device must be carried out in compliance with country-specific laws, regulations and standards.

Device components do not belong in the domestic waste.

- Dispose of electrical device components in accordance with the applicable national regulations.
- Dispose of the various device components in an environmentally friendly manner and in accordance with the applicable national regulations.

# 15 Declaration of conformity

We

BAUR GmbH
Raiffeisenstraße 8
6832 Sulz / Austria
headoffice@baur.at
https://www.baur.eu

declare, under our sole responsibility, that the BAUR product

**shirla sheath test and fault location device**

to which this declaration refers, conforms to the following standards or standard documents:

- Low Voltage Directive 2014/35/EC
  EN 61010-1:2010
  EN 61010-2-030:2010
  EN 50191:2010
- EMC Directive 2014/30/EU
  EN 55011:2009 + A1:2010
  EN 61000-4-2:2009
  EN 61000-4-4:2012
  EN 61000-4-5:2014
- Environmental testing
  EN 60068-2-ff

Signed: Torsten Berth, Technical Director
Dr. Eberhard Paulus, Director QM/QS

Sulz, 30/11/2015

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# shirla

## BAUR sheath test and fault location device


## Mobile cable sheath testing and fault location

- Fault pre-location and pin-pointing in a single device
- Data export via USB interface
- Mains and battery operated
- Simple operation and intuitive user interface

The shirla sheath test and fault location device is used for cable and cable sheath testing, and for the pre-location and pin-pointing of cable sheath faults and cable faults due to earth contact.

The fault pre-location is based on the measuring bridge principle according to Murray and Glaser. The measuring bridge is dimensioned specially for power cables, but also enables pre-location for control and lighting cables. Zero balance and evaluation take place automatically. The fault distance is shown in meters. Various cable sections can be entered, thus increasing the accuracy of the measurement.

For fault pin-pointing, shirla generates a pulsed voltage, thereby permitting the use of the step voltage method. Using the "Step voltage" set of the protrac® pin-pointing system, cable sheath faults and other faults due to earth contact can be located quickly and accurately.

### Functions

- Cable and cable sheath testing with DC voltage up to 10 kV
- Fault pre-location by means of high-resolution resistance measuring bridge
- Pre-location of cable sheath faults and faults due to earth contact with measuring bridge
- Step voltage method for cable sheath fault pin-pointing

### Features

**Pre-location of cable sheath faults and faults due to earth contact**

- Measuring bridge with automatic zero balancing
- Automatic evaluation
- High accuracy by accounting for different cable sections in terms of length, conductor cross-section and material

**Cable sheath fault pin-pointing**

- Pulsed voltage up to 10 kV
- 4 pulse patterns selectable
- Adjustable switch-on delay and operating time

**General functions**

- Continuously adjustable voltage
- Adjustable current and voltage limitation
- Automatic measurement sequences and reporting
- Automatic report export to USB stick
- Integrated discharge unit
- Connection for external emergency off unit in accordance with EN 50191

* Option

## Technical data

| Cable and cable sheath testing | |
|---|---|
| DC voltage | 0 – 10 kV |
| Output current | 10 mA @ DC 5 kV<br>5 mA @ DC 10 kV |
| Current indicator | |
| Accuracy | ±10 µA |
| Resolution | 1 µA |
| Insulation resistance measurement | 0.01 MOhm to 1 GOhm |
| Voltage and current limitation | adjustable |
| **Measuring bridge (pre-location of cable sheath faults and faults due to earth contact)** | |
| Measurement method | 4-wire measuring bridge according to Murray or Glaser |
| Output voltage | DC 100 V – 10 kV |
| Max. output current | 50 mA |
| Accuracy | 0.1% relating to the measurement result |
| Number of definable cable sections | 50 |
| **Step voltage method (cable sheath fault pin-pointing)** | |
| Pulsed DC voltage | 100 V – 10 kV<br>4 selectable pulse patterns |
| Max. output current | 700 mA |

| General | |
|---|---|
| Display | LCD with background lighting, screen resolution 320 x 240 pixels, Automatic brightness setting |
| Reporting | ▪ Shown on display<br>▪ Automatic export via USB interface (USB 2.0) |
| Data export format | Text file, bilingual: English, German |
| Power supply | |
| Mains voltage | AC 100 – 240 V, 50/60 Hz |
| Rechargeable battery | DC 12 V, 3.4 Ah |
| Max. power consumption | 200 VA |
| Max. discharge capacitance | 25 µF |
| Ambient temperature (operational) | -20 to +50°C |
| Storage temperature | -40 to +60°C |
| Relative humidity | Non-condensing |
| Weight and dimensions (W x H x D) | |
| shirla | Approx. 17 kg; approx. 440 x 490 x 220 mm |
| Transport case for accessories | Approx. 5 kg; approx. 450 x 355 x 125 mm |
| Degree of protection | IP54 (in closed state) |
| Safety and EMC | CE-compliant in accordance with Low Voltage Directive (2014/35/EU), EMC Directive (2014/30/EU), EN 60068-2-ff Environmental testing |
| **Integrated battery** | |
| Battery type | Lead-acid battery 12 V, 3.4 Ah |
| Battery life | Approx. 45 min (in HV mode) |
| Charging time | Approx. 4 h |

## Standard delivery

- BAUR shirla sheath test and fault location device incl.
  - HV connection cable, 4.5 m, fix mounted
  - 4-wire bridge connection cable, 2.5 m, fix mounted
  - Short-circuit cable, 1 m, 2 pcs
  - G-clamps, 24 mm, 4 pcs
  - Earth cable, 3 m, with earth terminal
  - Transport case for accessories
  - USB drive
  - Carrying strap
  - Mains supply cord, 2.5 m
  - User manual

## Accessories and options

- BAUR protrac® pin-pointing system, "Step voltage" set
- GDR 20-125 discharge and earth rod
- Accessories set for cable sheath fault location with UL 30
- External emergency off unit with signal lamps, 25 m or 50 m cable length, on hand cable drum


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