OPERATION MANUAL
(preliminary)

DIGISTANT®
Model 4463

Valid from: 22.08.2023

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Contents

1 For your safety

The following symbols on the DIGISTANT® model 4463 and in this operation manual warn of hazards.

1.1 Symbols used in this manual

1.1.1 Signal words

The following signal words are used in the operation manual according to the specified hazard classification.

DANGER
High degree of risk: indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING
Moderate degree of risk: indicates a hazardous situation which, if not avoided, may result in death or serious injury.
CAUTION
Low degree of risk: indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE
Property damage to the equipment or the surroundings will result if the hazard is not avoided.

Note: It is important to heed these safety notices in order to ensure you handle the DIGISTANT® model 4463 correctly.

IMPORTANT: Follow the information given in the operation manual.

1.1.2 Pictograms

	**Electric shock hazard**
	**Electrostatic discharge. Do not touch!** Take precautionary measures against static discharge.
	High Voltage! Danger to Life!
	Warning about dangerous electrical voltages.
	Observe the advice for protecting the instrument.

1.2 Symbols on the device

Symbol	Description
	Warning, reference to the documentation
	Warning of electrical shock hazard
WARNING! To prevent electrical shock do not open covers. Refer to qualified personnel. No user serviceable parts inside.	Warning of electrical shock hazard. Do not open covers.
CAUTION! To prevent fire replace only with same type and shown rating of fuse.	Caution of fire hazard. Replace a fuse just with a fuse from the same type and the same nominal capacity.

2 Introduction

IMPORTANT: Read the operation manual carefully before using the equipment, and keep for future reference.

2.1 Intended use

The instrument has been designed according to EN 61010-1:2011. Safety is ensured by the design and by the use of specific component types.

2.2 Customer service

2.2.1 Customer service department

For repair inquiries, please telephone our Service department on +49-7224-645-53, or email: service@burster.com (Germany only). If you are outside Germany, you should contact your burster agent (see also www.burster.com).

Please have the serial number to hand. The serial number is essential to establishing the definite technical status of the instrument and providing help quickly. You will find the serial number on the type plate of the DIGISTANT® model 4463.

2.2.2 Contact person

If you have any questions relating to the DIGISTANT® model 4463, please go directly to burster praezisionsmesstechnik gmbh & co. kg, or if outside Germany, please contact your burster agent (see also www.burster.com).

Head office

burster praezisionsmesstechnik gmbh & co kg
Talstr. 1 - 5
76593 Gernsbach Germany

Telephone: +49-7224-645-0
Fax: +49-7224-645-88
Email: info@burster.com

2.3 Download the test certificate

You have the option to download the test certificate for your DIGISTANT® model 4463 online. To do this, you need to register at http://www.burster.com/en/registration/. You can then download the test certificate directly by entering the serial number.

2.4 Ambient conditions

2.4.1 Storage conditions

The following requirements must be met when storing the DIGISTANT® model 4463:

- Store at temperatures between -10 °C and +55 °C
- The unit must be packed in clean packaging
- Store in a dry environment
- No condensation

2.4.2 Operating conditions

The following requirements must be met when operating the DIGISTANT® model 4463:

- Always operate indoors
- Operate at temperatures between +5 °C and +45 °C
- Maximal power consumption: 60 VA
- Reference temperature: +16 °C … +30 °C
- Power supply: 115/230 VAC, 47 … 63 Hz

Note: Avoid condensation after transportation or storage of the DIGISTANT® model 4463.

2.4.3 Restrictions on use

The DIGISTANT® model 4463 does not pose a hazard if used within its specification and in accordance with the safety regulations.

The manufacturer does not accept liability for any personal injury or property damage arising from misinterpretation of measurement results.

Note: The DIGISTANT® model 4463 is not intended as a substitute for safety devices and protective equipment. Use safety devices and protective equipment.

2.4.4 Cleaning

DANGER

Electrical shock hazard
Disconnect the DIGISTANT® model 4463 from the power supply before cleaning.

Disconnect the DIGISTANT® model 4463 from the power supply and use a slightly damp cloth for cleaning the unit.

CAUTION

Do not immerse the DIGISTANT® model 4463 in water or hold it under running water.
Do not use strong cleaning agents as these may damage the DIGISTANT® model 4463.
Use a slightly damp cloth to clean the DIGISTANT® model 4463.

External surface cleaning

To keep the device looking like new, clean the case and front panel keys using a soft cloth slightly dampened with either water or a non-abrasive mild cleaning solution that is not harmful to plastics.

2.5 Personnel

Personnel must be familiar with the relevant regulations. They must follow these regulations. Only trained personnel who are familiar with the applicable safety regulations are permitted to operate the DIGISTANT® model 4463.
burster is happy to provide your operating personnel with training on the DIGISTANT® model 4463. To find out more, please look at our range of services at www.burster.com.

2.6 Contents of pack

The following components are supplied:

- DIGISTANT® model 4463
- Operation manual
- RS232 cable
- Warranty document
- Test certificate

2.7 Unpacking

DANGER

Electrical shock hazard
Never connect the DIGISTANT® model 4463 if it shows signs of damage incurred in transit. Only ever use the DIGISTANT® model 4463 under the conditions specified in this operation manual.

Inspect the DIGISTANT® model 4463 for damage. If you suspect that the unit has been damaged during shipping, notify the delivery company within 72 hours.

The DIGISTANT® model 4463 should be shipped only in its original packaging or in packaging capable of providing an equivalent degree of protection.

2.8 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. This does not include damage arising from improper use.

Please note the following when sending the DIGISTANT® model 4463 in for repair:

- If there is a problem with the DIGISTANT® model 4463, please attach a note to the DIGISTANT® model 4463 case summarizing the fault.
- Technical specifications subject to change at any time without notice. We also state explicitly that we do not accept liability for consequential damage.
- The DIGISTANT® model 4463 must always be dispatched in suitable packaging.

2.9 Maintenance

2.9.1 Fuse replacing

The instrument includes a fuse located in the mains connector at the rear panel. Replace the fuse as follows:

This is how it works

1. Switch off the device.
2. Remove the end of power cord from the mains connector at the rear panel.

3. Insert the blade of a flat screwdriver into the opening cut in the mains voltage selector and pull out the fuse holder.
4. Remove the fuse and replace it with new fuse of the same rating.

2.10 Conversions and modifications

Note: The warranty shall be deemed void immediately if you open or dismantle the DIGISTANT® model 4463 during the warranty period.

The DIGISTANT® model 4463 does not contain any parts that are intended to be serviced by the user. Only the manufacturer's own qualified personnel are permitted to open the DIGISTANT® model 4463.

It is not permitted to make any changes to the DIGISTANT® model 4463 without the written agreement of burster praezisionsmesstechnik gmbh & co kg. burster praezisionsmesstechnik gmbh & co kg does not accept liability for damages or injury if this condition is disregarded.

3 Device design

- Dimensions : W 390 mm, H 128 mm, D 310 mm
- Weight : 5.5 kg
- Housing : metal sheet
- Interface : RS232 (optionally IEEE488, USB, Ethernet)
- Power supply : 115/230 Vac, 45…65 Hz
- Maximal power consumption : 60 VA Reference temperature : +16 °C … +30 °C
- Working temperature : +5 °C … +40 °C
- Storing temperature : -10 °C … +50 °C
- Reference temperature: +13 °C … +33 °C (Voltage, Current, TC, Frequency)
  +20 °C … +26 °C (RTD, Resistance)
- Protection fuses: T315mAL250 for 230 V
  T630mAL250 for 115 V

3.1 Voltage supply

DANGER

Electrical shock hazard
Never connect the DIGISTANT® model 4463 if it shows signs of damage incurred in transit. Only ever use the DIGISTANT® model 4463 under the conditions specified in this operation manual.

The supply voltage has been set to 230 V~ at the factory; it can be changed using the rotary selector switch.

Supply voltage:	230 V~ ± 10 %
Frequency range:	45 Hz ... 65 Hz
Power consumption:	approx. 30 VA
Fuse rating:	T 160 mA

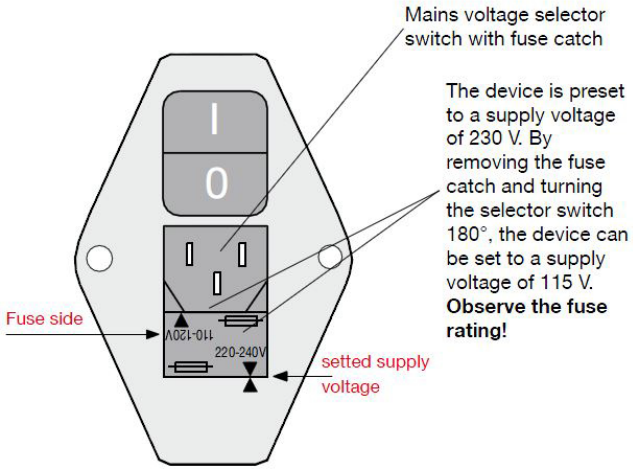


Figure 1: Voltage supply

4 Controls and connections

4.1 Front panel

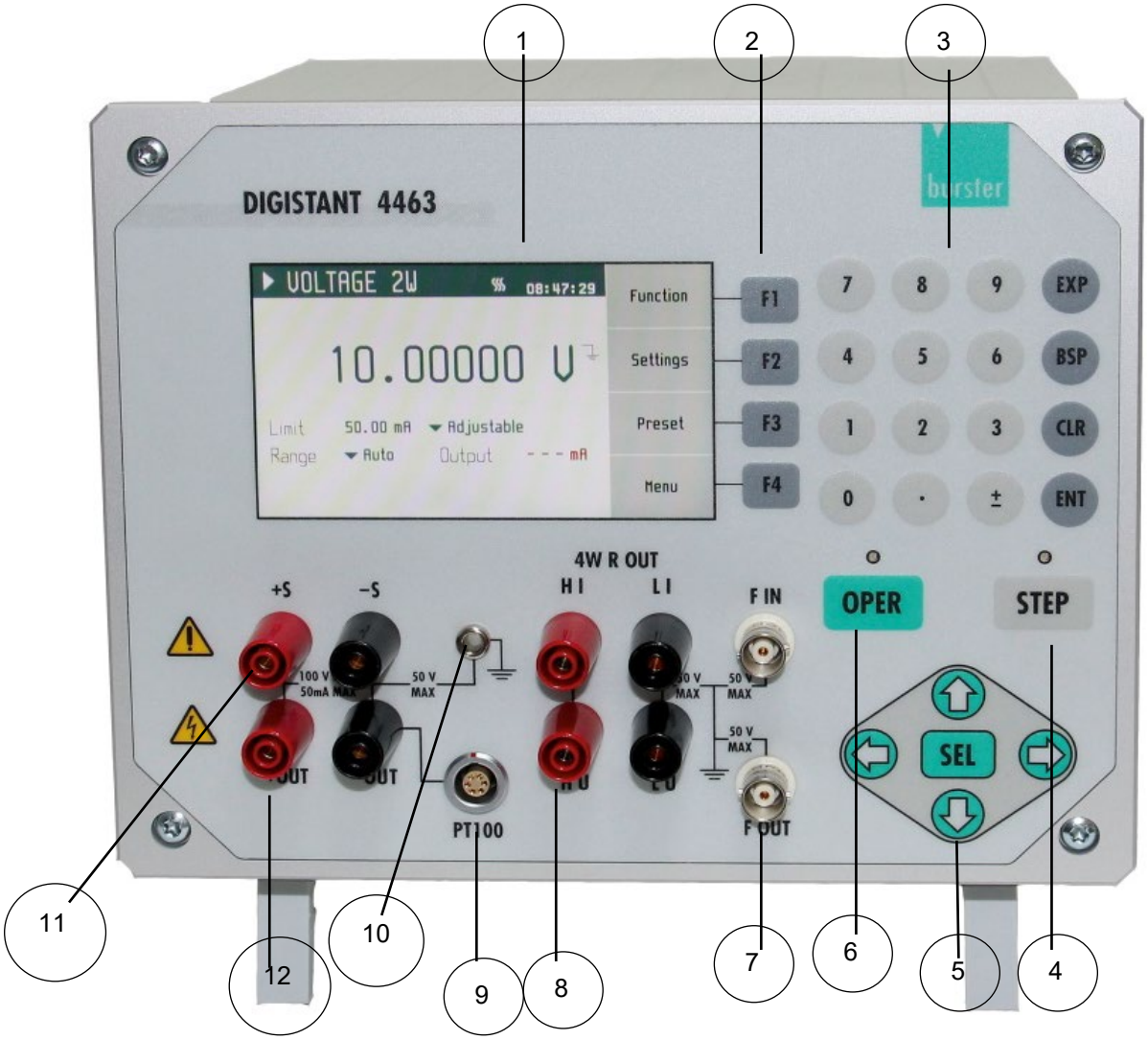


Figure 2: Front panel

Number	Meaning
1	Display
2	Softkeys
3	Number keys
4	Step function
5	⇦, ⇨, ⇧, ⇩Arrow buttons
6	Operation ON / OFF
7	FREQ terminal
8	Resistance 4 W and RTD 4 W function
9	Pt100 terminal for external Pt100 sensor Sensor is used for external RJ compensation in TC function
10	GND terminal (PE protective earth)
11	Voltage sense terminals for voltage 4 W function
12	Main terminals for Voltage, Current and TC functions

Table 1: Description front panel

4.2 Front terminals

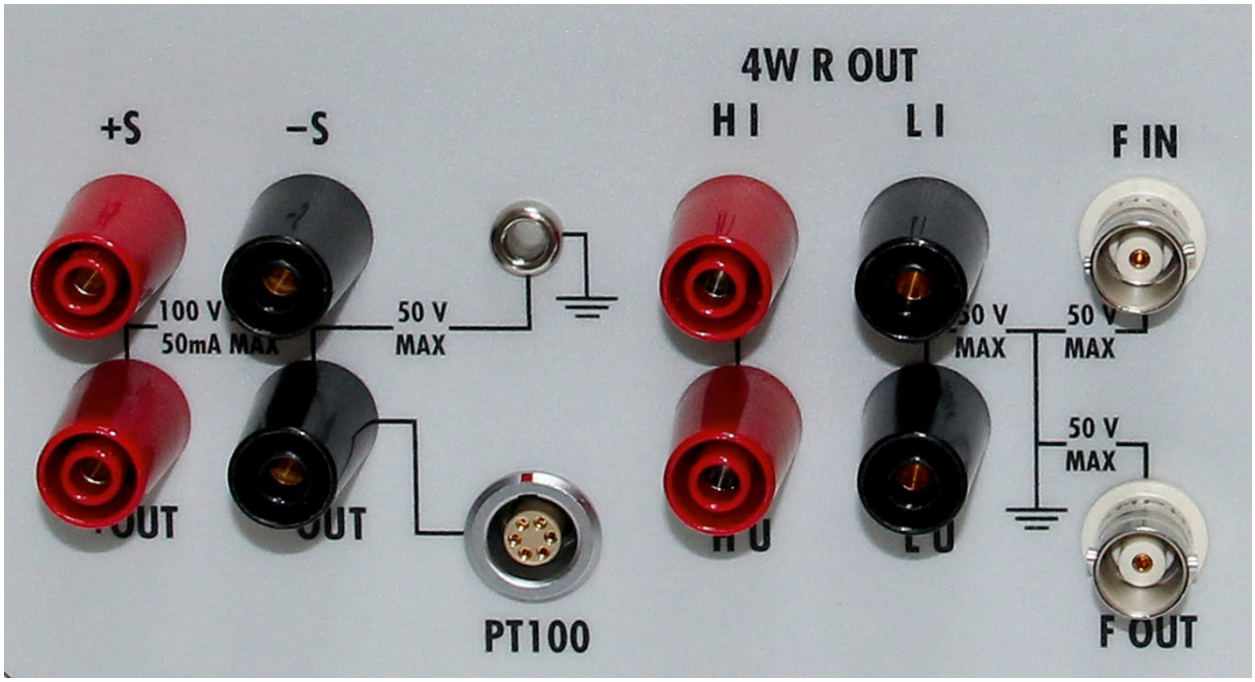


Figure 3: Front terminals

Designation	Meaning
+OUT, -OUT	Main terminals for Voltage, Current and TC functions
+S, -S	Sense terminals for Voltage 4 W function
PT100	Input connector for external Pt100 temperature sensor. Sensor is used for external RJ compensation in TC function
GND ⏚	Ground terminal is connected to the metal case (PE protective earth)
RTD/R OUT	Auxiliary Output/Input connector. Output for Resistance 4W and RTD 4W functions.
F UB, F OUT	Output/Input for Frequency function over BNC connectors.

4.3 Rear view

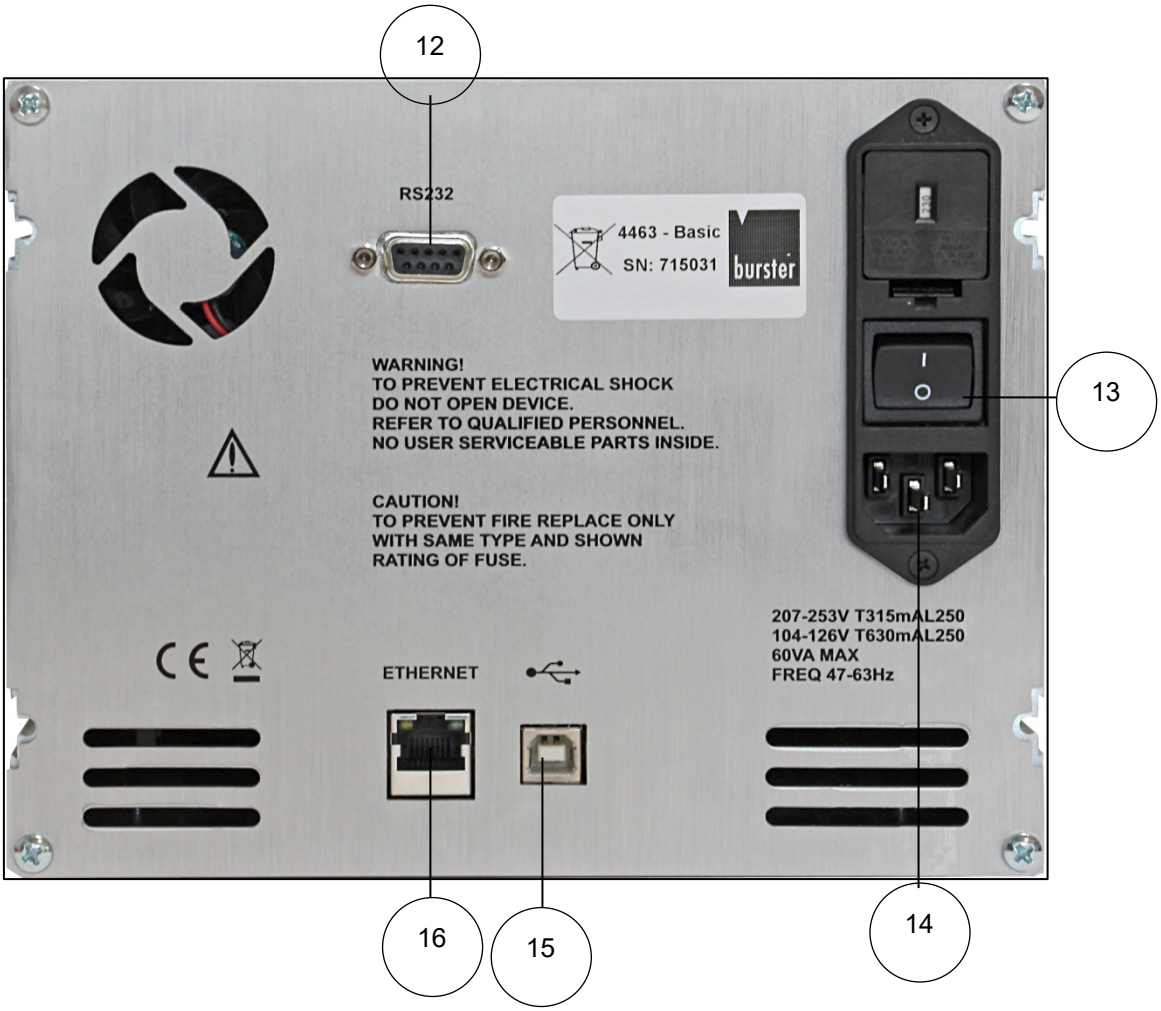


Figure 4: Rear view

Number	Meaning
12	RS232-interface
13	Power switch
14	Power connection
15	USB-interface
16	Ethernet interface

Table 2: Rear view

4.4 Display

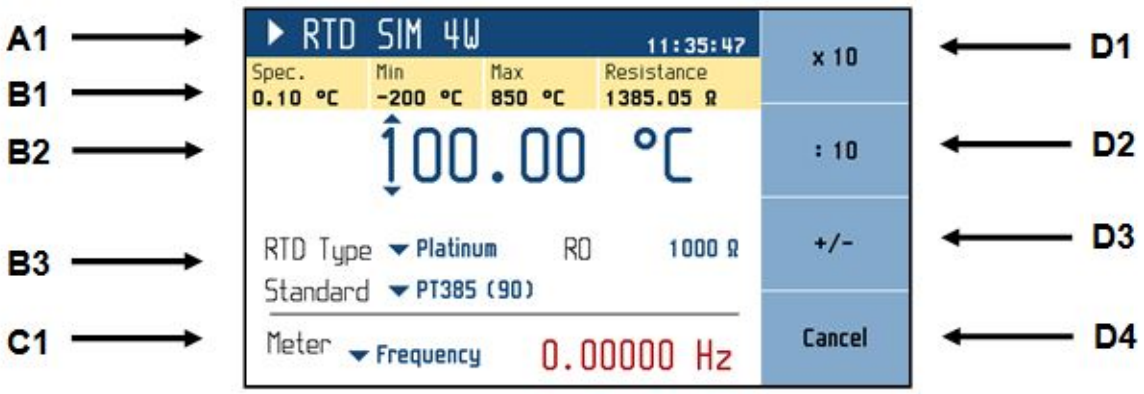


Figure 5: Display

The display is divided into four sections:

A. Information line

- Selected function (VOLTAGE 2W, CURRENT, …)
- Real time

B. Main area

This section displays the set-up values of generated signals and the data related to the device status. The section includes the following types of data:

1. Tooltip line
   This section displays additional information related to the selected item. It is displayed if any item on the screen is active (selected).
2. Main value
   There is displayed main value of selected function with the unit. There is displayed also actual position of cursor ▼▲ if the parameter is in edit mode. Position of cursor can be changed using keys ◄, ► and parameter can be changed using keys ▲,▼.
3. Auxiliary parameters
   This section displays auxiliary parameters of actually selected function:

- Temperature standard (PT385, PT3916, …)
- RTD type (Platinum, …)
- R0 resistance

C. Meter

This section displays measured frequency or counter value. Meter can be displayed or hidden according to the switch (Meter show) in the Menu

D. Softkey labels

There are four keys next to the display with variable function. The functions of these keys change during operation (depends on selected function and actual display mode). These four softkeys appear in main function window by default:

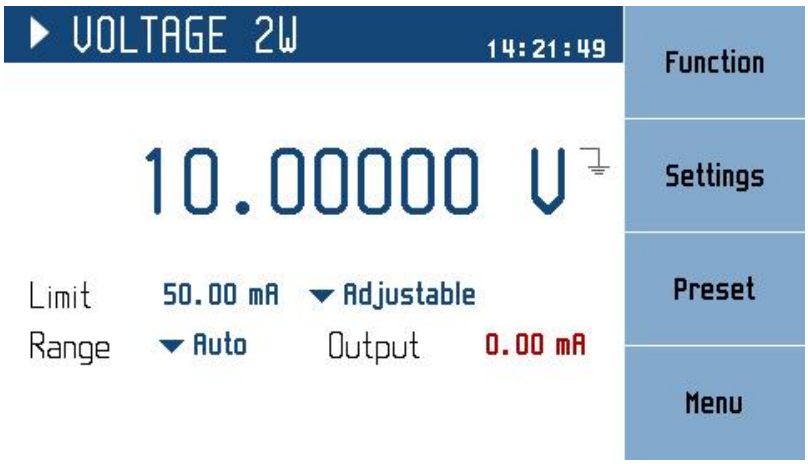


Figure 6: Softkeys

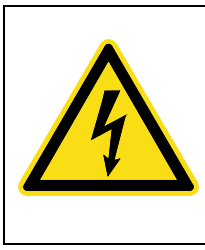
Function – Setting the function. See chapter 6.2

Settings – Auxiliary parameter of selected function. See chapter 6.1.1

Preset – One click setup of all function parameters. See chapter 6.3

Menu – General settings and auxiliary parameters of all functions. See chapter 6.1

5 Using the instrument for the first time



DANGER

Electrical shock hazard
Never switch on the DIGISTANT® model 4463 if it shows signs of damage incurred in transit. Only ever use the DIGISTANT® model 4463 under the conditions specified in this operation manual.

5.1 Power on

This is how it works

1. Before connecting the instrument to the mains, check the position of the mains voltage selector located at the rear panel.
2. Plug one end of the power cord into the connector located at the rear panel and connect the other end of the power cord into a wall outlet.
3. Switch on the mains switch located at the rear panel. Display is lit.

4.

Figure 7: Starting Screen

5. The instrument performs internal hardware checks for app. 5 seconds.
6. After the tests conclude, the instrument resets to its Startup state (first item in Preset table). Startup state can be changed. Default setting is:

   Function Voltage DC

   Set value 10.000V

   Output terminals OFF

5.2 Warm-up time

The instrument is ready after it is switched on and the initial checks complete. Specified parameters are guaranteed only when internal temperature reaches certain point.

Symbol appears on display when internal temperature gets out of range (e.g. on startup, ambient temperature is too high or too low), specified parameters are not guaranteed in such state.

Figure 8: Warm-up

5.3 User language

The default user language of the DIGISTANT® model 4463 is English. You can't select another user language.

5.3.1 Device information

Main menu is displayed after pressing „Menu" softkey. Main Menu allows configuration and calibration of the device.

Figure 9: Setup menu

Required menu item is highlighted using cursor keys ▲,▼ or display softkeys. Highlighted menu is selected by pressing SELECT key or „Select" softkey. Only editable items can be selected.

Information
This menu displays information about the DIGISTANT® model 4463. The user can't change items.

- Manufacturer
- Model
- Serial number
- Software version
- Calibration validity

6 Manual operation of the device

6.1 Main menu

Main menu is displayed after pressing „Menu“ softkey. Main Menu allows configuration and calibration of the device.

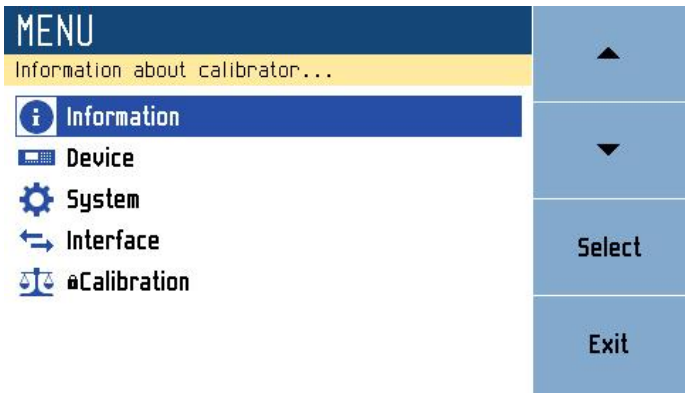


Figure 10: Setup menu

Required menu item is highlighted using cursor keys ▲,▼ or display softkeys. Highlighted menu is selected by pressing SELECT key or „Select“ softkey. Only editable items can be selected.

6.1.1 Settings menu

Settings menu is displayed after pressing „Settings“ softkey in main function window. It won’t appear in editing mode so when in editing mode you have to press “Cancel” first.

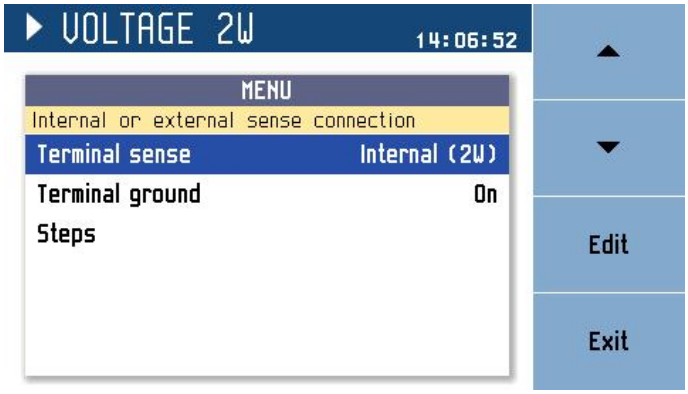


Figure 11: Settings menu

In settings menu you can edit all available auxiliary parameters of the current function. These settings are discarded on restart so if you would like to save them for your next calibration session, use the “Preset” feature.

Information
This menu displays information about the device. The user can’t change items.

- Manufacturer
- Model
- Serial number
- Software version
- Calibration validity

Device
This menu summarizes settings of auxiliary parameters for all functions. For description of individual items see chapter 6.2 titled Setting the function page 23.

System
This menu permits setting system parameters of device.

- Language
  Language setting.
- Backlight
  Display backlight level setting.
- Beeper
  Beeper setting.
- Show tooltips on display
  Enables / Disables tooltips in the function windows (specification, ranges …).
- Date&Time
  Internal date/time setting.

Interface
This menu permits setting parameters of remote control interfaces.

- Active bus
  Active bus setting. Only active bus can be used for remote control.
- RS232 Baudrate
  RS232 communication baudrate setting. The same baudrate must be used in the controller.
- GPIB Address
  GPIB address setting. Each instrument connected to the GPIB bus must have a unique address.
- LAN Settings
  Ethernet parameters setting. Device use Telnet protocol. Default setting is:
- DHCP ON
- IP Address 192.168.001.100 only valid if DHCP is OFF
- Subnet mask 255.255.255.000 only valid if DHCP is OFF
- Default gateway 255.255.255.255 only valid if DHCP is OFF
- Port number 23
- Host name 4463_SNXXXXXX only valid if DHCP is ON

Calibration
This menu permits adjusting of calibration constants. See chapter 8 titled Calibration page 78.

6.2 Setting the function

Function can be changed after pressing „Function“ softkey. New function is selected using cursor keys ▲,▼ or display softkeys. Selection must be confirmed by pressing SELECT key, ENTER key or „OK“ softkey.

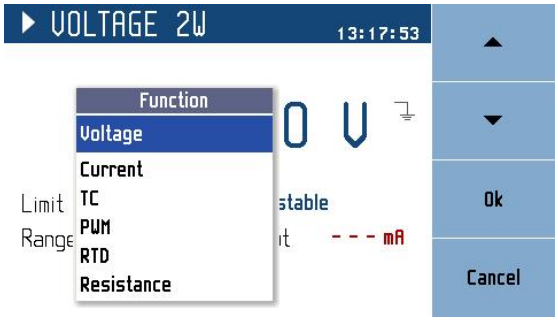


Figure 12: Function selection

6.2.1 Voltage

Offers direct setting of DC voltage.

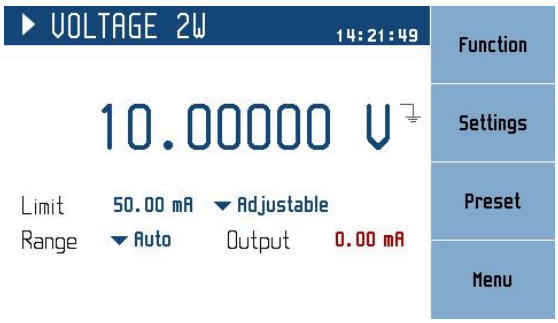


Figure 13: Voltage screen

Parameters:

Limit: 1.00 mA … 50.00 mA

Maximum output current without limiting the output voltage. Parameter can be changed in the switch position “Adjustable”. In the switch position “Maximum” is set to maximum value.

Range: Auto, 100V, 30V, 3V, 300mV
Voltage range selection.

Output: Output current measured value.

Auxiliary parameters (Settings):

Terminal sense: Internal (2W), External (4W)
Two or four wire output configuration.

Terminal ground: On, Off
Connects LO terminal with the protective earth (PE) terminal in On state. On state is indicated by the GND symbol ⏚ next to the main value.

Steps: Definition of 32 user programmable timing sequences. Each sequence contains up to 100 steps (amplitude/duration).

6.2.2 Current

Offers direct setting of DC current.

Figure 14: Current screen

Parameters:

Limit: 1.00 V … 100.00 V
Maximum output voltage without limiting the output current.
Parameter can be changed in the switch position “Adjustable”. In the switch position “Maximum” is set to maximum value.

Range: Auto, 50mA, 25mA
Current range selection.

Output Output voltage measured value.

Auxiliary parameters (Settings):

Terminal ground: On, Off
Connects LO terminal with the protective earth (PE) terminal in On state. On state is indicated by the GND symbol ⏚ next to the main value.

Steps: Definition of 32 user programmable timing sequences.
Each sequence contains up to 100 steps (amplitude/duration).

6.2.3 TC

Offers direct setting of TC temperature.

Figure 15: TC screen

Parameters:

TC type: R, S, B, J, T, E, K, N, M, C, D, G2

RJ mode: Manual, Extern
Reference junction compensation.

RJ: Reference junction temperature.

- Red measured value for Extern RJ mode.

- Blue editable value for Manual RJ mode.

Auxiliary parameters (Settings):

Terminal ground: On, Off
Connects LO terminal with the protective earth (PE) terminal in On state.
On state is indicated by the GND symbol ⏚ next to the main value.

Temperature unit: °C, °F, K

External RJ: Folder with all RJ settings.

RJ type: Platinum, Nickel – type of external RTD.

RJ R0: 100 Ω … 200 Ω, R0 value of external RTD.

Platinum standard: Pt385 (68), Pt385 (90), Pt3916, Pt3926, Pt user

Platinum user coeff. A:

Platinum user coeff. B:

Platinum user coeff. C: User coefficients for Pt user platinum standard.

Steps: Definition of 32 user programmable timing sequences. Each sequence contains up to 100 steps (amplitude/duration).

6.2.4 Frequency

Offers direct setting of frequency (period) of generated pulses.

Figure 16: Frequency screen

Parameters:

Duty: 0.50% … 99.50%, duty cycle of generated signal

Count: 0 … 9999999, number of generated pulses
Pulses generator must be set to On in Settings.

Pull-Up: Off, On

Actual: Actual number of generated pulses

Auxiliary parameters (Settings):

Expression: Frequency, Period

Pulses generator: Off, On
Exact number of pulses generation.

Steps: Definition of 32 user programmable timing sequences. Each sequence contains up to 100 steps (amplitude/duration).

6.2.5 RTD

Offers direct setting of temperature of simulated resistance thermometer.

Figure 17: Platinum screen

Parameters:

RTD Type: Platinum, Nickel

Standard: PT385 (68), PT385 (90), PT3916, PT3926, PT User

R0: 100 Ω … 1000 Ω

Auxiliary parameters (Settings):

Wire connection: 2W, 4W
Two or four wire output configuration.

Terminal ground: On, Off
Connects Li and Lu terminals with the protective earth (PE) terminal in On state. On state is indicated by the GND symbol next to the main value.

Temperature unit: °C, °F, K

Platinum user coeff. A:

Platinum user coeff. B:

Platinum user coeff. C: User coefficients for Pt user platinum standard.

Steps: Definition of 32 user programmable timing sequences. Each sequence contains up to 100 steps (amplitude/duration).

6.2.6 Resistance

Offers direct setting of Resistance.

Figure 18: Resistance screen

Parameters:

Short:Off, On Short circuit simulation. Also the short circuit must be connected to the output terminals by the OPER key.

Auxiliary parameters (Settings):

Wire connection: 2W, 4W
Two or four wire output configuration.

Terminal ground: On, Off
Connects Li and Lu terminals with the protective earth (PE) terminal in On state. On state is indicated by the GND symbol ⏚ next to the main value.

Steps: Definition of 32 user programmable timing sequences. Each sequence contains up to 100 steps (amplitude/duration).

6.3 Preset menu

Preset menu is displayed after pressing „Preset“ softkey in the main function window. It won’t appear in editing mode so when in editing mode you have to press “Cancel” first.

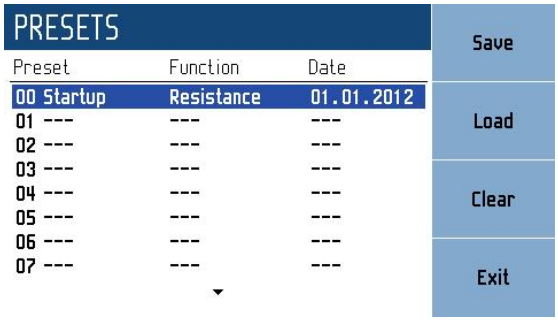


Figure 19: Preset menu

Presets contain all settings that normally disappear on restart. This includes auxiliary and main parameters for all functions (see previous chapter), selected function, main value and step state. Presets doesn’t contain system, interface or calibration data as well as output state and step tables. Up to a 100 presets can be stored including a special “Startup” preset which is loaded on every device startup.

Startup (position 00) is reserved for the definition of device settings after power on. User can save any required Startup configuration.

Preset can be selected using cursor keys where ◄, ► skip through pages.

Save – Save current device settings to selected preset. Preset name can be edited before final saving.

Load – Load selected preset and return to function window defined by the preset.

Clear – Set selected preset to default factory setup.

Exit – Return to main function window.

6.4 Setting the value of output signal

Edit mode

Parameters of output signal can be changed in Edit mode. Only parameters displayed in blue color can be changed. Display can be switched to edit mode in different ways:

- Pressing numeric button
- Pressing SELECT key
- Pressing cursor button

In edit mode is edited value highlighted by blue background. Exception is the main parameter, which is not highlighted. You can change among editable (blue) parameters pressing the SELECT key. Edit mode is finished by pressing CANCEL key.

Entry of the value using numeric keyboard

This is how it works

1. Use the numeric keyboard to set the desired value.
2. After the first digit is entered, input box is displayed. In the upper row of the input box is the name of edited parameter.
3. Using softkeys you can enter the new value in different units.

Figure 20: Numeric value entry

4. Enter desired value.
5. After the entry is complete press softkey with requested unit or press ENTER key. ENTER key inputs the value in basic units (V, Ω, °C …).
6. Instrument sets the new value.
7. The value is copied to the appropriate field in the screen and the input box disappears.

Note: All parameters have limits (high and low). If the entered value is outside these limits warning message is displayed „Value too high (low)“ and new value is not accepted.

Entry of the value using cursor keys

This is how it works

1. Press ◄, ►, ▲ or ▼ key. The display now includes cursor marks which points to the active digit.
2. ▲,▼ keys can be used to change the value. ◄, ► keys can be used to change the position of active digit.
3. To get to the default screen, press CANCEL key.

7 Remote control of the device

7.1 Remote control

Device can be controlled via RS232, GPIB, LAN and USB interface. Only one bus can be set as active for communication. It is therefore necessary to select and set-up one of the interfaces using the system menu. All interfaces shares the same commands except following commands, which are intended only for use with RS232, LAN and USB interface:

SYSTem:LOCal

This command places device in the “LOCAL” mode.

SYSTem:REMote

This command places device in the “REMOTE” mode.

SYSTem:RWLock

This command places the device in the “REMOTE” mode and locks all keys (including LOCAL key) on front panel.

Note: If device is not in REMOTE mode all other commands are ignored (for RS232, LAN and USB interface). With the exception of Compatible commands which are processed each time. GPIB interface places device in the “REMOTE” mode automatically by opening the GPIB interface and therefore these commands are not intended for this interface.

7.1.1 RS232 Interface

Device can be controlled via standard RS232 interface.

Following equipment is required:

- DIGISTANT® model 4463 precision DC calibrator
- Personal Computer (or other controlling device) with RS232 port (USB-to-RS232 converter is also possible)
- 9-pin D-SUB, 3-wire direct (1:1) male/female RS232 cable

The RS232 interface must be selected from system menu to be in operation (MENU->Interface->Active bus). There is only one RS232 setting accessible from the system menu under MENU->Interface path:

RS232 Baudrate 1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200

Other RS232 parameters are fixed to the following settings:

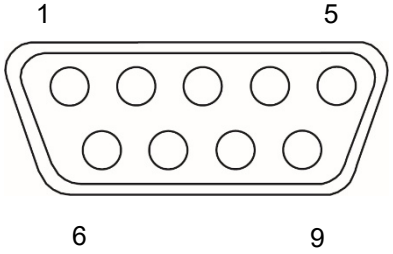
Number of data bits 8

Number of stop bits 1

Parity None

Handshake (XON/XOFF) Off

RS232 connection



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

Figure 21: RS232 9 pin D-SUB MALE connector

RS232 cable wiring between device and computer (configuration 1:1)

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

Table 3: RS232 cable connection

7.1.2 GPIB Interface (option)

Device can be controlled via GPIB (General Purpose Interface Bus) interface.

Following equipment is required:

- DIGISTANT® model 4463 precision DC calibrator with LAN, USB, IEEE488 bus option
- Personal Computer (or other controlling device) with GPIB interface
- GPIB cable

The GPIB interface must be selected from system menu to be in operation (MENU->Interface->Active bus). There is only one GPIB setting accessible from the system menu under MENU->Interface path:

GPIB Address 1 to 31

The instrument performs the following functions based on IEEE488 bus commands:

SH1, AH1, T5, L3, RL1, DC1

The instrument also recognizes the following general commands:

DCL Device Clear - resets the instrument to its basic state

SDC Selected Device Clear - resets the instrument to its basic state

GTL Go To Local - switches the remote control off

LLO Local Lock Out switches the local control off, the instrument cannot be controlled from the front panel

Commands are identical to the commands for RS-232 interface.

Figure 22: IEEE488 connector

7.1.3 LAN Interface (option)

LAN Interface allows communication with device using Telnet protocol. A proper setting must be established.

Following equipment is required:

- DIGISTANT® model 4463 precision DC calibrator with LAN, USB, IEEE488 bus option
- Personal Computer (or other controlling device) with LAN interface
- LAN cable

The LAN interface must be selected from system menu to be in operation (MENU->Interface->Active bus). There are following LAN settings accessible from system menu under MENU->Interface->LAN Settings path (values are default ones):

DHCP	ON	
IP Address	192.168.001.100	only valid if DHCP is OFF
Subnet mask	255.255.255.000	only valid if DHCP is OFF
Default gateway	255.255.255.255	only valid if DHCP is OFF
Port number	23	
Host name	4463_SNXXXXXX	only valid if DHCP is ON

If DHCP (Dynamic Host Configuration Protocol) is enabled, the IP Address and all necessary settings are done automatically and connection in Telnet protocol is done via “Host name” and “Port number”. Otherwise the IP address, Subnest mask and Default gateway should be properly set. In this case connection is done via “IP Address” and “Port number”.

Connection to the device using Microsoft Telnet terminal with DHCP option enabled:

Figure 23: LAN connection 1

If connection is successful, following screen will appear:

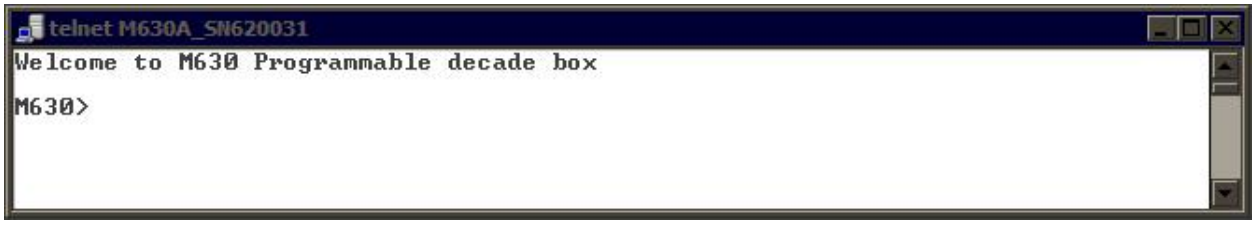


Figure 24: LAN connection 2

7.1.4 USB Interface (option)

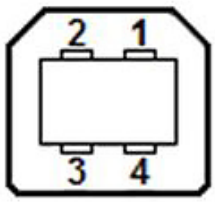
Device can be controlled via USB (Universal Serial Bus) interface.

Following equipment is required:

- DIGISTANT® model 4463 precision DC calibrator with LAN, USB, IEEE488 bus option
- Personal Computer (or other controlling device) with USB interface (USB type A connector)
- Standard USB A-B cable

The USB interface must be selected from system menu to be in operation (MENU->Interface->Active bus). There is no USB setting in the device menu.

Device is equipped with USB type B connector.



Pin	Label	Description
1	+5 V	Power supply
2	DATA-	Data signal -
3	DATA+	Data signal +
4	GND	Ground

Figure 25: USB connector

Communication from user control program is performed via standard RS232 interface. Following settings must be set on your PC for proper operation:

Baudrate	9600 Bd
Data bits	8
Stop bits	1
Parity	None

Also proper COM port must be selected. After connecting device to your PC, virtual COM port should appear in System Control panel of Microsoft Windows OS. This COM port is labeled “USB Serial Port (COMxx)”.

7.1.5 Command syntax

The commands described in this chapter can be issued through all buses (RS232/GPIB/LAN/USB).

All commands listed in this chapter are explained in two columns:

KEYWORD and PARAMETERS.

KEYWORD column includes the name of the command. Each command includes one or more keywords. If a keyword is in brackets ([ ]), it is not mandatory. Non-mandatory commands are used only to achieve compatibility with language standard SCPI.

Capitals designate the abbreviated form of the commands; extended form is written in lowercase.

Command parameters are in brackets (<>); each parameter is separated using a comma. Parameters in brackets ([ ]) are not mandatory. Line (|) means “or” and is used to separate several alternative parameters.

Semicolon ‘;’ is used to separate more commands written on one line.

E.g. :RES 100;:OUTP ON

Terminators:

For GPIB interface each command line must end with <lf>. Response from the device also returns <lf>. For non GPIB interfaces <cr>, <lf> or <crlf> can be used as terminator. The device returns <crlf> in this case. The device performs all commands written on one line of the program after it receives terminator. Without terminator, the program line is not executed.

Description of abbreviations

<DNPD> = Decimal Numeric Program Data, this format is used to express decimal number with or without the exponent.

<CPD> = Character Program Data. Usually, it represents a group of alternative character parameters. E.g. {SERial|GPIB|USB|LAN}.

<SPD> = String Program Data (quoted string). This type of parameter is similar to CPD, but allows transmission of more ISO characters.

<BOOL> = Boolean Program Data. This type of parameter has only two states 0 and 1. Parameter can take form of integer value (0 or 1), or character alias (ON or OFF). Device always returns integer value (0 or 1).

<UNIT> = unit parameter works in conjunction with DNPD parameter and specifies unit of DNPD (numeric) value. Unit must be selected from predefined ones. If UNIT part is omitted, default one is used. Query always returns actual unit.

? = 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 executes the program line.

<lf> = line feed. ASCII code 10. This code executes the program line.

7.1.6 SCPI Command Tree

This chapter summarizes all public SCPI commands supported by device in alphabetic order. Detailed description follows in next chapter.

:CALibration

```
:DATE(?) <DNPD>,<DNPD>,<DNPD>
:INTerval(?) <DNPD>
:POINt
    :AMPLitude(?) <DNPD>
    :CONVerter? <DNPD>
    :DATE(?) <DNPD>,<DNPD>,<DNPD>
    :MEASure? <DNPD>
    :MODE(?) <DNPD>
    :SELect(?) <DNPD>
    :SAVE
:SECure
    :EXIT
    :PASSword(?) <DNPD>
:ACAL
    :ENAB(?){ON|OFF|1|0}
```

:DISPlay

```
:ANNotation
    :CLOCk
        :DATE
            :FORMat(?) {MDYS|MDYA|DMYS|DMYO|DMYA|YMDS|YMDO}
        [:STATe](?) {ON|OFF|1|0}
    :TOOLtip
        [:STATe](?) {ON|OFF|1|0}
:METer
    [:STATe](?) {ON|OFF|1|0}
:BRIGhtness(?) <DNPD>
:LANGuage(?) {ENGLish}
```

:MEMory

```
:COUNt? <DNPD>
:PART<IND_MEMORY>
    :NAME? <CPD>
    :SIZE? <DNPD>
    :TRANsfer<IND_COUNTER>(?) <CPD>
```

:OUTPut

```
[:STATe](?) {ON|OFF|1|0}
:LOW(?) {FLOat|GROund}
:COMPensation(?) {ON|OFF|1|0}
:RESistance
    :SHORt(?) {ON|OFF|1|0}
    :COMPensation(?) {ON|OFF|1|0}
:FREQuency
    :PULL(?) {ON|OFF|1|0}
```

[:SOURce]

```
:VDC
    [:AMPLitude](?) <DNPD>[V]
    :RANGe(?) {AUTO|100V|30V|3V|300MV}
    :LIMiting
        [:AMPLitude](?) <DNPD>[A]
        :RESet(?) {ADJustable|MAXimum}
```

```
:CDC
        [:AMPLitude](?) <DNPD>[A]
        :RANGe(?) {AUTO|50MA|25MA}
        :LIMiting
                [:AMPLitude](?) <DNPD>[V]
                :RESet(?) {ADJustable|MAXimum}
:RTD
        [:AMPLitude](?) <DNPD>[{CEL|FAR|K}]
        :TYPE(?) {PLATinum|NICKel}
        :ZRESistance(?) <DNPD>[OHM]
        :STANdard(?) {PT385A|PT385B|PT3916|PT3926|USER}
        :COEFficient(?) <DNPD>,<DNPD>,<DNPD>
:TCPL
        [:AMPLitude](?) <DNPD>[{CEL|FAR|K}]
        :TYPE(?) {R|S|B|J|T|E|K|N|M|C|D|G2}
        :RJMode(?) {MANual|EXTern}
        :RJAMplitude(?) <DNPD>
        :RJEXtern
                :TYPE (?) {PLATinum|NICKel}
                :RJMode (?) <DNPD>[OHM]
                :PTSTandard(?) { PT385A|PT385B |PT3916|PT3926|PTUSER}
                :COEFficient(?) <DNPD>,<DNPD>,<DNPD>
:FREQuency
        [:AMPLitude](?) <DNPD>[HZ]
        :DUTY(?) <DNPD>
        :PULSes
                [:STATe](?) {ON|OFF|1|0}
                :COUNt(?) <DNPD>
                :ACTual? <DNPD>
:RESistance
        [:AMPLitude](?) <DNPD>[OHM]
:STEP
        [:STATe](?) {ON|OFF|1|0}
        :SELect<IND_STEP>(?) <DNPD>
        :PRESet
                :COUNt? <DNPD>
                :NAME(?) <SPD>
                :PCLear
                :RAPPend <SPD>
                :RCOunt? <DNPD>
                :ROW<IND_COUNTER>
                        :AMPLitude(?) <SPD>
                        :RDELete
                :SAVE
```

:MEASure

```
:VOLTage
        [:AMPLitude]? <DNPD>[V]
:CURRent
        [:AMPLitude]? <DNPD>[A]
:CONFigure(?) {FREQ|COUN}
:FREQuency
        [:AMPLitude]? <DNPD>[HZ]
:COUNter
        [:AMPLitude]? <DNPD>
        :CLEar
```

:TCPL

:RJAMplitude(?) <DNPD>

:STATus

:OPERation
:CONDition(?) <DNPD>
:ENABle(?) <DNPD>
[:EVENt]? <DNPD>
:NTRansition(?) <DNPD>
:PTRansition(?) <DNPD>
:QUEStionable
:CONDition(?) <DNPD>
:ENABle(?) <DNPD>
[:EVENt]? <DNPD>
:NTRansition(?) <DNPD>
:PTRansition(?) <DNPD>

:SYSTem

:BEEPer
:STATe(?) {ON|OFF|1|0}
:VOLume(?) <DNPD>
:KEYBoard(?) {ON|OFF|1|0}
:COMMunicate
:BUS(?) {SERial|GPIB|USB|LAN}
:GPIB
:ADDRess(?) <DNPD>
:LAN
:ADDRess(?) <CPD>
:MASK(?) <CPD>
:GATE(?) <CPD>
:PORT(?) <DNPD>
:HOST(?) <CPD>
:DHCP(?) {ON|OFF|1|0}
:RESTart
:SERial
:BAUD(?) {1200|2400|4800|9600|19200|38400|57600|115200}
:TBUS(?) {SERial|GPIB|USB|LAN}
:DATE(?) <DNPD>,<DNPD>,<DNPD>
:ERRor
[:NEXT]? <CPD>
:KEY(?) <DNPD>
:LOCal
:MODel? <DNPD>
:PRESet
:REMote
:RWLock
:SERVice
:CFLash
:CRAM
:TIME(?) <DNPD>,<DNPD>,<DNPD>
:VERSion? <CPD>

:UNIT

:TEMPerature(?) {CEL|FAR|K}

***CLS**

***ESE(?)**

***ESR?**

***IDN?**

***OPC(?)**

***OPT?**

***RST**

***SRE(?)**

***STB?**

***TST?**

***WAI**

7.1.7 Standard Status Data Structures

Device meets standard protocol according to the standard IEEE488.2. The protocol can be used for checking of error and status behavior of the device. It enables single-wire transmitting of SRQ command. The conditions on which SRQ signal (local control request) is sent can be set with parameters *STB?, *SRE?, *SRE, *ESR?, *ESE?, *ESE a *CLS.

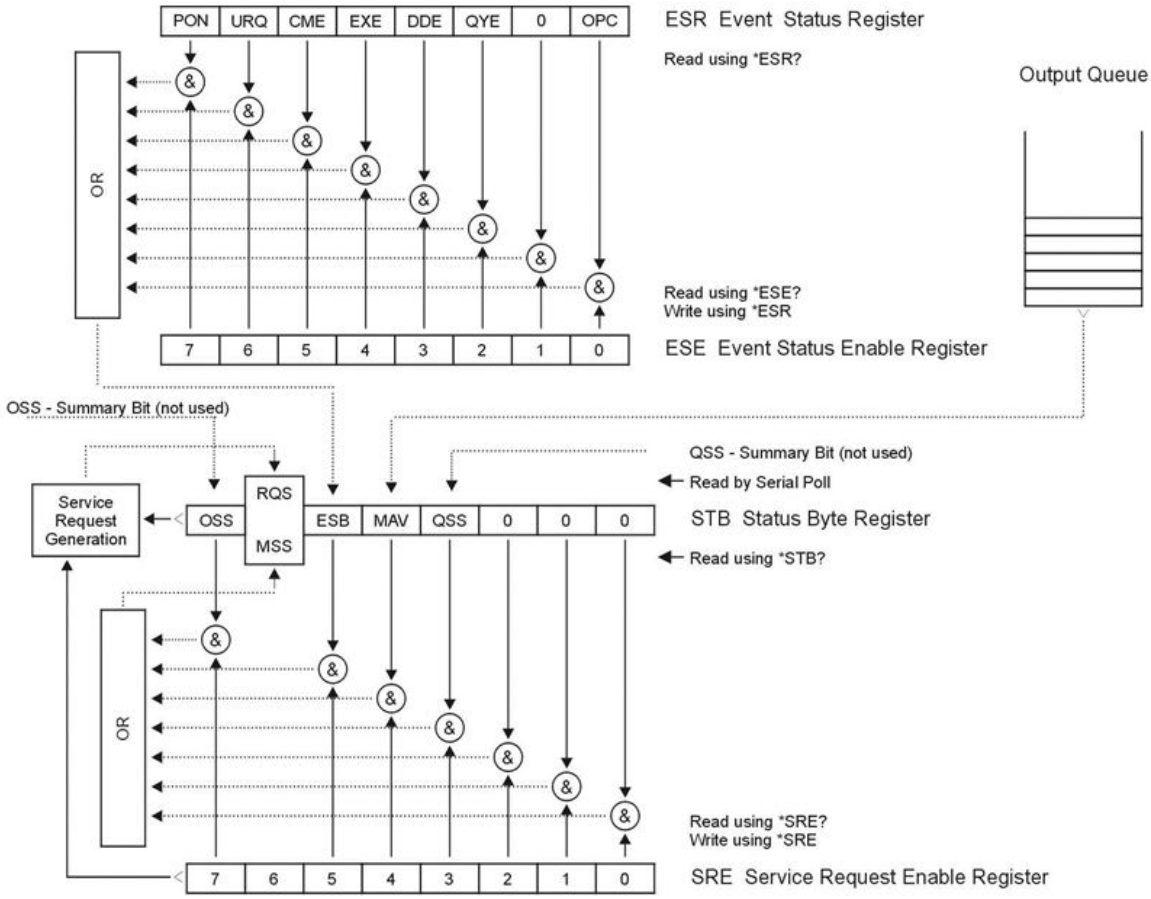


Figure 26: Status register overview

Status data structure contains following registers:

STB – Status Byte Register

SRE – Service Request Enable Register

ESR – Event Status Register

ESE – Event Status Enable Register

Output Queue

STB Status Byte Register

STB is main register where information from other status registers and from output queue is collected. Value of STB register is reset after switching on the device or after sending command *CLS. This command reset the STB register except bit MAV, which remains set if the output queue is not empty. STB register value can be read via serial message or through general query *STB?.

Bit configuration of Status Byte Register:

OSS	Operation Summary Status, bit 7. SCPI-defined. The OSS bit is set to 1 when the data in the OSR (Operation Status Register) contains one or more enabled bits which are true.

RQS	Request Service, bit 6. The bit is read as a part of status byte only when serial message is sent.
MSS	Master Summary Status, bit 6. The MSS bit is set to 1 whenever bits ESB or MAV are 1 and enabled (1) in the SRE. This bit can be read using the *STB? command. Its value is derived from STB and SRE status.
ESB	Event Summary Bit, bit 5. His value is derived from STB and SRE status. The ESB bit is set to 1 when one or more enabled ESR bits are set to 1.
MAV	Message Available, bit 4. The MAV bit is set to 1 whenever data is available in the IEEE488 Output Queue (the response on query is ready).
QSS	Questionable Summary Status, bit 3. SCPI-defined. The QSS bit is set to 1 when the data in the QSR (Questionable Status Register) contains one or more enabled bits which are true.

SRE Service Request Enable Register

The Service Request Enable Register suppresses or allows the STB bits. “0” value of a SRE bit means, that the bit does not influence value of MSS bit. Value of any unmasked STB bit results in setting of the MSS bit to the level “1” . SRE bit 6 is not influenced and its value is “0”. The SRE register value can be set via the command *SRE followed by mask register value (0 – 191). The register can be read with the command *SRE?. The register is automatically resets after switching the device on. The register is not reset by the command *CLS.

ESR Event Status Register

Every bit of the EventStatusRegister corresponds to one event. Bit is set when the event is changed and it remains set also when the event passed. The ESR is cleared when the power is turned on (except bit PON which is set), and every time it is read via command *ESR? Or cleared with *CLS.

Bit configuration of Event Status Register:

PON	Power On, bit 7. This event bit indicates that an off-to-on transition has occurred in the device’s power supply.
URQ	User Request, bit 6. Bit is not used and it is always “0”.
CME	Command Error, bit 5. This event bit indicates that the instrument has detected an incorrectly formed command or query.
EXE	Execution Error, bit 4. This event bit indicates that the received command cannot be executed, owing to the device state or the command parameter being out of limits.
DDE	Device Dependent Error, bit 3. This event bit indicates that an error has occurred which is neither a Command Error, a Query Error, nor an Execution Error. A Device-specific Error is any executed device operation that did not properly complete due to some condition, such as overload.
QYE	Query Error, bit 2. The bit is set if the device is addressed as talker and output queue is empty or if control unit did not pick up response before sending next query.
OPC	Operation Complete, bit 0. This event bit is generated in response to the *OPC command. It indicates that the device has completed all selected pending operations.

ESE Event Status Enable Register

The Event Status Enable Register allows one or more events in the Event Status Register to be reflected in the ESB summary-message bit. This register is defined for 8 bits, each corresponding to the bits in the Event Status Register. The Event Status Enable Register is read with the common query *ESE?. Data is returned as a binary-weighted value. The Event Status Enable Register is written to by the common command, *ESE. Sending the *ESE common command followed by a zero clears the ESE. The Event Status Enable Register is cleared upon power-on.

It suppresses or allows bits in ESR register. Value „0“ of a bit of ESE register suppresses influence of appropriate bit of ESR register on value of sum bit of ESB status register. Setting of any unmask bit of ESR register results in setting of ESB status register. ESE register value can be modified by command *ESE followed by value of mask register (integer in range 0 –255). Reading of the register can be

performed with command *ESE?. The register is automatically reset after switching on. The register is not reset with *CLS command.

Operation Status Register
Not used in this device.

Questionable Status Register
Not used in this device.

Output Queue

The Output Queue stores response messages until they are read from control unit. If there is at minimum one sign in the output queue, MAV register (message available) is set. The Output Queue is cleared upon power-on and after reading all signs from output queue.

Error Queue

The Error Queue stores error messages. They are placed in a “first in, first out” queue.
The queue is read destructively using the query command “SYSTem:ERRor?” to obtain a code number and error message. The query “SYSTem:ERRor?” can be used to read errors in the queue until it is empty, when the message “0, No Error” will be returned.

7.1.8 SCPI Standard Commands

This chapter describes standard SCPI commands.

***IDN?**

Syntax:
*IDN?

Description:
This command returns the identification of the manufacturer, model, serial number and firmware revision.

Parameters:
<CPD>: manufacturer
<CPD>: model
<DNPD>: serial number
<DNPD>: firmware version

Remarks:
Overlapped command

Example:
*IDN? Response: burster, 4463, 712341,1.000

***OPC**

Syntax:
*OPC

Description:

This command sets the OPC bit in the ESR (Event Status Register) when all pending operations are complete.

Parameters:

None

Remarks:
Overlapped command

Example:
*OPC

***OPC?**

Syntax:
*OPC?

Description:
This command returns “1” to the output queue after all pending operations inside device are complete.

Parameters:
<DNPD>: always returns 1

Remarks:
Sequential command

Example:
*OPC? Response: 1

***OPT?**

Syntax:
*OPT?

Description:
This command return the instrument’s hardware fitment. The only parameter returns presence of GPIB/LAN/USB interface.

Parameters:
<DNPD>: 0 – extended interface not present, 1 – extended interface present

Remarks:
Overlapped command

Example:
*OPT? Response: 1

***WAI**

Syntax:
*WAI

Description:
Prevents the instrument from executing any further commands or queries until all previous remote commands have been executed.

Parameters:
None

Remarks:
Sequential command

Example:
*WAI

***RST**

Syntax:
*RST

Description:
This command resets the device to its initial status.

Parameters:
None

Remarks:
Sequential command

Example:
*RST

***TST?**

Syntax:
*TST?

Description:
This command launches internal self-test and returns result.

Parameters:
<DNPD>: 0 – test passed, 1 – test failed

Remarks:
Sequential command

Example:
*TST? Response: 0

***STB?**

Syntax:
*STB?

Description:
This query returns content of register STB, which carries the MSS bit status.

Parameters:
<DNPD>: Status byte register, Range 0 … 255

Remarks:
Overlapped command

Example:
*STB? Response: 0

***SRE**

Syntax:
*SRE
*SRE?

Description:
This command allows set condition of the Service Request Enable register. Since bit 6 is not used, the maximum value is 191.

Parameters:
<DNPD>: Service Request Enable register

Remarks:
Overlapped command

Example:
*SRE 2
*SRE? Response: 2

***ESR?**

Syntax:
*ESR?

Description:

This query returns the contents of the Event Status Register and clears the register.

Parameters:
<DNPD>: Event Status Register

Remarks:
Overlapped command

Example:
*ESR? Response: 0

***ESE**

Syntax:
*ESE
*ESE?

Description:
This command programs the Event Status Enable register bits.

Parameters:
<DNPD>: Event Status Enable register, Range 0 … 255

Remarks:
Overlapped command

Example:
*ESE 2
*ESE? Response: 2

***CLS**

Syntax:
*CLS

Description:
This command clears all status data structures in the device i.e. Event Status Register, Status Byte Register except the MAV bit, Operation Status Register, Questionable Status Register. Also error queue is cleared. Output queue is unaffected.

Parameters:
None

Remarks:
Overlapped command

Example:
*CLS

7.1.9 SCPI Commands

This chapter describes all public SCPI commands in detailed form. The commands here are in alphabetic order.

:CALibration:DATE

Syntax:
:CALibration:DATE <DNPD>,<DNPD>,<DNPD>
:CALibration:DATE?

Description:
This command sets date of last calibration.

Parameters:
<DNPD>: Year, Range 2000 ... 2063
<DNPD>: Month, Range 1 ... 12
<DNPD>: Day, Range 1 ... 31

Remarks:
This command requires "Calibration" access
Overlapped command

Example:
CAL:DATE 2017,01,13
CAL:DATE? Response: 2017,01,13

:CALibration:INTerval

Syntax:
:CALibration:INTerval <DNPD>
:CALibration:INTerval?

Description:
This command sets recommended calibration interval for this unit.

Parameters:
<DNPD>: Month, Range 1 ... 240

Remarks:
This command requires "Calibration" access
Overlapped command

Example:
CAL:INT 12
CAL:INT? Response: 12

:CALibration:POINt:AMPLitude

Syntax:
:CALibration:POINt:AMPLitude <DNPD>
:CALibration:POINt:AMPLitude?

Description:
This command sets calibration value of particular point. Data will be saved to nonvolatile memory on CAL:POIN:SAVE command.

Parameters:
<DNPD>: Calibration point value. Ranges and default values varies in accordance to selected point (see “Calibration points”).

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:AMPL 1.944
CAL:POIN:AMPL? Response: 1.944000E+00

:**CALibration:POINt:CONVerter?**

Syntax:
:CALibration:POINt:CONVerter?

Description:
This command reads converter value of particular calibration point.

Parameters:
<DNPD>: Calibration converter value. Ranges and default values varies in accordance to selected point (see “Calibration points”).

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:CONV? Response: 1.944000E+00

:CALibration:POINt:DATE?

Syntax:
:CALibration:POINt:DATE?

Description:
This command reads date of last calibration of calibration point.

Parameters:
<DNPD>: Year, Range 2000 ... 2063
<DNPD>: Month, Range 1 ... 12
<DNPD>: Day, Range 1 ... 31

Remarks:
Overlapped command

Example:
CAL:POIN:DATE? Response: 2017,01,13

:CALibration:POINt:MEASure?

Syntax:
:CALibration:POINt:MEASure?

Description:
This command reads measured value of particular calibration point.

Parameters:
<DNPD>: Calibration measured value. Ranges and default values varies in accordance to selected point (see “Calibration points”).

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:MEAS? Response: 1.000000E+00

:CALibration:POINt:MODE

Syntax:
:CALibration:POINt:MODE <DNPD>
:CALibration:POINt:MODE?

Description:
This command enters calibration mode. Mode refers to a particular range.

Parameters:

<DNPD: Ranges and default values varies in accordance to selected point (see “Calibration points”).

Remarks:
This command requires "Calibration" access
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:MODE 5
CAL:POIN:MODE? Response: 5

:CALibration:POINt:SELect

Syntax:
:CALibration:POINt:SELect <DNPD>

:CALibration:POINt:SELect?

Description:
This command selects calibration points of particular mode.

Parameters:
<DNPD>: Ranges and default values varies in accordance to selected point (see “Calibration points”).

Remarks:
This command requires "Calibration" access
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:SEL 1
CAL:POIN:SEL? Response: 1

:CALibration:POINt:SAVE

Syntax:
:CALibration:POINt:SAVE

Description:
This command saves current calibration point to non-volatile memory. Unsaved changes will disappear on restart, selection of another calibration point or close the calibration.

Parameters:
None

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:POIN:SAVE

:CALibration:SECure:EXIT

Syntax:
:CALibration:SECure:EXIT

Description:
This command exits calibration mode and access.

Parameters:
None

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:SEC:EXIT

:CALibration:SECure:PASSword

Syntax:
:CALibration:SECure:PASSword <DNPD>
:CALibration:SECure:PASSword?

Description:
This command validates entered password and enables calibration access if verification is successful. Access is invalidated after reset or if CAL:SEC:EXIT command is issued. Calibration password can be changed from decade system menu MENU->Calibration->Password.

Parameters:
Range 0 ... 4294967295 (default 0)

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CAL:SEC:PASS 0

:CALibration:ACAL:ENAB

Syntax:
:CALibration:ACAL:ENAB <BOOL>
:CALibration:ACAL:ENAB?

Description:
This command enables/disables auto calibration.

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
·ON autocalibration is enabled
·OFF autocalibration id disabled
·1 same as ON
·0 same as OFF

Remarks:
Overlapped command

Example:
CAL:ACAL:ENAB ON
CAL:ACAL:ENAB? Response: 1

:DISPlay:ANNotation:CLOCk:DATE:FORMat

Syntax:
:DISPlay:ANNotation:CLOCk:DATE:FORMat <CPD>
:DISPlay:ANNotation:CLOCk:DATE:FORMat?

Description:
This command selects format of date displayed on device screen.

Parameters:

<CPD> {MDYS|MDYA|DMYS|DMYO|DMYA|YMDS|YMDO} (default MDYS)

MDYS M/D/Y format (M-month, D-day, Y-year)
MDYA M-D-Y format
DMYS D/M/Y format
DMYO D.M.Y format
DMYA D-M-Y format
YMDS Y/M/D format
YMDO Y.M.D format

Remarks:
Overlapped command

Example:
DISP:ANN:CLOC:DATE:FORM MDYS
DISP:ANN:CLOC:DATE:FORM? Response: MDYS

:DISPlay:ANNotation:CLOCk[:STATe]

Syntax:
:DISPlay:ANNotation:CLOCk[:STATe] <BOOL>
:DISPlay:ANNotation:CLOCk[:STATe]?

Description:
This command enables/disables showing actual time in title on device screen.

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
ON actual time is shown
OFF actual time is hidden
1 same as ON
0 same as OFF

Remarks:
Overlapped command

Example:
DISP:ANN:CLOC ON
DISP:ANN:CLOC? Response: 1

:DISPlay:ANNotation:TOOLtip[:STATe]

Syntax:
:DISPlay:ANNotation:TOOLtip[:STATe] <BOOL>
:DISPlay:ANNotation:TOOLtip[:STATe]?

Description:
This command enables/disables showing tooltip in top on device screen.

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
ON tooltip is shown
OFF tooltip is hidden
1 same as ON
0 same as OFF

Remarks:
Overlapped command

Example:
DISP:ANN:TOOL ON
DISP:ANN:TOOL? Response: 1

:DISPlay:METer[:STATe]

Syntax:
:DISPlay:METer[:STATe] <BOOL>
:DISPlay:METer[:STATe]?

Description:
This command enables/disables showing meter in bottom on device screen.

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON meter is shown
OFF meter is hidden
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
DISP:MET ON
DISP:MET? Response: 1

:DISPlay:BRIGhtness

Syntax:
:DISPlay:BRIGhtness <DNPD>
:DISPlay:BRIGhtness?

Description:

This command sets brightness of device display.

Parameters:
<DNPD> Range 0.0 ... 1.0 (default 1.0), 0.0 – Min, 1.0 – Max brightness

Remarks:
Overlapped command

Example:
DISP:BRIG 1.0
DISP:BRIG? Response: 1.000000E+00

:DISPlay:LANGuage

Syntax:
:DISPlay:LANGuage <CPD>
:DISPlay:LANGuage?

Description:
This command selects language that is used on device display.

Parameters:
<CPD> {ENGLish} (default ENGL)
·ENGLish english version

Remarks:
Overlapped command

Example:
DISP:LANG ENGL
DISP:LANG? Response: ENGL

:OUTPut[:STATe]

Syntax:
:OUTPut[:STATe] <BOOL>
:OUTPut[:STATe]?

Description:
This command switches ON/OFF output terminals.

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON output terminals are switched on
OFF output terminals are switched off
1 same as ON
0 same as OFF

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP ON
OUTP? Response: 1

:OUTPut:LOW

Syntax:
:OUTPut:LOW <CPD>
:OUTPut:LOW?

Description:
This command connects or disconnects the Lo terminals of voltage and current outputs to/from GND terminal.

Parameters:
<CPD> {FLOat|GROund} (default GRO)
FLOat
GROund

Remarks:
The value is stored in each preset

The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP:LOW FLO
OUTP:LOW? Response: FLO

:OUTPut:COMPensation

Syntax:
:OUTPut:COMPensation <BOOL>
:OUTPut:COMPensation?

Description:
This command select 4-wire voltage outputs connection (remote sense).

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON selsects 4-wire connection
OFF selsects 2-wire connection
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP:COMP ON
OUTP:COMP? Response: 1

:OUTPut:RESistance:SHORt

Syntax:
:OUTPut:RESistance:SHORt <BOOL>

:OUTPut:RESistance:SHORt?

Description:
This command turns on short function. “Short” is activated only if output terminals are switched on (see OUTP:STAT command).

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON short is set if output is on
OFF resistance is set if output is on
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP:RES:SHOR ON
OUTP:RES:SHOR? Response: 1

:OUTPut:RESistance:COMPensation

Syntax:
:OUTPut:RESistance:COMPensation <BOOL>
:OUTPut:RESistance:COMPensation?

Description:
This command select 4-wire resistance outputs connection (remote sense).

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
ON selsects 4-wire connection
OFF selsects 2-wire connection
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP:RES:COMP ON
OUTP:RES:COMP? Response: 1

:OUTPut:FREQuency:PULL

Syntax:
:OUTPut:FREQuency:PULL <BOOL>
:OUTPut:FREQuency:PULL?

Description:
This command connects the internal pull-up resistor (50 Ω) to the Frequency output.

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON connects pull-up resistor
OFF disconnects pull-up resistor
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
OUTP:FREQ:PULL ON
OUTP:FREQ:PULL? Response: 1

[:SOURce]:VDC[:AMPLitude]

Syntax:
[:SOURce]:VDC[:AMPLitude] <DNPD>[<UNIT>
[:SOURce]:VDC[:AMPLitude]?

Description:
This command sets voltage amplitude in Voltage function. Node SOUR:VDC also selects Voltage function if not already selected.

Parameters:
<DNPD> Range -100.0 ... 100.0 (default 10.0)
<UNIT> {V}
·V Volt

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
VDC 10.0
VDC? Response: 1.000000E+01 V

[:SOURce]:VDC:RANGe

Syntax:
[:SOURce]:VDC:RANGe <CPD>
[:SOURce]:VDC:RANGe?

Description:
This command selects range in Voltage function. Node SOUR:VDC also selects Voltage function if not already selected.

Parameters:
<CPD> {AUTO|100V|30V|3V|300MV} (default AUTO)
·AUTO auto-range mode
·100V fixed 100 V range
·30V fixed 30 V range
·3V fixed 3 V range
·300MV fixed 300 mV range

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
VDC:RANG AUTO
VDC:RANG? Response: AUTO

[:SOURce]:VDC:LIMiting[:AMPLitude]

Syntax:
[:SOURce]:VDC:LIMiting[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:VDC:LIMiting[:AMPLitude]?

Description:
This command sets output current limiting in Voltage function. This command operates in conjunction with VDC:LIM:RES command. Node SOUR:VDC also selects Voltage function if not already selected.

Parameters:
<DNPD> Voltage amplitude 0-30 V: Range 0.0 ... 0.05 (default 0.05)
<DNPD> Voltage amplitude 30.0001-100 V: Range 0.0 ... 0.05 (default 0.05)
<UNIT> {A}
·A Amper

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
VDC:LIM 0.05
VDC:LIM? Response: 5.000000E-02 A

[:SOURce]:VDC:LIMiting:RESet

Syntax:
[:SOURce]:VDC:LIMiting:RESet <CPD>
[:SOURce]:VDC:LIMiting:RESet?

Description:
This command selects output current limiting behavior, if was voltage amplitude changed. Node SOUR:VDC also selects Voltage function if not already selected.

Parameters:
<CPD> {ADJustable|MAXimum} (default ADJ)
·ADJustable output current limiting is adjustable (see VDC:LIM:AMPL)
·MAXimum output current limiting is always maximum

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
VDC:LIM:RES ADJ
VDC:LIM:RES? Response: ADJ

[:SOURce]:CDC[:AMPLitude]

Syntax:
[:SOURce]:CDC[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:CDC[:AMPLitude]?

Description:
This command sets current amplitude in Current function. Node SOUR:CDC also selects Current function if not already selected.

Parameters:
<DNPD> Range -0.05 ... 0.05 (default 0.01)
<UNIT> {A}
·A Amper

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
CDC 0.01
CDC? Response: 1.000000E-02 A

[:SOURce]:CDC:RANGe

Syntax:
[:SOURce]:CDC:RANGe <CPD>
[:SOURce]:CDC:RANGe?

Description:
This command selects range in Current function. Node SOUR:CDC also selects Current function if not already selected.

Parameters:
<CPD> {AUTO|50MA|25MA} (default AUTO)
·AUTO auto-range mode
·50MA fixed 50 mA range
·25MA fixed 25 mA range

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
CDC:RANG AUTO
CDC:RANG? Response: AUTO

[:SOURce]:CDC:LIMiting[:AMPLitude]

Syntax:
[:SOURce]:CDC:LIMiting[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:CDC:LIMiting[:AMPLitude]?

Description:
This command sets output voltage limiting in Current function. This command operates in conjunction with CDC:LIM:RES command. Node SOUR:CDC also selects Current function if not already selected.

Parameters:
<DNPD> Current amplitude 0-25 mA: Range 0.0 ... 100.0 (default 30.0)
<DNPD> Current amplitude 25.0001-50 mA: Range 0.0 ... 30.0 (default 30.0)
<UNIT> {V}
·V Voltage

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
CDC:LIM 30.0
CDC:LIM? Response: 3.000000E+01 V

[:SOURce]:CDC:LIMiting:RESet

Syntax:
[:SOURce]:CDC:LIMiting:RESet <CPD>
[:SOURce]:CDC:LIMiting:RESet?

Description:
This command selects output voltage limiting behavior, if was current amplitude changed. Node SOUR:CDC also selects Current function if not already selected.

Parameters:
<CPD> {ADJustable|MAXimum} (default ADJ)
·ADJustable output current limiting is adjustable (see CDC:LIM:AMPL)
·MAXimum output voltage limiting is always maximum

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
CDC:LIM:RES ADJ
CDC:LIM:RES? Response: ADJ

[:SOURce]:RTD[:AMPLitude]

Syntax:
[:SOURce]:RTD[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:RTD[:AMPLitude]?

Description:
This command sets temperature in RTD function. Node SOUR:RTD also selects RTD function if not already selected. If unit parameter is part of temperature, new unit is set.

Parameters:

<DNPD> Temperature at Nickel function. Default value is 100.0 °C.
<UNIT> {CEL|FAR|K}
·CEL degrees of Celsius
·FAR degrees of Fahrenheit
·K Kelvin

Remarks:

The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:

RTD 100.0
RTD? Response: 1.000000E+02 CEL

[:SOURce]:RTD:TYPE

Syntax:

[:SOURce]:RTD:TYPE <CPD>
[:SOURce]:RTD:TYPE?

Description:

This command selects RTD type in RTD function. Node SOUR:RTD also selects RTD function if not already selected.

Parameters:

<CPD> {PLATinum|NICKel} (default PLAT)
·PLATinum
·NICKel

Remarks:

The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:

RTD:TYPE PLAT
RTD:TYPE? Response: PLAT

[:SOURce]:RTD:ZRESistance

Syntax:

[:SOURce]:RTD:ZRESistance <DNPD>[<UNIT>]
[:SOURce]:RTD:ZRESistance?

Description:

This command sets resistance at 0 °C for Platinum function. Node SOUR:RTD also selects RTD function if not already selected.

Parameters:

<DNPD> Range 100.0 ... 1000.0 (default 100.0)
<UNIT> {OHM}
·OHM

Remarks:

The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:

RTD:ZRES 100.0
RTD:ZRES? Response: 1.000000E+02 OHM

[:SOURce]:RTD:STANdard

Syntax:
[:SOURce]:RTD:STANdard <CPD>
[:SOURce]:RTD:STANdard?

Description:
This command selects Platinum temperature standard. Node SOUR:RTD also selects RTD function if not already selected.

Parameters:

<CPD>	{PT385A|PT385B|PT3916|PT3926|USER} (default PT385A)
PT385A	Pt385 (68) standard
PT385B	Pt385 (90) standard
PT3916	Pt3916 standard
PT3926	Pt3926 standard
USER	User (see RTD:COEF command)

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
RTD:STAN PT385A
RTD:STAN? Response: PT385A

[:SOURce]:RTD:COEFficient

Syntax:
[:SOURce]:RTD:COEFficient <DNPD>,<DNPD>,<DNPD>
[:SOURce]:RTD:COEFficient?

Description:
This command allows to define Coefficients (A, B, C) used for “User” Platinum standard scale. Node SOUR:RTD also selects RTD function if not already selected.

Parameters:

<DNPD>	Range 3e-3 ... 5e-3 (default 3.9083E-3)
<DNPD>	Range -7e-7 ... -5e-7 (default -5.775E-7)
<DNPD>	Range -5e-12 ... -3e-12 (default -4.18301E-12)

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
RTD:COEF 3.9083E-3,-5.775E-7,-4.18301E-12
RTD:COEF? Response: 3.908300E-03,-5.775000E-07,-4.183010E-12

[:SOURce]:TCPL[:AMPLitude]

Syntax:
[:SOURce]:TCPL[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:TCPL[:AMPLitude]?

Description:
This command sets temperature in TC function. Node SOUR:TCPL also selects TC function if not already selected. If unit parameter is part of temperature, new unit is set.

Parameters:

<DNPD> TC function. Default value is 100.0 °C.

<UNIT> {CEL|FAR|K}

CEL degrees of Celsius

FAR degrees of Fahrenheit

K Kelvin

Remarks:

The value is set to default after power on

The value is set to default on *RST command

Overlapped command

Example:

TCPL 100.0

TCPL? Response: 1.000000E+02 CEL

[:SOURce]:TCPL:TYPE

Syntax:

[:SOURce]:TCPL:TYPE <CPD>

[:SOURce]:TCPL:TYPE?

Description:

This command selects thermocouple type. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:

<CPD> {R|S|B|J|T|E|K|N|M|C|D|G2} (default R)

R

S

B

J

T

E

K

N

M

C

D

G2

Remarks:

The value is stored in each preset

The value is set according to "Startup" preset after power on

The value is set to default on *RST command

Overlapped command

Example:

TCPL:TYPE R

TCPL:TYPE? Response: R

[:SOURce]:TCPL:RJMode

Syntax:

[:SOURce]:TCPL:RJMode <CPD>

[:SOURce]:TCPL:RJMode?

Description:

This command selects manual or external reference junction compensation. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:

<CPD> {MANual|EXTern} (default MAN)

MANual manual reference junction is set (see TCPL:RJAM)

EXTern external reference junction is set

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
TCPL:RJM MAN
TCPL:RJM? Response: MAN

[:SOURce]:TCPL:RJAMplitude

Syntax:
[:SOURce]:TCPL:RJAMplitude <DNPD>
[:SOURce]:TCPL:RJAMplitude?

Description:
This command sets/reads reference junction temperature. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:
<DNPD> Range -50.0 ... 150.0 (default 23.0)

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:

TCPL:RJAM 23.0
TCPL:RJAM? Response: 2.300000E+01

[:SOURce]:TCPL:RJEXtern:TYPE

Syntax:
[:SOURce]:TCPL:RJEXtern:TYPE <CPD>
[:SOURce]:TCPL:RJEXtern:TYPE?

Description:
This command selects reference junction type. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:
<CPD> {PLATinum|NICKel} (default PLAT)
·PLATinum
·NICKel

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
TCPL:RJEX:TYPE PLAT
TCPL:RJEX:TYPE? Response: PLAT

[:SOURce]:TCPL:RJEXtern:ZRESistance

Syntax:
[:SOURce]:TCPL:RJEXtern:ZRESistance <DNPD>[<UNIT>]
[:SOURce]:TCPL:RJEXtern:ZRESistance?

Description:
This command sets resistance at 0 °C for Platinum reference junction. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:

<DNPD> Range 100.0 ... 200.0 (default 100.0)
<UNIT> {OHM}

·OHM

Remarks:

The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:

TCPL:RJEX:ZRES 100.0
TCPL:RJEX:ZRES? Response: 1.000000E+02 OHM

[:SOURce]:TCPL:RJEXtern:PTSTandard

Syntax:

[:SOURce]:TCPL:RJEXtern:PTSTandard <CPD>
[:SOURce]:TCPL:RJEXtern:PTSTandard?

Description:

This command selects Platinum temperature standard for reference junction. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:

<CPD> {PT385A|PT385B|PT3916|PT3926|USER} (default PT385A)

PT385A	Pt385 (68) standard
PT385B	Pt385 (90) standard
PT3916	Pt3916 standard
PT3926	Pt3926 standard
USER	User (see RTD:COEF command)

Remarks:

The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:

TCPL:RJEX:PTST PT385A
TCPL:RJEX:PTST? Response: PT385A

[:SOURce]:TCPL:RJEXtern:COEFficient

Syntax:

[:SOURce]:TCPL:RJEXtern:COEFficient <DNPD>,<DNPD>,<DNPD>
[:SOURce]:TCPL:RJEXtern:COEFficient?

Description:

This command allows to define Coefficients (A, B, C) used for “User” Platinum standard reference junction scale. Node SOUR:TCPL also selects TC function if not already selected.

Parameters:

<DNPD> Range 3e-3 ... 5e-3 (default 3.9083E-3)
<DNPD> Range -7e-7 ... -5e-7 (default -5.775E-7
<DNPD> Range -5e-12 ... -3e-12 (default -4.18301E-12)

Remarks:

The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
TCPL:RJEX:COEF 3.9083E-3,-5.775E-7,-4.18301E-12
TCPL:RJEX:COEF? Response: 3.908300E-03,-5.775000E-07,-4.183010E-12

[:SOURce]:FREQuency[:AMPLitude]

Syntax:

[:SOURce]:FREQuency[:AMPLitude] <DNPD>[<UNIT>]

[:SOURce]:FREQuency[:AMPLitude]?

Description:
This command sets frequency (periond) amplitude in Frequency function.
Node SOUR:FREQ also selects Frequency function if not already selected.

Parameters:
<DNPD> Range 1E-2 ... 15E3 (default 1000.0)
<UNIT> {HZ}
·HZ Hertz

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
FREQ 1000.0
FREQ? Response: 1.000000E+03 HZ

[:SOURce]:FREQuency:DUTY

Syntax:
[:SOURce]:FREQuency:DUTY <DNPD>
[:SOURce]:FREQuency:DUTY?

Description:
This command sets duty cycle of generated signal in Frequency function.
Node SOUR:FREQ also selects Frequency function if not already selected.

Parameters:
<DNPD> Range 0.005 ... 0.995 (default 0.5)

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
FREQ:DUTY 0.5
FREQ:DUTY? Response: 5.000000E-01

[:SOURce]:FREQuency:PULSes[:STATe]

Syntax:
[:SOURce]:FREQuency:PULSes[:STATe] <BOOL>
[:SOURce]:FREQuency:PULSes[:STATe]?

Description:
This command switch on pulses generator. Node SOUR:FREQ also selects Frequency function if not already selected.

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON pulses generator activate (see FREQ:PULS:COUN)
OFF pulses generator deactivate

1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
FREQ:PULS ON
FREQ:PULS? Response: 1

[:SOURce]:FREQuency:PULSes:COUNt

Syntax:
[:SOURce]:FREQuency:PULSes:COUNt <DNPD>
[:SOURce]:FREQuency:PULSes:COUNt?

Description:
This command sets number of generated pulses. Pulses generator must be set to On (see FREQ:PULS). Node SOUR:FREQ also selects Frequency function if not already selected.

Parameters:
<DNPD> Range 1 ... 9999999 (default 100)

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
FREQ:PULS:COUN 100
FREQ:PULS:COUN? Response: 100

[:SOURce]:FREQuency:PULSes:ACTual?

Syntax:
[:SOURce]:FREQuency:PULSes:ACTual?

Description:
This command reads actual number of generated pulses.

Parameters:
<DNPD> Actual number of generated pulses (range 1 ... 9999999)

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
FREQ:PULS:ACT? Response: 0

[:SOURce]:RESistance[:AMPLitude]

Syntax:
[:SOURce]:RESistance[:AMPLitude] <DNPD>[<UNIT>]
[:SOURce]:RESistance[:AMPLitude]?

Description:
This command sets resistance amplitude in Resistance function.
Node SOUR:RES also selects Resistance function if not already selected.

Parameters:
<DNPD> Range 10 ... 3e5 (default 1000.0)

<UNIT> {OHM}
·OHM

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
RES 1000.0
RES? Response: 1.000000E+03 OHM

[:SOURce]:STEP[:STATe]

Syntax:
[:SOURce]:STEP[:STATe] <BOOL>
[:SOURce]:STEP[:STATe]?

Description:
This command turns on Step mode for the appropriate function. Step mode defines of 32 user programmable timing sequences for each function. Each sequence contains up to 100 steps (amplitude/duration).

Parameters:
<BOOL> {ON|OFF|1|0} (default 0)
ON step mode activate
OFF step mode deactivate
1 same as ON
0 same as OFF

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
STEP ON
STEP? Response: 1

[:SOURce]:STEP:SELect<IND_STEP>

Syntax:
[:SOURce]:STEP:SELect<IND_STEP> <DNPD>
[:SOURce]:STEP:SELect<IND_STEP>?

Description:
This command selects timing sequence. Selected sequence is shown on device display, can be executed using OUTP ON command and can be edited using SOUR:STEP:PRES group of commands. Sequence is defined by function and by number of timing sequence for this function.

Parameters:
<IND_STEP> Range 1 ... 6 (1 - if omitted):
1 – Voltage function
2 – Current function
3 – TC function
4 – Frequency function
5 – RTD function
6 - Resistance function
<DNPD> Range 1 ... maximum sequence count (32), one based index of sequence

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on

The value is set to default on *RST command
Overlapped command

Example:

STEP:SEL1 0
STEP:SEL1? Response: 0

[:SOURce]:STEP:PRESet:COUNt?

Syntax:
[:SOURce]:STEP:PRESet:COUNt?

Description:
This command retrieves maximum number of timing sequences. This number represents maximum index used in sequence commands.

Parameters:
<DNPD> Integer value representing maximum sequence count.

Remarks:
Overlapped command

Example:
STEP:PRES:COUN? Response: 64

[:SOURce]:STEP:PRESet:NAME

Syntax:
[:SOURce]:STEP:PRESet:NAME <SPD>
[:SOURce]:STEP:PRESet:NAME?

Description:
This command allows reading and changing sequence name. Data will be saved to non-volatile memory on STEP:PRES:SAVE command.

Parameters:
<SPD> Quoted sequence name. Upper alpha, lower alpha, digits and spaces are allowed. Maximum string size is 8 characters.

Remarks:
Overlapped command

Example:
STEP:PRES:NAME "STEP 1s"
STEP:PRES:NAME? Response: "STEP 1s"

[:SOURce]:STEP:PRESet:PCLear

Syntax:
[:SOURce]:STEP:PRESet:PCLear

Description:
This command clears existing sequence data including its timing table. Data will be saved to non-volatile memory on STEP:PRES:SAVE command.

Parameters:
None

Remarks:
Overlapped command

Example:
STEP:PRES:PCL

[:SOURce]:STEP:PRESet:RAPPend

Syntax:
[:SOURce]:STEP:PRESet:RAPPend <SPD>

Description:
This command appends new record at the end of timing table. Data will be saved to non-volatile memory on STEP:PRES:SAVE command.

Parameters:
<SPD> Quoted string representing amplitude. The amplitude consists of two float numeric fields separated by comma. The first one represents timing interval in seconds and the second one amplitude.

Remarks:
Overlapped command

Example:
STEP:PRES:RAPP "0.5,220.0"

[:SOURce]:STEP:PRESet:RCOunt?

Syntax:
[:SOURce]:STEP:PRESet:RCOunt?

Description:
This commands returns actual number of records in timing table.

Parameters:
<DNPD> Integer value representing number of records.

Remarks:
Overlapped command

Example:
STEP:PRES:RCO? Response: 6

[:SOURce]:STEP:PRESet:ROW<IND_ROW>:AMPLitude

Syntax:
[:SOURce]:STEP:PRESet:ROW<IND_ROW>:AMPLitude <SPD>
[:SOURce]:STEP:PRESet:ROW<IND_ROW>:AMPLitude?

Description:
This command sets / retrieves selected row in timing table. Data will be saved to nonvolatile memory on STEP:PRES:SAVE command.

Parameters:
<IND_ROW> Range 1 ... Row count (1 - if omitted)
<SPD> Quoted string representing amplitude. The amplitude consists of two float numeric fields separated by comma. The first one represents timing interval in seconds and the second one amplitude.

Remarks:
Overlapped command

Example:
STEP:PRES:ROW1:AMPL "0.5,220.0"
STEP:PRES:ROW1:AMPL? Response: "5.000000E-01,2.200000E+02"

[:SOURce]:STEP:PRESet:ROW<IND_ROW>:RDELete

Syntax:
[:SOURce]:STEP:PRESet:ROW<IND_ROW>:RDELete

Description:
This command deletes row from timing table. Data will be saved to non-volatile memory on STEP:PRES:SAVE command.

Parameters:
<IND_ROW> Range 1 ... Row count (1 - if omitted)

Remarks:
Overlapped command

Example:
STEP:PRES:ROW1:RDEL

[:SOURce]:STEP:PRESet:SAVE

Syntax:
[:SOURce]:STEP:PRESet:SAVE

Description:
This command saves current sequence to non-volatile memory. Unsaved changes will disappear on restart, function change or selection of another sequence.

Parameters:
None

Remarks:
Overlapped command

Example:
STEP:PRES:SAVE

:MEASure:VOLTage[:AMPLitude]?

Syntax:
:MEASure:VOLTage[:AMPLitude]?

Description:
This query returns value of output voltage in Current function.

Parameters:

<DNPD>	Range -100.0 ... 100.0
<UNIT>	{V}
·V	Voltage

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:VOLT? Response: 1.000000E+02 V

:MEASure:CURRent[:AMPLitude]?

Syntax:
:MEASure:CURRent[:AMPLitude]?

Description:
This query returns value of output current in Voltage function.

Parameters:

<DNPD>	Range -5e-2 ... 5e-2
<UNIT>	{A}
·A	Amper

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:CURR? Response: 5.000000E-02 A

:MEASure:CONFigure

Syntax:
:MEASure:CONFigure <CPD>
:MEASure:CONFigure?

Description:
This command sets the function of internal multimeter.

Parameters:
<CPD> {FREQ|COUN} (default FREQ)
FREQ Frequency
COUN Counter

Remarks:
The value is stored in each preset
The value is set according to "Startup" preset after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:CONF FREQ
MEAS:CONF? Response: FREQ

:MEASure:FREQuency[:AMPLitude]?

Syntax:
:MEASure:FREQuency[:AMPLitude]?

Description:
This query returns value of frequency meter.

Parameters:
<DNPD> Measured value
<UNIT> {HZ}
·HZ Hertz

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:FREQ? Response: 5.000000E+01 HZ

:MEASure:COUNter[:AMPLitude]?

Syntax:
:MEASure:COUNter[:AMPLitude]?

Description:
This query returns value of counter.

Parameters:
<DNPD> Measured value

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:COUN? Response: 1.0E+006

:MEASure:TCPL:RJAMplitude

Syntax:
:MEASure:TCPL:RJAMplitude?

Description:
This query returns external reference junction temperature.

Parameters:
<DNPD> Measured value

Remarks:
The value is set to default after power on
The value is set to default on *RST command
Overlapped command

Example:
MEAS:TCPL:RJAM? Response: 2.300000E+01

:STATus:OPERation:CONDition

Syntax:
:STATus:OPERation:CONDition?

Description:
This query returns the content of Operational Condition register. It is a decimal value which corresponds to the binary-weighted sum of all bits in the register. Register is not cleared after this query. The response to the query therefore represents an instantaneous 'Snapshot' of the register state, at the time that the query was accepted.

Parameters:
<DNPD> Operational Condition register

Remarks:
Overlapped command

Example:
STAT:OPER:COND? Response: 2

:STATus:OPERation:ENABle

Syntax:
:STATus:OPERation:ENABle <DNPD>
:STATus:OPERation:ENABle?

Description:
This command enables bits in the Operational Data Enable register. Selected bits are summarized at bit 7 (OSS) of the IEEE488.2 Status Byte register.

Parameters:
<DNPD> Operational Data Enable register

Remarks:
Overlapped command

Example:
STAT:OPER:ENAB 2
STAT:OPER:ENAB? Response: 2

:STATus:OPERation[:EVENt]?

Syntax:
:STATus:OPERation[:EVENt]?

Description:

This query returns the content of Operational Data Event register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Register is cleared after this query.

Parameters:
<DNPD> Operational Data Event register

Remarks:
Overlapped command

Example:
STAT:OPER? Response: 0

:STATus:OPERation:NTRansition

Syntax:
:STATus:OPERation:NTRansition <DNPD>
:STATus:OPERation:NTRansition?

Description:
This comman allows set Operation Negative Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:
<DNPD> Operation Negative Transition Register, Range 0… 32767

Remarks:
Overlapped command

Example:
STAT:OPER:NTR 2
STAT:OPER:NTR? Response: 2

:STATus:OPERation:PTRansition

Syntax:
:STATus:OPERation:PTRansition <DNPD>
:STATus:OPERation:PTRansition?

Description:
This comman allows set Operation Positive Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:
<DNPD> Operation Positive Transition Register, Range 0 … 32767

Remarks:
Overlapped command

Example:
STAT:OPER:PTR 1.0
STAT:OPER:PTR? Response: 1.000000E+00

:STATus:QUEStionable:CONDition

Syntax:
:STATus:QUEStionable:CONDition?

Description:
This query returns the content of Questionable Condition register. It is a decimal value which corresponds to the binary-weighted sum of all bits in the register. Register is not cleared after this query. The response to the query therefore represents an instantaneous 'Snapshot' of the register state, at the time that the query was accepted.

Parameters:
<DNPD> Questionable Condition register

Remarks:
Overlapped command

Example:
STAT:QUES:COND? Response: 2

:STATus:QUEStionable:ENABle

Syntax:
:STATus:QUEStionable:ENABle <DNPD>
:STATus:QUEStionable:ENABle?

Description:
This command enables bits in the Questionable Data Enable register. Selected bits are summarized at bit 3 (QSS) of the IEEE488.2 Status Byte register.

Parameters:
<DNPD> Questionable Data Enable register

Remarks:
Overlapped command

Example:
STAT:QUES:ENAB 2
STAT:QUES:ENAB? Response: 2

:STATus:QUEStionable[:EVENt]?

Syntax:
:STATus:QUEStionable[:EVENt]?

Description:
This query returns the content of Questionable Data Event register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Register is cleared after this query.

Parameters:
<DNPD> Questionable Data Event register

Remarks:
Overlapped command

Example:
STAT:QUES? Response: 0

:STATus:QUEStionable:NTRansition

Syntax:
:STATus:QUEStionable:NTRansition <DNPD>
:STATus:QUEStionable:NTRansition?

Description:
This comman allows set Questionable Negative Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the negative transition filter shall cause a 1 to 0 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:
<DNPD> Questionable Negative Transition Register, Range 0… 32767

Remarks:
Overlapped command

Example:
STAT:QUES:NTR 2
STAT:QUES:NTR? Response: 2

:STATus:QUEStionable:PTRansition

Syntax:
:STATus:QUEStionable:PTRansition <DNPD>
:STATus:QUEStionable:PTRansition?

Description:
This command allows set Questionable Positive Transition Register. It is a decimal value which corresponds to the binary-weighted sum of all bits set in the register. Setting a bit in the positive transition filter shall cause a 0 to 1 transition in the corresponding bit of the associated condition register to cause a 1 to be written in the associated bit of the corresponding event register.

Parameters:
<DNPD> Questionable Positive Transition Register, Range 0… 32767

Remarks:
Overlapped command

Example:
STAT:QUES:PTR 2
STAT:QUES:PTR? Response: 2

:SYSTem:BEEPer:STATe

Syntax:
:SYSTem:BEEPer:STATe <BOOL>
:SYSTem:BEEPer:STATe?

Description:
This command sets state of device beeper.

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
ON device system beeper is enabled
OFF device system beeper is disabled
1 same as ON
0 same as OFF

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:BEEP:STAT ON
SYST:BEEP:STAT? Response: 1

:SYSTem:BEEPer:VOLume

Syntax:
:SYSTem:BEEPer:VOLume <DNPD>
:SYSTem:BEEPer:VOLume?

Description:
This command sets the system device beeper volume.

Parameters:
<DNPD> Range 0.0 ... 1.0 (Max. volume) (default 0.2)

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:BEEP:VOL 0.2
SYST:BEEP:VOL? Response: 2.000000E-01

:SYSTem:BEEPer:KEYBoard

Syntax:
:SYSTem:BEEPer:KEYBoard <BOOL>
:SYSTem:BEEPer:KEYBoard?

Description:
This command sets state of keyboard beeper.

Parameters:

<BOOL> {ON|OFF|1|0} (default 1)

ON device system beeper is enabled

OFF device system beeper is disabled

1 same as ON

0 same as OFF

Remarks:

Overlapped command

Example:

SYST:BEEP:KEYB ON

SYST:BEEP:KEYB? Response: 1

:SYSTem:COMMunicate:BUS

Syntax:

:SYSTem:COMMunicate:BUS <CPD>

:SYSTem:COMMunicate:BUS?

Description:

This command selects communication interface.

Parameters:

<CPD> {SERial|GPIB|USB|LAN} (default SER)

·SERial RS232 interface

·GPIB GPIB interface

·USB USB interface

·LAN LAN interface

Remarks:

Sequential command

Value is not affected by reset

Example:

SYST:COMM:BUS SER

SYST:COMM:BUS? Response: SER

:SYSTem:COMMunicate:GPIB:ADDRess

Syntax:

:SYSTem:COMMunicate:GPIB:ADDRess <DNPD>

:SYSTem:COMMunicate:GPIB:ADDRess?

Description:

This commands allows set communication GPIB address

Parameters:

<DNPD> Range 1 ... 31 (default 2)

Remarks:

Overlapped command

Value is not affected by reset

Example:

SYST:COMM:GPIB:ADDR 2

SYST:COMM:GPIB:ADDR? Response: 2

:SYSTem:COMMunicate:LAN:ADDRess

Syntax:

:SYSTem:COMMunicate:LAN:ADDRess <CPD>

:SYSTem:COMMunicate:LAN:ADDRess?

Description:

This command allows to change IP address if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:
<CPD> Range 000.000.000.000 ... 255.255.255.255
(default 192.168.001.100)

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:ADDR 192.168.001.100
SYST:COMM:LAN:ADDR? Response: 192.168.001.100

:SYSTem:COMMunicate:LAN:MASK

Syntax:
:SYSTem:COMMunicate:LAN:MASK <CPD>
:SYSTem:COMMunicate:LAN:MASK?

Description:
This command allows to change subnet mask if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:
<CPD> Range 000.000.000.000 ... 255.255.255.255
(default 255.255.255.000)

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:MASK 255.255.255.000
SYST:COMM:LAN:MASK? Response: 255.255.255.000

:SYSTem:COMMunicate:LAN:GATE

Syntax:
:SYSTem:COMMunicate:LAN:GATE <CPD>
:SYSTem:COMMunicate:LAN:GATE?

Description:
This command allows to change default gateway if DHCP is switched off. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:
<CPD> Range 000.000.000.000 ... 25.255.255.255
(default 255.255.255.255)

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:GATE 255.255.255.255
SYST:COMM:LAN:GATE? Response: 255.255.255.255

:SYSTem:COMMunicate:LAN:PORT

Syntax:
:SYSTem:COMMunicate:LAN:PORT <DNPD>
:SYSTem:COMMunicate:LAN:PORT?

Description:
This command allows to change port number. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:
<DNPD> Range 0 ... 9999 (default 23)

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:PORT 23
SYST:COMM:LAN:PORT? Response: 23

:SYSTem:COMMunicate:LAN:HOST

Syntax:
:SYSTem:COMMunicate:LAN:HOST <CPD>
:SYSTem:COMMunicate:LAN:HOST?

Description:
This command allows to change host name if DHCP is switched on. Interface must be restarted to take effect (see SYST:COMM:REST command).

Parameters:
<CPD> Upper alpha, lower alpha, digits, underscores and spaces are allowable. Maximum string size is 14 characters.

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:HOST 4463_SNXXXXXX
SYST:COMM:LAN:HOST? Response: 4463_SNXXXXXX

:SYSTem:COMMunicate:LAN:DHCP

Syntax:
:SYSTem:COMMunicate:LAN:DHCP <BOOL>
:SYSTem:COMMunicate:LAN:DHCP?

Description:
This command allows switch On/Off DHCP.

Parameters:
<BOOL> {ON|OFF|1|0} (default 1)
ON DHCP is On
OFF DHCP is Off
1 same as ON
0 same as OFF

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:LAN:DHCP ON
SYST:COMM:LAN:DHCP? Response: 1

:SYSTem:COMMunicate:RESTart

Syntax:
:SYSTem:COMMunicate:RESTart

Description:
This command will restart communication interface. It will take several seconds. During this period device will not respond to any commands. Restart is needed for all LAN setting changes.

Parameters:
None

Remarks:
Overlapped command

Example:
SYST:COMM:REST

:SYSTem:COMMunicate:SERial:BAUD

Syntax:
:SYSTem:COMMunicate:SERial:BAUD <CPD>
:SYSTem:COMMunicate:SERial:BAUD?

Description:
This command allows changing RS232 transfer rate.

Parameters:
<CPD> {1200|2400|4800|9600|19200|38400|57600|115200} (default 9600)

1200	1200 Bd
2400	2400 Bd
4800	4800 Bd
9600	9600 Bd
19200	19200 Bd
38400	38400 Bd
57600	57600 Bd
115200	115200 Bd

Remarks:
Overlapped command
Value is not affected by reset

Example:
SYST:COMM:SER:BAUD 9600
SYST:COMM:SER:BAUD? Response: 9600

:SYSTem:DATE

Syntax:
:SYSTem:DATE <DNPD>,<DNPD>,<DNPD>
:SYSTem:DATE?

Description:
This commands allows to change system device date.

Parameters:
<DNPD> Year, Range 2000 ... 2063
<DNPD> Month, Range 1 ... 12
<DNPD> Day, Range 1 ... 31

Remarks:
Overlapped command

Example:
SYST:DATE 2012,12,31
SYST:DATE? Response: 2012,12,31

:SYSTem:ERRor[:NEXT]?

Syntax:
:SYSTem:ERRor[:NEXT]?

Description:
This command reads SCPI error (maximum 32) that occurred at first. If number of SCPI errors exceeds 32, error -350 “Queue overflow” is returned. For all available error codes and messages see “SCPI Error codes” table. Error queue is cleared by reading all errors or by issuing *CLS command.

Parameters:
<DNPD> Error code
<SPD> Quoted error message

Remarks:
Overlapped command

Example:
SYST:ERR? Response: -300,”Device error”

:SYSTem:KEY

Syntax:
:SYSTem:KEY <DNPD>
:SYSTem:KEY?

Description:
This command allows send key code to the device the same way the user can press keys on front panel. Query returns last pressed key.

Key	Code
KEY_0	16
KEY_1	15
KEY_2	21
KEY_3	27
KEY_4	14
KEY_5	14
KEY_6	26
KEY_7	13
KEY_8	19
KEY_9	25
KEY_SELECT	2
KEY_ENTER	34
KEY_CANCEL	33
KEY_UP	5
KEY_DOWN	1
KEY_LEFT	3
KEY_RIGHT	4
KEY_EXPONENT	31
KEY_BACKSPACE	32
KEY_POINT	22
KEY_USER_1	7
KEY_USER_2	8
KEY_USER_3	9
KEY_USER_4	10
KEY_SIGN	28
KEY_OPER	11
KEY_STEP	17

Table 4: Keyboard codes

Parameters:
<DNPD> Key code. For particular key codes see table above.

Remarks:
Overlapped command

Example:
SYST:KEY 12
SYST:KEY? Response: 12

:SYSTem:LOCal

Syntax:
:SYSTem:LOCal

Description:
This command places device in the LOCAL mode and unlocks all keys on front panel of the device. The Command is valid only for RS232, LAN and USB interfaces. The device will not respond to commands in LOCAL mode.

Parameters:
None

Remarks:
Overlapped command

Example:
SYST:LOC

:SYSTem:PRESet

Syntax:
:SYSTem:PRESet

Description:
This command will preset all device settings. These settings are the same as the RESET ones.

Parameters:
None

Remarks:
Overlapped command

Example:
SYST:PRES

:SYSTem:REMote

Syntax:
:SYSTem:REMote

Description:
This command places device in the REMOTE mode and locks all keys but LOCAL key. The Command is valid only for RS232, LAN and USB interfaces. The device will not respond to any other command until is in REMOTE mode.

Parameters:
None

Remarks:
Overlapped command

Example:
SYST:REM

:SYSTem:RWLock

Syntax:
:SYSTem:RWLock

Description:
This command places device in the REMOTE mode and locks all keys including

LOCAL key. The Command is valid only for RS232, LAN, USB interfaces. The device will not respond to any other command until is in REMOTE mode.

Parameters:
None

Remarks:
Overlapped command

Example:
SYST:RWL

:SYSTem:TIME

Syntax:
:SYSTem:TIME <DNPD>,<DNPD>,<DNPD>
:SYSTem:TIME?

Description:
This commands allows set system device time (RTC).

Parameters:
<DNPD> Hours, Range 0 ... 23
<DNPD> Minutes, Range 0 ... 59
<DNPD> Seconds, Range 0 ... 59

Remarks:
Overlapped command

Example:
SYST:TIME 10,45,15
SYST:TIME? Response: 10,45,15

:SYSTem:VERSion?

Syntax:
:SYSTem:VERSion?

Description:
This query retreives version of implemented SCPI language

Parameters:
<CPD> SCPI language version

Remarks:
Overlapped command

Example:
SYST:VERS? Response: 1999.0

:UNIT:TEMPerature

Syntax:
:UNIT:TEMPerature <CPD>
:UNIT:TEMPerature?

Description:
This function allows to set unit for all temperature functions (Platinum, Nickel).

Parameters:
<CPD> {CEL|FAR|K} (default CEL)
CEL degrees of Celsius
FAR degrees of Fahrenheit
K Kelvin

Remarks:
Overlapped command
Value is not affected by reset

Example:
UNIT:TEMP CEL
UNIT:TEMP? Response: CEL

7.1.10 SCPI Error codes

Device distinguishes following SCPI error codes. These codes are reported on device display screen or can be read by SYST:ERR? Command.

Error	Message
-100	"Command error"
-101	"Invalid character"
-102	"Syntax error"
-103	"Invalid separator"
-104	"Data type error"
-105	"GET not allowed"
-108	"Parameter not allowed"
-109	"Missing parameter"
-112	"Program mnemonic too long"
-113	"Undefined header"
-114	"Header suffix out of range"
-120	"Numeric data error"
-121	"Invalid character in number"
-130	"Suffix error"
-141	"Invalid character data"
-144	"Character data too long"
-151	"Invalid string data"
-161	"Invalid block data"
-203	"Command protected"
-220	"Parameter error"
-222	"Data out of range"
-283	"Illegal variable name"
-350	"Queue overflow"
-400	"Query error"
-410	"Query INTERRUPTED"
-420	"Query UNTERMINATED"
-430	"Query DEADLOCKED"
-440	"Query UNTERMINATED after indefinite response"
514	"Command not allowed with GPIB"

Table 5: SCPI error codes

8 Calibration

Access to the calibration mode is from the setup Menu.

Correct password must be entered before calibration.

IMPORTANT: Without correct password, the access to the calibration mode is refused.

Default factory set calibration code is “2”. Return to standard mode is possible after pushing the CANCEL key.

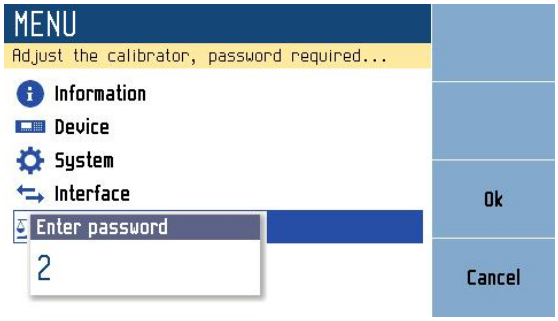


Figure 27: Password entry

8.1 Calibration menu

Calibration menu appears after entering the correct password.

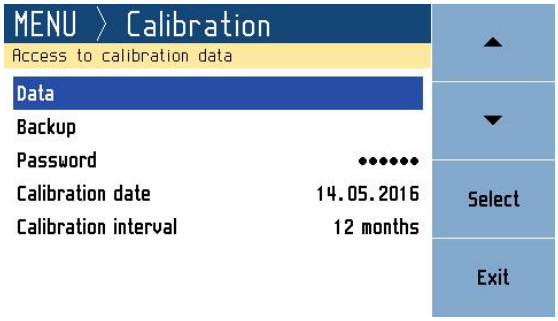


Figure 28: Password entry

Data
Direct access to all calibration data.

Backup
Backup is a tool for managing calibration backups. For example it allows recovery of older calibration data.

Password
Calibration Password editing.

Calibration date
Last calibration date.

Calibration interval
Recommended calibration interval for this unit

8.2 Calibration data

Voltage
Calibration points of voltage DC ranges (300mV, 3V, 30V, 100V). Each voltage range is calibrated in 4 fixed calibration points (Offset +, Offset -, Full range +, Full range -). 8 1/2 digit standard multimeter is required for voltage calibration.

Current
Calibration points of current DC ranges (25mA, 50mA). Each current range is calibrated in 4 fixed calibration points (Offset +, Offset -, Full range +, Full range -). 8 1/2 digit standard multimeter is required for current calibration.

Temperature
Calibration points of external RJ junction temperature meter. Meter is calibrated in 1 fixed calibration point (temperature offset). External reference junction is required.

Frequency
Calibration points of frequency generator. Frequency is calibrated in 1 fixed calibration point (100 Hz). Frequency meter with accuracy 10ppm or better is required.

Resistance
Calibration points of resistance decade. Resistance decade is calibrated in 25 points. 8 1/2 digit standard multimeter is required for resistance decade calibration.

Advanced
Other calibration settings, auto calibration.

The instrument can be calibrated:

- completely, i.e. all functions are calibrated in all recommended points
- partially, i.e. only selected functions are calibrated in all recommended points
- partially, i.e. only selected functions are calibrated in selected points

Complete calibration consists of all partial calibrations performed in the order defined by the calibration menu. If an item of the calibration menu, e.g. „Voltage" is selected, it is not necessary to calibrate all ranges defined by the calibration algorithm. If new calibration of all ranges is not possible (e.g. the required standard is not available), old calibration data can be confirmed, i.e. current step of the calibration can be skipped.

IMPORTANT: Calibration can be finished in any point of the calibration procedure. However this particular calibration influences parameters of the calibrator. Accuracy of the calibrator is guaranteed when full calibration was done.

8.3 Selection of calibration point

This is how it works

1. After the Calibration > Data menu is displayed, one of partial calibrations can be selected.
2. Use ▲,▼ cursor keys or display softkeys to move the cursor through the list.
3. Having selected the required function to be calibrated, press SELECT key or Select softkey.
4. The following data are shown (the following example is valid for Voltage calibration data):

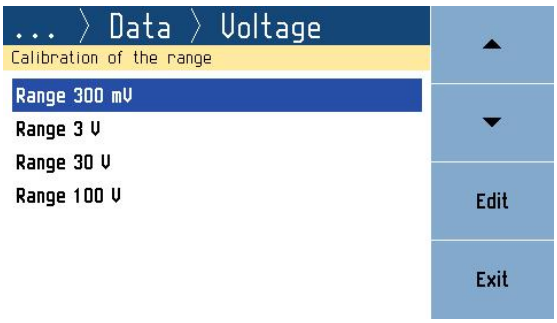


Figure 29: Calibration range selection

The table lists recommended calibration ranges. Having selected the required calibration range using SELECT key or Edit softkey, the following data are shown.

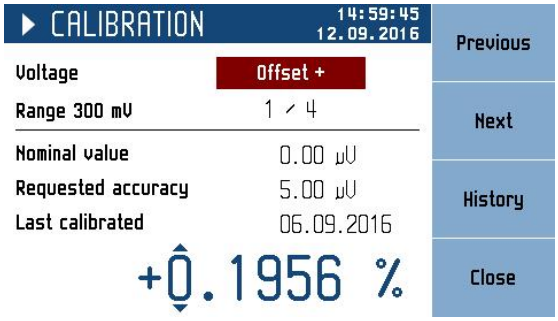


Figure 30: Calibration point

Softkeys have the following meaning:

Previous	selects previous point of calibrated range
Next	selects next point of calibrated range
History	displays history of selected calibration point
Save	new calibration value is entered into the memory, old value is lost.
Close	current calibration point is skipped, old value is retained in the memory. The calibrator returns to the previous menu.

8.4 Setting the new calibration data

Select required calibration point.

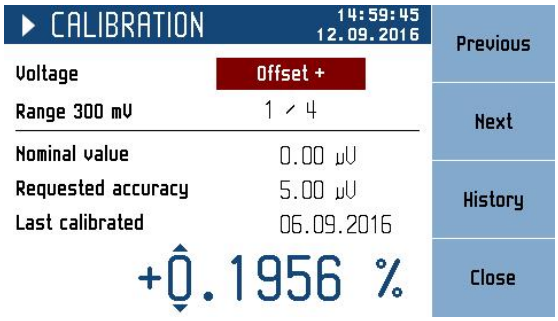


Figure 31: Setting new calibration data

Connect output terminals by pressing OPER key. Connect standard multimeter to the output terminals. Use cursor buttons to set new value of selected calibration point. Required nominal value and requested accuracy is displayed. New calibration value is written by pressing Save softkey (Output terminals must be switched ON).

The procedure is repeated for all calibration points of the selected range. If you press Exit softkey the calibrator returns back to the previous menu level.

Termination of calibration
Calibration can be terminated by repeated press the Close/Exit softkey until the calibrator returns to the Main menu.

9 Technical data

Uncertainties include long-term stability, temperature coefficient, linearity, line regulation and the traceability of factory and National calibration standards. Specified accuracy is valid after one hour warm up in temperature range 23°C ± 10 °C. Specified accuracy is one-year accuracy.

DC voltage

Summary range:	0 to 100 Vdc
Voltage resolution:	6½ Vdc
Typical linearity:	2 ppm
4W sense compensation limit	0.2 V

Auto calibration enabled

Range +/-	Resolution	Max. current	± (ppm of output + V)	
			1 year	
300 mV	100 nV	50 mA	15	2.5 µV
3 V	1 µV	50 mA	15	10 µV
30 V	10 µV	50 mA	15	100 µV
100 V	100 µV	25 mA	15	500 µV

Auto calibration disabled

Range +/-	Resolution	Max. current	± (ppm of output + V)							
			Stability 24 hours [1]		90 days		180 days		1 year	
300 mV	100 nV	50 mA	3	1.5 µV	15	2.5 µV	18	3 µV	20	3 µV
3 V	1 µV	50 mA	3	5 µV	15	10 µV	18	15 µV	20	20 µV
30 V	10 µV	50 mA	3	50 µV	15	100 µV	18	150 µV	20	200 µV
100 V	100 µV	25 mA	3	200 µV	15	500 µV	18	750 µV	20	1 mV

1) 24 hour stability applies at a constant temperature (± 1°C)

DC current

Summary range:	0 to 50 mAdc
Current resolution:	6 digits
Typical linearity:	15 ppm

Auto calibration enabled

Range +/-	Resolution	Max. voltage	± (ppm of output + A)	
			1 year	
25 mA	100 nA	100 V	35	1 µA
50 mA	100 nA	30 V	35	1 µA

Auto calibration disabled

Range +/-	Resolution	Max. voltage	± (ppm of output + A)					
			90 days		180 days		1 year	
25 mA	100 nA	100 V	35	1 µA	40	1 µA	50	1 µA
50 mA	100 nA	30 V	35	1 µA	40	1 µA	50	1 µA

Frequency source

Summary range: 10 mHz to 15 kHz

Open collector: Max. 30 V/50 mA

Or internal pull up 100 R to +5 V (±10 %)

Range	+/- (ppm of output + Hz)		Resolution
200 mHz	50	0.0 Hz	100 nHz
2000 mHz	50	0.0 Hz	1 µHz
20 Hz	50	0.0 Hz	10 µHz
200 Hz	50	0.0 Hz	100 µHz
2000 Hz	50	0.0 Hz	10 mHz
4 kHz	100	0.0 Hz	100 mHz
10 kHz	600	0.0 Hz	1 Hz
15 kHz	1500	0.0 Hz	10 Hz

Frequency meter

Summary range: 10 mHz to 100 kHz

Frequency resolution: 5½ digits

Accuracy: ±50 ppm

Current meter (in voltage function)

Ranges: 5 mA, 25 mA, 50 mA (based on current limit setting)

Resolution: 10 µA

Accuracy: ± 0.1 % of range

Voltage meter (in current function)

Ranges: 100 V

Resolution: 10 mV

Accuracy: ± 0.1 % of range

Current limit setting (in voltage function)

Ranges: 50 mA

Resolution: 10 µA

Accuracy: ± 0.2 % of range

Voltage limit setting (in current function)

Ranges: 100 V

Resolution: 10 mV

Accuracy: ± 0.2 % of range

TC

Resolution: 0.01 °C

Type	Range	± °C
R (EN60584-1/ITS90)	**-50 … -10 °C**	0.8 °C
	-10 … 100 °C	0.6 °C
	100 … 400 °C	0.4 °C
	400 … 1768 °C	0.3 °C
S (EN60584-1/ITS90)	**-50 … -20 °C**	0.7 °C
	-20 … 100 °C	0.6 °C
	100 … 1768 °C	0.4 °C
B (EN60584-1/ITS90)	**400 … 500 °C**	0.8 °C
	500 … 800 °C	0.6 °C
	800 … 1820 °C	0.4 °C
J (EN60584-1/ITS90)	**-210 … -180 °C**	0.15 °C
	-180 … 1200 °C	0.1 °C
T (EN60584-1/ITS90)	**-200 … -100 °C**	0.2 °C
	-100 … 400 °C	0.1 °C
E (EN60584-1/ITS90)	**-250 … -200 °C**	0.25 °C
	-200 … 1000 °C	0.1 °C
K (EN60584-1/ITS90)	**-200 … -100 °C**	0.2 °C
	-100 … 900 °C	0.1 °C
	900 … 1372 °C	0.15 °C
N (EN60584-1/ITS90)	**-200 … -100 °C**	0.3 °C
	-100 … 100 °C	0.15 °C
	100 … 900 °C	0.1 °C
	900 … 1300 °C	0.15 °C

M (General Electric IPTS 68)	**-50 … 1410 °C**	0.1 °C
C (Hoskins ITS 90)	**0 … 100 °C**	0.3 °C
	100 … 900 °C	0.2 °C
	900 … 2315 °C	0.3 °C
D (Hoskins ITS 90)	**0 … 300 °C**	0.3 °C
	300 … 1100 °C	0.2 °C
	1100 … 2315 °C	0.3 °C
G2 (Hoskins ITS 90)	**0 … 300 °C**	0.5 °C
	300 … 2100 °C	0.2 °C
	2100 … 2315 °C	0.3 °C

Pt100 meter for RJ

Summary range: -50 to 150 °C

Resolution: 0.01 °C

Range	± °C [2)]
-50 … 150 °C	0.02 °C

2) Reference temperature range 23 °C ± 2°C

Option Model 4485-V001

External reference junction for thermocouples.

RTD 4W (full version only)

Pt summary range:- 200 °C to +850 °C

Ni summary range:- 60 °C to +300 °C

Resolution: 0.01 °C

Type	Range	± °C [3)]
Pt100 … Pt1000	**-200 … 0 °C**	0.15 °C
Pt100 … Pt1000	**0 … 850 °C**	0.2 °C
Ni100 … Ni1000	**-60 … 300 °C**	0.1 °C

3) Reference temperature range 23 °C ± 2°C

RTD 2W (full version only)

Pt summary range: -200 °C to +850 °C

Ni summary range:- 60 °C to +300 °C

Resolution: 0.01 °C

Type	Range	± °C [4)]
Pt100 … Pt1000	**-200 … 850 °C**	0.2 °C
Ni100 … Ni1000	**-60 … 300 °C**	0.15 °C

4) Reference temperature range 23 °C ± 2°C

Resistance 4W (full version only)

Summary range: 10 Ω to 300 kΩ

Short resistance: < 50 mΩ

Range	±(% of output + Ω) [5)]		Resolution
20 Ω	0.05	15 mΩ	0.0001 Ω
200 Ω	0.05	15 mΩ	0.001 Ω
1000 Ω	0.02	0	0.01 Ω
3000 Ω	0.02	0	0.1 Ω
10000 Ω	0.02	0	1 Ω
30 kΩ	0.05	0	0.01 kΩ
100 kΩ	0.1	0	0.1 kΩ
300 kΩ	0.5	0	1 kΩ

5) Reference temperature range 23 °C ± 2°C

6)

Resistance 2W (full version only)

Terminals: Hi, Li (adapter)

Summary range: 10 Ω to 300 kΩ

Specification: add 10 mΩ to the 4W specification

Short resistance: < 200 mΩ

RTD, Resistance limits

Maximum dissipation power: 0.3 W

Maximum current: 0.2 A

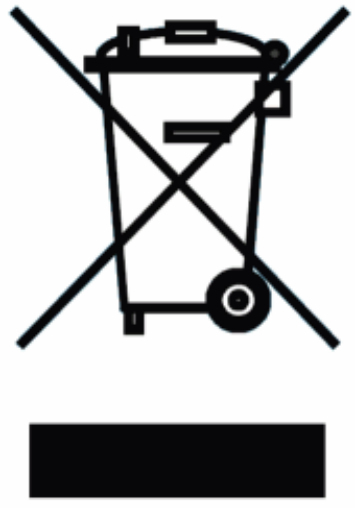
Maximum voltage: 50 Vpk

Temperature coefficient

Temperature coefficient outside of the reference temperature range is 10 % of the stated specification per °C (for example 2x specification for 43°C – Voltage and Current DC).

Note: Only data shown with tolerance or with band of limits are tested. All other values have informative character.

10 Disposal



Battery disposal

In Germany, the end user is legally obliged to return all used batteries, and it is illegal to dispose of batteries in the household waste. This law may also affect you as purchaser of the instrument described here. Please dispose of your used batteries properly and in accordance with national statutory regulations. Either take them to the relevant collection point in your organization or to the collection points provided by your local authority, our company or any battery retail outlet.

Instrument disposal

If your instrument is no longer usable, please comply with your legal obligations by disposing of the instrument described here in accordance with statutory regulations. You will then be helping to protect the environment!