

OPERATION MANUAL

RTD simulator

Model 4530-V300 /-V400

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The measurement solution.



Konformitätserklärung (nach EN ISO/IEC 17050-1:2010)

Declaration of conformity (in accordance with EN ISO/IEC 17050-1:2010)

Name des Ausstellers: burster präzisionsmesstechnik gmbh & co kg
Issuer's name:

Anschrift des Ausstellers: Talstr. 1-5
Issuer's address: 76593 Gernsbach, Germany

Gegenstand der Erklärung: Präzisions RTD-Simulator
Object of the declaration: Precision RTD Simulator

Modellnummer(n) (Typ): 4530
Model number / type:

Diese Erklärung beinhaltet obengenannte Produkte mit allen Optionen
This declaration covers all options of the above product(s)

Das oben beschriebene Produkt ist konform mit den Anforderungen der folgenden Dokumente:

The object of the declaration described above is in conformity with the requirements of the following documents:

Dokument-Nr <i>Documents No.</i>	Titel <i>Title</i>	Ausgabe/Ausgabedatum <i>Edition/Date of issue</i>
2006/95/EC	Niederspannungsrichtlinie <i>Low voltage directive</i>	2006
2004/108/EC	Elektromagnetische Verträglichkeit <i>Electromagnetic Compatibility</i>	2004
EN 61000-3-2	Elektromagnetische Verträglichkeit Grenzwerte für Oberschwingungsströme <i>Electromagnetic Compatibility Limits for harmonic current emissions</i>	2006
EN 61000-3-3	Elektromagnetische Verträglichkeit Begrenzung von Spannungsänderungen, Spannungsschwankungen und Flicker in öffentlichen Niederspannungs-Versorgungsnetzen für Geräte mit einem Bemessungsstrom <i>Electromagnetic Compatibility Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current</i>	2008
EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen – industrielle Umgebung <i>EMC Generic immunity</i>	2006

Gernsbach
Ort / place

13.02.2013
Datum / date

i.V. Christian Karius
Quality Manager

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1. Introduction

1.1 Intended use

The precision RTD simulator is used where measuring instruments or regulators must be checked or calibrated with high precision.

The simulator is suitable for calibration laboratories and service centers which need a computer-controlled resistance decade for automation of calibration procedures.

All standard platinum and nickel RTDs may be simulated with a very high accuracy according to scales ITS 90 or IPTS 68.

Temperature regulators, transducers etc. often supply a pulsed signal current in order to reduce the self-heating of the RTD. Devices with an electronic simulation of RTD are therefore tending to swing. Because of this they don't work with this applications. Here, the advantage of the RTD simulator model 4530 becomes obvious as it can simulate the resistance sensor by real Ohm simulation without problems.

Of course the RTD simulator can be used also as a classical resistance decade.

1.2 Customer service

1.2.1 Customer service

For repair queries

Please contact us on:

(+49) 07224-645-53.

Please have your serial number ready for such enquiries. This information is essential in order to find out the technical status of the device and hence provide help quickly.

The serial number is shown on the type plate.

1.2.2 Factory warranty

burster praezisionsmesstechnik gmbh & co kg provides a manufacturer's warranty for a period of 24 months after delivery.

Any repairs required during this time will be made without charge.

Damages caused by improper use of the device are not covered by the warranty.

If the device needs to be returned for repairs, please note the following requirements for packing and shipping:

- If you have a problem with the device, please attach a note to the case summarizing the fault.
- The technical data can change at any time without notification. We also state explicitly that we do not accept liability for consequential damage.

1.2.3 Address

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2. Preparing for use

Note:

If there is a transport damage, don't switch on the device!

Note:

The 4530 RTD simulator must be shipped only in its original packaging provided by us or in a container capable of providing an equivalent degree of protection.

2.1 Unpacking

The device has a weight of 4 kg and due to this it is packed for protection against shock during shipment.

- Unpack the device carefully.
- Verify that all items are present.

The standard scope of delivery is:

- RTD simulator Model 4530-VX00
 - power supply unit
 - RS232 Cable (4530-V300)
 - Demo program
 - Manual
- Inspect the device carefully for damage

If there is a suspicion of damage

- Notify the delivery company immediately (within 72 hours).
- Retain the packaging for examination by a representative of the manufacturer and/or the delivery company.

2.2 Module 19" (extra ordered option)

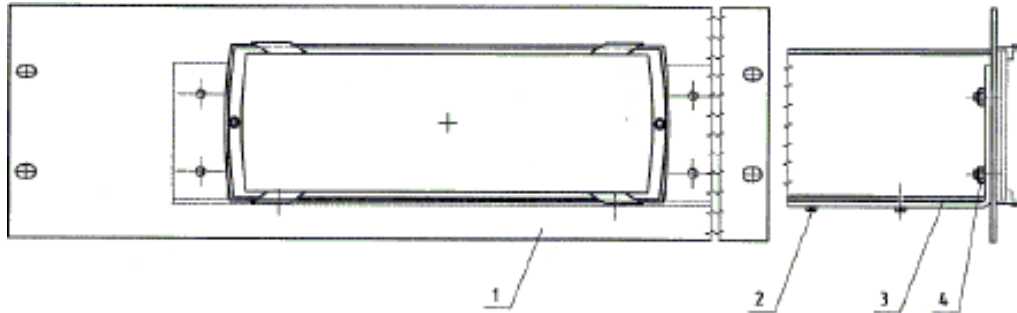


Figure 1: Assembly frame for an assembly of 4530 into a 19" rack.

The RTD-simulator may be ordered with an assembly frame for an easy assembling into a 19" rack.

Order Code: 2316-Z001

2.3 Description

The device comes in a sturdy aluminum housing. The keyboard and display are located at the front panel the terminals are at the rear panel.

2-, 3- and 4-wire connection is possible.

The resistance elements are switched to the output terminals through reed relays. This relays are types with a low thermoelectric voltage.

The resistors are made of foil or metal with a low temperature coefficient.

Metal housing is connected to the ground terminal.

The board with resistors and relays creates independent mechanical block.

CPU unit with a one-chip micro-controller generates all necessary internal control signals. Calibration data and set-up parameters are saved in EEPROM memory.

Pt100, Pt200, Pt500, Pt1000, Ni100 or Ni1000 can be selected by a simple menu navigation. In addition, the selection of temperature scales ITS 90 (DIN EN 60751) or IPTS 68 (DIN 43760) and the two temperature coefficients of platinum, $\alpha = 0.385$ (European) or $\alpha = 0.392$ (US), is possible. After the entry of the characteristic values the input of the temperature levels can be made very simply at the numeric keyboard. Presently set values are indicated at the display.

2.4 Power supply

The 4530 is supplied by an internal power supply unit (100 – 240 V AC).

3. Terminals and controls

3.1 Terminals

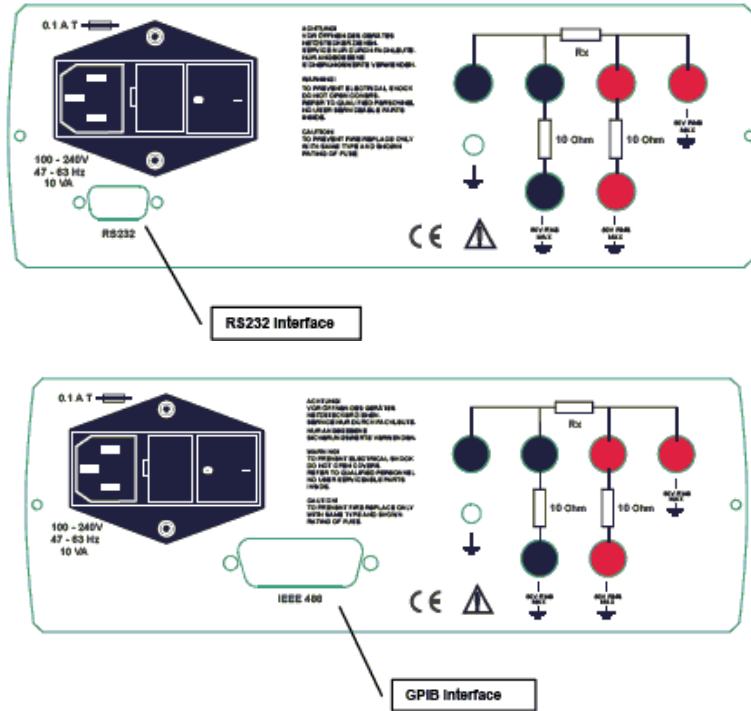


Figure 2: The rear panel of the 4530

At the rear panel you may find the power cord socket, the output terminals and the RS232 or IEEE488 (GPIB, IEC-Bus) interface terminal.

The resistance values are available at the output terminal, according to the printed symbol. You may use the 2, 3, or 4 wire connection.

The both terminals at the lower row are used to simulate lead resistance with a value of 10 Ω.

The right terminal, with symbol “GROUND”, is connected to the housing of the simulator.

3.2 Keyboard



Figure 3: The Keyboard is located at the front panel

Numerical values may be entered from the numerical part of keyboard.

The keys 2, 4, 6 and 8 have also a meaning as display cursor keys.

The following keys are located at the keyboard, except from the numerical keys:

Key	Meaning
[MENU]	Enters the "SETUP/CALIBRATION" menus
[BSP]	Deletes the last entered number
[ESC]	Cancels the last entered value or leaves the last set mode
[ENT]	Confirms set value or confirms the selected item in the MENU. It also switches between the numerical mode (black label) and display cursor mode of the keys 2, 4, 6 and 8. Switching over is indicated with the symbol "↑" in the lower right corner of the display.

3.3 Display




Figure 4: The two row display is located at the front panel

The two-row alphanumeric display is located at the front panel of the 4530. It is used to display all information.

Main values, e.g. simulated temperatures or output resistances, are displayed in the upper row.

Auxiliary information is displayed in the lower row.

The following symbols may be displayed in the lower right corner, depending on the status of the 4530:

- ↑ keys 2, 4, 6 and 8 are switched to the cursor mode
-  simulator is in remote control via RS232 (IEEE488 optionally)

3.4 Short and Open simulation (only version 4530-VXXX-001)

When the SHORT function is selected, the output resistance is lower than 100 mΩ (typically 50 mΩ).

The maximum allowed current is 500 mA.

When OPEN function is selected, the output resistance is higher than 1 GΩ.

The maximum allowed voltage is 50 V_{eff}.

Note:

Resistance values in range 16 Ω to 10 kΩ are calibrated absolutely. The resistance value is not defined against SHORT position. The SHORT and OPEN simulation is only intended for a functional checking of the tested instrument.

4. Operation

4.1 Switching on/off

For switching on or off the 4530, the mains switch is used. You'll find this switch at the rear panel of the simulator.

4.2 Standard mode

After switching on the device operates in the standard mode.

The following information is shown at the display:

-100.000 °C Pt100 IPTS68 †

The upper row shows the simulated temperature or resistance value.

The lower row shows the type of the simulated temperature sensor (Pt100) and the setup temperature scale (IPTS 68).

The arrow symbol in right corner informs that the cursor mode of the keys 2, 4, 6 and 8 is activated.

These temperature sensors are available:

- Pt100
- Pt200
- Pt500
- Pt1000
- Ni100
- Ni1000

These temperature scales are available

- IPTS 68
- ITS 90

Activating SETUP mode

- Press the **[MENU]** key

4.2.1 Use of the cursor keys

Before using the cursor keys, maybe you have to activate the cursor mode:

- Push the **[ENT]** key.

The arrow in the lower right corner shows that the keys are in cursor mode.

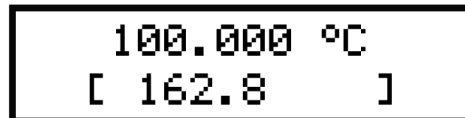
The Cursor keys **[▲]** and **[▼]** enables to increase or decrease the number on the active position. The active position is signed by the symbol “_” at the desired number.

With cursor keys **[◀]** and **[▶]** you'll change the active position of the cursor.

4.2.2 Numerical keyboard

With the numerical keys temperature (or resistance) values may be entered directly.

A recently entered value is displayed in brackets under the active value.



To confirm the new value:

- Push the **[ENT]** key.

Pushing the key “ENT” switches the keys 2, 4, 6 and 8 to cursor mode.

To delete the last entered number:

- Push the **[BSP]** key.

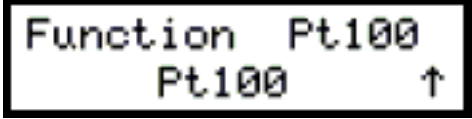
To exit setting mode:

- Press the **[ESC]** key.

After pressing the ESC key you have left the numerical entry.

4.3 Setup mode

This mode enables to set or display auxiliary parameters.



```
Function Pt100
Pt100      ↑
```

To enter setup mode:

- Push the **[MENU]** key at standard mode.

To call up parameters:

- Call up the desired parameter with cursor key **[▲]** or **[▼]**.

You'll find a description of the Parameters and their settings at the following (chapter 4.3.1 to 4.3.7)

To leave the setup mode:

- Push the **[ESC]** key.

4.3.1 Function

Use this parameter to specify the basic function of the 4530.

These basic functions are available:

- R
- Pt100
- Pt200
- Pt500
- Pt1000
- Ni100
- Ni1000
- Short (optional)
- Open (optional)

To specify the basic function of the 4530:

- Push the **[MENU]** key at standard mode.

The 4530 switches to SETUP mode

- Call up the “Function” parameter.

To do this use the cursor keys **[▲]** or **[▼]**.

- Set the 4530 to the desired basic function.

To do this use the cursor keys **[◀]** and **[▶]**.

The 4530 will show you the selected function at the lower row of the display.

- Acknowledge the new function.

Press the **[ENT]** key to do this.

After pressing this key, the new function will appear at the upper row of the display.

Note:

The last entered function is valid even if the instrument is switched off and on again.

4.3.2 Selecting the temperature scale (T.scale)

Use the parameter “T.scale” to select the temperature scale.

These scales are available:

- IPTS 68
- ITS 90

To select a temperature scale:

- Press the **[MENU]** key at standard mode.

The 4530 now switches to SETUP mode

- Call up the parameter “T.scale”.

To do this, use the **[▲]** and **[▼]** keys.

- Select the desired temperature scale.

Use the **[◀]** and **[▶]** keys to do this.

The 4530 shows the selected temperature scale at the lower row of the display.

- Acknowledge the new scale by pressing the **[ENT]** key.

The 4530 now shows the new scale at the upper row of the display.

Note:

The last selected temperature scale is valid even if the instrument is switched off and on again.

4.3.3 Selecting a Pt temperature sensor type (Pt type)

Use this parameter to select the type of the standard Pt sensor.

These types are available:

- US (1,392)
- DIN (IEC) (1,385)

To select the type of a Pt temperature sensor:

- Press the **[MENU]** key at standard mode.

The 4530 now switches to SETUP mode

- Call up the parameter "Pt type".

To do this, use the **[▲]** and **[▼]** keys.

- Select the desired type.

Use the **[◀]** and **[▶]** keys to do this.

The 4530 shows the selected sensor type at the lower row of the display.

- Acknowledge the new sensor type.

Press the **[ENT]** key to do this.

The 4530 now shows the new Pt temperature sensor type at the upper row of the display.

Note:

The last selected pt temperature sensor type is valid even if the instrument is switched off and on again.

4.3.4 Selecting a click volume (volume)

Enabling or disabling the beep sound when any key is pressed.

These steps are available:

- “OFF” (no sound)
- “LOW” (low level volume)
- “HIGH” (high level volume)

To select the type of a Pt temperature Sensor:

- Press the **[MENU]** key at standard mode.

The 4530 now switches to SETUP mode

- Call up the parameter “Volume”.

To do this, use the **[▲]** and **[▼]** key.

- Select the desired step.

Use the **[◀]** and **[▶]** keys to do this.

The 4530 shows the selected step at the lower row of the display.

- Acknowledge the new volume by pressing the **[ENT]** key.

The 4530 now shows the new volume at the upper row of the display.

Note:

The last set volume is valid even if the instrument is switched off and on again.

4.3.5 Baud rate RS232 (4530-V300) / Option IEEE488 address (4530-V400)

This parameter allows the setup of the RS232 interface transfer rate in baud (Bd) or the setting of an IEEE488 interface address (GPIB, IEC-bus).

These baud rates are available:

- 300 Bd
- 600 Bd
- 1 200 Bd
- 2 400 Bd
- 4 800 Bd
- 9 600 Bd
- 19 200 Bd

To set the transfer rate of a simulator with RS232 interface:

- Press the [MENU] key at standard mode.
The 4530 now switches to SETUP mode
- Call up the parameter “Baud rate”.
To do this, use the [▲] and [▼] keys of the keypad.
- Select the desired baud rate.
Use the [◀] and [▶] keys to do this.
The 4530 shows the new selected baud rate at the lower row of the display.
- Acknowledge the new baud rate by pressing the [ENT] key.
The 4530 now shows the new baud rate at the upper row of the display.

Note:

The last set baud rate is valid even if the instrument is switched off and on again.

To set the address of a simulator with an IEEE488 interface (GPIB, IEC-Bus):

- Follow the procedure of setting a new RS232 transfer rate, until you have reached the parameter “IEC addr”.
This parameter is used to set the address of the device.
The new address has to be in range “0” to “30”.

Note:

The new address is valid even if the instrument is switched off and on again.

4.3.6 Set a new password for calibration mode (Cal.code)

Note:

Write down the active password. If you forget the calibration code, you have to send the device to buster.

The purpose of this password is to prevent unauthorized users from changing the calibration of the instrument.

The password for calibration mode is a five digit number, which must be entered to access the calibration mode.

If the password is set to "00000", this information is displayed in the setup menu. Otherwise the 4530 displays "*****".

To change the password:

- Press the **[MENU]** key at standard mode.
The 4530 now switches to SETUP mode.
- Select the Parameter "Cal.code" with the cursor keys **[▲]** and **[▼]**.
To do this, use the **[▲]** and **[▼]** keys of the keypad.
- Switch the keypad to numerical mode.
To do this, press the **[ENT]** key.

If the old password is "00000":

- Use the numerical keys to insert the new password.
- Confirm the new password with the **[ENT]** key.
The new password is not shown at the menu.

If another password is set:

- Insert the old password.
- Confirm the old password with the **[ENT]** key.
After the old password is entered correctly the simulator displays "00000".
- Use the numerical keys to insert the new password.
- Confirm the new password with the **[ENT]** key.
The new password is not shown at the menu.

Note:

The new password is valid even if the instrument is switched off and on again.

4.3.7 Serial number (Serial n.)

This parameter is used to display the serial number of the 4530.

To display the serial number:

- Press the **[MENU]** key at standard mode.
The 4530 now switches to SETUP mode.
- Select the Parameter "Serial n.". To do this use the cursor keys **[▲]** and **[▼]**.
The display now shows the serial number.

Note:

This parameter cannot be changed.

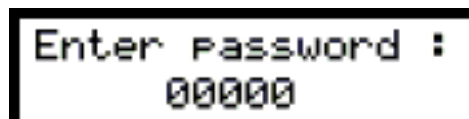
4.4 Calibration mode

In this mode you may recalibrate the resistance elements of the simulator.

To get access to the calibration mode:

- Press twice the **[MENU]** key at standard mode.
At SETUP mode you have to press this key only at one time.

Before calibration you have to enter the correct password. Without a correct password the access to the calibration mode is refused.



To return to standard mode:

- Press the **[ESC]** key.
You'll now return directly to standard mode

4.5 The procedure of recalibration

The procedure of recalibration consists of the measurement of 23 basic resistance values and of the entry of the current measured values. During calibration you may enter the values by using the [▲] and [▼] keys.

You may find the calibration points nominal values and their accuracy in the following table:

Table 1: Calibration points and their accuracy

Calibration Point	Nominal value	accuracy
R00	31,6 Ω	1 mΩ
R01	61,9 Ω	1 mΩ
R02	121 Ω	2 mΩ
R03	237 Ω	3 mΩ
R04	464 Ω	6 mΩ
R05	909 Ω	15 mΩ
R06	1780 Ω	30 mΩ
R07	3480 Ω	100 mΩ
R08	6870 Ω	250 mΩ
R09	13,5 kΩ	500 mΩ
R10	26,6 kΩ	1 Ω
R11	52,2 kΩ	5 Ω
R12	103 kΩ	10 Ω
R13	202 kΩ	20 Ω
R14	398 kΩ	40 Ω
R15	780 kΩ	80 Ω
R16	1540 kΩ	200 Ω
R17	3020 kΩ	400 Ω
R18	5920 kΩ	1 kΩ
R19	12 MΩ	5 kΩ
R20	23 MΩ	50 kΩ
R21	46 MΩ	200 kΩ
R22	85 MΩ	500 kΩ

To calibrate:

- Set the first calibration point (resistance element).

Use the [▲] and [▼] keys to set the element.

- Measure the resistance of the selected element.

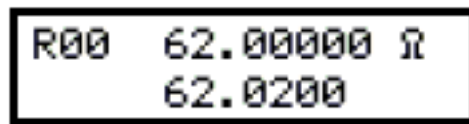
Use an ohm-meter with an appropriate accuracy in 4-wire-connection.

- Switch the keypad to numerical mode.

Press the [ENT] key to do this.

- Enter the measured resistance value in ohms (Ω).

You'll find the original value in the upper and the new entered value in the lower row of the display.



```
R00 62.00000 Ω
62.0200
```

- Confirm the new entered value by pressing the [ENT] key.
- Repeat this procedure for all calibration points.

5. Performance verification test

The verification procedure is based on the measuring of resistance at the output terminals with a standard multimeter in recommended points.

5.1 Required equipment

You need a ohmmeter with a nominal accuracy of 0.001 % in range of 10 Ω to 10 k Ω (HP3458A, Wavetek 1281 or similar).

5.2 Setting

- Switch the simulator to resistance mode.
- Connect the standard multimeter to the output terminals of 4530.
Use four-wire connection.

5.3 Procedure of testing

- Checking the output resistance
- Checking the lead resistance simulation

5.4 Verifying parameters

To perform a parameter verification test:

- Connect the simulator to the standard ohm-meter (multimeter).
- Switch on both instruments.
- Wait at least for one hour

During this time both instruments have to stabilize at a laboratory ambient with a temperature of 23 ± 2 °C.

- Check the resistance value at the checkpoints according to the table below.

The maximum deviation is given in the table (refer to Table 2: on page 27).

Table 2: Maximum deviations

Nominal Value [Ω]	Max. deviation [$m\Omega$]
20,0000	3,6
50,000	4,5
100,000	6,0
200,00	9,0
500,00	25
1000,0	50
2000,0	100
5000	750
10000	1500

- Connect the standard ohm-meter to the 10 Ω lead resistor at terminal “Hi”.
- Measure the resistance value of the lead resistor.
The allowed deviation is ± 0.1 %.
- Check the lead resistor at terminal “Lo” in the same way.

6. Remote control

The standard version of 4530 is equipped with a RS232 interface.

The IEEE488 version (GPIB, IEC-Bus) is described in chapter 6.2.

The commands in both versions are the same.

6.1 Remote control RS232

- Transmission baud rate may be selected from 300 to 19200 Bd.
- Number of data bits is 8.
- Number of stop bits is 1.
- No parity.

For data flow control neither hardware handshake (RTS/CTS) nor program handshake (XON/XOFF) is used.

The RS232 line is metallically separated to other electronic circuits.

RS232 connection

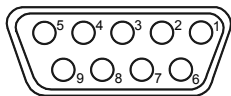


Figure 5: 9 pin connector D-SUB FEMALE (view to the rear panel)

Pin	Label	I/O	Description
2	TXD	Output	Transmitter
3	RXD	Input	Receiver
5	GND	-	Ground

Cable between simulator and computer (configuration 1:1)

Computer	D-Sub 1	D-Sub 2	1427
Receiver	2	2	Transmitter
Transmitter	3	3	Receiver
Ground	5	5	Ground

6.2 Remote control IEEE488 (GPIB, IEC-bus)

The following list of commands is valid for RTD-simulators with IEEE488 interface.

The simulator performs the following functions based on IEEE488 bus commands.

SH1, AH1, T5, L3, RL1, DC1

The simulator recognizes the following general commands:

“DCL”

Device Clear - resets 4530 to its delivery status

“SDC”

Selected Device Clear - resets 4530 to its delivery status

“GTL”

Go To Local - disables the remote control

“LLO”

Local Lock Out - disables the local control, 4530 can only be controlled by remote control.



Figure 6: Plug arrangement IEEE488 Interface

6.3 Commands

The communication between simulator and computer consists of a flow of the two periodically alternating command types (command-response and query-response).

A command is always a letter followed by a parameter and ended by control sign <CR> or <LF>.

The response is always ended with the control signs "<CR><LF>".

If an unknown command is received 4530 returns the string "? <CR><LF>".

A correct executed command is confirmed by the string "Ok <CR><LF>".

If a correct query is received 4530 returns the response in the format described above.

Both lower case letters and capital letters can be used.

6.3.1 Syntax

<DNPD>

Decimal Numeric Program Data, this format is used to express decimal number with or without exponent.

<CPD>

Character Program Data. Usually this format represents a group of alternative character parameters e.g. {0 | 1 | 2 | 3}.

?

A flag indicating a request for the value of the parameter specified by the command. No other parameter than the question mark can be used.

(?)

A flag indicating a request for the parameter specified by the command. This command permits a value to be set as well as requested.

<CR>

"carriage return". ASCII code 13. This code inserts a line.

<LF>

"line feed". ASCII code 10. This code inserts a line.

6.4 Command list

6.4.1 Value setting / reading

A (?) <DNPD>

This command sets a resistance (resistance function) or temperature value (temperature sensor simulating mode).

<DNPD>

Represents a resistance value in Ohm or a simulated temperature in °C. If the temperature mode is activated, both negative and positive values are acceptable. At resistance mode only positive values are acceptable.

The limit values are shown in chapter 8 “Technical data”.

In case of a command, the simulator confirms the correct setting with the string „Ok <CR><LF>”.

In case of a query, 4530 returns the set resistance/temperature value in the same format as it is set for the display (number of decimal places).

For example the value -120 °C is returned as -120.000<CR><LF>.

Positive numbers are sent without polarity sign.

Example:

The command “A123.564 <CR>” sets the temperature 123.564 °C, if the simulator is in temperature simulation mode. If the simulator is in resistance mode, 123.564 Ω will be set.

If only the query „A?<CR>” is sent, the simulator returns response in the format „123.564<CR><LF>”.

6.4.2 Function setting

F <CPD> { 0 | 1 | 2 | 3 | 4 | 5 | S | O }

The following functions are available:

Code	Function
0	resistance mode
1	Pt100temperature sensor simulation
2	Pt200 temperature sensor simulation
3	Pt500 temperature sensor simulation
4	Pt1000 temperature sensor simulation
5	Ni100 temperature sensor simulation
6	Ni1000 temperature sensor simulation
S	Short simulation (extra ordered option)
O	Open simulation (extra ordered option)

The 4530 confirms the execution with the string „Ok <CR><LF>”.

Example:

„F1<CR>” sets the simulation of a Pt100 sensor.



6.4.3 I/D (device identification)

*IDN?

The response contains the name of the manufacturer, the model type number, the serial number and the firmware version.

The response may look like this:

1 2 3 4 5 6 7 8	
B U R S T E R ,	- Manufacturer
9 10 11 12 13	
4 5 3 0 ,	- Type number
14 15 16 17 18 19	
X X X X X ,	- Serial number
20 21 22	
X . X	- Software version

Example:

If the query “*IDN?<CR><LF>” is sent, the simulator returns:

“BURSTER,4530,61200,1.0<CR><LF>”

6.4.4 Setting the sensor type

T <CPD> {0 | 1}

Use this command to set a temperature scale

Code	Sensor type
0	Type DIN EN 60751 (1.385)
1	Type US/JIS (1.3916)

The 4530 confirms the correct setting with the string “OK <CR><LF>”

Example:

The string “T1<CR>” sets the platinum sensor type 1.385 (DIN EN 60751).

6.4.5 Temperature scale

S <CPD> {0 | 1}

Use this command to set a temperature scale

Code	Temperature scale
0	ITS 90
1	IPTS 68

The 4530 confirms the correct setting with the string "OK <CR><LF>"

Example:

The string "S1<CR>" sets the Scale IPTS 68.

6.4.6 Status report

V?

The 4530 returns the device status in the form „FxSxTx <CR><LF>“. The values corresponding to the actual status of the simulator are located at the positions of the "x" signs.

Example:

After the query "V?<CR>" the simulator returns the string „F4S1T1<CR><LF>" (Pt1000, 1.385, IPTS 68)

7. Demo program

To provide an easy operation of the simulator from the computer, and to check the RS232 line (IEEE488 bus) of 4530, a simple operating program is delivered with the simulator.

The installation disk contains a program (for WIN95/98/ME/NT/2000/XP/WIN7/WIN8 only), that allows your computer to communicate with 4530 through a standard serial line (IEEE488). For example, you may set a value or function on the simulator.

7.1 Installing the program

- Launch the file "SETUP.EXE"

The installation program asks for the destination directory (pre-defined is "RTD simulator").

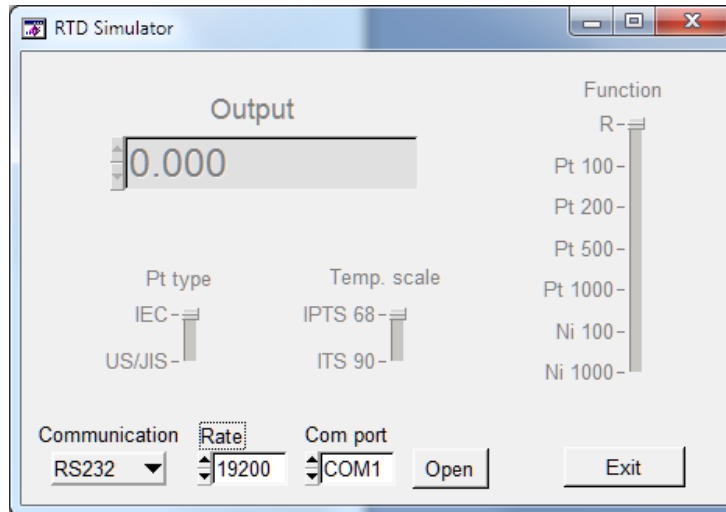
- Insert another directory or confirm "RTD simulator".

The installation program executes the installation.

The file "UNINST.EXE" is also copied into the selected directory, for an alternative delete of the directory from the system.

7.2 Program description

When launching the program “RTD Simulator”, the following control panel is displayed on screen.



- First select the appropriate interface (RS232 or IEEE488).

To select the interface use the operating element „Communication“. Standard is RS232.

To control a simulator with RS232 Interface:

- Set the serial port number to which the instrument is connected.
- Select the baud rate.
- Click the **[Open]** button.

After pushing the **[Open]** button the program checks the connection to the instrument.

Once an instrument is found, you can control it.

To control a simulator with IEEE488 interface:

- Set the IEEE488 address.
- Click the **[Open]** button.

After clicking the **[Open]** button the program checks the connection to the instrument.

Once an instrument is found, you can control it.

To exit the program:

- Click the **[Exit]** button.

8. Technical data

8.1 Range of temperature simulation

Only values, functions, ranges with signed accuracy in relative or absolute expression or where limits are specified, are guaranteed.

Platinum:	-200,000 °C to 850,000 °C	
Nickel:	-60,000 °C to 250,000 °C	
Sensor types:	Pt100, Pt200, Pt500, Pt1000, Ni 100 and Ni 1000	
Temperature scale:	ITS 90, IPTS 68	
Platinum sensor standard:	DIN 43760	$\alpha = 0,3850$ to IPTS 68
	DIN EN 60751	$\alpha = 0,3851$ to ITS 90
	US(US/JIS)	$\alpha = 0,3916$
Nickel sensor standard:	DIN 43760	$\alpha = 0,6180$
Range of resistance simulation:	16,0000 Ω - 10000 Ω	
Temperature coefficient:	< 1ppm/°C	(16 Ω - 2000 Ω)
	< 5ppm/°C	(2 k Ω - 10 k Ω)
Maximum power dissipation:	0,3 W	
Maximum current:	100 mA	(16 Ω – 30 Ω)
	50 mA	(30 Ω – 100 Ω)
	20 mA	(100 Ω - 500 Ω)
	10 mA	(500 Ω - 3000 Ω)
	5 mA	(3000 Ω - 10000 Ω)
Connection:	2- 3- und 4-wire	
Terminals:	4 mm, gold plated terminals	
Remote control:	RS232-Schnittstelle, metallically separated orIEEE488 (GPIB,IEC-bus)	
Range of working temperature:	23 °C \pm 5 °C	
Dimensions (W x H x D):	250 mm x 100 mm x 390 mm	
Weight:	4 kg	

8.2 Accuracy

Specified accuracy is valid after a 10 minute warm up period in temperature of $23 \pm 5 \text{ }^\circ\text{C}$.

Uncertainties include long-term stability, temperature coefficient, linearity, load and line regulation and traceability of factory to national calibration standards. The specified accuracy is valid for one year.

Resistance

Range	Accuracy
16 Ω - 400 Ω	0.003 % + 3 m Ω
400 Ω - 2000 Ω	0.005 %
2000 Ω - 10000 Ω	0.015 %

Pt temperature sensor simulation accuracy

Range	Pt100	Pt200	Pt500	Pt1000
-200 to 200 $^\circ\text{C}$	0.02 $^\circ\text{C}$	0.02 $^\circ\text{C}$	0.02 $^\circ\text{C}$	0.03 $^\circ\text{C}$
200 to 500 $^\circ\text{C}$	0.03 $^\circ\text{C}$	0.04 $^\circ\text{C}$	0.06 $^\circ\text{C}$	0.15 $^\circ\text{C}$
500 to 850 $^\circ\text{C}$	0.04 $^\circ\text{C}$	0.06 $^\circ\text{C}$	0.15 $^\circ\text{C}$	0.2 $^\circ\text{C}$

Ni temperature sensor simulation accuracy

Temperature range	Ni100 (R4W)	Ni1000 (R4W)	Ni10000 (R2W)
-60 to 300 $^\circ\text{C}$	0.02 $^\circ\text{C}$	0.04 $^\circ\text{C}$	0.04 $^\circ\text{C}$

The simulation of lead resistors with 10 Ω and 20 Ω is available.

The lead resistance accuracy is 0.1 %; the maximum allowed current is 100 mA