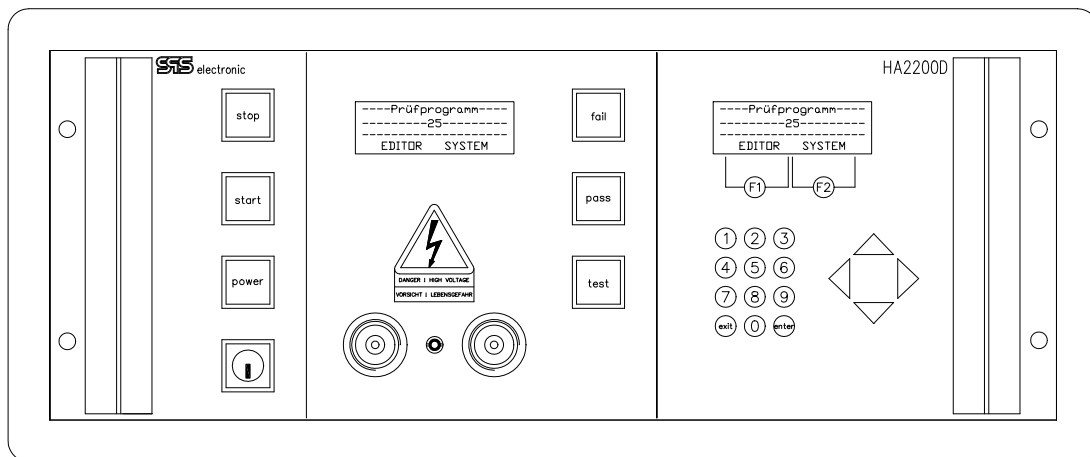


# User's Manual

## High Voltage Testers

### HA 2200A, HA 2200B, HA 2200D, HA 2200E, HA 2200G, HA 2201G

Last update: 03 Jul 2012



Series:	HA 2200 B
---------	-----------

Serial number:	
----------------	--

Constructed in:	
-----------------	--

*SPS electronic GmbH*  
Blätteräcker 18, 74523 Schwäbisch Hall

Phone: +49 (0) 79 07 878 - 0  
Fax: +49 (0) 79 07 878 - 10

e-mail: [info@spselectronic.com](mailto:info@spselectronic.com)  
Internet: [www.spselectronic.com](http://www.spselectronic.com)



# Contents

<b>1</b>	<b>General Information</b>	<b>5</b>
1.1	Information on this manual	5
1.2	Requirements for operation of device	7
1.3	General instructions and regulations on safety	8
1.4	Service	11
<b>2</b>	<b>Hardware Description</b>	<b>12</b>
2.1	Functions	12
2.1.1	Description of test types	12
2.2	Technical Data	13
2.2.1	Measuring ranges of Insulation Test	15
2.3	Design and functions	16
2.3.1	Front panel	16
2.3.2	Rear panel	17
2.4	Expansions, options and accessories	18
2.4.1	Options	18
2.4.2	Accessories	18
<b>3</b>	<b>Operation</b>	<b>19</b>
3.1	Start of operation	19
3.1.1	Requirements	19
3.1.2	Important note about device orientation:	19
3.1.3	Installation of test station	19
3.1.4	Connecting DUT	20
3.2	Changing of system parameters	21
3.2.1	Menu structure: System parameter	22
3.2.2	Password	24
3.2.3	Language	24
3.2.4	Mode	25
3.2.5	Special menu	25
3.2.6	Printer menu	26
3.2.7	Time	27
3.2.8	Date	27
3.2.9	Buzzer	27
3.2.10	Start mode	27
3.2.11	COM mode	27
3.2.12	PASS beep	27
3.3	Changing of test parameters	28
3.3.1	Menu structure: test parameter	29
3.3.2	Test parameters	31
3.3.3	Programming individual test programs (manually)	33
3.3.4	Programming individual test programs with a PC	33

---

3.4 Executing tests .....	34
3.5 Remote control by RS 232 .....	35
3.5.1 Syntax .....	35
3.5.2 Global Commands .....	36
3.5.3 Local Commands .....	37
3.5.4 Status and error parameters .....	39
3.6 Error display .....	42
3.7 Maintenance and function check .....	42
<b>Appendix .....</b>	<b>43</b>
A Special functions .....	43
A-1 Multistart tests .....	43
A-2 Digital program selection .....	44
A-3 Operation with IEC-interface IE 22-h .....	44
B Interface Configuration .....	45
B-1 Digital Interface X1 .....	45
B-2 Serial interface X2 .....	47
B-3 Socket X3: Warning lamp connector .....	48
B-4 Socket X4: Protective circuit (optional equipment) .....	48
B-5 Socket X5: Foot switch connector .....	49
C Information on programming and program run .....	49
D Protocolling of test results .....	50
E Terms of warranty .....	52

# 1 General Information

## 1.1 Information on this manual

This operating manual is part of the technical documentation for the high voltage tester *HA 2200* of *SPS electronic GmbH*.

In this operating manual you will find all the information on how to operate this tester properly, safely and economically, how to prevent danger, how to reduce repair costs and downtimes as well as how to increase the tester's service life.

Should you, while reading this manual, find misprints, information you don't understand or wrong information, please don't hesitate to inform *SPS electronic GmbH* respectively.

### Contents

In this operating manual you will find three chapters and one appendix.

You will find additional information in the appendix.

The headline will show you which chapter you are reading.

The bottom line will show you the type of device in the middle, and on the right-hand side the page number.

### Piktograms and symbols

- **Warnings** are symbolized by warning triangles with danger symbol, they warn of possible personal injury and/or damage to property:



**General Warning**




**Dangerous electric current or voltage**

- **Pointers** are symbolized by the information pictogram and give recommendations or additional information:



**You can order all of these accessories directly from *SPS electronic GmbH*.**

- **Continuations** of coherent sections on the next page are symbolized by the symbol  in the lower right corner of a page.



**... PIKTOGRAMME UND SYMBOLE**

- **More than one operation** is symbolized by ●  
example: ● insulation test (IS-test)  
          ● high voltage test (HV-Test)
  
- **Consecutive operations** are numbered step by step.  
example: 1. switch on power switch  
          2. press key F2 (< Prgnr >)
  
- **results** are symbolized by ⇒  
example: ⇒ LC-display shows current program number.

## 1.2 Requirements for operation of device

### 1.2.1 Operating specifications

The tester must be reliable and perform properly.

Only authorized personnel, e.g. electricians and/or electrical engineers who have read and fully understood this manual, are allowed to operate a tester.

Operation of the tester is not allowed if:

- the tester is not assembled, operated, maintained and serviced according to this manual or as recommended by *SPS electronic GmbH* respectively
- it is modified and/or repaired without authorization
- it is disassembled and/or safety equipment is disregarded
- components, tools, auxiliary equipment and/or means, and/or fuel, coolants and lubricants which have not been approved or recommended by *SPS electronic GmbH* are being used
- replacement parts which are not original *SPS electronic GmbH* ones or which are not supplied by a supplier recommended by *SPS electronic GmbH* are being built in

### 1.2.2 Product liability

Series 2200 testers are manufactured, adjusted/calibrated and tested according to the latest and approved technical and safety regulations.

The testers comply in design and in the selection of component parts and accessories with the terms agreed upon in the order confirmation.

*SPS electronic GmbH* will be liable for errors or failures/ommissions to the extent of the obligations guaranteed in the order confirmation.

The terms of guarantee and liability of the *SPS electronic GmbH* sales and delivery conditions are applicable.

The contents of this operating manual complies with the condition of this tester at time of issue of this manual.

*SPS electronic GmbH* products are subject to change due to continuous development and improvement.

No liability claims can be made on the grounds of the contents of this manual (e.g. data, specifications, diagrams/charts, misprints, etc.).

Errors and omissions excepted!

***SPS electronic GmbH* will only be liable if the tester HA 2200 has been operated or used properly (pl. see 1.2.1).**

**If the testers are not operated or used properly the operator will be solely responsible for endangering life and limb of the user or a third party and for damaging the device and other property as well!**



## 1.3 General instructions and regulations on safety

The high voltage tester *HA 2200* is produced in compliance with the technical requirements at time of delivery.

Nevertheless, there can occur dangerous situations in connection with the tester if not operated properly by trained personnel or if used inexpertly or against regulations.



**Further to this manual the generally applicable legal regulations and other binding directives in regard to safety on the job, to accident prevention and to environmental protection must be observed.**

### 1.3.1 User's responsibility

- Only when **performing properly and reliably** the tester must be operated (pl. see 1.2.1)
- Equipment for protection and safety, locking devices and couplings, etc. must be checked by a technical expert at least once a year.  
The test results must be recorded in a **test certificate** and they must be kept in a file.
- **Instruction is compulsory** when operating, in any way, a machine or an equipment which may endanger the health and/or life of persons.  
People operating in any way an *HA 2200* must acknowledge with their signature that they read and understood this operation manual, especially the paragraph on instructions and regulations on safety.
- Dangerous areas resulting from **incorporating** the tester into a system or device must be located and secured by the user/operator.  
When setting up or installing devices, systems or production facilities of different manufacturers or suppliers as well as after modifications by company or service personnel whereby electrical equipment is manipulated, the operator must, before starting the operation, conduct a precise check according to the accident prevention regulations VBG 4 and in compliance with the appropriate electro-technical regulations respectively.

### 1.3.2 Personnel

- Operating manual, instructions and regulations are an essential part of the tester and must, at all times, be within easy reach of all the persons operating in any way an **HA 2200**.
- Before starting to operate an **HA 2200** tester, questions concerning their proper operation have to be answered by or discussed with the personnel in charge.
- Any operation in connection with an **HA 2200** tester shall only be executed by personnel trained respectively, e.g. electricians and/or technical engineers and who have been authorized by the operator/user to do so.
- Trainees and persons under the age of 18 shall only operate an **HA 2200** when supervised by trained personnel, like electricians and/or technical engineers.
- Adjustments/calibrations, maintenance and inspections have to be executed in time and according to specifications.

### 1.3.3 Safety equipment

The **HA 2200** testers are, for the safety of the operating personnel, equipped with below safety equipment:

- safety current limiting for high voltage test DC (only HA 2200B)
- safety current limiting for insulation test (insulation test is available as an option for HA 2200B and HA 2200G. Safety current limiting only for HA 2200B.)
- optional: test hood

### 1.3.4 Information on additional literature

The professional associations and trade unions have, for the safety of persons, published below literature:

- VBG 1                      Accident Prevention – General Regulations
- VBG 4                      Accident Prevention – Electrical Systems and Production Facilities
- VBG 109                    Accident Prevention – First Aid
- DIN EN 50 191            Installation and Operation of Electrical Systems
- DIN VDE 0106            Protection against Electric Shock  
  part 1                      Classification of Electrical and Electronical Production Facilities
- DIN 40 008 part 3        Safety Labels for Electrical Engineering;  
  Danger Signs and Supplementary Labels
- DIN 40 050                IP-Protective Systems; Contact and/or Foreign Matter, and Water  
  Protection for Electrical Production Facilities
- DIN VDE 0100            Installation of Power Plants up to 1000 V



**This literature will give you additional information and it is an essential part of this operating manual. Their observance therefore is mandatory!**

**You can buy or order literature giving information on above instructions and regulations at or from:**

- **on laws and regulations**  
  at your book store/dealer  
  or  
  from Carl Heymanns Verlag KG, Luxemburger Straße 449, D-50939 Köln
- **on accident prevention regulations**  
  from a professional/trade association  
  or  
  from Carl Heymanns Verlag KG, Luxemburger Straße 449, D-50939 Köln
- **directives, safety regulations and respective leaflets of professional/trade associations**  
  from a professional/trade association  
  or  
  from Carl Heymanns Verlag KG, Luxemburger Straße 449, D-50939 Köln
- **DIN-Standards**  
  from Beuth Verlag GmbH, Burggrafenstraße 6, D-10787 Berlin
- **VDE-Regulations**  
  from VDE-Verlag GmbH, Bismarckstraße 33, D-10625 Berlin

## 1.4 Service

*SPS electronic GmbH* will gladly be at your disposal if you need to find solutions to special problems, for doing repairs, for maintaining your equipment or for necessary alterations, in a nutshell for everything this manual doesn't tell you.

Please contact us via any of the below communication possibilities:

*SPS electronic GmbH*  
Blätteräcker 18  
74523 Schwäbisch Hall  
Phone: (0 79 07) 8 78 - 0  
Fax: (0 79 07) 8 78 - 99  
e-mail: [service@spselectronic.com](mailto:service@spselectronic.com)  
Internet: [www.spselectronic.com](http://www.spselectronic.com)

## 2 Hardware Description

### 2.1 Functions

With the high voltage tester **HA 2200** safety tests for electrical devices according standardized test regulations (EN, IEC, VDE etc.) can be performed.

The device offers the following tests:

- High voltage test up to 5000|5500 VAC and/or 6000 VDC (*depending on device version*)
  - test voltage AC or DC (*depending on device version*)
  - with or without voltage ramp
  - possibility of descending ramp at test end (*not all versions*)
  - test types *test(t)*, *burn*, or *static* (*not all versions*)
  - Measurement of active current or apparent current (*depending on device version*)
- Insulation test up to 5000 VDC (optional for HA 2200B/G)
  - with or without voltage ramp
  - test types *test(t)* or *static*

The standard device is designed as a stand-alone test station for one operator.

#### 2.1.1 Description of test types

test (t):

- This testing type allows gentle testing, with a programmable voltage ramp at the beginning and the end of the test.
- Test can be performed over a programmable time range.
- If an error occurs during a test, the test voltage is switched off immediately.

burn:

- This testing type is used for troubleshooting.
- No voltage ramps can be performed.
- Test time is limited to 15 seconds.
- The test will not be aborted if the current thresholds get exceeded during the test. Only the measured values at the very end of the test will be evaluated.

static:

- Similar to test type *test (t)*, however without time limit.
- Test is only aborted in case of an error, or manually by the operator.
- There is no PASS result.

## 2.2 Technical Data

<b>Dimensions and weight</b>			
width / depth/ height	approx. 490 / 360 / 180 mm		
weight	170 N (17,0 kg) (HA2200A/B) / 280 N (28,0 kg) (HA2200D/E/G)		
<b>Environmental conditions</b>			
● temperature	operating: 15 °C – 40 °C non-operating: 5 °C – 60 °C		
● humidity	max. 70% (not condensating)		
<b>Connection specification</b>			
● power supply	230 V / 50 Hz (115 V / 60 Hz optional)		
● power consumption	max. 550 VA (HA 2200D/E/G), max. 100 VA (HA2200 A/B)		
<b>Operating specifications</b>			
● high voltage test			
- test voltage	250 500 – 5000 5500 V AC or 250 500 – 6000 V DC, ± 2%, programmable		
- measuring accuracy	1,5 % of max. dial value		
- residual ripple DC	< 5% w. no-load operation		
- thresholds	programmable		
- current measuring ranges	<b>range</b>	<b>resolution</b>	<b>precision</b>
HA 220xG .....	0 up to 1 mA	0.01 mA	1.5% of max. dial value
HA 2200 A .....	0 up to 3 mA	0.1 mA	1.5% of max. dial value
HA 2200 B/D/E, HA 220xG..	0 up to 10 mA	0.1 mA	1.5% of max. dial value
HA 2200 D/E, HA 220xG.....	0 up to 100 mA	0.1 mA	1.5% of max. dial value
● insulation test			
- test voltage	500–6000 V DC, ± 2%, programmable		
- thresholds	programmable		
- measuring ranges	<i>voltage dependant, see diagrams on next page</i>		
<b>Additional features</b>			
<ul style="list-style-type: none"> <li>● 19" / 4 HE-plug-in with integrated keyboard and two LC displays</li> <li>● RS 232 – interface for printer connection or remote control</li> <li>● menu driven programming (up to 100 test programs programmable)</li> <li>● programmable emergency loop inquiry</li> <li>● Automatic switching between measuring ranges 10mA / 100 mA if <math>I_{max} &gt; 9,5 \text{ mA}</math> (HA 220x D/E/G) or 1 mA / 10 mA if <math>I_{max} &gt; 0.95 \text{ mA}</math> (HA 2200G, HA2201G)</li> </ul>			

### **Note:**

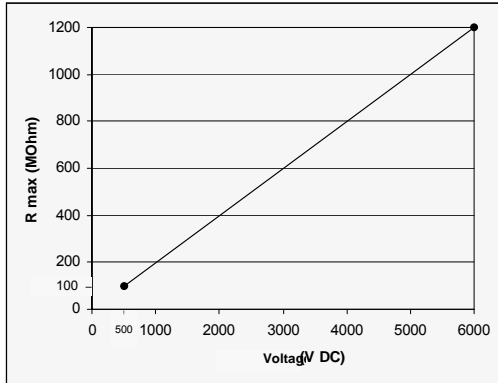
The device's internal memory allows 100 different test programs at max.  
With the optionally available Remote Software 3332 DAT, the number of possible test programs is unlimited!



### Overview device types

	HA 2200A	HA 2200B	HA 2200D HA 2200E	HA 2200G ( HA 2201G )
<b>Output AC</b> - short circuit current - transformer power - frequency	0.25 - 5 kV / 3 mA  < 3 mA	—	0.25 - 5 kV / 100 mA  200 mA 500 VA 50 60 Hz	0.5 - 5 kV / 100 mA ( 0.5 - 5.5 kV / 100 mA )  200 mA 500 VA 50 60 Hz
<b>Output DC</b> - short circuit current - transformer power	—	0.25 - 6 kV / 10 mA  < 12 mA	0.25 - 6 kV / 100 mA  200 mA 500 VA <i>DC: only HA2200E</i>	0.5 - 6 kV / 100 mA  200 mA 500 VA <i>DC: optional for HA220xG</i>
<b>Potential</b>	free	PE	free	free
<b>Real current measurm.</b>	no	no	no	yes
<b>ARC evaluation</b>	—	—	optional	optional
<b>Insulation test (IR)</b>	optional	optional	—	optional
<b>4-wire-technique</b>	optional			
<b>Connector on backside</b>	optional			
<b>Plug-in</b>	19" / 4 HU			
<b>Power supply</b>	230 V / 50 Hz or 115 V / 60 Hz			

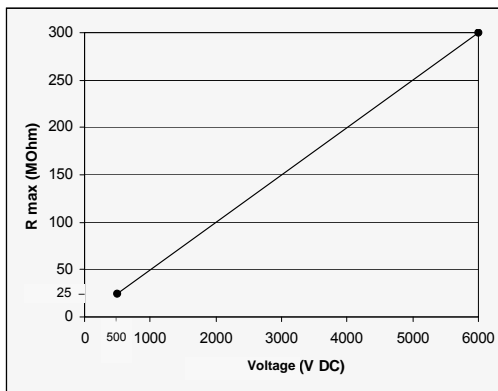
### 2.2.1 Measuring ranges of Insulation Test



Measuring range: 100 μA

This range is used if

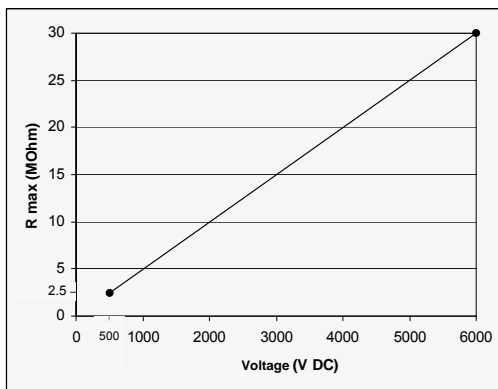
$$\frac{U_{nom}}{R_{min}} \leq 0.095 \text{ mA}$$



Measuring range: 1 mA

This range is used if

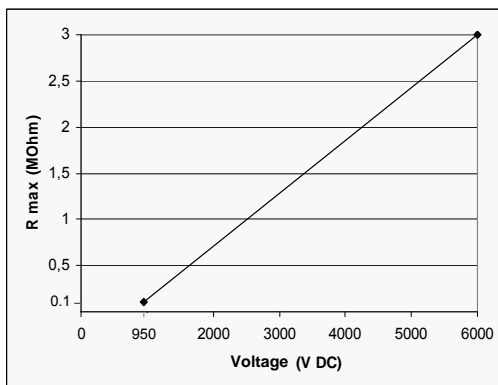
$$\frac{U_{nom}}{R_{min}} \leq 0.950 \text{ mA}$$



Measuring range: 10 mA

This range is used if

$$\frac{U_{nom}}{R_{min}} \leq 9.5 \text{ mA}$$



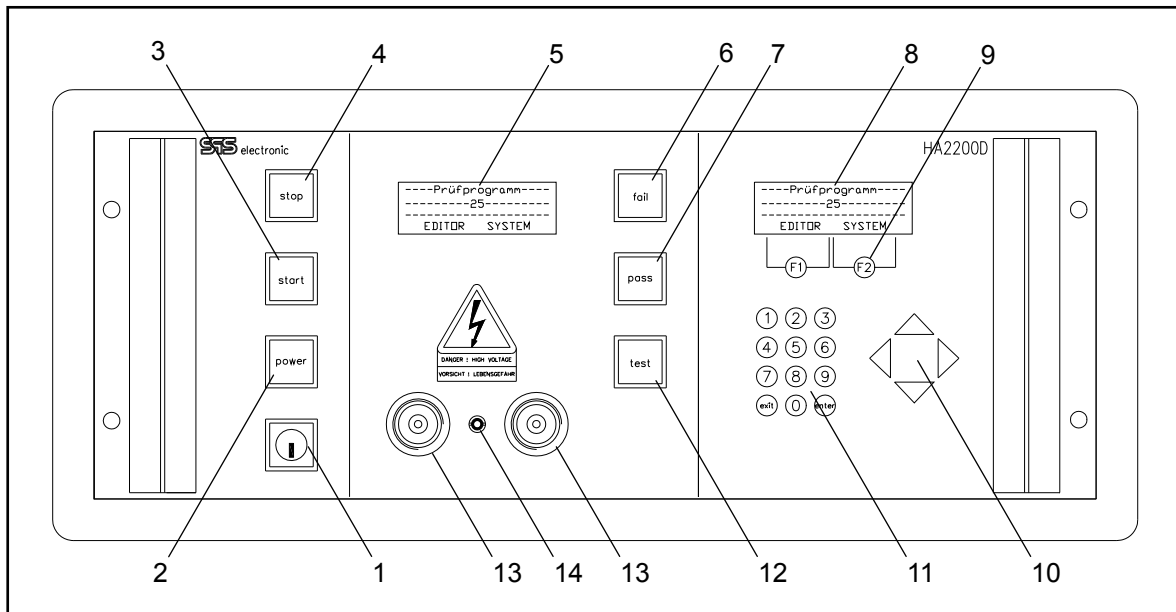
Measuring range: 100 mA

This range is used if

$$\frac{U_{nom}}{R_{min}} > 9.5 \text{ mA}$$

## 2.3 Design and functions

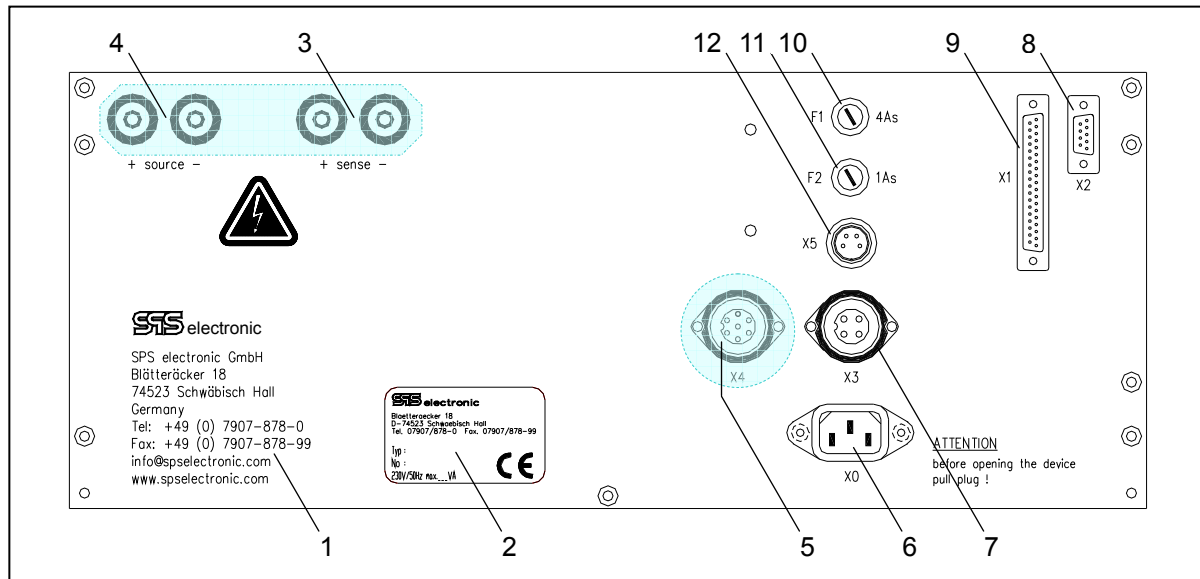
### 2.3.1 Front panel



front panel of HA 2200

1. key switch to switch device on or off
2. illuminated button POWER
3. illuminated button START to set device active
4. illuminated button STOP to abort test runs
5. LCD to display measurement values
6. red illuminated button *fail*  
lights up if test failed or DUT did not pass test
7. green light *pass*  
lights up if DUT passed test
8. LC display as user interface, displays parameters, error messages etc.
9. operating keys F1 and F2
10. Cursor keys for selections
11. number keys for inputs
12. illuminated button TEST, lights while test is performed
13. connection sockets for HV-pistols
14. connector for control line of HV-pistol with integrated start-key

### 2.3.2 Rear panel



rear panel of HA 2200

1. address of manufacturer
2. type label with
  - address of manufacturer
  - device designation (type)
  - serial number (No)
  - max. power consumption at 230 V / 50 Hz in VA
  - CE mark
3. sense connectors (optional)
4. source connectors (optional)
5. connector X4 for emergency loop appliances (optional)
6. cold appliance socket X0 for power cable
7. connection socket X3 for external warning lights
8. connection socket X2 to interface COM1 for serial printers or PC
9. connection socket X1 for digital signals and test hood
10. fuse F1, to protect the device
11. fuse F2, to protect external warning lights
12. connection socket X5 for foot-operated switch

## 2.4 Expansions, options and accessories

### 2.4.1 Options

- power supply 115 V / 60 Hz
- test voltage 7,5 kVAC (only HA 2200D and HA 2200E)
- current range 1 mA / 10 mA (only HA 2200D and HA 2200E)
- connectors on the back side
- sense module for 4-wire-technique
- insulation test
- IEC interface IE 22 h

### 2.4.2 Accessories

- high voltage pistol *SP 03 / SP 02*
  - with / without start key
- test hood *HB 3300D* / test hood *HB 2000D*
- printer *DK 23* with connecting cable
  - type: *EPSON LQ 300+*
  - matrix printer for standard paper
  - endless form or single sheet feeder
  - RS 232 - interface and parallel interface
- PC software for data acquisition and remote control: *3332 DAT*  
WINDOWS-surface
- PC software for creation and administration of test programs via PC: *3332 LINK*  
WINDOWS-surface



Accessories can be ordered directly from *SPS electronic GmbH*.

Please write to our sales department for any inquiries you may have  
or for placing your orders:

*SPS electronic GmbH*  
Blätteräcker 18  
74523 Schwäbisch Hall  
Phone: (0 79 07) 8 78 - 0  
Fax: (0 79 07) 878-99  
e-mail: [sales@spselectronic.com](mailto:sales@spselectronic.com)  
Internet: [www.spselectronic.com](http://www.spselectronic.com)

## 3 Operation

### 3.1 Start of operation

#### 3.1.1 Requirements

The tester *HA 2200* as well as all the electrical connections and cables must function and perform properly and reliably.  
Only authorized personnel, like electricians or electrical engineers or personnel supervised by same shall operate a tester.  
The generally applicable safety regulations (pl. see paragraph 1.3) and the generally valid legal regulations as well as any other applicable and valid regulations as to safety on-the-job, accident prevention and environmental protection have to be observed and persons working in such an area, have to be instructed respectively.



There is danger of life caused by electric current or voltage if not dealing properly with electrical systems!



The testing voltage is potential free (acc. EN 50 191) and **must not** be grounded!  
Otherwise, there is danger of hazard, destruction and bad measurements!



#### 3.1.2 Important note about device orientation:

**Devices equipped with DC test technique may only be set and operated in horizontal position!**

The voltage rectifier in these devices is mounted with an oil bearing. If the device is set up or operated on-edge or upside-down, oil might leak from the bearing and damage the device!

This applies to the following device types:

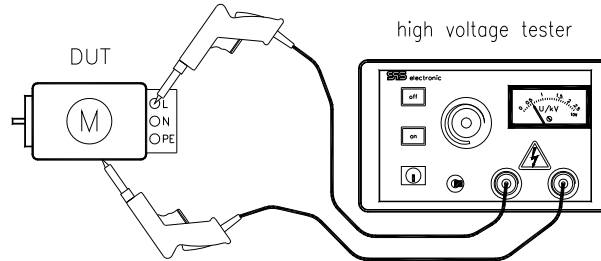
- HA 2200 E
- HA 220x G with device option "direct voltage test"

#### 3.1.3 Installation of test station

1. choose a level, clean and dry base for your test station
2. if necessary, turn off power switch (key switch) at tester
3. plug power cable at the back of tester into cold appliance socket and connect to power supply
4. connecting the high voltage pistols  
in case of using a pistol SP03, connect the plug of the start signal to to pos. 14
5. if required connect external devices to interfaces:
  - PC or printer to RS 232 interface at the back

### 3.1.4 Connecting DUT

The DUT are contacted manually with the high voltage pistols:



(schematic representation)

With accordingly equipped devices, the DUT can also be contacted via the connectors on the device's rear panel (pos. 3+4, page 17).

#### **Note:**

#### **For devices equipped with insulation test and 4-wire-technique:**

The insulation test is always performed in 2-wire-technique.

Therefore, the DUT has to be connected in 2-wire-technique, too.

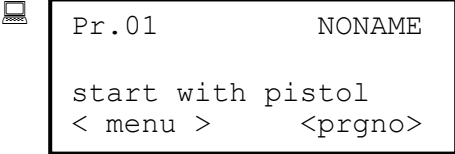
Otherwise, the measuring module's internal resistance of 100 MOhm would be included in the measured section.

## 3.2 Changing of system parameters

The parameter group »System Parameters« allows changes of the device's basic operation settings

### Choosing the parameter group »System Parameter«

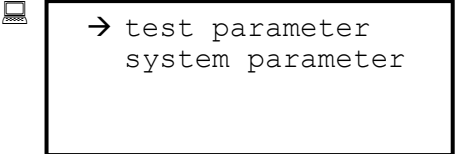
- After powering on the device, the initial display appears:



```
Pr.01          NONAME
start with pistol
< menu >      <prgno>
```

After pressing the key F1 (<menu>), you have to enter eventually the menu password. This depends on the password settings within the system parameters.

- The parameter groups are displayed:



```
→ test parameter
   system parameter
```

- Choosing the parameter group:
  - ☞ with the cursor keys, set the arrow (→) to »system parameter«
  - ☞ acknowledge your selection with F2 (< choose >)

### Hint



#### For entry of letters, numbers and special characters with number keys (needed when entering name of program and protocol's header and footer):

Handling is very similar to a handy keypad. If a key is pressed several times, all the characters shown on the key are displayed in rotation.

E.G. key „2“: A → B → C → a → b → c → 2

With the cursor keys, the cursor can be set to the location where a character shall be inserted.

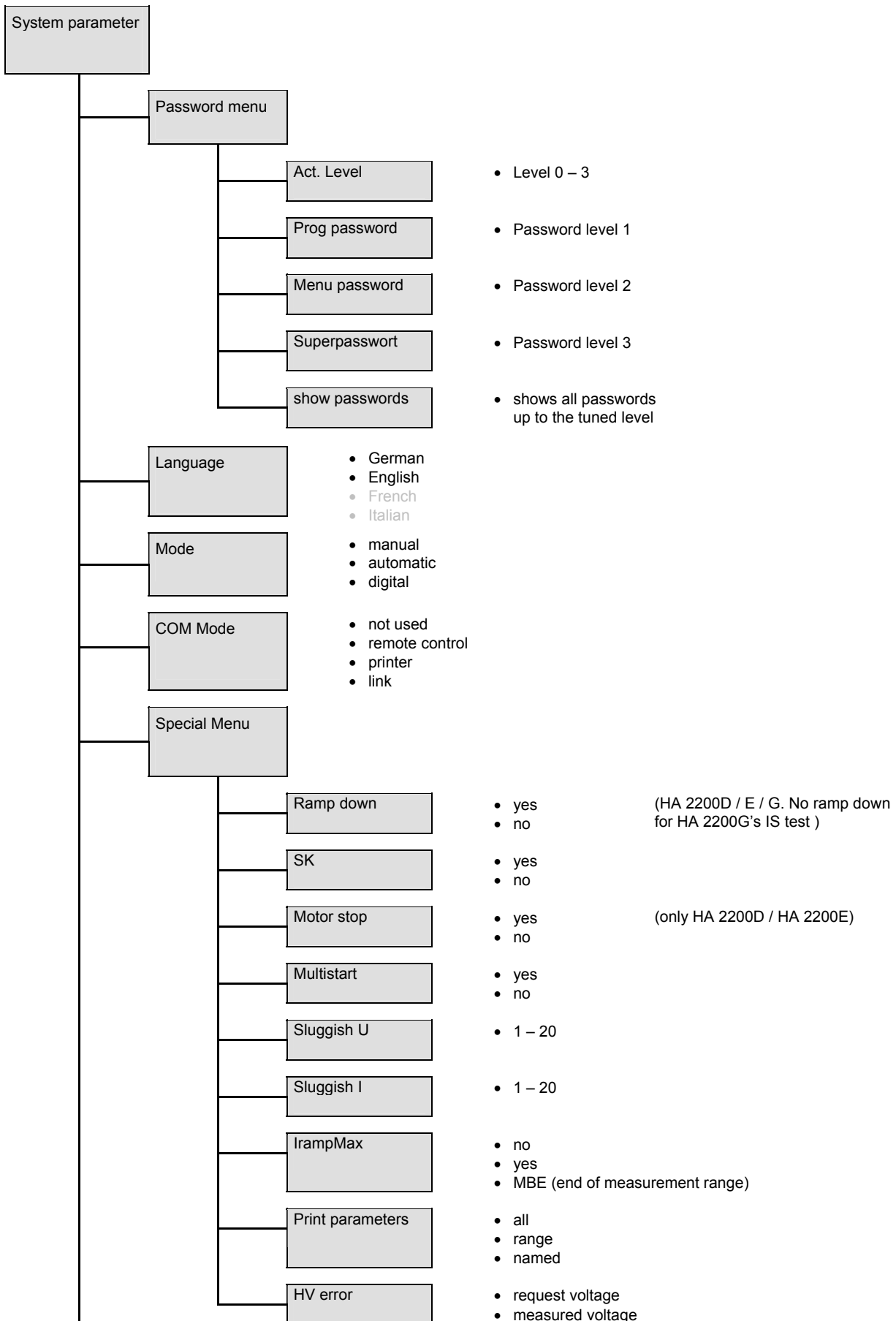
With [cursor ↑] a blank is inserted at the actual position.

With [cursor ↓] the character at the actual position gets deleted.

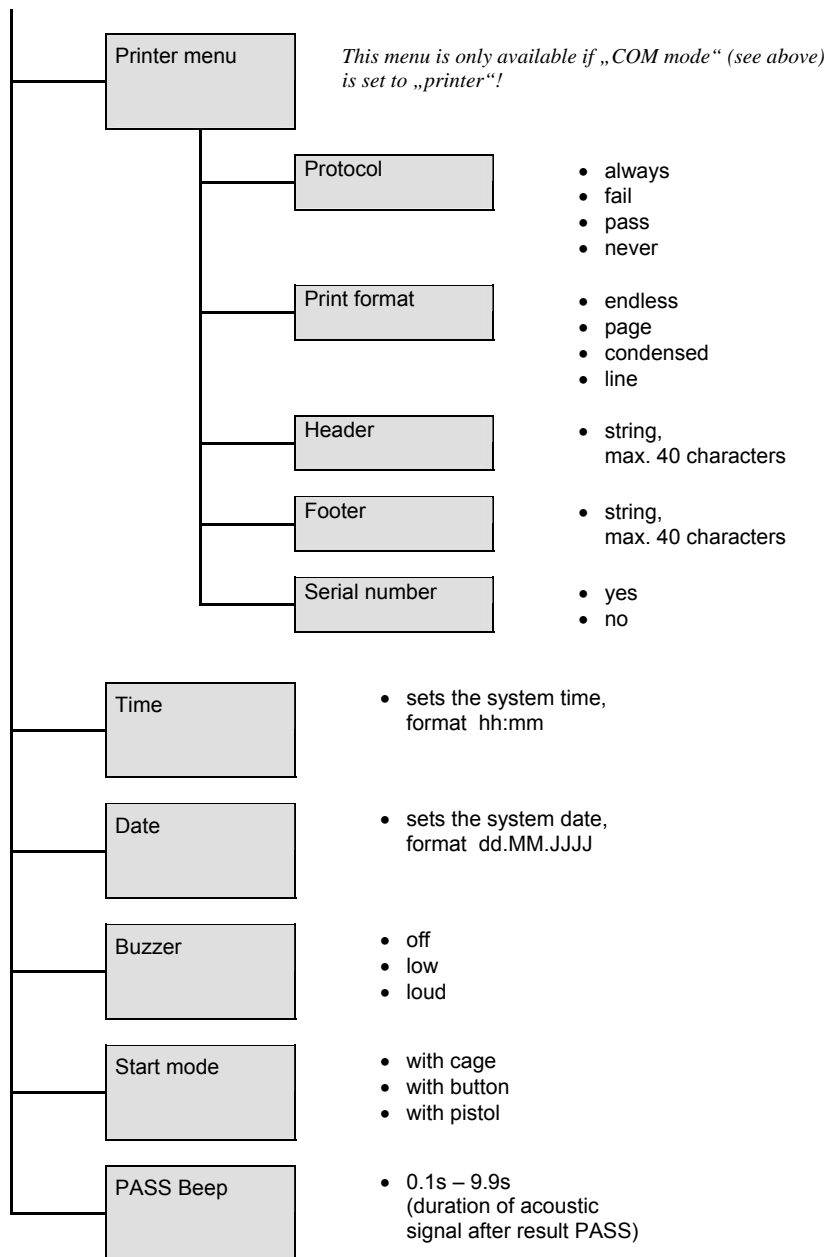
The key »1« yields to: 1 → . → , → / → - → \_ → +



### 3.2.1 Menu structure: System parameter



... MENU STRUCTURE: SYSTEM PARAMETERS



### 3.2.2 Password

All functions of the device HA 2200 may be protected on several levels, each with a discrete password, to avoid an unauthorized operation.

The device provides several operating levels:

#### Level 0:

On this level, only plain testing with the actual program is possible.

The user can't make any changes to the system parameters or test parameters (programs).

Furthermore, it is not possible to change the actual test program.

Since level 0 is lowest possible operation mode, it can **not** be protected with a password!

#### Level 1:

On this level, the user is additionally allowed to change the test program.

#### Level 2:

This level allows access to the system parameters and test parameters (programs).

It offers the complete functional range of the device.

#### Level 3:

This level is reserved for purposes of technical service.

#### Parameters of parameter group „Password“:

- **Actual level:** Input: 0 – 2. This sets the level of operation. To switch to a level higher than the actual, the password of the desired level must be entered.
- **Prog password:** Input: 4-digit password for level 1. (Manufacturer's default is »0000«)
- **Menu password:** Input: 4-digit password for level 2. (Manufacturer's default is »0000«)
- **Passwords:** After having chosen this function, all passwords (up to the actual level) are displayed. For safety reasons, this display is blinded out after approx. 3s.

After switching on the device, the last active operating level is restored.

### 3.2.3 Language

Here one can change the language of the user interface.

#### Parameters of parameter group „Language“:

- German
- English

### 3.2.4 Mode

This parameter sets the operation mode of the high voltage tester HA 2200.

#### Parameters of parameter group „Mode“:

- manual (normal testing operation, LINK programming is possible)
- automatic (remote control by a PC connected to the RS 232 interface. **NOT** for LINK programming!)
- digital (test program selection by external I/O, LINK programming possible)

### 3.2.5 Special menu

In this parameter group, extended operational options can be set.

#### Parameters of parameter group „Special menu“:

- **Ramp down:** Selection: YES or NO (Do **not** use in conjunction with »Motor stop« function!)  
 YES: each test run is finished with a descending voltage ramp  
 NO: at the end of a test, the voltage is simply switched off  
 In case of YES, the following applies: Time (Ramp-down) = Time (Ramp-up)

- **SK** (protective circuit): Selection: YES or NO  
 YES: protective circuit is inquired  
 NO: protective circuit inquiry is deactivated

**NOTE:** »YES« just enables a software-driven deactivation of the device.  
 For safety reasons, an additional hardware-driven interruption is needed!

- **Motor stop:** Selection: YES or NO (Do **not** use in conjunction with »Ramp down« function!)  
 If this function is activated, the servo motor controlling the voltage of the HV generator remains in its last position if there's no need to recalibrate the testing voltage.  
 (Accelerates the overall test execution. Available only with HA 2200D/E.)

If the function »motor stop« is activated, the device will ignore the settings of the following parameters:

- ramp time
- Ramp down

The following preconditions **must** be fulfilled:

- $U_{nom}$  must be the same as in the previous test step
- no changes of AC/DC – parameters (frequency) may occur from one step to the next

If any of these preconditions are **not** fulfilled, the stepping motor will step back to zero voltage.

- **Multistart:** Selection: YES or NO  
 When this setting is activated, the device will perform a sequence of up to four test programs when powering on. *See also: Test parameter »Multistart«*
- **I<sub>rampMax</sub>:** Selection: NO, YES or MBE  
 NO: Release current for ramp is the same as  $I_{max}$  during the test  
 YES: Release current for ramp as set in test parameter *RampCurr. (max)*  
 MBE: Release current for ramp is MBE (End of measurement range, or  $I_{max}$ )

- **Print parameters:** Selection: ALL / RANGE / NAMED

ALL: This will print the test parameters of all test programs (0-99).

RANGE: User will be prompted for a range of test programs, which will be printed.

NAMED: This will print all test programs that have another name than „, NONAME “ (with two leading and two ending blanks).

In any case, a list of all system parameters will be printed prior to the test parameters.

- **HV error:** Selection: REQUEST or MEASURED

MEASURED: After an error during HV-test, the truly measured value is returned. While this value is correct in most cases, it sometimes may happen that "strange" values are returned, due to voltage peaks or drops in the moment of error.

REQUEST: In case of an error, the value of nominal test voltage is returned.

### 3.2.6 Printer menu

In this parameter group, the settings for protocolling test results on a printer can be adjusted.

#### Parameters of parameter group „Printer menu“:

- **Protocol:** Selection: ALWAYS, FAIL, PASS or NEVER

ALWAYS: Protocol is printed after every test run

FAIL: Protocol is printed if test result is FAIL

PASS: Protocol is only printed after test result PASS

NEVER: The printing of test protocols is deactivated

- **Print format:** Selection: ENDLESS, LINE, NARROW or PAGE

This sets the layout for the test protocols.

Please see appendix for examples.

- **Header:** Input: character string, max. 40 characters

Definition of a heading line that will appear on the top of each page.

Please see the hint on page 21

- **Footer:** Input: character string, max. 40 characters

Definition of a footer that will appear on the bottom of each page.

Please see the hint on page S.21

- **Serial number:** Selection: YES or NO

YES: User is prompted for a serial number (up to 20 characters) before each test

NO: no serial numbers are used

### 3.2.7 Time

Here one can adjust the system time of the high voltage tester HA 2200.  
Format: hh:mm (hours:minutes)

### 3.2.8 Date

Here on can set the system date of the high voltage tester HA 2200.  
Format: dd.mm.yy (day.month.year)

### 3.2.9 Buzzer

This sets the volume of the device's buzzer.

- Selection: OFF, SOFT, LOUD

### 3.2.10 Start mode

Here it is defined how a test is started.

- Selection: CAGE, BUTTON, PISTOL

CAGE: the test is started by closing the connected test hood

BUTTON: the test is started with the key TEST at the device's front panel

PISTOL: the test is started by the high voltage pistol

### 3.2.11 COM mode

This defines the operating mode in which the COM interface is running.

- Selection: NOT USED, REMOTE, PRINTER or LINK

NOT USED: the COM interface is deactivated

REMOTE: for remote controlling the HA 2200 by PC and remote control software

PRINTER: for connecting a protocol printer

LINK: for programming and administrating programs by our LINK software.  
For using the LINK software, the system parameter »Mode« must be set to either »manual« or »digital«, but **not** to »automatic«.

### 3.2.12 PASS beep

This sets the duration of the buzzer signal after test result GOOD.

- Input: 0.1 – 9.9 [s]

At any time, the buzzer signal can be aborted by pressing any key at the device.

### 3.3 Changing of test parameters

Within the parameter group »test parameter«, settings of the individual test programs can be adjusted.

#### Choosing the parameter group »test parameter«

- After powering on the device, the initial display appears:



```
Pr.01          NONAME
start with pistol
< menu >      <prgno>
```

After pressing the key F1 (<menu>), you have to enter eventually the menu password. This depends on the password settings within the system parameters.

- The parameter groups are displayed:

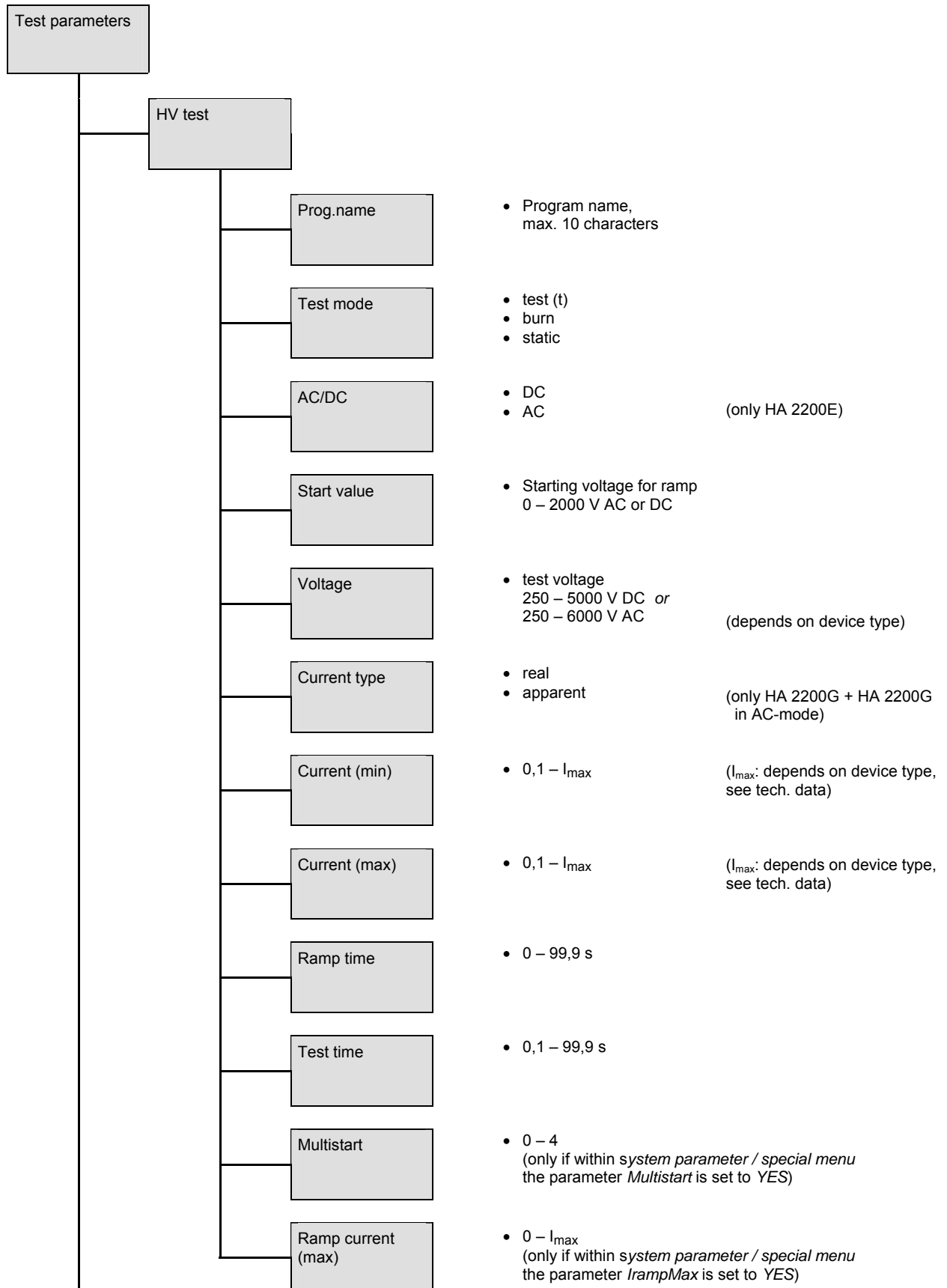


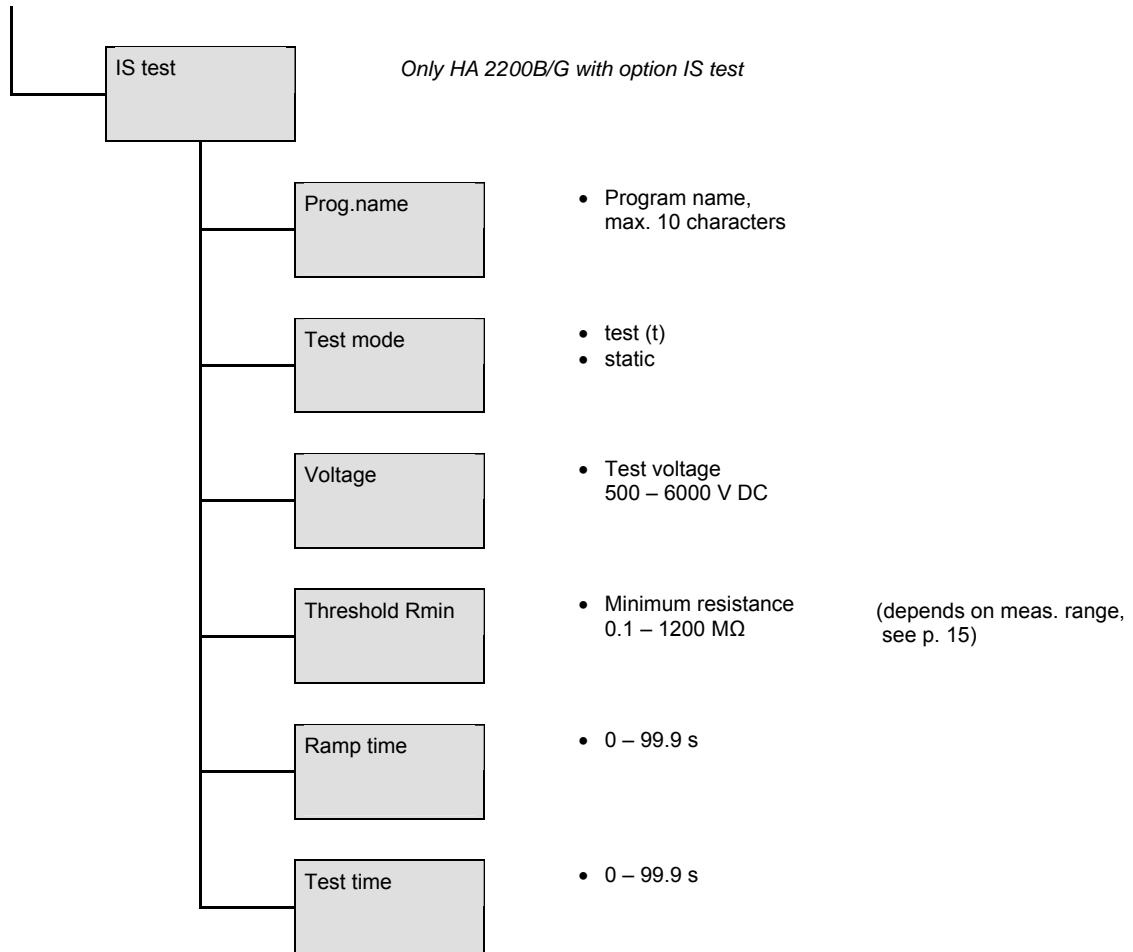
```
→ test parameter
system parameter
```

- Choosing the parameter group:

- ☞ with the cursor keys, set the arrow (→) to »test parameter«
- ☞ acknowledge your selection with F2 (< choose >)

**3.3.1 Menu structure: test parameter**





### 3.3.2 Test parameters

#### HV Test

- **Prog.name:** Input: Character string, max. 10 characters  
This defines a new name for the actual test program. (See hint on p. 21)
- **Test mode:** Selection: TEST (T), BURN or STATIC  
(*Burning not available with HA 2200E in DC-mode*)  
Here the desired testing mode can be selected. (See explanation chap. 2.1.1, p.12)
- **AC/DC:** Selection: AC or DC  
(*only HA 2200E*)  
This defines the voltage type for testing: AC or DC
- **Start value:** Selection: 0.25 – 5 resp. 0.25 – 6 [kV]  
Start value for the test voltage when using a voltage ramp.
- **Voltage:** Input: 0.25 – 5 resp. 0.25 – 6 [kV]  
This sets the nominal test voltage.
- **Current type:** Selection: REAL or APPARENT  
(*only HA 2200G and HA2201G, in AC-mode*)  
This defines whether the real current or the apparent current will be measured.  
(*When operating the HA220xG in DC mode, this should be set to »APPARENT«*)
- **Current (min):** Input: 0.1 –  $I_{\max}$   
Minimal release current. (Must be less than »Current(max)« )
- **Current (max):** Input: 0.1 –  $I_{\max}$   
Maximum release current
- **Ramp time:** Input: 0 – 99.9 [s]  
This sets the duration for the voltage ramp. This time value is also used for »Ramp-down«, if this feature is activated through the respective system parameter.  
Hint: »Ramp-down« decreases the voltage to the value of »Start value« (see above), not to zero.
- **Test Time:** Input: 0,1 – 99.9 [s]  
This sets the overall test time.
- **Multistart:** Input: 0 – 4  
Here one can define how many test programs shall be executed successively, if the option *multistart* has been activated within the *system parameters*.  
See also: Appendix A-1 Multistart .
- **Ramp Current (max):** Input: 0 – 99.9 [mA]  
This defines the maximum release current while a voltage ramp is performed.  
To actually use this feature, the system parameter *I<sub>rampMax</sub>* must be set to *YES*.

**IS Test** (only HA2200B/G with option IS test)

- **Prog.name:** Input: Character string, max. 10 characters  
This defines a new name for the actual test program. (See hint on p. 21)
- **Test mode:** Selection: TEST (T), BURN or STATIC  
Here the desired testing mode can be selected. (See explanation chap. 2.1.1, p.12)
- **Voltage:** Input: 0.25|0.5 – 6 [kV]  
This defines the nominal test voltage.
- **Threshold Rmin:** Input: 0.1 – 1200 MΩ (voltage dependant)  
This defines the minimum resistance for the insulation test. The available range for  $R_{\min}$  depends on the chosen test voltage, and is shown in the display's topmost line.
- **Ramp time:** Input: 0 – 99.9 [s]  
Defines the duration of the voltage ramp.
- **Test time:** Input: 0.1 – 99.9 [s]  
This defines the test time for the insulation test (without voltage ramp).

### 3.3.3 Programming individual test programs (manually)

The high voltage tester **HA 2200** can store up to 99 different testing programs. Delivered devices contain the default test program on all program numbers. The default test program (called »NONAME«) contains all available tests with their default values.

To arrange an individual test program, proceed the following steps:

1. Set the tester back to basic display:  
switch the **HA 2200** off and on, or press <F1> several times
2. choose the desired number of test program (1-99) :
  - press <F2> (Prgno.)
  - enter the desired number of test program with number or cursor keys
  - acknowledge your selection with <F2>
3. Set the test parameters as desired

Every change in a test program will be saved immediately by pressing <F2> (<OK>).

### 3.3.4 Programming individual test programs with a PC

By means of the PC software »3332link«, which comes shipping with the device, it is possible to do the programming of the HA 2200 with a PC, or to read the test programs out of the device, for purposes of administrating or archiving on a PC or a network.

To do so, the device HA 2200 must be prepared as follows:

1. *System parameter / COM mode* must be set to »Link«
2. *System parameter / Mode* must be set to either »manual« or »digital« (**not** »automatik«)

The connection to the PC must be made with a standard RS232 cable between the connector X2 on the device's rear panel and a free COM port at the PC.

For more details on this procedure, please see the enclosed user's manual of the software 3332link.

## 3.4 Executing tests

1. If provided for, switch on external devices (control desk, PC, printer)
2. Switch on power switch (key switch) at tester  
 ⇒ tester initializes itself automatically.  
 after about five seconds, basic display will appear:

Pr.01	NONAME
start with pistol	
< menu >	<prgno.>

3. Select one of below functions:

- **Executing test with preset program**

- ☞ press the green key START  
 ⇒ the red lamp STOP lights up, and the test voltage is released
- ☞ press and release key(s) START at the control desk, *or*  
 contact DUT with the HV-pistols, press the integrated start switch, hold depressed and contacted until the end of the test  
 ⇒ the lights *fail* and *pass* light as long as the key(s) is (are) depressed
- ☞ eventually enter serial number  
 (depending on the system parameter *printer menu / serial number*)  
 ⇒ test run is started

- **Loading of a different program**

- ☞ press F2 to select < prgno >
- ☞ enter program password (if active)
  - ☞ enter desired program number
  - ☞ press F2 (< OK >)  
 ⇒ program is loaded
- or*
- ☞ change step by step with cursor keys  
 ⇒ program is loaded

- **Changing of program settings**

- ☞ press F1 to select < menu >
- ☞ enter menu password (if active)
- ☞ change program settings as required

### Concerning HV-tests with DC voltage

- When performing high voltage tests with DC voltage, the DUT gets discharged after termination of the test run.
- The signal lamps PASS or FAIL won't light up until the discharging has finished.
- When contacting the DUT manually, it gets also discharged by the HV-pistols. Therefore it must stay contacted until the good- or fail-beep has sounded.



## 3.5 Remote control by RS 232

1. Within the *system parameters*, set COM MODE to Remote Control
2. Within the *system parameters*, select OPERATING MODE: automatic

 A message appears on display:

```

operat. mode
automatic activated

<cancel>
    
```

- ⇒ the device is now in remote mode and remains in this mode even after powering the device off and on.
  - ⇒ To leave this mode:
    - ☞ press F1 (<CANCEL>) for about 3 sec and
    - ☞ turn power switch off and on
      - ⇒ tester initializes itself.
3. The tester can be controlled by the commands described in the following chapter.
  4. The evaluation of measuring results (pass, fail) is up to the user (PC). However, if  $I_{\max}$  gets exceeded during an HV-AC-test, the device will report an error.

Below please find description and syntax of commands for data exchange between tester **HA 2200** and PC. Data exchange is made via serial interface.

### 3.5.1 Syntax

- command format:
 

[command]<LF>	max. length 40 characters
---------------	---------------------------
- answer format:
 

[answer]<LF>
--------------
- commands:
 

*[global command]	permanently available command
[local command]	command depending on structure which can only be executed under certain conditions
- global and local commands:
 

[execute command]	controls tester directly
[configuration command]<SP>[parameter]	sets device parameter
[data request command]?	expects a value

### 3.5.2 Global Commands

*IDN?	verifies device identification <i>example for answer: HA2200, Ver. 1.00, 07.11.2001&lt;LF&gt;</i>										
*VER?	verifies version of device control <i>example for answer: 820&lt;LF&gt;</i>										
*MOD?	verifies current device mode (0, 32, or 64) <i>example for answer: 0&lt;LF&gt;</i>										
*STA?	reads status register <i>example for answer: 3&lt;LF&gt;</i>										
*LLO <status>	Enables or disables the possibility of test abort by the button F1 on the device keyboard, according to the value of <i>status</i> : 0 = enable abort 1 = disable abort (active until power off)										
*LLO?	queries if status is locked or unlocked <i>example for answer: 0&lt;LF&gt; unlocked</i> <i>1&lt;LF&gt; locked</i>										
*INP <digital input>?	Reads the status of digital input. Possible answers are: 0 = off, 1 = on. Format of <digital input> is xx (always 2 digits) <i>example for answer: 0&lt;LF&gt;</i> <u>Standard digital inputs:</u>										
	<table border="0"> <tr> <td>DEVICE ON</td> <td>16</td> </tr> <tr> <td>INT_START (HV-pistol)</td> <td>13</td> </tr> <tr> <td>EXT_START (2-hand-control, test hood)</td> <td>13</td> </tr> <tr> <td>EXT_ACK</td> <td>14</td> </tr> <tr> <td>EXT_BREAK</td> <td>15</td> </tr> </table>	DEVICE ON	16	INT_START (HV-pistol)	13	EXT_START (2-hand-control, test hood)	13	EXT_ACK	14	EXT_BREAK	15
DEVICE ON	16										
INT_START (HV-pistol)	13										
EXT_START (2-hand-control, test hood)	13										
EXT_ACK	14										
EXT_BREAK	15										
*ERR?	reads first (oldest) stored error from error queue and deletes it there error-ID and description are divided by » , « error queue is a first-in, first-out (FIFO) and can store maximally 10 errors if error buffer is full, then error »200,Queue Overflow« will be stored on the last position <i>example for error: 0, No error&lt;LF&gt;</i>										
*CEQ	clears all errors from error queue.										
*CLS	clears status register and error queue as well as input and output buffer for serial communication. Breaks the testing (if running) and puts device in idle state. The parameters set by commands CONF remain but the type of latest test and its result are cleared.										
*RST	returns the device to the power-on startup conditions. It is similar to the *CLS command. However, all test parameters are set to their default values.										

### 3.5.3 Local Commands

#### ● CONF group

##### HV Test

CONF:HH:TIME <test time>	sets test time: range 0.1 - 99.9; format xx.x [s]
CONF:HH:TIME?	queries currently set test time
CONF:HH:IMAX <max. current>	Sets the maximal current: range 0.0 - 99.9; format xx.xx [mA]
CONF:HH:IMAX?	queries the actual value of maximum current.
CONF:HH:TMODE:TEST NEND BURN	sets the testing mode
CONF:HH:TMODE?	queries the actual testing mode
CONF:HH:UTYP:AC DC	sets voltage type and frequency
CONF:HH:UTYP?	queries voltage type and frequency
CONF:HH:VOLT <test voltage>	sets nominal test voltage; format xxxx [V]
CONF:HH:VOLT?	queries nominal test voltage
CONF:HH:USTART <start voltage>	sets start voltage for testing with voltage ramp; format xxxx
CONF:HH:USTART?	queries the ramp's start voltage
CONF:HH:ITYP:REAL TOTAL	sets the type of current measurement (only for HA220xG)
CONF:HH:ITYP?	queries the actual type of current measurement
CONF:HH:RAMP <ramp time>	sets time for voltage ramp; format xx.x [s]
CONF:HH:RAMP?	queries the actual value of ramp time
CONF:HH:START:OFF MAN HOLD	Sets the start mode: OFF = Test starts immediately MAN = Test starts with start button HOLD = Start signal must be applied <u>throughout the whole test time</u>
CONF:HH:START?	queries the actual start mode
CONF:HH:DEF	sets all parameters for the high voltage test to their default values: 5 s, 4.0 mA

##### IS Test

CONF:IS:TIME <test time>	sets test time: range 0.1 - 99.9; format xx.x [s]
CONF:IS:TIME?	queries currently set test time
CONF:IS:RMIN <minimal resistance>	Sets the minimum of acceptable resistance: range 0.1 - [ $\text{test voltage} / 5 \mu\text{A}$ ]; default 1.0 [M $\Omega$ ]
CONF:IS:RMIN?	queries the actual value of minimum resistance.
CONF:IS:TMODE:TEST NEND	sets the testing mode
CONF:IS:TMODE?	queries the actual testing mode
CONF:IS:VOLT <test voltage>	sets nominal test voltage; format xxxx [V]
CONF:IS:VOLT?	queries nominal test voltage
CONF:IS:RAMP <ramp time>	sets time for voltage ramp; format xx.x [s]
CONF:IS:RAMP?	queries the actual value of ramp time
CONF:IS:START:OFF MAN HOLD	Sets the start mode: OFF = Test starts immediately MAN = Test starts with start button HOLD = Start signal must be applied <u>throughout the whole test time</u>
CONF:IS:START?	queries the actual start mode
CONF:IS:DEF	sets all parameters for the insulation test to their default values: 5 s, 4.0 mA

## Default values after CONF:XX:DEF

Parameter	Default value
TIME	05.0 s
IMIN	00.00 mA
IMAX	09.00 mA
TMODE (test mode)	test(t)
UTYP	AC (50 Hz), <i>if available</i>
VOLT (test voltage)	2000 V
USTART (ramp)	0000 V
ITYP (current measurement)	real <i>if available</i>
RAMP (ramp time)	02.0 s
START (start mode)	OFF

### ● MEAS group

MEAS:HH	starts the high voltage test
MEAS:IS	starts the insulation test
MEAS?	queries currently set test mode

### ● READ group

#### HV Test

READ:HH:VOLT?	reads actual voltage (from HV generator if only 2-wire-technique, otherwise from sense modul). Result in [V]
READ:HH:UGEN?	reads value for voltage from HV generator, result in [V]
READ:HH:CURR?	reads actual value of current, result in [mA]

#### IS Test

READ:IS:RES?	reads value for resistance. Result in [kV], where e.g. “=27.8“ → result is exactly 27.8 e.g. “>30.0“ → result exceeds actual measuring range
READ:IS:UGEN?	reads value for voltage from HV generator, result in [V]
READ:IS:CURR?	reads actual value of current, result in [mA]

### ● SYST group

SYST:RDWN:ON OFF	sets test mode with/without ramp-down ( <i>not HA2200B</i> )
SYST:HH:RDWN?	queries whether voltage ramp-down is used or not
SYST:HALT	interrupts testing
SYST:PASS:ON OFF	green signal light »pass« is switched on or off <sup>1</sup>
SYST:FAIL:ON OFF	red signal light »fail« is switched on or off <sup>1</sup>
SYST:TEST:ON OFF	yellow signal light »test« is switched on or off <sup>1</sup>
SYST:BEEP:LOUD SOFT OFF	sets buzzer to loud / soft volume, or switches buzzer off

<sup>1</sup> also sets the corresponding output at ext. I/O port

### 3.5.4 Status and error parameters

#### Command version (controlling variant)

Device constant including which commands are supported by the tester.

The one hundred (in future also the one thousand) digit positions characterizes the basic model, the other two positions are planned for variants. The value list will be updated when a new variant is being executed.

This value can be read by the command \*VER? .

<i>Command version</i>	<i>Description</i>	<i>Remark</i>
820 – HA 2200 <b>B</b>	HA-test up to 6 kVDC* / 10 mA	
840 – HA 2200 <b>D</b>	HA-test up to 5 kVAC / 100 mA	
850 – HA 2200 <b>E</b>	HA-test up to 5 kVAC / 100 mA + 6 kVDC* / 100 mA	
860 – HA 2200 <b>G</b>	HA-test up to 5 kVAC / 100 mA	
870 – HA 2200 <b>G</b>	HA-test up to 5 kVAC / 100 mA + 6 kVDC* / 100 mA	
880 – HA 2200 <b>G</b>	HA-test AC+DC (as 870), IS-test up to 6 kVDC*	

\*DC = rectified and smoothed  
alternating voltage

#### Device mode (operating mode)

Characterizes the current operating mode of tester.

This value can be read by the command \*MOD? .

Bit position	B7	B6	B5	B4	B3	B2	B1	B0
Meaning	operating mode			data exchange		remote status		

Operating mode	manual	automatic	digital
Bits B7 – B6 – B5	000 (0)	001 (32)	010 (64)

Data exchange	RS-232	IEEE-488
Bits B4 – B3	00 (0)	01 (8)

remote status	testing	program exchange	result exchange
Bits B2 – B1 – B0	000 (0)	001 (1)	010 (2)

Data exchange and remote status are only relevant in operating mode »automatic«

## Status register

Characterizes the current activity when the device performs a testing.

This value can be read by the command \*STA? .

Bit position	B7	B6	B5	B4	B3	B2	B1	B0
Meaning	<u>activity</u>				<u>test end</u>			

Status	hex	bin	dec
<b><u>Activity</u></b>			
idle state	\$00	0000 0000	0
test starting	\$10	0001 0000	16
test preparing	\$20	0010 0000	32
rampe up *	\$30	0011 0000	48
measuring	\$60	0110 0000	96
rampe down *	\$50	0101 0000	80
test ending	\$40	0100 0000	64
test finished	\$80	1000 0000	128
<b><u>Test end</u></b>			
STOP button (user break)	\$81	1000 0001	129
HA-test – high current	\$82	1000 0010	130
after SYST:HALT	\$8F	1000 1111	143
<i>* only when supported by device variant</i>			

## Error messages

They describe errors in command syntax or of their wrong use as well as device depending errors.

Number	Description
200	Queue overflow
0	No error
1	Invalid start character
2	Invalid end character
3	Invalid command
4	Invalid MEAS parameter
5	Invalid CONF parameter
6	Invalid SYST parameter
7	Invalid READ parameter
8	
9	Unable to start measurement

## 3.6 Error display

Most errors are displayed on the LCD.

Furthermore, the red light *fail* indicates an error if

- operator aborted the test, or if
- there was an error during the test

## 3.7 Maintenance and function check

The test device *HA 2200* needs no serving.



**Pull plug before opening housing!**

*SPS electronic GmbH* recommends to return series HA2200 devices **for an annual check** to guarantee the accuracy of calibration/measured values.

Should defects be detected when checking those testers, then the device in question has to be recalibrated by *SPS electronic GmbH*.

### Dummy test

To check functions of the tester, or if you suspect some irregular function, you should execute a dummy test regularly:

To do so, execute with the tester high voltage tests respectively at one or several DUTs – DUTs which will definitely not pass these tests or for which different measurement results have already been established.

Please compare the results of both measurements afterwards.

Should the results be about the same, then the tester functions perfectly, without errors.

## Appendix

### A Special functions

#### A-1 Multistart tests

Often it can be useful to process several test programs one after another automatically.

Conceivable uses would be e.g. to let a DUT be tested with different voltage levels or to test different wirings over a test hood.

For this purpose the function multi-start was integrated in the high voltage tester **HA 2200**.

To activate the multistart function:

1. in the parameter group *system parameter / special menu*, set the parameter *multistart* to YES
2. in the parameter group *test parameter / multistart*, select the desired value

Multistart works as follows:

- After switching on the device, at first the last runned test program will be performed.
- After finishing this program, the next program in the device's memory (program number + 1) will be run ...
- etc. ...

This means, if in the last session the program no.  $n$  was active, then

- Multistart 1 will run only program number  $n$
- Multistart 4 will run the programs  $n$  to  $n+3$  one after another
- Multistart 2 and 3 accordingly

According to the chosen multistart program the corresponding output of the external I/O-interface will be set automatically.



## A-2 Digital program selection

With the *system parameters*, the operating mode *digital* can be selected.

In this operating mode, the test program is selected by the digital interface X1 (Dsub37) at the rear panel by coding the inputs 0 bis 3 binarily:

Pin-no. at X1	21	2	20	1
associated input	3	2	1	0

(see also appendix B-1)

	coding				corresp. to test program no.
<i>1 means: voltage 24 V* is applied 0 means: voltage 24 V* is not applied</i>	0	0	0	0	0
	0	0	0	1	1
	0	0	1	0	2
	0	0	1	1	3
	0	1	0	0	4
	.	.	.	.	.
	1	1	1	1	15

\*24 V unfiltered external voltage (see PIN configuration of interface X1)

## A-3 Operation with IEC-interface IE 22-h

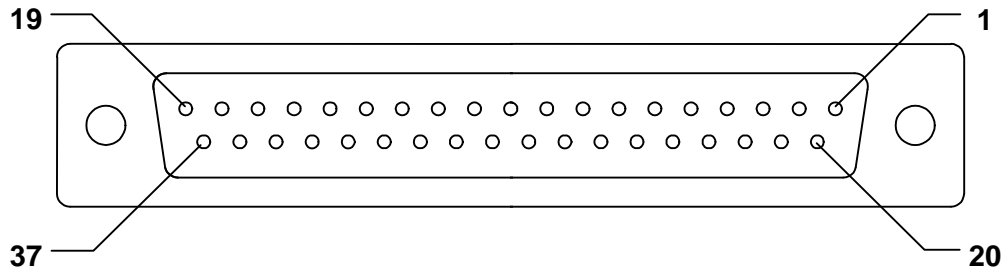
As an alternative to RS 232, the remote controlling of the high voltage tester HA 2200 can also be done by IEEE. For that purpose, the IEC-interface *IE 22-h* is available.

Proceeding:

- Connect the converter to the socket X2 (Dsub9).
- The operating mode of the HA 2200 must be set to *automatic* (see chap. 3.5, p. 35)
- The converter automatically translates incoming IEEE signals to RS 232, and outgoing RS 232 signals to IEEE.

## B Interface Configuration

### B-1 Digital Interface X1



**Socket X1 (Dsub37, female)**

PIN	Configuration	Description
1	Input 0	4 bit-program selection
2	Input 2	4 bit-program selection
3	Input 4	<i>not used</i>
4	Input 6	<i>not used</i>
5	Input 8	<i>not used</i>
6	Input 10	<i>not used</i>
7	Input 12 / EXT_START	starts the test
8	Input 14 / EXT_BREAK	aborts a test
9	EXT_OFF	OFF (=red STOP key)
10	Output 8	multistart: program 1
11	Output 10	multistart: program 3
12	Output 12	<i>not used</i>
13	Output 14 / EXT_PASS	test result PASS
16,35	GND	mass
17,18,36,37	+24V	<i>not used</i>
20	Input 1	4 bit-program selection
21	Input 3	4 bit-program selection
22	Input 5	<i>not used</i>
23	Input 7	<i>not used</i>
24	Input 9 / EXT_SK	external emergency loop
25	Input 11	external voltage against mass
26	Input 13 / EXT_ACK	acknowledge
27	Input 15 / EXT_ON	set device ready for operation
28	NC	<i>not used</i>
29	Output 9	multistart: program 2
30	Output 11	multistart: program 4
31	Output 13 / EXT_TEST	signal: test is running
32	Output 15 / EXT_FAIL	test result FAIL
rest free	NC	

## Description of most important signals of I/O interface:

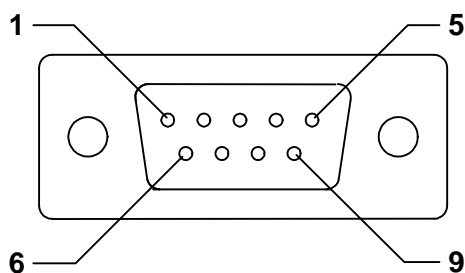
### Inputs:

<u>PIN</u>	<u>Configuration</u>	<u>Description</u>
1,2,20,21	4-bit program selection	see appendix A-2: Digital program selection
7	EXT_START	starts the next test run (corresponds to key TEST)
8	EXT_BREAK	breaks a running test
24	EXT_SK	protective circuit signal. +24V must be applied throughout the whole test
26	EXT_ACK	acknowledges a faulty measurement (corresponds to key FAIL)
27	EXT_ON	unlocks the test voltage (set device ready for operation, corresponds to key START)
9	EXT_OFF	locks the test voltage (break any test run, corresponds to key STOP)

### Outputs:

<u>PIN</u>	<u>Configuration</u>	<u>Description</u>
10	Multistart: Prog. 1	is set as long as multistart-programm 1 is running
29	Multistart: Prog. 2	is set as long as multistart-programm 2 is running
11	Multistart: Prog. 3	is set as long as multistart-programm 3 is running
30	Multistart: Prog. 4	is set as long as multistart-programm 4 is running
13	EXT_PASS	gets set if test ends with result PASS
31	EXT_TEST	gets set along with signal START and remains set throughout the test
32	EXT_FAIL	gets set if test ends with test result FAIL

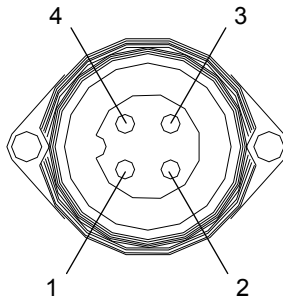
**B-2 Serial interface X2**



**plug RS232 (Dsub9)**

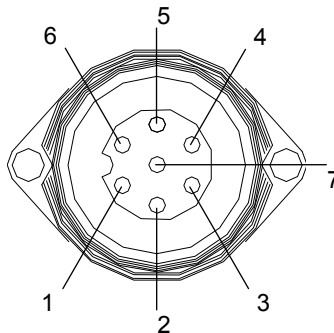
PIN	Description	Allocation
1	-	<i>not used</i>
2	RxD	Receive Data
3	TxD	Transmit Data
4	-	<i>not used</i>
5	mass	ground of serial interface
6	-	<i>not used</i>
7	-	<i>not used</i>
8	-	<i>not used</i>
9	-	<i>not used</i>

Interface configuration	
baud rate	9600 bps
data bits	8
parity	none
start bits	1
stop bits	1
XON/XOFF	switched off
handshake	no hardware or software handshake

**B-3 Socket X3: Warning lamp connector**

PIN	Description
1	N
2	red (230 V)
3	green (230 V)
4	PE

The power of any connected warning lamps must not exceed 25 watts.

**B-4 Socket X4: Protective circuit (optional equipment)**

PIN	Description
1	L out
2	L in
3	N out
4	N in
5	<i>not used</i>
6	<i>not used</i>
7	<i>not used</i>

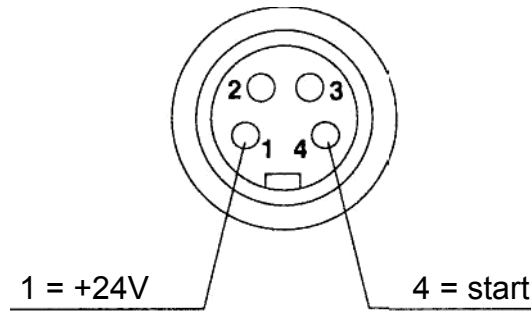
This socket is designed to switch off the supply voltage of the HV-module, controlled by external hardware.

To do so, the plug has to be reconnected as follows:

PIN 1 → PIN 2 : bridge / contact

PIN 3 → PIN 4 : bridge / contact

**B-5 Socket X5: Foot switch connector**



PIN	Description	Configuration
1	+24V	reference potential
4	start (start/test time)	starting the device via foot switch or test hood

**C Information on programming and program run**

- Protocol print-outs and issuing of audible signals take time after each test step. If protocols and audible signals are not needed, please adjust system parameters:

```

PROTOCOL → never
BUZZER   → off
    
```

- With digital control, a bad result can also be accepted with EXT\_ACK. With new start signal the last step is repeated.
- The lights *pass* and *fail* appear after each test step and display always the partial results. The lights go out if a new test step is performed.

## D Protocolling of test results

Only in output formats `page` and `endless` will the cause of error be printed in the protocol. The meanings are:

<b>For all types of test</b>	
<code>U.break</code>	test was aborted by operator

<b>For HV-DC-test</b>	
<code>&gt;Imax</code>	max. value for current exceeded
<code>&lt;Usoll</code>	falling below nominal value for test voltage
<code>Usense</code>	voltage measuring faulty

<b>For HV-AC-test</b>	
<code>&gt;Imax</code>	max. value for current exceeded
<code>&lt;Imin</code>	falling below nominal value for current
<code>&lt;Usoll</code>	falling below nominal value for test voltage
<code>&gt;Usoll</code>	max. value for voltage exceeded
<code>SK</code>	protective circuit interrupted

**Example for protocol format »page«**

SPS electronic GmbH

program : 0      --TEST--      date : 04.02.2002  
 SN: 1AA3

```
-----
* HV-test parameters * t=5.0s tr= 2.0s U= 2000VDC  Imax= 9.00 mA
  time      | current | voltage | error | result
-----
01: 12:33  | 0.0 mA | 2051 VDC | ---- | PASS
02: 12:33  | 0.0 mA | 2049 VDC | ---- | PASS
-----
```

```
-----
* HV-test parameters * t=5.0s tr=11.0s U= 2000VAC  Imax=50.0 mA
  time      | current | voltage | error | result
-----
01: 12:33  | 0.0 mA | 2048 VDC | ---- | PASS
02: 12:34  | 0.0 mA | 2050 VDC | U.break | FAIL
-----
```

**Example for protocol format »condensed«**

SPS electronic GmbH

program : 02      --TEST--      04.02.2002

```
-----
* HV-test parameters * t=5.0s tr=2.0s
  U= 2000VDC  Imax= 9.00 mA
  time      | current | voltage | result
-----
01: 12:05  | 0.0 mA | 2051 VDC | PASS
02: 12:06  | 0.01 mA | 2052 kV | PASS
-----
```

**Example for protocol format »line«**

SPS electronic GmbH

Date: 04.02.2002

```
12:33 Pr.02 t= 5.0s tr= 2.0s U: 2051 VDC I: 0.0 mA *** PASS
12:33 Pr.02 t= 5.0s tr= 2.0s U: 2049 VDC I: 0.0 mA *** PASS
12:33 Pr.02 t= 5.0s tr= 2.0s U: 2051 VDC I: 0.0 mA *** PASS
12:33 Pr.02 t= 5.0s tr= 2.0s U: 721 VDC I: 0.0 mA *** FAIL
12:33 Pr.02 t= 5.0s tr= 2.0s U: 2055 VDC I: 0.0 mA *** PASS
:
:
```

## **E Terms of warranty**

### **1. Warranty period**

The warranty period is 12 months after delivery.

### **2. Voraussetzungen für einen Garantieanspruch**

- The high voltage tester HA 2200 must have been put into operation by qualified personnel at the customer's.
- Inspections must be carried out regularly (once a year) and thoroughly (by SPS electronic GmbH).
- Defective or worn parts have to be replaced immediately. The operation of such parts is forbidden for safety reasons.
- Defective parts, subject to guarantee claims, have to be sent to SPS electronic GmbH for inspection.
- Defects occurred must be reported to SPS electronic GmbH immediately.

### **3. Beginning of guarantee period**

Guarantee starts with the date of delivery note.

### **4. Guarantee**

SPS electronic GmbH guarantees a good function of the high voltage test device, a conscientious and professional design and manufacture as well as the use of high-quality material.

All parts are being replaced free of charge if parts became defective or useless during the guarantee period due to the use of inadequate material, manufacturing faults or an imperfect engineering.

### **5. Excluded from guarantee**

- Damages due to outside influences, above all because of handling malpractices or of local conditions.
- Damages at devices from which the serial number has been removed, destroyed or falsified.
- Wear parts, such as fuses, signal bulbs, etc.

# EG-Konformitätserklärung

## EC Declaration of Conformity

---

Wir / we :

**SPS electronic GmbH**  
**Steuerungs- und Prüfsysteme**  
**Blätteräcker 18**  
**D-74523 Schwäbisch Hall**

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

*declare, that the following unit complies with all essential safety requirements of the EC Directive.*

Geräteart: Hochspannungsprüfgerät  
*Description of device: High Voltage Tester*

Typ / Type : HA 2200 / 2201 A/B/D/E/G

### EG Richtlinien / EC Directives:

- EG Maschinenrichtlinie 98/392/EWG mit Änderungen  
*EC Directive for machinery 98/392/EEC with amendments*
- EG Niederspannungsrichtlinie 2006/95/EC  
*EC Directive for low voltage 2006/95/EC*
- EG Richtlinie Elektromagnetische Verträglichkeit 2004/108/EC mit Änderungen  
*EC Directive electromagnetic compatibility 2004/108/EC with amendments*

Angewandte harmonisierte Normen:  
*Applicable harmonized standards:*

- EN 61 000-3-2; EN 61 000-3-3; EN 55 014-1; EN 55 014-2; EN 50 191

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

19.12.2007

Datum / date:

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

Unterschrift / Sign:

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 EG-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 EC directives.*