Manual

Hipot Tester
HA 1805B

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1 General Information

1.1 Information on this operating manual

This operating manual is part of the technical documentation for the high voltage tester *HA1805* of *SPS electronic GmbH*.
This operating manual contains all the information on how to operate this device properly, safely and economically, how to prevent dangerous situations, how to reduce repair costs and downtimes and how to prolong the service life of these devices.

Should you, while perusing this operating manual, find any misprints, any information you do not understand or which are incorrect please do not hesitate to inform *SPS electronic GmbH* about same.

Pictographs and Symbols

- **Warnings** are characterized by warning triangles with danger symbol and warn of dangers which can lead to personal injury and/or material damage:

General Warning

Danger caused by electric current or voltage

- **Information** on same are characterized by the Information Pictograph and give advice or additional information:

You can order accessories directly from *SPS electronic GmbH*.

- **Continuations** of contextual paragraphs on the next page are characterized by the symbol on the right-hand margin.

1.2 Requirements for the operation of this device

1.2.1 Regulations for application

The tester must be in an operational and reliable condition.

Only personnel having completely read and understood this operating manual and who are authorized skilled electricians or who have been instructed in electrical engineering are allowed to perform any operations with and at the testers.

The tester is not to be operated if or for:

- operations are performed which are not specified in this operating manual or which have not been recommended by *SPS electronic GmbH* concerning installation, operation, maintenance and service.
- unauthorized alterations and/or repairs
- dismantling and/or avoiding of safety devices
- use of components, tools, additional installations, supplements and working material which have not been approved or recommended by *SPS electronic GmbH*
- building in of spare parts which are not original *SPS electronic GmbH* spare parts or of spare parts from suppliers not recommended by *SPS electronic GmbH*

1.2.2 Product liability

The testers have been produced, adjusted and tested according to the state of the art and the approved safety requirements.
The devices comply with the conditions agreed upon by contract of the confirmation of order concerning execution, single parts and accessories selection.

SPS electronic GmbH will be liable for errors or omissions to the extent of the guarantee liabilities of the confirmation of order.
Applicable are the general conditions of delivery of the Central Association of Electrical Engineering and the Electronics Industry, registered association (ZVEI).

The contents of this operating manual is in compliance with the condition of the tester on the date when same was drawn up.
Subject to change are technical alterations because of further developments and improvements of these products by *SPS electronic GmbH*.
Liability claims can therefore not be derived from the contents of this operating manual (data, descriptions, graphs, misprints, etc.).

Errors and omissions excepted!

***SPS electronic GmbH* will only be liable in case of application of the testers according to regulations (pl. see 1.2.1).**
If those regulations have not been applied the operator is solely responsible for risks of hazard to body and life of the user or a third party and impairments of the tester and other material assets!

1.3 General safety regulations

The high voltage tester HA1805 has been manufactured according to the state of the art at the time of its delivery.

Nevertheless the tester is not without hazards if it is applied by untrained personnel, applied improperly or not applied according to regulations.

In addition to this operating manual the generally applicable legal regulations and other binding instructions concerning safety regulations, regulations for preventing accidents and regulations for the protection of the environment must be adhered to.

Beware of high electronic voltage and electromagnetic fields

In case of defective test objects, like e.g. arc-overs, there can occur electromagnetic fields. This is of particular concern to persons with active or passive medical devices, like e.g. cardiac pacemaker.

1.3.1 Obligations of the operator

- The tester is only to be operated according to regulations and in operational condition (see chap. 1.2.1)
- Protective and safety devices, locking devices and couplings, etc. have to be inspected by an expert at least once a year.
- A protocol on the test results has to be drawn up in form of a **test report** same has to be retained.
- Instructions on operations with or at a machine or installation as to hazards to health and/or life of persons are obligatory.
- Persons who operate with or at an *HA1805* have to confirm by their signature to have read and comprehended this operating manual especially in regard to the operating instructions.
- Dangerous zones resulting from the integration of the tester into a system or a device have to be located by the operator and safeguarded against.
  When assembling or installing devices, systems or items of equipment of different manufacturers or suppliers and after modifications by company or service personnel where changes within the electric equipement were made the operator has, before putting into operation, to perform a precise inspection according to the accident prevention regulations VBG 4 in compliance with the individually applicable rules of electrical engineering.

1.3.2 Operating instructions for personnel

- Operating instructions, general instructions and regulations are part of the tester and have to be accessible, readable and complete for all those who operate with or at the HA1805.
- Before operating with or at the HA1805 questions have to be answered or uncertainties have to be explained by the personnel in charge.
- Any operations with or at the HA1805 may only be performed by workers skilled in electrical engineering or trained in electronic engineering and who have been given instructions for such operations and thus been authorized by the operator.
- Testing personnel may only operate the HA1805 when a skilled electrician is in charge.
- Adjustments, service and inspections have to be performed according to the instructions specified and according to schedule.

1.3.3 Safety installations

The HA1805 testers are, for the safety of the operating personnel, equipped with below safety equipment:

- safety current limiting for insulation test
- safety current limiting for high voltage test

Capacitive DUTs and DC high voltage

When testing with DC high voltage, capacitive DUTs are getting charged. At the end of an insulation test or HV-DC test, the test object is discharged, the PASS / FAIL signal is output only after the end of the discharge. That's why tests with DC high voltage always have to go through to the end in a controlled manner. If the contact is prematurely disconnected (or if the tester is switched off, mains voltage failure, etc.), the test object is not discharged and may still be charged with dangerously high energy!

This also applies to safety current-limited testers (<10 mA DC)! Although the test voltage / current of these devices is not dangerous as such in direct contact, capacitive DUTs can still be charged with dangerously high energy!

If such conditions are met by appropriate DUT types, the personal safety measures according to EN 50191 must be observed, even with safety-limited test equipment.

1.3.4 Note on possible disorder of USB devices

When testing with high-voltage, it is possible that failing testpieces may cause disorder of USB devices in close surrounding of the test field.

Please see annex A-2 for a problem description, and measures to avoid.

1.3.5 Information on further publications

For the protection of persons the trade associations and unions have published below literature:

• DIN EN 50191	Installation and Operation of Electrical Installations
• DIN EN 50274	Protection against Electric Shock – Protection against unintended direct contact of dangerous active parts
• DIN 40 008 part 3	Safety Signs for Electrical Engineering; Warning Signs and Additional Signs
• DIN 40 050	IP-Protective System, Protection against Contact, Foreign Matter and Water for Production Equipment
• DIN 57100	Specifications for the Installation of Power Plants with Nominal Voltages of up to 1000 V
• BGI 891	Establishing and operation of electrical test plants

2 Description

2.1 Device functions

You can perform safety tests at electric devices according to standard test regulations (EN, IEC, VDE etc.) with the safety tester HA1805.

Below tests can be performed:

Standard tests:	HA1805B
IS: Insulation test	100–6000 V DC / 10 mA
HV: High voltage test	100–5500 V AC / 3 mA 100–6000 V DC / 10 mA

*) When DUT connected to power socket: max. 3000 VAC / 4000 VDC. Higher testvoltages can be used when DUT is connected by HV pistols, or by rear panel connectors X13/X14.

The test device works with a fully electronic high-voltage generator. The high voltage is readjusted fully automatically during the test operation, depending on the load, once the test voltage has been correctly adjusted.

If the voltage change is too fast (> 2% per full wave), the voltage drop will be recognized as an error.

Warning:

When the DUT is connected using a connection box (e.g. "A3"), the test voltage *Unom* must be <= 3000 VAC / 4000 VDC ! Voltages higher than that can destroy the power socket of the connection box!

Testing over the device's DUT power socket is automatically limited to 3000 VAC / 4000 VDC.

To use voltages bigger than 3000 VAC / 4000V DC, make the connection using HV-pistols.

2.1.1 Integrated Dummy Test Program

The high voltage tester HA1805 comes shipping with a premade dummy test program.

The "Dummy" test program is tailored so that you can use a test dummy of SPS electronic to ensure the correct function of the tester. The dummy program guides through the testing procedure, using text steps to give instructions what has to be switched at the dummy, what has to be connected at next, etc. If the tester reckognizes all "fail"-simulations as "error", and all "pass"-simulations as "pass", then the correct function of the tester is assured.

2.2 Technical Data

Measurements and weights	
Width / depth / height	ca. 450 / 380 / 240 mm
weight	ca. 130 N (13.0 kg)

Ambient	
temperature	operation: 15 °C – 40 °C (allowed for general operation) storage: 5 °C – 60 °C
Air humidity	max. 70 % (non-condensing) (allowed for general operation)
ambient conditions to comply with the stated technical specifications	23 °C (± 5 °C) and max. 50% relative air humidity (not condensing)

Connection data	
Power supply	wide range 90-253 V / 50-60 Hz
Power input	HA1805B: max. 500 VA

IS Test (Insulation Test)			
Test voltage	free programmable from 100 up to 6000 V DC *(voltage range 100-199 V: tolerances not specified)*		
Short circuit current	< 12 mA DC, safety current limited acc. to EN 50191		
Output voltage	residual ripple DC: < 3% acc. VDE 0432 / EN 61180		
Limit value	free programmable 0.25 MΩ - 6.0 GΩ		
Measuring range	**Range (automatic)** 0.250 MΩ - 6.00 GΩ (max. 1 GΩ/kV) **Accuracy (of value)** ***(for pure ohmic load)*** **HA 1805 B:** 5% ± 3 digits** n.a. *** on last significant bit*		**Significant bits (resolution)** 4 @ < 1 MΩ / 3 @ > 1 MΩ **in range** 0,250 MΩ/kV – 1 GΩ/kV > 1 GΩ/kV
Voltage display	**range** 6000 V	**resolution** 1 V	**accuracy (of value)** 1.5% ± 10 V

** Maximum capacitive load should not exceed 1µF per second of ramp time. Otherwise there is chance for ringing (over-voltage).*

The total capacitive load must not exceed 10µF, otherwise correct discharge can not be guaranteed.

HV Test (High Voltage Test)			
Test voltage	free programmable from 100 up to 6000 V DC *(voltage range 100-199 V:* free programmable from 100 up to 5500 V AC *tolerances not specified)* residual ripple DC: < 3% acc. VDE 0432 / EN 61180		
Short circuit current	≤ 3 mA AC / < 12 mA DC		
Measuring range I	**auto range** 40µA DC 200µA DC 1mA DC 10mA DC 200µA AC 1mA AC 3mA AC	**resolution** 0.001 mA 0.001 mA 0.001 mA 0.001 mA 0.001 mA 0.001 mA 0.001 mA	**accuracy display** 5% of meas.range 2% of meas.range 1.5% of meas.range 1.5% of meas.range 2.5% of meas.range 2.5% of meas.range 5% of meas.range
Measuring range U	**range** 5500 VAC / 6000 VDC	**resolution** 1 V	**accuracy display** 1.5% of nominal value ± 10 V
Measuring range ARC	**range** 0 – 100%	**resolution** 1 %	**accuracy display** *d.n.a.*

** Maximum capacitive load should not exceed 1µF per second of ramp time. Otherwise there is chance for ringing (over-voltage).*

The total capacitive load must not exceed 10µF, otherwise correct discharge can not be guaranteed.

I/O Test	
Inputs 1 – 8	input voltage: 24 V DC ± 30% input resistance: 10 kΩ
Outputs 1 – 8	output voltage: +24V on PIN 20 + 21 , GND on PIN 24 + 25 ± 3% up to 2A total output current: max. 250 mA per output potential free to test voltage and internal supply, short-circuit proof

** Inputs are typically supplied by output voltage.*

Features
• Table housing, with integrated LC touch display
• 10.1" TFT colour display 1024x600 pixels
• Operation with capacitive touch
• USB 2.0 interface
• Ethernet 10/100/1000 Mbit
• 1GHz 32bit Dual-Core CPU + GPU with 512Mbyte RAM
• 1GB internal storage
• External CAN interface
• RS232 serial interface
• Customizable GUI

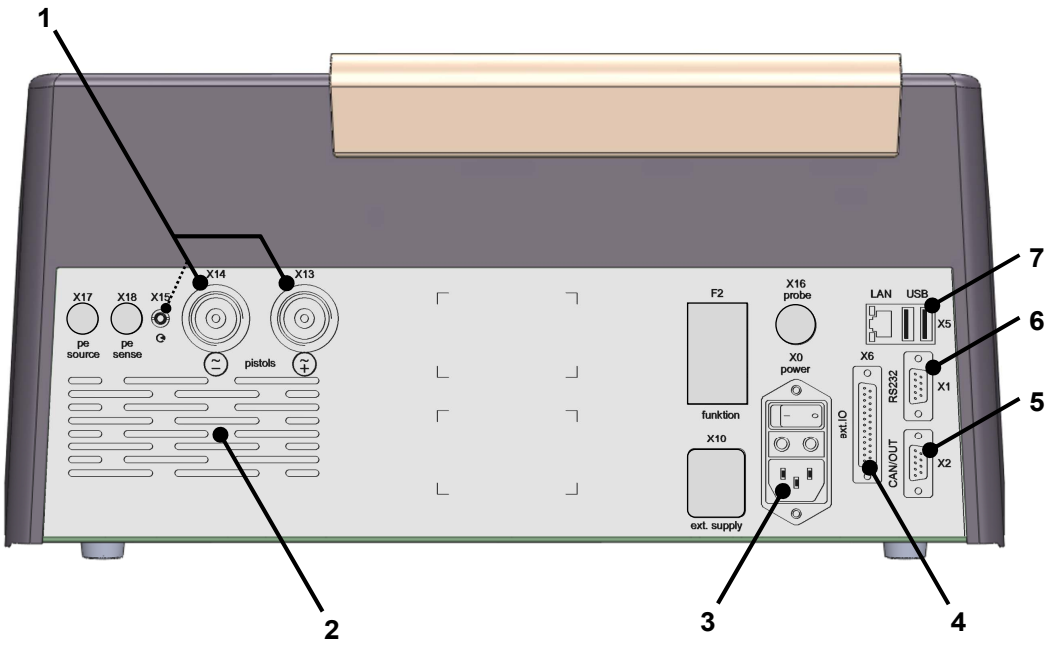
2.3 Set-up of device

2.3.1 Front panel

1 LC touch display – *the touch display provides easy & comfortable user interaction.*

2 warning sign – *indicating the device can produce high voltage*

2.3.2 Rear panel



1 Connectors for high voltage pistols (X13/X14), and connector for start signal line of HV-pistol (X15)

2 ventilation grids – keep free of obstruction!

3 power switch for switching device on and off,
and cold equipment socket for power supply cable (X0), with fuses: 115V: 4A / 230V: 2A , slow

4 I/O interface (X6)

5 serial CAN interface (X2) (for connection of extension units)

6 RS232 interface: serial interface for connection of a PC (X1)

7 1 x LAN, 2 x USB connectors (X5) ***)**

***)** *Only one storage medium at a time can be active. If e.g. two USB sticks are plugged, then the stick that was plugged in at last is the active one.*

3 Putting into operation

3.1 Requirements

Tester *HA1805* as well as all of the electric connections and lines must be in operational and reliable condition.
The General Safety Regulations (pl. see chapter 1.3) and the generally applicable legal rules as well as other binding directives for industrial safety, for accident prevention and for the protection of the environment have to be adhered to and persons staying in the area of operation must be informed respectively.

There is danger to life caused by electric current or voltage in case of handling electric installations inappropriately!

3.2 Connection of device

1. switch off power switch at tester
2. plug power cable of tester into cold equipment socket (X0) at back of device
3. connect power cable to power supply
4. If provided for, connect external devices to interfaces

3.3 Switching the device on

The HA1805 is switched on with the power switch at the rear of the device (X0).

The test device then is starting its internal Operating System. This takes approx. 10 seconds.
When finished, the device is showing the start screen, and is ready to perform tests.

3.4 Switching the device off

The high voltage tester HA1805 is switched off with the power switch at the rear of the device.

In case of tests with high voltage (IS- and HV-test) the DUT has to remain connected until a test result is displayed. At the end of the test time the DUT is discharged.

If the HA1805 is switched off prematurely, the DUT cannot be discharged!

4 General Operation

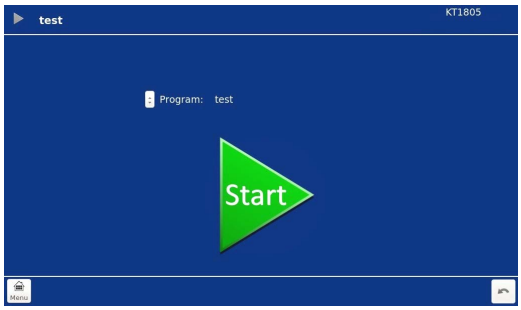
4.1 Operating elements

All operations are carried out via the device's touch screen. If you want to push a function-button, switch between registers, chose an element out of a list – just touch the wanted element with your finger.

When entering parameter values or text, a virtual QWERTY keyboard is shown on the display, where you can enter numbers and characters as required.

Hint: To enter capital letters or special characters, the according key has to be touched long.

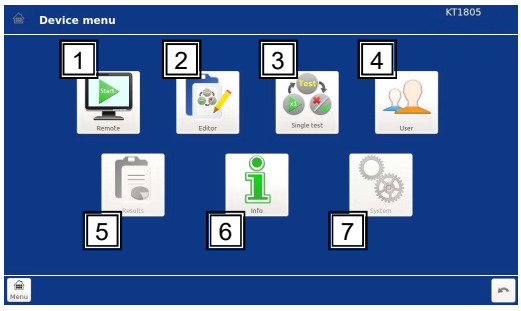
4.2 Start Screen



After the user-login, the device is showing the start screen with the latest used program active. You can immediately start testing by pushing the START triangle.

To choose another test program, push the dropdown arrow left of the program name. It will show a list of all test programs saved in the device, and you simply touch the program you want to use next.

4.3 Main Menu



This is the main menu that provides access to all features and functions of the HA1805. This menu can always be reached by the "menu" button in the lower left corner of the screen.

(1) Remote – Switches the device into remote mode (e.g. for operation with DAT1805/3805 software)

(2) Editor – opens the program editor where test programs can be created or modified.

(3) Single test – opens an interface where single test steps can be executed directly.

(4) Users – opens the user administration where users and passwords can be administrated.

(5) Results – opens the result browser where the saved test results can be reviewed.

(6) Info – shows the info screen with basic information about the device.

(7) System – Opens the options dialog where general system settings can be made.

4.3.1 User Managment

In this menu, the users of the device are managed. Each user is registered with a unique name and a password. Also, each user has a set of rights, that define what sort of actions the users is allowed to do, and what actions are not allowed.

Run single tests – allows access to the "single test" menu

Run programs – allows to execute test programs

Modify programs – allows access to the "editor" and to create, edit or delete test programs

Select programs – allows to change the active program at the "Start" screen

Enter menu – allows access to the "System" menu

Change device setup – allows to make changes in the "Info" menu, thus also to make Firmware-updates

Manage users – allows access to the "User" menu

Skip dummy tests – gives authority to skip a pending dummy test

When "**Use Device Login**" is activated, then on device start-up there will be a login screen. Access to the device is only possible when an existing user name with correct password is entered.
To change the actual user, push the "Logout" button in the lower right corner. A new login screen will be shown, so that another user can log in.

If the user/password system is not needed as safety measure (e.g. laboratory usage with only one person using the device), you can deactivate the "Use Device Login" checkbox. In this case there will be no login dialog, and all functions of the device are freely accessible.

4.3.2 Remote

Using this button will set the HA1805 into remote mode. The device is awaitening commands on either RS-232 or ethernet (depending on which was activated in the System Settings).
On the screen, you can see the communication commands as they are transmitted, as well as the relevant test values and measurements when a test is running.

4.3.3 Single Test

From this menu, all tests of the HA1805 can be executed directly, without using any test program. This test mode is useful e.g. for figuring good test parameters for new DUT types, or for specific error searching, or any other circumstance when you want to make quick manual testing with changing test parameters.

Note: in Single Test mode, the test results will not be protocolled to a file. There is only the result screen at the end of the test step.

4.3.4 Program Editor

In the editor module, test programs are managed. Programs can be created, modified, duplicated or deleted. When the editor is opened, the left side shows a list of all programs currently stored in the device. When a program is selected, the right side shows the test steps in that program.

The buttons at the bottom left of the screen offer all needed functions:

During program list view:

Edit – the currently selected program is opened for editing
Save – the selected program is saved to memory
Save as – the selected program is saved to memory with a new name
Add – the selected program is opened for editing, with the test step selection immediately opened
Delete – the selected program is deleted from memory. (There will be a saftey inquiry before deleting.)

When a test program is opened for editing:

Open – goes back to the program list so that another program can be selected
Save – the currently opened program is saved to memory
Save as – the currently opened program is saved to memory with a new name
Add – opens the test step selection to insert a new test step. The new step is inserted *after* the currently highlighted test step.
Delete – the currently highlighted test step is deleted from the program. There is no safety inquiry.
Run – executes the actually selected test step as a "real" test. If test step "#Test begin" is selected, then the whole test program is executed.
Default – all parameters and settings of the selected test step will be reset to default values.

When saving a test program, the program name can't contain the following characters: \ / : * ? " < > |

4.3.5 Results

In this module, the saved test protocols of previous test runs can be reviewed.
The list on the left side shows the names of all saved test protocols.
The naming scheme is "Pyyyymmdd_hhmmss" (year/month/day__hour/minute/second).
Example: a test program was run on June 17th 2015, the test finished at 11:42, then the test protocol is saved as "P20150617_114200".

With "Export" you can copy the test results to e.g. a USB stick. Per default a folder "results" is created as destination, but the name/path can be changed manually.

The XML results can be opened and viewed in any internet browser.

Note: for correct display in the browser, the res_style.* and XHTML*.* – files are required. These files are automatically copied together with the results by the export function. If you later want to copy the results from the USB stick to another location, be sure to also copy the res_style.* and XHTML*.* files.

Searching in the result files

The result files can be searched by different criteria. In the "Text" tab you can set filters for Serial-nr, Program, Device, Product-ID and Tester. The wildcards "?" for replacing single characters and "*" for replacing multiple characters can be used. In the "Other" tab you can set specific week-nr, or "started / ended" to search for tests in a certain date range, and/or search for tests with the result Passed/Failed/Break.

4.4 System Settings

In this module, you will be able to change general system settings.

4.4.1 Network settings

4.4.1.1 Device

In this tab, the settings are made to connect the device to a local network (LAN).

- **IP address** "Address" of tester in the network, format "xxx.xxx.xxx.xxx". This IP has to be assigned to each tester locally and has to be non-recurrent in the network.
- **Netmask** When applying sub networks, this mask determines which parts of the IP-address contain the network-ID (identification: "255") and which contain the host-ID (identification: "0"). (default: 255.255.255.0)
- **Gateway** If there are more than one network connected in the local Ethernet via a gateway then the IP of the gateway must be entered here.
- **DNS Server** IP adress of the DNS server, if one is present in the local network

4.4.1.2 Printer

- **Printer address** "Address" of a network printer, format "xxx.xxx.xxx.xxx".

The printing of test protocols is carried out via ethernet to a network printer.

For network printing, only PostScript-compatible printers can be used!

Note:

For various printer models it is necessary to manually activate Postscript support in the printer's system settings. Often this is referred to as "emulation mode" or "PDL" setting (Page Description Language).
(e.g. for Kyocera printers, the emulation mode "KPDL" must be enabled).

Please see your printer's operating manual for details on enabling Postscript support.

4.4.2 Remote Operation

Tab "Remote":

- **Remote mode** The remote mode can be switched between "Serial" and "Network", or can be set to "digital" operating mode.
- **Network port** For network operation, the communication port must be specified. (Default: port 3800). In case of serial communication, this option is not active.
- **Remote startup** When this option is checked, the device will always start directly into remote mode when it is switched on.

Tab "Digital":

Here, the existing test programs are assigned to the up to 16 digital program slots:
With <<set the marked test program (right list) is assigned to the marked program slot 0–15 (left list). With remove>> the marked slot can be cleared again.

In operating mode "Digital", the program selection is done via the inputs 1–4 at interface X6: If e.g. the signal "0110" applies to the 4 inputs 2^0–2^3, then the test program of program slot 06 is active.

4.4.3 Date & Time settings

In this menu, the system date and system time can be adjusted.

4.4.4 Test signal settings

On this page the usage of certain digitial inputs/outputs for interface X6 is defined:

Output signals = ON: device will use digital outputs 1 to 4 to put out status signals during testing. Only outputs 5 to 8 are available for custom usage in test step IO.

Output signals = OFF: the device will not put out status signals on X6. All outputs 1 to 8 are available in test step IO.

Input signals = ON: device will use digital inputs 1, 4, 6 and 8 for predefined external input signals. Only inputs 2, 3, 5 and 7 are available for custom usage in test step IO.

Input signals = OFF: the device will not read status signals from X6. The inputs 1 to 7 are available in test step IO.

Start signals: here you can define up to three additional signals that can be used to start the actually loaded test program: "PE probe start" (switch at test probe, or X6/10), "HV pistol start" (start switch of HV pistol), "Ext.IO input 8" (X6/18), or "Ext.IO input SK" (X6/19).

If the connection box A3-1800 is used, both input and output signals must be set to ON!

4.4.5 Environment settings

Language: In this tab, the language of the user interface can be switched.

Info Line: Here the two-line information display on the top-right of the device display can be configured:
"None", "Firmware version", "IP address", "Date&Time", or "Custom" (any own text)

4.4.6 Global test options

Tab IS Test: "Detection delay time (0 – 100 %)"

The parameter "Detection delay time" specifies the time span at the start of an insulation test that is not checked for the R_{min} threshold.

Example: If "Detection Delay time" is set to e.g. 40% and an insulation test with a test duration of 10s is carried out, then the evaluation of the R_{min} threshold takes place only after 4 seconds.

This function is helpful if test items require a certain amount of time due to their design (e.g. capacitive behavior) before stable measurements are obtained.

Reckognition of general hardware faults (e.g. short-circuit detection) remains unaffected and still leads to immediate test break.

Tab "PW Test":

— This tab is not relevant for HA 1805 & HA 1885 devices —

Here, the "PW Offset" option can be activated. The entered value is then automatically subtracted from all measured values from the protective conductor tests.

Due to the 4-wire measurement, the test device's protective conductor test basically works almost loss-free. Depending on the test setup, there may be situations in which the 4-wire measurement cannot be carried out to the actual test point (additional contacting constructs, contact resistances, etc). Such additional losses can be corrected with the "PW Offset".

4.4.7 Beeper settings

Here, the behaviour of the signal beeper can be adjusted:

On/Off – This will generally enable or disable the signal beeper.
Note: Beeper=Off will also deactivate the external beeper.

For each PASSED step – after each "PASSED" test step there will be a short single beep.

For each FAILED step – after a "FAILED" test step there will be a double beep.

For user action – there will be a signal beep when user interaction is required (contacting test probe or HV pistols, answering a visual test, etc.)

4.4.8 Storage settings

In this menu, the storage location of test programs and result protocols is configured.
If the device is connected to a LAN, the programs and results can be stored on a server.

Tabs "Programs", "Results", "Pictures":

Location:
Flash – the files are stored in the device's internal flash memory. This is default setting.
USB – the files are stored on a connected USB stick
FTP Server – the files are stored on a network server, using the FTP protocol
SMB Server – the files are stored on a network server, using the SMB protocol

The configuration for FTP- or SMB protocol is done in the respective tab.
For SMB server, the "authentication" has be set according to the requirements of the server. In most cases, the "auto" setting should let client and server negotiate the required method.
If in the FTP configuration no port number is defined, the standard port 21 is used.

The device can create folders/directories on the server if the required access authorisations are granted by the server. Else, the directory structure has to be created by the server administration.

Note: saving and loading of files to server is asynchronous. If LAN connection is temporarily lost, the files will be synchronised as soon as connection is re-established.

4.4.9 Import & Export

In this tab, it is possible to import test programs, or to export result protocols or test programs.

Notes:

This function will copy all files from the source directory. Selection of single files is not possible.

If in the target directory already exist files with same name, they will be overwritten. There is no safety inquiry.

"Import" and "Export" is in relation to the locations that are defined in "Storage settings". E.g. if the setting is to hold the test programs on a server, then "import" means that test programs will be copied to the server directory.

Storage setting	Import from / Export to:		
	USB	Server FTP	Server SMB
Flash	●	●	●
USB	—	●	●
Server FTP	●	—	●
Server SMB	●	●	—

4.5 Test parameters

4.5.1 Common parameters:

The test parameters in the tabs "Go to", "Safety" and "Ramp" are functioning the same way for all test steps ("Ramp" only for steps HV and IS).

Step Titles:

Each test step can have two different names: "Title" and "Print Title".

- "Title" is always used in on-screen-display, and in the result protocols.
- "Print Title" is used for printing of test protocols.

Per default, both names are the same (i.e. the list-name of the respective test step), but these names can be edited at free will, if required.

Tab "Go to":

In this tab you can define how to continue the test process, if the current test step ends with either the result "Pass" or "Fail":

- **Next step** Test process is continued with the next test step in the program.
- **Go to step ##** Jumps to test step no. "##" and continues the test process from there.
- **Finish** Test process is ended, no further test steps are carried out.

Related, in the "General" tab:

- **Repeat possibility** If the test step ends with "Fail", a dialog is displayed asking if the step should be repeated. If the repetition ends without error, the test step will be rated as "PASS".

Tab "Safety":

In this tab it is defined which kind of safety setting is used to start the test step:

Field "Safety Control":

Off – Test step starts immediately, without checking the protective circuit.

Impulse – Test will start after short impulse on used "safety contact".

Hold – signal on "safety contact" has to apply during the complete duration of the test step until the test result will be displayed. Premature release will break the test step with result FAIL.

Field "Safety Contact":

HV pistol – uses the start signaller of HV-Pistol SP03 as the active safety contact

PE probe – uses the start button of PE-probe as the active safety contact (or signal "Start_PE" on digital interface X6, PIN 10)

Ext.IO input SK – uses signal "Input_SK" on digital interface X6 (PIN 19) as the active safety contact

Ext.IO Input 8 – uses signal "Ext_Start" on digital interface X6 (PIN 18) as the active safety contact

Ext.IO input 1..7 – uses a signal on the chosen digital input on interface X6 (PIN 11..17) as safety contact

Tab "Ramp":

The test steps HV and IS can use voltage ramping at the start and end of a test step.

t Ramp up – Time duration for voltage ramp when starting test. 0s means no voltage ramp.

U ramp start – Initial voltage value at start of voltage ramp

Ramp down – Selection of a dropping voltage ramp at end of test (same time as ramp up)

I ramp – Activates custom current thresholds IR min and IR max during voltage ramping.
If not activated, the normal I min / I max thresholds are used also during voltage ramp.

4.5.2 AA: Test Start / ZZ: Test End

Each test program does have an "AA" step at the beginning and a "ZZ" step at the end. By means of these steps, certain general settings for the test program are defined.

Step AA:

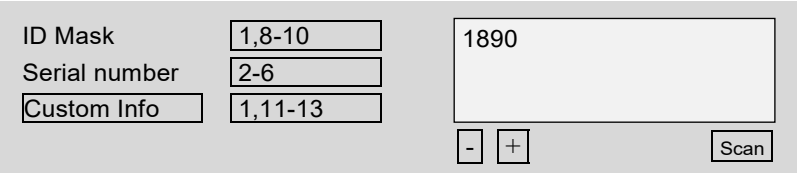
Tab "Data":

- **Saving =** Never / On Pass / On Fail / Always
- **Printing =** Never / On Pass / On Fail / Always

These settings define in which cases a result protocol is saved to memory, and in which cases a test protocol will be printed.

Tab "Barcode":

In this tab, each program can be assigned to a certain barcode sequence. Thereby it is possible to scan a barcode at the START screen, and then the according test program is automatically loaded and started.



In the fields beneath "ID Mask", "Serial nr." and "Custom Info" it is defined which positions of a scanned barcode will be evaluated for the respective element.
In order to link a test program to a certain barcode sequence, push the "Scan" button and scan a suited barcode. In the "ID" field to the right, the evaluated ID will be shown.

Example:
- the barcode "1234567890abcd" is scanned, and acknowledged with "OK".
- per specification "1,8-10" the ID **1**234567**890**abcd ⇒ 1890 is assigned to the current test program.
In future, if at the START screen any barcode **1**xxxxxx**890**xxx... is scanned, then this test program will be loaded and started. The evaluation for "serial nr." and "custom info" is done in similar manner.

Step ZZ:

- **Show results for** xx **s**

This setting defines how long the PASS/FAIL result will be shown, before returning to the START screen.

- **Manual confirmation of failed result**

When this option is activated, then a FAIL test must be manually acknowledged (Confirmation button on the screen, or EXT_ACK on IO-Interface X6, resp. "QUITT" button on connection panel A3). The warning beeper sounds continuously until the failed test has been acknowledged.
When not activated, a failed test is signalled by a double beep, and after elapse of result showtime the device returns to the START screen (colored in RED, to indicate that the last test was failed).

4.5.3 HV: High Voltage Test

With the high voltage test, the electrical strength between the contacted potentials is evaluated.

In case of insufficient or damaged electric strength of the DUT, an arc-over will occur.

Explanation of test parameters for HV high voltage test:

• **t Test**	Preset value for duration of test (without ramp time)	(0.1 – 999.9 s)
• **U nom**	Preset value for test voltage	(100 – 5500[1)] V [AC]) (100 – 6000[1)] V [DC])
• **Voltage type**	Sets the kind of test voltage	(AC 50Hz / AC 60Hz / DC)
• **I min / max**	Required minimum / allowed maximum current for PASS result	(0.000 – 3.00/10.00 mA [AC/DC])
• **Connection**	Method of DUT contacting (see next page)	(Pistol)
• **Keep power after test**	With this option, the test voltage is not switched off at the end of the test step. In this way, step-shaped voltage ramps can be generated in connection with further subsequent HV steps.	

[1)] When DUT connected to ext. connection box: max voltage 3000 VAC / 4000 VDC !

Only available if device is equipped with the according extensions:

• **ARC max**	Sets the maximum allowed signal disturbance. The arc-over detection is looking for partial discharges, i.e. high-frequency "peaks" in the electric signal of the test current, indicating weak parts in the DUT's insulation system. The value is in range 0% (perfectly clean/calm signal) up to 100% (full & strong flashover).

Connection – explanation of parameter

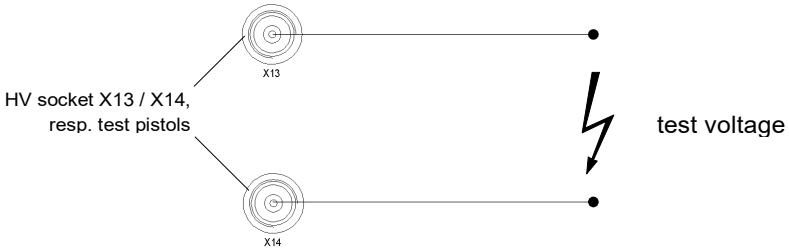
1. Mains

Not available for device HA1805.

2. Pistols

This connection type can be used if not all parts of the device are accessible via a mains connection. Voltage is applied by HV connectors X13 / X14, resp. by test pistols connected to X13/X14.

Principle of voltage application for connection type "Pistols":



3. Class 2

Not available for device HA1805.

4.5.4 IS: Insulation Resistance Test

With the insulation test IS, the insulation resistance between the contacted potentials is evaluated.

In case of insufficient or damaged electric strength of the DUT, an arc-over will occur.

Warning:
When the DUT is connected using a connection box, the test voltage Unom must be <= 4000V !
Voltages higher than 4000V can destroy the conection box!
To use voltages bigger than 4000V, make the connection directly by HV-pistols or HV-terminals.

Explanation of test parameters for IS insulation test:

• **t Test**	Preset value for duration of test (without ramp time)	(0.1 – 999.9 s)
• **U nom**	Preset value for test voltage	(100 – 6000[1)] V)
• **R min**	Required minimum resistance for PASS-result	(0.25 – 10000.00 MOhm)
• **Connection**	Method of DUT contacting *(see previous page)*	(Pistol)
• **Keep power after test**	With this option, the test voltage is not switched off at the end of the test step. In this way, step-shaped voltage ramps can be generated in connection with further subsequent IS steps.	

[1)] When DUT connected to ext. connection box: max voltage 4000 V!

4.5.5 SO/RI: Set Output / Read Input

By means of the I/O-tests it is possible to transmit digital signals on the I/O-interface, or to read incoming signals.
This way external systems can be controlled, or the test process can be controlled dependent on the condition of external systems by branching via the "If-Pass / If-Error" - conditions depending on the read-out result.

Information:

- For each in- or output "0", "1", or "□" can be specified:
  - 0 – Signal must be (read) "low", resp. will be set to "low"
  - 1 – Signal must be (read) "high", resp. will be set to "high"
  - □ – Signal condition is ignored (read), resp. remains unchanged

- When **reading** signals, the specified bit combination must be read exactly from the digital inputs to achieve the test result PASS. Unspecified inputs will be ignored.
- After starting test step the space of time of [t Test] is awaited. If by process end of test time the specified bit combination has not been achieved, the test result will be FAILED.

- When **setting** signals, all outputs specified with "0" are set to "low" and those specified with "1" are set to "high". The status of unspecified outputs will remain unchanged.
- After starting the test step the outputs are set immediately. Then you wait for the space of time [t Test] before ending the test step and the next one is started. This can be applied if parts of the controlled external systems will need a certain space of time to convert the signals received.

Note:
The availability of digital inputs and outputs depends on the chosen system settings, see chpt. 4.4.4 "Test signal settings", p. 19.

4.5.6 SA: Set Analog Output

With the SA step, an analog signal in range 0 – 10 V can be set on the CAN-interface X2 / PIN9.

Explanation of parameters for SA-step:

Output template	Here you can enter a name for the current settings, or select a previously created one. When "Add" is pressed, the current parameter settings are saved into a profile; i.e. these settings later can be recalled at any time by choosing the according profile name.
Range	The signals of the analog interface are always in range 0V – 10V. With the "Range" parameter a normalisation of the displayed values can be achieved. E.g. if Range/Unit is set to "300 Ohm", then a signal of 10V will be interpreted as 300 Ohm, both in the screen displays and in the test protocols.
Unit	The unit to be used for the analog signal.
Value	The normalised analog value that is put out.
t Test	Running time for the test step.

4.5.7 RA: Read Analog Input

With the RA step, the two analog inputs of interface X6 can be read and evaluated. The input signal must always be in range 0V … 10V.

Explanation of parameters for RA-step:

Input template	Here you can enter a name for the current settings, or select a previously created one. When "Add" is pressed, the current parameter settings are saved into a profile; i.e. these settings later can be recalled at any time by choosing the according profile name.
Channel	Chooses whether to read analog input 1 or input 2 (X6: PIN 9 / PIN 22).
Range	The signals of the analog interface are always in range 0V – 10V. With the "Range" parameter a normalisation of the displayed values can be achieved. E.g. if Range/Unit is set to "300 Ohm", then an incoming analog signal of 10V will be interpreted as 300 Ohm, both in the screen displays and in the test protocols.
Unit	The unit to be used for the analog signal.
Min. value	Minimum of the normalised analog value to reach test result "Pass"
Max. value	Maximum of the normalised analog value to reach test result "Pass"
t Test	Maximum running time for the test step.
t Good	If all measuring values are continuously within the limit values for the duration of [t Good], the test will already be ended before the end of the process of [t Test].

4.5.8 VT: Visual Test

This test step can be carried out in three different methods: as *Info Step* or as *View Test* or as *Control Step.*

The Info-step can, for example, be used to give instructions to the operator: “Connect DUT now!“.

In case of the visual test, the PASS/FAIL result will depend on the visual judgement of the operator.

The control step does not have a PASS/FAIL result. This can be used to make jumps in the test program depending on the operator's Yes/No answer, by using the "Go to: If Yes / If No" option.

Explanation of test parameters for VT visual test:

• **Text**	Entry of inquiry or information text that is shown on the display.
• **Step type**	Selection of test method:
○ Info	The indicated text is displayed to the operator and can only be acknowledged with OK. There is no test result PASS or ERROR.
○ View test	The indicated inquiry is displayed to the operator and can be answered by YES or NO. Depending on the answer the result of the step will be PASS or ERROR.
○ Control	The indicated question is displayed to the operator and can be answered by YES or NO. There is no test result PASS or ERROR. Thereby it is possible to perform jumps in the test program, without affecting the overall test result.
• **Evaluation**	With this option the evaluation logics can be changed over – since for some questions, "no" in fact is the "good" answer:
○ Yes = pass, No = fail	
○ No = pass, Yes = fail	*"Is the DUT red hot?"* → *"No"* ⇒ test result PASS.

4.5.9 CI: Comment Input Step

With the CI step, it is possible to enter text or numbers during a test run, and include this data in the test protocol.
For example, this can be used to scan barcodes and put them into the protocol.

The CI step allowes input of up to three different items.
Each item can be given an individual name as required.
If the step shall have less then three items, use the "minus button" to remove one or two items. Vice versa, the "plus button" can be used to re-enable removed items.

Tab "Validiation"

With the validation feature, the entries or scanned barcodes can be checked, e.g. to ensure that the correct barcode was scanned at all.

Four functions can be used in a validation field:
("Wildcard Matching", a system function from the Linux operating system is used)

a	Each character / number / symbol stands for itself.
?	The question mark stands for any one single character.
*	The asterisk stands for no or for any number of arbitrary characters
[…]	Square brackets present a set of characters.

Examples:

abc*	barcode of any length, the barcode must start with "abc".
???????	the barcode must have exactly 7 digits, any content
abc	somewhere in the barcode "abc" must appear
[0-9]*	barcode of any length, the first digit must be a number
[ABC]??z	the barcode must have 4 digits. The first character must be an A *or* a B *or* a C, and the last character must be a "z".

5 Testing Operation

5.1 Outline

- **Connecting the DUT**
  When using a connection box (e.g. "A3"), just put the DUT's mains plug into the power socket of the box. All electrical tests will now be executed via the DUT's mains supply.
  If required by the actual test norm, and/or if you need to test device parts that are not reachable via the mains connection, the DUT can also be contacted manually. At the rear of HA1805, there are connectors for HV test pistols (X13, X14).

- **Loading of test program**
  At the START screen, the display is showing the actually loaded test program. To switch to another test program, tap on the dropdown arrow to show the program list, then tap on the program you want to use.

- **Start of test**
  To run the test program, tap on the green START triangle.

- **Test step process**
  The program's test steps are consecutively carried out with their programmed parameters.
  Depending on test step and set start control the single steps will start automatically or when contacting DUT or after activating start control.
  While one test step is in process the current measuring values are displayed.

- **Test step result**
  If a test step ends with PASS, the next step will start immediately.
  If a test step ends with FAIL, then:
  - the test process is stopped.
  - the screen turns RED, and shows a big FAIL message
  - the cause of error is shown in the status field of the test step display.

  The error must be acknowledged with the "Back"-button.

- **Test result**
  If all test steps resulted in PASS, the complete test result is PASS.
  The device will show the start screen again, colored in green, to indicate that the last test run was good.

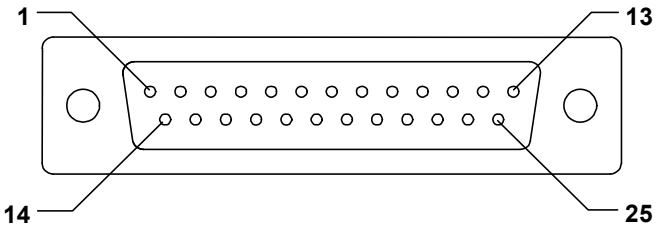
  If the result of any one test step was FAIL, the complete test result is FAIL.
  After error acknowledgement, the device will show the start screen again, in standard coloring.

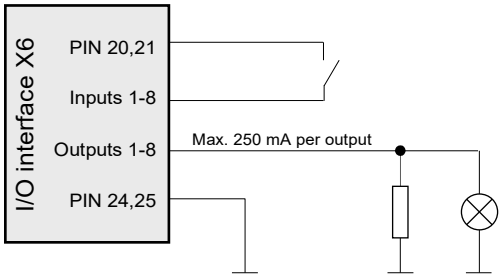
  In the manual test mode you can now either
  - immediately start the next test with START key, or
  - switch to the result module and examine the test protocol with all measured values

Annex

A Interface Configuration

A-1 External I/O Interface X6





Basic circuit for using IO-interface X6

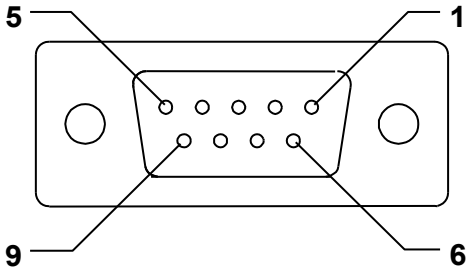
PIN	description	configuration
1	output 1	*free* / EXT_PASS **)
2	output 2	*free* / EXT_FAIL **)
3	output 3	*free* / EXT_BUZZER **)
4	output 4	*free* / EXT_TEST **)
5	output 5	*free*
6	output 6	*free*
7	output 7	*free*
8	output 8	*free*
9	analog input 1 1)	[0V … 10V]
10	PE start	START_PE
11	input 1	*free* / EXT_YES / 4bit program selection (2^0) **)
12	input 2	*free* / / 4bit program selection (2^1) **)
13	input 3	*free* / / 4bit program selection (2^2) **)
14	input 4	*free* / EXT_NO / 4bit program selection (2^3) **)
15	input 5	*free*
16	input 6	*free* / EXT_ACK **)
17	input 7	*free*
18	input 8	EXT_START
19	input SK	EXT_SK
20	+24 V DC *)	voltage against ground *)
21	+24 V DC *)	voltage against ground *)
22	analog input 2 1)	[0V … 10V]
23	*n.a.*	*not used*
24	ext.GND	grounding
25	ext.GND	grounding

1) potential-free from internal supply

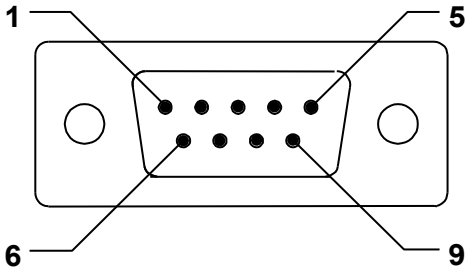
*) internal 24V supply, do **NOT** feed in from external

**) The configuration of digital inputs and outputs is depending on the system settings, see chpt. 4.4.4 "Test signal settings", p. 19.

A-2 RS-232 Interface X1, CAN Interface X2



X1: socket RS232 (Dsub9)



X2: plug CAN (Dsub9)

PIN	description	configuration
1	——	*not used*
2	RxD	Receive Data
3	TxD	Transmit Data
4	——	*not used*
5	GND	Mass
6-9	——	*not used*

PIN	description	configuration
1	——	*not used*
2	CANL_EXT	Low speed CAN line
3	GND (CAN) [1)]	Mass of CAN signal
4+5	GND (Analog)	Mass of analog signal
6	——	*not used*
7	CANH_EXT	High Speed CAN line
8	——	*not used*
9	AO	Analog out, 0-10 V

Interface configuration:
9600 Baud, 8 Data, 1 Stopbit, No parity.

[1)] potential-free from internal supply

B USB devices, and "Testing with High Voltage"

- When testing with high voltage, a failing testpiece can be the cause for electromagnetic radiation (because of voltage arc-over at the weak point in the testpiece), and the resulting sparkling can cause EM radiation of high frequencies. This radiation gets emitted by the test lines – antenna principle – , and may get recepted again by USB lines in the closer surrounding.
- USB controllers are generally vulnerable to stray fields of high frequencies, and thus the communication with USB can get interrupted. In particular, it is possible that short occurances of stray fields put the USB-controller into a persistent inoperable state, so that USB communication keeps being interrupted.
- If such an USB malfunction occurs, often it is already sufficient to just unplug the USB cable, and plug it in again after a few seconds. If the malfunction still persists, it is needed to switch the affected devices off, and on again.

Concerned Situations and devices:

- generally every kind of PC or similar device that is using a USB connection, and is located in very close neighborhood to a test with high voltage.
- in particular such PCs that are using DAT3800 or DAT1800 software to control a testing device, and are using an USB connection to the test device.
- also test devices of series 3800 or 1800, when they are themselves using external USB devices, like e.g. USB keyboard, USB barcode scanner, or USB sticks for data exchange.

Measures to avoid failures

- as far as possible, it is recommended to keep a sufficiently large distance between USB cables/devices, and testpiece / testing lines. (Recommended are at least 30cm, the practical rule is "the more, the better".)
- it is recommended to use well-shielded USB cables with ferrite-core coil.
  (On its own this is won't eliminate the possibility of errors, but it generally reduces sensitivity against stray fields, and makes occurance of errors less likely.)

C Trouble Shooting

If the device is signalling one of the following error messages:

- *"No answer from generator"*
- *"No operating status from generator"*
- *"No communication to generator"*
- *"24V supply damaged"*

In case of any of these errors, please restart the device at least one time, i.e. switch the device off and on again. Usually there is no problem with the hardware, and the error will be gone after restart.

If the error still persits, please contact the service of SPS electronic GmbH.

If the HA1805 is reporting:

- *"Please switch on device! Check intern and extern emergency stop!"*

Check whether the Emergency-Stop switch is correctly pulled, whether the jumper plugs at X4 or X11 are correctly connected, or whether you have to push the green lightbutton "ON".

EU-Konformitätserklärung
EU Declaration of Conformity

Wir / *we* :

SPS electronic GmbH
The Electrical Safety Test Company
Eugen-Bolz-Str. 8
D-74523 Schwäbisch Hall

erklären hiermit, dass das nachfolgend genannte Gerät den einschlägigen grundlegenden Sicherheitsforderungen der EU-Richtlinien entspricht.

declare, that the following unit complies with all essential safety requirements of the EU Directives.

Geräteart: *Description of device:*	Hochspannungstester *High Voltage Tester*
Typ / *Type* :	HA1805 B

EU Richtlinien / *EU Directives:*

☐ EG Maschinenrichtlinie 2006/42/EG mit Änderungen
EC Directive for machinery 2006/42/EC with amendments

☒ EU Niederspannungsrichtlinie 2014/35/EU
EU Directive for low voltage 2014/35/EU

☒ EU Richtlinie Elektromagnetische Verträglichkeit 2014/30/EU mit Änderungen
EU Directive electromagnetic compatibility 2014/30/EU with amendments

Angewandte harmonisierte Normen:
Applicable harmonized standards:

- EN 61 000-3-2; EN 61 000-3-3; EN 61 326; EN 50 191

Angewandte nationale Normen und technische Spezifikationen:
Applicable national standards and technical specifications:

SPS electronic
SPS electronic GmbH
Blätteräcker 18 • 74523 Schwäbisch Hall-Sulzdorf
Telefon 0 79 07 / 878-0 • Fax 0 79 07 / 878-99

30.06.2017
Datum / date:

ppa. Dipl. Ing. Stefan Ruhl

Dieser Konformitätserklärung unterliegt grundsätzlich nur das von uns gelieferte oder in Betrieb genommene Gerät.
Für Änderungen und Erweiterungen ist der Betreiber verantwortlich und damit für die Sicherstellung der Übereinstimmung der veränderten Anlage mit der betreffenden EU-Richtlinie.

Subject to this declaration of conformity is the device as supplied or placed into operation by us.
The operator is responsible for subsequent alterations and extensions, and therefore has to ensure the altered unit complies with the corresponding EU directives.