

# ELABO

TestSystems

Service

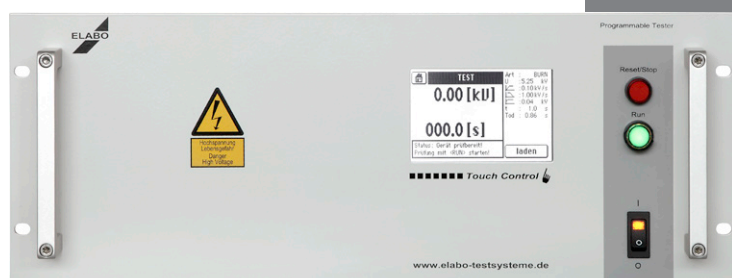
ELABO

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ELABO GmbH, Hotline ++49 7951/307-202  
www.elabo-testsysteme.com



## Operating Manual AC Combi-Tester G7-1G/-1T G7-1H/-1U

Full-electronic  
combi-tester HV,IS,PE

Elabo **BestPerformance**

## 1. INTRODUCTION

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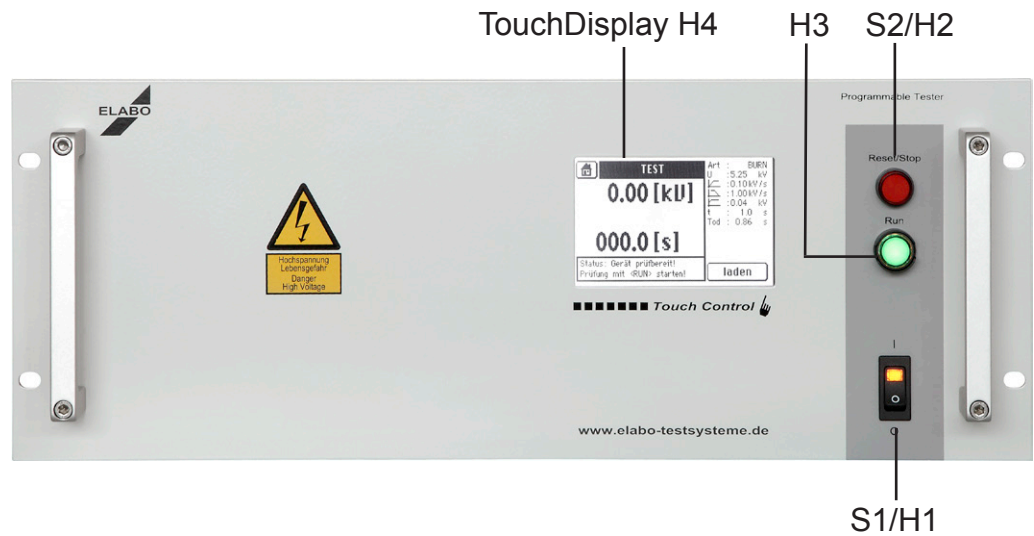
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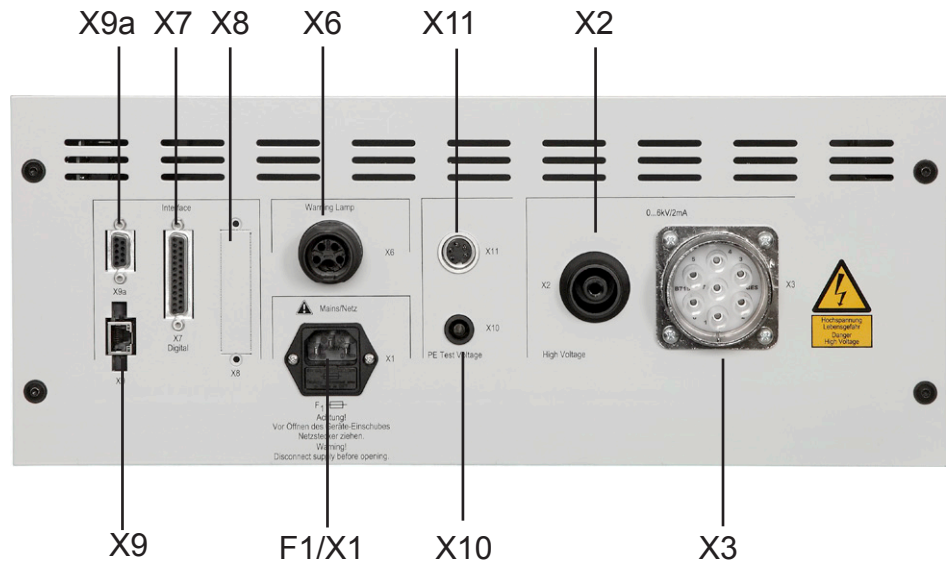
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A OPERATING ELEMENTS



base-device types	display	HV (V AC)	HV (mA)	ISO (V DC)	PE (A)
G7-1G	yes	100 ... 2500	max. 100	1200	5 ... 32
G7-1T	no	200 ... 5000			
G7-1H	yes	100 ... 1500	max. 200	1200	5 ... 32
G7-1U	no	200 ... 3000			

# 1. INTRODUCTION



## Info about device versions and options

The device can be delivered with some optional features, this options are completes or enhances the performance range of the device. Some optional features are only as single option possible. ELABO completes the number of options constantly (as required). Optional features of the device, are described in the appendix „Options“

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No.	Equipment	Function
F1	Fuse drawer	Adapter for mains fuse
S1/H1	Toggle switch/pilot lamp	Mains switch with indicator lamp
S2/H2	Illuminated button Reset (red)	Switching OFF test voltage / Reset
S3/H3	Illuminated button Set (green)	Ready for testing Starting test run (only at display devices)
H4	TouchDisplay	Operating of the tester
X1	Cold appliance mounting jack with fuse adapter 10 A	Main cable connection / mains fuse (fine wire fuse T 3.15 A - 5 x 20 mm)
X2	HV-jack	Connection high voltage + / ~ (high potential)
X3	HV-jack	Connection high voltage - / ~ (low potential)
X4	HV-jack	Feed back of high voltage ( + / ~ ) for X2 (Option)
X5	HV-jack	Feed back of high voltage ( - / ~ ) for X3 (Option)
X6	Socket (Warning Lamps)	Connection warning lamps
X7	Socket (D-SUB 25pole) female	DA-interface - digital Inputs/Outputs, Safety circuit
X8	Socket (D-SUB 37pole) male	DA-interface - additional digital/analog inputs/outputs (options)
X9	RJ45 (DSUB, USB) - socket	Ethernet bus interface (RS232, USB - option) for automatic control of the tester (and firmware update of touch display module)
X9a	Socket (D-SUB 9pole)	RS-232 - Service-interface (firmware update control module)
X11	HV-jack	Connection high voltage - parallel to X2
X12	HV-jack	Connection high voltage - parallel to X3



## 1. INTRODUCTION

### 1 INTRODUCTION

The safety of all personnel who come into contact with the tester essentially depends on an adequate understanding of the device. For this reason:



**Prior to the first putting into operation read these operating instruction!**

**Note on operating instructions!!**



**These operating instructions apply to devices with and without the touchscreen display. The menus shown can be useful for illustrating the functions on devices without a display and therefore contribute to an improved understanding of the device.**

#### 1.1 GENERAL INFORMATION

These operating instructions will make it easier to become familiar with tester and its possible uses prior to placing in operation, and to use it correctly. They contain information that will ensure functionally correct, cost-effective and safe operation and they must always be available in the place where the device is used.

The operating instructions are not only an indispensable aid for new trainee operators, they also contain useful tips, information and suggestions for the experienced operator. They are a necessary reference work for all users. By reading the operating instructions

- Hazards will be avoided
- Operating sequences will be optimised and accelerated
- Repair costs and downtimes will be minimised
- Reliability and service life will be increased

The operating instructions should also be read carefully by the device owners and managerial staff. In particular in relation to transport and installation, as well warranty aspects.

In chapter 2 important safety instructions and information about hazards is given that will prepare you for hazardous situations that may occur. Reading up during operation is unfortunately too late. Also note the following basic principle:



**Cautious and careful working is the best protection from accidents!**

The quality of the tests performed using the device is crucially dependent on maintenance and care. Regular maintenance work and care are described in these operating instructions. If repairs are necessary, we will be pleased to provide you with support and supply you with the necessary original spare parts.

If you have questions after reading the operating instructions, the ELABO hotline (telephone +49 7951/307-202) is available to provide information.

## 1. INTRODUCTION

### 1.2 ABBREVIATIONS AND SYMBOLS

- SO Special option that is not included as standard
- 1 List, here the recommended sequence of actions is to be followed
  - List



#### **CAUTION ELECTRIC HIGH VOLTAGE - DANGER TO LIFE!**

Hazardous point, risk of serious injury to the operator and other personnel! - chapter 2.1



Risk for the device! - chapter 2.1



Information on efficient and cost-effective operation - chapter 2.1

### 1.3 SHORT DESCRIPTION OF THE TESTERS

The tester G7-1G are designed for operation by using the integrated touchscreen display and also via interface.

As an alternative, the device G7-1T are intended to be controlled using an external PC/PLC. For this reason there is no display.

The modular design of the tester permits optimal adaptation to the individual needs of the user. Expansion modules, standard accessories and individual accessories offer the right solution for every application.

The basic devices available are automated devices (without display) for use in test systems and „stand-alone“ devices (with display).

By optional features the devices can be equipped with additional functions.

The uses for the device family range from an individual manually operated test bench, through a PC-controlled test station (with control, evaluation, statistics and test plan management via PC software) to a complex fully automatic test station with conveyor belt, autom. contact, labeling etc..

ELABO offers a modern software package for controlling this device series and the management of the data via a PC.

#### **Devices with touchscreen display**

The user can be operated entirely using the touchscreen panel. This operation covers the control of the device during the test, the generation and management of test steps and test plans.

The display informs the operator at all times about the parameters and the status of the tests.

#### **HV part:**

The device serves for the insulation test and withstand voltage test at electrical equipment, machines, construction elements and insulating material. The test is carried out with AC up to 5000 V/ test current maximal 100 mA.

## 1. INTRODUCTION

The electronic voltage ramp up makes it possible to perform tests on electronic devices that can only be tested non-destructively by slowly increasing the test voltage or on test objects with high self-capacitance. Due to the fully electronically regulated test voltage, the variable transformer otherwise used is not necessary. The current and voltage measurements are made on the high voltage side. An integrated residual voltage measurement ensures safe discharge of test object capacitance.

### ISO (insulation) part

Insulation resistance measurement with voltages from 50 V to 1200 V DC /current limited to maximal 1 mA.



**Attention high voltage mortal danger!** The resistance measurement is not current-limited, it is performed with the full HV current.

### Attention discharge currents - Danger for Life !!

Particularly valid for test objects with internal capacitance (capacitors).

Particularly if HV tests with direct current (DC) are performed, test objects with internal capacitances are capable of storing high charges. After disconnection, these charges may be compensated via the body of the operator (when touching the contacts).

If the test object remains connected to the HV tester sufficiently long after switching OFF the high voltage, it will automatically be discharged via the HV-tester. Prerequisite for this: If discharging is prevented (disconnection), "extremely dangerous discharge currents" may be generated.

### PE part

Measurements of the PE conductor resistance or the voltage drop at the PE conductor are possible with a test current of 10 ... 32 A at a voltage of 6 V or 12 V AC.



### Function section (option):

Switching unit and power supply of the test object. Measurement of the voltage, current and power consumption. Depend of the variation of the function part, up to 3x 400 V/25 A.

### PC software (option)

By controlling the tester via a PC/PLC all the advantages of modern software can be exploited. Graphic, colour user prompts enable the operator to see the status of the tests at a glance. Test parameters can be saved in test plans, access control using passwords is possible. The test data can be evaluated using Accept/Fault statistics. Other advantages are the acquisition of barcodes using scanners, data integration via in-house networks, communication with conveyor belt controllers, etc..



**Important note:** To connect the test object to the device, a connection box or a connection panel is required. Another possibility is installation in a test system (rack) with suitable power supply and switch panel.

## 1. INTRODUCTION

### 1.4 Standards supported

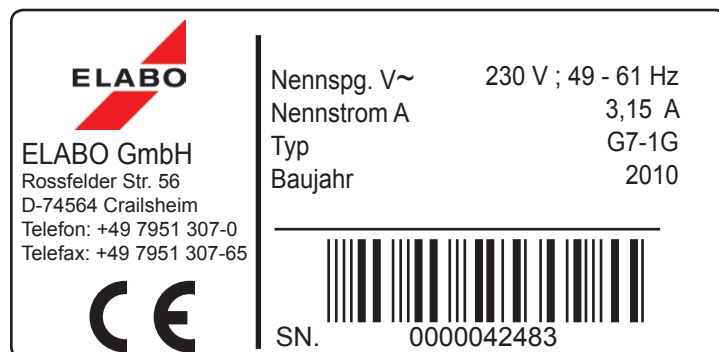
The device supports tests, e.g., in accordance with:

- EN 60335-1 Household and similar electrical appliances. Safety
- EN 60598-1 Luminaires
- EN 60950 Information technology equipment. Safety
- EN 61010-1 Safety regulations for electric measurement, control and laboratory equipment
- EN 60601 Medical electrical equipment

### 1.5 NAME PLATE

#### ELABO tester

The name plate (example) is on the rear of the device.



## 2. SAFETY REGULATIONS

### 2 SAFETY INSTRUCTIONS

Before working with the tester the operating instructions and all enclosures must have been attentively read and understood by all persons operating the tester. The tester may be operated by trained and skilled staff only.

When the device is in operation, voltages of up to **5000 AC Volt** can be produced. If the device is fitted with options, significantly higher voltages can occur. **There is mortal danger when working with high voltage!** ELABO has therefore equipped this device and all its components with all the necessary safety features to protect the user against hazards that may occur during correct use. Please note:

**CAUTIOUS AND CAREFUL WORKING IS THE BEST PROTECTION FROM ACCIDENTS !**

#### 2.1 MARKINGS FOR SAFETY INSTRUCTIONS AND WARNINGS

##### Danger Zone



**Electric High Voltage - danger to life !**

**IN DEALING WITH HIGH VOLTAGE THERE IS DANGER TO LIFE!**

This marking warns of a point that is hazardous due to high electrical voltage. It is given beside all work steps during which there is **risk of serious injury** for the operator or others. It is given beside working and operating procedures that are to be followed exactly to ensure people or the tester are not endangered by high electrical voltage.

**PAY ATTENTION TO THE NOTES AND ACT VERY CAREFUL IN THESE SITUATIONS. ALSO PASS ALL SAFETY REGULATIONS ON TO OTHER OPERATORS.**

##### Caution !

This sign signifies **danger for the tester** in case of non-observance of instruction.



##### Note!

This sign signifies that a more effective and more economic use of the tester is possible.



#### 2.2 WARRANTY

Claims under the warranty can only be made if the warranty conditions in the general terms and conditions are followed. The conditions in the operating instructions are also to be observed.

## 2. SAFETY REGULATIONS

### 2.3 USE AS PER SPECIFICATIONS AND EXCLUSION OF LIABILITY

The tester is only allowed to be used for the intended tests. Any other usage is considered incorrect. ELABO is not liable for any resulting damage, the risk is borne solely by the user. Correct usage also includes compliance with the information in these operating instructions.

The tester and its components have been developed and built for usage in an industrial environment. In accordance with DIN EN 55022 ITE, this system is a class A appliance. Neither the tester as a complete unit nor its individual components are allowed to be used in a different environment. If this information is not followed, ELABO accepts no liability whatsoever for any interference produced and the resulting damage.

Prior to working with the tester, these operating instructions and all appendices must be carefully read and understood by all personnel operating the tester. The tester is only allowed to be operated by trained personnel.

The safety features and design of the tester are not allowed to be modified. Any change requires the express agreement of ELABO.

Unauthorized changes to the tester, as well as the usage of spare parts, accessories and additional equipment that has not been tested and approved by ELABO may degrade the function and properties of the tester. ELABO is not liable for resulting damage.

ELABO does not accept any liability for damage resulting from the failure to follow the operating instructions or due to failure to take due care during transport, installation, handling, operation, care and maintenance or repair of the device, even if specific mention of this duty to take care is not specifically highlighted in these operating instructions.

### 2.4 GENERAL RULES OF CONDUCT AND SAFETY INSTRUCTIONS

The tester is built to the state-of-the-art and recognised safety rules. Nevertheless, during operation there may be a risk of serious injury to the user or other personnel, or damage to the device or other property.



The tester is only allowed to be used in correct working order and correctly taking into account the operating instructions. Malfunctions that may degrade safety are to be rectified without delay.



Managerial staff must ensure personnel tasked with working on the tester have read and understood the operating instructions prior to starting work. The managerial staff have the obligation to only ever operate the device in correct working order and to ensure the operators use the tester correctly.

## 2. SAFETY REGULATIONS



These operating instructions must always be available in the place the device is installed. Incomplete or illegible operating instructions are to be replaced without delay. In this situation we would of course be pleased to be of assistance.



In addition to the operating instructions, statutory, generally applicable and other binding regulations for the prevention of accidents and for the protection of the environment are to be followed.

### Note:



**DIN EN 50191 (VDE 0104) regulates the operation of test systems. Follow the stipulations in the DIN standard.**

DIN EN 50191

### 2.5 Protective facilities / Emergency Off

- All the system's safety features are to be checked for correct function prior to putting into operation each day.
- Prior to placing the system in operation, all safety features must be correctly fitted and functional.
- Safety features are only ever allowed to be removed for repair.
- Safety limit switches are not allowed to be bypassed.

### 2.6 Operator qualifications

- The operators must hold an appropriate qualification to operate the system. The operators must be informed and instructed about the function and especially the risks and hazards related to the system.
- Anybody who works on the system must have read the operating instructions, be familiar with the content and follow it.
- The responsible superior has the obligation to instruct the personnel based on the operating instructions.
- Temporary employees and trainees are only allowed to work on the system under the supervision of appropriately qualified personnel.
- The responsibilities of the personnel are to be clearly defined.

### 2.7 Working clothes (personal protection equipment) and protection at work

- Wear the necessary working clothing for your activity, e.g. ESD footwear, safety shoes, flame-retardant clothing, etc. Obtain information on this issue from your supervisor or the safety officer.
- If necessary, wear hearing protection.

## 2. SAFETY REGULATIONS

### 2.8 Maintenance

- The stipulated maintenance and inspection work is to be performed at the intervals defined.
- Inform operators prior to starting maintenance and service work.
- During all maintenance and inspection work, electrically isolate the device / system and secure against unexpected switch on.
- The work is only allowed to be undertaken by appropriately trained personnel, all safety precautions are to be taken.
- To perform maintenance and servicing work, workshop equipment appropriate for the work to be performed is imperative!

### 2.9 Moisture and humidity

- The parts of the system are not allowed to be subject to moisture, humidity and/or dust.
- Particularly the electrical parts and the test mechanism and test sensors for the system must be protected against moisture, humidity and dust.

### 2.10 Compliance with the technical data

- The technical performance data as per the name plate must not be exceeded.
- The fuse protection for the supply cables must not be higher than the max. value defined by ELABO.

### 2.11 Physical/design changes to the system/device

Without the prior written approval of ELABO, it is not allowed to make changes, additions or modifications to the system. If this instruction is not followed, the device/machine/system will lose its EC conformity.

- Immediately replace additional parts and accessories that are not in correct working condition.
- Only use genuine spare parts. Only these comply with the technically defined requirements.

### 2.12 Other information

**Escape routes:** The escape routes are to be kept clear.

In accordance with UVV „Elektrische Anlagen und Betriebsmittel“ (Electrical systems and equipment) (BGV A2) §2, paragraph 3 the term **Elektrofachkraft (electrician)** is defined as followed (translation of the original German text):

An electrician in the context of the prevention of accidents is a person who, due to his/her specialist training, knowledge and experience, as well as knowledge of the application regulations is able to assess the work allocated and recognise possible hazards.





2. SAFETY REGULATIONS

2.13 Information on the high voltage



Attention high electrical voltage - mortal danger!

**IN DEALING WITH HIGH VOLTAGE THERE IS DANGER TO LIFE!**

When performing tests using the device you will be working with a high voltage up to **5000 Volt AC**. If the device is fitted with options, significantly higher voltages can occur. **There is mortal danger when working with high voltage!**

**Follow DIN EN 50191 (DIN VDE 0104). The EN standard regulates the operation of test systems and test benches.**



In the case of test voltages over 1000V the HV device must be equipped with a warning lamp set (red and green lamps). See chapter 7.2 warning lights.

**Attention high voltage:** The contact elements used for the HV and IS test (test probes etc.) must be designed for the maximum voltage supplied by the device.



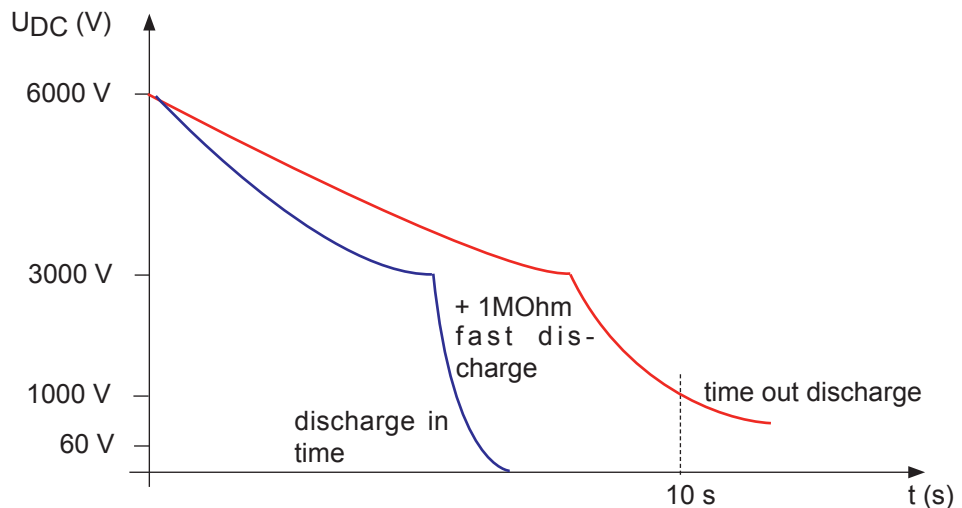
2.14 Discharging test objects with internal capacitance

**Attention discharge currents - mortal danger!!** particularly in the case of test objects with internal capacitance (capacitors).

Particularly during tests with **DC**, test objects with internal capacitance can **store large amounts of charge**. After disconnecting, this charge may be dissipated via the operator's body (if the test object is touched in the appropriate place).

If the test object is left connected to the tester after switching off the high voltage, it will discharge automatically via the tester. If this discharging is prevented (disconnection), potentially fatal discharge currents may be produced.

Discharging via the device



## 2. SAFETY REGULATIONS

After the end of the test (end of test time), the test object connected is automatically discharged. For this purpose a discharge resistor is connected internally and the voltage across the resistor read (residual voltage measurement). The discharging is undertaken using an internal resistor until a voltage of 3000 V is reached, the device then connects a 1 MOhm resistor in parallel. If the voltage doesn't underrun a residual voltage of 60 V within - 10 s at DC the device indicates the fault message „Attention residual voltage“.



**Note:** The residual voltage measurement can **not** switched off on the „Setup“ menu or using an interface command.

Automatic discharging is performed only on HV-DC or ISO test. At HV-AC test the high voltage is switched off on zero-crossing.



**Attention:** Leave the test object connected until it is discharged. The device indicates this state with the illumination of the green RUN button.

### **Additional discharging via an external resistor**



The device has an output for the connection of an external discharge resistor. At the end of the HV/ IS test this output is connected by the device. On this topic see chapter 6.2.5.1 „Outputs/external discharge relay“.

### 3. MAKEREADY

## 3 PUTTING INTO OPERATION

### 3.1 TRANSPORT AND INSTALLATION

The tester is supplied fully packed and is only allowed to be removed from the packaging in the immediate vicinity of the installation location.



The device can be installed in a suitable industrial rack or housing for 19" plug-ins. The device must be secured against **unintentional movement**.

The surface on which the device is installed must be appropriate for the weight of the tester (approx. 30 kg!) and always provide a secure mounting for the device.



During installation it is to be ensured the labels with information and safety labels on the device are not covered.

To avoid an electrical shock because of condense water, the device should have room temperature before the first use.

### 3.2 AMBIENT CONDITIONS



The tester is not allowed to be operated in a dusty, inflammable, aggressive or humid environment. The values permitted for temperature and atmospheric humidity are given in chapter 1.4 „Main technical data“.

### 3.3 INSTALLATION IN HOUSING OR RACK

**Note:** Slide the device carefully to the rear to the stop. Do not jam the device on insertion.



After the inserting the device in a housing, it must be secured at the front using 4 screws.

**Operation with a loosely inserted tester is not allowed!**

Installation without a modular system or housing is not allowed.



Fig. 3.1: Tester with display and accessories installed in 19" / 4HU housing

3. MAKERREADY

3.4 Connection to the connection box / connection panel / test system

Devices with internal switching

The device is provided with a connection box, a connection panel. Devices with internal switching can be recognised by the Krönes HV connector. ELABO offers suitable connection boxes and connection panels for the device. The figures below show the principles of connection using a box.

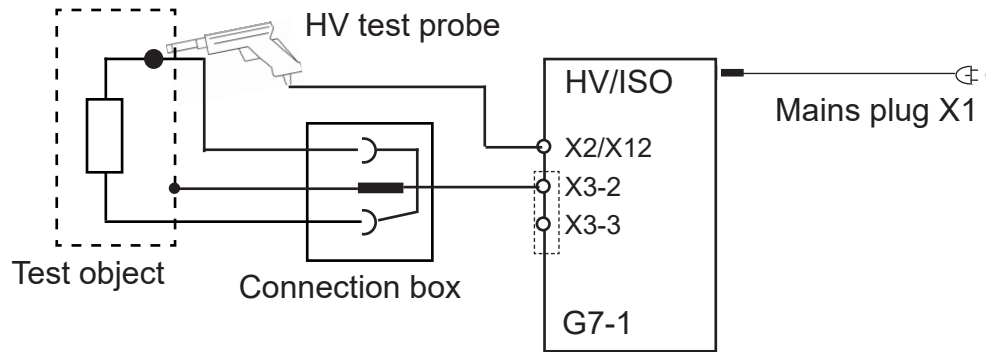


Fig. 3.2a: Principle of connection via box and HV-test probe

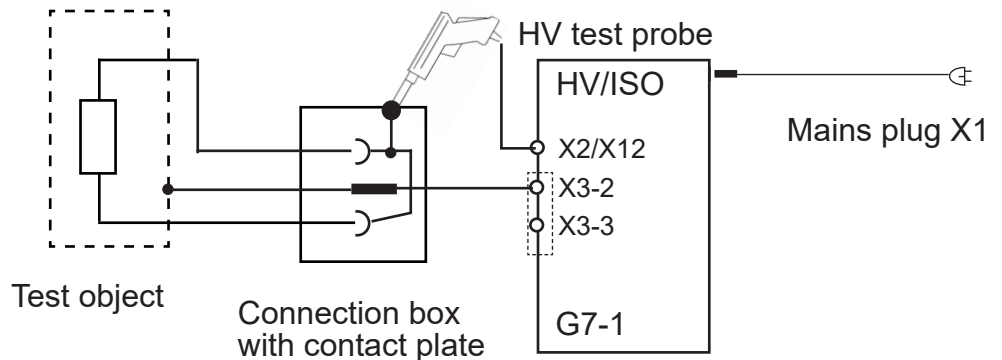


Fig. 3.2b: Principle of connection via box and HV-test probe at contact plate

**Attention:** The principle of connection according fig. 3.2c, is only permissible by using a two hand control unit (ELABO order nummer F9-1L).

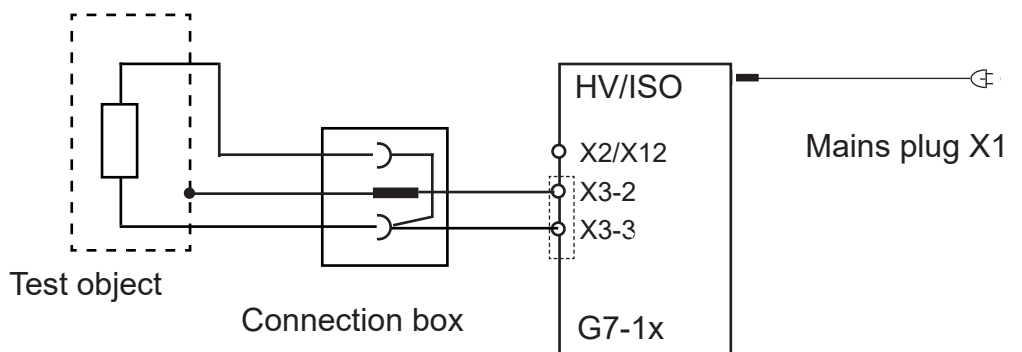


Fig. 3.2c: Principle of connection via box (only permissible by using a two hand control unit).

Connection for ISO-Testing

See High voltage test.

3. MAKEREADY

Connection for PE-Testing

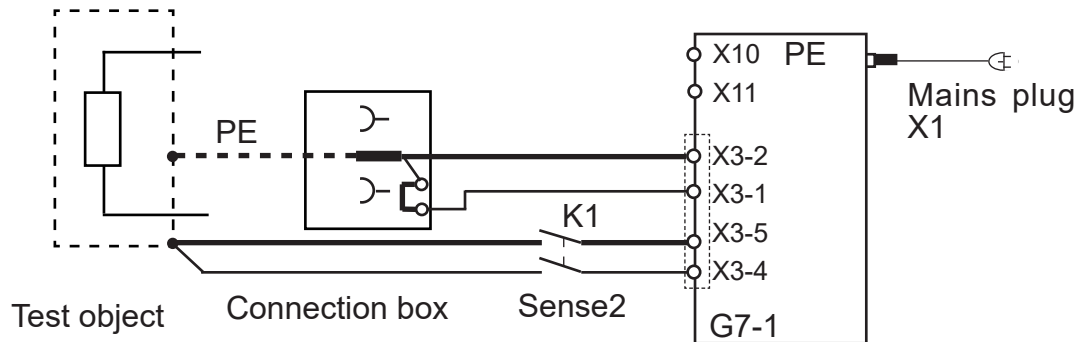


Fig. 3.3a: Principle of connection PE - via box with-out test probe (four wire measuring)

**Note:** The connection to the object chassis should be switch-able by a suitable switching element. This is required, to prevent a feedback of the test voltage (ISO-/HV test) to the tester. X3-5/X3-4 are shorted inside the device by a relay to PE. Open the connection to the object chassis over K1, before start up an ISO-/HV-test and also before using the PE-test probe for PE-testing.

**At using the PE-test probe** - no other connection to the object chassis, has to be present (Fig. 3.4d). In case of other connections to the chassis, it is possible to get significant measurement errors.

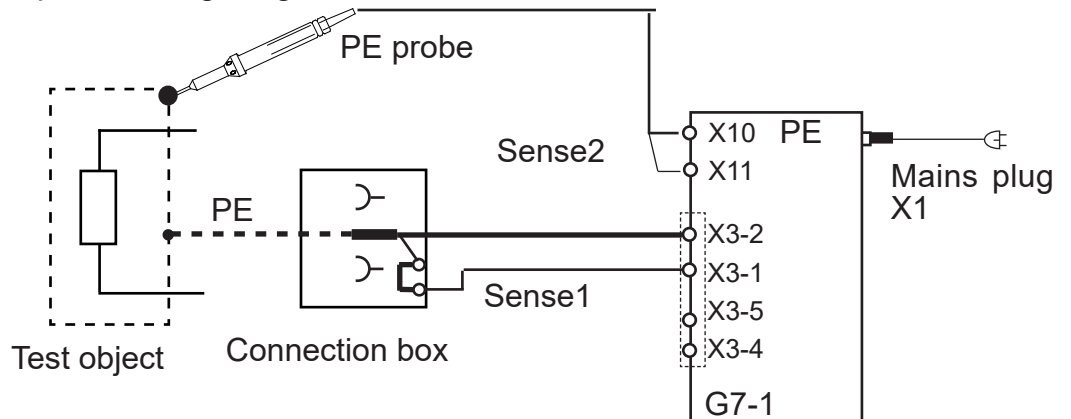


Fig. 3.3b: Principle of connection PE - via box and PE-test probe (four wire measuring)

**Note:** Place the PE-probe in the fixture holder. No connection to the test object chassis, has to be present.

### 3. MAKEREADY

#### 3.4.1 Requirements for connecting lines to the test object

Under the requirements (current, voltage, mechanical stress, handling, etcetera), must be used appropriate and certificated connecting cables and contacting devices.

**Use high quality cables:** Insulation material with: - a low dielectric constant; - low dielectric loss factor; - a high insulation resistance. In addition, an effectual voltage strength, is necessary.

**Voltage strength:** The connecting lines must be certificated and tested, for the maximum voltage of the test device.

**Current:** The connecting lines must be certificated and tested, for the maximum current of the test device. Have attention for continuous test.

**Mechanical stress:** The connecting lines must be constructed for the mechanical stress, at the test place. If necessary, - place the cables in safety positions; - use a cable protective tube; - or use other appropriate precautions .

**Handling:** The connecting lines must be well to handling. Use elastic, fine-wire cables, with sufficient lengths. Have attention for the weight of the cables.

Have attention for other risks on the test place eg. humidity, hotness, chemical hazard ... .

#### 3.4.2 Cable length

The length of the measurement lines must be constructed, as long as necessary, however as short as possible. Long connecting lines exhibit possibly a relatively high reactive part. It has a substantial influence on the high voltage measurement, in the small measuring range (special with 2 or 5 mA devices). A similar case is valid for the insulation resistance measurement, in the 100 MOhm range and higher (only for DC-devices).

### 3. MAKEREADY

#### 3.5 Mains CONNECTION

The device is connected to the mains using a mains cable with a plug with an earth contact.

Mains connection 230 V/49 - 61 Hz, mains fuse protection 16 A (provided by the customer).

#### 3.6 USING AND CONTROLLING

Prior to connecting the device to the mains, the following preparations must be made and the following instructions observed.

The tester can be used as a „stand-alone“ device (separate housing) or in automatic test systems (rack). In the case of devices with a touchscreen display, the device can be operated manually or using external control. In the case of automated devices, control must in all cases be via an external computer.

The high voltage is only allowed to be drawn via the high voltage sockets X2 and X3 on the rear of the device.

The device is controlled remotely in conjunction with the Ethernet interface X9 or RS232 / USB interface on the rear of the housing. It is then **only possible to define the test parameters using the interface (remote mode)** (test voltage, I<sub>max</sub>, I<sub>min</sub>, U<sub>min</sub>, etc.). The DA interface is to be connected as per the pin assignment given in chapter 6.2.4.

The commands for the RS-232 / Ethernet / USB interface are listed in the separate manual „Fernsteuerung über Schnittstelle“ (Remote control via interface).

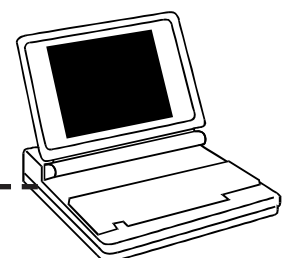
The safety circuit(s) must always be closed for test operation.

For safety reasons the device has two ‚safety circuits‘ SK1 and SK2 (see also chapter 6.2.6). If the safety circuit is interrupted, the high voltage is switched off immediately. It is not possible to apply the HV with a safety circuit open.

#### 3.7 Connection to the computer

The device must always be controlled remotely via an interface:

- Ethernet- or RS232-/ USB interface (option), depending on the options fitted to the device.



### 3. MAKEREADY

#### 3.8. Operating Touch Display

Touchscreen displays are touch-sensitive monitors. Areas are defined on them that represent, e. g. buttons (touch buttons), fields and message windows. There is in principle no difference between the operation of „touch buttons“ and pressing normal buttons. You operate touch buttons by touching them with a special „blunt“ stylus or your fingertip.

#### Errors due to triggering actions unintentionally!

Always only ever touch one point on the screen.

#### Damage to the surface of the touchscreen display!

Do not use any pointed, sharp or hot objects to operate the touchscreen display

#### 3.8.1 Entering arbitrary numerical values

- Touch the field where the entry is to be made (e.g. test time, actual value for the voltage, etc).

The system opens a numerical keypad.

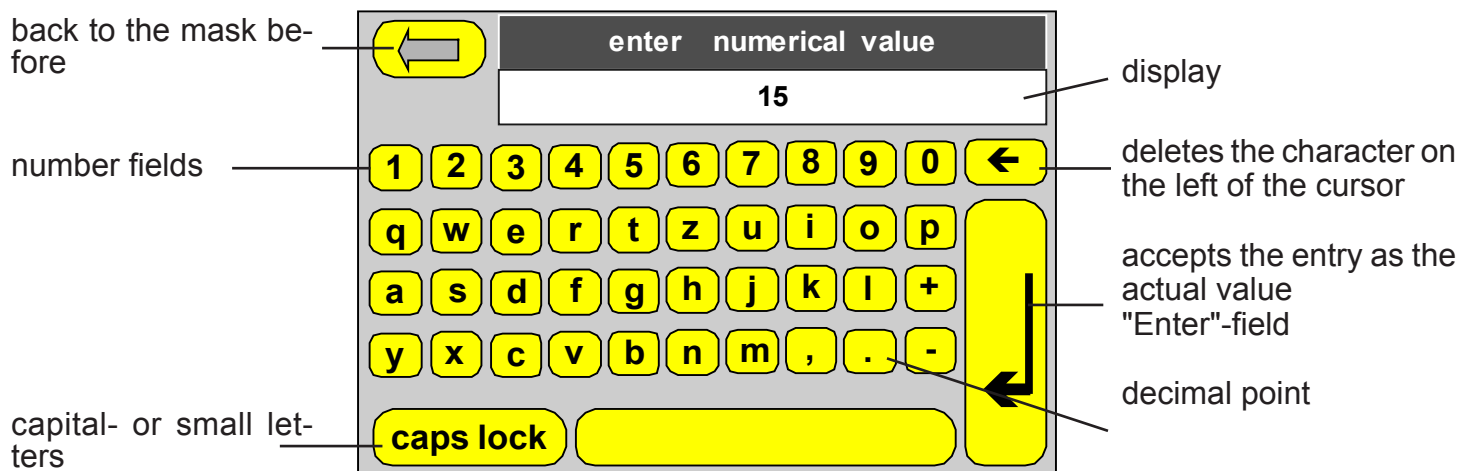


Fig. 3.6: Numeric keypad

The top line indicates the value currently entered (e.g. 15).

- Change the actual value by touching the number fields.
- Accept the value entered by touching the „Enter“ field. The new value is accepted as the actual value.



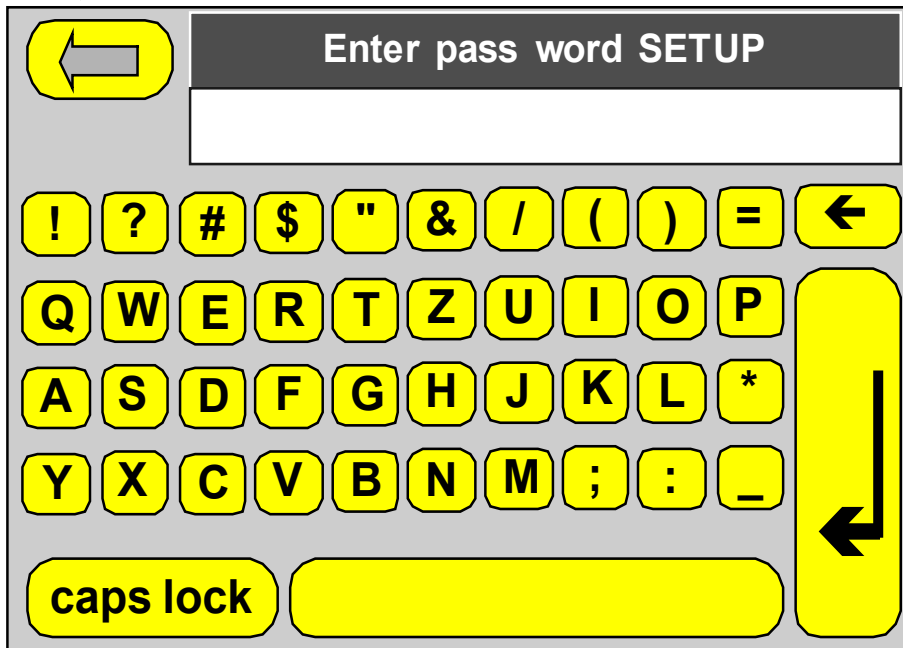
### 3. MAKEREADY

#### 3.8.2 Entering arbitrary text

The screen permits the entry of passwords, test plan names, descriptions, comments, etc.

- Touch the field where the entry is to be made (e.g. details, class names, etc).
- The screen is displayed automatically if an entry (e.g. password) is expected.

back to the mask before



Text box (max 256 characters)

Deletes the character on the left of the cursor

Accepts the entry as the actual value

Fig. 3.7: Screen keyboard for text entry

The text box indicates the text entered, in the case of passwords „#####“ characters are displayed.

- Enter your text by touching the alphanumeric fields.
- Accept the text entered by touching the „Enter“ field. The text is applied.

3. MAKEREADY

**3.9 Password protection**

For the device with a touchscreen display, there is 3-level password protection. The passwords can be activated and deactivated independently of each other. The passwords for the individual levels can be set separately.

Passwords are defined using the „Setup“ button

**3.9.1 Password level 1**

Protection against unauthorised usage of the device. It is not possible to make any changes to the test parameters or in the setup of the device. It is possible to load an existing test plan and execute the test. Changes at existing test plans are not possible.

ELABO default setting „**MESS**“

**3.9.2 Password level 2**

Protection against changes to the „test parameters“. Prompt after opening „Test plans“, „Manual test“ or „set of parameter“.

ELABO default setting „**PARAM**“

**3.9.3 Password level 3**

Protection of the „settings“ and Result browser menu. Prompt after opening the menu.

ELABO default setting „**SETUP**“

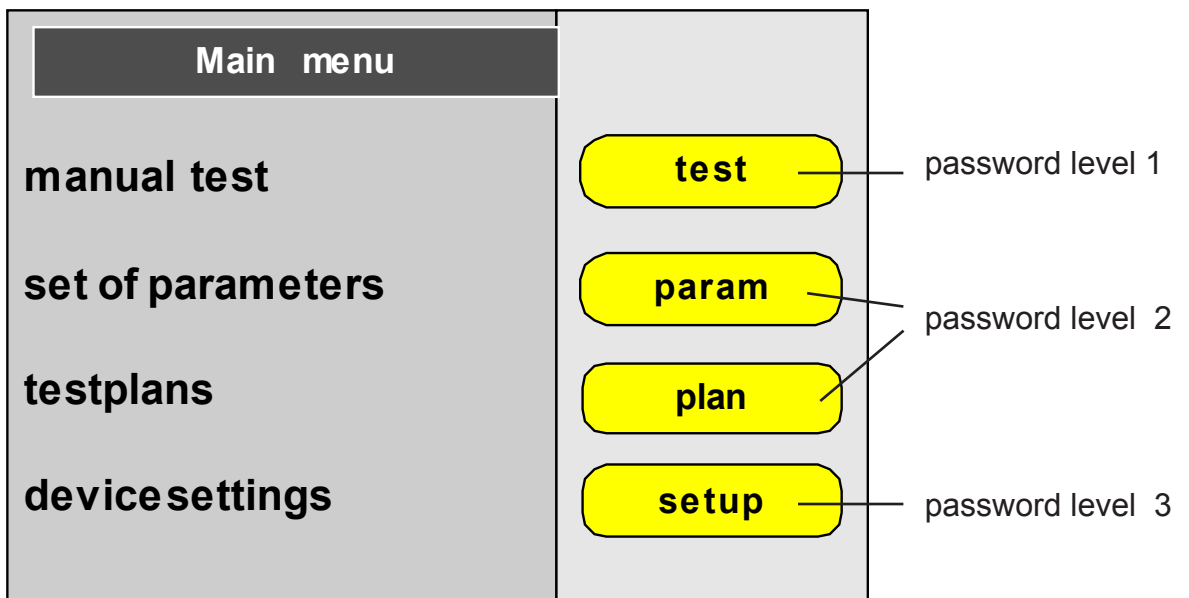


Fig. 3.8: „Start menu“ password levels

**Note:** On entering of the pass word, the level is unlocked permanently. The anew entering of the pass word is then on the next boot-up of the tester, necessary.

**Note:** If individual passwords no more known, it is possible to reset the old pass word by using a universal pass word, see also chapt. 10.6.

3. MAKEREADY

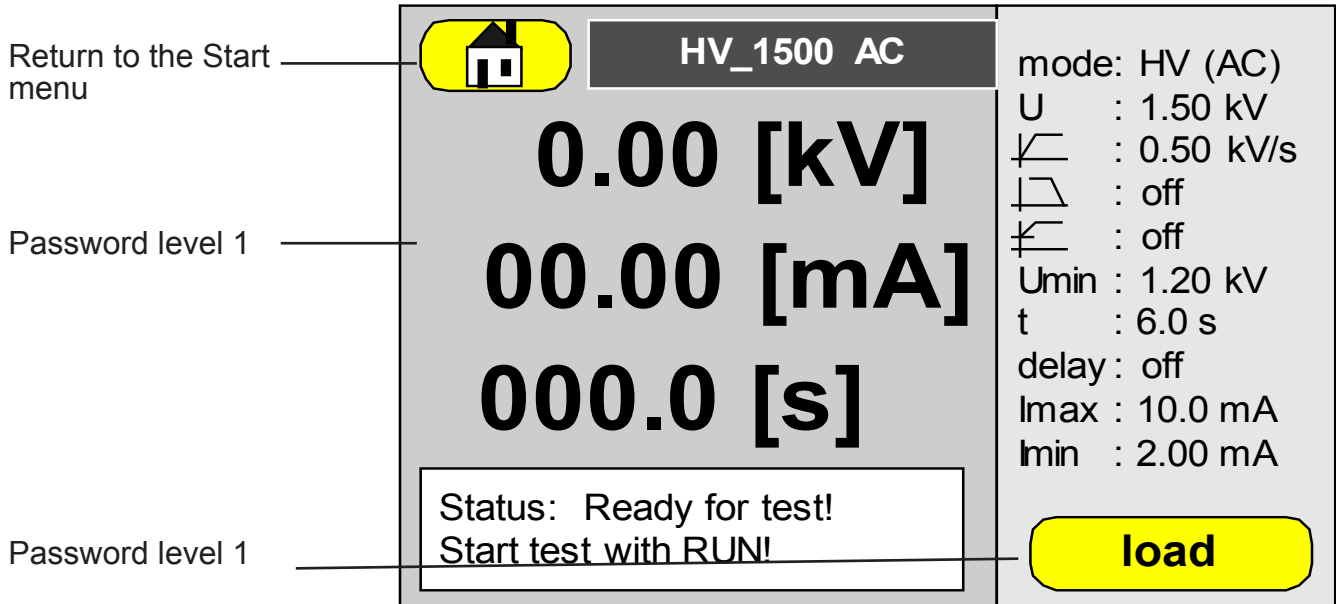


Fig. 3.9: Password levels „e.g. High voltage test“

### 3. MAKEREADY

#### 3.10 Switching on

Prerequisite:

- The device is installed in accordance with chapter 3.1 to 3.3.
- The device is connected in accordance with chapter 3.4 to 3.7.
- Chapters 3.8 and 3.9 are familiar.

- Switch the mains switch S1 to the „I“ position.

The mains indicator H1 in the switch illuminates.

The system is booting up and the display indicates the startup screen for approx. 5 s.

Now a the display is dark for approx. 5 s.



Fig. 3.10: ELABO Startup-screen

The display reports now

type  
serial no.  
software version



Fig. 3.11: ELABO Startup-screen

After the boot process, the device indicates the "main menu".



Fig. 3.12: Main menu



**Note:** As delivered all passwords are activated. If a menu command is selected, the password prompt appears, see chapter 3.9 further forward in this document.

3. MAKEREADY

3.11 Changing language

Language setting for the menu system\*).

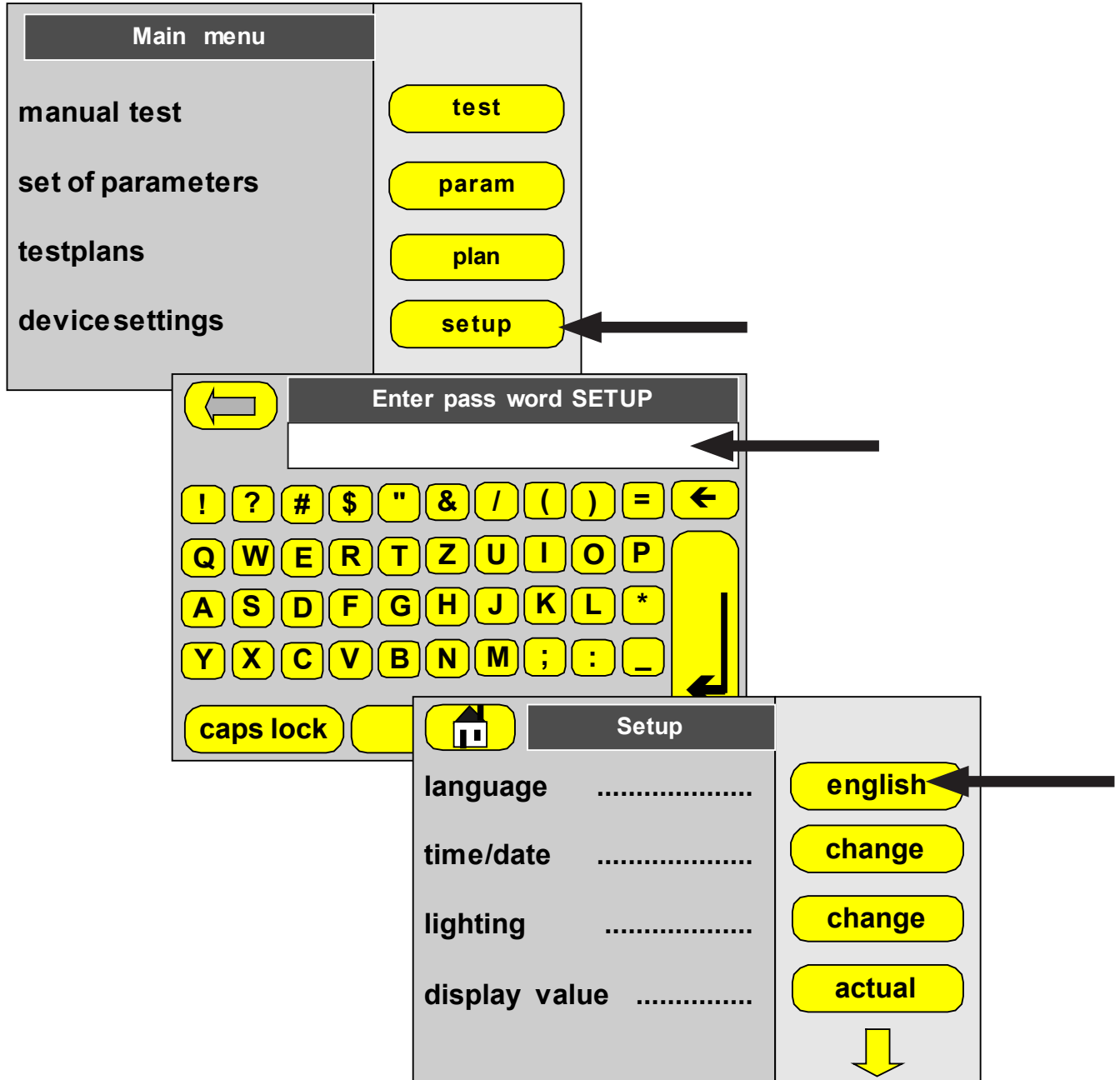


Fig. 3.13: Language setting

- Select the „Settings“ menu command (password level 3 necessary).
- Set the required language , by touch to the language field..
- Close the setup menu.
- Accept the .changes.

The change to the language will only be permanently active after you save the changes, see also chapter 10.6. Setup.

3. MAKEREADY

3.12 STATE past switch ON HV/IS

The device has a mains switch. After the application of the supply voltage, the device is placed in operation by switching on the mains switch.

After the mains switch is switched on, the built-in mains indicator H1 illuminates. The green indicator on the front panel is also briefly illuminated. If the optional warning lamp set (chapter 7.2) is connected, its green indicator also illuminates.

**Devices with touchscreen display:** After booting the operating system the touchscreen menu appears, see chapter 3.10.

**Remote control mode:** A high signal is applied to pin 4 on X7. The device is controlled using the digital interface (X7) in conjunction with the RS232 /Ethernet/USB interface.

**Interface only operation:** A low signal is applied to pin 4 on X7. The device is controlled only via the RS232 or Ethernet interface.

**Two starts mode:** Two start signals are always necessary to apply the high voltage. These can be: two start commands via the interface, or in the „Remote mode“ a „digital“ start and a start command over the interface (pay attention to sequence for commands). In the „Local mode“ (front panel) the green Set button must be pressed twice.

Operating mode	Front panel only		DA interface and RS232/Ethernet/USB				RS232/Ethernet/USB only	
		Front panel		Digital X7		RS232 X8 Ethernet X9		Only RS232 X8 Ethernet X9/
	SK1	SK2 <sup>1)</sup>	Remote	Set button				
	X7-21	X7-15	X7-4		X7-4	X7-2	X7-5	X7-4
	off	off	low		low	low	low	low
HV ready for test	on	on	low	1. Start	high	high (edge)	low	low
HV ON	on	on	low	2. Start			low	set HV (2)

<sup>1)</sup> Only tester past june 2010. See also Chapt. 6.2.3 "Digital Interface X7"

Fig. 3.14: Signal table



**Note:** Define the value for the test voltage and the I<sub>max</sub> limit, as well as start/stop voltage and ramp speeds and any other parameters as necessary via the touch-screen display or interface (remote mode).

For more detailed information see chapter 10.

3. MAKEREADY

3.12.1 SWITCH ON HV/IS

The diagram shows the states for the HV/ISO test. All prerequisites must be met for the high voltage test (see also state table further forward in this document). The safety circuit(s) must be closed.

**IN THE „HV ON“ STATE THE HIGH VOLTAGE IS APPLIED.**

**THERE IS MORTAL DANGER WHEN WORKING WITH HIGH VOLTAGE! FOR THIS REASON: WORK PARTICULARLY CAREFULLY AND CAUTIOUSLY!**



**Note:**

If the „SET“ and „RESET“ signal (X7, pin 3) are present at the same time, the „RESET“ command has priority: there is no start.

See also chapter 4 **OPERATING MODES.**

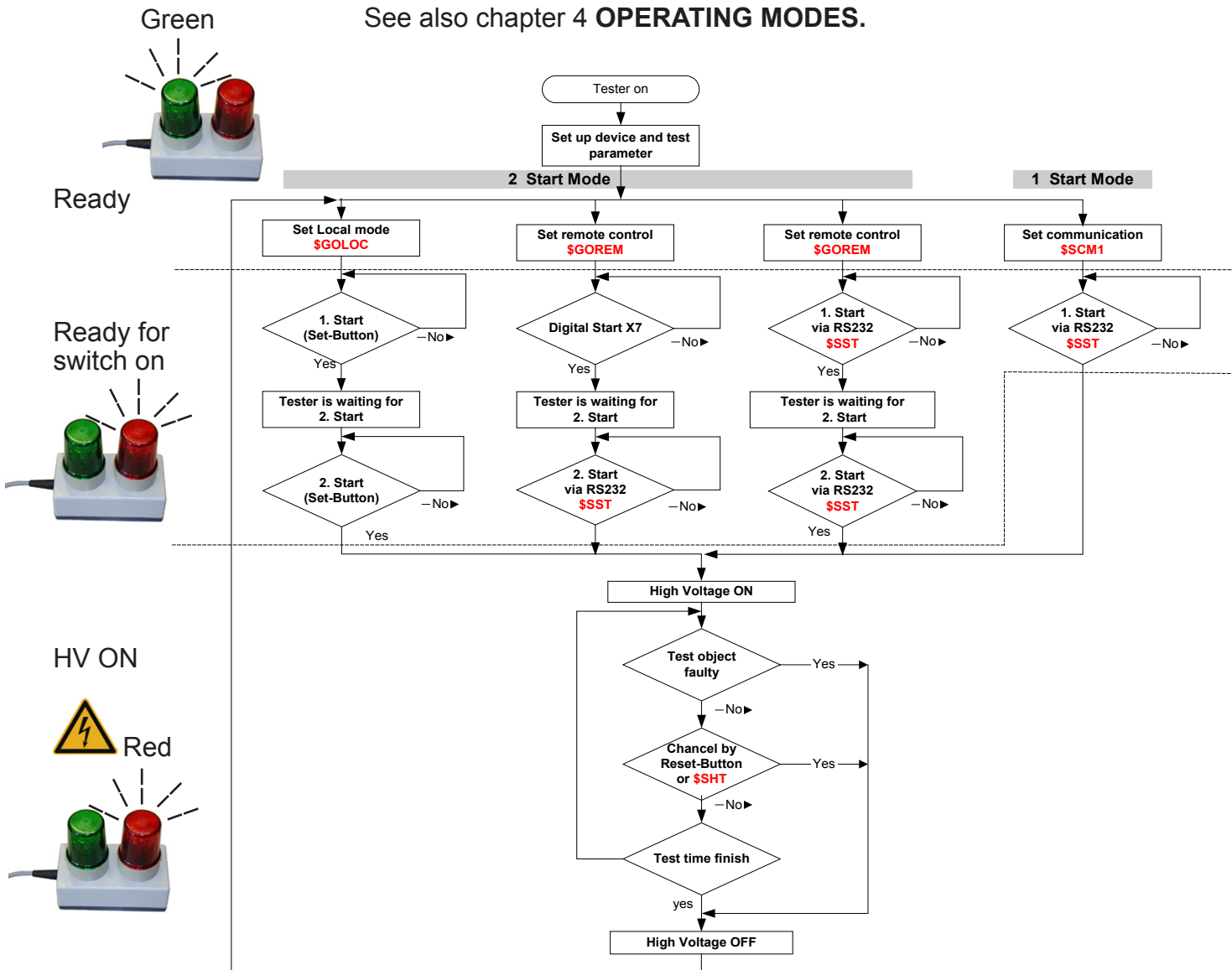


Fig. 3.15: 1. and 2 starts mode

### 3. MAKEREADY

The **red illuminated push-button S2/H2** illuminates and the actual values for output current and output voltage are indicated or can be retrieved via the interface.

For information on the selection of the other settings (AC/DC switching, trigger mode, measurement type, voltage set-point definition, etc.), as well as error messages: see chapter 5 and 10.



	Ready for switch on	HV ON	Fault
S2/H2 red	flashing	illuminated	flashing
S3/H3 green	off	off	off

#### 3.12.2 STATES ISO

**Note:** Define the value for the IS test voltage as well as the start/stop voltages and ramp speeds as necessary using the touchscreen display or interface (remote mode).

Define the value for the measurement range, the Rmin/ Rmax limit, as well as any other parameters as necessary using the touchscreen display or interface (remote mode).

**Attention - High Voltage - Danger For Life: the IS test is undertaken using DC high voltage.**



**IN THE „HV ON“ STATE THE HIGH VOLTAGE IS APPLIED.**

**The states are the same as for the high voltage test, see further forward in this document.**



3. MAKEREADY

3.12.3 STATES PE



**Note:** Define the value for the test current and the Rmax limit, as well as any other parameters using the touch-display or interface (remote control mode).

**State PE READY**

The device is ready, i.e. all prerequisites are met to undertake the PE test (see also table further forward in this document).

**State PE ON**

Manual start using PE probe (digital input on interface X7). Press the PE probe onto an electrically conductive part of the test object.

Automatic start via interface: The PE test is started by the control computer using an interface command.

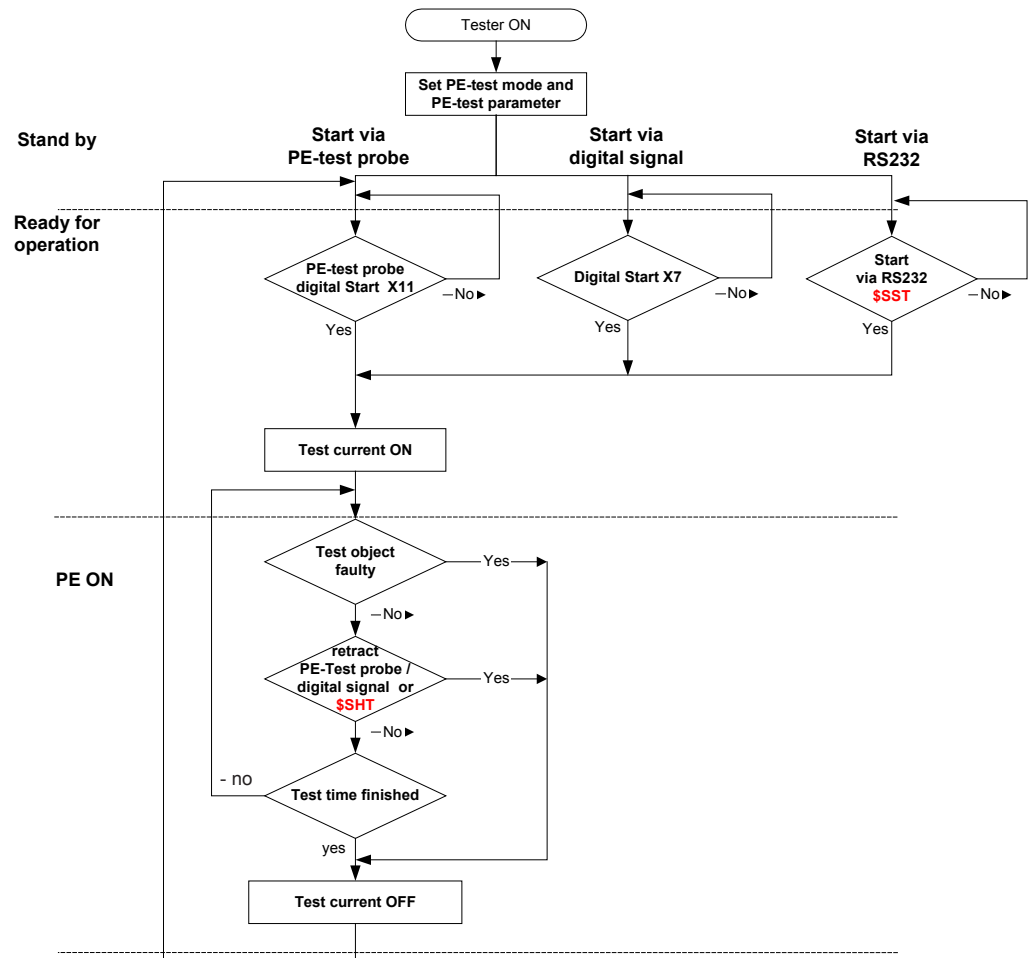


Fig. 3.16: PE start via PE-probe or interface

### 3. MAKEREADY

#### 3.13 CONTACT MONITORING

On the usage of the device in automatic systems, in many cases it is necessary to check the contact to the test object. One possible method of performing this check can be to monitor the current flowing through the test object with the high voltage applied.



For this purpose a base load is connected in parallel with the test object; if the current flowing does not reach a specific minimum value  $I_{min}$ , the connection is faulty. The magnitude of the current flowing can be monitored and evaluated via the interface using the  $I_{min}$  value.



The circuit diagram below (Fig. 3.18) shows the principle of the monitoring of the minimum current.

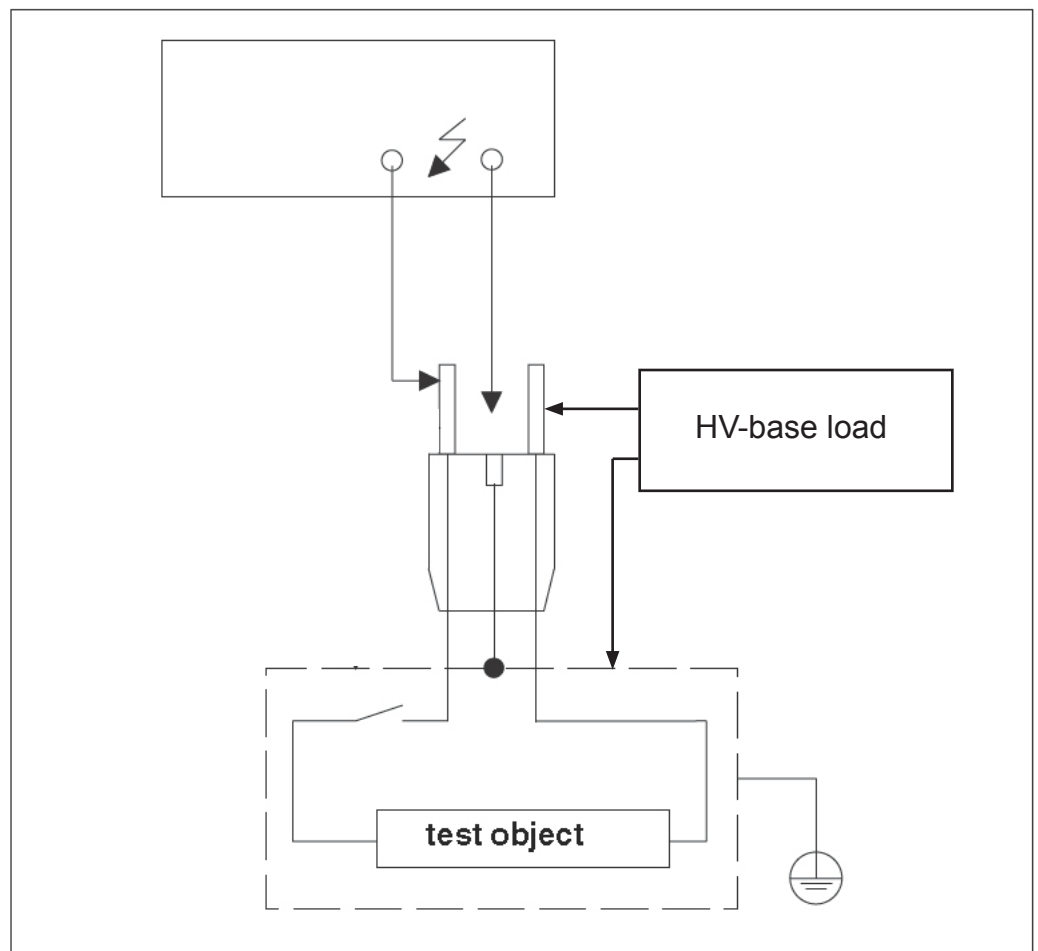


Fig. 3.17: Contact monitoring

### 3. MAKEREADY

#### 3.14 SAFETY CIRCUITS SK1 and SK2

The high voltage device is equipped with two safety circuits. Operation with a second safety circuit increases the safety on test systems with guards.



**ONLY AN ELECTRICIAN IS ALLOWED TO WORK ON THE SAFETY CIRCUIT, WITH THE DEVICE ELECTRICALLY ISOLATED FROM THE MAINS (UNPLUG FROM THE MAINS SOCKET).**

**Attention:**



Faulty safety circuits are only allowed to be repaired by an electrician with appropriate skills.

**Attention:**



The managerial staff must ensure the safety circuit works correctly, on site, immediately after the completion of the repair.

**Note:** SK1 is closed by connecting to U<sub>e</sub>  
SK2 is closed by connecting to GND

On this topic see chapter „Digital interface X7“

#### 3.14.1 Fault in the device's safety circuit



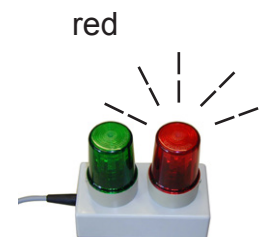
**Important:** If a malfunction is found in the safety circuit incorporated in the device, testing must be interrupted immediately. No further tests are allowed. The device must be sent to ELABO for repair without delay.

#### 3.15 Indication at the discharge of test objects

**Important:** Have attention to chapter 2.14 and 2.15.

If the test voltage is off, the test object is discharged by the tester automatically. The integrated residual voltage detection is monitoring the discharge process. If the residual voltage under-runs 60 V, the discharge process is finished.

As long as the discharge process is active, the red button "RESET" and the red lamp of warning-set is active. The digital output HV-ON (X7 pin 9) is holding "high".



4. Operating modes

4 OPERATING MODES

The device permits three basic operating modes: PE protective earth conductor test and high voltage test or insulation resistance test without ramp and with ramp. The operating modes must be pre-selected in the parameter settings, in the test plan or via the interface. The illustration below gives an overview of the operating modes, voltages and currents. .

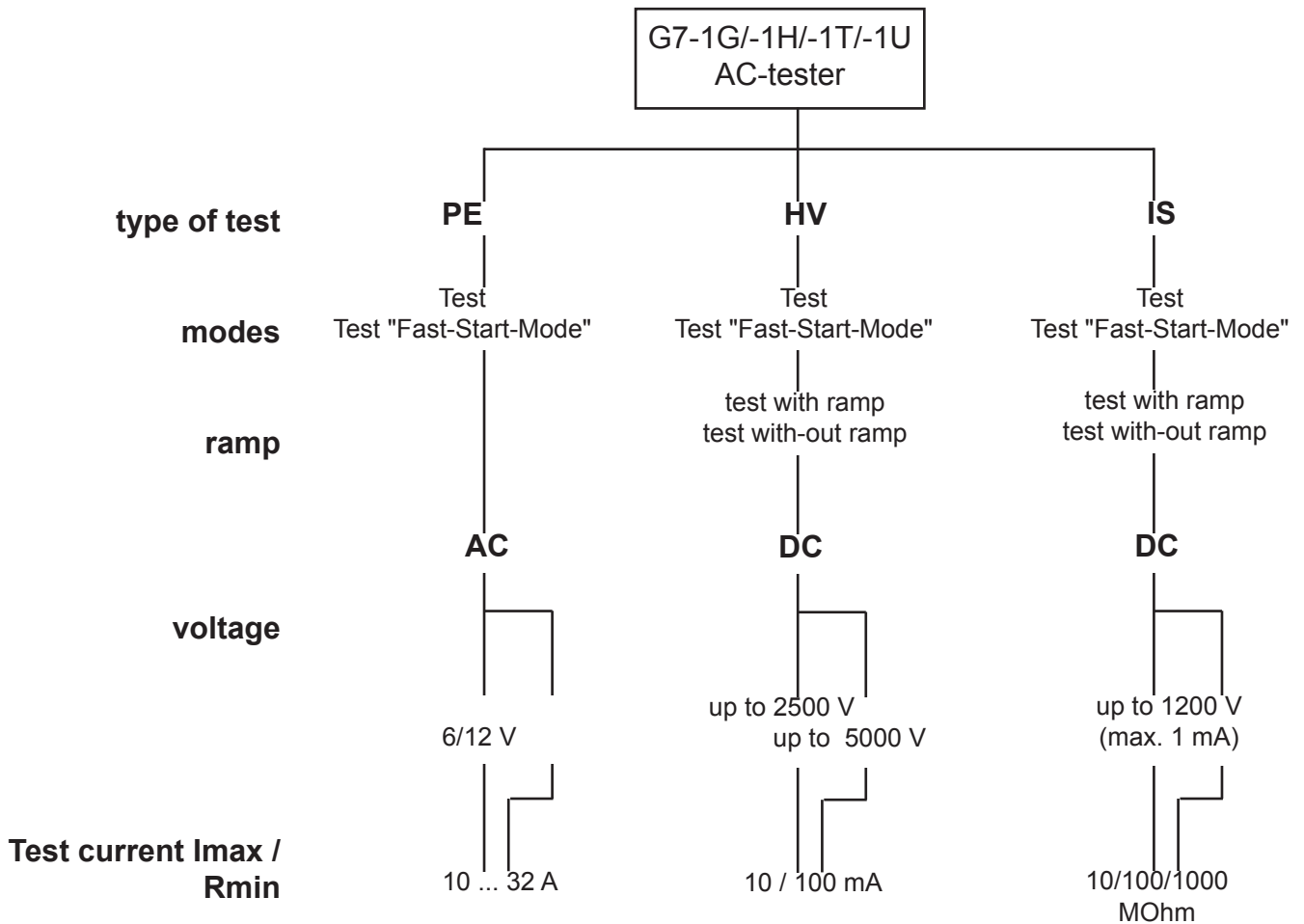


Fig. 4.1: Voltages and currents (special devices are different)

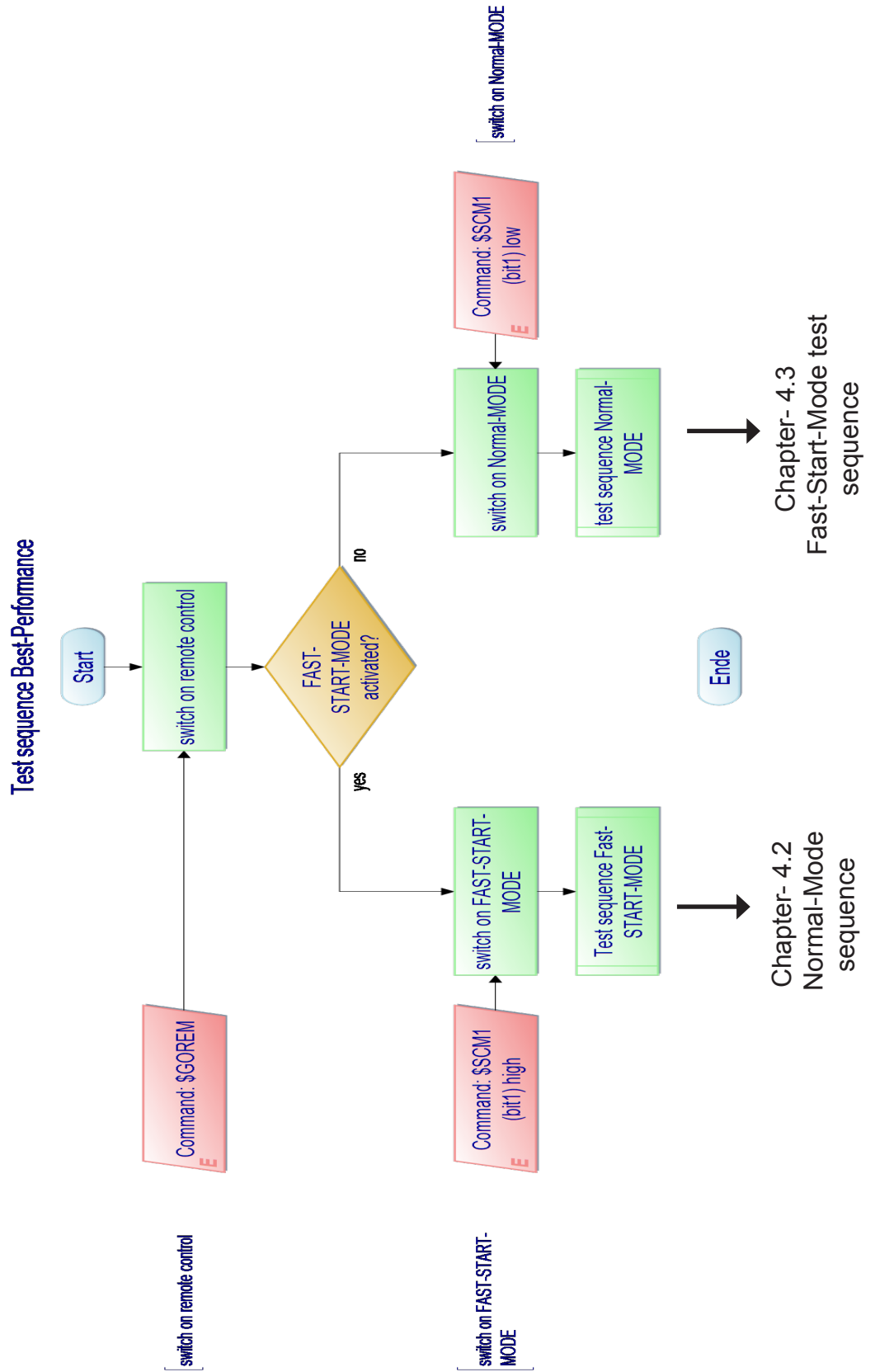
During the usage of the device, a differentiation is to be made between the s basic operating modes PE, HV and ISO.

For more detailed information see chapter 4.1ff.

Function tests can be processed as optional operating modes. However, the installation / attachment of optional hardware is necessary for this purpose.

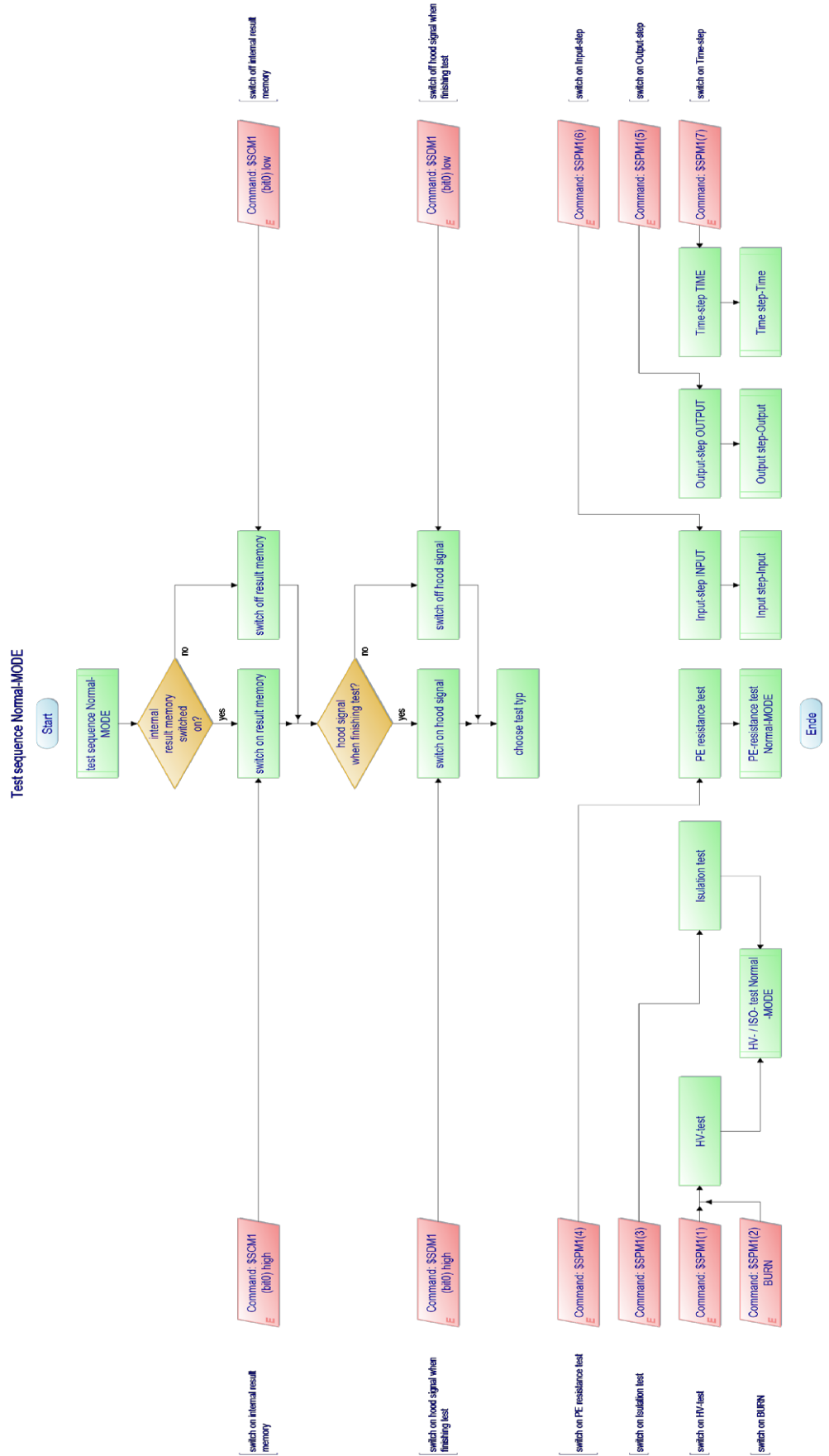
## 4. Operating modes

### 4.1 FAST-START-MODE OR NORMAL-MODE



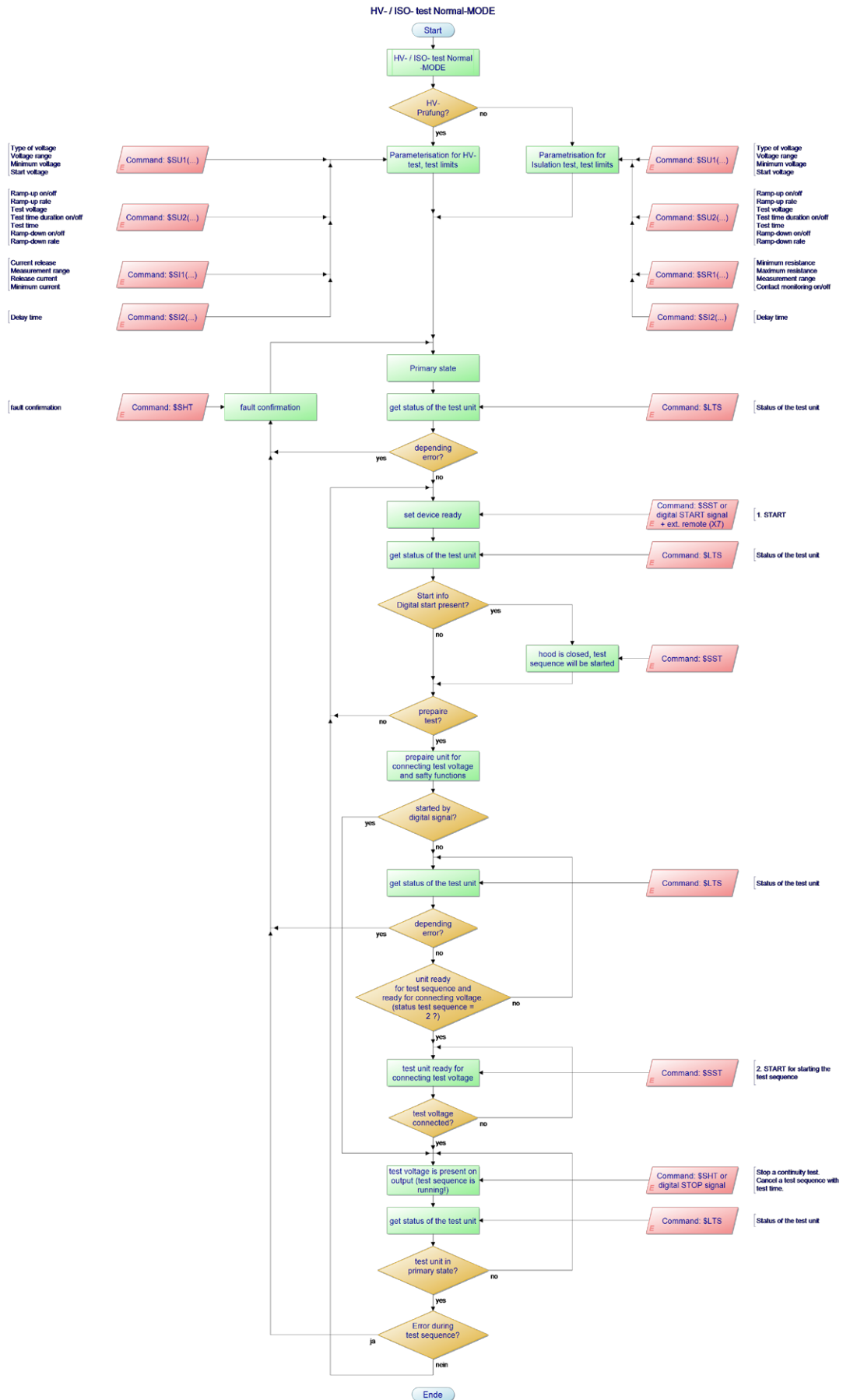
## 4. Operating modes

### 4.2 Normal-Mode Test sequence



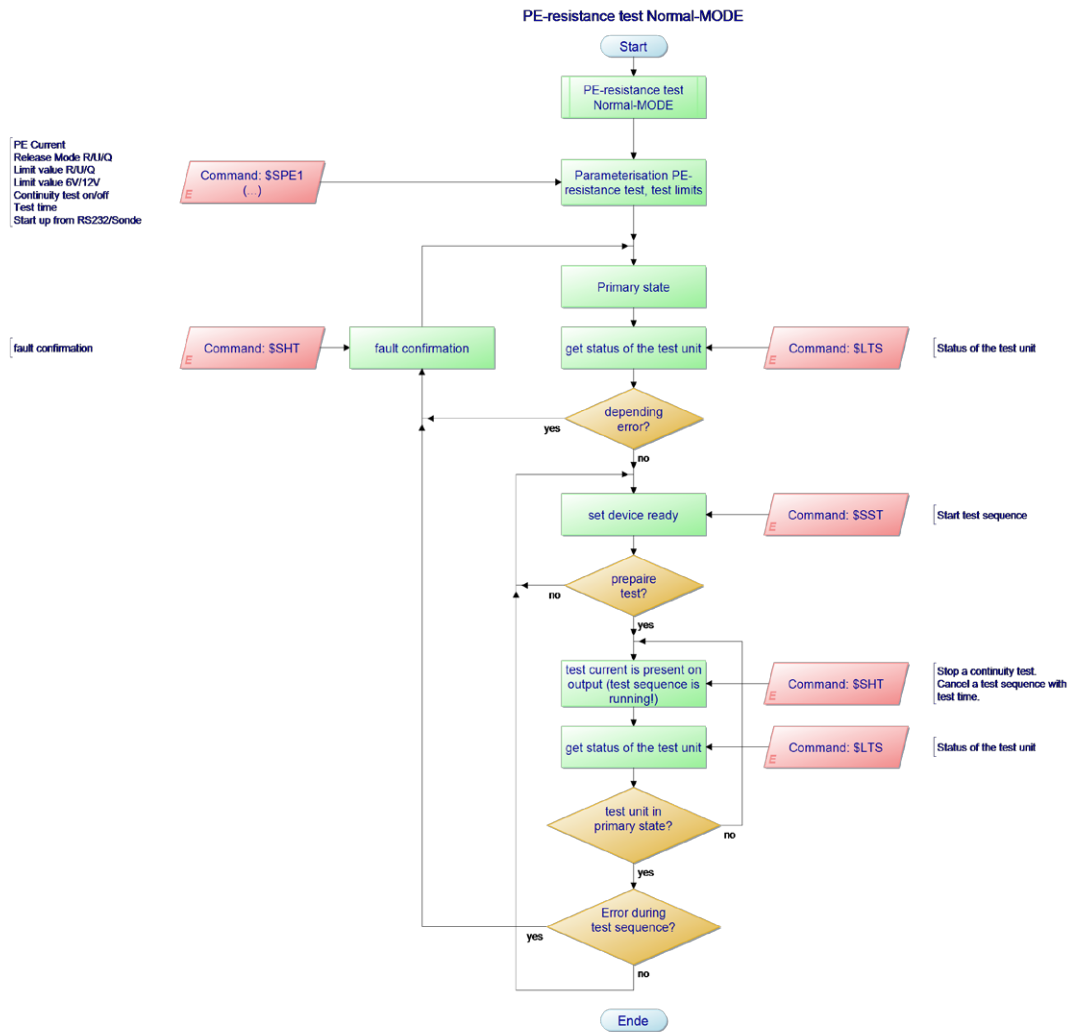
## 4. Operating modes

### 4.2.1 HV/IS-test normal mode



## 4. Operating modes

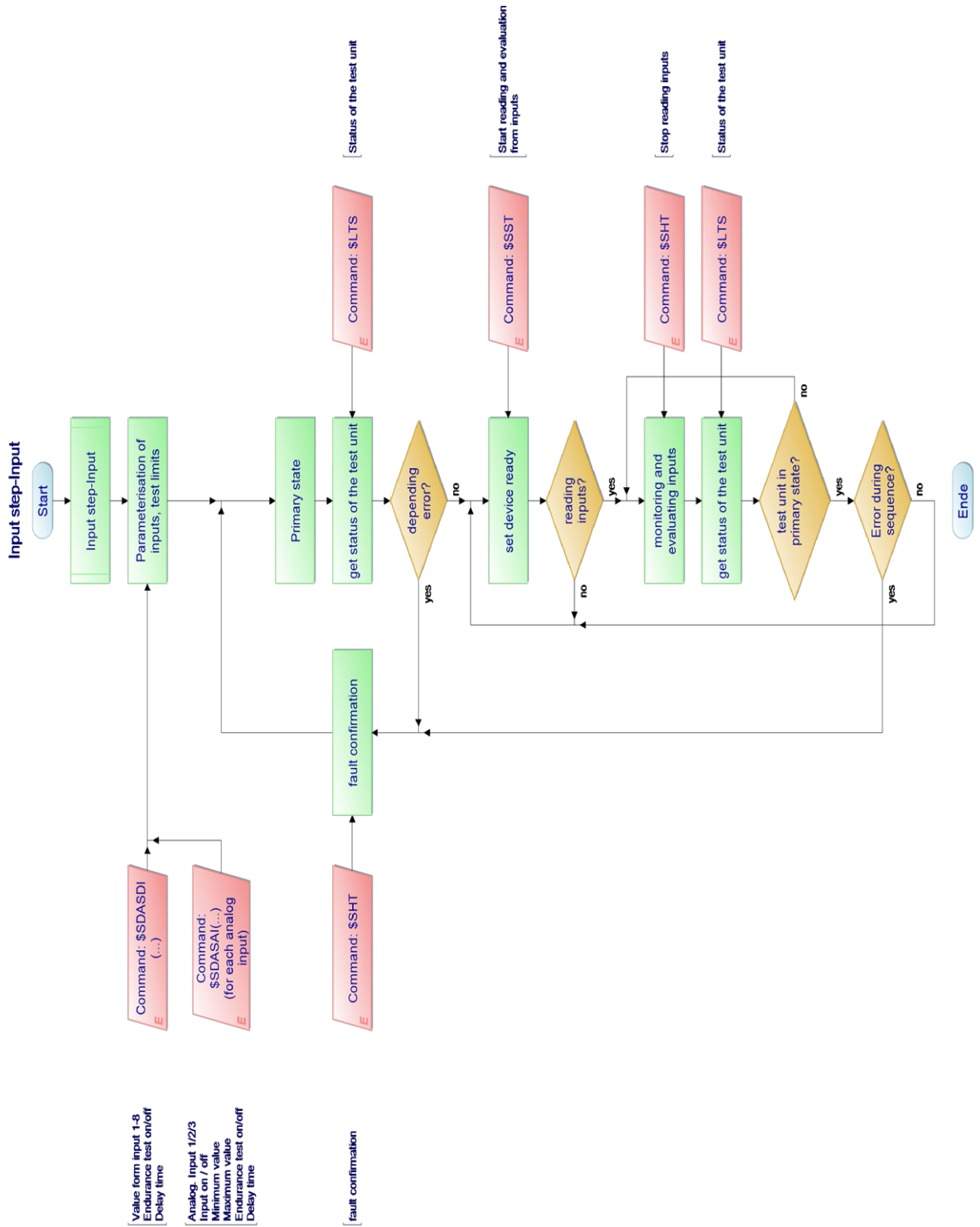
### 4.2.2 PE-test normal mode





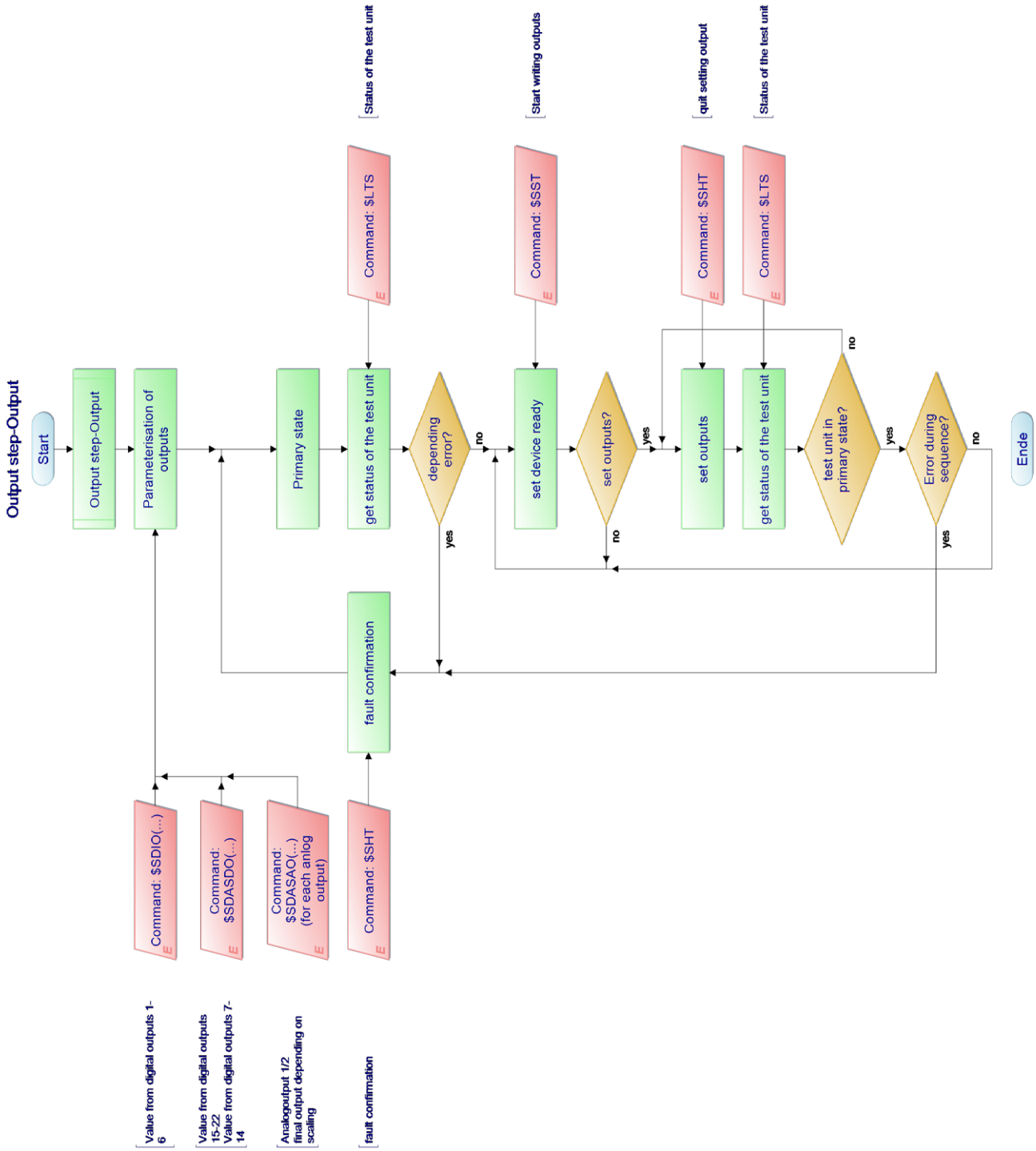
## 4. Operating modes

### 4.2.3 Normal mode input step



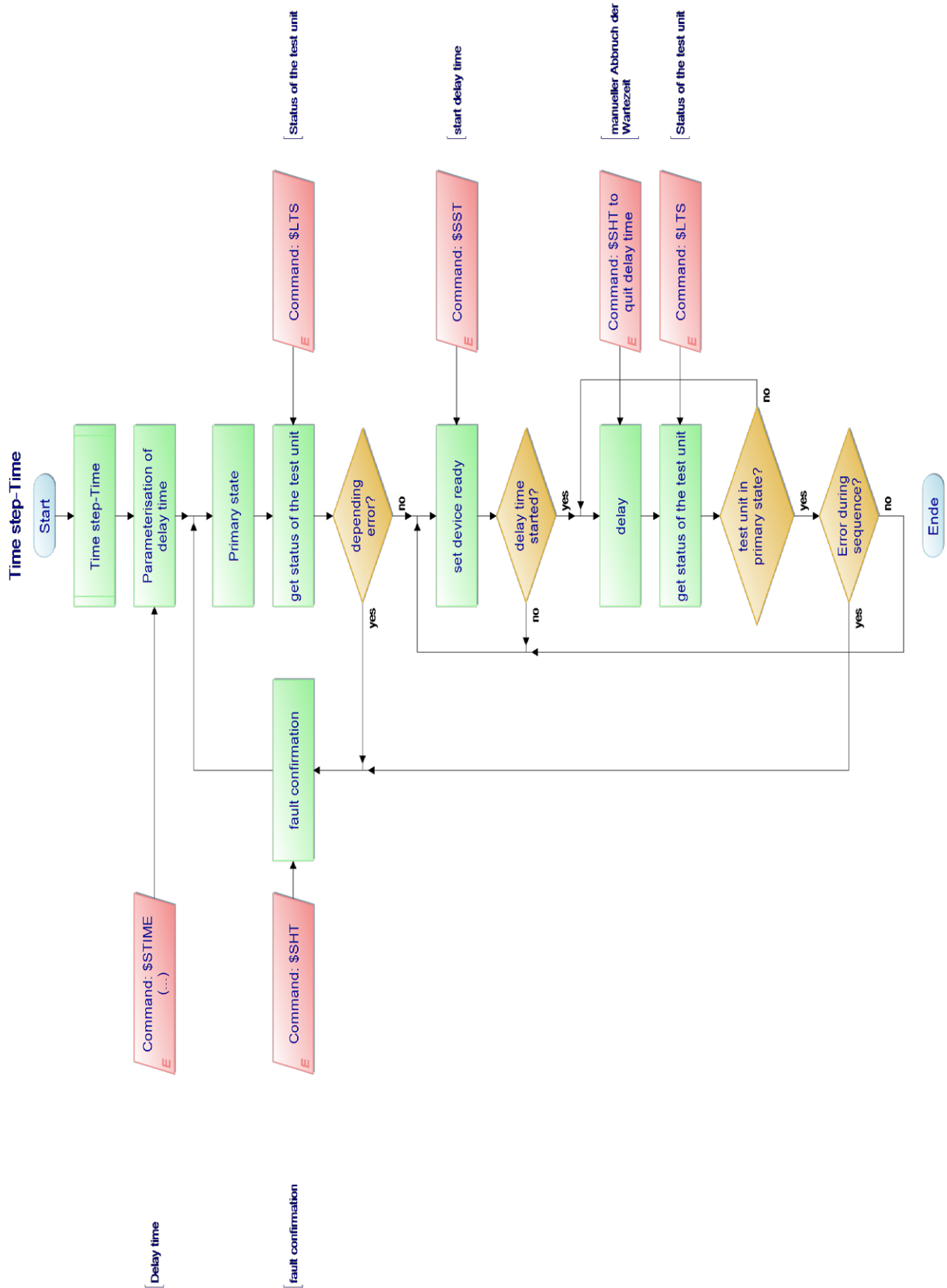
## 4. Operating modes

### 4.2.4 Normal mode output step



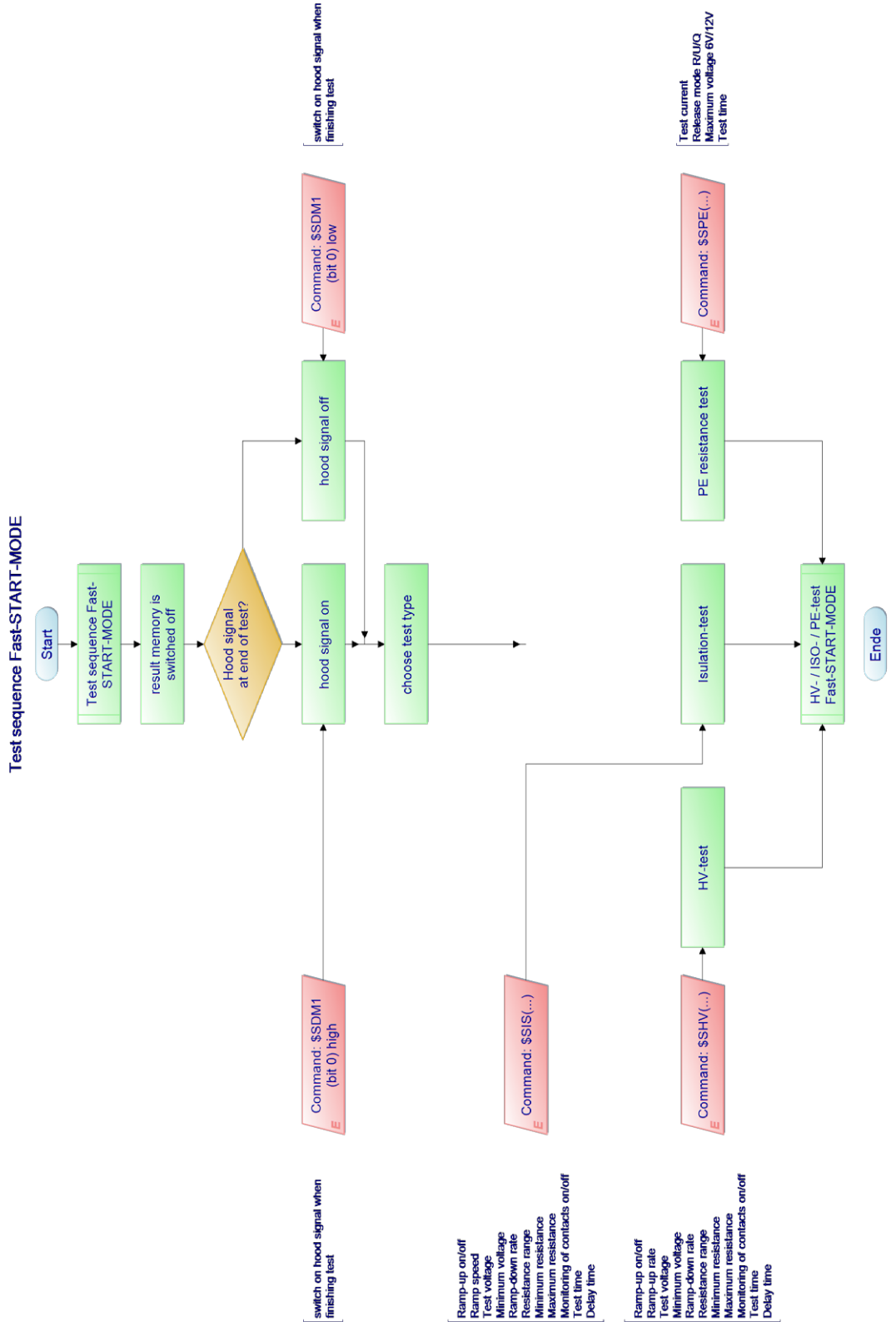
## 4. Operating modes

### 4.2.4 Normal mode time step



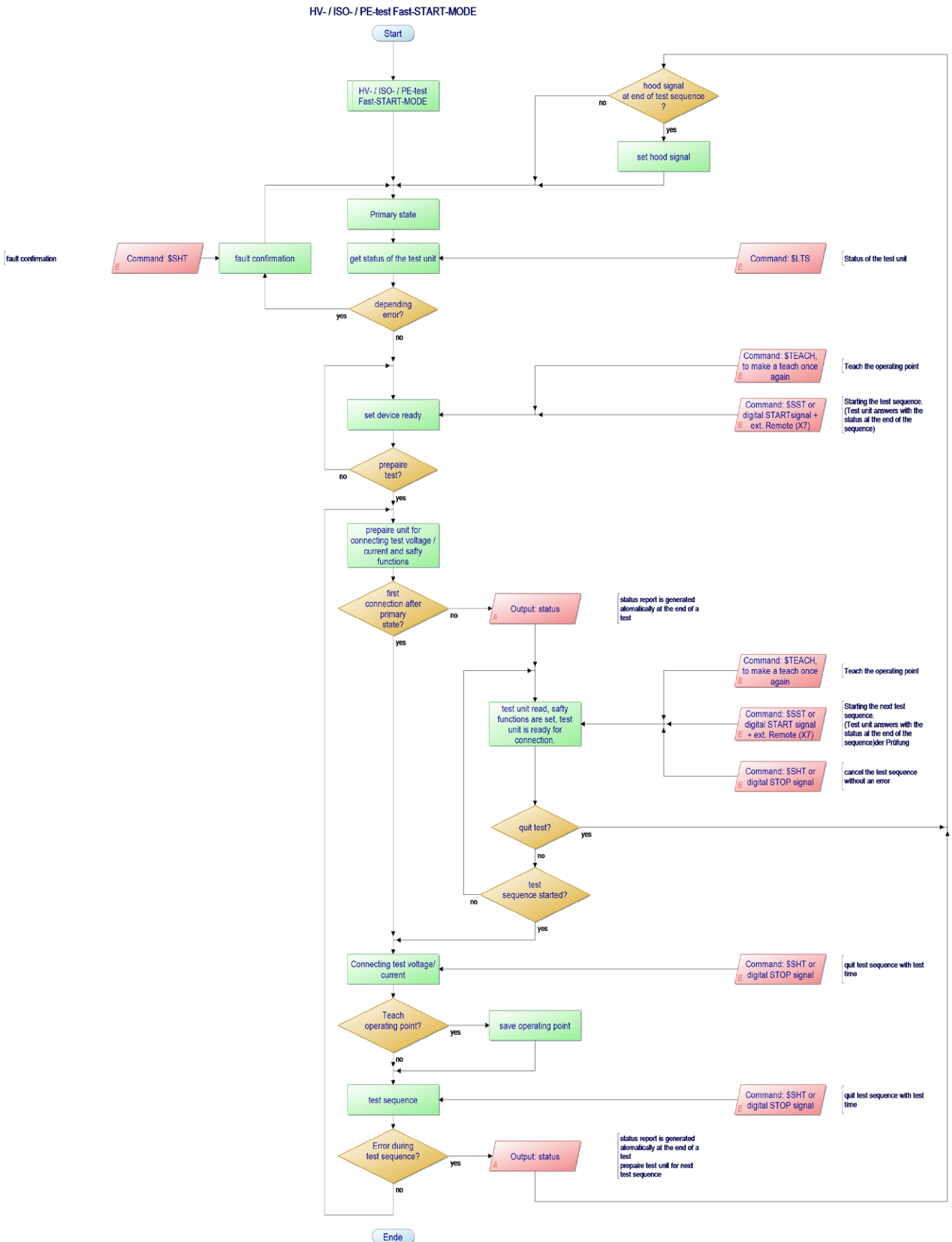
4. Operating modes

4.3 Fast-Start-Mode test sequence



## 4. Operating modes

### 4.3.1 Fast-Start-Mode PE-HV-ISO-Test



5. ERROR MESSAGES

5 ERROR MESSAGES

Depending on the priority of the error, in some circumstances the high voltage is switched off.

At the same time the text describing the error is indicated on the display and the related outputs on the interface X7 set (cf. chapter 6).

The text describing the error and the errors messages are cleared once the error has been acknowledged using the red illuminated push-button (S2/H2), on the digital interface using RESET (X7, pin 3) or using the serial command „\$SHT“, and the faults have been rectified.

The table below gives an overview of the possible errors and their consequences. An error with a higher priority (further up in the list) will be superimposed over a lower priority error and suppress its message.

Abbreviations and explanations on the information in the table:

- BB State READY (chapter 3.12)
- E State ON (chapter 3.12).

Poll using „\$LTS“ command Z column (see appendix for documentation on remote control).

State	Fault	Digital outputs					RS232 Status	Action	Acknowledge- ment of the error necessary?
		Ac- cept	I > max	Sys-Fault	HV-ON	H2			
BB	SK - Safety circuit open	0	0	0	0	off	9,10	No start	no
E	I > I <sub>max</sub> flash over	0	1	0	0	flashing	5, 50;51	High voltage switched off	yes
E	Over temperature	0	0	1		flashing	14	High voltage switched off, leave to cool down	yes
E	SK offen (Safety circuit open)	0	0	1	0	flashing	9,10	High voltage switched off	yes
E	HV-voltage is not reached U < U <sub>min</sub>	0	0	1	0	flashing	2,3	High voltage switched off	yes
E	Reset via S2 "User break" or via command „\$SHT“	0	0	1	0	flashing	8		yes
E	Test time not finished	0	0	1	0	flashing	4	High voltage switched off	yes
E	Contact monitoring I < I <sub>min</sub>	0	0	1	0	flashing	6	High voltage switched off	yes
E	Timeout: switch off residual voltage monitoring	0	0	1	0	flashing	15	High voltage switched off	yes
E	Maximum test time exceeded	0	0	1	0	flashing	16	High voltage switched off	yes
E	No error	1	0	0	0	off	0 and 1	High voltage switched off after test time elapsed	no

Digital output "HV-ON" is switched on (1) if the high voltage is active (also at residual voltage while discharge)

6. INTERFACES

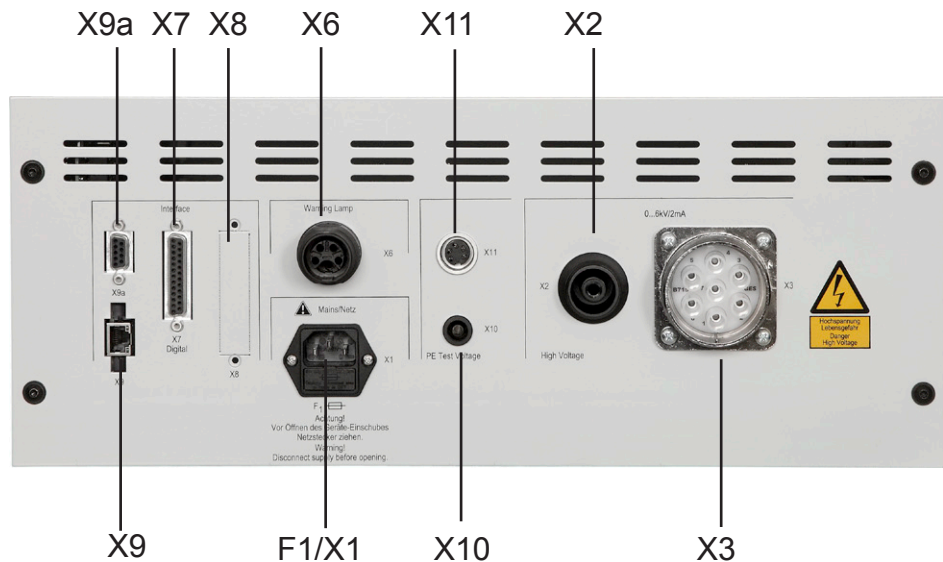
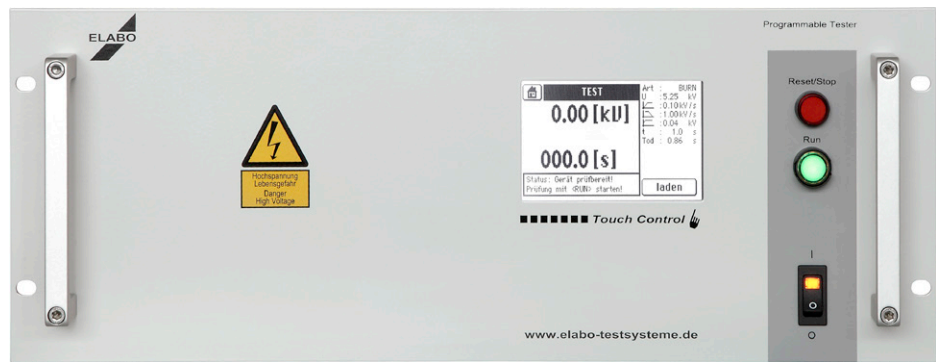
6 CONNECTIONS / INTERFACES

6.1 Power connections

6.1.1 High Voltage

The high voltage connectors X3 and X12 on the rear are used as an output for the test voltage.

- X2 HV socket - connection of the HV test probe.
- X3 Krönes HV socket 7pole - connection of the adapter box.(see also Chapt. 6.3).



6.1.2 PE-Conductor Test (Rx)

For the connection for the protective earth conductor measurement a lab terminal (PE current1) and a control socket (sense1) are provided. PE current2 and sense2 are connected to X3.

- X10 DIN socket 5pole, sense and start contact (chapt 6.4).
- X11 Test current socket (32 A)

## 6. INTERFACES

### 6.1.3 X6 Warning lamp set 94-2C connection

The round connector is for the connection of the Elabo warning lamp set 94-2C or signal tower F9-1A..

X6-1	Phase (230 V) for green lamp
X6-2	Phase (230 V) for red lamp
X6-3	N for both lamps



## 6. INTERFACES

### 6.2 INTERFACES

**Note - driver software for PC.**

Driver-software and driver-manuals are located at the ELABO Support CD, enclosed to the device manual. The interface and the control commands are described in the separate manual „Remote control via RS232/Ethernet“.

#### 6.2.1 Ethernet-INTERFACE X9

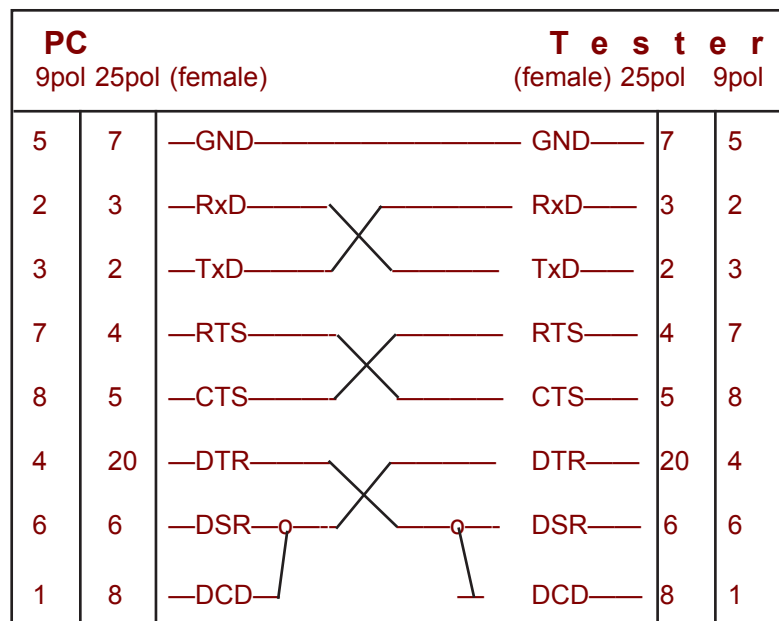
The Ethernet-interface is installed in the device as the standard interface. Via interface X9, the firmware update of the touch display module is possible (see also chapter 13 ELABO Lite Software).

#### 6.2.2 USB-INTERFACE X9

The USB-interface is installed in the device as optional interface (replacement for the Ethernet-interface).

#### 6.2.3 RS232 INTERFACE X9

The USB-interface is installed in the device as optional interface (replacement for the Ethernet-interface). The 9-pin D-SUB socket X9 is provided for the connection to a control computer. The connections DTR, DSR,



DCD are not essential necessary.

#### 6.2.4 Service-INTERFACE X9a (RS232)

Use the service-interface X9a exclusive for updating the firmware of the control module of the tester, via the ELABO Light Software (Chapt. 13).

The occupation of X9a see fig. 6.2.

Note: The control of the tester via X9a is not possible, use interface X9 for this.

## 6. INTERFACES

### 6.2.5 DIGITAL INTERFACE X7

For the connection of the safety circuits and for external control, the device has a 25-pin connector X7.

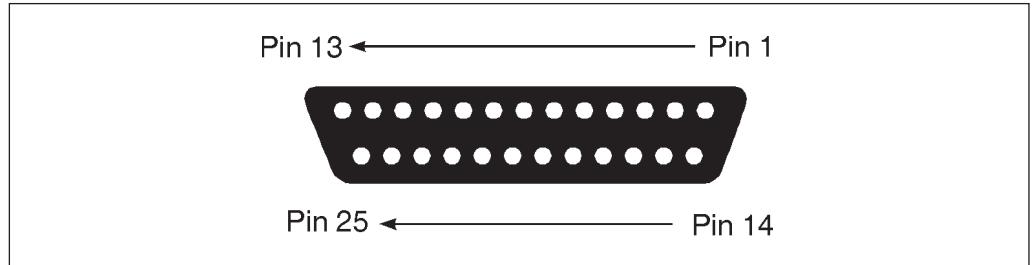


Fig. 6.3: View of connector X7



**Note:** The inputs and outputs described in the following are connected to X7 in the standard device. Additional digital outputs can be purchased as an option.

**Note:** To activate the digital inputs, a voltage of +5...24V DC must be applied. For this purpose you can apply the +24V (+Ue) control voltage on pin 22. Ground is pin 17 (GNDE).

#### Auxiliary voltage +Ue:

This floating control voltage makes it possible for the user to control the device via the digital interface without the need to connect an external power supply.



**Note:** The maximum load including the outputs should not exceed 300mA.

Pin 22      **+Ue** (24V/0.3A)

Pin 17      **GND** (reference potential)

#### Safety circuit „SK1“:

If this pin is connected to +Ue (pin 22) or an external power supply, SK1 is closed. In the case of operation in a test system the circuit is closed by a safety switch that is actuated when the guard is closed.

Pin 21      **SK1**

#### Safety circuit SK2

Pin 15      **SK2 (default)** - If this pin is connected to GND (pin 17) SK2 is closed ( negative switching).

Pin 16      **SK2** - Using internal jumpers, SK2 can be changed to +“positive switching“. SK2 is then closed by making a connection between pin 16 and +24 V DC (pin 22)..

#### 6.2.5.1 OUTPUTS

The digital outputs are designed for „positive switching“, for 24V/ approx. 50mA. The reference potential in this case is also GND.

## 6. INTERFACES

### Over current trip „I > I<sub>max</sub>“:

„Positive switching“ transistor output. In case of an over current trip, the output is set to „High“.

Pin 8            **I>I<sub>max</sub>**            Load rating: 24 V/max. 50 mA

### High voltage applied „HV-On“ (safety tests active - HV, ISO):

„Positive switching“ transistor output. The output is set to „High“ if the HV-, or ISO-Test is active. As long as high voltage is applied to the output jacks, the red reset button on the front panel lights up. This also applies to voltages, which coming back from the test object(charging). On PE-test the output is not active.

Pin 9            **HV-On**            Load rating: 24 V/max. 50 mA

### Test „Accept“

„Positive switching“ transistor output. The output is set to „High“ if the prior test has been performed without a fault. The output stays „High“ until the start of the next test.

Pin 10           **Accept**            Load rating: 24 V/max. 50 mA

### „Open cover“

„Positive switching“ transistor output. This output is used to operate a pneumatically operated test cabinet. After the end of the test a pulse approx. 250 ms long is generated to open the test cabinet. This function can be disabled depending on the configuration of the device.

Pin 11           **Open cover** Load rating: 24 V/max. 50 mA

### „System-fault“

„Positive switching“ transistor output. The output is set to „High“ if a test is interrupted prematurely, the contact monitoring becomes active, the minimum test voltage is not reached, or other system errors occur.

Pin 12           **System-fault** Load rating: 24 V/max. 50 mA

### „External discharge relay“ (only active at HV DC and ISO)

Using this output a relay can be operated that discharges the test object after the high voltage is switched off (in addition to the internal discharge). It is recommended to execute the discharging, by using a suitable resistor in alliance with the normal-closed contacts of the external relay.

„Positive switching“ transistor output. The output is set to „High“ when the test is started (HV applied). After the high voltage is switched off, the output switches to „Low“:

- **immediate** - with residual voltage measurement switched off
- **after dropping below 3000 V** - with residual voltage measurement switched on

Pin 13           **External discharge relay** Load rating: 24V/max. 50mA

## 6. INTERFACES

### 6.2.5.2 INPUTS

A „High“ signal on a digital input on the digital interface can be achieved in two different ways.

- Connect the auxiliary voltage +Ue (X7, Pin22) to the related input.
- Apply an external auxiliary voltage of +24 V DC to the related input pin. However, in this case the ground for this supply voltage is to be connected to GND (X7, pin 17).

An open (digital-) input is recognized as LOW.



**Note delay-time:** Between the reset-operation of an input and a following set operation of an other input, a minimum delay-time of 100 ms must exist (reaction time of the electronic, relay setting, ...).

#### „Set HV“ Start an HV test:

The connection of pin 2 to +Ue (or an external supply voltage) will apply the high voltage. The signal can be present as pulse of 100 ... 500 ms, preferably.



**Note:** A „set“ using this interface is only accepted if the device is in the remote control mode (pin 4 connected to +Ue, see Remote control mode)

Pin 2            **Set HV**

#### „Reset HV“ Interrupt or switch off a HV test:

The connection of pin 3 to +Ue (or an external supply voltage) interrupts a high voltage test started, or clears an error that has occurred previously. The signal can be present as pulse of 100 ... 500 ms, preferably.

A **reset** signal always has priority over a **set** signal.



**Note:** A reset using this interface is only accepted if the device is in the remote control mode (pin 4 connected to +Ue, see Remote control mode).

Pin 3            **Reset HV**

#### „Remote“ control mode:

The device is placed in the remote control mode by connecting pin 4 to +Ue (or an external supply voltage). Only then is it possible to control the high voltage tester using the digital interface.

Pin 4            **Remote**

#### „PE start probe“

The connection of pin 5 to +Ue (or an external supply voltage) will switch on the PE test. The signal must be present for the duration of the PE-test. In other case the device will report "user interrupt". The input is replacing the start via the PE probe (button).

**Note:** Only in the remote control mode (see Remote control mode)

Pin 5            **PE start probe**

#### Pins not connected

Pin 1; pin 6, pin 7, pin 14,

## 6. INTERFACES

### 6.2.5.3 DIO - additional digital interface (option)

See also chapter 12.

#### Expanded digital interface option G1-1 E06

These 6 additional digital outputs DIO1 ... DIO6, can be set/reset in the test plan. For this, appropriate presettings must be performed and input / output parameter blocks have been created. See also chapter 12. A further possibility is activation / deactivation via serial remote control (see remote control commands). All outputs are positive switching transistor outputs.

The additional digital outputs DIO1 ... DIO6 are located at the 25-pole interface XS7. The load rating per output is 24V/max. 50mA.

DIO1	XS7 Pin 18
DIO2	XS7 Pin 19
DIO3	XS7 Pin 20
DIO4	XS7 Pin 23
DIO5	XS7 Pin 24
DIO6	XS7 Pin 25

### 6.2.6 XS8 - Expanded digital/analog interface (option)

The additional outputs/inputs can be controlled in the device menu or via serial remote control (see remote control commands). See also Chapt. 12.

#### Expanded digital/analog interface XS8

- 16 additional digital outputs
- 8 additional digital inputs
- 2 additional analog outputs
- 3 additional analog inputs

#### 16 additional digital output

The 16 additional digital outputs DASDO1 ... DASDO16, can be switched on/off in the test plan. For this, appropriate presettings must be performed and input / output parameter blocks have been created. See also chapter 12. A further possibility is activation / deactivation via serial remote control (see remote control command \$DASDO)

All outputs are positive switching transistor outputs. The load rating per output is 24V/max. 10mA

#### 8 additional digital inputs

The 8 additional digital inputs DASDI1 ... DASDI8, can be switched active or off in the menu. For this purpose the „Input“ function is to be inserted at a suitable point in the test plan and the related input and its state (on/off) evaluated. A further possibility is activation / deactivation via serial remote control (see remote control command \$DASDI).

Digital Inputs 5 - 24 V DC

## 6. INTERFACES

XS8 Pin	Digital	Analog	
1	DIO7		Digital output
2	DIO9		max. 10mA
3	DIO11		"
4	DIO13		"
5	DIO15		"
6	DIO17		"
7	DIO19		"
8	DIO21		"
9		DII1	Digital input
10		DII3	5 - 24 V DC
11		DII5	"
12		DII7	"
13	GNDD		Ground digital
14	24V		24V voltage
15	nc		not connected
16		AO1	Analog output
17		AI1	Analog input
18		AI3	0 - 10 V DC
19	GNDA		Ground analog
20	DIO8		Digital input
21	DIO10		"
22	DIO12		"
23	DIO14		"
24	DIO16		"
25	DIO18		"
26	DIO20		"
27	DIO22		"
28	DII2		Digital input
29	DII4		"
30	DII6		"
31	DII8		"
32	GNDD		Ground digital
33	24V		24V voltage
34	nc		not connected
35		AO2	Analog output
36		AI2	Analog input
37	GNDA		Ground analog

### 2 additional analog outputs

The both additional analog outputs ADSAO1 and DASAO2, can be defined in the menu. For this purpose the „Analog output“ function is to be inserted at a suitable point in the test plan and the related output and its state (value) defined. A further possibility is activation / deactivation via serial remote control (see remote control command \$DASAO).

## 6. INTERFACES

Analog outputs 0 ... 10 V DC.

### 3 additional analog inputs

The three additional analog outputs ADSAI1 ... DASAI3, can be defined in the menu. For this purpose the „Analog input“ function is to be inserted at a suitable point in the test plan and the related output and its state (value) evaluated. A further possibility is activation / deactivation via serial remote control (see remote control command \$DASAI).

Analog Inputs 0 ... 10 V DC.

**24 V DC** - auxiliary voltage - load rating max. 500 mA.

6. INTERFACES

6.4 High voltage connector X3

Only on KombiTester

The Krönes high voltage connector X3 is used to connect adapter boxes, test cabinets, etc. to the device.

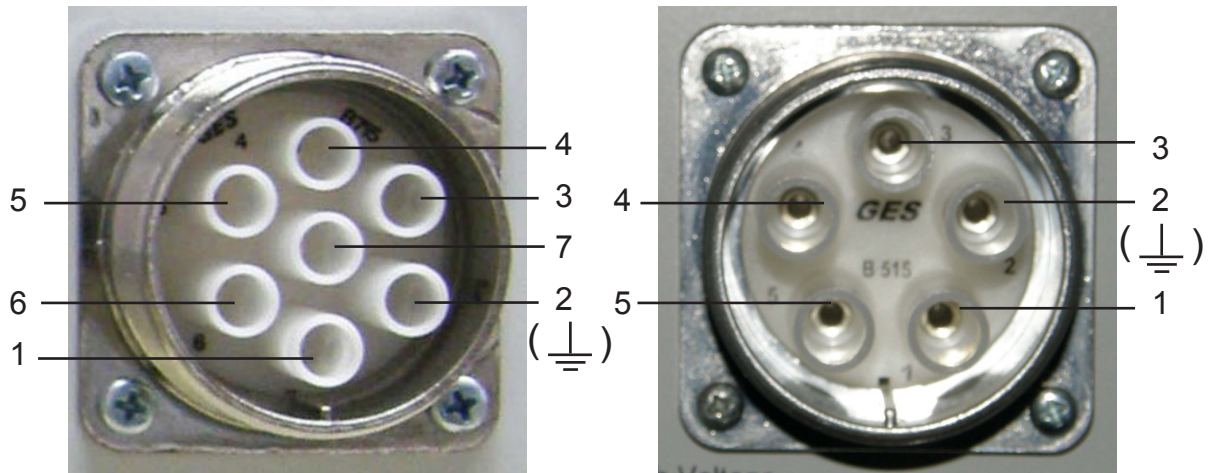


Abb. 1.1: Fig. 6.4: Krönes high voltage connector 7-pole, 5-pole

1 Sense wire for the protective earth conductor test (sense1)	1 Sense wire for the protective earth conductor test (sense1)
2 COM/ (⏏) for PE current (cur.1) and IS HV test voltage (-/~)	2 COM/ (⏏) for PE current (cur.1) and IS / HV test voltage (-/~)
3 IS / HV test voltage (+/~) parallel to the test probe (X2)	3 IS / HV test voltage (+/~) parallel to the test probe (X2)
4 Sense wire for the protective earth conductor test (sense2), parallel to PE-test probe X11-4	4 shorted to pin 3
5 PE current (cur.2), parallel to PE-test probe X10 (lab-terminal)	5 free
6 on AC- tester not used	
7 on AC-tester not used	

**Note:** The tester delivers floating test voltage, on the (⏏) pins grounding is possible.

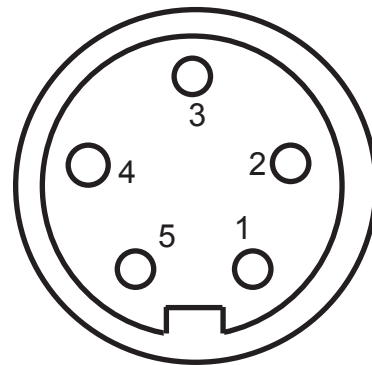


6. INTERFACES

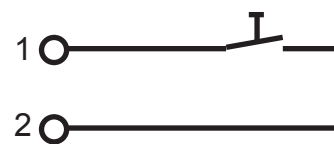
**6.5 PE-Test probe 94-4S control connector X11**

Only on KombiTester with Krönes high voltage connector (X3).

The connector X11 is used to connect the PE-test probe 94-4S to the device..



- 1 Start button
- 2 Start button
- 3 not used
- 4 Sense line PE-Sense 2
- 5 not used



## 7. ACCESSORIES (Option)

### 7 ACCESSORIES AND ATTACHMENTS

#### 7.1 TEST CABINET (OPTION)

The testing instrument can be operated in connection with a test cabinet. Control is then via the digital interface in the remote control mode and the PC interface.

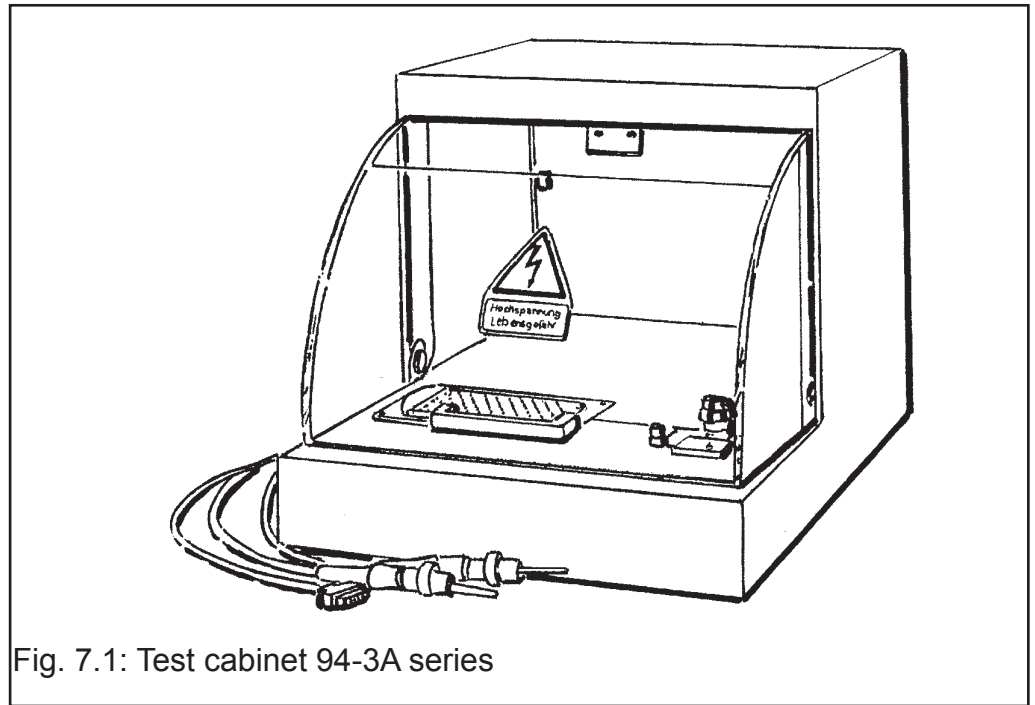


Fig. 7.1: Test cabinet 94-3A series

#### Test cabinet connection:



**The high-voltage tester has to be disconnected from the mains (pull plug) before connecting the test cabinet!**

The connecting cables of the test cabinet are put into the rear HV ports of the test unit. The control cable for the cabinet is connected to the D-SUB connector X7 (DA interface). For connection with HV-Tester, are also other types of high-voltage-plug systems possible (eg. Krönes).

#### Principle of operation in the two start mode:

The safety circuit (SK1) is closed by closing the protective hood. Pin 22 ( $U_E$ ) is connected to pin 21 (SK1). At the same time the 1st start signal for the test is given. Pin 2 (SET) is connected to pin 22 via the auxiliary contact on the test cabinet (magnetic switch).



The second start must come from the computer via the PC interface (HV is applied - see also chapter 3.12).

Suitable test cabinets from ELABO:

- 94-3A series - manual protective hood
- 94-3B series - automatic protective hood (pulse)
- 94-3C series - double test cabinet

## 7. ACCESSORIES (Option)

### 7.2 WARNING LIGHTS 94-2C / F9-1A

In the case of test voltages over 1000 V the HV device must be equipped with a warning lamp set (red and green lamps). See DIN VDE 0104.

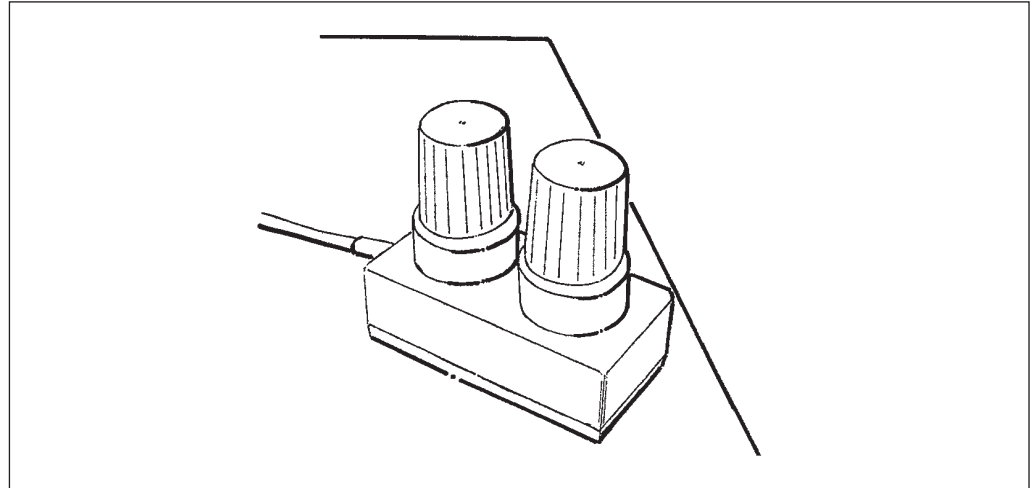


Fig. 7.2: Warning lamp set 94-2C

**Before connecting the warning lamps the tester has to be disconnected from the power supply (Pull out plug!) !**

The warning lamps are connected to the rear of the tester via the socket (X6).

### 7.3 TEST PROBES 94-2A

The high voltage tester can be equipped with 2 safety test probes for manual testing.



**Attention high voltage, flashover:** The contact elements used for the HV test (test probes, connection boxes etc.) must be designed for the maximum voltage supplied by the HV device.

**When working with the test probe extreme caution and attention must be exercised. If the test probes are used negligently or carelessly, there is MORTAL DANGER DUE TO THE HIGH VOLTAGE!**



**The high-voltage tester has to be disconnected from the mains (pull plug) before connecting the test probes!**

**Follow all safety instructions and warnings!**

The test probes are connected to the sockets on the rear of the device and secured.



**Attention:** The connection of test probes and other contact elements are only permit at the front or rear panel (one of both). At safety reasons, simultaneous connections at front and rear panel are not allowed.

## 8. MAINTENANCE AND ATTENDANCE

### 8 MAINTENANCE AND CARE



**Prior to all maintenance work and care the device must be disconnected from the mains (pull out plug!)**

The device is largely maintenance-free!

#### 8.1 FUSE REPLACEMENT

In case of fluctuations in the mains supply or if the device is overloaded a fuse will blow. After a malfunction the fuse must be replaced.

If a fuse should blow, it is only allowed to be replaced once, if the fuse blows again after its replacement, please send the device to your nearest ELABO service centre or contact the ELABO hot line (+ + 49 7951/307-202).

**Only use the type of fuse stated!**



**Work inside the device only may be executed by an electric qualified employee.**



**On working inside the device it is imperative the tester is disconnected from the mains (pull out plug!) !**



#### Mains fuse.

The fuse is on the rear of the device under the mains connector in a holder (F1).

The holder is to be pulled out and the fuse replaced. In the holder there is space for a replacement fuse.

**Fuse type:** T 3,2 A/250 V

#### 8.2 CARING FOR THE HOUSING

To clean the housing only use a clean, dry, fluff-free cloth.

**Do not clean the unit with cleaning agent or water at any time.**



#### 8.3 CARING FOR THE TOUCHSCREEN DISPLAY

A clean, slightly moist, fluff-free cloth is the most suitable means of cleaning the touchscreen display. Do not use any cleaning agent or other chemicals for cleaning.

## 9. SPECIFICATION

## 9 TECHNICAL DATA

## 9.1 Device-specific TECHNICAL DATA

Type	G1-1G	G1-1T	G1-1H	G1-1U
Mode	hand/auto	auto	hand/auto	auto
High voltage	AC		AC	
output voltage	0,1 ... 2,50 kV AC 0,2 ... 5,00 kV AC isolated from earth		0,1 ... 1,50 kV AC 0,2 ... 3,00 kV AC isolated from earth	
measurement range / resolution	10 mA / 10 $\mu$ A 100 mA / 100 $\mu$ A		20 mA / 20 $\mu$ A 200 mA / 200 $\mu$ A	
tripping to	complex or real current			
adjusting speed ramp	0 ... 3,5 kV/s			
voltage setting error	typical 10 V			
voltage measurement error	1 % of. act. value / $\pm$ 3 digit			
current measurement error	1 % of. act. value / $\pm$ 3 digit			
Insulation				
output voltage	0,05... 1,2 kV DC earthbound			
test current	appr. 1 mA			
measurement range / resolution	0,1 .. 10,0 M $\Omega$ / 100 k $\Omega$ 1 .. 100 M $\Omega$ / 1 M $\Omega$ 0,1 .. 1000 M $\Omega$ / 10 M $\Omega$ (auto range)			
measurement accuracy	1 % v. of act. value. / $\pm$ 3 digit			
PE				
output voltage	6 /12 V AC			
test current	5 ... 32 A			
range resistance/ resolution	0 ... 1.200 Ohm 0.001 Ohm			
range voltage drop / resolution	0 ... 12.00 V 0.01 V			
measurement error	1,5% of act. value. +/- 3 digit			
Main data				
test time	0,5 .. 999 s			
nominal capacity	500 VA			
short-circuit current	> 200 mA			
weight	25 kg	24 kg	26 kg	25 kg

## 9. SPECIFICATION

### 9.2 Common TECHNICAL DATA DC- devices

Mains connection:	230 V +10% -10% / 49 - 51 Hz / 10 A
Operating temperature:	10°C - 50°C
Atmospheric humidity:	25 - 75% rel. humidity
Dimensions:	19"4HU, depth 360 mm

### 9.3 Interfaces, miscellaneous

Internal program memory (touchscreen display): >150 parameter sets

Safety circuit: SK 1  
SK 2

Interfaces: digital (Standard)

6 additional digital outputs DIO 1-6 (option)  
expanded digital/analog outputs/inputs DAS (option)

Ethernet (Standard) and  
RS232 (Option) or USB (Option)  
service-interface (RS232)

Take into account in addition Chapt. 3.4.1 "Requirements for connecting lines to the test object" und 3.4.2 "Cable length".

<sup>1)</sup> **Note - Tester with Krönes HV plug-in connection:** Based on the plug-in connector, a basic current is effected up to 15  $\mu$ A. This particularly has affects in the 100 MOhm measurement range. Consider also Chapt. 3.4.1 "Requirements for connecting lines to the test object".

## 10. Menu System

### 10 Touchscreen display menu system

The device is operated and the device parameters and text parameters are set using the touchscreen display.

#### 10.1 General

The menu system is provided by a dedicated display module. The display module passes the commands and parameters to the controller of the device hardware. The hardware controller is carrying out the test. The actual measured values and results are returned to the display module and displayed.

**Note:** The usage of the touchscreen is described in chapter 3.8. Follow the operating instructions for the touchscreen to prevent damage.

The menu system is operated solely using the touchscreen.

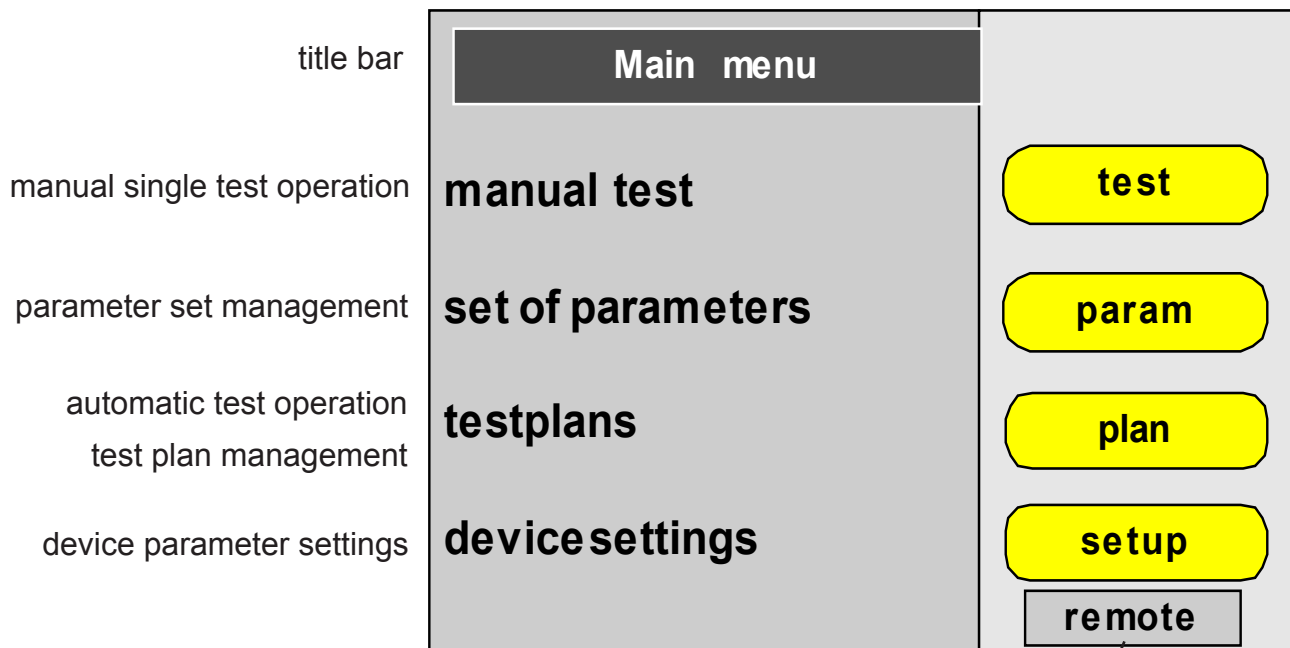


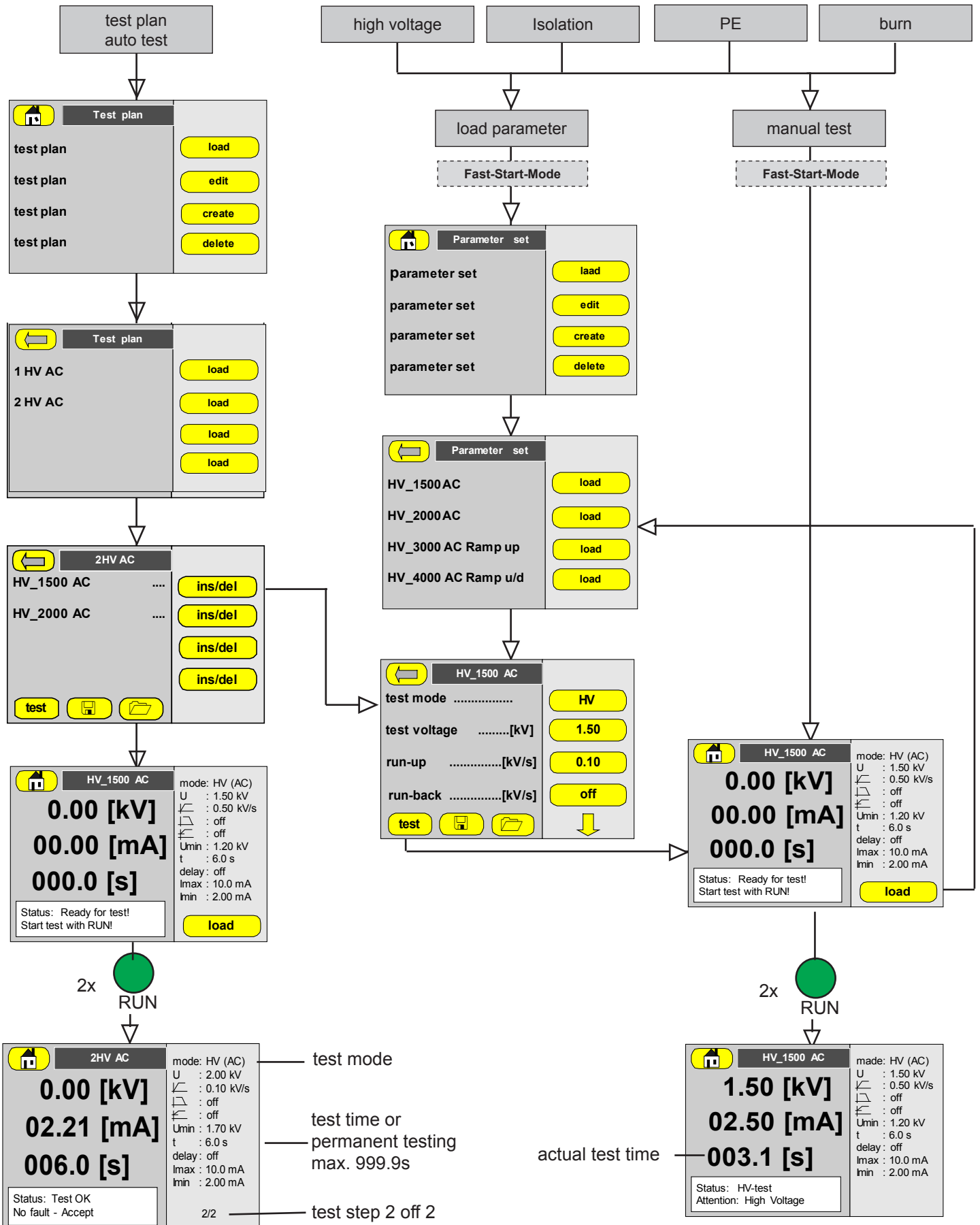
Fig. 10.1: Main menu

local operation of the device or via the interface X9 (remote)

**Note:** After the device is switched on, the menu commands are protected by passwords. On this topic see chapter 3.10 Password protection.

10. Menu System

10.1.1 Overview, HV test example





10. Menu System

10.2 Main menu

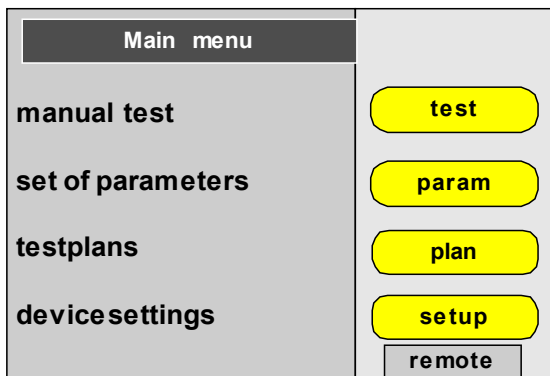
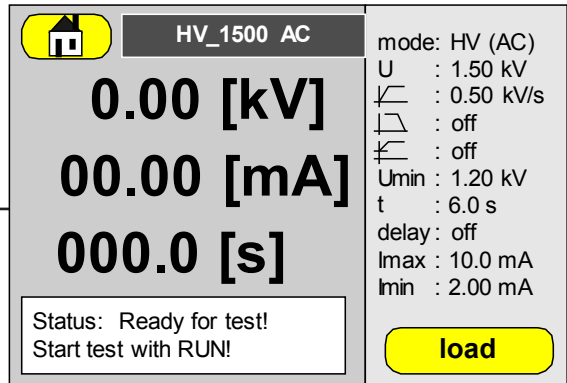
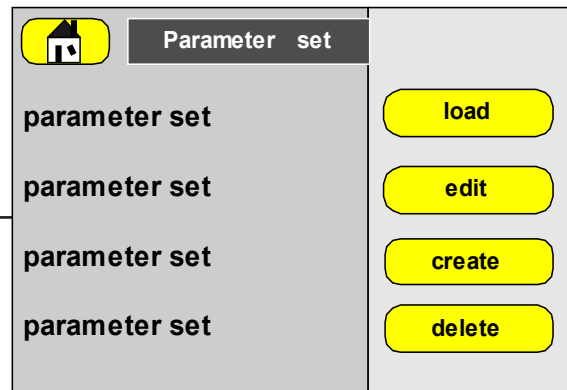


Fig. 10.2a: Main menu



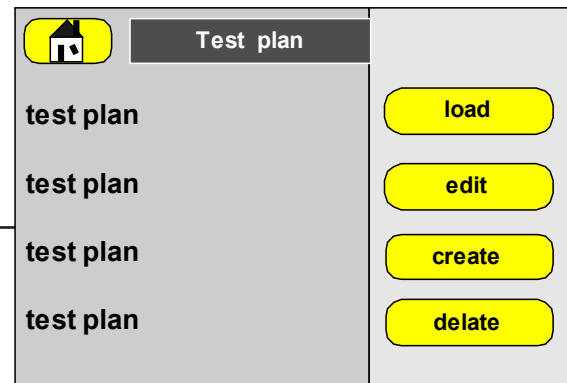
Chapt. 10.3

Fig. 10.2b: Manual testing



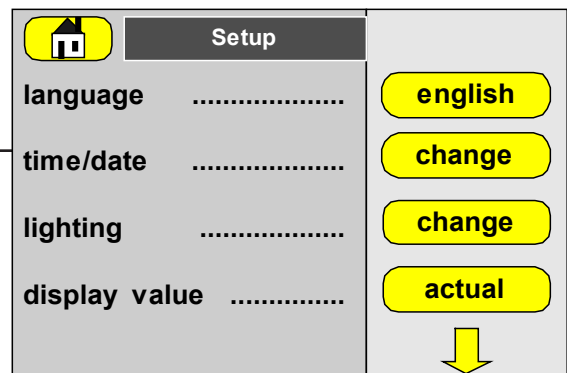
Chapt. 10.4

Abb. 10.2c: Parameter set management



Chapt. 10.5

Fig. 10.2d: Auto testing / test plan management



Chapt 10.6

Fig. 10.2e: Device-Setup

10. Menu System

**test**

(MESS)

10.3 Manual test

After opening the manual test, the operator must enter the password for level 1 (MESS). Note - capitalization/small initial letters.

The status screen for the manual testing appears.

The test parameters of the last test are actual again. They are displayed in the right column of the status screen.

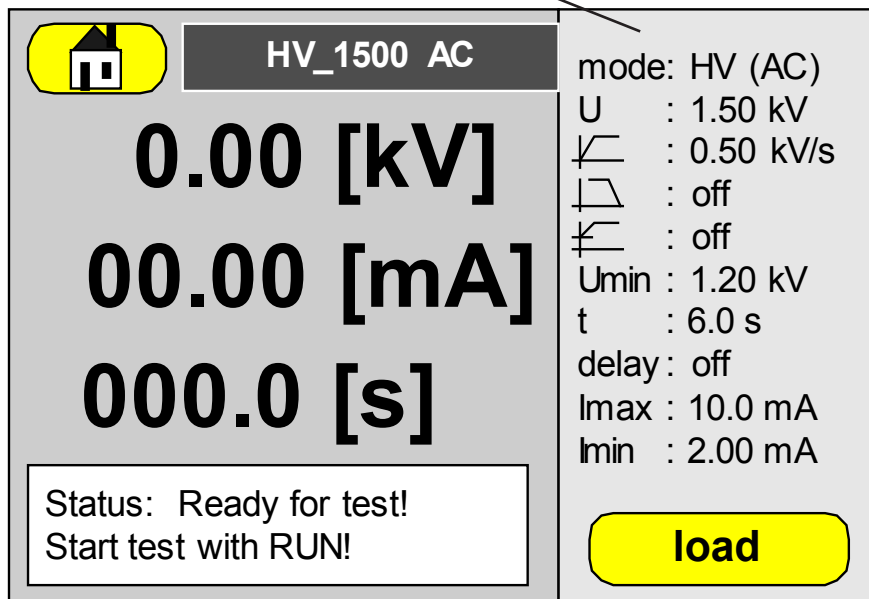


Fig. 10.3: Manual test - parameter menu

Possibilities:

Start the test with the parameters currently set , by using the green push-button "RUN" at the tester or closing the safety test cabinet (SK must be closed).



**load**

**load** - is opening the parameter-set management for selecting and loading a parameter-set with different values. Also possible is the to modify of the test parameter values.

10. Menu System

10.3.1 Manual test with actual parameter

The test parameters are displayed in the right column of the status screen.

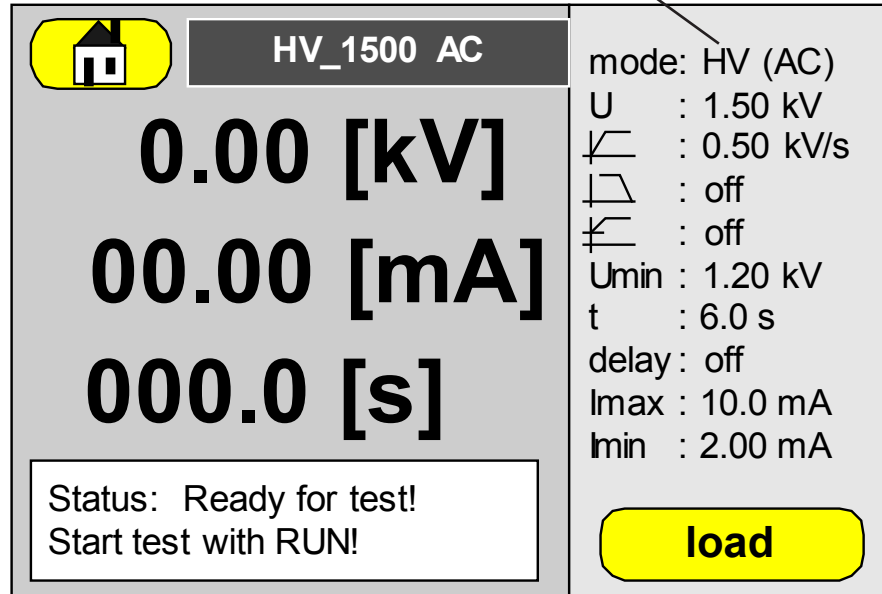


Fig. 10.3: Manual test - ready for test screen

**Start testing:** The device now waits for the manual confirmation of the start. This confirmation can be given using the green RUN button on the device or by closing the protective hood on the test cabinet.

In the case of operation via the front panel (local) the green RUN button (S3/H3) on the device must be pressed twice (2nd start), on this topic also see chapter 3.12.1.

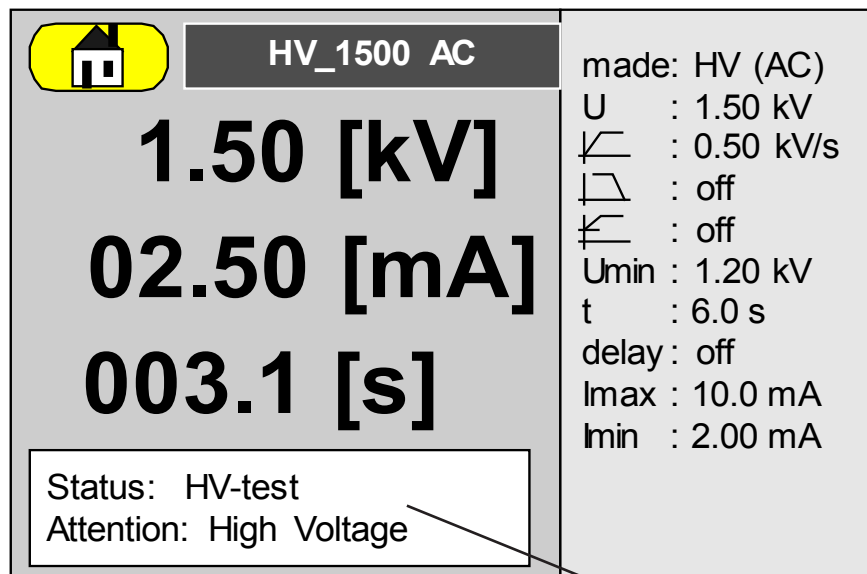
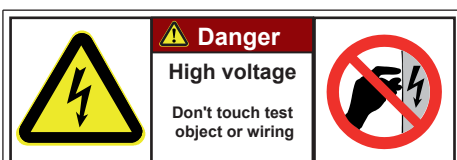


Fig. 10.4: Manual test - test screen - HV test running



**Attention - High Voltage - danger for life:**

High voltage on the test object housing! Don't touch the test object or the wiring.

10. Menu System

After the end of the test time or manual interruption (red reset S2/H2) the device indicates the result of the test.

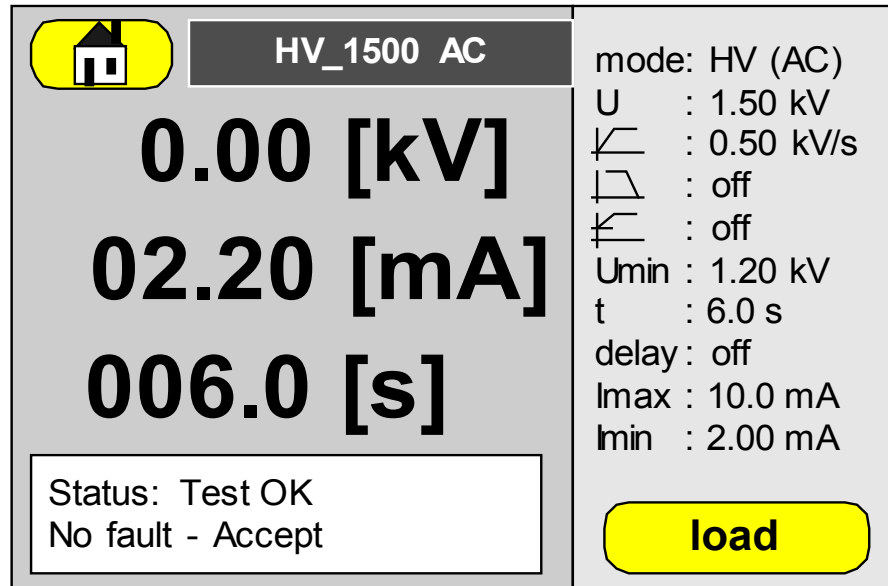


Fig. 10.5: Manual test - test screen - acceptable test result



If the device detects faults, the test is interrupted immediately and a corresponding error message displayed in plain text. The erroneous test must be acknowledged using the red reset button S2/H2.

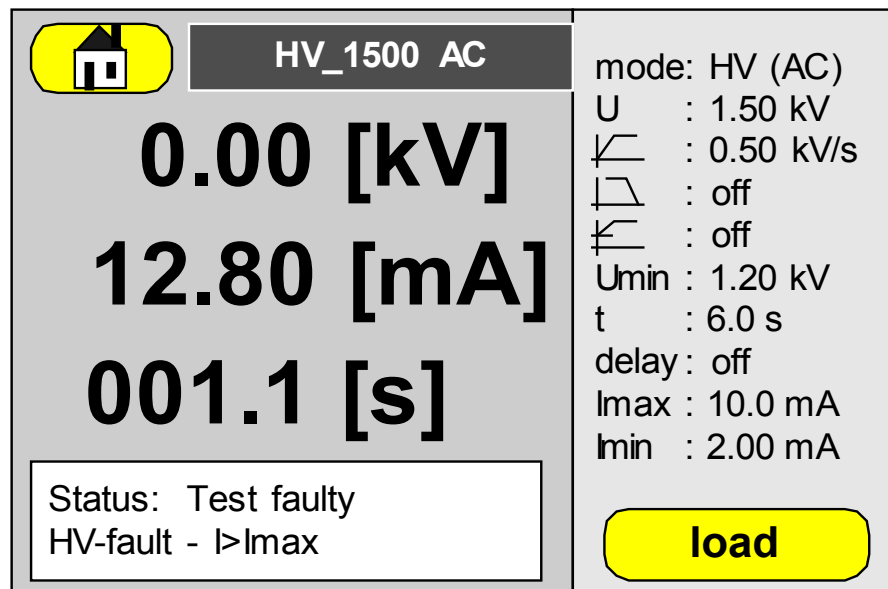


Fig. 10.6: Manual test - test screen - faulty test result

10. Menu System

10.3.2 Load parameter

**load**

(PARAM)

After opening „load, the operator must enter the password for level 2 (parameters).

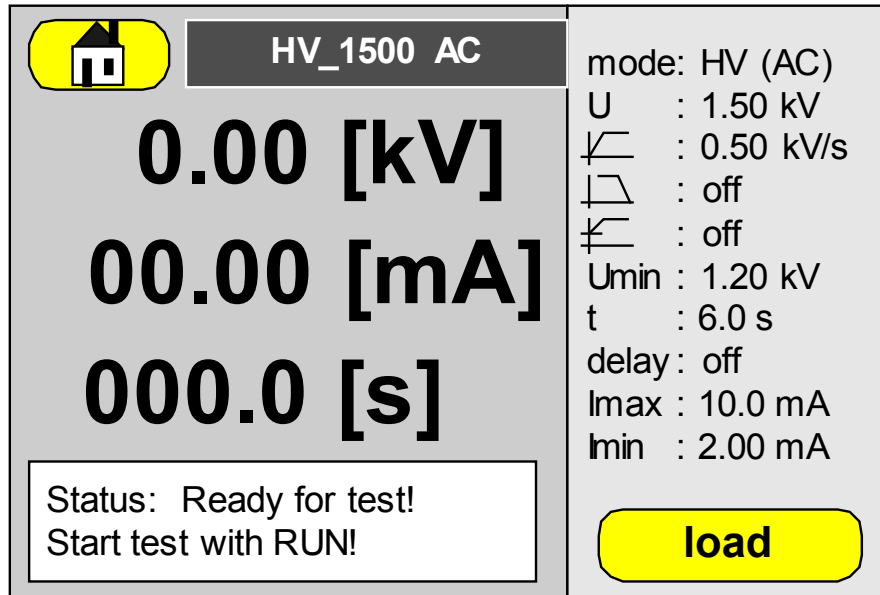


Fig. 10.7: Manual test - test screen - load parameter

The menu is used for editing and adding parameter sets. Parameter sets can be assembled into test plans and in this way produce a defined test sequence (see test plan management). The related test steps must be defined for the individual test types (HV, ISO, PE; TIME).

The existing parameter sets are listed in the left field .By touching the button "load", it is possible to open and edit the parameter set.

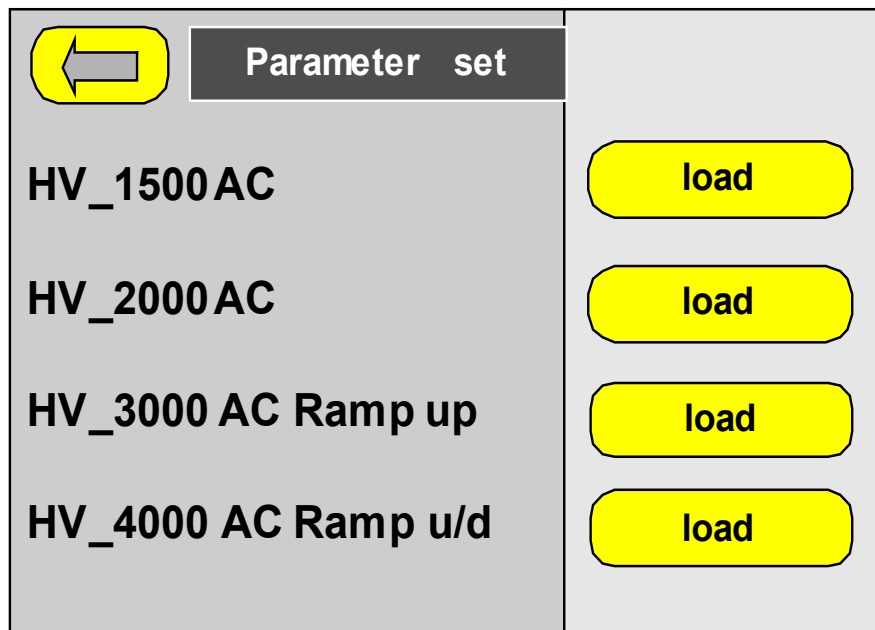


Fig. 10.9: Load parameter set

**load**

- Load the desired parameter set by touching the button "load". (eg. HV\_1500 AC).

10. Menu System

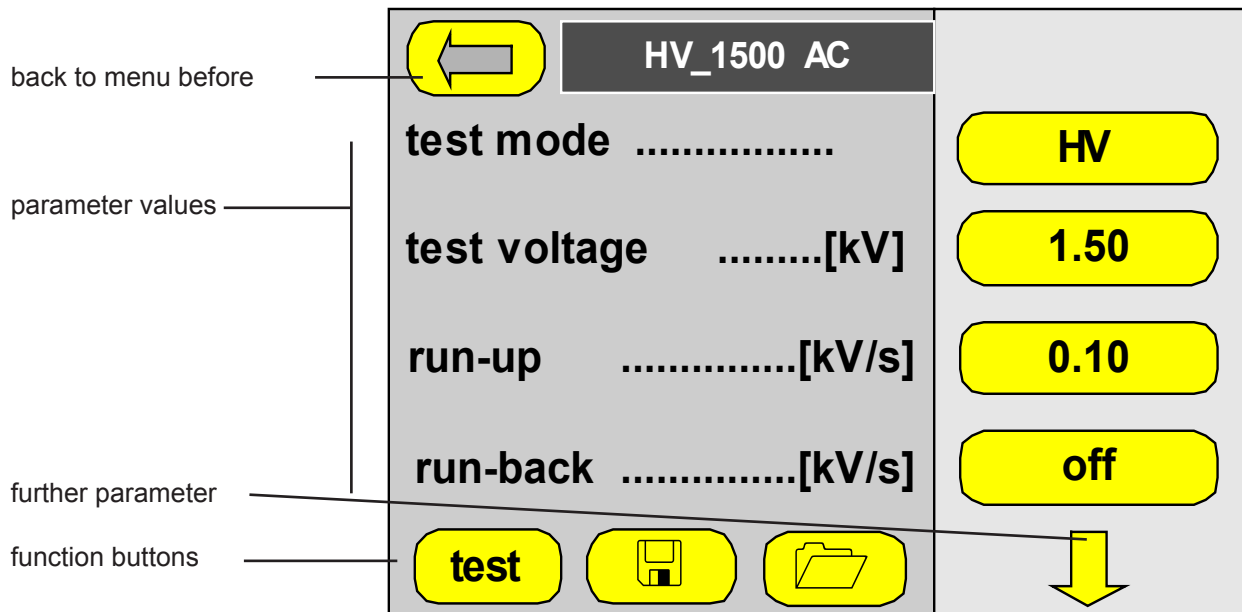


Fig. 10.12: Load parameter - parameter screen

The test parameters for the test types are described in chapter 11.



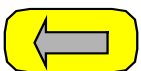
„**Test**“ - starts the manual test with the actual parameter values - see also chapter 10.3.



„**Save**“ - saves the changes made. You can assign a new name to the modified set or use the old name (overwrite the parameters) .



„**Selection**“ - of a special parameter set. The parameter set selection is shown.



„**Menu**“ - closes the parameter screen and returns to the menu before

10. Menu System

**Param**

(PARAM)

**10.4 PARAMETER SET MANAGEMENT**

After opening „set of parameters, the operator must enter the password for level 2 (PARAM).

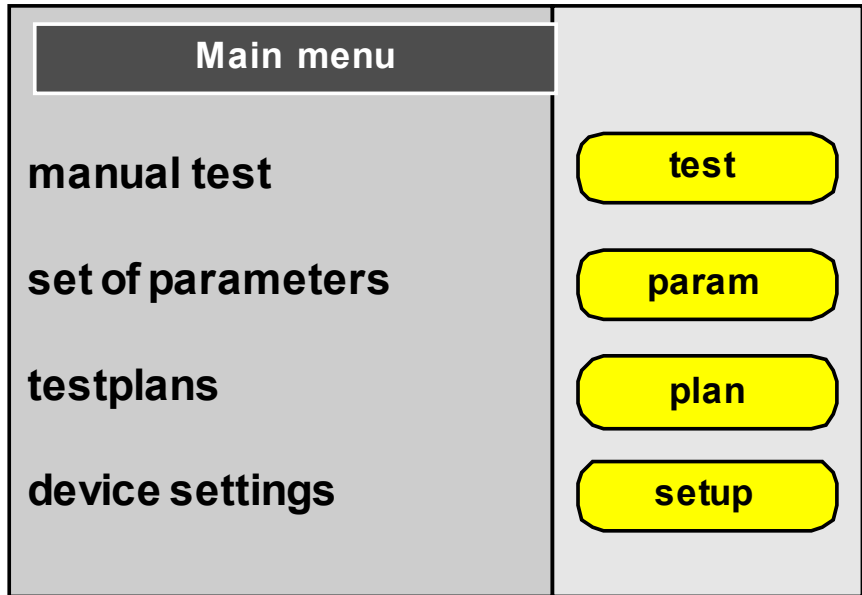


Fig. 10:10: Main menu - set of parameters

The menu is used to create and edit parameter sets. **Parameter sets are the prerequisite for carry out any tests.**

**Manual test** - the actual parameter set includes the base and limit values as well as the test time for the test.

**Automatic test (test plan)** - single parameter sets are forming a test plan. The device is executing the parameter sets in sequence.

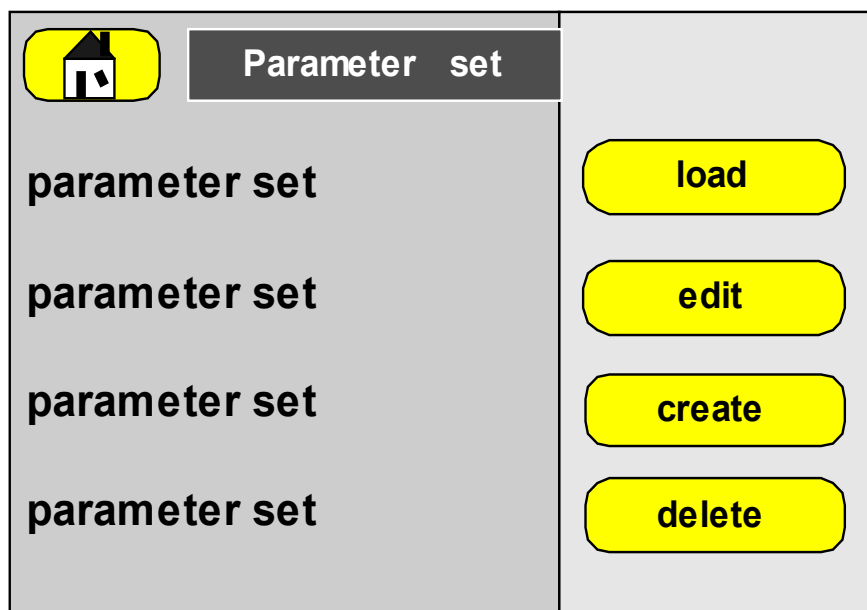


Fig. 10:11: Parameter set-menü

## 10. Menu System

**load**

**load** - a list of all defined parameter sets. Mark and load a parameter set of the list. See also Chapt. 10.3.2. It is possible:

**edit**

- to start an manual test with the actual parameters,
- to edit and save one of the parameter sets.

**edit** - opens a list of all defined parameter sets. Mark and edit a parameter set of the list. Edit and save one of the parameter sets.

**create**

**create** - For this a existing parameter set can be saved with an new name. Edit the parameter values for the new requirements. The creation of an new empty parameter set is also possible.

**delete**

**delete** - opens a list of all defined parameter sets. Mark a parameter set for delete and confirm it.

### 10.4.1 Load Parameter set

Opens a list of all defined parameter sets. Mark and load a parameter set of the list.

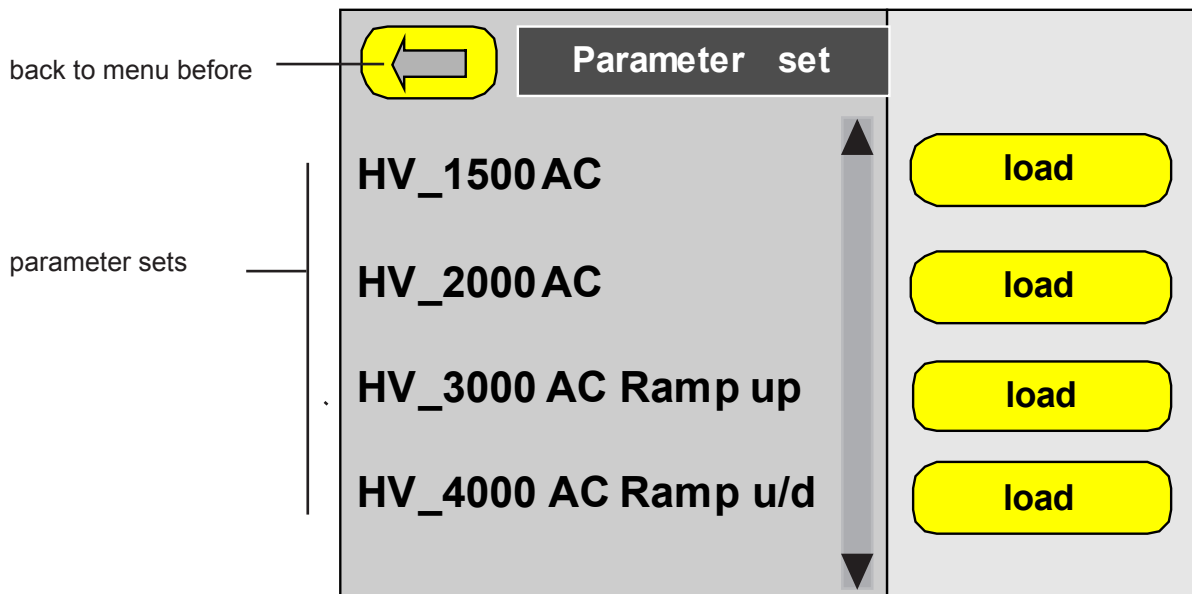


Fig. 10.12: Parameter set - load

**load**

- Open the parameter set by touch to the button "load" (eg. HV\_1500 AC).



### 10. Menu System

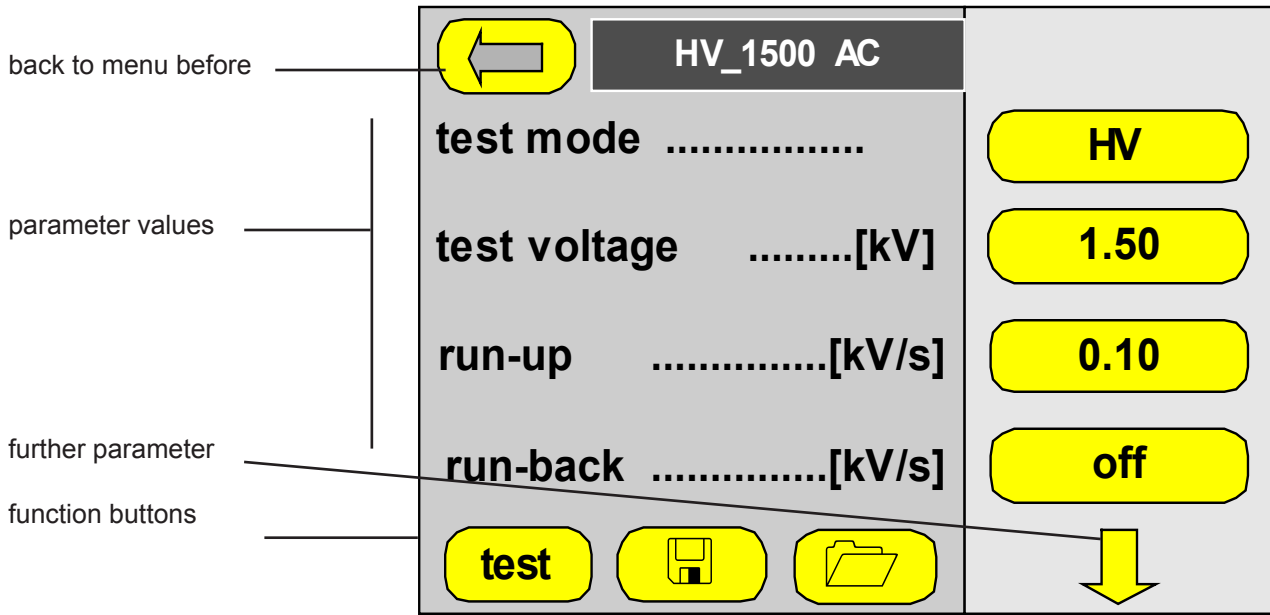


Fig. 10.13: Parameter set - Parameter mask HV\_1500 AC

- Edit the parameter values. The test parameters it self are described in chapter 11.



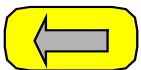
„**Test**“ - starts the manual test with the actual parameter values - see also chapter 10.3.



„**Save**“ - saves the changes made. You can assign a new name to the modified set or use the old name (overwrite the parameters) .



„**Selection**“ - of a special parameter set. The parameter set selection is shown.



„**Menu**“ - closes the parameter screen and returns to the menu. before

10. Menu System

**edit**

**10.4.2 Edit Parameter set**

Opens a list of all defined parameter sets. Mark and edit a parameter set of the list.

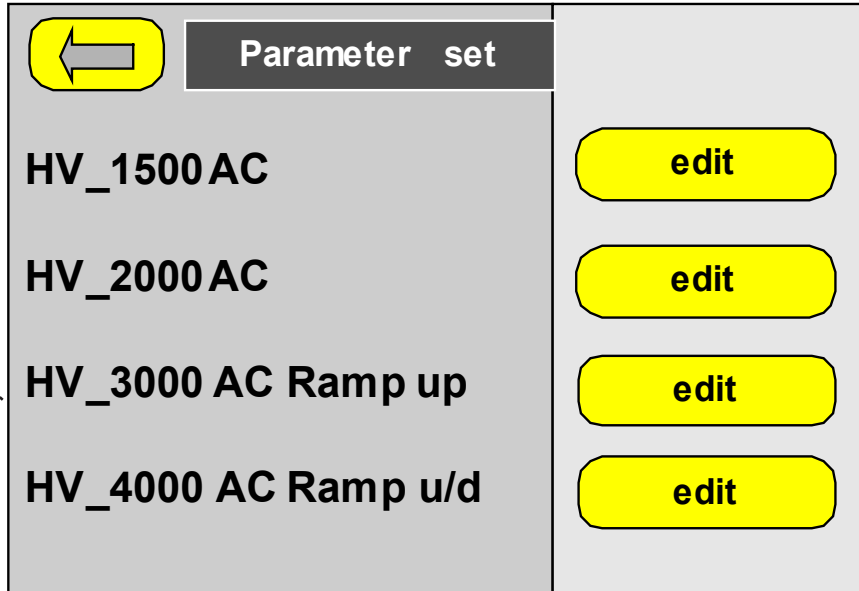


Fig . 10.14: Parameter set - edit

**edit**

- Open the parameter set by touch to the button "edit" (eg. HV\_1500 AC).

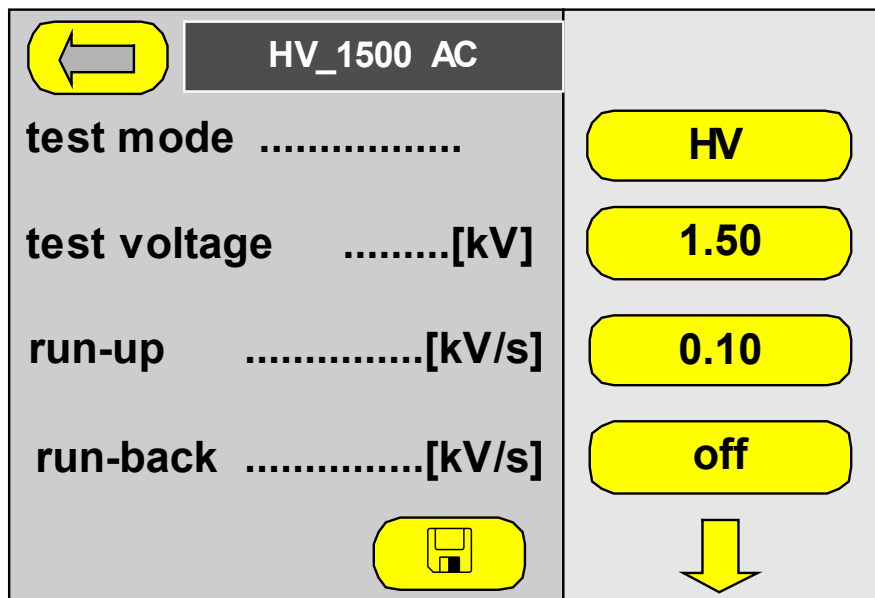


Fig. 10.15: Parameter set - Parameter mask HV\_1500 AC

10. Menu System

10.4.3 Create parameter set

**create**

For this a existing parameter set can be saved with an new name. Edit the parameter values for the new requirements. The creation of an new empty parameter set is also possible.

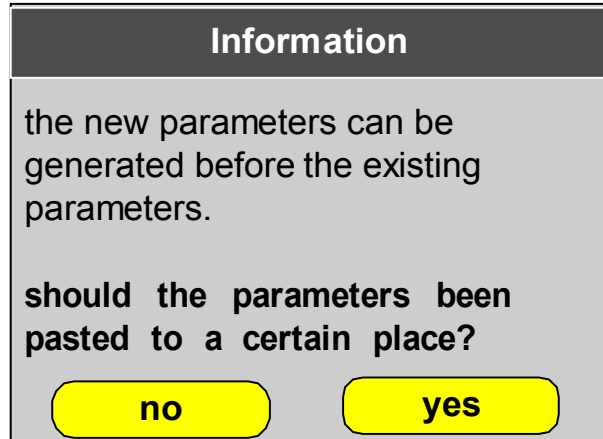


Fig. 10.16: Parameter set - create

**no**

**no** - shows a alpha-numeric soft key board for entering the new parameter set name. The new parameter set will be placed at the end of the list.

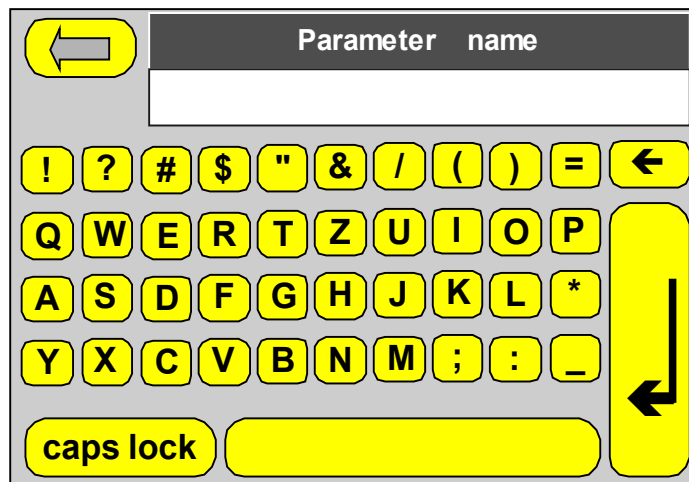


Fig. 10.17: Parameter set - enter new name

**yes**

**Yes** - opens a list of all defined parameter sets. Mark the position in the list for paste the new parameter set.

10. Menu System



10.4.4 Delete parameter set

Opens a list of all defined parameter sets. Mark a parameter set for delete and confirm it.

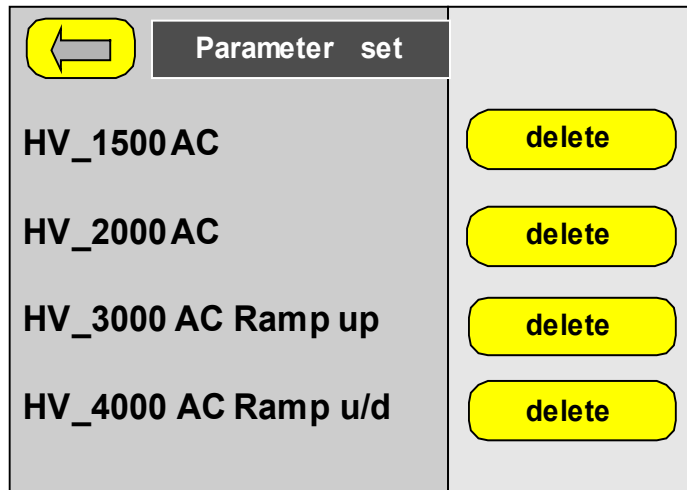


Fig. 10.18: Parameter set - delete

- Mark the parameter set by touch to the button "delete" " (eg. HV\_1500 AC).



Confirm by touch to the button "delete" in the information mask.

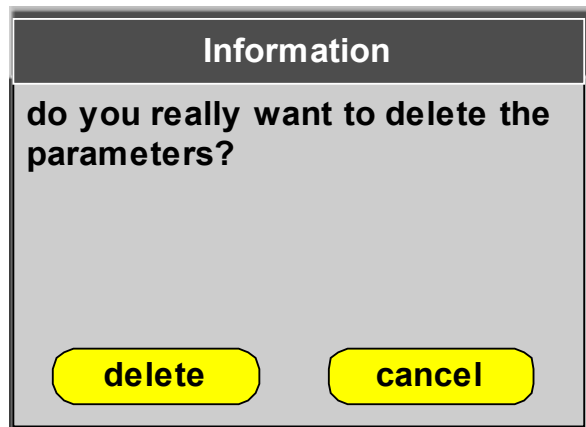


Fig . 10.19: Parameter set -confirm delete

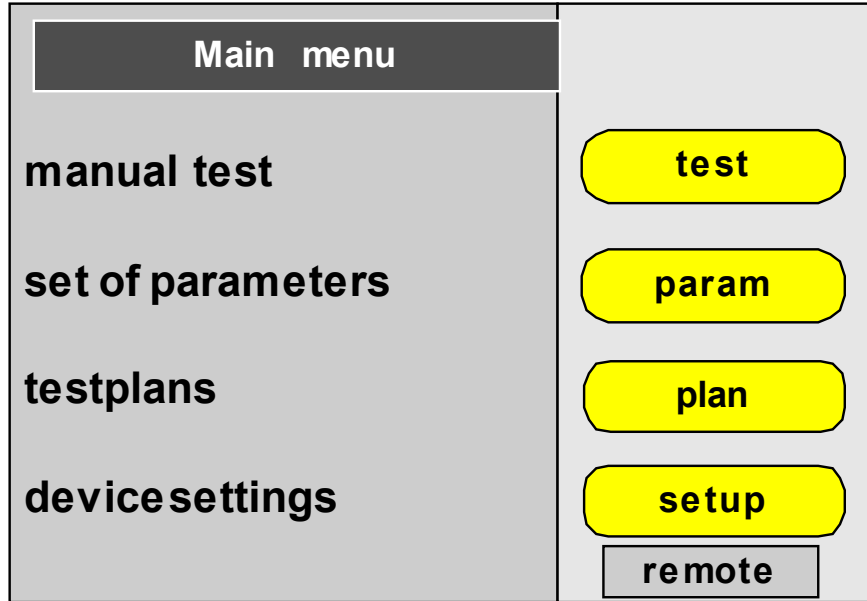
10. Menu System

10.5 Test plan Management and Automatic testing

**plan**

(PARAM)

After opening „Test plan management“, the operator must enter the password for level 2 (PARAM).



Only at remote operation

Fig. 10:20: Main menu - Test plans

The menu is used for adding test plans. Test plans contain one or more test steps and so form a defined test sequence. The sequence is displayed in the form of a list; the device runs through the list from top to bottom.

Depending on the options fitted to the device, e.g. HV, ISO. steps that are used to provide information to/prompt the operator, to poll buttons or to poll/set a digital input/output (option).

To be able to assemble test plans, test steps must be defined for the individual test types (HV, ISO ..). This action is carry out on the main menu with "set of parameters", on this topic see chapter 10.4. „set of parameters“.

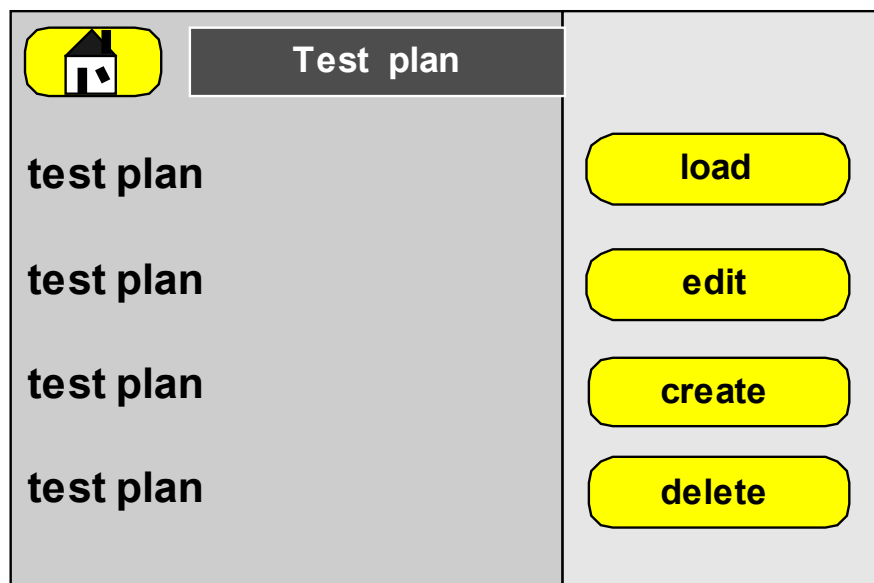


Fig. 10.21: Test plan management - test plan selection

## 10. Menu System

### load

**load** - a list of all defined test plans. Mark and load a test plan of the list. See also Chapt. 10.5.1. It is possible:

- to create a test plan by chose one or more parameter sets,
- to edit and save test plans,
- to start an automatic test sequence by selecting and start one of the test plans.

### edit

**edit** - opens a list of all defined test plans. Mark and edit a test plan of the list. Edit and save actual the test plan

### create

**create** - an existing test plan can be saved with an new name. Edit the test plan for the new requirements. The creation of an new empty test plan is also possible.

### delete

**delete** - opens a list of all defined test plans. Mark a test plan for delete and confirm it.

Note: Create test plans with " meaningful" names.

10. Menu System

**load**

10.5.1 Load test plan / Auto testing

Opens a list of all defined test plans. Mark and load a test plan of the list for auto testing.

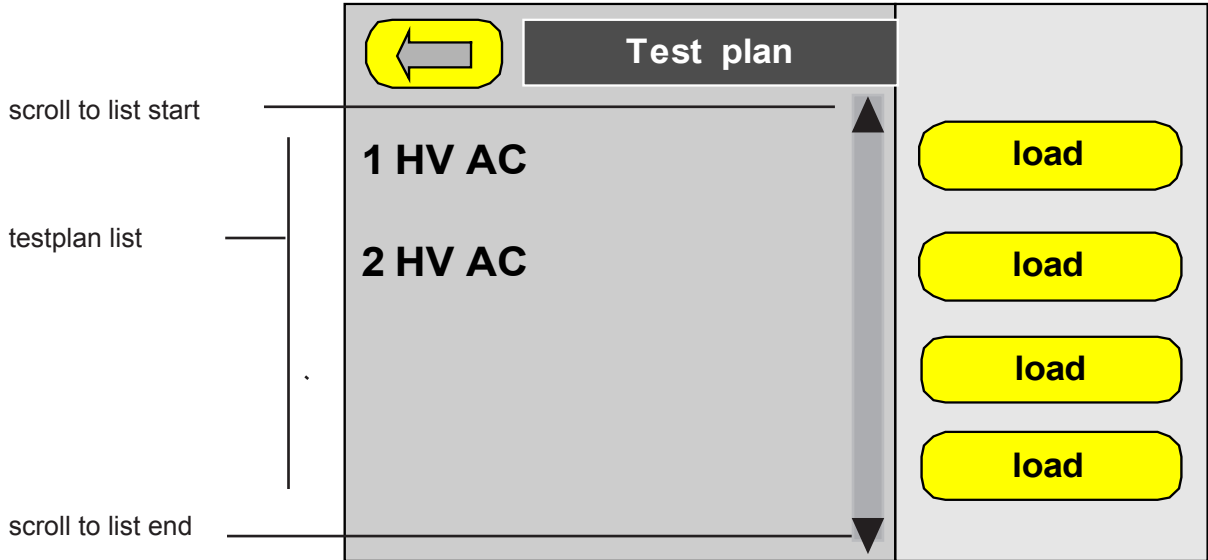


Fig. 10.22: Test plan - load

**load**

- Open the test plan by touch to the button "edit" (eg. 2HV AC).

**Note:** In this example, the test plan name shows the function of the test plan. The plan includes two parameter sets for HV-test.

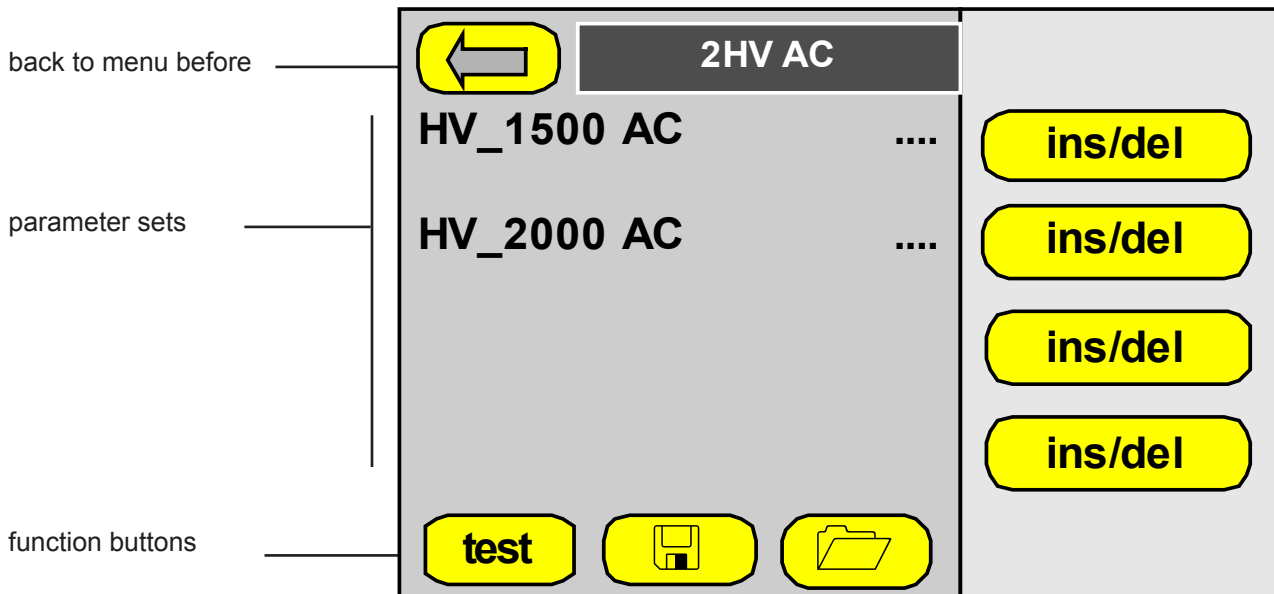


Fig. 10.23: Test plan - includes parameter sets

**ins/del**

- Edit the test plan. It is possible:

**delete** - a parameter set in the test plan,

**before** - includes the new parameter set before the marked into the list.

**behind** - includes the new parameter set behind the marked into the list.

10. Menu System

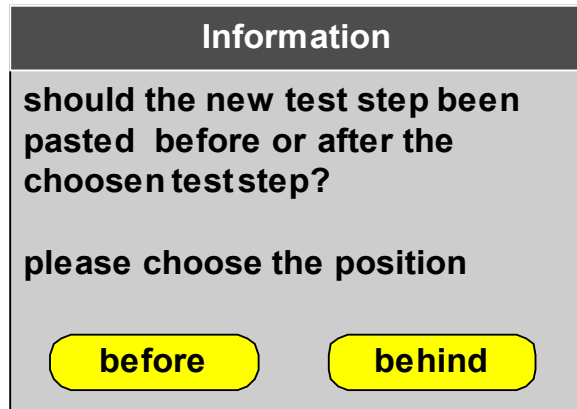


Fig. 10.24: Test plan - insert parameter set



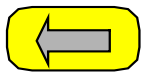
"**Test**" - starts the automatic test with the first parameter set in the test plan - see also chapter 10.5.2.



„**Save**“ - saves the changes made. You can assign a new name to the modified test plan or use the old name (overwrite the test plan).



„**Selection**“ - of a special test plan. The test plan selection is shown.



„**Menu**“ - closes the test plan screen and returns to the menu before



10. Menu System

10.5.2 Automatic test

**test**

"test" - starts the automatic test with the first parameter set in the test plan  
The test parameters are displayed in the right column of the status screen

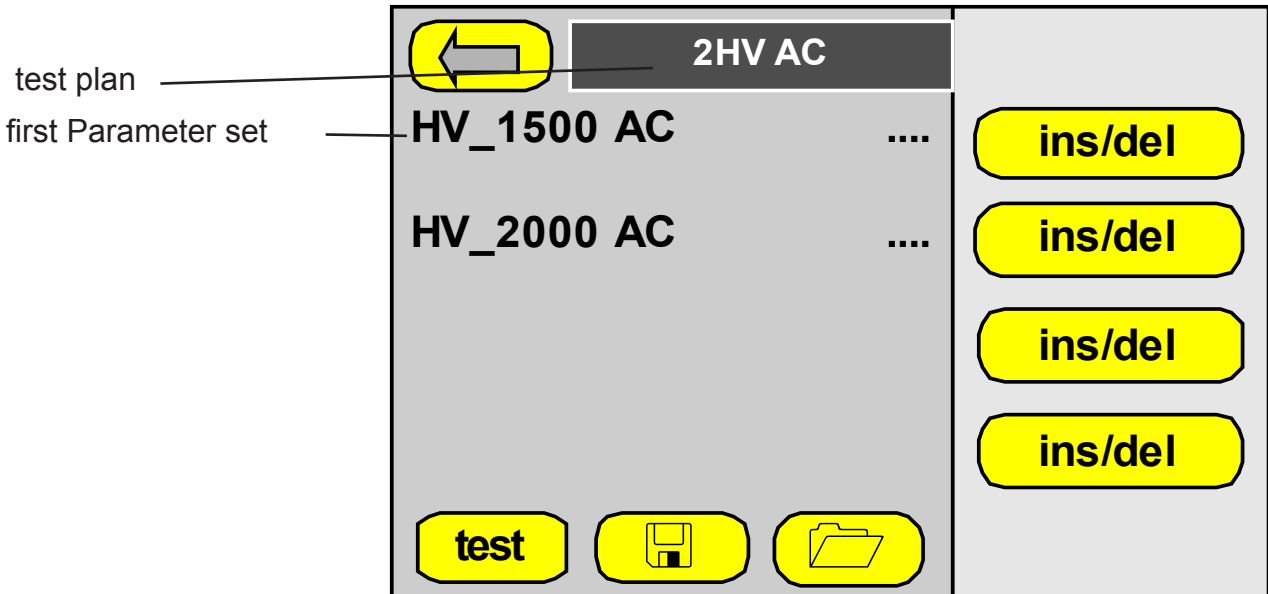


Fig. 10.25: Test plan - start automatic test

The device is loading the first parameter set of the test plan (eg. HV\_1500 AC).

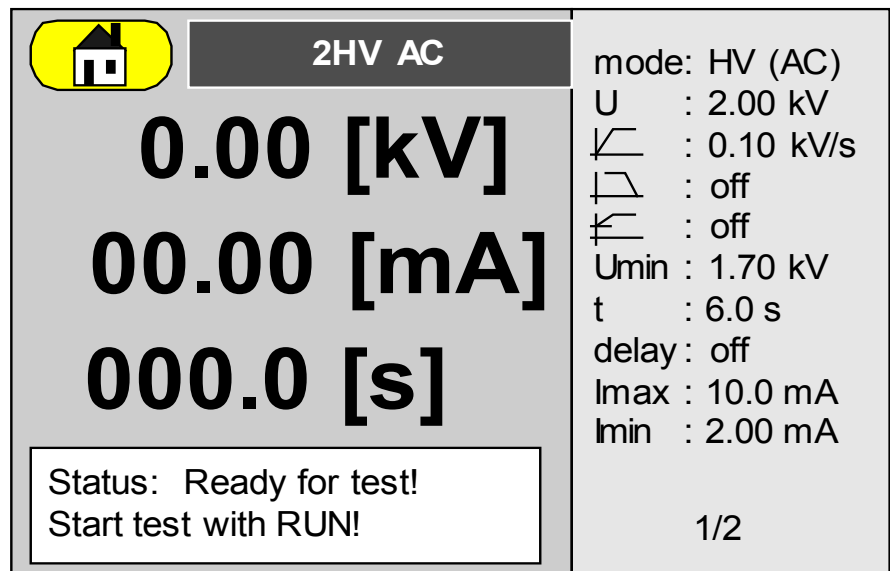


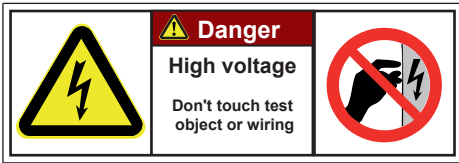
Fig. 10.26: Test plan - first parameter set



**Start testing:** The device now waits for the manual confirmation of the start. This confirmation can be given using the green RUN button on the device or by closing the protective hood on the test cabinet.

In the case of operation via the front panel (local) the green RUN button (S3/H3) on the device must be pressed twice (2nd start), on this topic also see chapter 3.12.1. The 2nd-start must be carry out within 30 s. After that the device interrupts the test with error (confirmation required).

10. Menu System



**Attention - High Voltage - danger for life:**

High voltage on the test object housing! Don't touch the test object or the wiring.

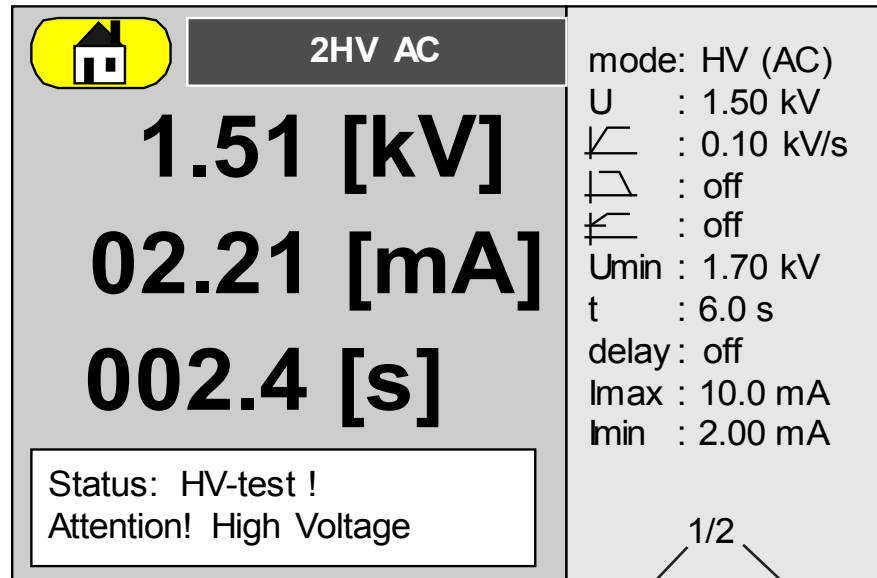


Fig. 10.27: Automatic test- test screen



The device is executing the first test. The actual test step and the number of test steps in the test plan are shown on the right below.

If the test step is finish (test time) the device is loading the next parameter set and is waiting for the manual confirmation of the start. .

In the case of operation via the front panel (local) the green RUN button (S3/H3) on the device must be pressed twice (2nd start), on this topic also see chapter 3.12.1.

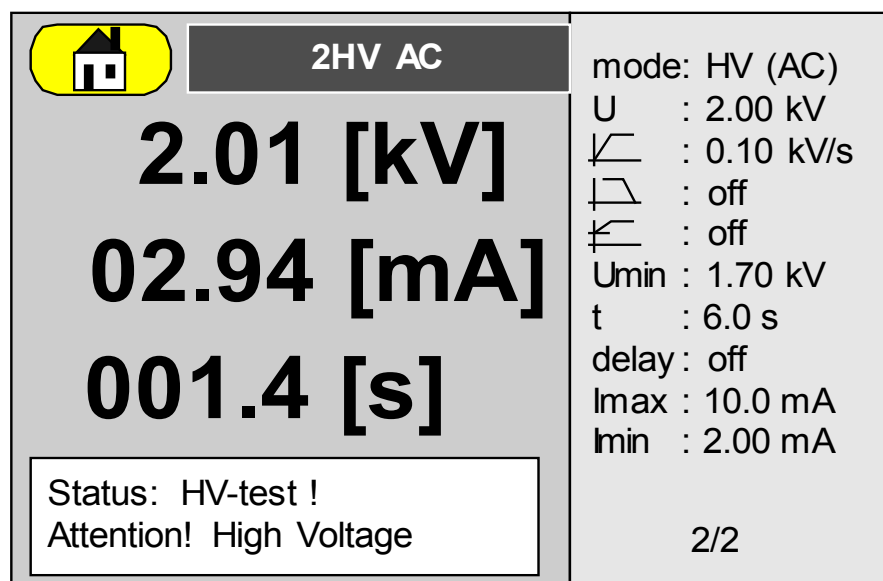


Fig. 10.28: Automatic test - test screen step 1 of 2

10. Menu System

After the end of the test plan the device indicates the result of the test.

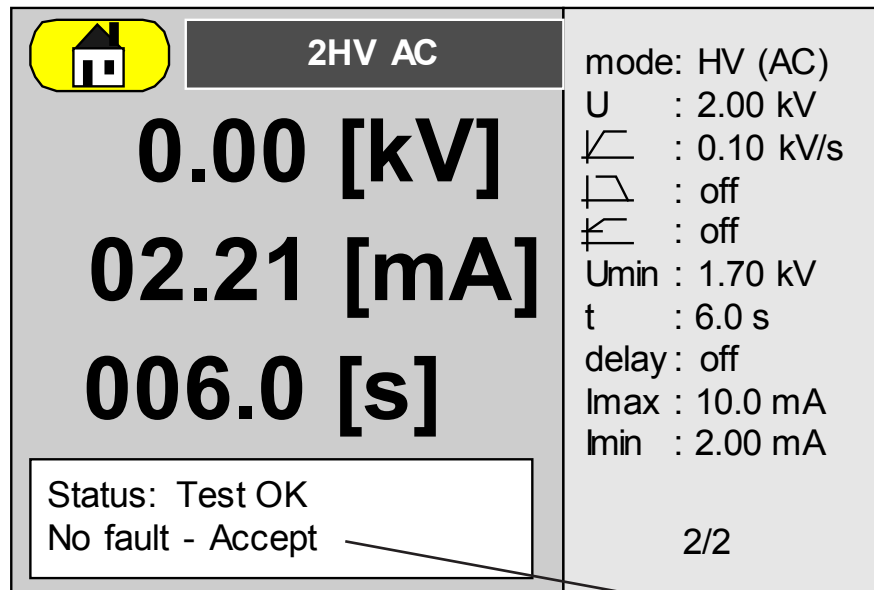


Fig. 10.29: Automatic test- test screen - result ACCEPT



10.5.3 Fault handling Auto Test

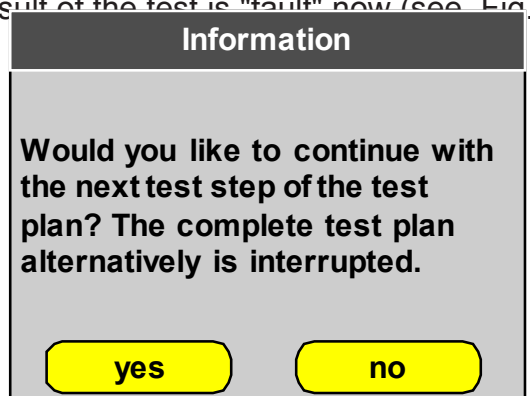
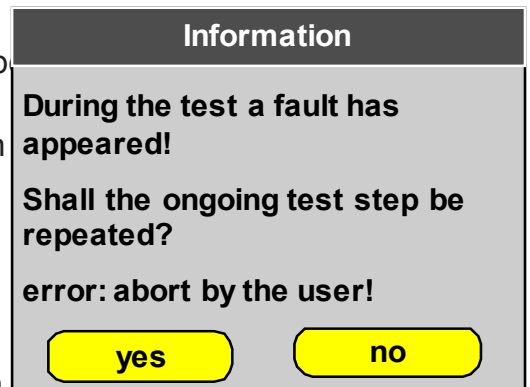
If the device detects faults or at manual interruption (red reset S2/H2), the test is interrupted immediately and a corresponding error message displayed in plain text.

**yes** - the faulty test step can be repeated

**no** - it is possible now:  
 - to execute the next test step in the plan  
 - to interrupt the test run.

**yes** - executes the next test step in the plan

**no** - interrupts the test run. The result of the test is "fault" now (see Fig. 10.30).



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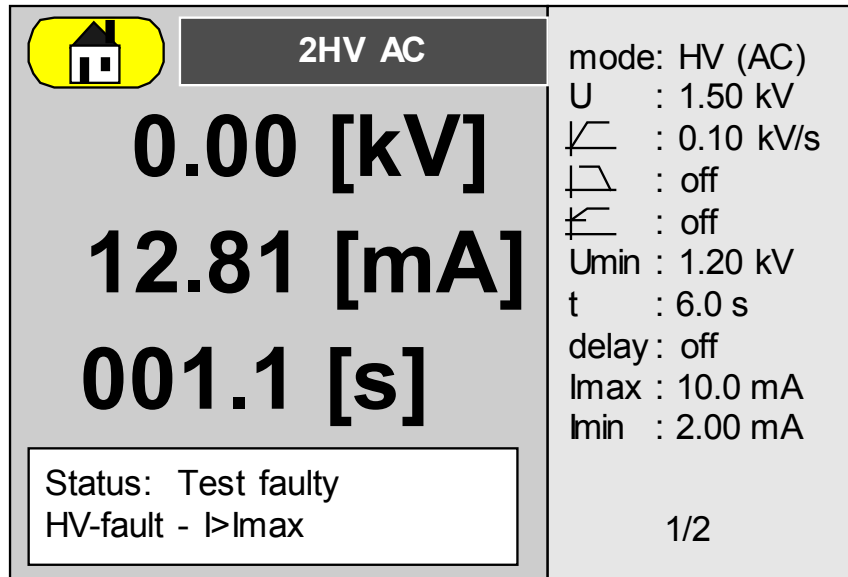


Fig. 10.30: Automatic test - test screen - result fault



The faulty test must be acknowledged using the red reset button S2/H2.

10. Menu System

10.5.4 Edit test plan

**change**

Opens a list of all defined test plans. Mark a test plan of the list to "edit" it .

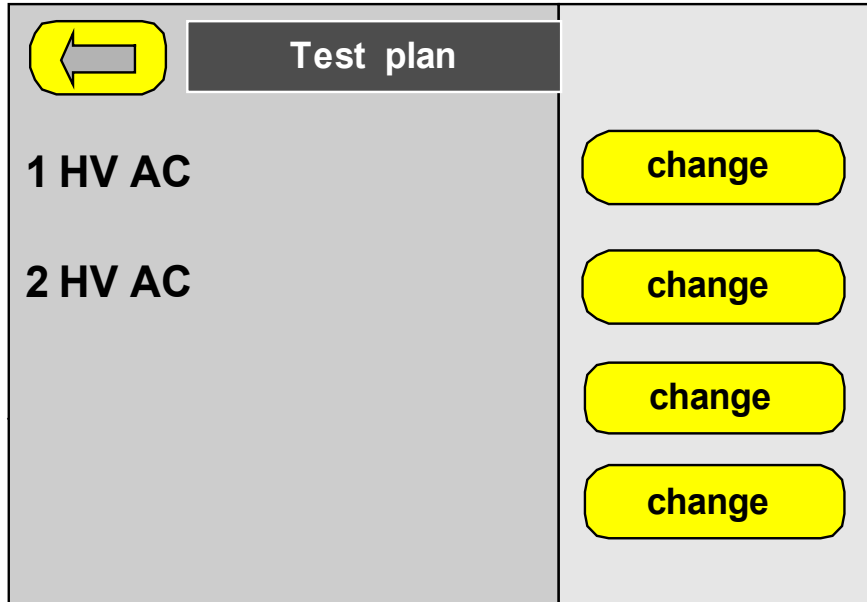


Fig. 10.31: Test plan - edit

**ins/del**

- Opens the test plan by touching the button "edit" (eg. 2HV AC).

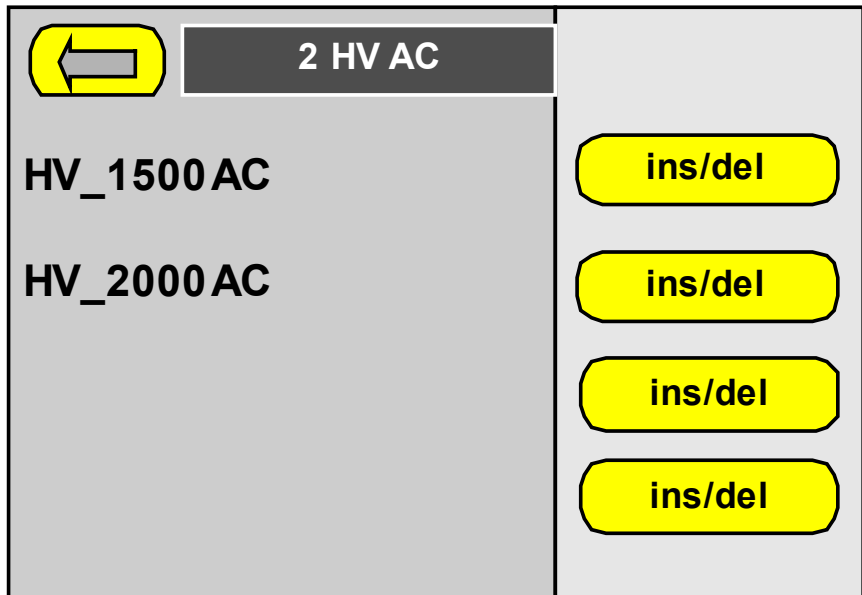


Fig. 10.32: Test plan 2HV AC - parameter sets

- Delete or insert a parameter set in the test plan. Parameter sets are described in Chapt. 10.4.

**Save**

- saves the changes made. You can assign a new name to the modified test plan or use the old name (over-write the test plan).

10. Menu System

10.5.5 Create test plan

**create**

For this, an existing test plan can be saved with a new name. Edit the test plan for the new requirements. The creation of a new empty test plan is also possible.

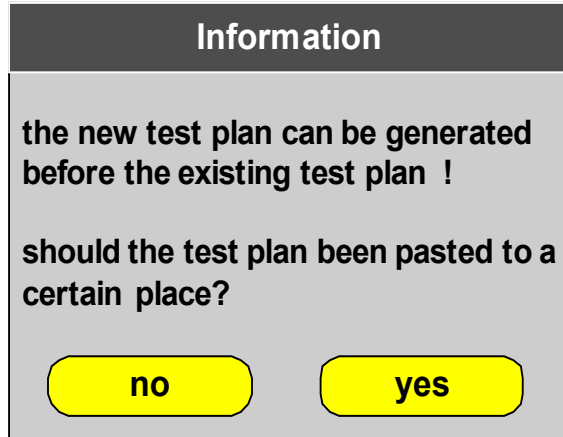


Fig. 10.16: Parameter set - create

**no**

**no** - shows a alpha-numeric soft key-board for entering the new test plan name. The new test plan will be placed at the end of the list.

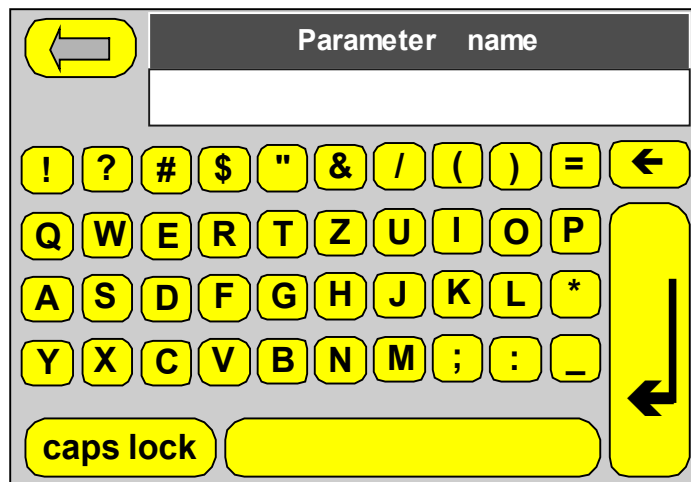


Fig. 10.17: Parameter set - enter the new name

**yes**

**yes** - opens a list of all defined test plans. Mark the position in the list for paste the new test plan

10. Menu System

10.5.6 Delete test plan

**delete**

Opens a list of all defined test plans. Mark a test plan for deleting and confirm it.

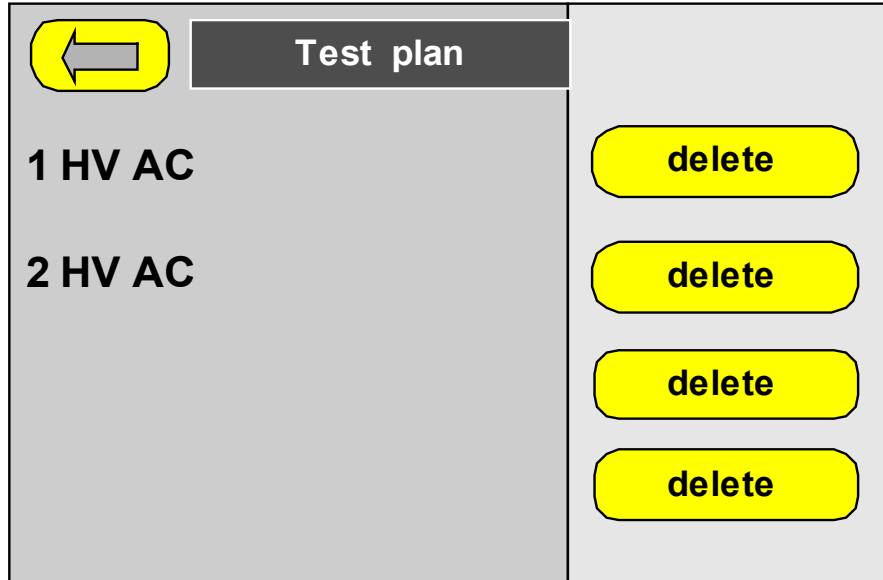


Fig. 10.35: Test plan - delete

**delete**

- Mark the test plan by touch to the button "delete" (eg. 2HV AC).
- Confirm by touch to the button "delete" in the information mask.

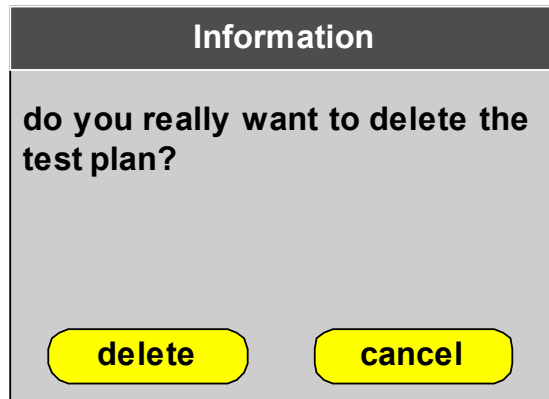


Fig. 10.36: Test plan -delete

10. Menu System

10.6 Setup (Device parameter)

**Setup**

After opening „Settings“, the operator must enter the password for level 3 (SETUP).

(SETUP)

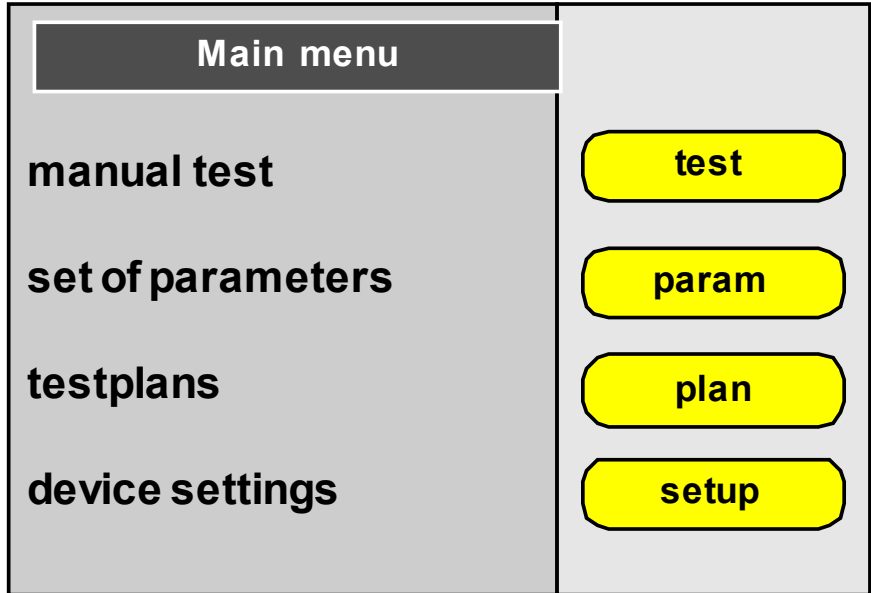


Fig. 10.37: Main menu

The menu is used to setup the device parameters and operating parameters. The parameters are displayed in screen masks. The masks can be changed by touching the upper or lower arrow.

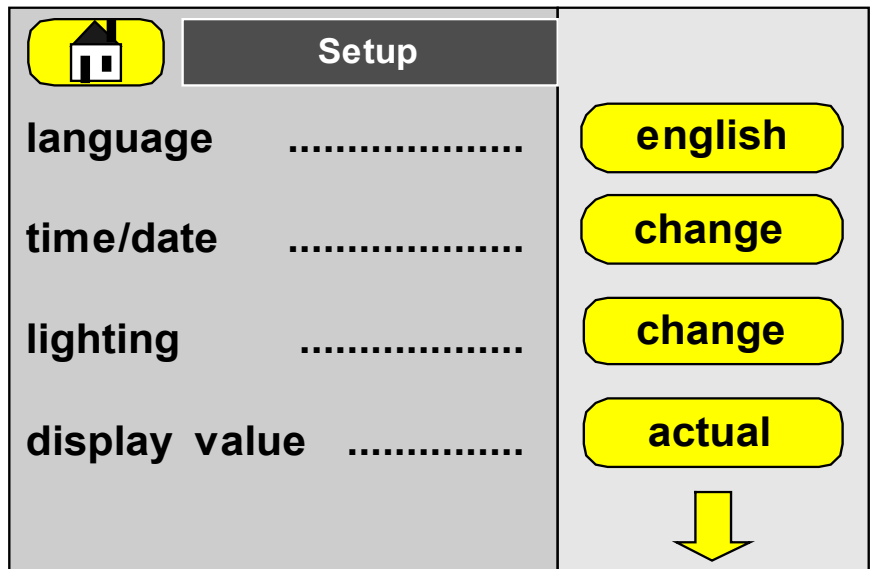


Fig. 10.38: Setup part1

next mask

Select **Language** - language setting for the menu system. The change to the language will become permanently active after the changes are saved.



10. Menu System

**Time and Date**

**Setting time** - set the current time (time format hh:mm) e.g. 12:21).

**Set time mode** - for US-time (12 h) mode or european time (24 h). am - 0:00 ... 12:00 - pm - 13:00 .... 24:00.

**Set date** - set the current date dependent (format DD.MM.JJJJ e.g. .13.03.2010).

**Set date mode** -  
format DD.MM.JJJJ, MM.DD.JJJJ, JJJJ.MM.DD

**Set the day of the week**

**Ligthing** - adjust the brightness of the display in percent.

**Display value (after testing)**

**actual** - the result and the measured value for the last test performed are displayed until accepted (manually using red reset button).

**last-** the result and the measured value for the last test performed are displayed until a new test is started (manually using green set button).

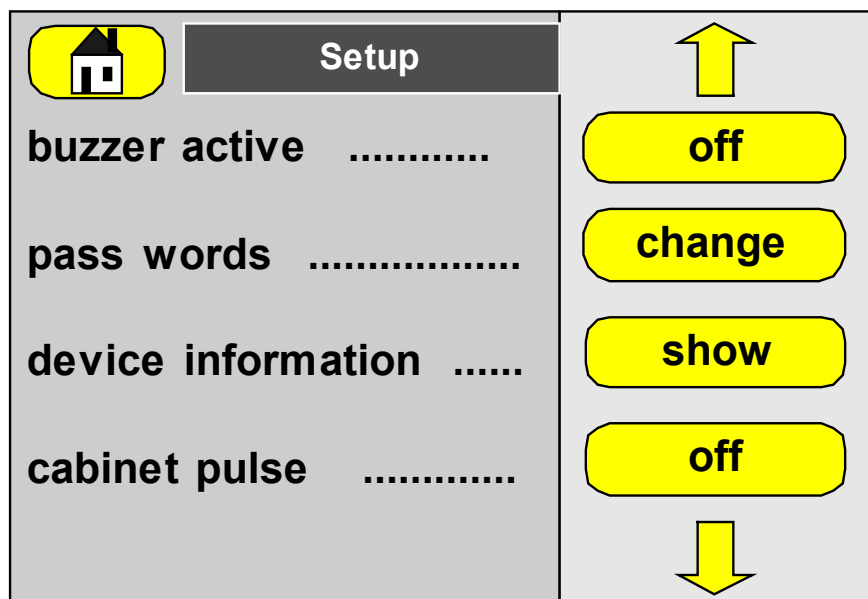


Fig. 10.39: Setup part 2

**Buzzer active** - Buzzer On/Off.

**Off** - the buzzer is switched off.

**On** - the buzzer is active

Passed - the buzzer sounds permanent

Fault - interval sound for appr. 5 s

Short intervals - manual interruption

Medium intervals -fault during high voltage test (limit value was exceeded)

Long intervals - interruption at time out (residual voltage measurement, test voltage not reached, etc.)

## 10. Menu System

measurement, test voltage not reached, etc.)  
fault at: bonding, manual time out, mains inverse polarity,  
mains supply not within tolerance.

**Buzzer volume** - Loudness of the buzzer in percent.

**Passwords** - Activate and change Passwords for the levels 1, 2, 3 (assignments of the password steps and predefined passwords - see Chapt. 3.9). The passwords for the layers are individually set able.

**Note:** For activating the menu "Settings - Password" the level-3 password for "Settings" is necessary.

### **Test- level-1**

- Enter the new password for Test (see Chapt. 3.9).
- Accept the new password by using the "save"- button.

The new password is now active.

### **Parameter - level-2 / Setup - level-3**

Enter the passwords for "Parameter" and Setup" in the same way then "Measure".

### **Pass words activ**

**inactive** - no password is active.

**active** - passwords active. For starting a new function, it is necessary to enter the password.

**Note - Pass words lost:** Request the ELABO service for a "master passwords". By using the master password it is possible to unlock the device.

**Device information** - Shows the device number, the software version and the integrated hardware of the device.

### **Cabinet impuls**

**Off** - operation without test cabinet.

**On** - for ELABO 93-4B series test cabinet. The device device sends a pulse to the test cabinet and as a result opens the lock. The pulse is generated at the end of the test time or after a „reset“. This is necessary if the device is used in conjunction with an ELABO 93-4B series test cabinet. The test time is increased by approx. 250 ms as a result.

10. Menu System

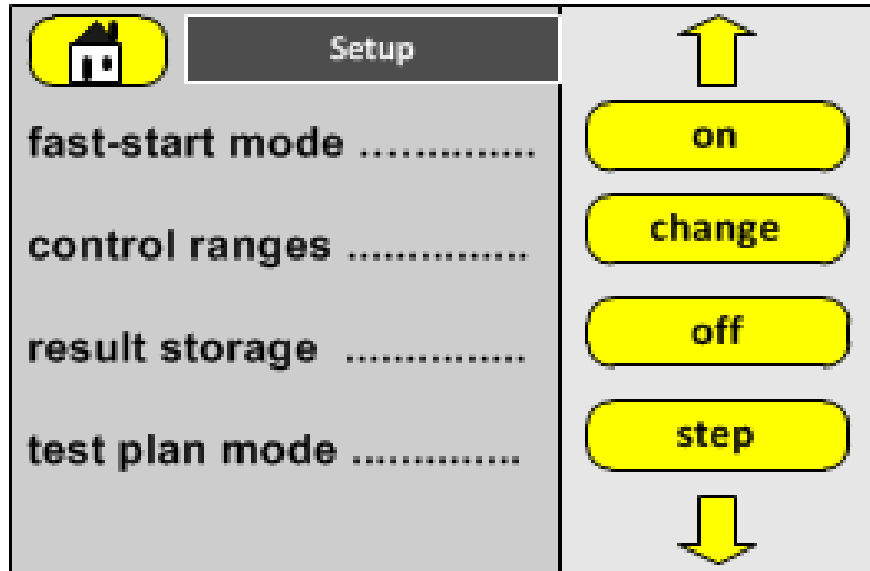


Fig. 10.40: Setup part 3

**Fast-start-mode** -Fast mode awaits the "Teaching" of a test item. The regulation of the device is then optimized on the learned values of the test item. On similar test items can then be achieved a much faster test cycle, since the operating point is already known.

**Off** - In "Normal operation", the regulation is performed for HV / ISO to + / - 10 V (Vset), for PE to 0 .. 0.5 A.

**On**- In fast mode, the parameters of "Control ranges" are active. See also chapter 14.

**Control range** (only visible if fast mode is "On") – Control accuracy for HV / ISO / PE. Minimum / maximum value to the desired value (Regulation window).

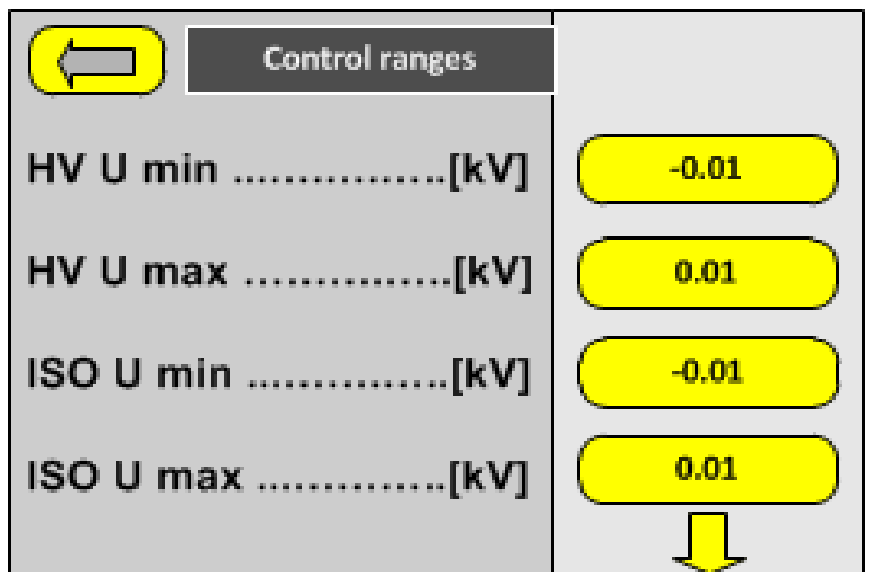


Fig. 10.40a: Control ranges

Input of numeric values, see Chapter 3.8.1 "Enter free numeric values".

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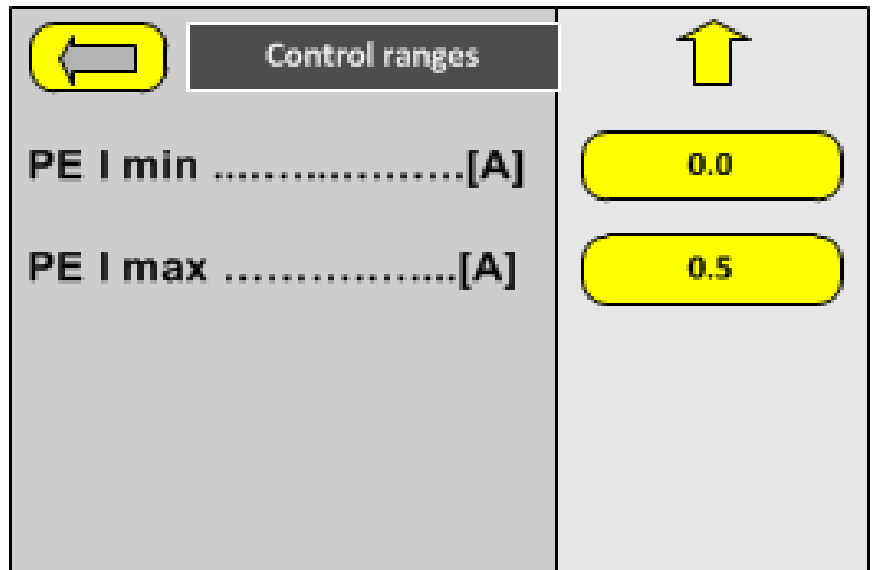


Fig. 10.40b: Control ranges PE

**Results** - internal memory area for test parameter with results and measurement values. By using the ELABO "Light-Software" for the G-device series, it is possible to read out this memory area. Connect the device via X9a (service interface) to your PC. See Chapt. 13 ELABO Light Software.

- Off** - no intermediate storage active,
- On** - the device saves up to 500 results.

**Test plan mode** - definite the processing of the test plan

- Auto** - after manual start, the test plan will processing with out any keystroke.
- Step** - every test step, must be start up by pressing the start button.

10. Menu System

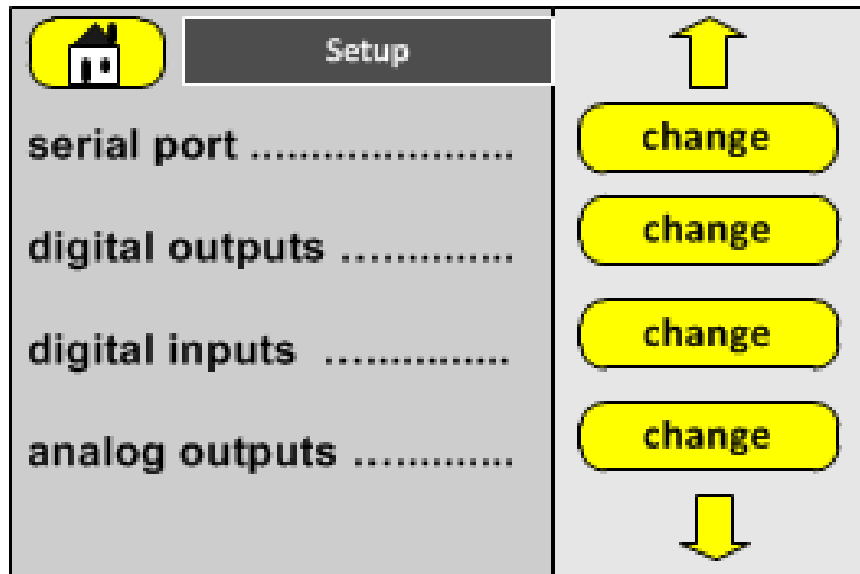


Fig. 10.41: Setup part 4 (DAS- interface - option E07 only)

**Serial Interface** - for remote control via PC.

**Baud rate** (for COM-Port)- Baud rate of the serial interface. The baud rate of the opposite terminal must be set to the same value. Possible values: 4800, 9600, 19200, 38400, 57600, 11520.

Standard setting COM port: Baud: 115200, Data bits: 8, Stop pulse: 1, Parity: none, Check sum on remote control: off.

**Checksum** Checksum on/ off.

**Digital outputs / Digital Inputs / Analog outputs / Analog inputs** - (only for tester with integrated DAS- interface - option E07).

**change** - is showing a listing with the outputs or inputs. It is possible to set individual names for the Out-/input

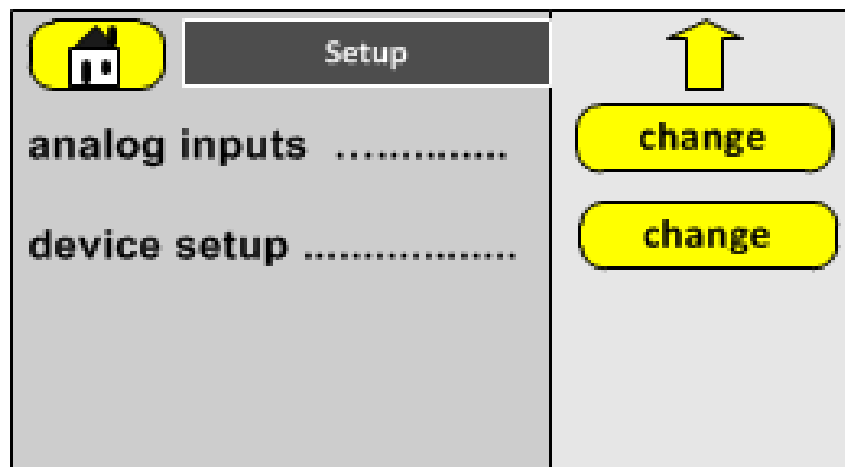


Fig. 10.42: Setup part 5

**Device-Setup** - for internal parameter. This parameter are set and edit by the ELABO-service, only. Of this reason the sub menu is password protected.

## 11. Test parameter

### 11 Test parameters

#### 11.1 Parameters for high voltage test

On this menu the settings for the HV tests are made. Depending on which device variant you have, some of the parameters given in the following may not be available or it may not be possible to edit some parameters. The values entered are changed in the parameter set currently open. The parameters in the following relate to the AC standard device.

In case of devices with options fitted, the parameters may vary. On this topic see chapter "Options".

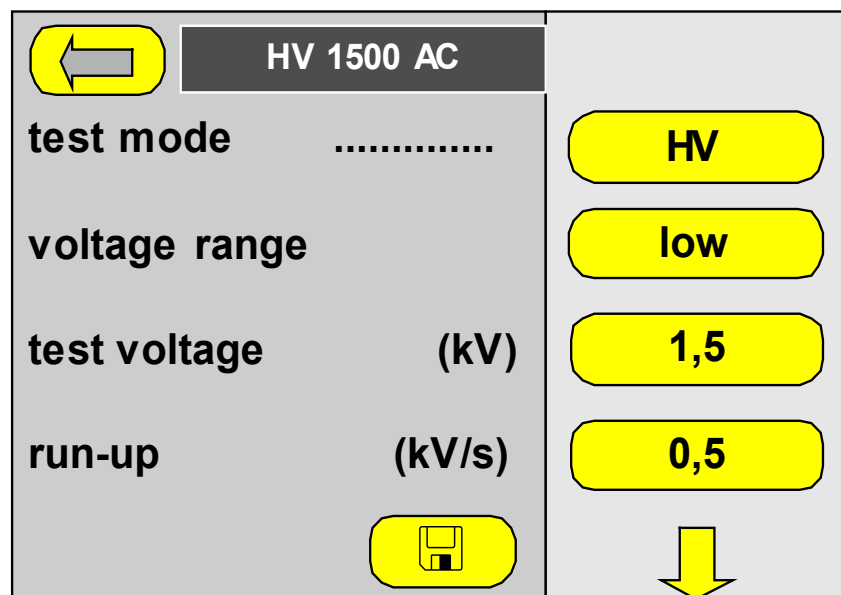


Fig. 11.1a: HV test parameters 1

#### Test mode "HV / ISO / PE / Time / Burn"

**HV** - HV-test with AC voltage max. 5000 V /max. 200 mA.

**ISO** - Insulation-test with DC voltage 1200 V max. 1000 MOhm.

**PE** - protective earth conductor test with AC voltage 6/12 V / 5 ... 32 A / 0 ... 1200 mOhm.

**Burn** (option) - HV-test with AC voltage max. 5000 V with the maximum of test current. The over current tripping is not active.

**Time** - Waiting time step, eg. time to discharging the test object past a HV test.

#### Voltage range "low / high"

**low** - test voltage max. 100 ... 2500 V AC

**high** - test voltage max. 200 ... 5000 V AC

**Test voltage "0.01 ... 5.0 kV AC"** - set the test voltage for the HV-test .

**Run up (on/off)** - activates the ramp-up function of the test voltage.

11. Test parameter

**off**- no ramp-up function, the full test voltage is applied.

**on** - ramp-up function active. The test voltage is increased linearly from the start voltage up to the test voltage.

**Ramp up voltage (0.00 ... 3.50 kV/s)** - defines the amount by which the test voltage is increased linearly in a time unit. The start voltage is used as the start value, the end value is the test voltage set. After the test voltage is reached, the test time set is started.

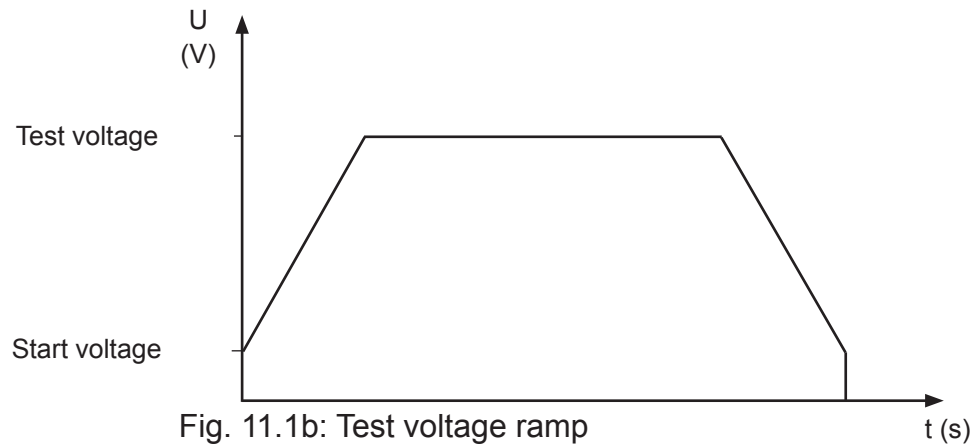


Fig. 11.1b: Test voltage ramp

**Run back (on/off)** - activates the ramp-down function of the test voltage.

**Off** - no voltage ramp down. The full test voltage is switched off abruptly. In case of test objects with integrated inductance, this action can result in switching off voltage spikes.

**On** - voltage ramp down active. The test voltage is reduced linearly from the test voltage to the start voltage as per the ramp down speed and then switched off.

**Ramp down speed (0,00 ... 3.50 kV/s)** - the test voltage is reduced linearly by the value given per time unit.

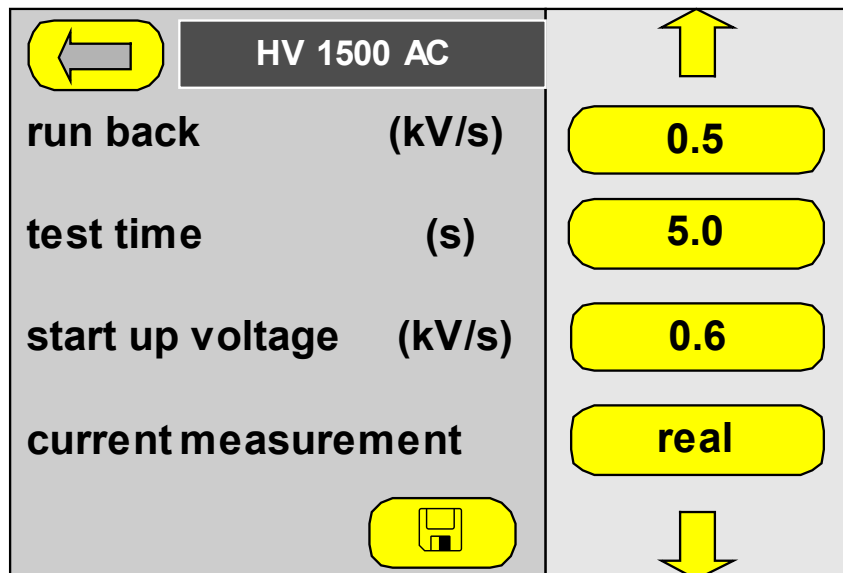


Fig. 11.1c: Test parameter 2- HV

## 11. Test parameter

**Test time (Continuous / 0.5 ... 999.9 s)** - the test time can be set from 0.5 to 999.9s. The test time is irrelevant in the case of „Continuous test on“.

**Continuous test** -active. The test voltage is applied continuously. The test must be interrupted manually using the red „Reset“ button S2/H2 if a fault occurs (eg.  $I > I_{max}$ ). The continuous test can last max. 999.9 seconds.

**Test time 0.5 ... 999.9 s** - test time active. The test voltage is applied for the duration of the test time.

**Start up voltage (on/off)** - defines the voltage value from which the high voltage ramp starts.

**on (0.02 kV/s up to (test voltage - 0.01 kV/s))**

**off** - start voltage - No ramp function, the full test voltage is switched on.

**Current measurement** - enter the part of the current that is to be used for tripping.

**real** - evaluation of the real part of the test current (effective).

**complex**- evaluation of the complex current (test current with real and reactive part).

**Current range (mA)** - enter the measurement range in which the test current is to be evaluated. This parameter may be dependent on the voltage device type.

**10 mA** measurement range

**100 mA** measurement range

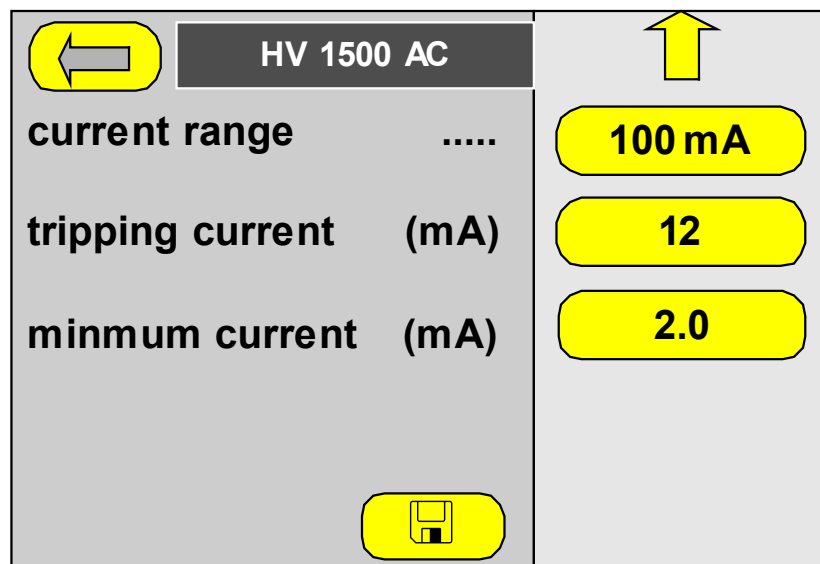


Fig. 11.1d: HV test parameter 3

**Tripping current (0.01 ... 10 / 100 mA):** - the current entered is the maximum current that is allowed to flow during the HV testing. If this value is exceeded, an HV fault ( $I > I_{max}$ ) is indicated (test object fault - HV flashover). The tripping current ( $I_{max}$ ) is dependent on the measurement range.



## 11. Test parameter

**Minimum current (on/0.00 ... dynamic):** - the current entered must flow during the HV testing as a minimum. If the current is less than this value, a contact fault ( $I < I_{min}$ ) is indicated.

**off** - no minimum voltage monitoring.

**on - (0.00 up to tripping current )** minimum current monitoring active. The current range is all times 0.1 / 0.01 lower then the tripping current.

## 11. Test parameter

### 11.2 Parameters insulation resistance test ISO

On this menu the settings for the insulation resistance test are made. .

ISO tests are made using DC, with the test object isolated from the mains. The insulation resistance between live parts and the housing is measured and evaluated. The parameters are largely identical to the parameters for the high voltage test (chapter 11.1).

Depending on which device variant you have, some of the parameters given in the following may not be available or it may not be possible to edit some parameters. The values entered are changed in the parameter set currently open. The parameters in the following relate to the standard device with 1200 V/ 1 mA.

In case of devices with options fitted, the parameters may vary.

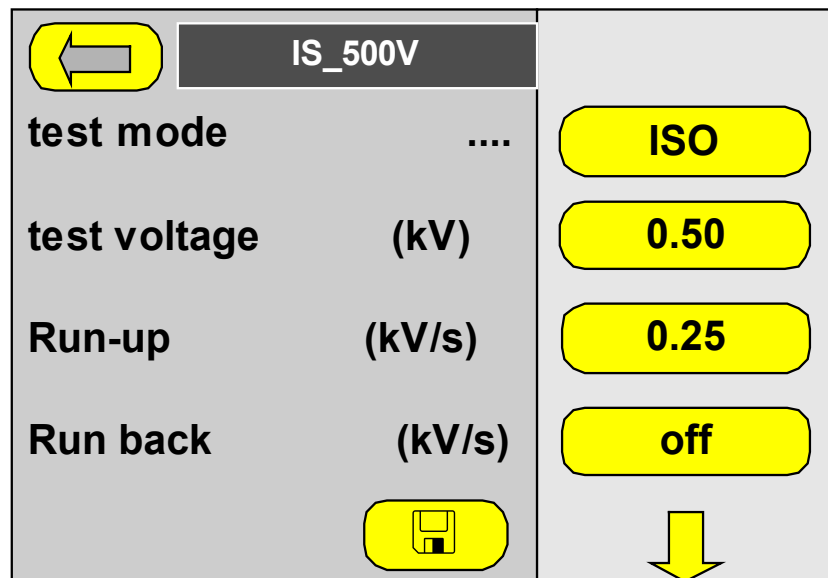


Fig. 11.2a: ISO test parameter 1

#### Test mode "HV / ISO / PE / Burn / Time"

**HV** - HV-test with AC voltage max. 5000 V / max. 200 mA.

**ISO** - Insulation-test with DC voltage 1200 V max. 250 MOhm.

**PE** - protective earth conductor test with AC voltage 6/12 V / 5 ... 32 A / 0 ... 1200 mOhm.

**Burn** (option) - HV-test with AC voltage max. 5000 V with the maximum of test current. The over current tripping is not active.

**Time** - Waiting time step, eg. time to discharging the test object past a ISO test.

**Test voltage "0.05 ... 1,2 kV DC"** - set the test voltage for the HV-test .

**Run up (on/off)** - activates the ramp-up function of the test voltage.

**off**- no ramp-up function, the full test voltage is applied.

**on** - ramp-up function active. The test voltage is increased linearly from the start voltage up to the test voltage.

**Ramp up voltage (0.01 .. 1.00 kV/s)"** - defines the amount by which the test voltage is increased linearly in a time unit. The

## 11. Test parameter

start voltage is used as the start value, the end value is the test voltage set. After the test voltage is reached, the test time set is started.

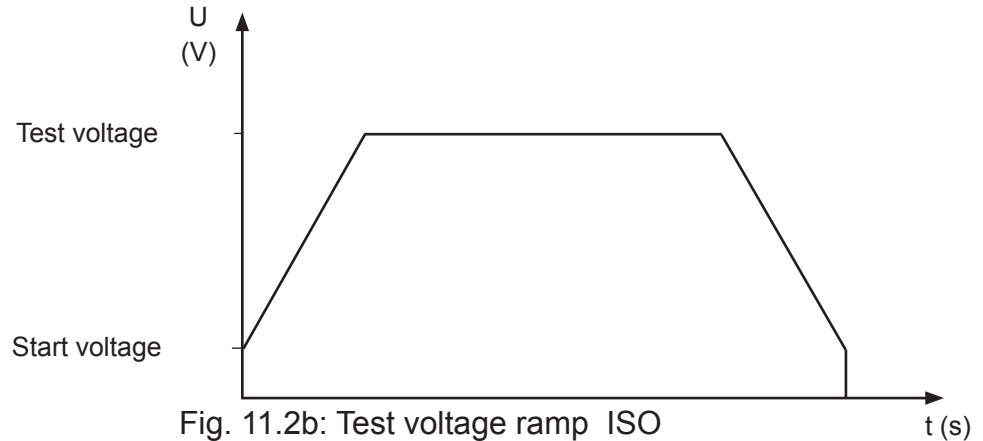


Fig. 11.2b: Test voltage ramp ISO

**Run down (on/off)** - activates the ramp-down function of the test voltage.

**Off** - no voltage ramp down. The full test voltage is switched off abruptly. In case of test objects with integrated inductance, this action can result in switch off voltage spikes.

**On** - voltage ramp down active. The test voltage is reduced linearly from the test voltage to the start voltage as per the ramp down speed and then switched off.

**Ramp down speed (0.01 ... 1.00 kV/s)** - the test voltage is reduced linearly by the value given per time unit.

**Start voltage (on/off)** - defines the voltage value from which the high voltage ramp starts.

**on (0.04 kV/s up to (test voltage - 0.01 kV/s))**

**off** - start voltage - No ramp function, the full test voltage is switched on.

**Test time (Continuous / 0.5 ... 999.9 s)** - the test time can be set from 0.5 to 999.9s. The test time is irrelevant in the case of „Continuous test on“.

**Continuous test** -active. The test voltage is applied continuously. The test must be interrupted manually using the red „Reset“ button S2/H2 or if a fault occurs (eg.  $R < R_{min}$ ). The continuous test can last max. 999.9 seconds.

**Test time 0.5 ... 999.9 s** - test time active. The test voltage is applied for the duration of the test time.

## 11. Test parameter

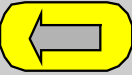



 <span style="background-color: #333; color: white; padding: 2px 10px; font-weight: bold;">IS_500V</span> 		
<b>test time</b>	(s)	<span style="background-color: #ffff00; border: 1px solid black; border-radius: 10px; padding: 5px 20px; font-weight: bold;">5.00</span>
<b>delay time</b>	(s)	<span style="background-color: #ffff00; border: 1px solid black; border-radius: 10px; padding: 5px 20px; font-weight: bold;">1.01</span>
<b>start up voltage</b>	(kV/s)	<span style="background-color: #ffff00; border: 1px solid black; border-radius: 10px; padding: 5px 20px; font-weight: bold;">0.01</span>
<b>Range</b>	.....	<span style="background-color: #ffff00; border: 1px solid black; border-radius: 10px; padding: 5px 20px; font-weight: bold;">100 MOhm</span>
		

Fig. 11.2c: ISO test parameter 2

**Delay time „off / on 0.1 ... 80.0 s “** - defines a period before the actual measurement. The HV is applied, however the Rmin tripping ( $R < R_{min}$ ) is deactivated for the time entered. This feature is provided for test objects that drawn high switch on currents, e.g. test objects with a high capacitive load.

**off** - no delay. The  $R < R_{min}$  evaluation is active.

**on 0.1 ... 80.0 s** - delay active. the delay time can be set from 0.1 to 999.9s The  $R < R_{min}$  evaluation is disabled in this time.

**Range (MOhm)** - enter the measurement range in which the insulation resistance is to be evaluated. This parameter may be dependent on the device type.

**10 MOhm** measurement range

**100 MOhm** measurement range

**1000 MOhm** measurement range

**auto** - the suitable measurement range is scanned automatically. The scan is carried out, from the lowest to the highest range.

11. Test parameter

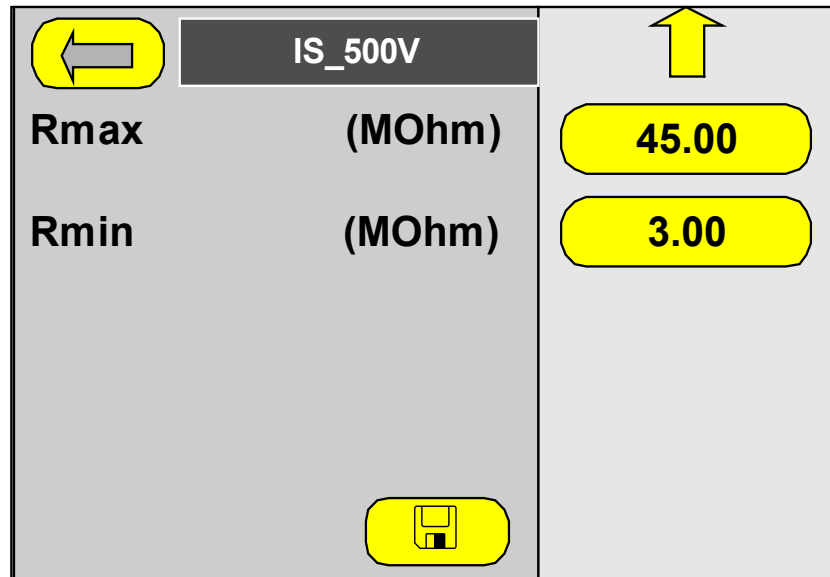


Fig. 11.2d: ISO test parameter 3

**Rmax (1 ... 1000 MOhm):** - largest insulation resistance allowed. If this value is exceeded, a fault (no contact  $R > R_{max}$ ) is indicated. This parameter is used for the contact monitoring. The  $R_{max}$  is dependent on the measurement range and can be between 1 and 1000 MOhm. The ranges are depended on the device type.

**Rmin (1 ... dynamic):** - lowest insulation resistance allowed. If the resistance is less than this value, an insulation fault  $R < R_{min}$  is indicated. The  $R_{min}$  is dependent on the measurement range and can be between 1 and 1000 MOhm. The ranges are depended on the device type.

## 11. Test parameter

### 11.3 Setting parameters protective earth conductor test (PE)

This screen contains the parameters for the PE (protective earth conductor) test. The PE step permits tests; depending in the test type, in accordance with EN 60335 (VDE 0700), EN 60204 (VDE 0113), EN 60601 (VDE 0411).

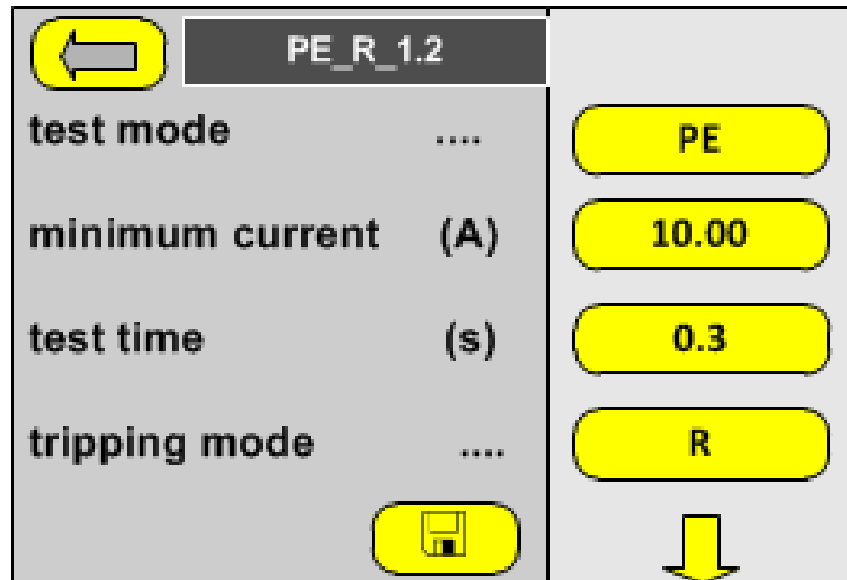


Fig. 11.3a: PE test parameter 1

#### Test mode "HV / ISO / PE / Burn / Time"

**HV** - HV-test with AC voltage max. 5000 V / max. 200 mA.

**ISO** - Insulation-test with DC voltage 1200 V max. 1000 MOhm.

**PE** - protective earth conductor test with AC voltage 6/12 V / 5 ... 32 A / 0 ... 1200 mOhm.

**Burn** (option) - HV-test with AC voltage max. 5000 V with the maximum of test current. The over current tripping is not active.

**Time** - Waiting time step, eg. time to discharging the test object past a ISO test. **Test time:** - the duration of the PE testing in seconds.

**Minimum current (A):** - for PE-test. Definition of the minimum test-current for the protective earth conductor connection. If the test-current is less then this min-value, a  $I < I_{min}$  fault is indicated (included SW-Rel. 7/320/00/04).

#### Tripping mode (U, R):

**U voltage (0.1 ... 12.0 V)** in accordance with EN 60601 (VDE 0411)

**R resistance (0 .... 1.2 Ohm)** in accordance with EN 60335 (VDE 0700)

## 11. Test parameter

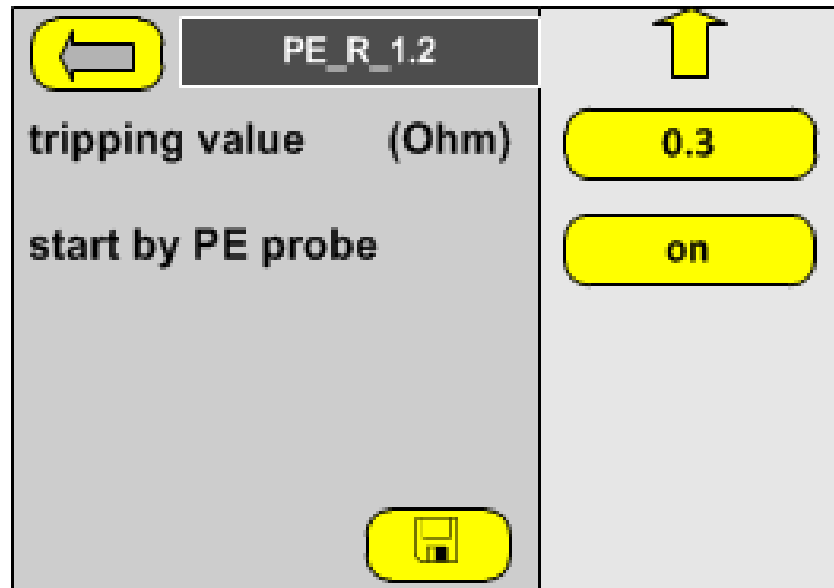


Fig. 11.3b: PE test parameter 2

**Tripping value (U, R):**

**R resistance (0 .... 1.2 Ohm)** nach EN 60601 (VDE 0411).

**Tripping limit value - R resistance (Ohm):** - The largest resistance allowed to the protective earth conductor connection. If this value is exceeded, a PE fault is indicated.

**U voltage drop (0 .... 12 V)** acc. EN 60335 (VDE 0700).

**Tripping limit value - voltage drop:** - definition of the maximum voltage drop over the protective earth conductor connection. If this value is exceeded, a PE fault is indicated.

**Start by PE probe** - manual PE testing, start using PE test probe. The PE test step waits until the PE test probe is pressed against the test object (internal switch). Only then is the test current applied.

11. Test parameter

11.4 Setting parameters Burn (Option)

BURN with AC voltage, for the localisation of low insulation points inside the test object. By the over-flash of the voltage, it is possible, to welding out the insulation fault. The maximum short-circuit current at BURN is: appr. 250 mA in 2,5 kV range and appr. 150 mA in 5 kV range.

The BURN mode, don't ensures a non destructive testing, since the tripping current release is blocked. Use the BURN function only for the localisation an welding out of low insulation points.

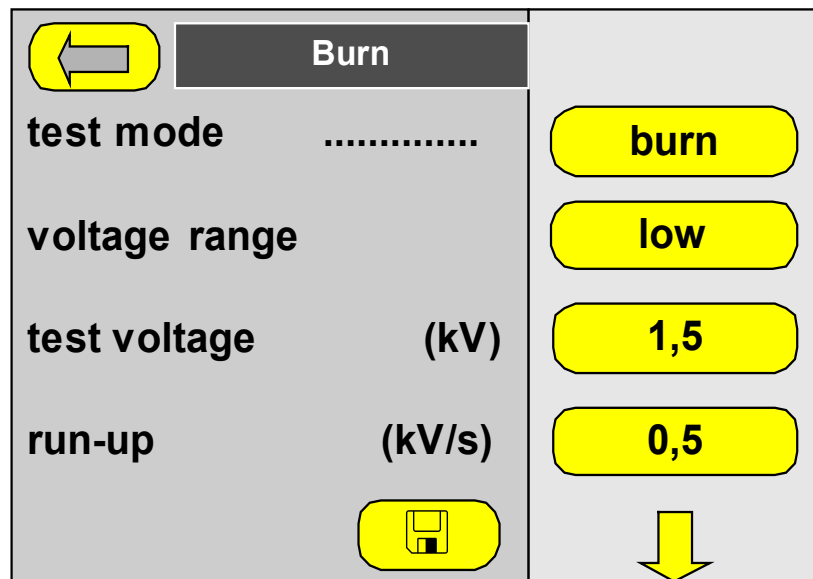


Fig. 11.4a: Test parameter 1 - burn

Test mode "HV / ISO / PE / Burn / Time"

**HV** - HV-test with AC voltage max. 5000 V / max. 200 mA.

**ISO** - Insulation-test with DC voltage 1200 V max. 250 MOhm.

**PE** - protective earth conductor test with AC voltage 6/12 V / 5 ... 32 A / 0 ... 1200 mOhm.

**Burn** (option) - HV-test with AC voltage max. 5000 V with the maximum of test current. The over current tripping is not active.

**Time** - Waiting time step, eg. time to discharging the test object past a ISO test.

Voltage range "low / high"

**low** - test voltage max. 100 .... 2500 V AC

**high** - test voltage max. 200 .... 5000 V AC

Test voltage "0.01 ... 5.0 kV AC" - set the test voltage for the HV-test .

Run up (on/off) - activates the ramp-up function of the test voltage.

**off**- no ramp-up function, the full test voltage is applied.

**on** - ramp-up function active. The test voltage is increased linearly from the start voltage up to the test voltage.



11. Test parameter

**Ramp up voltage (0.00 ... 3.50 kV/s)** - defines the amount by which the test voltage is increased linearly in a time unit. The start voltage is used as the start value, the end value is the test voltage set. After the test voltage is reached, the test time set is started.

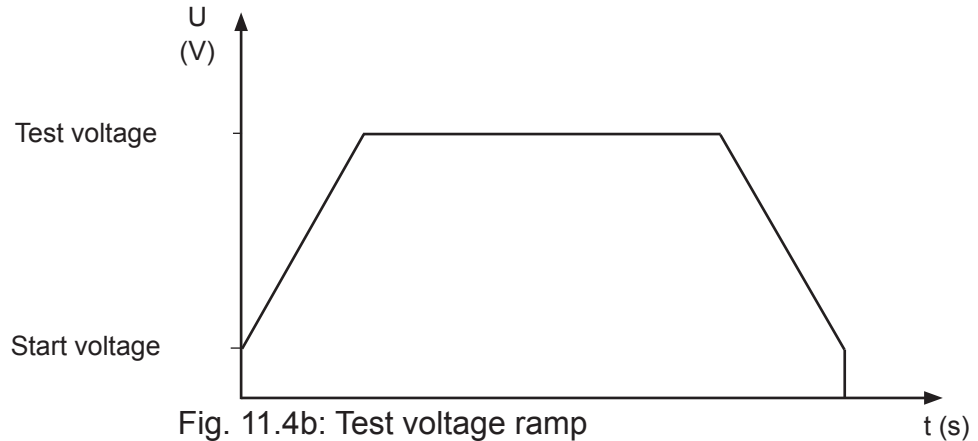


Fig. 11.4b: Test voltage ramp

**Run back (on/off)** - activates the ramp-down function of the test voltage.

**Off** - no voltage ramp down. The full test voltage is switched off abruptly. In case of test objects with integrated inductance, this action can result in switching off voltage spikes.

**On** - voltage ramp down active. The test voltage is reduced linearly from the test voltage to the start voltage as per the ramp down speed and then switched off.

**Ramp down speed (0,00 ... 3.50 kV/s)** - the test voltage is reduced linearly by the value given per time unit.

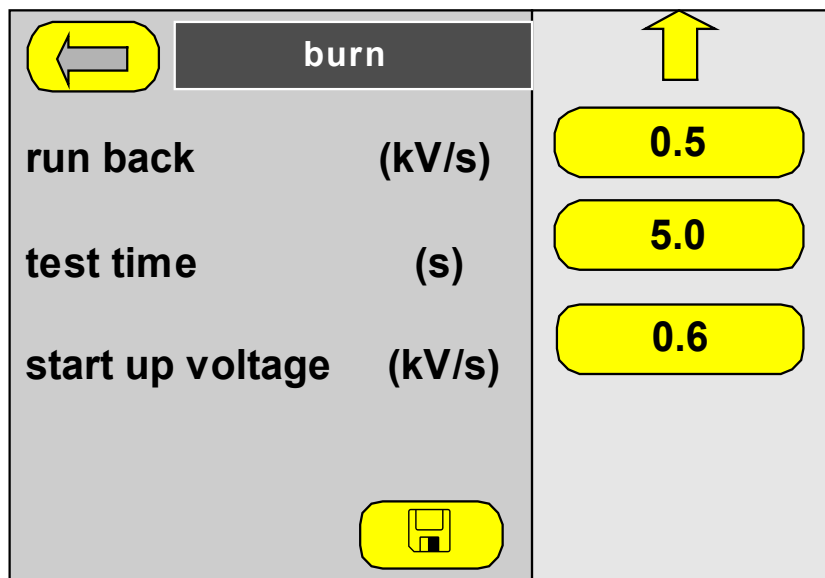


Fig. 11.4c: HV- burn test parameters 2

**Test time (Continuous / 0.5 ... 999.9 s)** - the test time can be set from 0.5 to 999.9s. The test time is irrelevant in the case of „Continuous test on“.

**Continuous test** -active. The test voltage is applied continuously. The test must be interrupted manually using the red „Reset“

## 11. Test parameter

button S2/H2 if a fault occurs (eg.  $I > I_{max}$ ). The continuous test can last max. 999.9 seconds.

**Test time 0.5 ... 999.9 s** - test time active. The test voltage is applied for the duration of the test time.

**Start up voltage (on/off)** - defines the voltage value from which the high voltage ramp starts.

**on (0.02 kV/s up to (test voltage - 0.01 kV/s))**

**off** - start voltage - No ramp function, the full test voltage is switched on.

## 11. Test parameter

### 11.5 Time-Step

The time step can be inserted in any place in the test plan. Time steps serves for interrupting the test sequence for a specified time. This is necessary perhaps before starting a function test, for switching ON and for the booting up of the test object.

The rest time is showing in test screen. Every time a interrupting of the delay is possible.

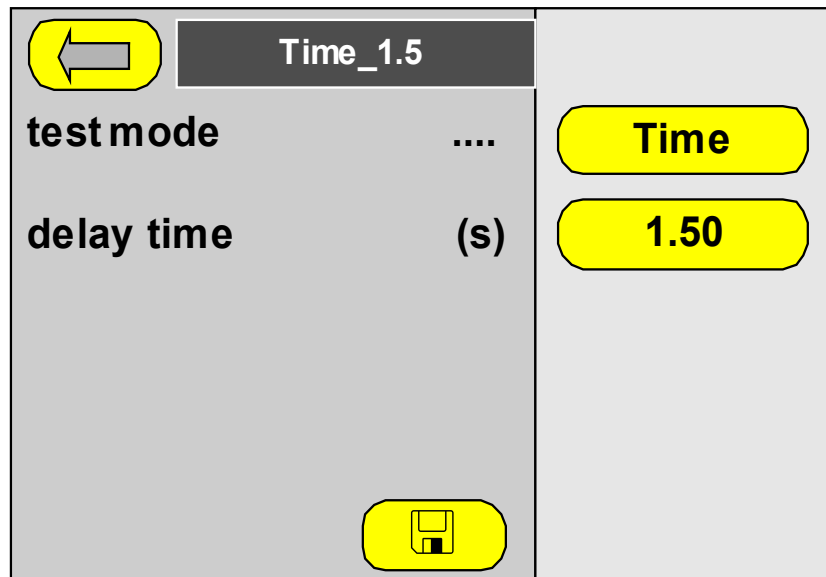


Fig. 11.5: Test parameter Time

#### Test mode "HV / ISO / PE / Burn / Time"

**HV** - HV-test with AC voltage max. 5000 V / max. 200 mA.

**ISO** - Insulation-test with DC voltage 1200 V max. 1000 MOhm.

**PE** - protective earth conductor test with AC voltage 6/12 V / 5 ... 32 A / 0 ... 1200 mOhm.

**Burn** (option) - HV-test with AC voltage 2500/5000 V with the maximum of test current. The over current tripping is not active.

**Time** - Waiting time step, eg. time to discharging the test object past a ISO test.

**Delay time (0.5 ... 999.9 s)** - for this time the test run is stopped and the device is stand by.

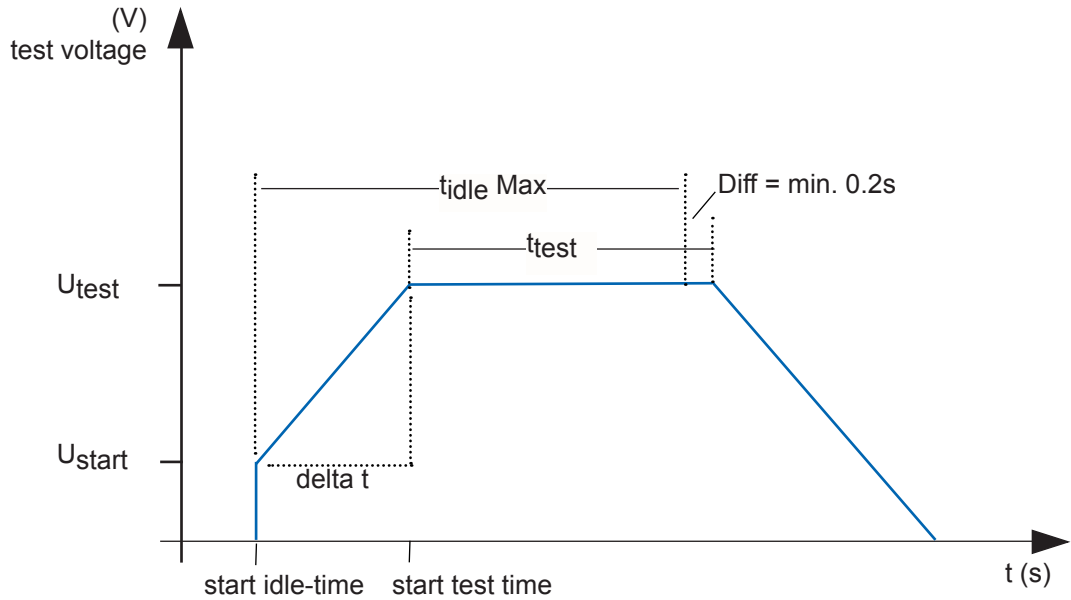
**off** - no delay .

**delay time 0.5 ... 999.9 s** - delay active.

11. Test parameter

11.6 CALCULATION OF THE IDLE TIME (HV / ISO)

Idle time (0.1 ... 80.0 s) means " no evaluation of the test current / insulation resistance.



Calculation of the maximum idle time, with active "ramp-up".

$$t_{\text{idle Max}} = \frac{U_{\text{test}} (V) - U_{\text{start}} (V)}{\text{ramp-up rate (V/s)}}$$

Calculation of the maximum idle time, with out "ramp-up".

$$t_{\text{idle Max}} = \text{test time (s)} - \text{Diff (min 0.2s)}$$

Note: For a correct evaluation of the test current / ISO-resistance, a minimum test time off 0.2 s (Diff) is necessary, in all cases.

12. Input/Output test step

**12 OPTIONAL OUTPUTS / INPUTS**

For the device can be ordered as an option, two additional interface cards with only outputs or outputs and inputs. The installation of the optional cards must be carried out by the manufacturer, because interventions must be made in the hardware of the device. For update of a the tester with this options, sent the device to ELABO.

The device can be equipped with both interface cards simultaneously. The presence of the card must be defined in the menu Setup - device setup (pass word protected).

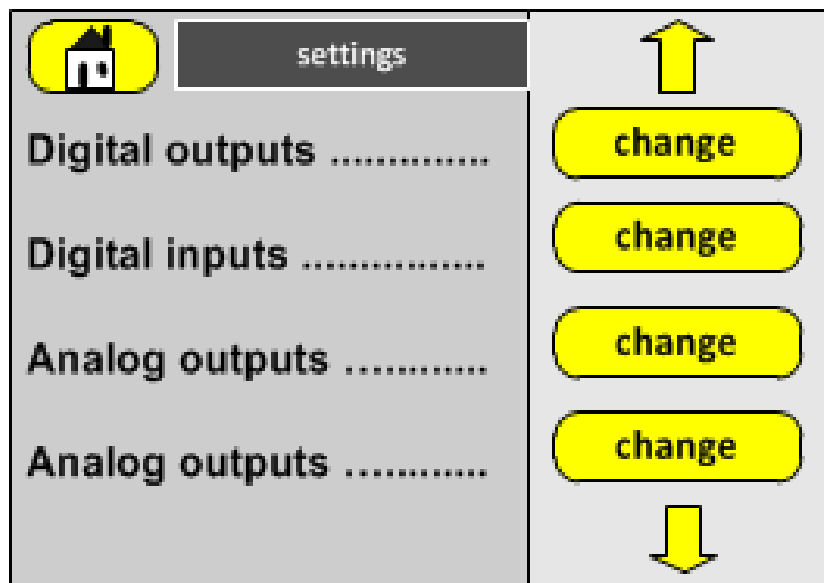
**12.1 Base settings Outputs/Inputs**

The base settings includes for:

**Digital** In-/Outputs the definition of a self-explanatory name.

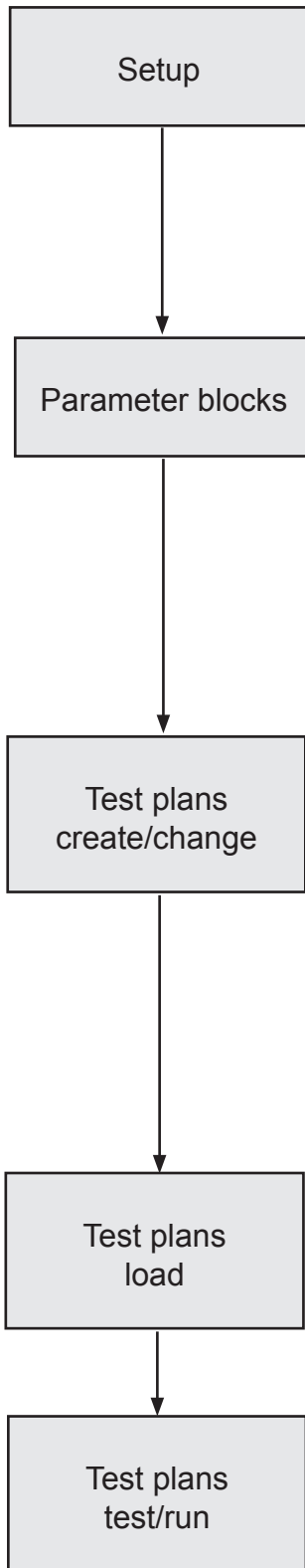
**Analog** In-/Outputs the definition of a self-explanatory name, the unit (SI) and the final values (scale).

The base settings are made in the menu "Setup".



12. Input/Output test step

Over view

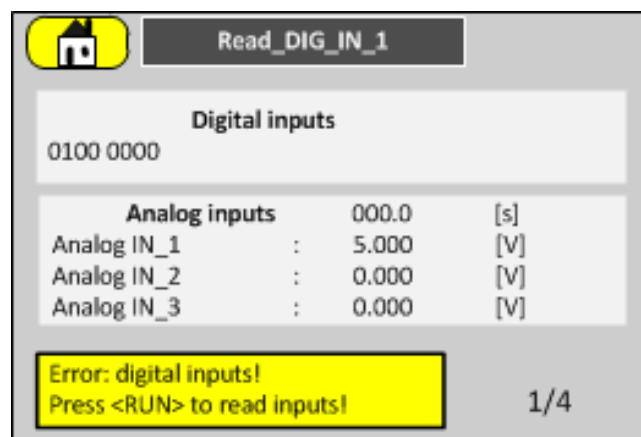


	New name	Si-unit	final value
Digital OUT	X		
Analog OUT	X	X	X
Digital IN	X		
Analog IN	X	X	X

	Test time	Dead time	Off/On	Min. value	Max. value	nominal value
Digital OUT	X	X	X			
Analog OUT	X	X	X			X
Digital IN	X	X	X			
Analog IN	X	X	X	X	X	

Test plan sequence	
Read Digital IN	
Set Analog OUT	
ISO-500 V	
HV-1000 V	
Set Digital OUT	
Read Analog IN	

Test plan list	
testplan 1	
testplan 2	



Read\_DIG\_IN\_1

Digital inputs  
0100 0000

Analog inputs      000.0      [s]  
 Analog IN\_1        : 5.000      [V]  
 Analog IN\_2        : 0.000      [V]  
 Analog IN\_3        : 0.000      [V]

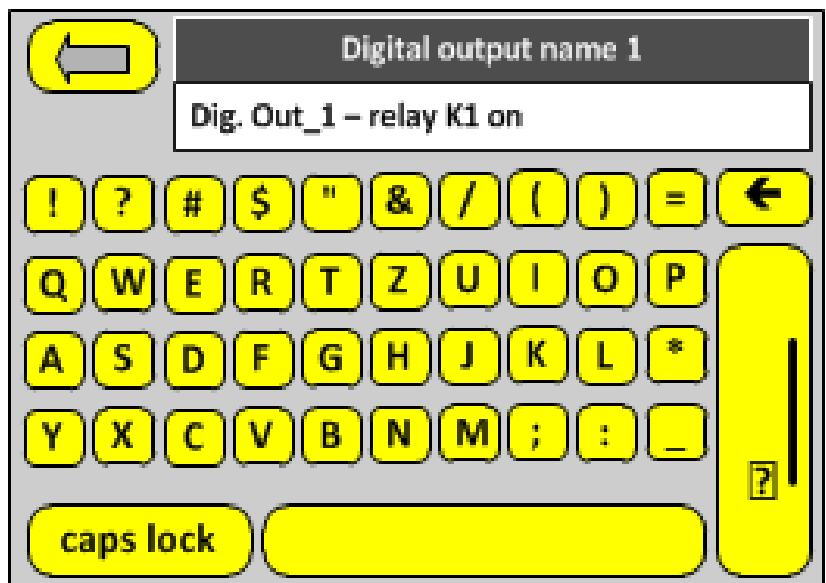
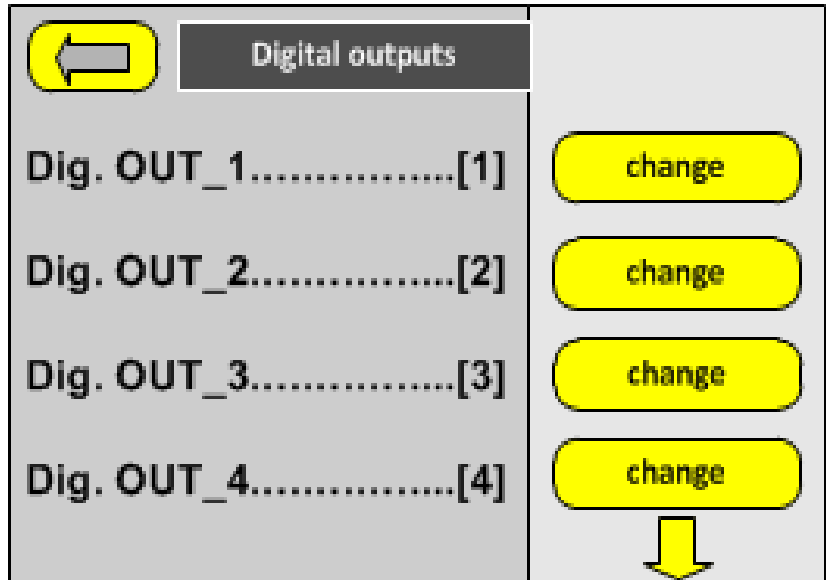
Error: digital inputs!  
Press <RUN> to read inputs!

1/4

## 12. Input/Output test step

### 12.1.1 Digital Output/Input Setup

For additional digital in-/outputs, the definition of self-explanatory names is possible. In the menu parameter-block definition, the tester is showing this self-explanatory name for the out-/input.



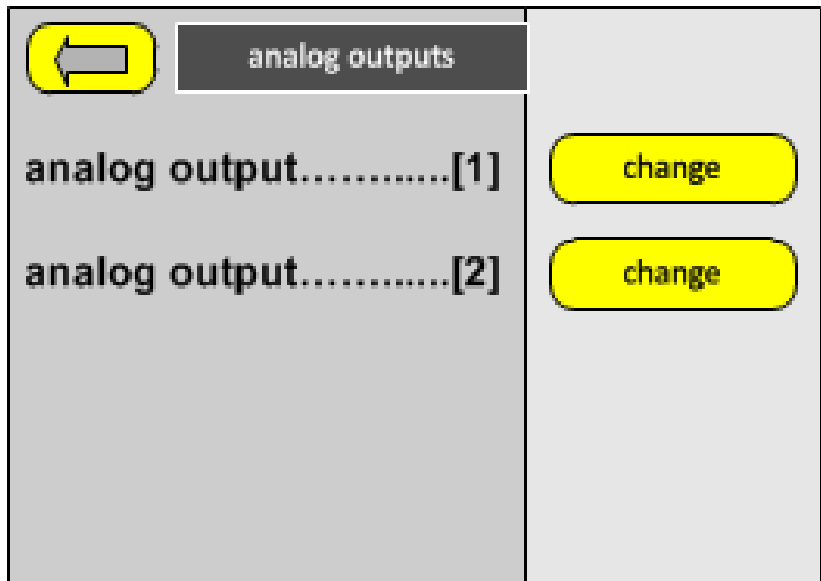
12. Input/Output test step

12.1.2 Analog Outputs/Inputs

The expanded digital/analog interface Option G7-1 E07 (chapter 12.3) provides 16 digital / 2 analog outputs and 8 digital / 3 analog inputs.

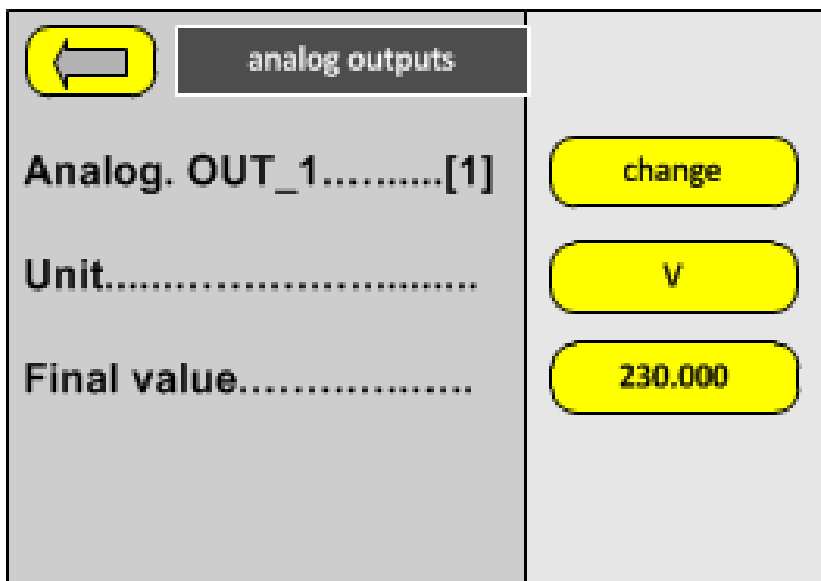
The analog outputs/inputs are working with DC-voltage of 0.0 ... 10.00 V. Example: The analog output is used for generating of the nominal value of an AC supply of 0 - 230 V. In this case, the si-unit (V) and the final value of the AC-voltage (230) must be predefined for the analog output.

Chose Analog OUT.. "change" (see Fig. 12.1).



The display will show all analog outputs.

Chose the analog output for definition "change".

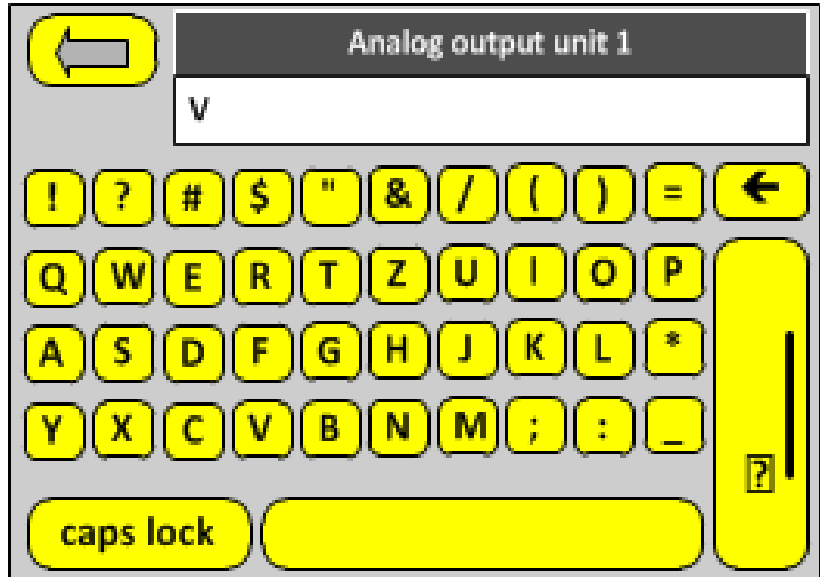


For analog in-/outputs, the definition of self-explanatory names is possible. In the menu parameter-block definition, the tester is showing this self-explanatory name for the out-/input. See also chapter 12.1.1.

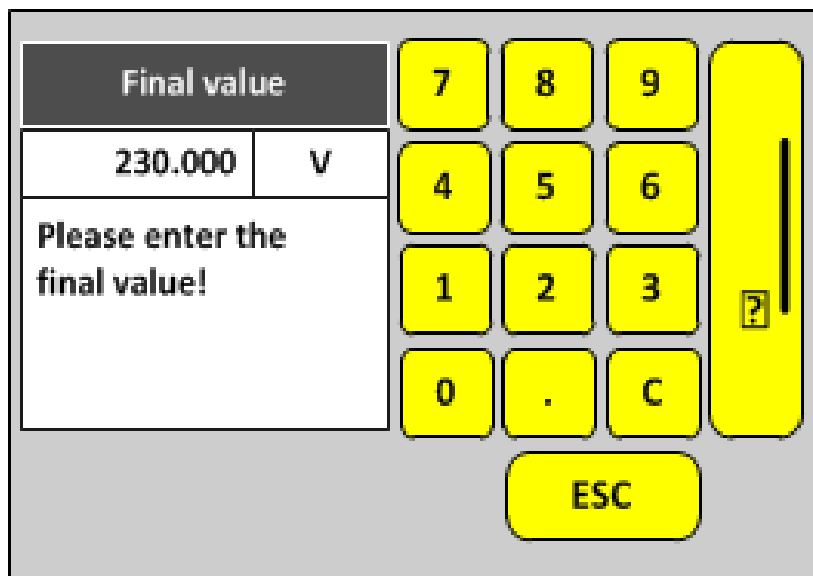


12. Input/Output test step

Enter the si-unit e.g. V (Volt) if the output-voltage is used for the nominal value of a voltage.



Enter the final value e.g. 230, (10 V DC analog output voltage = 230 V result voltage on the supply).



Confirm the inputs.

## 12. Input/Output test step

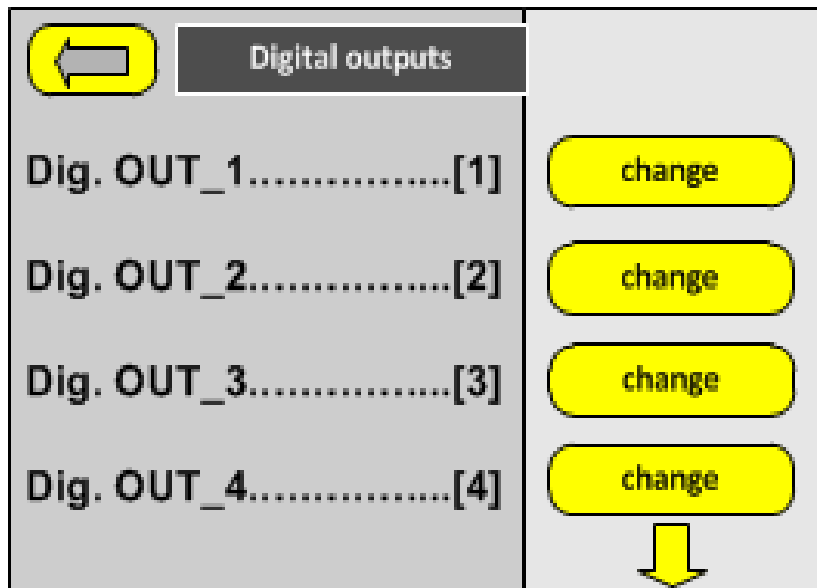
### 12.2 Additional digital interface Option G7-1 E06

6 additional digital outputs DIO1 ... DIO6. See also chapter 6.2.5.3 "DIO additional digital interface".

For this digital outputs the numbers 1 to 6 are fix reserved.

For the additional digital outputs, the definition of self-explanatory names is possible. See chapter 12.1.

The activation (set) of outputs is only possible in test plans. See chapter 12.6.



## 12. Input/Output test step

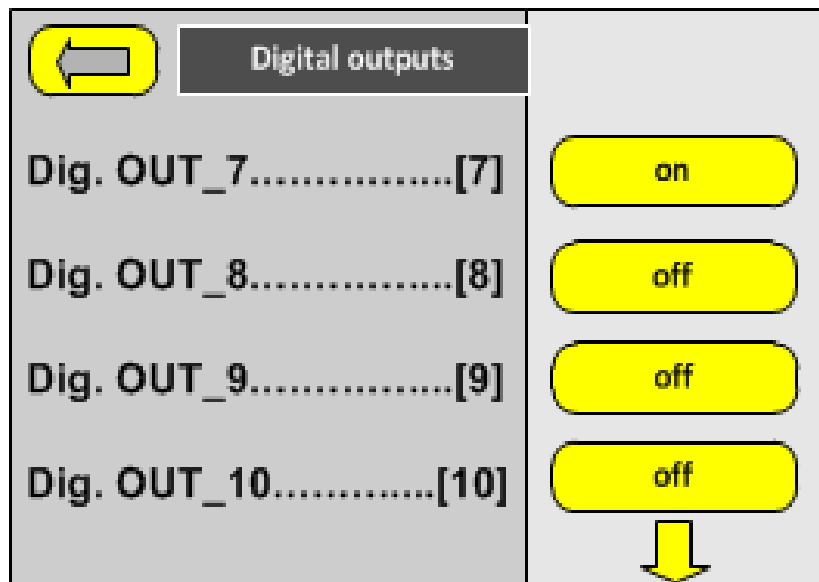
### 12.3 Expanded digital/analog interface Option G7-1 E07

The **expanded digital/analog interface** includes for:

- 16 additional digital outputs DASDO1 ... DASDO16. For this digital outputs the numbers 7 to 22 are fix reserved.
- 8 additional digital inputs DASDI1 ... DASDI8
- 2 additional analog outputs DASAO1 ... DASAO2
- 3 additional analog inputs DASAI1 ... DASAI3

See also chapter 6.2.6, "X8 - **expanded digital/analog interface**".

For analog in-/outputs, the definition of self-explanatory names is possible. See chapter 12.1.

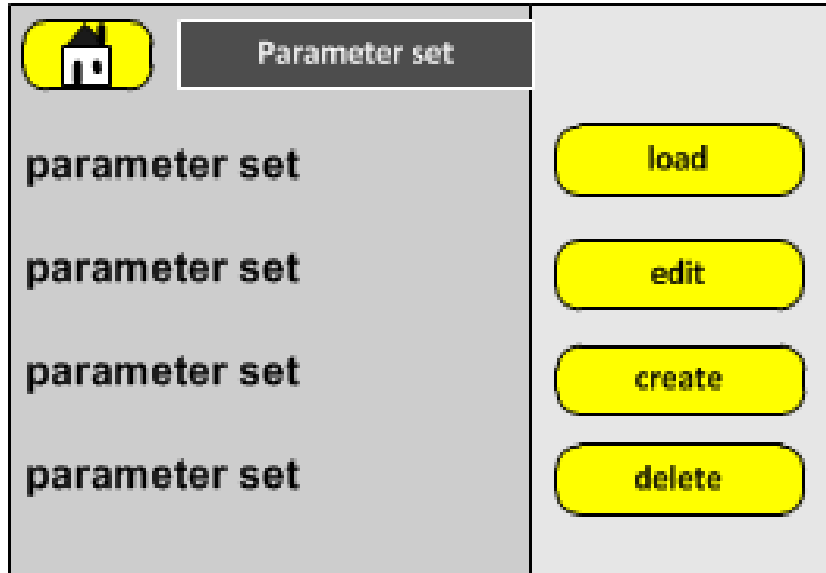


The activation (set) of outputs is only possible in test plans. See chapter 12.6.

## 12. Input/Output test step

### 12.4 Create parameter blocks

Read and Set of inputs/outputs are only possible in test plan sequences on automatic test runs. For this, input / output parameter blocks must be created, before. This parameter blocks are. These parameter blocks are available now, for including in the test plans. See also chapter 12.5 "Test plans".



Enter a self-explanatory name for the parameter block (see example above).

Set the required "test mode" to "Input or Output" (in this case to "Output")

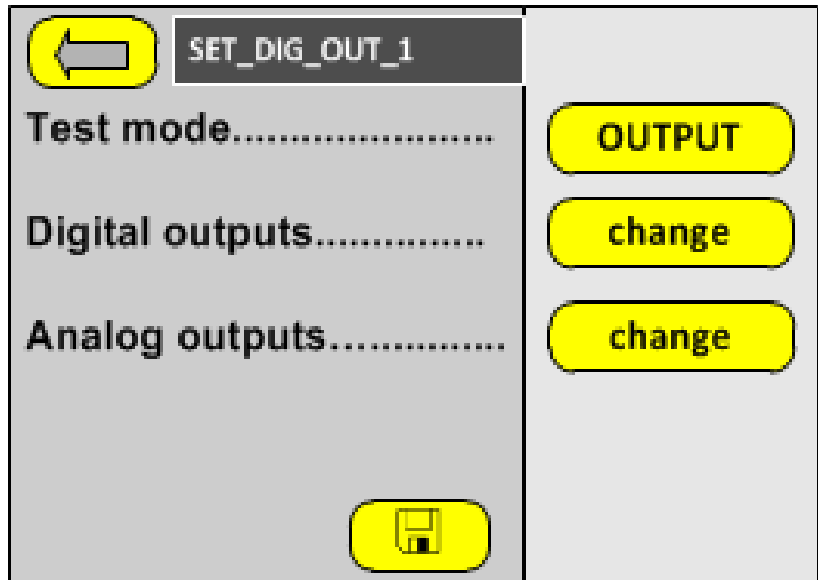
Set the parameter to the required values.

## 12. Input/Output test step

### 12.4.1 Digital Outputs

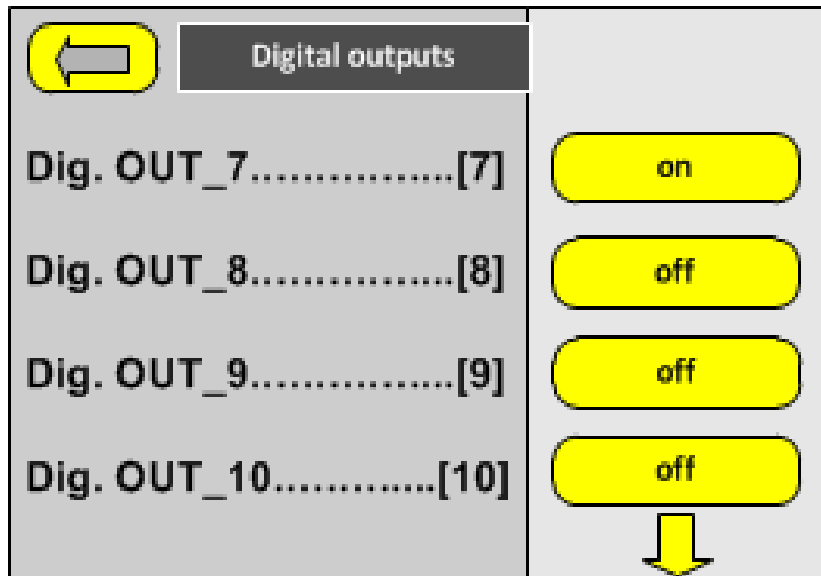
Digital outputs can be set to 1 (on) or 0 (off) state. They can be used for the control of relay / digital inputs (have note to the output current - see chapter 6.2.6).

Chose "digital output - change".



The display will show all digital outputs.

Activate one or more digital outputs by touch to the button. The actual state will shown on the button (on/off).



**Note:**

**Additional digital interface** option G7-1 E06 (chapter 12.3) provides 6 digital outputs. If option E06 is integrated, the device is showing "Dig. OUT\_1 to Dig. OUT\_6 .

**The expanded digital/analog interface** Option G7-1 E07 (chapter 12.3) provides 16 digital / 2 analog outputs and 8 digital / 3 analog inputs. If option E07 is integrated, the device is showing "Dig. OUT\_7 to Dig. OUT\_22 .

12. Input/Output test step

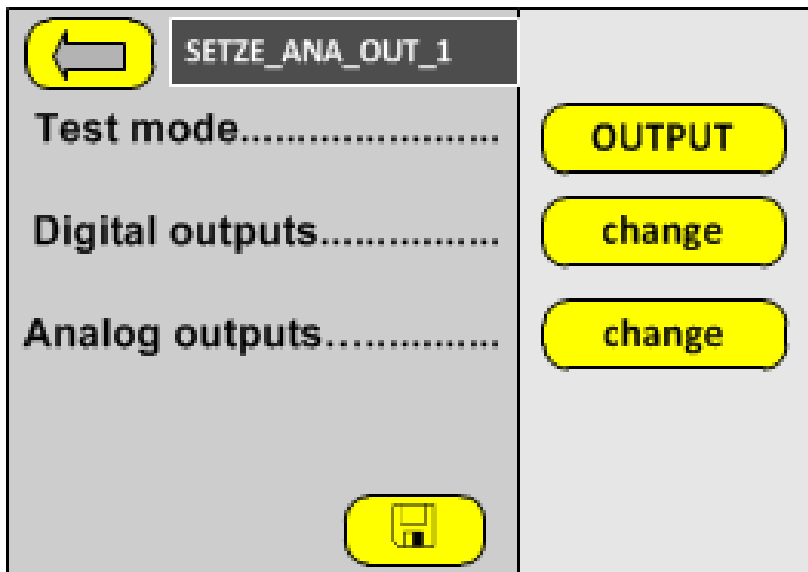
12.4.2 Analog Output

The expanded digital/analog interface Option G7-1 E07 (chapter 12.3) provides 2 analog outputs.

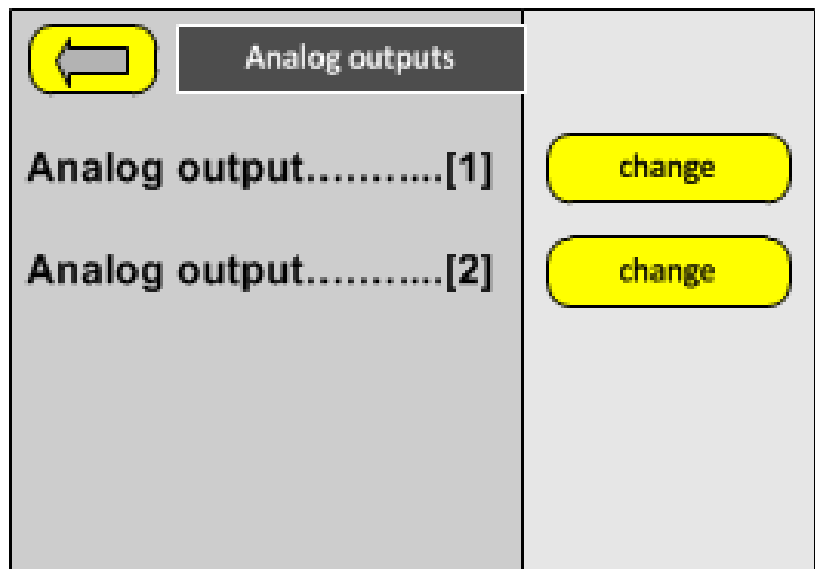
Analog outputs are working with DC-voltage of 0.0 ... 10.00 V.

Example: The analog output is used for generating of the nominal value of an AC supply of 0 - 230 V. In this case, the si-unit (V) and the final value of the AC-voltage (230) must be predefined for the analog output.

Choose "Analog Outputs - Change".



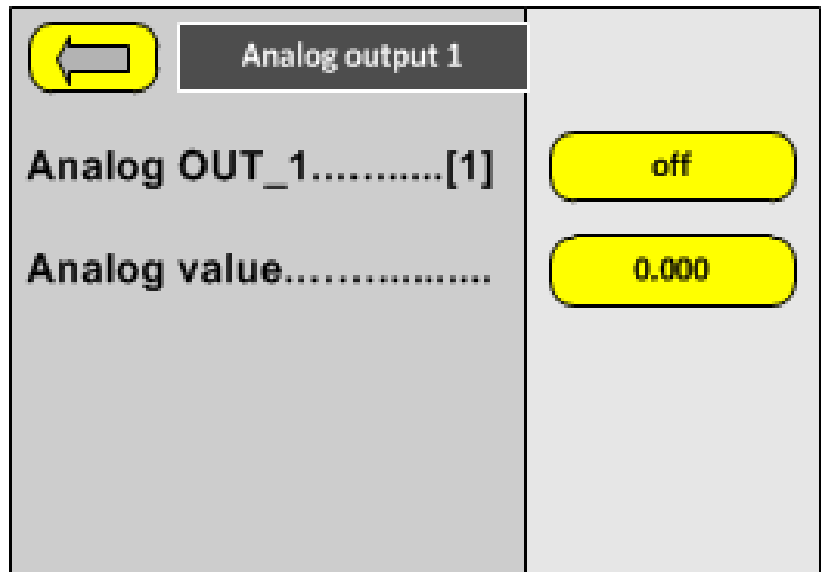
The display will show all analog outputs.



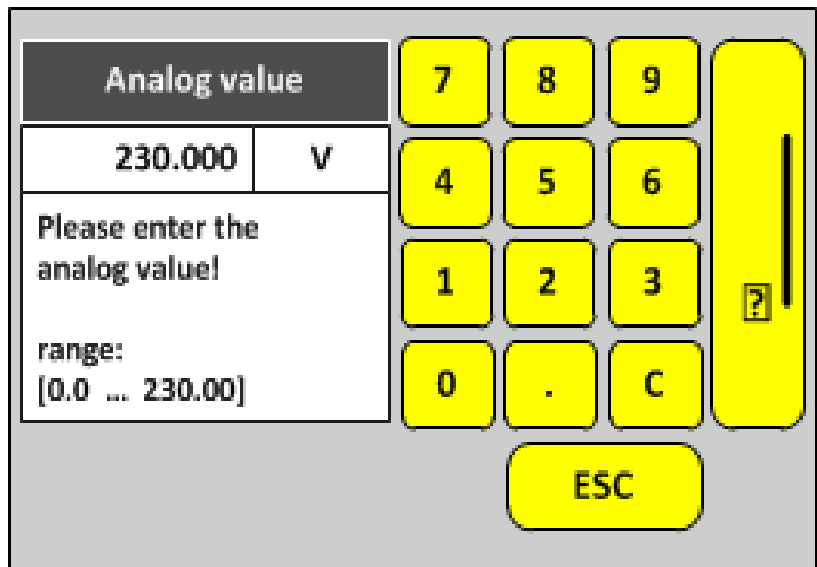
Choose the analog output for "change".

12. Input/Output test step

Activate the analog outputs by touch to the button. The actual state will shown on the button (on/off).



Choose "analog value". The display is show the input screen.



The info area is showing the input range (see also chapter 12.1.2).

Enter the desired output value. The device converts the input value to a corresponding target value of 0 - 10 V DC.

Save the value by using the "Save" Button.

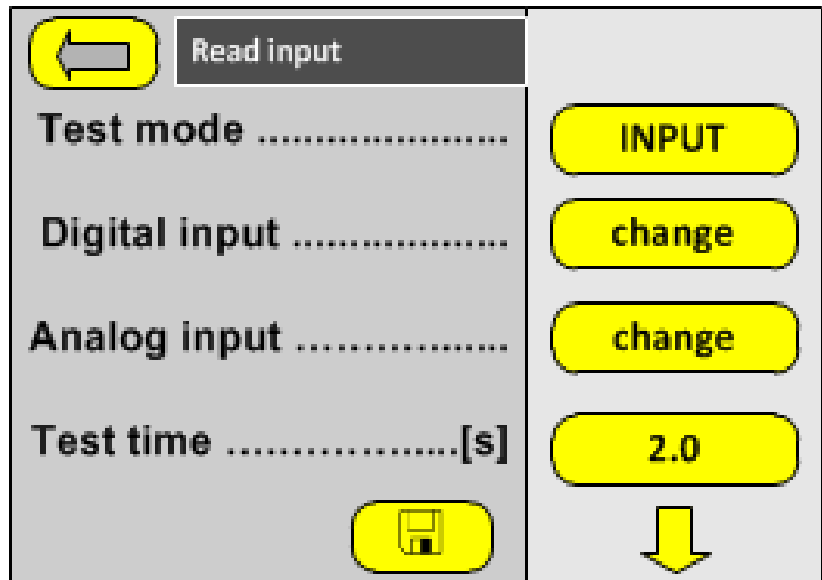


12. Input/Output test step

12.4.3 Digital Inputs (Input)

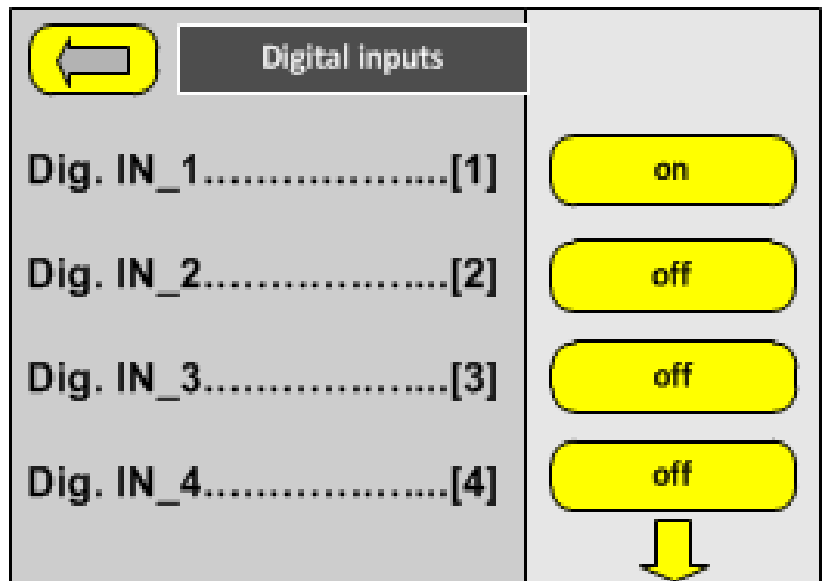
The state of digital inputs can be 1 (on) or 0 (off). Digital inputs can be used for monitoring of switches / digital outputs, etc. (note to the input voltage - see chapter 6.2.6). Corresponds the state of the input not the expectation on the definitions, the unit displays "Error" and waits for user input.

Choose "digital inputs - Change"



The display will show all digital inputs.

Activate one or more digital inputs by touch to the button. The query of the digital input is made to "on" or "off". The expected state indicates the button.



Save the input value by using the "Save Button".



## 12. Input/Output test step

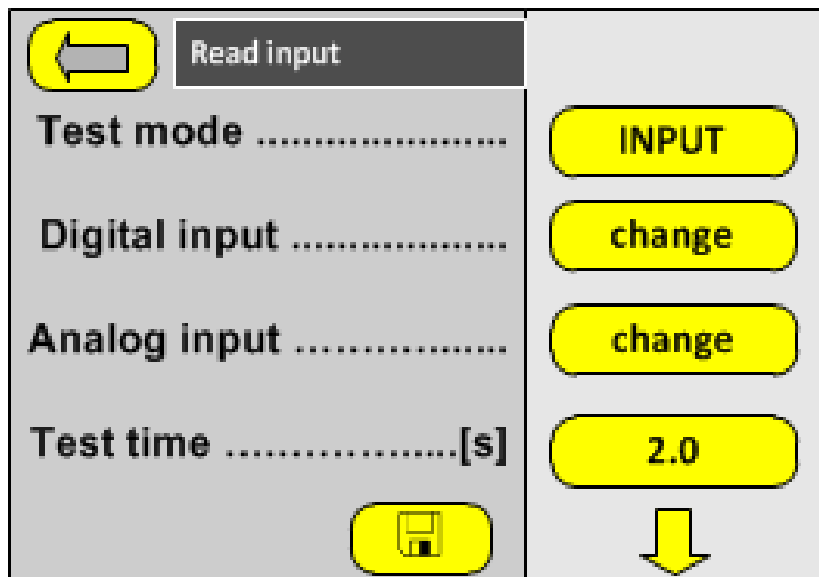
### 12.4.4 Analog Inputs

The expanded digital/analog interface Option G7-1 E07 (chapter 12.3) provides 3 analog inputs.

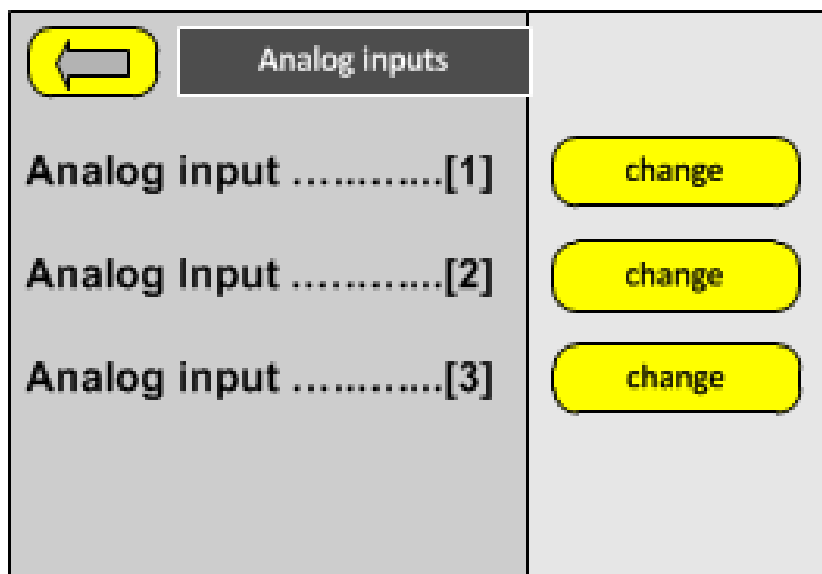
Analog inputs are working with DC-voltage of 0.0 ... 10.00 V. At definition of mi.- / max limit values, it is possible to carry-out at validation of the input voltage. Corresponds the value of the input, not the expectations on the definition, the unit displays "Error" and waits for user input..

The DC-voltage can serve for monitoring an actual value, e.g. a voltage of 0 ... 1000 V via transducer. In this case, the si-unit (V) and the final value of the voltage (1000) must be predefined for the analog input.

Choose "Analog input - Change".



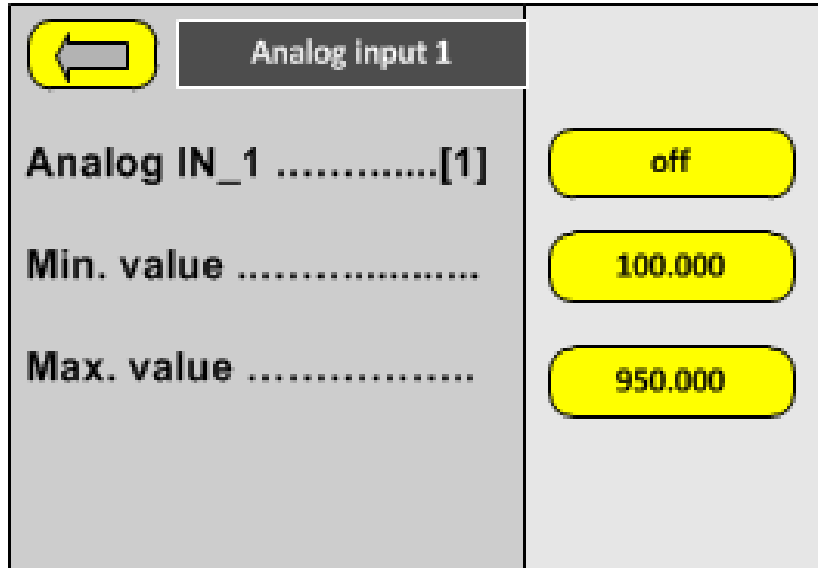
The display will show all analog inputs.



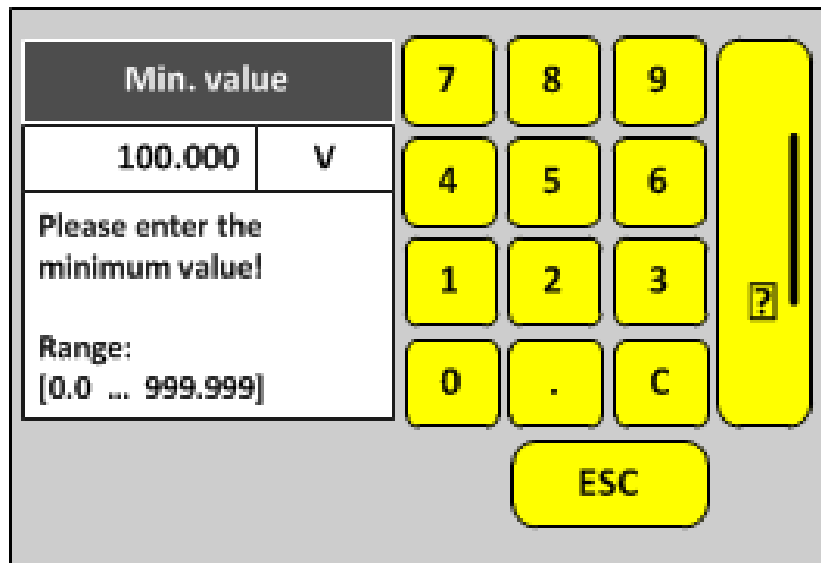
Choose the analog input for - "change".

12. Input/Output test step

Activate the analog input by touch to the button. The actual state will shown on the button (on/off)



Enter min.- and max. limit for the input value. The display is show the input screen.



The info area is showing the input range (see also chapter 12.1.2).

Enter the desired min./ max. limit values. The device converts the input values to the corresponding target values of 0 - 10 V DC.



Save the value by using the "Save" Button.

## 12. Input/Output test step

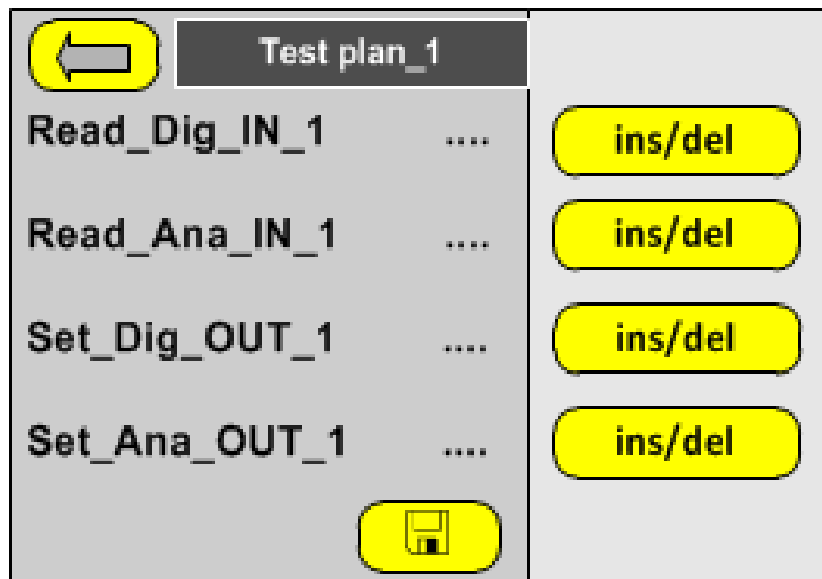
### 12.5 Create Test plans (Input/Output)

Read and Set of inputs/outputs are only possible in test plan sequences on automatic test runs. For this, input / output parameter blocks must be created, before. See also chapter 12.4 "Parameter blocks".

Choose "test plan" in the main menu.

Create new test plans or edit existing test plans by insert "Input/Output" parameter blocks. See also chapter 10.5.

The device is providing the definite "Input/Output" parameter blocks in addition to the HV/IS ..... -parameter block to insert in the test plan.



Insert "Input/Output" blocks in the test plan-sequence, on the desired position.



Save the value by using the "Save" Button.

## 12. Input/Output test step

### 12.6 Load and execute test plans (Input/Output)

Prerequisite: See chapter 12.5.



**Note:** The execution of test plans is possible in manual mode or in automatic mode. The setting is made in the menu "Setup - Test plan mode". See also chapter 10.4 - illustr.. 10.41.

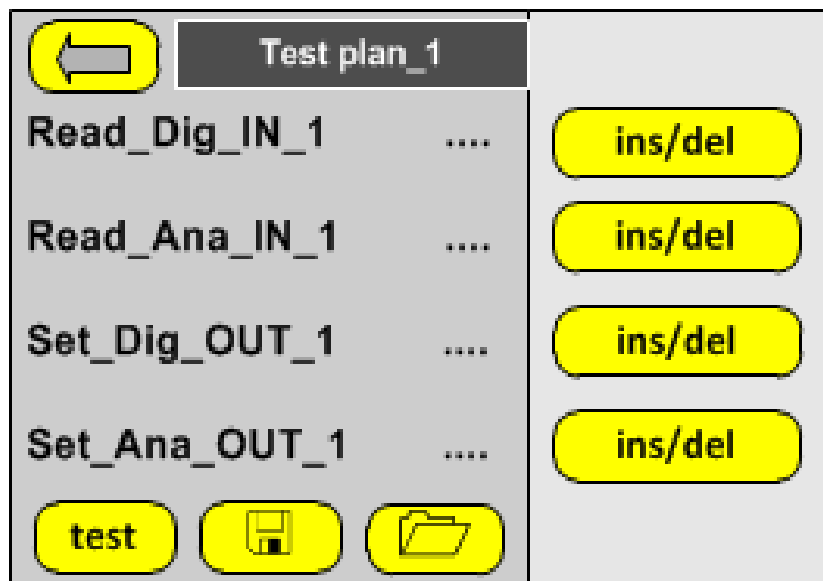
**Test plan mode - step:** The start of test-steps must be done by user-input (eg, push button).

**Test plan mode - auto:** Test-steps are running as sequence automatically.. Only if "error" an operator intervention is required.

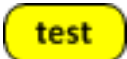
Choose "test plan" in the main menu.

Choose "Load test plan" in the main "test plan".

Choose the desired test plan at the list. See also chapter 10.5.



It is possible to edit the loaded test plan on this place (insert or delete parameter blocks).



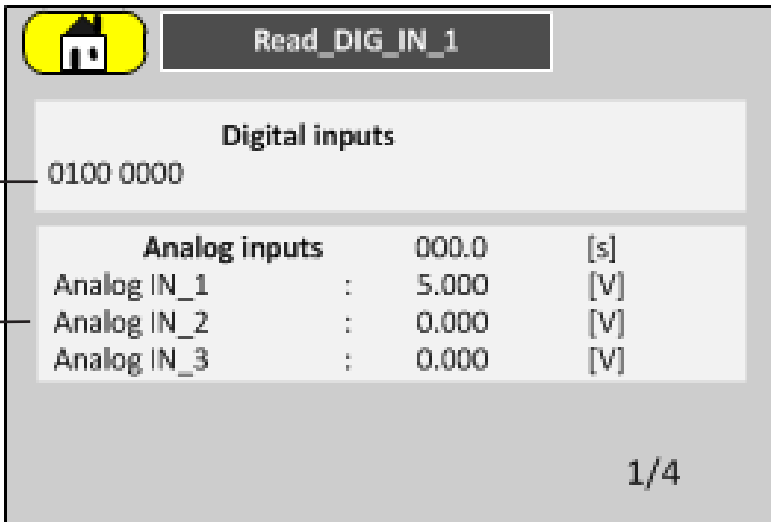
#### 12.6.1 Start /execute test plan (auto- mode)

**Note:** Test-steps are running as sequence automatically.

12. Input/Output test step

12.6.1.1 Read digital input

The tester is reading the digital inputs. If the reading pattern is correct (according to the settings in the parameter block), the next step is executed. If the device will find difference, error is reported. See also chapter 10.5.3 Error handling.



The screenshot shows a test step window titled "Read\_DIG\_IN\_1". It features a yellow house icon in the top left corner. The main content area is divided into two sections: "Digital inputs" and "Analog inputs".

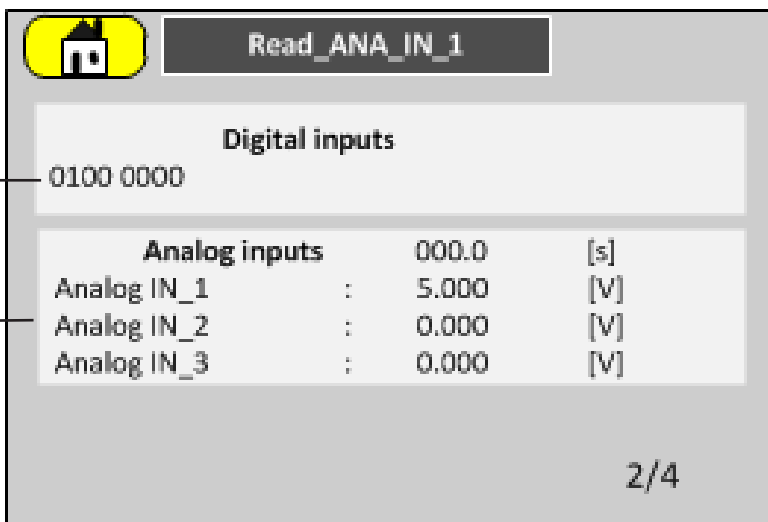
On the left side of the screenshot, there are two labels with lines pointing to the interface: "State digital inputs" points to the "Digital inputs" section, and "Values analog inputs" points to the "Analog inputs" table.

Digital inputs			
0100 0000			
Analog inputs		000.0	[s]
Analog IN_1	:	5.000	[V]
Analog IN_2	:	0.000	[V]
Analog IN_3	:	0.000	[V]

1/4

12.6.1.2 Read analog input

The tester is reading the analog inputs. If the values are within the limits, the next step is executed. If a value is under- or overrun the limits, error is reported. See also chapter 10.5.3 Error handling.



The screenshot shows a test step window titled "Read\_ANA\_IN\_1". It features a yellow house icon in the top left corner. The main content area is divided into two sections: "Digital inputs" and "Analog inputs".

On the left side of the screenshot, there are two labels with lines pointing to the interface: "State digital inputs" points to the "Digital inputs" section, and "Values analog inputs" points to the "Analog inputs" table.

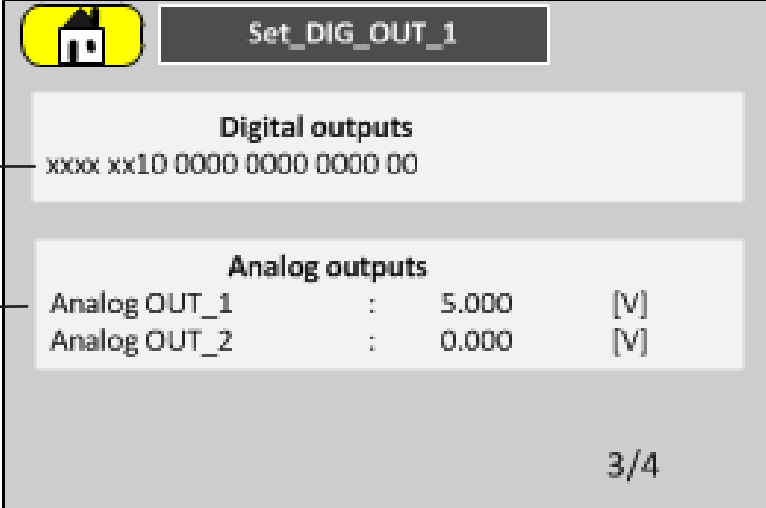
Digital inputs			
0100 0000			
Analog inputs		000.0	[s]
Analog IN_1	:	5.000	[V]
Analog IN_2	:	0.000	[V]
Analog IN_3	:	0.000	[V]

2/4

## 12. Input/Output test step

### 12.6.1.3 Set digital output

Whether a digital output is set or not, is defined in the parameter set.



The screenshot shows a menu titled "Set\_DIG\_OUT\_1" with a house icon. It is divided into two sections: "Digital outputs" and "Analog outputs".

- Digital outputs:** The display shows "xxxx xx10 0000 0000 0000 00". A line points from the text "State digital outputs" to this section.
- Analog outputs:** The display shows:
 

Analog OUT_1	:	5.000	[V]
Analog OUT_2	:	0.000	[V]

 A line points from the text "Values analog outputs" to this section.

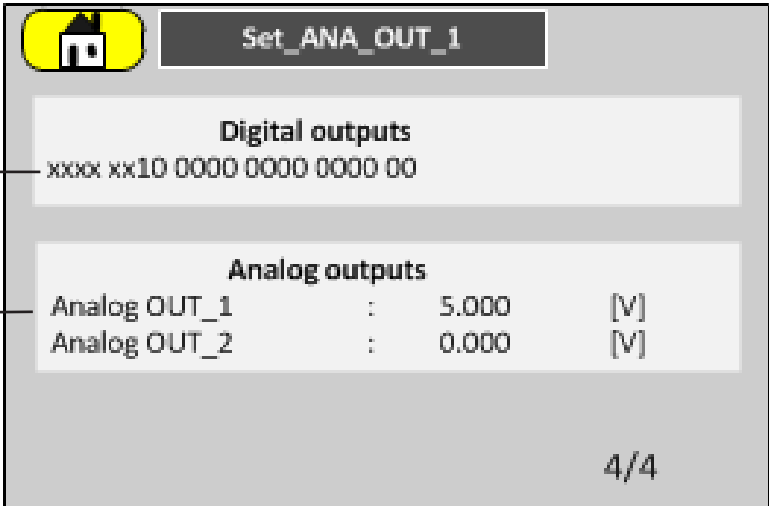
At the bottom right of the screen, the page number "3/4" is displayed.

**Note:** In the example illustration the **expanded digital/analog interface** Option G7-1 E07 (chapter 12.3) is integrated in the tester. The additional digital **interface** Option G7-1 E06 is not integrated. Therefore, the state of the inputs 1 - 6 is "x"

See also chapter 10.5.2 "auto testing".

### 12.6.1.4 Set analog output

Whether analog output is set or not and the value of the voltage, is defined in the parameter set.



The screenshot shows a menu titled "Set\_ANA\_OUT\_1" with a house icon. It is divided into two sections: "Digital outputs" and "Analog outputs".

- Digital outputs:** The display shows "xxxx xx10 0000 0000 0000 00". A line points from the text "State digital outputs" to this section.
- Analog outputs:** The display shows:
 

Analog OUT_1	:	5.000	[V]
Analog OUT_2	:	0.000	[V]

 A line points from the text "Values analog outputs" to this section.

At the bottom right of the screen, the page number "4/4" is displayed.

See also chapter 10.5.2 "auto testing".

12. Input/Output test step

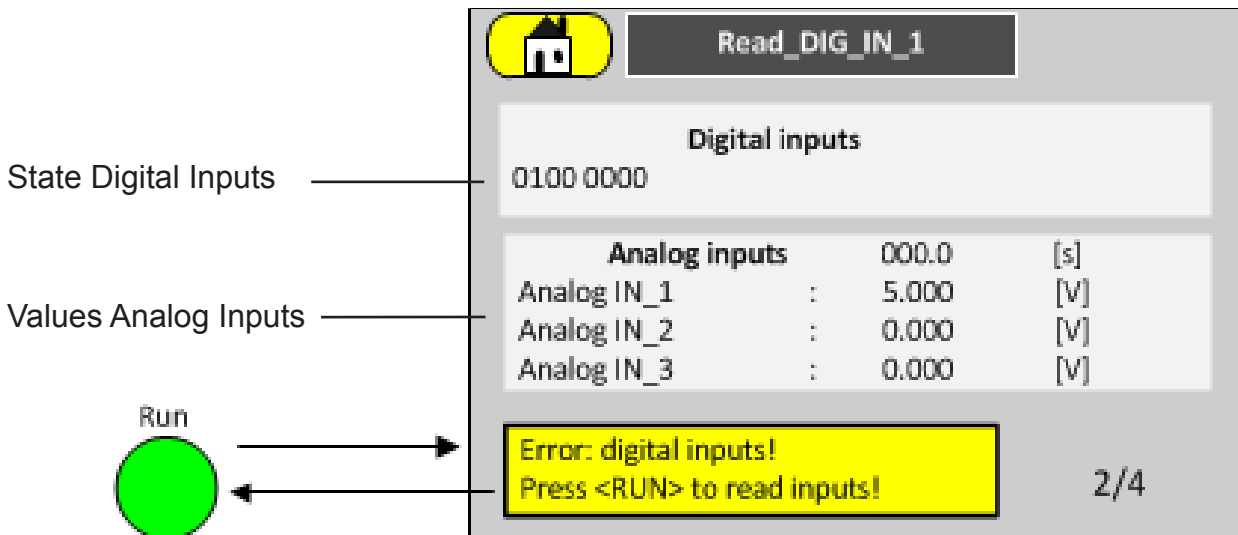
**test**

**12.6.2 Start /execute test plan (step mode)**

**Note:** Test steps are running in "step" mode. All steps must be started by the operator.

**12.6.2.1 Read digital input**

Press the green "Run" - button, for start the read action.



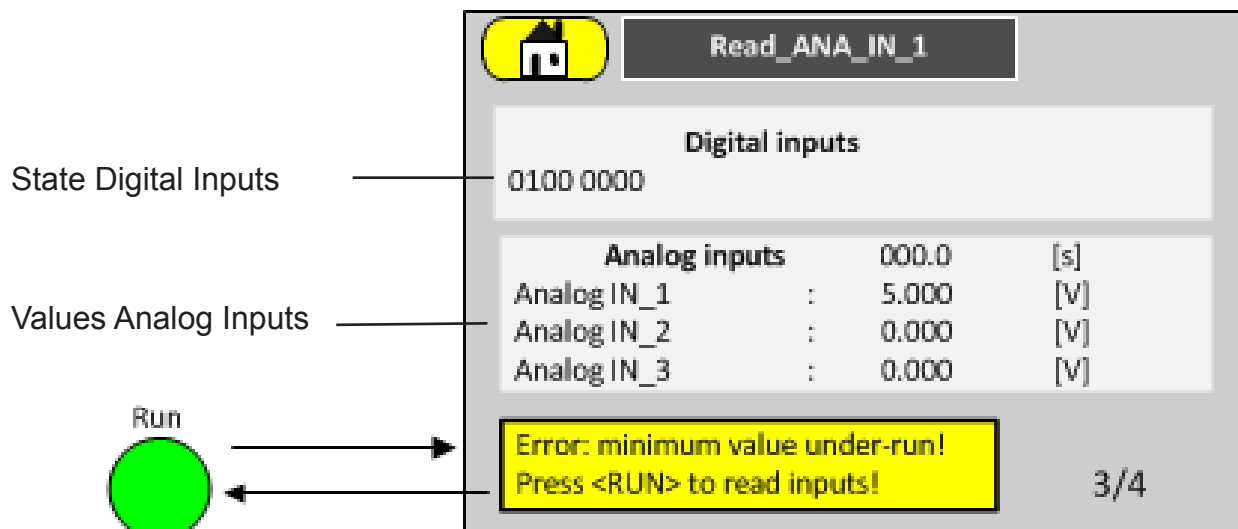
In this case, the tester reports "Error: digital inputs" - forecasting: 1 signal at input 1, specified "0" in the parameter block..

See also chapter 10.5.3 Error handling:

The tester is waiting for user input.

**12.6.2.2 Read Analog Input**

Press the green "Run" - button, for start the read action.



In this case, the tester reports "Error: Min value underrun" - forecasting: min. value of 100 V specified in the parameter block.

See also chapter 10.5.3 Error handling.

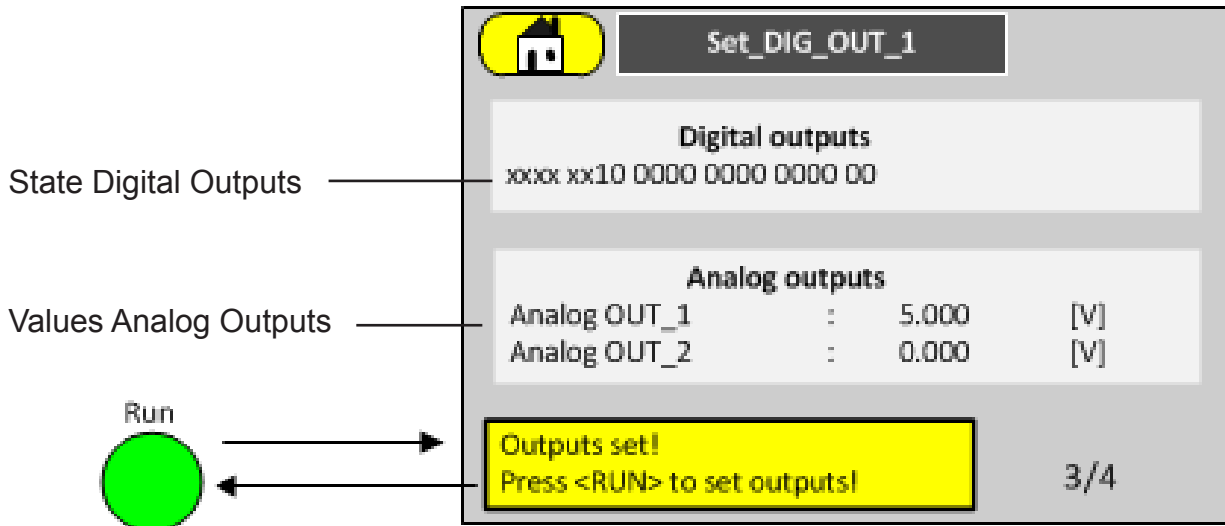
The tester is waiting for user input.

## 12. Input/Output test step

### 12.6.2.3 Set Digital Output

Press the green "Run" - button, for start the set action.

Whether a digital output is set or not, is defined in the parameter set.



**Note:** In the example illustration the **expanded digital/analog interface** Option G7-1 E07 (chapter 12.3) is integrated in the tester. The additional digital **interface** Option G7-1 E06 is not integrated. Therefore, the state of the inputs 1 - 6 is "x".

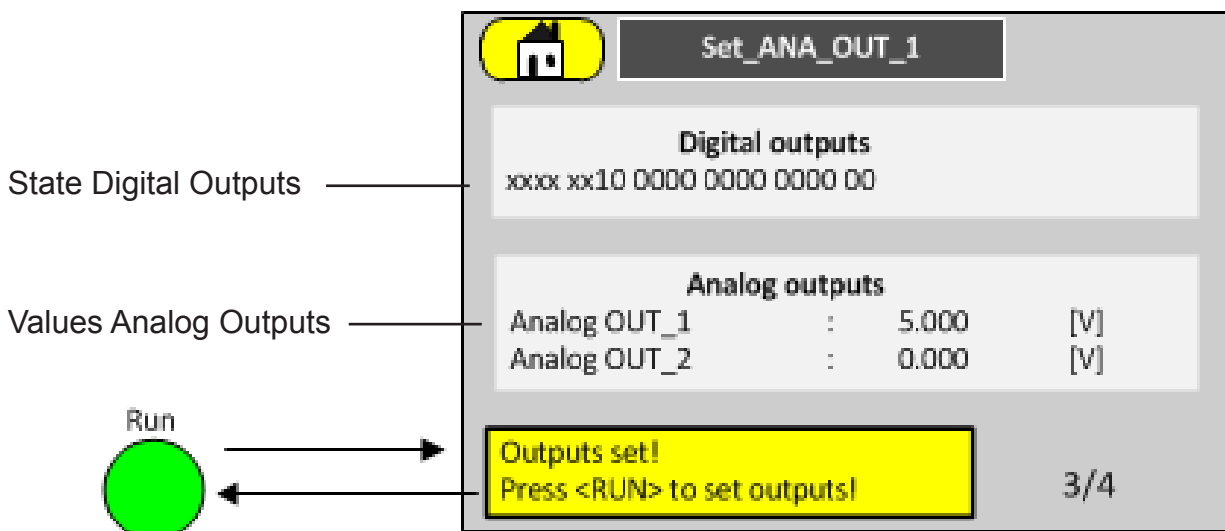
In this case, the tester reports "Error: digital inputs" - forecasting: 1 signal at input 1, specified "0" in the parameter block.

The tester is waiting for user input.

### 12.6.2.4 Set Analog Output

Press the green "Run" - button, for start the set action.

Whether a analog output is set or not, is defined in the parameter set.



See also chapter 10.5.2 "auto testing".



## 13. LITE SOFTWARE

### 13 ELABO Lite-Software

The ELABO Lite software provides different "simple" functions for the control of the device and for the individual testing.

Help function: Prompts for the functions of the Lite software can be displayed over the F1 button.

#### 13.1 CommandLine Tool:

The control commands are listed in the separate manual "Remote control/ Serial remote control G1-G7-series"

#### 13.2 Flash-Programmer für Firmware Update

- Control module (G1-1G and G1-1 T)
- Touch display module (G1-1G)

**Attention:** The firmware update must be carried out via the correct interface.

- Control module via the service interface X9a (X9a)
- Touch display module via interface X9 (Ethernet, USB, RS232)

If the firmware is transferred to the wrong module, the device is no longer able to work. In this case you can transfer again the right firmware with the Flash programmer of the Lite software and such overwrite the wrong entry (pay attention to the right interface).

#### 13.3 Treiber Test

Over this function, single tests can be executed, with individual parameter settings. E.g. HV, ISO tests are possible dependent on the device and its equipment.

The software shows the results of the individual test on the field "Results".

**Note:** For the execution of individual tests there must exist a physical connection to the unit (interface X9).

#### 13.4 Result Explorer/Messwertspeicher auslesen

The function permits the selections and display of the stored results of the tests (measured data storage). To be able to use the function, the measured data storage must be set to "ON" in the "Setup" of the device (see chapter 10 Setup)

## 13. LITE SOFTWARE

### 13.5 RS-Config / Serial interface RS232

The function scans automatically all COM ports of the PC for connected ELABO G1-/ G7 equipment. The function tries to make connection with the device.

If this is successful the found interface and the baud rate are shown and they can be taken.

### 13.6 Translation Tool

## 14. FAST-START-MODE

### 14 FAST START MODE

Note: Included at SW-Rel. 7/320/00/04

The fast-start mode allows to perform tests of one type of test more effective / faster. For this purpose, taught in the first test of the operating point (taught). The device uses the determined operating for all subsequent tests, until is taught again.

If the user changes the type of test (eg HV to ISO), the device must be taught again.

The fast-start-mode affects test types across, ie HV, ISO and PE. Types of test such as HV and ISO need in this mode only one START.

An activation of the fast start mode is possible via the menu system (setup - chapter 10.6) or by the remote control command. See also diagrams in chapter 4.

#### **Requirements for use of the Fast-Start Mode:**

- Only one type of test - either HV or ISO or PE.
- The same test parameters of the test object (eg use in routine tests in systems with short cycle times).
- Teaching of the operating point (test parameters) on the first test.
- Settling the default parameters for test voltage / test current (in the menu system or via the command set).

#### **Restrictions on fast-start mode**

- No execution of test plans possible.
- Maximum test time is 9.9 seconds
- Only one command to start the test.
- For the PE test a PE test probe can not be used.
- Duration for the first test (Teach) is equal to a test without fast-start mode.
- Display of the total duration for the fast-mode testing (test time + stabilisation time). The test time is running in the background.

## 14. FAST-START-MODE

### 14.1 FAST START MODE OVERVIEW

Note: See also diagrams in Chapter 4

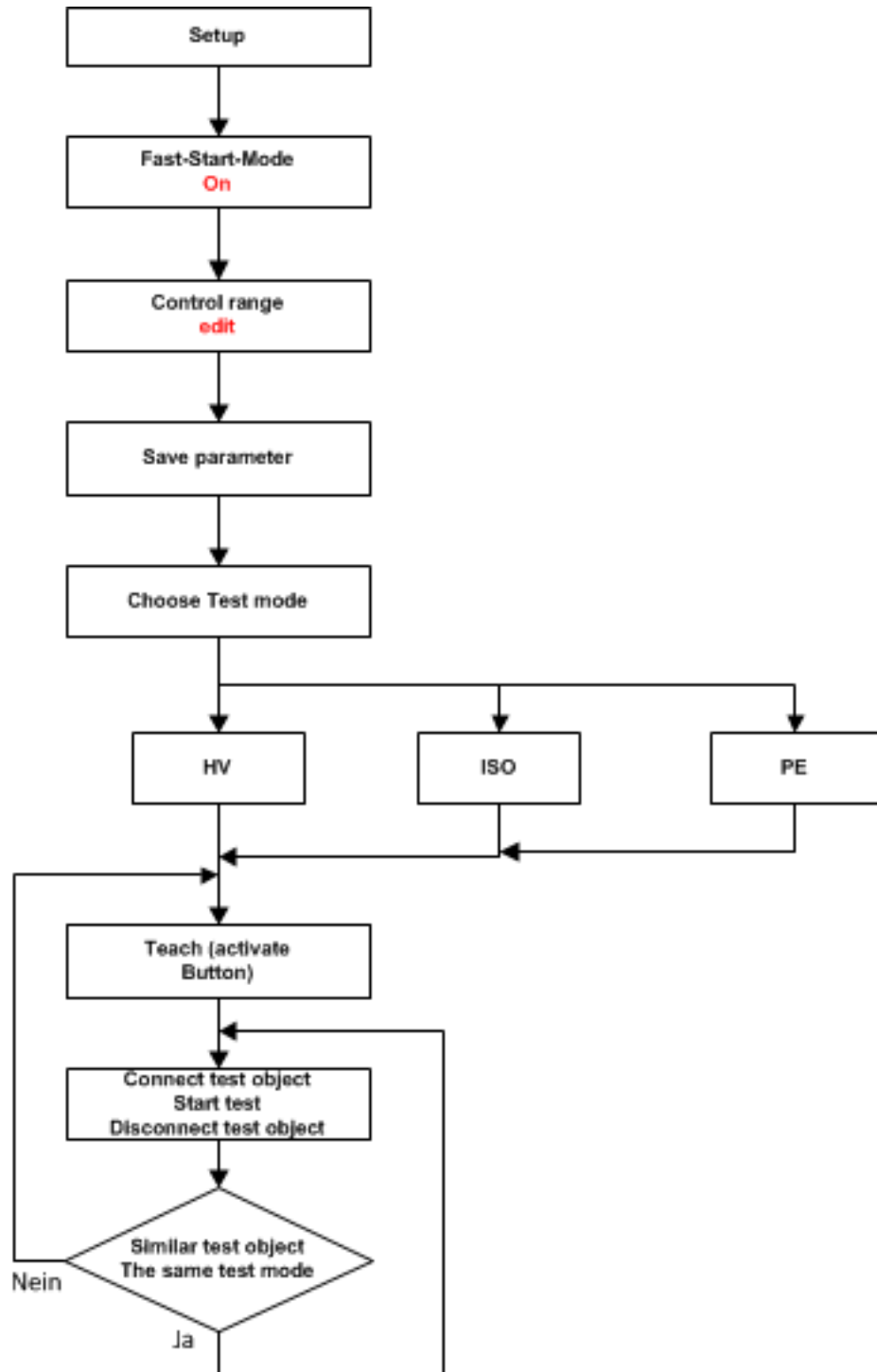


Fig. 14.1: Diagram overview

## 14. FAST-START-MODE

### 14.2 FAST-START-MODE STATUS DISPLAY

At active fast-start mode appears in the display of the button "Teaching". To activate the learning process, the button will be pressed. The teach-in button will appear in reverse.

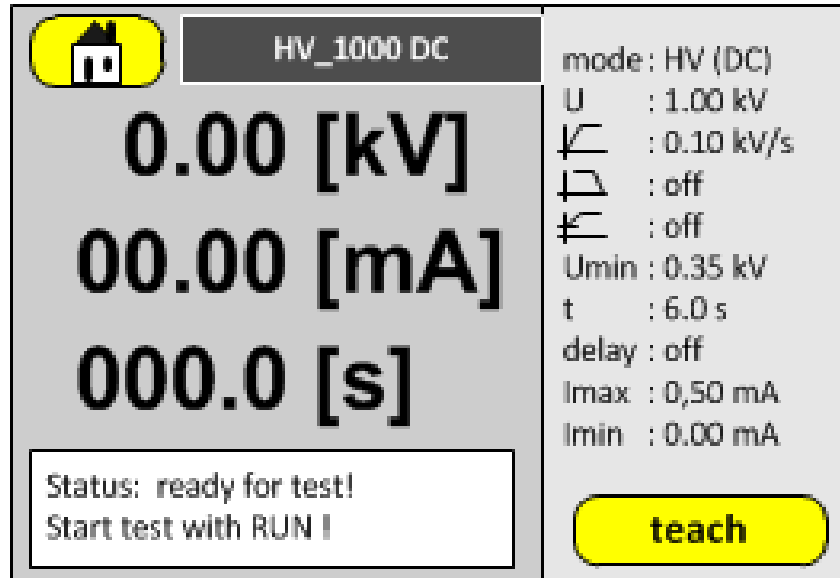
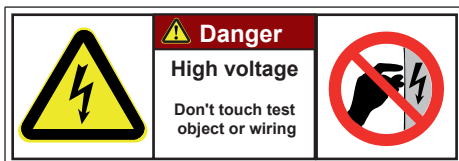


Fig. 14.2: Fast-Start-Mode - teaching active



#### Attention - High Voltage - danger for life:

High voltage on the test object housing! Don't touch the test object or the wiring.



By pressing the green RUN button the test run starts.

The device performs the test and stores the determined parameters as operating points.

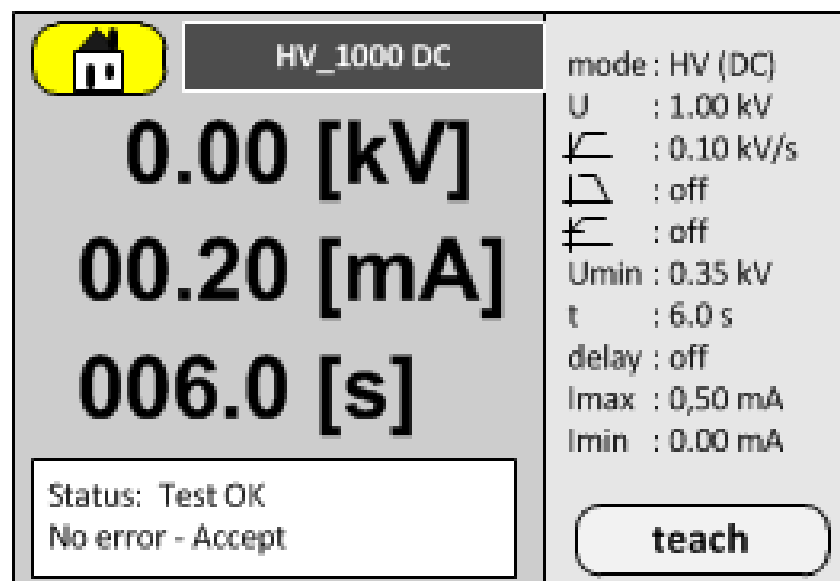


Fig. 14.3: Fast-Start-Mode - teaching ready

## 14. FAST-START-MODE

After the "Teach-test" the teach-in button changes back to the normal display (Fig.14.3).

In subsequent tests, the device maintains no longer complete regulations, but adjusts itself immediately to the determined optimal operating point.

After reaching the operating point, the unit returns to normal regulation. Deviations are corrected as in normal operation.

Note: By pressing the teach-in button at any time re-teaching is possible.

15. OPTIONS/ADD-ONS

15 Over view Options

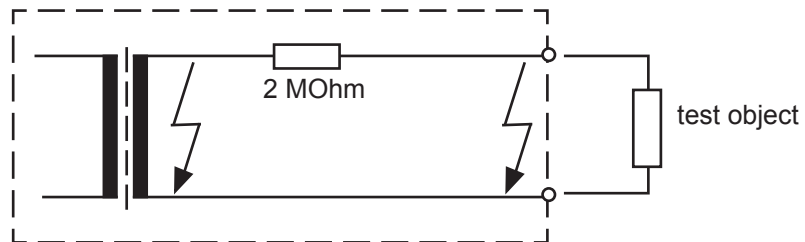
The number of the device option is attaching the device type.

		HV-DC-tester			HV AC-tester	
		G7-1A G7-1M	G7-1B G7-1N	G7-1C G7-1P	G7-1G G7-1T	G7-1H G7-1U
with display						
without display						
Device option	No. 1)					
Extension IS-Measuring GOhm range	E02-1	●	●	●		
Safety current limitation	E03				●	●
Voltage read back (not in combination with E50)	E04	○	○	○		
Burn mode (not in combination with E03)	E05				○	○
Additional digital output OPT	E06	●	●	●	●	●
Additional dig./anal. in-/out 16 DOut, 8 DIn, 3 AOut, 2 AIIn	E07	●	●	●	●	●
Power measurement	E11	●	●	●	●	●
USB	E12	●	●	●	●	●
5pole. HV-connector (instead of 7-pole HV)	E50	●	●	●	●	●
Calibration	E99	●	●	●	●	●
1) This number is attaching the device type e.g. G7-1A E01						
○ not in combination with other options						

## 15. OPTIONS/ADD-ONS

### 15.1 Option E03 Safety current limitation AC-tester

Option "Safety current limitation" is restricting the output current of the HV-tester to 3 mA. Based on the current limitation, the characteristic of the High Voltage Source is „soft“ (see load characteristic diagram).



**Note „Unominal not reached“:** At the lower voltage range, the nominal voltage is not reachable at a high test current. The tester is interrupting the test with the message „Unominal not reached“.

#### Output voltage current-limited EN 50191 (VDE 0104)

Since the output is current-limited, the safety measures according to EN 50191 (VDE 0104, sub-clause 1.2-b), e. g. provision of safeguarding devices at test benches, warning indicator lights, use of devices for protection against electric shock and other necessary protective provisions are not explicitly required.

Touching the current-limited high voltage is not dangerous to life, but can be very painful. Due to the shock, maybe other accidents could happen. Therefore it is advisable to bar off test zones. Prior to use, the equipment and materials must be checked for visible damage and/or defects.

#### DC -Voltage discharge currents higher than 3 mA

After switching OFF the high voltage, the test object is automatically discharging via the HV-tester. Prerequisite for this: The test object is connected to the HV-tester, for a enough long time. If the discharging not possible, „discharge currents“ higher than 3 mA maybe generated, this is then highly dangerous. **Danger for Life!**



**Note - Voltage reed-back unit Option E04:** The consequence of a connected reed-back unit, is a higher base current (leakage) at the HV-measurement. The impedance of the reed-back unit is parallel to the impedance of the test object. This affects particularly in the 100  $\mu$ A measurement range. Input impedance of the reed-back unit > 3 GOhm.





# EU-Konformitätserklärung

## EU-Declaration of Conformity

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**Hiermit erklären wir in alleiniger Verantwortung, dass das Produkt**  
**We declare under our sole responsibility that the product**

Bezeichnung des Produkts: **Kombiprüfgeräte**  
Designation of the device/equipment: **Combi Tester**

Typ/Type: **G7-1x Gerätereihe**      **G7-1x device typs**

Zusätzliche Angaben: **BestPerformance**  
Additional information:

**in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:**  
**complies with the following provisions applying to it:**

EU-Richtlinie:	Niederspannungsrichtlinie	2014/35/EU
	EMV-Richtlinie	2014/30/EU
	Maschinenrichtlinie	2006/42/EG

EU provisions:	Low voltage directive	2014/35/EU
	EMC directive	2014/30/EU
	Machine guideline	2006/42/EC

Angewendete harmonisierte Normen, insbesondere:  
Applied harmonized standards in particular:

DIN EN 61326-1; VDE 0843-20-1  
DIN EN 61326-2-1; VDE 0843-20-2  
DIN IEC 60060-1; VDE 0432-1  
DIN EN 60060-2; VDE 0432-2  
DIN EN 61180-1; VDE 0432-10  
DIN EN 61180-2; VDE 0432-11  
DIN EN 61010-1; VDE 0411-1  
DIN EN 60204-1; VDE 0113-1  
DIN EN 13849-1

DIN EN 50191; VDE 0104

(Normen in den jeweils aktuellen Ausführungen)  
(All standards in actual version)

Dokumentations-Beauftragter :  
Authorized person for documentation:

Mr. Andreas Bausch, ELABO GmbH

Thomas Höhle

Geschäftsleitung/Management

Name/Name

Funktion/Function

24.05.2016

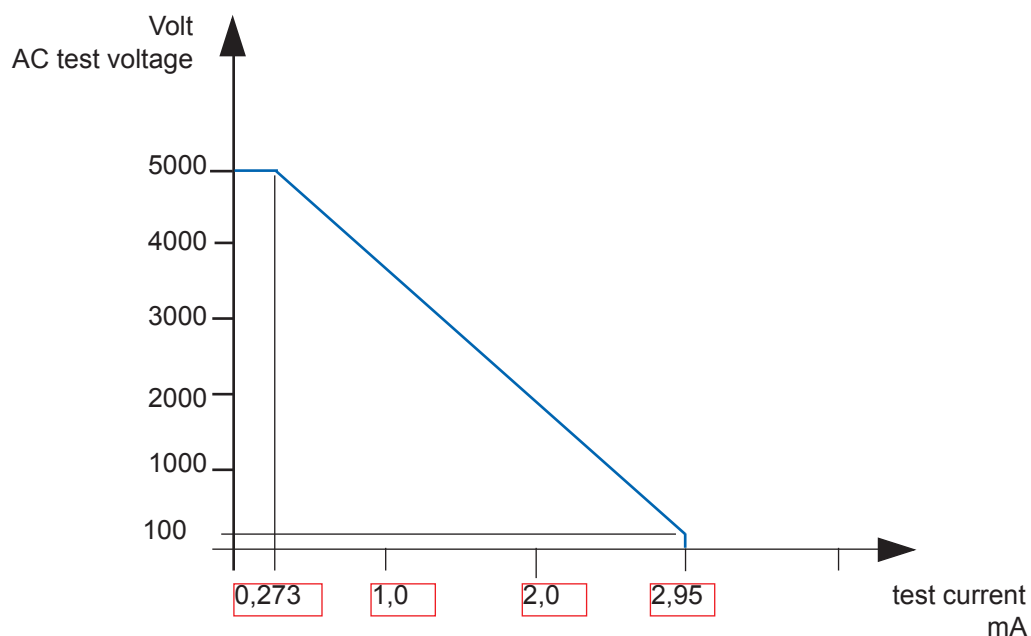
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15. OPTIONS/ADD-ONS

**Load characteristic current-limited**

AC-Load characteristic



**Note:** At earth-bound test voltage, the internal leakage current of the device, is reducing the test current. At floating test voltage, the test current is reaching the full 3 mA.



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