

OPERATION MANUAL

DIGISTANT® Model 4462

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The measurement solution.

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

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

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

Gegenstand der Erklärung: Hochpräzisions-Kalibrierquelle DIGISTANT®
Object of the declaration: High precision calibration source DIGISTANT®

Modellnummer(n) (Typ): 4462
Model number / type:

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

Das oben beschriebene Produkt ist konform mit den Anforderungen der folgenden Dokumente:
The object of the declaration described above is in conformity with the requirements of the following documents:

Dokument-Nr <i>Documents No.</i>	Titel <i>Title</i>	Ausgabe/Ausgabedatum <i>Edition/Date of issue</i>
2006/95/EC	Niederspannungsrichtlinie <i>Low voltage directive</i>	2006
2004/108/EC	Elektromagnetische Verträglichkeit <i>Electromagnetic Compatibility</i>	2004
EN 61010-1	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte <i>Safety requirements for electrical equipment for measurement, control an laboratory use.</i>	2010
EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen – industrielle Umgebung <i>Electrical equipment for measurement, control and laboratory use. General requirements</i>	2006
DIN EN 55011	Industrielle, wissenschaftliche und medizinische Geräte - Funkstörungen – Grenzwerte und Messverfahren <i>Industrial, scientific and medical equipment – Radio frequency disturbance characteristics – Limits and methods of measurement</i>	2010

Gernsbach 24.04.2013 i.V. Christian Karius
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DANGER!

Outputs may be dangerous to touch because of high voltages. You risk death from electric shock if you come into contact with these voltages.

1. Always use shock-protected instrumentation leads or safety cables.
2. Avoid the transfer of the voltages to apparently safe points in connected equipment or circuits.



CAUTION!

Risk of voltage peaks when switching between measuring ranges. These may damage connected equipment.

1. Use the „manual range selection“ function.
2. Configure only when the device under test is disconnected.

Note:

From version V201001 onwards, May 2010, switching from a smaller range to a larger range only generates **minimal** transient peaks.

1. General information

1.1 Application

The precision calibration unit combines high accuracy, low drift, low noise and superior long-term stability with multiple functionality and simple operation.

Ramps, $\Delta+/\Delta-$, and multiple set point storage make the operation of the device easier for the user. For that reason the application possibilities are many:

- Testing current and voltage meters
- Precise testing of thermocouple temperature measuring instruments
- Calibration of controllers, sensors, detection devices and other devices used in process control
- Open-loop process control with the aid of integrated ramp functions.

The DIGISTANT® model 4462 can be used both as a stand-alone table-top device, as well as in automatic, computer-assisted manufacturing and testing systems.

1.2 Description

It is possible to set currents of $\pm 200 \text{ nA} \dots \pm 52 \text{ mA}$, voltages of $\pm 1 \text{ }\mu\text{V} \dots \pm 30 \text{ V}$ and, optionally, temperature set point values of 14 thermocouple model.

The output value is fed back via the sensor line to eliminate voltage drops across the measuring leads. The device has an adjustable current/voltage limitation. An external voltage divider of 1 up to 1:1000 can be considered internally.

With the thermocouple sourcing option you can enter $^{\circ}\text{C}$, $^{\circ}\text{F}$ and K, the temperature scales ITS 90 or IPTS 68 and the comparison point mode constant/external. Furthermore, when sourcing thermocouples a calibrated external comparison point can be used, whereby the data for calibration in the device can be taken into consideration.

Indication of the source value is carried out in large 12 mm figures on an illuminated graphics-LCD. The device can be operated both via the keyboard as well as the interface.

2. Preparation for operation

2.1 Unpacking the device

The device weighs 6 kg and is enclosed in a suitable, shockproof packaging. Unpack the device carefully and ensure that the scope of delivery is complete.

Standard scope of delivery includes:

- 1 DIGISTANT® model 4462
- 1 Connecting cable
- Demo program digital on the homepage (www.burster.com)
- User's manual digital on the homepage (www.burster.com)
- Data Sheet digital on the homepage (www.burster.com)

Check the device thoroughly for any signs of damage.

If any damage seems to have occurred during transport, please notify the supplier within 72 hours.

The packaging should be retained so that it can be examined by the manufacturer and/or supplier.

The DIGISTANT® model 4462 must only be transported in its original or an equivalent packaging.

2.2 Commissioning the device

Ensure that the mains voltage selector is set to the correct supply voltage. Using the accompanying cable, connect the device to a standard, grounded socket



DANGER!

Mains diversion caused by transportation damages!

Therefore dangerous voltages at the housing!

Only switch on the device, if NO transportation damage is evident!

2.3 Supply voltage

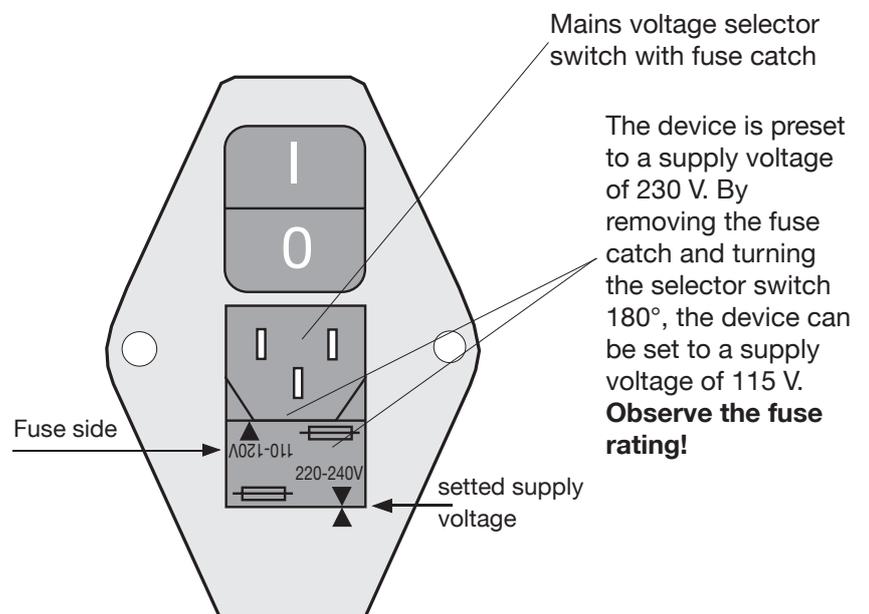
The supply voltage has been set to 230 V~ at the factory; it can be changed using the rotary selector switch.

Supply voltage: 230 V~ ± 10 %

Frequency range: 45 Hz ... 65 Hz

Power consumption: approx. 30 VA

Fuse rating: T 160 mA



2.4 Main fuse

The mains fuse is located below the mains connection socket on the rear panel of the device.

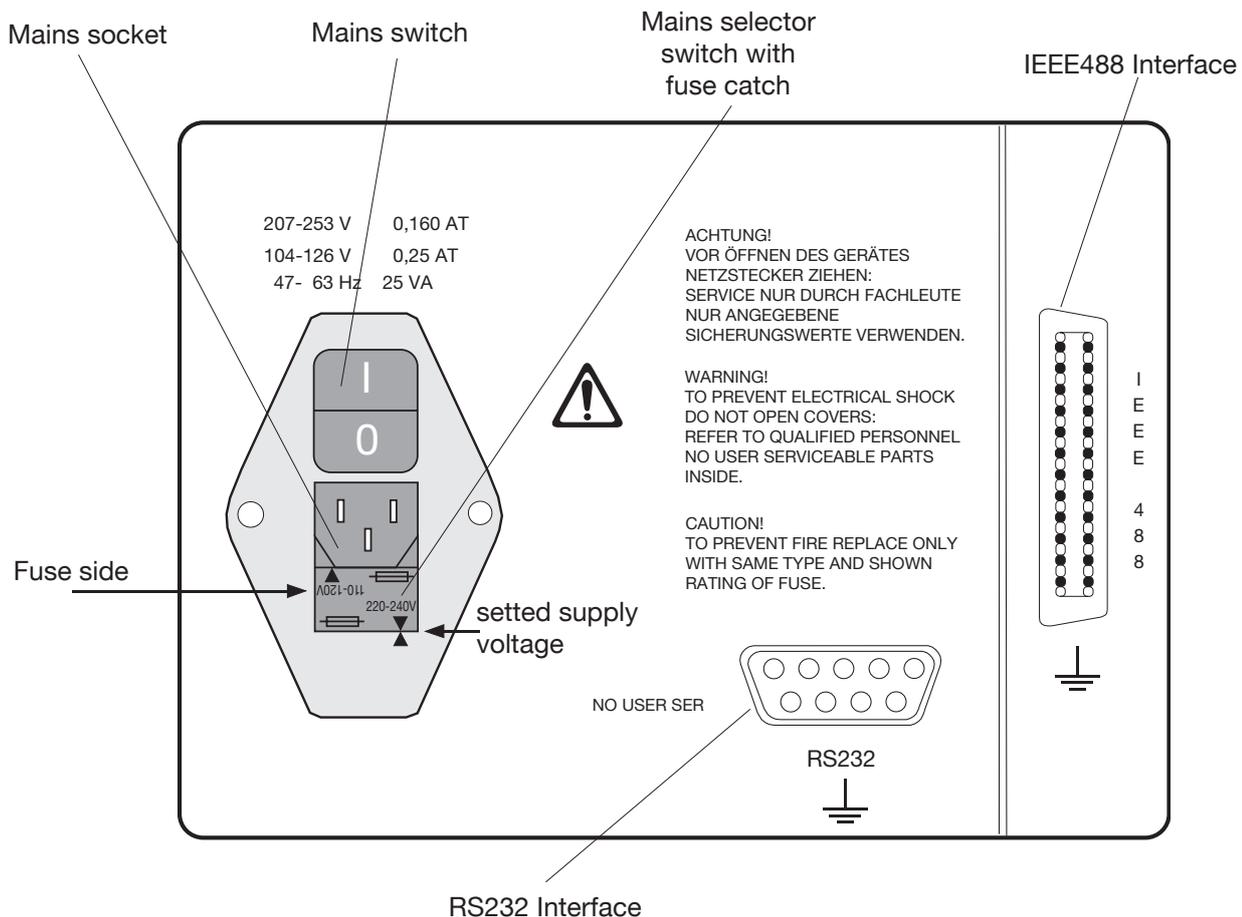
Before replacing the fuse, ensure that the device has been properly disconnected from the mains (remove the connection cable from grounded socket).

Only use original 5 x 20 mm, 0.16 AT fuses for 230 V~ and 0.25 AT fuses for 115 V~.

2.5 Power supply and connection on the back panel

Check the mains selector whether is correct turn to the supply voltage. The device should only be connected with the delivered connection cable via the mains socket.

Caution: The device must in no case switch on, if transits Damage are clear. Through mains supply carrying overs can fit life dangerous voltage on the housing or the outputs.



- For reasons of electromagnetic compatibility, the mains socket of the device must only be connected to the 230 V~ (115 V~) mains network using the ferrite-coated, shielded cable included in the scope of delivery.
- The optional IEEE488 bus-connection plug is standardized. To observe applicable interference protection guidelines, only a shielded interface cable and shielded plugs must be used.

DIGISTANT® Model 4462

- The standard RS232 interface must only be connected using a shielded, twisted cable and shielded plugs.
- The Pt100 terminal must only be connected to a Pt100 sensor by means of a shielded cable. The cable shield must not be located on the plug housing in the event of any uncertainty concerning the sensor ground, as this might result in measurement errors caused by double-ground compensation currents.
- The Pt100 input is the connection for the reference junction and Pt100 measurement.

2.6 Operational test

DIGISTANT TYP 4462			
VERSION:	V9801		
CAL:	0001		
DEVICE-SN:	4711007		
EXT-RJ-SN:	0815007		
			CONT

Display: Identification menu when the device is turned on.

The menu appears for 5 seconds. After this occurred automatically the jump in the main menu. By activating the F4-key [CONT] calls immediately the main menu.

Declaration of the display:	VERSION:	Software version
	CAL.:	Calibration number, count of calibrations
	DEVICE-SN:	Serial number of the device
	EXT-RJ-SN:	Serial number of the external reference junction

2.7 Calibration

The device is calibrated before delivery.

The measurement instruments used for this purpose comply with DIN ISO 9000ff standards.

The device should be re-calibrated once every year or so.

Re-calibration is performed via the RS232 interface; this task should only be carried out by the manufacturer.

2.8 Storage

Permissible storage temperatures lie between 0°C and 60 °C .

If the device has been exposed to moisture during storage, ensure that it is completely dry on the inside and outside before commissioning it.

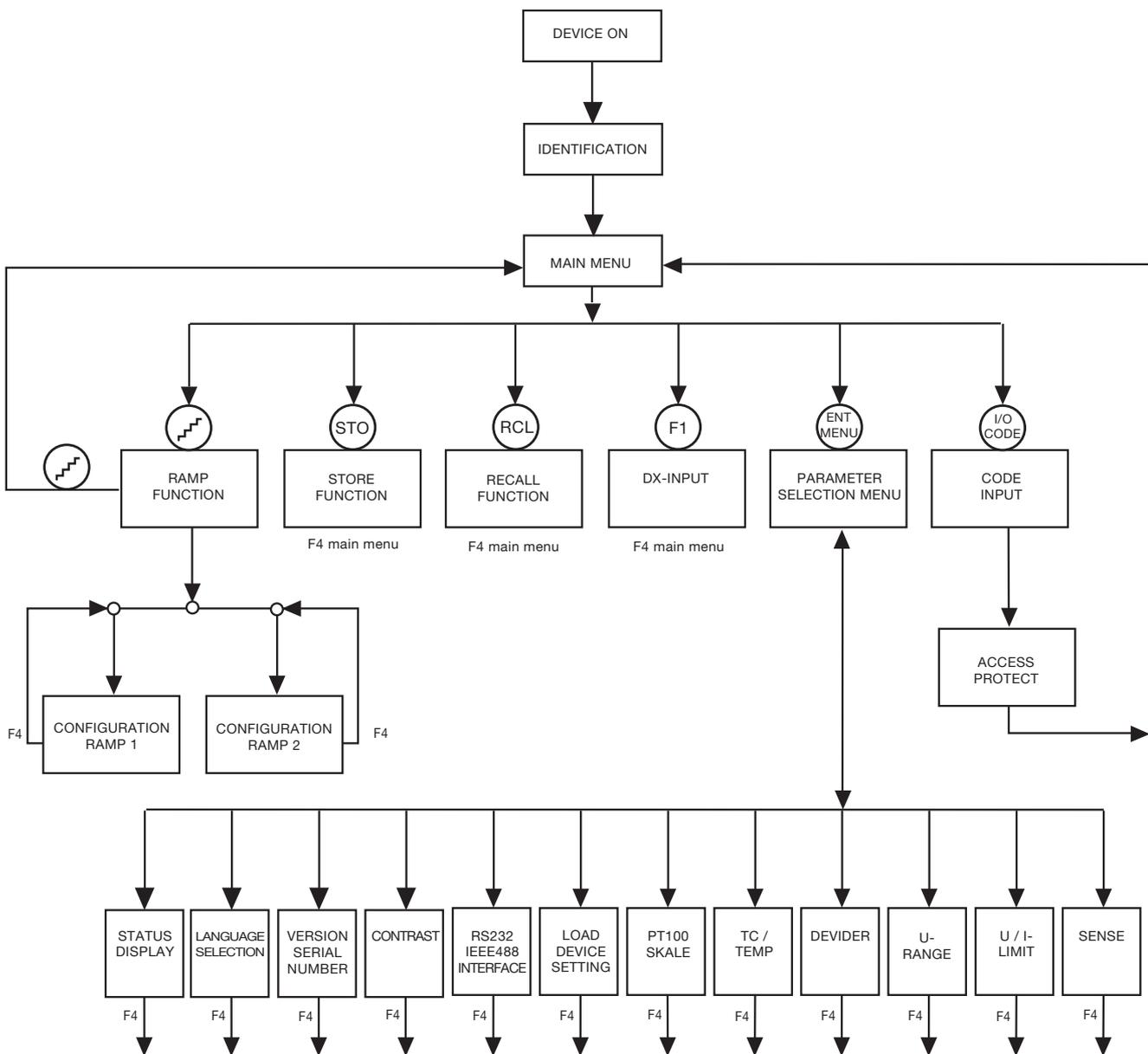
No other measures are required for commissioning after storage.

3. Control elements and connections

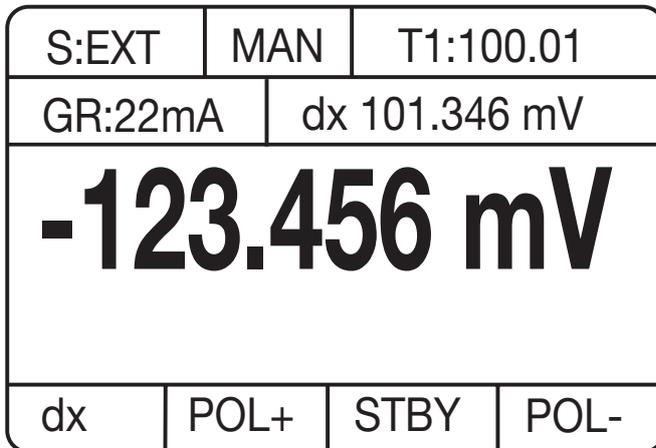
3.1 General

The device can be operated from the keyboard or via the RS232 Interface or optional IEEE488. Keyboard operation is described in the following.

3.2 Overview of controls



3.3 Display

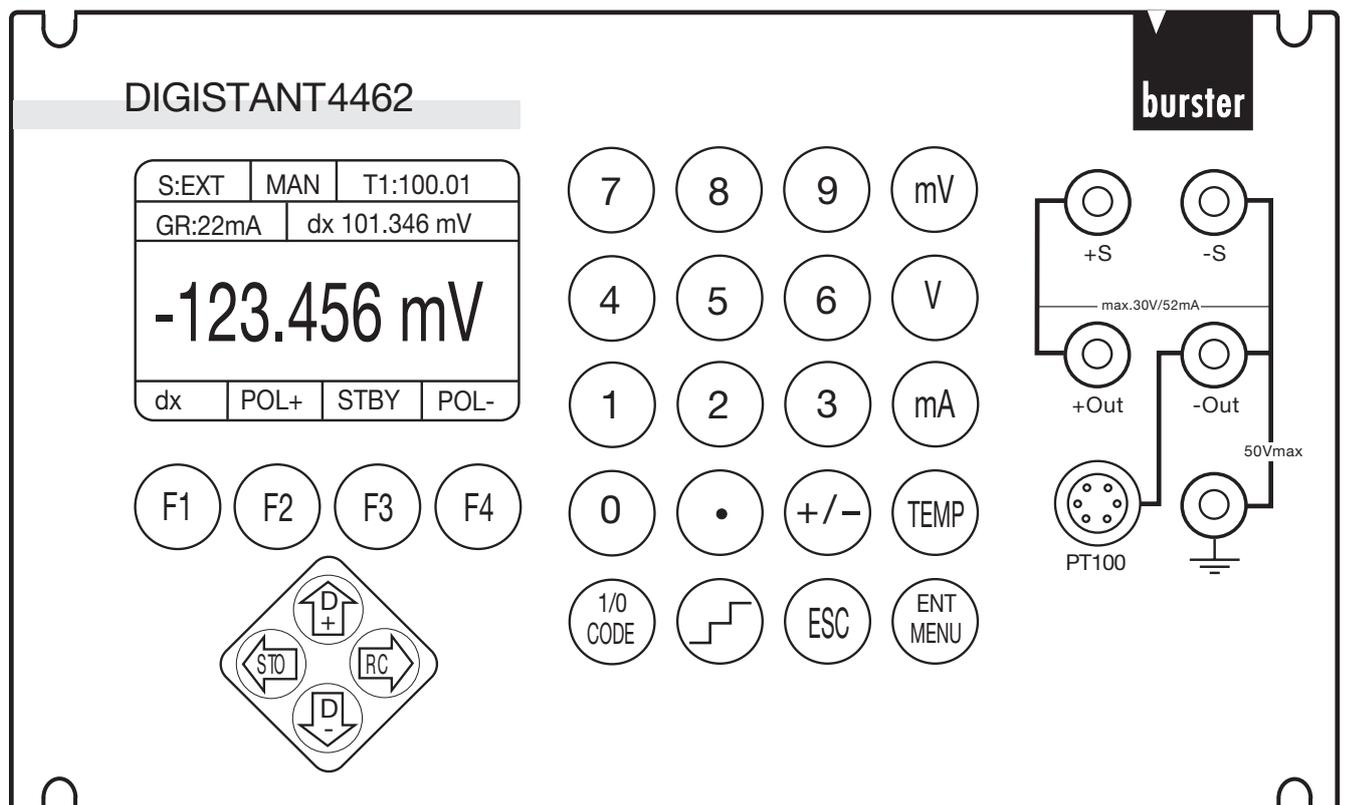


Graphics LCD display with LED illumination.

Visual field: 56,27 mm x 38 mm

Resolution: 128 x 64 dots

3.4 Description of the keys

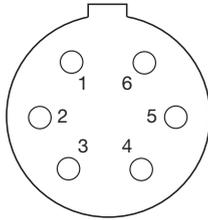


- [0] - [9]: Number keys 0 to 9
- [.]: Point key
- [+/-]: Sign key
- [mV]: Acknowledges when entering voltage in mV

[V]:	Acknowledges when entering voltage in V.
[mA]:	Acknowledges when entering current in mA.
[TEMP]:	Acknowledges when entering the temperature in °C, °F or K. The current temperature unit becomes adjusted in the temperature menu.
[F1] bis [F4]:	These programmable keys have different functions depending on the menu in which they are used. Their designations are displayed in the bottom line of each menu.
[←]:	Cursor left key: It is used for the selection of a parameter value from a list and as a Backspace Key of an entry.
[STO]:	STORE key: The menu for storing a value-pair will start.
[⇒]:	Cursor right key: It is used for the selection of a parameter value from a list.
[RCL]:	RECALL key: The menu for retrieving a value-pair will start.
[↑]:	Cursor up key: It is used for the selection of a parameter in a menu.
[Δ+]:	Δ PLUS key: The delta-x value selected currently will be added and spent to the current transmission value. With on but not started ramp function will be selected and spend the next ramp value.
[↓]:	Cursor down key: It is used for the selection of a parameter in a menu.
[Δ-]:	Δ MINUS key: The delta-x value selected currently will be subtracted and spent to the current transmission value. With on but not started ramp function will be selected and spend the last ramp value.
[]:	RAMP key: For activating the ramp function.
[1/0]:	RAMP START key: For starting/stopping the ramp function if the ramp function is on.
[CODE]:	CODE Input key: The code input menu will be started. In this menu must be entered a four-digit code. According to input you come to the Grip menu.
[ESC]:	ESCAPE key: This key is used to cancel a current entry and exit the input mode.
[ENT]:	ENTER key: This key is used to acknowledge a numeric entry if it does not set current, voltage or temperature value. In the menu load value-pair: The announced value-pair will be loaded and go back to the main menu. In the menu save value-pair: The current value-pair will be saved under announced number.
[MENU]:	The parameter selection menu will be recalled.

3.5 Description of the terminals

3.5.1 Pt100 Input



View of the socket

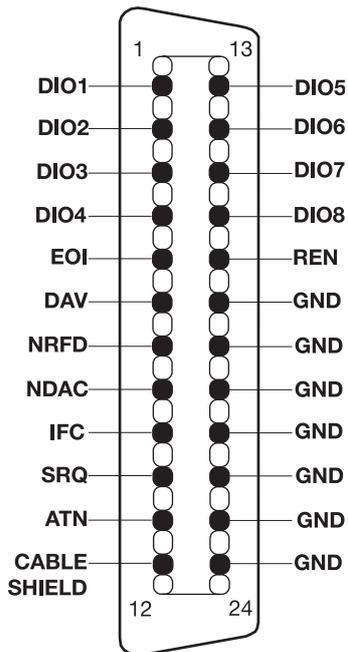
- | | |
|---|--------------------------|
| 1 | + U |
| 2 | + I |
| 3 | - I |
| 4 | Functional ground |
| 5 | Functional ground |
| 6 | - U |

Plug housing : Potential PE
Counter plug : burster model 4291-0

Two-wire technique can be used if the corresponding sensor terminals are bridged.

Note: **NEVER** apply the cable shield to the plug housing if there is any uncertainty concerning the sensor ground, as this might result in inadvertent potential binding on the temperature sensor and lead to measurement errors caused by double-ground compensation currents. (The plug housing serves as protective ground)

3.5.2 IEEE488 Interface



The 24-pole IEEE488 plug-connector is standardized and has the displayed pin assignment.

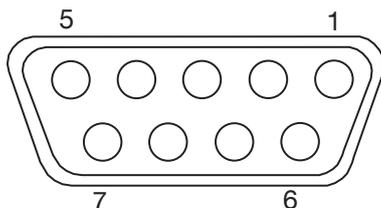
To comply with applicable interference protection guidelines (VDE 0871B), all interface cables and plugs must be shielded at both ends.

Caution: As a protection against electrostatic discharge connection is protected with a dust cap. Is a IEEE488 cable, connected, the cap should be attached to the socket of the connector.

Plug housing : Potential PE
Matching data cable : Model 5230-001

GND is internally grounded.

3.5.3 RS232 Interface



9-pol. Sub MiniD socket
View of socket

- | | |
|---|-----------------------------------|
| 1 | NC |
| 2 | TXD |
| 3 | RXD |
| 4 | |
| 5 | Digital GND (internally grounded) |
| 6 | |
| 7 | NC |
| 8 | |
| 9 | NC |

Plug housing: Potential PE

Counter-plug: Model 9900-V209

Matching data cable: Model 9900-K333

Bridged inside the device

4. Manual operation of the device

4.1 Transmission main menu

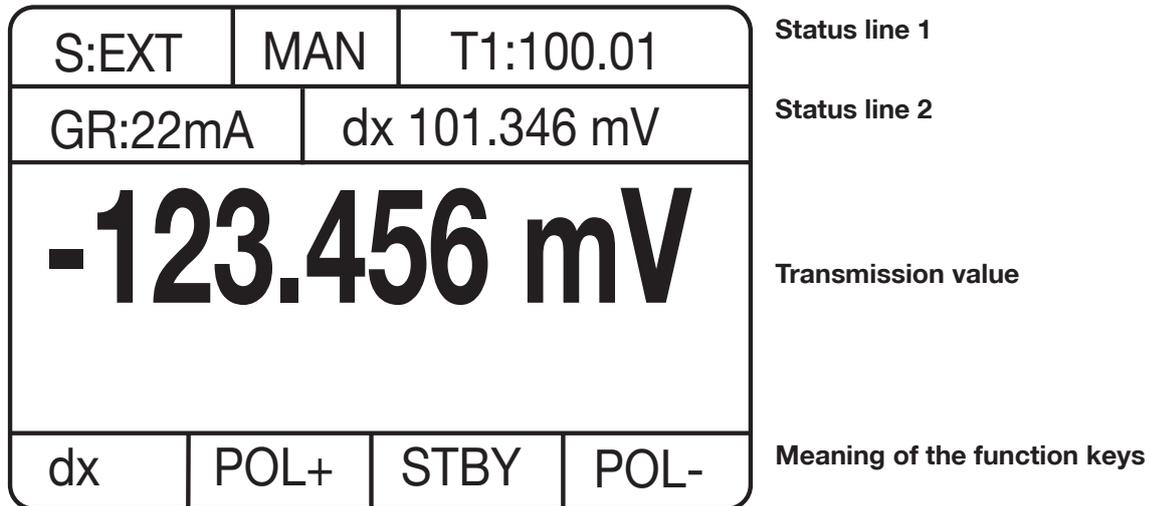


Figure: Transmission main menu

This menu is essentially intended for the entry and display of transmission values.

STATUS DISPLAY

Status line 1:

Field 1: Display **S:EXT** if an external sensor is selected for U transmission or TC transmission
Display **S:???** if the external sensor has reversed polarity.

Field 2: Display **MAN** if manual range selection is active for U transmission or TC transmission.

Field 3: If the **divider function** is selected, the division factor is displayed in this field.
(Only relevant for U transmission and TC transmission)
On the occurrence of an overload or measurement error, **OVER** is displayed in this field.
In this case, the division factor is not indicated.

Status line 2: Several options for selecting the display of status line 2 for TC transmission are provided in the status selection menu:

Option 1: (always for U transmission and I transmission)



Figure: Status line 2 with limiter and ΔX value

Field 1: The selected **current limit** for U transmission and TC transmission, or the selected **voltage limit** for I transmission.

Field 2: The currently selected **ΔX value**

Option 2: (only for TC transmission)

TC: K	EXT -123.456 C	Status line 2
--------------	-----------------------	----------------------

Figure: Status line 2 with TC type, RJ model and RJ temperature

Field 1: The selected **thermocouple**

Field 2: The selected **reference junction (EXTernal or MANual)** with the **reference junction temperature (on the occurrence of measurement errors, an error code is displayed instead of the temperature value)**

Option 3: (only for TC transmission)

TC: K	U (t) -123.456mV	Status line 2
--------------	-------------------------	----------------------

Figure: Status line 2 with TC type and transmission voltage

Field 1: The selected **thermocouple**

Field 2: The **actual value from the voltage sensor** being used as a temperature sensor.

Option 4: (only for TC transmission)

TC: K	U (0C) -123.456mV	Status line 2
--------------	--------------------------	----------------------

Figure: Status line 2 with TC type and sensor voltage with respect to 0 °C

Field 1: The selected **thermocouple**

Field 2: The voltage transmission value **with respect to 0° C.**

TRANSMISSION-VALUE FIELD (display with large characters)

1. A **valid transmission value**. (numeric value with unit)
2. On incorrect entry: >>> **with unit**
3. If activated in the status selection menu, the **measured Pt100 temperature** can be displayed in upper case characters instead of the transmission value. In this case, the transmission value is displayed in field 2 of status line 2 (lower case characters).

4.1.1 Version, serial number (Identification menu)

DIGISTANT TYP 4462			
VERSION:	V9801		
CAL:	0002		
DEVICE-SN:	4711007		
EXT-RJ-SN:	0815007		
		HOME	RETU

Figure: Version, serial number

This menu is invoked from the **parameter selection menu**, if the parameter **VERSION SERIAL NO.** has been selected on Page 2 there.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.1.2 Selecting a language

LANGUAGE:	DEUTSCH		
LANGUAGE:	ENGLISH		
LANGUAGE:	FRANCAIS		
		HOME	RETU

Figure: Selection of a language

This menu is invoked from the **parameter selection menu**, if the parameter **SELECT LANGUAGE** has been activated on **Page 2** there.

4.2 Entering of a value (transmission value)

Entries are made with the help of the numeric keys [0] to [9], the decimal key [.] and the sign key [+/-].
Entries are completed with the unit keys:

[mV], [V] :	For a voltage value.	(-30.0000V to 30.0000V)
[mA]:	For a current value.	(-52.0000mA to +52.0000mA)
[TEMP]:	For a temperature value (TC) (value range depends on the TC model ([TEMP] implies °C, °F or K, depending on the setting; this setting is performed in the TEMPERATURE menu). While an entry is being made, the display of the function keys remains hidden. If required (divider function), the F1 key can be assigned as a unit key [μV]. The [←] key can be used to delete the character entered last.	

A pending entry can be aborted with the [ESC] key. In this case, the last valid transmission value is displayed again. If an invalid transmission value is entered, „>>>“ with the corresponding unit is displayed in upper case characters instead of the numeric value in the transmission-value field. Press the [ESC] key to display the last valid transmission value or perform a new entry.

Δ-PLUS function:

Pressing the [Δ+] key adds the current Δ value to the current transmission value; if valid, the result is output and displayed as the new transmission value:

Δ-MINUS function:

Pressing the [Δ-] key subtracts the current Δ value from the current transmission value; if valid, the result is output and displayed as the new transmission value.

STDBY function

Pressing the **F3 key [STBY]** causes a 0 to be output (current, voltage or temperature, depending on the previous setting). However, the old transmission value is saved.

The following entries can be made with the STDBY function:

Press the F2 key [POL+] to output the stored transmission value with a positive sign. The STDBY function is deactivated as a result.

Press the F4 key [POL-] to output the stored transmission value with a negative sign. The STDBY function is deactivated as a result.

Press the [ESC] key to exit the STDBY function but continue an output of 0 (the stored transmission value is deleted)

POLARITY -PLUS function

Press the **F2 key [POL+]** to obtain a positive output of the current transmission value:

New transmission value = +1 * | current transmission value |. If the STDBY function was activated, it is now deactivated.

POLARITY-MINUS function

Press the **F4 key [POL-]** to obtain a negative output of the current transmission value:

New transmission value = -1 * | current transmission value |. If the STDBY function was activated, it is now deactivated.

STORE function

Press the **STO key (← key)** to invoke the STORE menu for saving a value pair (transmission value and Δ value).

RECALL function

Press the **RCL key** (\Rightarrow **key**) to invoke the RECALL menu for loading a value pair (transmission value and Δ value).

Pressing the **F1 key** [**dX**] invokes the ΔX menu where a ΔX new value can be entered.

Press the **[1/0] key** to invoke the code entry menu. A valid, 4 digit numeric code needs to be entered in this menu in order to invoke the access menu or trigger a SW-RESET.

Pressing the **[\square]** **key** invokes the ramp function.

Press the **[ENT] key** to invoke the parameter selection menu.

4.3 Ramp function

S:EXT	MAN	T1:100.123
TC: K	U (t)	-123.456mV
-234.768 °C		
hh:mm:ss	RAM1	RAM2

Figure: Transmission menu with active ramp

This function is invoked by pressing the **[\square]** **key** in the transmission main menu.

Pressing the key again (with the ramp stopped) effects an exit from the ramp function and a return to the transmission main menu.

The two status lines remain unchanged with respect to the transmission main menu.

When a measurement is started, the remaining time is counted down in seconds, given a time interval of ≥ 2 seconds, and displayed in the F1, F2 key field. The F1 and F2 keys are inactive in this process. Given a time interval of < 2 seconds, START is displayed in this field if the ramp has been started.

The ramp can be started and stopped with the **[1/0]key** (toggle function).

The **Cursor UP key** [\uparrow] can be used to select, display and output the next ramp value (if valid) with the ramp function active but stopped.

The **Cursor DOWN key** [\downarrow] can be used to select, display and output the previous ramp value (if valid) with the ramp function active but stopped.

F3 key [RAM1]:

1. If the RAM1 display is not inverted: Ramp 1 (constant ΔX and time intervals) is selected. The RAM1 display is inverted.
2. If the RAM1 display is inverted: The configuration menu for ramp 1 is invoked

F4 key [RAM2]:

1. If the RAM2 display is not inverted: Ramp 2 (variable ΔX and time intervals) is selected.
The RAM2 display is inverted.
2. If the RAM2 display is inverted: The configuration menu for ramp 2 is invoked.

BEHAVIOUR of the RAMP FUNCTION

If the ramp function is invoked, the ramp is started with the initial value. Once the specified number of repetitions has been attained (0 = continuous pass), the ramp is stopped.

The ramp can be stopped ahead of time by pressing the [1/0] key.

After the ramp has stopped, the transmission value last generated by the ramp function is retained. On a renewed start, the ramp does not start automatically at the initial value, but at the current transmission value (even if the ramp value has been modified by means of the [↑] or [↓] key).

When the ramp function is exited, the transmission value last generated by the ramp function is retained.

4.3.1 Ramp 1 configuration menu

SEQUENCE:	TRIANGLE
REPETITIONS :	17
START-VAL. :	-123.456mV
END-VAL. :	-29.8765 V
DELTA-VAL. :	-100.567mV
DELTA-TIME :	hh.mm.ss.s
RETU	

Figure: Ramp 1 configuration menu

If the RAM1 display is inverted, this menu can be invoked by pressing the F3 key [RAM1] with the ramp function active.

Pressing the **F4 key [RETU]** effects a return to the ramp function. When this menu is exited, a check is made as to whether the start, end and delta values have identical units. In the event of a discrepancy, an error message is issued and the menu is not exited. The values then need to be corrected. The menu can only be exited if no errors are present.

A parameter can be selected with the help of the [↑] and [↓] **cursor keys**. The selected parameter is displayed in inverse form.

If access has been granted, the selected parameter can be changed.

Set the **SEQUENCE**:

The following values can be set by pressing the [⇒] and [⇐] **cursor keys**:

TRIANGULAR
SAWTOOTH

Enter the number of **REPETITIONS**:

Numeric keys [0] to [9] can be used to enter a **value between 0 and 99**.

0 implies continuous operation.

If this PARAMETERS is selected, the value range is displayed in the form **0 >---< 99** in the last line of the display.

The [**←**] **key** can be used to delete the character entered last.

Entries are completed with the [**ENT**] **key**.

A pending entry can be cancelled with the [**ESC**] **key**.

Enter the **START VALUE**:

The numeric keys [0] to [9], decimal key [.] and sign key [+/-] can be used to enter a new start value. Entries are completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

Enter the **END VALUE**:

The numeric keys [0] to [9], decimal key [.] and sign key [+/-] can be used to enter a new end value. Entries are completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**

Enter the **DELTA-VALUE**: (only positive values)

The numeric keys [0] to [9] and decimal key [.] can be used **to enter** a new delta value. **The entry is completed by pressing a unit key. [V], [mV] or F3 key [μ V]** (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

Enter the **DELTA-TIME**:

The numeric keys [0] to [9] can be used to enter the time in the form hh:mm:ss.s. The entry is completed with the [**ENT**] **key**.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with **the** [**ESC**] **key**.

4.3.2 Ramp 2 configuratios menu

SEQUENCE:		TRIANGLE	
REPETITIONS	:	15	
STEPS	:	20	
VAL. [1]	:	-17.2345 mA	
TIME [1]	:	hh.mm.ss.x	
V [-]	V [+]		RETU

Figure: Ramp 2 configuration menu (Page 1)

VAL. [2]	:	-18.2345 mA	
TIME [2]	:	hh.mm.ss.x	
VAL. [3]	:	-19.2345 mA	
TIME [3]	:	hh.mm.ss.x	
VAL. [4]	:	-20.2345 mA	
TIME [4]	:	hh.mm.ss.x	
V [-]	V [+]	V [1]	RETU

Figure: Ramp 2 configuration menu (Page 2)

This menu is invoked by pressing the F4 key [RAM2] with the ramp function active, if the RAM2 display is inverted.

Press the **F4 key [RETU]** to return to the ramp function.

A parameter can be selected with the help of the **[↑]** and **[↓]** cursor keys. The selected parameterS is displayed in inverse form.

If access has been granted, the selected PARAMETERS can be changed.

Set the **SEQUENCE:**

The following values can be set by pressing the **[⇒]** and **[⇐]** cursor keys:

TRIANGULAR
SAWTOOTH

Enter the number of **REPETITIONS:**

Numeric keys [0] to [9] can be used to enter a **value between 0 and 99.**

0 implies continuous operation.

If this PARAMETERS is selected, the value range is displayed in the form **0 >—< 99** in the 6th line of the display.

Entries are completed with the **[ENT]** key.

The [**←**] **key** can be used to delete the character entered last.
A pending entry can be cancelled with the [**ESC**] **key**.

Enter the number of **STEPS**:

The numeric keys can be used to set a **value between 2 and 31**. If this parameter is selected, the value range is displayed in the form **2 >—< 31** in the 6th line of the LCD.

Entries are completed with the [**ENT**] **key**.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

The ramp consists of a **maximum of 31 steps**. The value pairs (transmission value and dwell time) of each step can be adjusted individually. The values for step 1 are displayed - together with the SEQUENCE, REPETITIONS and STEPS - on Page 1.

The other 30 value pairs can be selected in 30 further pages (3 value pairs per page). The pages can be calculated with the **F1 key [W[-]] (previous page)** and **F2 key [W[+]] (next page)**.

The **1st page can be selected with the F3 key [W[1]]**:

Enter a step value **VALUE[i]**:

The numeric keys [0] to [9], decimal key [.] and sign key [+/-] can be used to enter a new step value. The entry is completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value. The individual step values can have different units.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

Enter a step time **TIME[i]**:

The numeric keys [0] to [9] can be used to enter the time in the form hh:mm:ss.s. The entry is completed with the [**ENT**] **key**.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

4.4 Delta-X-value setting

DELTA INPUT			
DELTA-U : 123.456 mV			
DELTA-I : 21.3467 mA			
DELTA-T : 22.453 °C			
0 V	>----<	60 V	
			RETU

Figure: Δ X menu

This menu is invoked by pressing the **F1 key [dX]** in the transmission main menu.

In accordance with the currently set transmission mode, the corresponding delta value is selected and displayed in inverse form. The [**↑**] and [**↓**] **cursor keys** can be used to select the other delta values. The selected delta value is displayed in inverse form.

The value range of the selected delta value is indicated in the 6th line of the LCD.

The selected **DELTA VALUE** can be modified (only positive values).
 The numeric keys [0] to [9] and decimal key [.] can be used to enter a new delta value. The entry is completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a ΔU value, [mA] for a ΔI value and [TEMP] for a ΔT value.

The [\leftarrow] key can be used to delete the character entered last.
 A pending entry can be cancelled with the [ESC] key

Press the **F4-key [RETU]** to return to the transmission main menu.

4.5 Store function

MEMORY NUMB.: 13			
OUTPUT:		-123.456 mV	
DELTA :		12.3452 mV	
0 >---<		99	
OUTPUT [13]:		-123.456 mV	
DELTA [13]:		12.3452 mV	
STO			ESC

Figure: Store menu

This menu is invoked by pressing the [STO] key in the transmission main menu.

The current **TRANSMISSION** and **DELTA values** are indicated in addition to the memory number (displayed in inverse form).

These values can be selected with the [\uparrow] and [\downarrow] cursor keys, **edited** and then saved (the selected value is displayed in inverse form)

The current memory contents are also indicated (e.g. **TRANSMITTER [i]** and **DELTA [i]** of the selected memory location i). These values are indicated solely for monitoring, and **cannot** be selected or **modified**.

The numeric keys can be used to select a **MEMORY LOCATION between 0 and 99**. If this PARAMETERS is selected, the corresponding value range is indicated in the 4th line of the display in the form **0 > - < 99**.

Press the [ESC] key to cancel the entry without saving the values.

Press the [ENT] key to complete the entry.

The MEMORY LOCATION can also be selected with the [\leftarrow] and [\rightarrow] cursor keys.

Modifying the TRANSMISSION value to be saved:

The numeric keys [0] to [9], decimal key [.] and sign key [+/-] can be used to enter a new TRANSMISSION value. The entry is completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value. The individual step values can have different units.

The [\leftarrow] key can be used to delete the character entered last.

A pending entry can be cancelled with the [ESC] key.

Modifying the DELTA value to be saved:

The numeric keys [0] to [9] and decimal key [.] can be used to enter a new DELTA value. The entry is completed by pressing a unit key. [V], [mV] or F3 key [μ V] (with divider) for a voltage value, [mA] for a current value and [TEMP] for a temperature value. The individual step values can have different units.

The [\leftarrow] key can be used to delete the character entered last.

A pending entry can be cancelled with the [ESC] key.

Pressing the F1 [STO] or [ENT] key saves the TRANSMISSION and DELTA values under the indicated number and effects a return to the transmission main menu.

Pressing the F4 key [ABBR] effects a return to the main menu **without saving the values**.

4.6 Recall function

MEMORY NUMB.: 11			
0 >---< 99			
OUTPUT [11] : -123.456 mV			
DELTA [11] : 12.3452 mV			
RCL			ESC

Figure: Recall menu

This menu is invoked by pressing the [RCL] key in the transmission main menu.

The current **TRANSMISSION [i]** and **DELTA [i] values** are indicated in addition to the memory location (displayed in inverse form).

These values are intended solely as information, and **cannot be modified**.

The numeric keys can be used to select a **MEMORY LOCATION between 0 and 99**.

The value range of the memory number is indicated in the 3rd line of the display in the form

0 > - < 99.

Press the [ESC] key to cancel the entry without saving the values.

Press **the [ENT] key** to complete the entry.

The MEMORY LOCATION can also be selected with the [\leftarrow] and [\Rightarrow] cursor keys.

Pressing the F1 [RCL] or [ENT] key loads the **TRANSMISSION [i]** and **DELTA [i] values** of the selected memory location i and effects a return to the main menu.

Pressing the F4 key [ABBR] effects a return to the main menu **without loading the values**.

4.7 Parameter selection menu

SENSE			S1
I-/U-LIMIT			
U-RANGE SELECTION			
U-DIVIDER			
TC / TEMPERATURE			
PT100 SKALE			
SEL	S2		RETU

Figure: parameter selection menu, page 1

CONFIG.STORE/LOAD			S2
INTERFACE			
CONTRAST			
VERSION SER. NUMB			
SELECT LANGUAGE			
DISPLAY			
SEL	S1		RETU

Figure: parameter selection menu, page 2

This menu is invoked by pressing the [ENT] key in the transmission main menu.

It is intended for selecting other menus.

The parameter selection menu consists of **two page**.

The current page number is indicated in the **top right** corner: **S1 for page 1** and **S2 for page 2**.

The **F2 key** can be used to toggle between the pages. It is designated **S1 on page 2** and **S2 on page 1**.

A parameter can be selected with the [↑] and [↓] cursor keys. The selected parameter is displayed in inverse form.

Pressing the **F1 key [SEL]** invokes a menu related to the selected parameter.

The page as well as the selected parameter remain saved. Consequently, a renewed invocation of the PARAMETERS selection menu causes the original settings to be displayed.

Pressing the **F4 key [RETU]** effects a return to the transmission main menu.

4.8 Sense setting

Caution: Voltage peak - disconnect the device under test before making a sense switch over!

SENSE SETTING			
SENSE:		EXTERN	
		HOME	RETU

Figure: Sense setting menu

This menu is invoked from the **parameter selection menu** if **page 1** of the **SENSE** parameter was selected there.

SENSE can be set to **INTERN** or

EXTERN with the [**←**] and [**→**] cursor keys.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

Sense setting **EXTERN**

The 4 wire voltage sensing, 2 wire as load lead and 2 wire as sense lead, arised the input voltage stability on the feed in point. The actual value of the voltage on the feed in point is measured over separately voltage sensing lead without fall of voltage. A load dependent fall of voltage can be compensated to the given value.

4.9 Current/Voltage limit setting

LIMIT			
U-LIMIT :		20 V	
I-LIMIT :		10 mA	
1 V > --- < 32 V			
		HOME	RETU

Figure: Menu for setting the current/voltage limit

This menu is invoked from the **parameter selection menu** if page 1 of the **I/U limit** parameter was selected there.

If a voltage or **temperature value is being output**, the **I-LIMIT** parameter is **selected** automatically (inverse display).

If a **current value is being output**, the **U-LIMIT** parameterS is **selected** automatically (inverse display).

The **[↑]** and **[↓]** **cursor keys** can be used to **toggle** between the **U-LIMIT** and **I-LIMIT** parameters (the selected parameters is displayed in inverse form). The value range corresponding to the selected limit is indicated in the 6th line of the LCD.

Enter the voltage LIMIT (U-limit): (Value range: 1 V to 32 V)

The numeric keys [0] to [9] can be used to enter a new U-LIMIT. The entry is completed by pressing the [V] key.

The [**←**] **key** can be used to delete the character entered last.

A pending entry can be cancelled with the [**ESC**] **key**.

Enter the current LIMIT (I-limit): (Value range: 1mA bis 55mA)

The numeric keys [0] to [9] can be used to enter a new I-LIMIT. The entry is completed by pressing the [V] key.

The [**←**] **key** can be used to delete the character entered last.

The entering process can be cancelled using the [**ESC**] **key**.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

The current is limited during U transmission; the voltage is limited during I transmission.

4.10 Range selection for setting voltage

SELECT RANGE. OUT U			
SELECT RANGE : MAN			
RANGE: 300.00 mV			
		HOME	RETU

Figure: Range selection menu for voltage transmission

This menu is invoked from the **parameter selection menu** if **page 1** of the **U-RANGE SELECTION** parameter was selected there.

The **RANGE SELECTION** parameter can be set to

AUTOmatic or

MANual with the [**←**] and [**⇒**] cursor keys.

On the **MAN**ual setting, the **RANGE** is also displayed in the next line. In this case, the RANGE parameter can be selected with the [↑] and [↓] cursor keys (inverse display).

The **RANGE** can be toggled between

300.000 mV,

3.00000 V and

30.000 V using the [←] and [→] cursor keys.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.



CAUTION

Risk of voltage peaks when switching between measuring ranges.

These may damage connected equipment.

1. Use the „manual range selection“ function.
2. Configure only when the device under test is disconnected.

Note:

From version V201001 onwards, May 2010, switching from a smaller range to a larger range only generates minimal transient peaks.

4.11 Divider setting

VOLTAGE DIVIDER			
DIVIDER : ON			
FACTOR: 100			
		HOME	RETU

Figure: Menu for setting the voltage divider

This menu is invoked from the **parameter selection menu**, if **page 1** of the **DIVIDER** parameter was selected there.

If an external voltage divider is connected, this menu can be used to activate the divider function and enter the division factor.

The transmission value to be output by the divider can then be specified.

The [↑] and [↓] cursor keys can be used to toggle between the **DIVIDER** and **FACTOR** parameters. The selected parameter is displayed in inverse form.

The **DIVIDER** can be switched **ON** or **OFF** with the [⇒] and [⇐] cursor keys.

A **FACTOR** with a value ranging between **1.000000** and **1010.000** can be entered with the numeric keys [0] to [9] and decimal key [.]

If **FACTOR** has been selected, the value range is indicated in the form **1.0 >—< 1010.0** in the 6th line of the LCD.

The entry is completed with the **[ENT]** key.

The [⇐] key can be used to delete the character entered last.

A pending entry can be cancelled with the **[ESC]** key.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.12 Thermocouple/temperature menu

TC-TYPE: K IPTS68			
REF-TYPE: EXTERN			
REF-TEMP: 30.00 K			
TEMP.DIMENSION:			K
SKALE: IPTS68			
		HOME	RETU

Figure: Thermocouple/temperature menu

THIS MENU IS ONLY AVAILABLE WITH THE THERMOCOUPLE OPTION.

This menu is invoked from the **parameter selection menu** if **page 1** of the **TC / TEMPERATURE** parameter was selected there.

The various parameters can be selected with the [↑] and [↓] cursor keys. The selected parameter is displayed in inverse form.

The [⇒] and [⇐] cursor keys can be used to make a selection between the following types of TC:
R, S, B, J, T, E, K, U, L, N, C, D, G2, M

The reference junction (REF-TYPE) can be set to one of the following values with the [↑] and [↓] cursor keys:

- EXTERN:** External reference junction, temperatures are measured with an external Pt100 sensor.
- MANUEL:** The reference junction temperature is not measured, but entered manually.

If an external reference junction is selected, its temperature **REF-TEMP** is measured and displayed here. If the manual setting is chosen for the reference junction, the temperature needs to be entered here.

Value range: -50 °C to 150 °C.

If REF-TEMP has been selected, the value range is indicated in the 6th line of the LCD in the form **-50 C > - < 150 C**. The numeric keys [0] to [9], decimal key [.] and sign key [+/-] can be used to enter the reference junction temperature. The entry is completed by pressing the [TEMP] key. The [\leftarrow] key can be used to delete the character entered last. A pending entry can be cancelled with the [ESC] key.

The **temperature unit** can be set to one of the following values with the [\Rightarrow] and [\leftarrow] cursor keys:

- K** Kelvin
- C** Celsius
- F** Fahrenheit.

In the case of Celsius and Fahrenheit degrees, the ° character is omitted because it is not available in the lower case font. However, the ° character is displayed with transmission values and measurement values represented in upper case.

All temperature values are displayed with this selected unit.

The [TEMP] key receives the designation of the temperature unit selected here.

The temperature SCALE can be set to one of the following values with the [\Rightarrow] and [\leftarrow] cursor keys:

- ITS90**
- IPTS68**

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.13 Pt100 scaling

A = 0.0039083			
Ro = 100			
B = -5.775E-07			
C = -4.183E-12			
DIN EN: 0.0039083			
0.003 < -- > 0.006			
Exp	EN	HOME	RETU

Figure: Pt100 scaling

THIS MENU IS ONLY AVAILABLE WITH THE THERMOCOUPLE OPTION.

This menu is invoked from the parameter selection menu if **page 1** of the **PT100 SCALING** parameter was selected there.

The coefficients for calculation of Pt100 temperature can be modified in this routine.

DIN EN coefficients are used as the default values.

The related DIN EN value in each case is displayed in the 5th line.

The permissible entry range in each case is displayed in the 6th line.

The various coefficients can be selected with the [\uparrow] and [\downarrow] cursor keys.

The selected coefficient is displayed in inverse form.

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New coefficients can be entered with the numeric keys [0] to [9], decimal key [.] , sign key [+/-] and F1 key [Exp]. Entries are completed with the **[ENT]** key.

The **[←]** key can be used to delete the character entered last.

A pending entry can be cancelled with the **[ESC]** key.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

Pressing the **F2 key [EN]** calls up a list of all DIN EN values.

DIN EN VALUES			
A = 0.0039083			
Ro = 100			
B = -5.775E-07			
C = -4.183E-12			
			RETU

Figure: Pt100 DIN EN coefficients

Pressing the **F4 [RETU]** key effects a return to Pt100 scaling.

4.14 Device selection stored and load

STORE/LOAD CONFIG.			
STORE NUMBER: 13			
STO LAB: 1234567890			
1 > ---- < 33 (DEFAULT)			
STOR	LOAD	HOME	RETU

Figure: Device setting store and load

This menu is invoked from the parameter selection menu if page 2 of the **DEVICE SETTING** parameter was selected there.

Device settings can be stored and loaded in this menu.

The interface settings and 100 transmission value / ΔX value pairs are not saved.

32 device settings can be saved. A default setting can be loaded in addition to these 32 stored device settings. A 10-digit ID can be assigned to every memory location.

The MEMORY LOCATION and ID parameters can be selected with the [↑] and [↓] cursor keys. The selected parameter is displayed in inverse form.

A **MEMORY LOCATION** ranging between 1 and 33 can be entered with the numeric keys [0] to [9]. If MEMORY LOCATION has been selected, the corresponding value range is indicated in the form **1 >—< 33 (DEFAULT)** in the 6th line of the LCD.

Entries are completed with the **[ENT] key**.

The **[←] key** can be used to delete the character entered last.

A pending entry can be cancelled with the **[ESC] key**.

The memory locations can also be toggled with the [←] and [→] cursor keys. **Memory location 33 is the default setting**; it can be loaded but not saved. For this reason, the F1 key is not designated on the selection of memory location 33.

The **ID** (max. 10 digits) of a memory location can be entered with the numeric keys [0] to [9]. In addition, the letters A, G, N and T can be selected directly with the function keys 1 to 4. The [↑] and [↓] cursor keys can be used to toggle these letters. The [→] key is used to accept a letter.

Entries are completed with the [ENT] key.

The [←]key can be used to delete the character entered last.

A pending entry can be cancelled with the [ESC] key.

Pressing the F1 key [STORE] stores the current setting under the selected memory number and effects a return to the transmission main menu.

Pressing the F2 key [LOAD] loads the selected memory setting and effects a return to the transmission main menu.

Pressing the F4 key [RETU] effects a return to the parameter selection menu without loading or storing any values.

Pressing the F3 key [HOME] directly invokes the transmission main menu without loading or storing any values.

4.15 Interface menu

INTERFACE-MENU			
INTERFACE: RS232			
CONF		HOME	RETU

Figure: Interface menu

This menu is invoked from the **parameter selection menu** if **page 2** of the **INTERFACES** parameter was selected there.

The [←] and [→] cursor keys can be used to select one of the following values:

IEEE488 : The device can be operated via the IEEE488 interface.

RS232 : The device can be operated via the RS232 interface.

The **F1 key [CONF]** can be used to invoke the configuration menu of the currently selected interface.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.15.1 IEEE488 configuration menu

CONFIG. IEEE488			
ADDRESS: 9			
TRIGGER: PASSIV			
SERIAL POLL: 4462 / 6705			
1 > ---- < 31			
		HOME	RETU

Figure: IEEE488 configuration menu

The IEEE488 interface is configured in this menu.

The [↑] and [↓] cursor keys can be used to select the various parameters in the menu. The selected parameter is displayed in inverse form. Only this parameter can be modified.

Set the **ADDRESS:**

The numeric keys [0] to [9] can be used to enter a new value.

Value range: 1 to 31

If ADDRESS has been selected, the value range is indicated in the form **1 >—< 31** in the 6th line of the LCD. Entries are completed with the **[ENT] key**.

The [←] key can be used to delete the character entered last.

A pending entry can be cancelled with the **[ESC] key**.

Select a **TRIGGER:**

The [←] and [→] cursor keys can be used to select one of the following values: **ACTIVE**
PASSIVE

Select the **SERIAL POLL :**

The [←] and [→] cursor keys can be used to select one of the following attitudes: **4462**

6705 (Change-over of the behavior for SERIAL POLL function between 4462- and 7605 attitudes).

Pressing the **F4 key [RETU]** effects a return to the interface menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.15.2 RS232 configuration menu

DATABITS:		8	
STOPBITS:		1	
PARITY:		NONE	
BAUDRATE:		9600	
CHAR.DELAY:		OFF	
		HOME	RETU

Figure: RS232 Configuration menu

The RS232 interface is configured in this menu.

The [↑] and [↓] cursor keys can be used to select the various parameters in the menu. The selected parameter is displayed in inverse form. Only this parameter can be modified. DATA BITS, STOP BITS and PARITY are selected together.

Setting the **DATA BITS, STOP BITS and PARITY:**

As only certain combinations are possible, these parameters are set together.

The following combinations can be set with the [⇒] and [⇐] cursor keys.

8 data bits	1 stop bit	no parity
7 data bits	2 stop bits	no parity
7 data bits	1 stop bits	even parity
7 data bits	1 stop bits	odd parity
8 data bits	2 stop bits	no parity
8 data bits	1 stop bits	even parity
8 data bits	1 stop bits	odd parity

Set the **BAUDRATE:**

The following values can be selected with the [⇐] and [⇒] cursor keys:

38400
19200
9600
4800
2400
1200
600
300

Set the **CHARACTERDEL**ay:

The following settings can be made with the [⇐] and [⇒] cursor keys:

ON
OFF

Pressing the **F4 key [RETU]** effects a return to the interface menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.16 Contrast

LCD-CONTRAST			
CONTRAST: 5			
0 > ---- < 10			
		HOME	RETU

Figure: Contrast setting menu

This menu is invoked from the **parameter selection menu** if page 2 of the **CONTRAST** parameter was selected there.

The **CONTRAST** value can be adjusted between 0 and 10 with the numeric keys [0] to [9].

The value range is indicated in the form **0 >—< 10** in the 6th line of the LCD:
Entries are completed with the **[ENT]** key.

The **[←]** key can be used to delete the character entered last.
A pending entry can be cancelled with the **[ESC]** key.

The contrast can also be adjusted with the **[←]** and **[⇒]** cursor keys.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

4.17 Status indication

STATUS DISPLAY			
LINE 2: LIMIT OUT, dx			
ANZEIGE: PT100 TEMP.			
		HOME	RETU

Figure: Status display menu

THIS MENU IS ONLY AVAILABLE WITH THE THERMOCOUPLE OPTION.

This menu is invoked from the **parameter selection menu** if page 2 of the **STATUS DISPLAY** parameter was selected there.

The [↑] and [↓] cursor keys can be used to select the various parameters in the menu. The selected parameter is displayed in inverse form. Only this parameter can be modified.

The **status display of LINE 2** can be switched to the following modes with the [←] and [→] cursor keys:

LIMIT, dx	U-/I limit and ΔX value
TC TYPE, TEMP	TC model and reference junction type with reference junction temperature
TC TYPE, U(t)	TC-TYP model and transmission voltage
TC TYPE, U(O)	TYPE and transmission voltage based on 0° C

THE SELECTION OF STATUS LINE 2 IS ONLY RELEVANT WITH TC TRANSMISSION.

The upper case **DISPLAY** can be set to the following modes with the [←] and [→] cursor keys:

TRANSMISSION VALUE	The transmission value
PT100 TEMP.	The measured Pt100 temperature

If the PT100 TEMP is displayed in upper case, then the transmission value in field 2 of status line 2 is displayed in lower case, irrespective of the status display selected for line 2.

Pressing the **F4 key [RETU]** effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** directly invokes the transmission main menu.

The [↑] and [↓] cursor keys can be used to make a selection between the available languages (German, English, French). The selected language is displayed in inverse form.

Pressing the **F4 key [RETU]** accepts the selected language and effects a return to the parameter selection menu.

Pressing the **F3 key [HOME]** accepts the selected language and directly invokes the transmission main menu.

4.18 Code input

CODE-INPUT			
PLEASE ENTER CODE 4 NUMBERS: ****			
			RETU

Figure: Code entry

The code entry menu offers two possibilities:

- a) Invocation of the access menu or
- b) Setting of the device to a defined state.

Enter code number 2609 to invoke the access menu.

Enter code number 9062 to set the device to a defined state.

Various menu items can be enabled or disabled in the access menu.

Only the menu items marked with an asterisk (*) are enabled.

If the device is set to a defined state with the related code (i.e. device settings as on delivery), all user settings are deleted.

The code is entered with the numeric keys [0] to [9].
Every number entry is confirmed with the display of a *.

Pending code entries can be cancelled with the **[ESC]** key.

Pressing the **F4** key **[RETU]** effects a return to the transmission main menu.

4.19 Access menu

ACCESS			P1
* OUTPUT FUNCTION			
* RAMPFUNCTION			
* CONFIGURE RAMP 1			
* CONFIGURE RAMP 2			
P+	P-		RETU

Figure: Access menu, page 1

ACCESS			P2
* dX INPUT			
* STORE FUNCTION * RECALL FUNCTION * SENSE			
P+	P-		RETU

Figure: Access menu, page 2

ACCESS			P3
* U-/I-LIMIT			
* U-RANGE SELECTION * U-DIVIDER * INTERFACE			
P+	P-		RETU

Figure: Access menu, page 3

ACCESS			P4
* SELECT LANGUAGE			
* CONTRAST * STORE CONFIGURATION * LOAD CONFIGURATION			
P+	P-		RETU

Figure: Access menu, page 4

ACCESS			P5
* TC-Type			
* RJ, TEMPERATURE			
* PT100 SCALE			
* DISPLAY			
P+	P-		RETU

Figure: Access menu, page 5

This menu is invoked via the code selection. It consists of a total of 5 pages.

The current page number is indicated at the top right.

The **F1 key [S+]** is used to call up the **next page**.

The **F2 key [S-]** is used to call up the **previous page**.

The  and  cursor keys can be used to select the various parameters in the menu. The selected parameter is displayed in inverse form. Access to the selected function can be modified here.

The  and  cursor keys can be used to enable or disable access to the selected function.

Enabled functions are marked with a *.

Pressing the **F4 key [RETU]** effects a return to the transmission main menu.

4.20 20 mA SINK

The DIGISTANT® model 4462 can be operates with a voltage to 30 V as „ 20 mA SINK“.

The equipment is attaches according to the polarity.

The current values are entered with minus sign.

It must be noted that no voltage limit is setting.

The equipment is appropriate only for DC voltage.

The connection to the loop voltage take place only in the switched on condition by the DIGISTANT® 4462.

5. Remote control of device

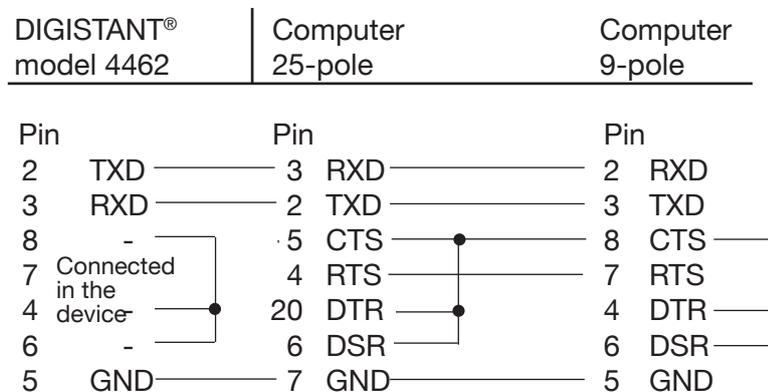
5.1 General information

The DIGISTANT® model 4462 is equipped with a RS232-C interface and an IEEE488 interface. The selection of the required interface and its parametrization are described in Section 4.15 titled „Interface menu“.

5.1.1 Terminal assignment of the RS232 interface

The 9 pole Submin D socket is assigned as follows:

With RS232 interface:



Note: In the case of Basic programs, DTR, DSR and CTS must be bridged on the PC side. This is achieved automatically by the internal bridges of the device if a 9-pole 1:1 model 9900-K033 cable is used.

5.1.2 Control via the RS232 interface

To allow control of the device via the RS232 interface, all the RS232 parameters in the interface menu (Section 4.15.2) must be set.

Protocol

The following ANSI standard transmission protocol is used by the serial interface of the DIGISTANT® model 4462:

ANSI X3.28-1976 Subcategory 2.1, A3

Command without query form

- The device waits for a command having the form: <STX>Command1<LF><ETX>
 <STX>: ASCII value 02
 Command1: SCPI command without query form
 <LF>: ASCII value 10
 <ETX>: ASCII value 03
- On the reception of a valid command, the device responds with <ACK>.
 On the reception of an invalid command, the device responds with <NAK>.
 <ACK>: ASCII value 06
 <NAK>: ASCII value 21

Command with query form

1. The device waits for a command having the form : <STX>Command2<LF><ETX>
<STX>: ASCII value 02
Command2: SCPI command with query form
<LF>: ASCII value 10
<ETX>: ASCII value 03
2. On the reception of a valid command, the device responds with <ACK>. On the reception of an invalid command, the device responds with <NAK>.
<ACK>: ASCII value 06
<NAK>: ASCII value 21
3. To fetch the requested data, an <EOT> must be sent to the device.
<EOT>: ASCII value 0
4. The device then supplies the data in the following form:
<STX>Data<CR><LF><ETX>
<CR>: ASCII value 13
5. The reception of the data must be acknowledged with <ACK>.
6. Items 4 and 5 are repeated until no data are present any more. The device then responds with <EOT>. After that, the device assumes its initial state and is ready ready to receive a new command.

Timer functions

Timer A (response timer)

Timer A is used by the transmitting station as a safeguard against no response or an invalid one.

- Start: Timer A is started once data transmission has been completed with ETX as described previously under item 4.
- Stop: Timer A is stopped once a valid response has been received <ACK>.
- Time out: When a time out occurs, the DIGISTANT® 4462 sends an <EOT> and assumes its initial state (ready for a new command).

The time out value of timer A is set firmly to 15 seconds.

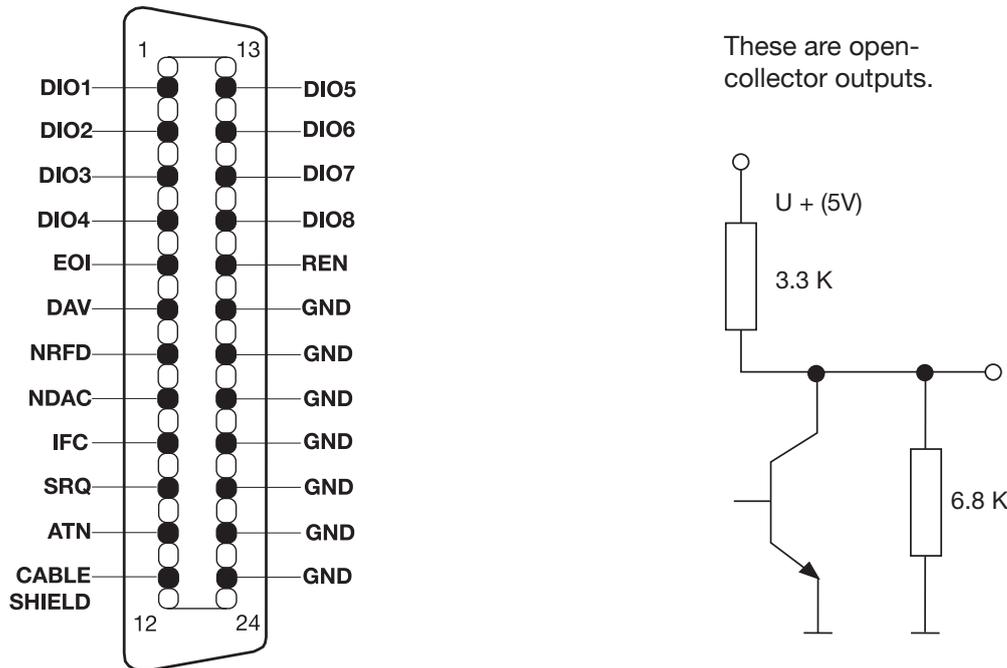
Timer B (receive timer)

Timer B is used by the receiving station as protection against failure to identify an <ETX> signal.

- Start: Timer B is started on the reception of the <STX> signal as described previously under item 1.
- Restart: Timer B is restarted during data transfer to allow the reception of data blocks of variable lengths.
- Stop: Timer B is stopped on the reception of the <ETX> signal.
- Time out: When a time out occurs, the received data (command) are discarded. The device then assumes its initial state and is ready to receive a new command.

The time out value of timer B is set firmly to 15 seconds.

5.1.3 Terminal assignment of the optional IEEE488 interface



The 24-pole IEEE488 connection plug is standardized and has the indicated pin assignment.

To comply with applicable interference protection guidelines (e.g. VDE 0871B), all interface cables and plugs must be shielded and grounded at both ends.

5.1.4 Control via the IEEE488 interface of the DIGISTANT® 4462

For the device to be controlled via the IEEE488 interface, the IEEE488 must be selected in the interface menu (Section 4.15.1).

Setting the device address

The device address of the 4462 for control via the IEEE488 is set in the corresponding interface menu. A number in the range 1 ... 31 can be selected for the address. The default setting 9 is used in all the examples here. Every device connected to the IEEE488 must have its own address. If the address of a device is changed on the front panel, the new address becomes effective immediately.

Input/output commands

For control of the 4462 by an IEEE488 controller, the corresponding input/output commands must be known. The command syntax is provided in the operating manual of the IEEE488 controller. The following input/output commands are used in the Basic language of the HP series 200/300:

OUTPUT and ENTER.

If a National-PC card has been installed, the commands are:

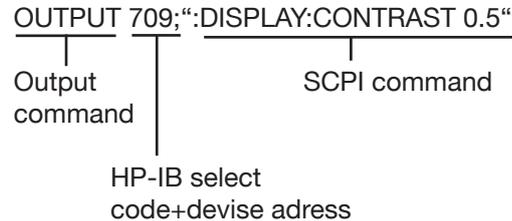
IBWRT and IBRD.

The examples in this manual are written in Q Basic.

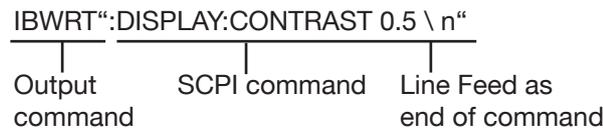
Sending a command

Commands sent to the 4462 must comply with the SCPI format. For example, the following command is sent to adjust the display contrast:

1. in HP Basic:



2. with National:



Reception of data from the 4462

The 4462 sends data requested via an SCPI query command. For example, on receiving the following query: `OUTPUT709;":DISP:CONT?"`

the 4462 writes the current setting of the display contrast to its output buffer. This response can be fetched with the input command of the IEEE488 controller.

Remote/local

On receiving a command addressed to it, the 4462 switches into the remote state. In this state, function key F4 is designated LOCAL, and except for this key, all other keys are disabled.

A switch over to the local mode can be performed by pressing the local key or sending a Go-to-local command via the IEEE488.1.

If a Local Lockout command was sent via the IEEE488.1, the 4462 can only be switched to the local mode using the Go-to-local command, because the local key is also disabled in this case. This corresponds to the command `SYSTEM:CLOCK ON` (e.g. with an RS232 interface).

5.2 DIGISTANT® command language

5.2.1 Introduction

The command language of the 4462 is called **SCPI** (**S**tandard **C**ommands for **P**rogrammable **I**nstruments). SCPI is a universal language with standardized commands agreed by the leading manufacturers of electrical equipment. SCPI not only provides a standardized set of commands but also allows manufacturers to define their own commands in accordance with specific rules.

In addition to these commands, all SCPI devices should implement the following **IEEE488.2 common commands**:

- *CLS Clear Status Command
- *ESE Standard Event Status Enable Command
- *ESE? Standard Event Status Enable Query
- *ESR? Standard Event Status Register Query
- *IDN? Identification Query
- *OPC Operation Complete Command
- *OPC? Operation Complete Query

- *RST Reset Command
- *SRE Service Request Enable Command
- *SRE? Service Request Enable Query
- *STB? Read Status Byte Query
- *TST? Self-Test Query
- *WAI Wait to Continue Command

5.2.2 Command header

e.g. **DISPlay**

Every SCPI command header has a long and a short form, and every SCPI device should just accept precisely this long and short form. The IEEE488.2 limits the length of a command header to 12 characters.

The long form either comprises one single word or abbreviations of several words. The short form is an abbreviation of the long form.

If a command consists of a single word, this word is the long form of the command (e.g. DISPLAY). If a command consists of several words, it is formed from the first letters of each word and the entire last word. For example, the words ‚line frequency‘ are shortened to the command ‚LFREQUENCY‘.

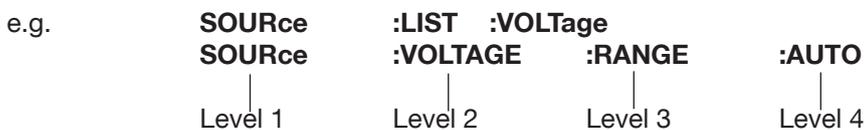
The short form of the command header normally comprises the first four letters of the long form (e.g. DISP). An exception is when the long form consists of more than four letters, the fourth one being a vowel. In this case, the vowel is left out. The short form then only contains the first three letters of the long form. For example, the short form of the calibration command is CAL.

The command list shows commands in their long form, with the short form in upper case and the remainder of the command in lower case.

Commands can be transmitted in lower and upper case.

5.2.3 Command tree

The SCPI command tree has a hierarchical structure. This allows the same command header to be used for several different functions on different levels of the hierarchy.



The different command levels are separated by a „:“. Some commands have optional headers. For example, the command INITiate:IMMEDIATE has an optional header „IMMEDIATE“ on level 2. Optional headers need not be transmitted with their related commands.

The command list shows optional command sections enclosed in square brackets, e.g. INITiate[:IMMEDIATE]. The brackets are not part of the command, and must not be transmitted with it.

5.2.4 Query form

All commands have a related query form, if not specified otherwise. As defined in IEEE488.2, the query form of a command is created by appending a question mark to the command header (e.g. DISPLAY:CONTRAST?). A query form can, but need not, be sent with a parameter. When the 4462 receives the query form of a command, the current setting related to the command is written to the output buffer. The response to a query command does not contain the command header. If the response to a query command consists of one word, the short form is always used.

5.2.5 Parameters

The parameters valid for an instruction are provided together with syntax descriptions in the following instruction list. The parameters are separated from the instruction header by means of a blank space.

Format of a parameter:

A parameter which sets a voltage, current or TC value can be entered in several formats and with several units.

The value can be specified in integer, floating-point or exponential form.

Valid units for a parameter are:

Current value with optional unit:	Value range:	-52 mA to 52 mA.
	Valid units:	UA, MA, A, KA, MAA.
	Default unit:	A.
Voltage value with optional unit:	Value range:	-30 V to 30 V (variable in the case of manual range selection).
	Valid units:	UV, MV, V, KV, MAV.
	Default unit:	V.
Temperature value with optional unit:	Value range:	Dependent on the type of thermocouple.
	Valid units:	C or CEL, F or FAR, K.
	Default unit:	Set in the device.

Format of the ON/OFF - parameters

The ON/OFF parameters can be replaced by numeric parameters. The 4462 always responds with numeric values to a query form.

OFF -> 0
ON -> 1

If only an instantaneous setting is requested, this parameter can be omitted from the query form of a command.

5.2.6 End-of-command character

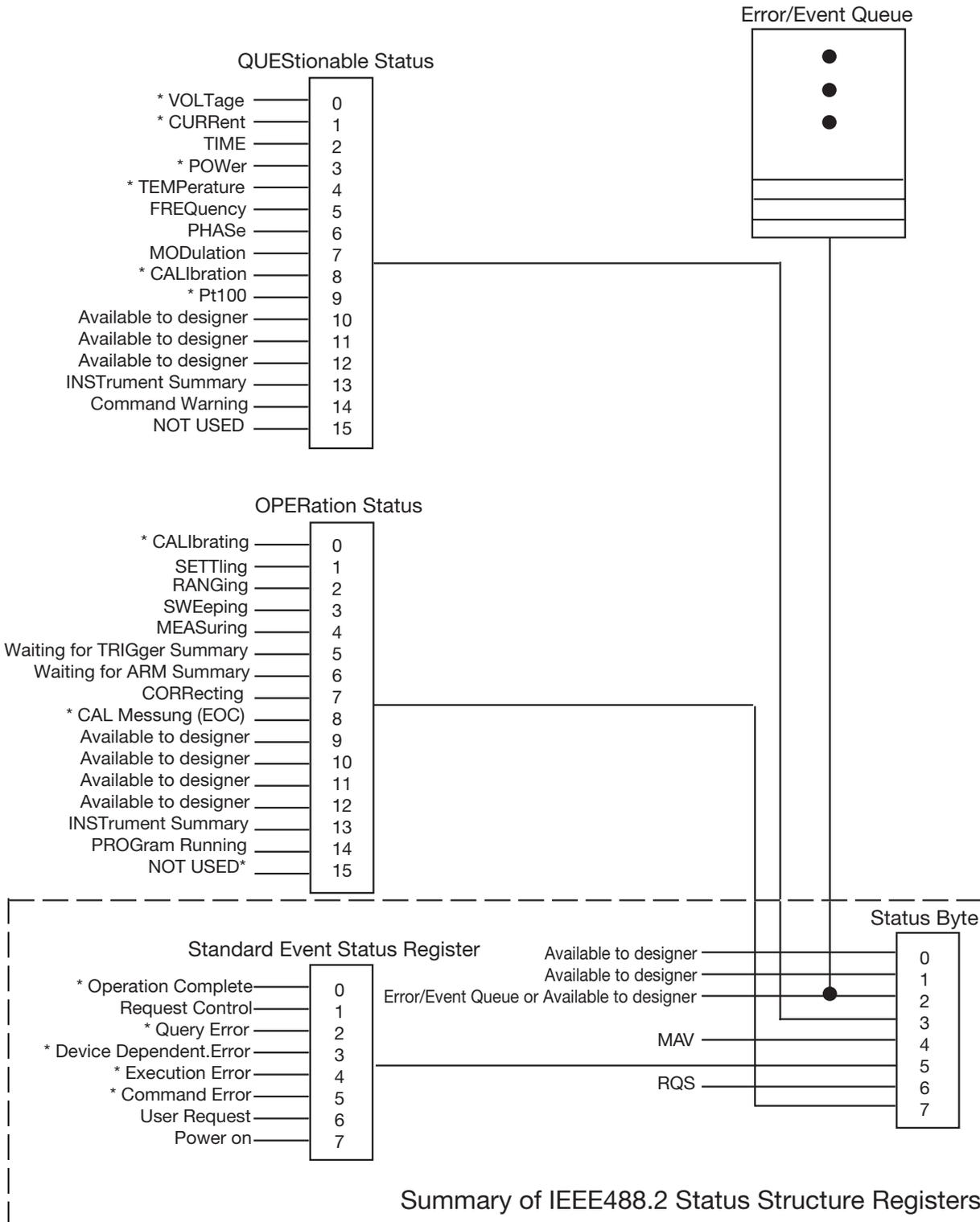
A line feed (nl), semicolon (;) or EOI (IEEE488.1 end or indentify), together with the character sent last (EOI only in the case of IEEE488 control) indicate the end of a command.

For example, if the HP200/300 Basic „OUTPUT709;“:INIT“ is sent, the controller automatically appends <cr><nl> to the command. With other IEEE488 controllers such as a National PC card, the <nl> character might need to be entered explicitly. (e.g.: ibwrt“:init\n“).

5.2.7 Status messages

Every SCPI device requires the status mechanism described in Chapter 11 of IEEE488.2, including the full implementation of the Event Status Register structure.

The following diagram shows the basic SCPI data structure with the related registers.



The events/functions marked with * are implemented inside the device.

5.2.8 Operation Status Register

The Operation Status Register indicates states which are part of the standard functions of the 4462. When a bit in the Operation Status Enable Register is enabled, the Operation Status Summary Bit (bit 7) in the Status Register is set. When bit 7 in the Service Request Enable Register is enabled, a Service Request is sent to the System Controller if the 4462 is being controlled via the IEEE488. The bits used by the 4462 are:

- 0 - Calibrating - The 4462 is performing a calibration.
- 8 - EOC - End of Conversion: This bit indicates that the 4462 has obtained a valid measurement value.

The commands for controlling the Operation Status structure are:

STATus:OPERation:EVENT?
STATus:OPERation:ENABLE
STATus:OPERation:CONDition?

5.2.9 Questionable Status Register

The Questionable Status Register indicates that the data presently being recorded are invalid for some reason.

When a bit in the Questionable Status Register is set and the corresponding bit in the Questionable Status Enable Register enabled, the Questionable Status Summary bit (bit 3) in the Status Register is set. When bit 3 in the Service Request Enable Register is enabled, a Service Request is sent to the System Controller if the 4462 is being controlled via the IEEE488.

Bit 14 is the Command Warning bit which indicates that a parameter has been ignored during the processing of a command.

The commands for controlling the Questionable Status structure are:

STATus:QUESTionable:EVENT?
STATus:QUESTionable:ENABLE
STATus:QUESTionable:CONDition?

5.2.10 Standard Event Register

The Standard Event Register indicates various states of the 4462. When a bit in the Standard Event Register is set and the corresponding bit in the Standard Event Enable Register is enabled, bit 5 in the Status Register is set. When bit 5 in the Service Request Enable Register is enabled, a Service Request is sent to the System Controller if the 4462 is being controlled via the IEEE488.

The bits used in the 4462 have the following meanings:

- Bit 0 Operation Complete This bit is set in response to the *OPC command. It indicates that the device has finished executing the selected operation.
- Bit 2 Query Error A query error was detected. This bit indicates that either:
 - (1) data were requested although none are available,
 - (2) or data in the output buffer were lost.

Bit 3 Device Dep. Error	The Device Dependent Error bit indicates that an error occurred during a measurement.
Bit 4 Execution Error	The Execution Error bit is set on the transmission of an incorrect parameter.
Bit 5 Command Error	The Command Error Bit is set when the SCPI interpreter fails to recognize a command.

The IEEE488.2 commands for controlling the Standard Event data structure are:

*ESR?
*ESE
*ESE?

5.2.11 Status Byte

The Status byte is used to summarize several Event Registers in a Status Register. The Status byte of every Event Register contains an Event Register Summary bit which indicates whether an event has occurred in the related Event Register. The Summary bit is only set if the corresponding bit in the Event Enable Register is set. When the Summary bit is set and bit in the Service Request Enable Register is enabled, a Service Request is sent to the System Controller if the 4462 is being controlled via the IEEE488.

The bits in the Status byte are:

Bits 0-2	Not used
Bit 3	Questionable Status Summary bit. This bit is set if an enabled bit has been set in the Questionable Event Enable Register of the Questionable Event Register.
Bit 4	MAV - Message Available. The MAV bit is set if data are available in the output buffer of the 4462.
Bit 5	ESB - Event Status Summary Bit. This bit indicates whether an enabled event has occurred in the Event Status Register of the 4462.
Bit 7	Operation Status Summary Bit. This bit is set if an enabled event has occurred in the Operation Status Register.

The IEEE488.2 commands for setting the Status data structure are:*

*SRB?
*SRE
*SRE?

5.3 Basic function scope of the subsystems

Source subsystem (5.4.3):

Output of current, voltage and temperature
Range selection for the voltage and temperature
Setting of the Δ -values
Storage function for the output values
Setting of the limit
Setting of the sensor lines
Configuration of the ramp
Configuration of the divider

Sensor subsystem

Setting of the type of reference junction in the case of temperature simulation (5.4.4)
Setting of the temperature for a manual reference junction
Scanning of the reference junction temperature

5.4 SCPI commands

The SCPI commands are displayed in long and short form. The long form contains the entire command, while the short form consists of the sections indicated in upper case. Command sections enclosed in square brackets need not be transmitted.

Related parameters are appended with a blank character.
The commands can be entered in upper or lower case, long or short form.

The query form of a command is created by appending a question mark directly to the command.
If a command is sent with a parameter, although no parameter is expected, the Command Warning bit (bit 14) in the Questionable Status Register is set. The parameter is ignored and no error is indicated.

On the occurrence of an error, the 4462 issues <NAK> instead of <ACK>. The cause of the error can be determined with the command „:SYSTem:ERRor?“ (also described subsequently). In addition, the corresponding error bits are set in the Status Registers (refer to Section 5.2.11, Status Register).

The SCPI version can be requested with the command SYSTem:VERSion?

5.4.1 STATus Subsystem

STATus:OPERation:CONDition? (short form-> S:O:c?)

DESCRIPTION: The Operation Status Condition Register is read out.

SYNTAX: **STATus:OPERation:CONDition? or S:O:C?**

PARAMETERS: No parameters.

QUERY FORM: Only query form. The contents of the 16 bit register are returned as a decimal value.

COMMENTS:

RESTRICTIONS: None

STATus:OPERation:ENABLE

DESCRIPTION: The Operation Status Enable Register is set.

SYNTAX: **STATus:OPERation:ENABLE <parameter>**

PARAMETERS: Decimal value (value range: 0 to 32767)

QUERY FORM: **STATus:OPERation:ENABLE?**
The contents of the 16-bit register are returned as a decimal value.

COMMENTS:

RESTRICTIONS: None

STATus:OPERation[:EVENT]? (short form -> S:O:E?)

DESCRIPTION:	The Operation Status Event Register is read out.
SYNTAX:	STATus:OPERation[:EVENT]? or S:O:E?
PARAMETERS:	No parameters.
QUERY FORM:	Only query form. The contents of the 16 bit register are returned as a decimal value.
COMMENTS:	
RESTRICTIONS:	None

STATus:QUEStionable:CONDition? (short form -> S:Q:C?)_

DESCRIPTION:	The Questionable Status Condition Register is read out.
SYNTAX:	STATus:QUEStionable:CONDition? or S:Q:C?
PARAMETERS:	No parameters.
QUERY FORM:	Only query form. The contents of the 16 bit register are returned as a decimal value.
COMMENTS:	
RESTRICTIONS:	None

STATus:QUEStionable:ENABLE

DESCRIPTION:	The Questionable Enable Register is set.
SYNTAX:	STATus:QUEStionable:ENABLE <parameter>
PARAMETERS:	Decimal value (value range: 0 to 32767)
QUERY FORM:	STATus:QUEStionable:ENABLE? The contents of the 16 bit register are returned as a decimal value.
COMMENTS:	
RESTRICTIONS:	None

STATUS:QUESTIONable[:EVENT]? (short form -> S:Q:E?)

DESCRIPTION: The Questionable Status Event Register is read out.

SYNTAX: **STATUS:QUESTIONable[:EVENT]? or S:Q:E?**

PARAMETERS: No parameters.

QUERY FORM: Only query form. The contents of the 16 bit register are returned as a decimal value.

COMMENTS:

RESTRICTIONS: None

STATUS:QUESTIONable:SOURce? (short form -> S:Q:S?)

DESCRIPTION: The source status is returned.

SYNTAX: **STATUS:QUESTIONable:SOURce? or S:Q:S?**

PARAMETERS: No parameters.

QUERY FORM: Only query form. The contents of the 8 bit register are returned as a hexadecimal value. In the event of an error, the corresponding bit is set to 1.

COMMENTS:

RESTRICTIONS: None

Bit number	Meaning
0	Output stage overloaded
1	-
2	-
3	Pt100 error
4	D/A coverter overloaded
5	-
6	-
7	-

STATUS:QUESTIONable:TEMPerature? (short form -> S:Q:T?)

DESCRIPTION: The status of the temperature measurement is returned.

SYNTAX: **STATUS:QUESTIONable:TEMPerature? or S:Q:T?**

PARAMETERS: No parameters.

QUERY FORM: Only query form. The contents of the 8 bit register are returned as a hexadecimal value. In the event of an error, the corresponding bit is set to 1.

COMMENTS:

RESTRICTIONS: None

Bit number	Meaning
0	I-cable break
1	U-cable break
2	R (Pt100) out of range
3	Invalid temperature
4	-
5	-
6	-
7	-

STATus:PRESet

DESCRIPTION: The Operation Status Enable Register and the Questionable Status Enable Register are reset.

SYNTAX: **STATus:PRESet**

PARAMETERS: No parameters.

QUERY FORM: No Query form.

COMMENTS:

RESTRICTIONS: None

5.4.2 SYSTEM Subsystem

SYSTem:ERRor[:NEXT]?

DESCRIPTION: The contents of the error buffer are requested.

SYNTAX: **SYSTem:ERRor[:NEXT]?**

PARAMETERS: No parameters.

QUERY FORM: Only query form.

LIST OF ERROR MESSAGES

0,	NO ERROR:	No error is present.
-100,	COMMAND ERROR:	An invalid command was sent.
-101,	INVALID CHARACTER:	The command contains an invalid character.
-105,	GET NOT ALLOWED:	GET was sent within another command.
-109,	MISSING PARAMETER:	A parameter is missing.
-110,	COMMAND HEADER ERROR:	The command has an invalid header.
-120,	NUMERIC DATA ERROR:	A numerical value is invalid.
-200,	EXECUTION ERROR:	Due to a particular device state, the command could not be executed.
-204,	ILLEGAL DEVICE STATE:	The command is valid but cannot be executed in the present state of the device.
-213,	INIT IGNORED:	The INITIALize command was ignored.
-220,	PARAMETER ERROR:	The command has an invalid parameter.
-221,	SETTING CONFLICT:	Due to a particular setting, the command with the related parameter cannot be executed.
-222,	DATA OUT OF RANGE:	A parameter lies outside the valid limits.
-224,	ILLEGAL PARAMETER VALUE:	The parameter is valid but not used by the device.
-231,	DATA QUESTIONABLE:	The value of a parameter is questionable.

-350, QUEUE OVERFLOW: The error buffer has overflowed.
-400, QUERY ERROR: A query was sent although no data are present.
-410, QUERY INTERRUPTED: The device was interrupted before it could send a complete response.
-420, QUERY UNTERMINATED: A response could not be terminated properly.

RESTRICTIONS: None

110, VOLTAGE OVERRANGE: Source voltage is too high
210, CURRENT OVERRANGE: Source current is too high
300, POWER 15V ANA: 15 V analog supply is not OK
510, TEMPERATURE OVERRANGE: Simulated temperature is invalid
520, PT 100 ERROR: Pt 100 Error
602, OUT OVER: Output stage overloaded

COMMENTS:

RESTRICTIONS: None

SYSTem:KLOCK

DESCRIPTION: This locks the keypad of the device.

SYNTAX: **SYSTem:KLOCK <parameter>**

PARAMETERS: 1 or ON -> The keypad is locked.
0 or OFF -> The keypad is released.

QUERY FORM: **SYSTem:KLOCK?**

RESPONSE: 1, if the keypad is locked.
0, if the keypad is released.

COMMENTS:

RESTRICTIONS: None

SYSTem:VERsion?

DESCRIPTION: The SCPI version is requested.

SYNTAX: **SYSTem:VERsion?**

PARAMETERS: No parameters.

QUERY FORM: Only query form.

RESPONSE: 1997.0

COMMENTS:

RESTRICTIONS: None

5.4.3 SOURce Subsystem

SOURce:CURRent[:LEVel][:IMMEdiate][:AMPLitude]

DESCRIPTION: A current value is output.

SYNTAX: **SOURce:CURRent[:LEVel][:IMMEdiate][:AMPLitude] <parameter>**

PARAMETERS: The current value with an optional unit.
Value range: -52 mA to 52 mA
Valid units: UA, MA, A, KA, MAA
Default unit: A

QUERY FORM: **SOURce:CURRent[:LEVel][:IMMEdiate][:AMPLitude]?**

RESPONSE: If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. With each unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:VOLTage[:LEVel][:IMMEdiate][:AMPLitude]

DESCRIPTION: A voltage value is output.

SYNTAX: **SOURce:VOLTage[:LEVel][:IMMEdiate][:AMPLitude] <parameter>**

PARAMETERS: The voltage value with an optional unit.
Value range: -30 V to 30 V (variable in the case of manual range selection)
Valid units: UV, MV, V, KV, MAV
Default unit: V

QUERY FORM: **SOURce:VOLTage[:LEVel][:IMMEdiate][:AMPLitude]?**

RESPONSE: If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. A unit is supplied in each case.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:TCouple[:LEVel][:IMMEdiate][:AMPLitude]

DESCRIPTION:	A temperature value is simulated for a thermocouple.		
SYNTAX:	SOURce:TCouple[:LEVel][:IMMEdiate][:AMPLitude] <parameter>		
PARAMETERS:	A temperature value with an optional unit. Value range: Depend on the type of thermocouple. Valid units: C or CEL, F or FAR, K Default unit: Set in the device.		
QUERY FORM:	SOURce:TCouple[:LEVel][:IMMEdiate][:AMPLitude]?		
RESPONSE:	If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. A unit is supplied in each case		
COMMENTS:			
RESTRICTIONS:	This instruction is not permissible	<ul style="list-style-type: none"> - in the calibration mode - in the ramp mode - in the absence of a TC option 	

SOURce:VOLTage:RANGe

DESCRIPTION:	The range for U transmission is selected here manually.		
SYNTAX:	SOURce:VOLTage:RANGe <parameter>		
PARAMETERS:	300 MV	->	The 300 mV range is set.
	3 V	->	The 3 V range is set.
	30/60 V	->	The 30/60 V range is set.
QUERY FORM:	SOURce:VOLTage:RANGe?		
RESPONSE:	300 MV	->	If the 300 mV range has been set.
	3 V	->	If the 3 V range has been set.
	30/60 V	->	If the 30/60 V range has been set.
COMMENTS:			
RESTRICTIONS:	This instruction is not permissible	<ul style="list-style-type: none"> - in the calibration mode - in the ramp mode 	

SOURce:VOLTage:RANGe:AUTO

DESCRIPTION: Switch over between automatic and manual range selection for U transmission.

SYNTAX: **SOURce:VOLTage:RANGe:AUTO <parameter>**

PARAMETERS: 1 or ON -> Automatic range selection is set.
0 or OFF -> Manual range selection is set.

QUERY FORM: **SOURce:VOLTage:RANGe:AUTO?**

RESPONSE: 1 or ON -> If automatic range selection has been set.
0 or OFF -> If manual range selection has been set.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:CURRent:DELTA

DESCRIPTION: A current Δ -value is set.

SYNTAX: **SOURce:CURRent:DELTA <parameter>**

PARAMETERS: The current value with an optional unit.
Value range: 0 mA to 104 mA
Valid units: UA, MA, A, KA, MAA
Default unit: A

QUERY FORM: **SOURce:CURRent:DELTA?**

RESPONSE: The currently set current Δ -value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:VOLTage:DELTA

DESCRIPTION: A voltage Δ -value is set.

SYNTAX: **SOURce:VOLTage:DELTA <parameter>**

PARAMETERS: The voltage value with an optional unit.
Value range: 0 V to 60 V (variable in the case of manual range selection)
Valid units: UV, MV, V, KV, MAV
Default unit: V

QUERY FORM: **SOURce:VOLTage:DELTA?**

RESPONSE: The currently set voltage Δ -value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:TCouple:DELTA

DESCRIPTION: A temperature Δ -value is set for TC transmission.

SYNTAX: **SOURce:TCouple:DELTA <parameter>**

PARAMETERS: The temperature value with an optional unit.
Value range: 0 to 3000 K
Valid units: C or CEL, F or FAR, K
Default unit: Set in the device.

QUERY FORM: **SOURce:TCouple:DELTA?**

RESPONSE: The currently set temperature Δ -value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode
- in the absence of a TC option

SOURce:DELTA:ADD

DESCRIPTION: The current transmission value is increased by the related ΔX -value to result in a new transmission value.

SYNTAX: **SOURce:DELTA:ADD**

PARAMETERS: No parameters

QUERY FORM: **No query form**

RESPONSE:

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:DELTA:SUB

DESCRIPTION: The current transmission value is decreased by the related ΔX -value to result in a new transmission value.

SYNTAX: **SOURce:DELTA:SUB**

PARAMETERS: No parameters

QUERY FORM: **No query form**

RESPONSE:

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:STORe

DESCRIPTION:	The current transmission value and related ΔX -value are stored.	
SYNTAX:	SOURce:STORe <parameter>	
PARAMETERS:	Integer value between 0 and 99. It corresponds to the memory number under which the value pair is stored.	
QUERY FORM:	SOURce:STORe <parameter>	
RESPONSE:	The value pair stored under the memory number: transmission value, ΔX -value In each case, a numerical value with a unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:RECall

DESCRIPTION:	The transmission value and related ΔX -value are loaded from memory.	
SYNTAX:	SOURce:RECall <parameter>	
PARAMETERS:	A memory number between 0 and 99. It corresponds to the memory number from which the value pair is to be loaded.	
QUERY FORM:	SOURce:RECall? <parameter>	
RESPONSE:	The value pair stored under the memory number: Transmission value, ΔX -value. In each case, a numerical value with a unit is supplied. With the query form, the value pair is not loaded from memory, but simply indicated.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:STORe:CURRent <number, transmission value, delta value>

DESCRIPTION:	The transmitted current value and current delta value are stored in memory under the specified number.	
SYNTAX:	SOURce:STORe:CURRent <number, transmission value, delta value>	
PARAMETERS:	number, transmission value, delta value	
	number ->	A memory number between 0 and 99 transmission
	value ->	A current value between -52 mA and +52 mA with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A
	Delta value->	A current value between 0 mA and +104 mA with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A
QUERY FORM:	No query form	
RESPONSE:	---	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:STORe:VOLTage <number, transmission value, delta value>

DESCRIPTION: The transmitted voltage value and voltage delta value are stored in memory under the specified number.

SYNTAX: **SOURce:STORe:VOLTage <number, transmission value, delta value>**

PARAMETERS: Number, transmission value, delta value
number -> A memory number between 0 and 99
transmission value-> A memory number between -30 V and +30 V with an optional unit.
Valid units: UV, MV, V, KV, MAV
Default unit: V
delta value -> A voltage value between 0V and 60V with an optional unit.
Valid units: UV, MV, V, KV, MAV
Default unit: V

QUERY FORM: **No query form**

RESPONSE: --

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:STORe:TCOuple <number, transmission value, delta value>

DESCRIPTION: The transmitted temperature value and temperature delta value are stored in memory under the specified number.

SYNTAX: **SOURce:STORe:TCOuple <number, transmission value, delta value>**

PARAMETERS: Number, transmission value, delta value
number -> A memory number between 0 and 99
transmission value-> A temperature value with an optional unit.
Valid units: K, C or CEL, F or FAR
Default unit: Set in the device.
Value range: 0 to 3000 K
delta value -> A temperature value with an optional unit.
Valid units: K, C or CEL, F or FAR
Default unit: Set in the device
Value range: Dependent on the TC model

QUERY FORM: **No query form**

RESPONSE: --

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode
- in the absence of a TC option

SOURce:VOLTage:ALC:SOURce

DESCRIPTION: The sensor is set

SYNTAX: **SOURce:VOLTage:ALC:SOURce <parameter>**

PARAMETERS: INT or INTERNAL -> Internal sensor
EXT or EXTERNAL -> An external sensor needs to be connected.

QUERY FORM: **SOURce:VOLTage:ALC:SOURce?**

RESPONSE: INT -> If the internal sensor has been set.
EXT -> If an external sensor has been set.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

Caution: Voltage peak - disconnect the device under test before making a sense switch over!

SOURce:VOLTage:PROTection:LEVel

DESCRIPTION: The voltage limit for I transmission is set.

SYNTAX: **SOURce:VOLTage:PROTection:LEVel <parameter>**

PARAMETERS: A voltage between 1V and +30V with an optional unit.
Valid units: UV, MV, V, KV, MAV
Default unit: V

QUERY FORM: **SOURce:VOLTage:PROTection:LEVel?**

RESPONSE: The set voltage limit as a numerical value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:CURRent: PROTection:LEVel

DESCRIPTION:	The current limit for U transmission is set.
SYNTAX:	SOURce:CURRent:PROTection:LEVel <parameter>
PARAMETERS:	A current value between 1mA and +52mA with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A
QUERY FORM:	SOURce:CURRent:PROTection:LEVel?
RESPONSE:	The set current limit as a numerical value with a unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode

SOURce:MODE

DESCRIPTION:	The transmission mode is set. Normal transmission, ramp 1 or ramp 2.
SYNTAX:	SOURce:MODE <parameter>
PARAMETERS:	FIXed -> Normal transmission mode SWEep -> Ramp 1 (same transmission mode, same Δ -values and same Δ -time) LIST -> Ramp 2 (different transmission modes, different Δ -values and different Δ -times)
QUERY FORM:	SOURce:MODE?
RESPONSE:	FIX -> If the normal transmission mode has been set. WE -> If the mode with ramp 1 has been set. LIST -> If the mode with ramp 2 has been set.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible.

SOURce:SWEep:WAVeform

DESCRIPTION:	The waveform of ramp 1 is set.
SYNTAX:	SOURce:SWEep:WAVeform <parameter>
PARAMETERS:	TRiangle -> Triangular waveform SAWTooth -> Sawtooth waveform
QUERY FORM:	SOURce:SWEep:WAVeform?
RESPONSE:	TRI -> If a triangular waveform has been set. SAWT -> If a sawtooth waveform has been set.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode

SOURce:SWEEp:COUNT

DESCRIPTION: The number of repetitions for ramp 1 is set.

SYNTAX: **SOURce:SWEEp:COUNT <parameter>**

PARAMETERS: Number of repetitions: 0 to 99 (0 means continuous operation).

QUERY FORM: **SOURce:SWEEp:COUNT?**

RESPONSE: The set number of repetitions: 0 to 99

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:SWEEp:DWELi

DESCRIPTION: The Δ -time for ramp 1 is set.

SYNTAX: **SOURce:SWEEp:DWELi <parameter>**

PARAMETERS: The Δ -time in hh,mm,ss.s.
hh -> Hours, 0 to 99
mm -> Minutes, 0 to 59
ss.s -> Seconds, 0 to 59.9

QUERY FORM: **SOURce:SWEEp:DWELi?**

RESPONSE: The set Δ -time in hh,mm,ss.s.
h -> Hours, 0 to 99
mm -> Minutes, 0 to 59
ss.s -> Seconds, 0 to 59.9

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:CURREnt:STARt

DESCRIPTION: A start current value is set for ramp 1

SYNTAX: **SOURce:CURREnt:STARt <parameter>**

PARAMETERS: A start current value between -52mA and +52mA with an optional unit.
Valid units: UA, MA, A, KA, MAA
Default unit: A

QUERY FORM: **SOURce:CURREnt:STARt?**

RESPONSE: A start value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:VOLTage:START

DESCRIPTION:	A start voltage value is set for ramp 1	
SYNTAX:	SOURce:VOLTage:START <parameter>	
PARAMETERS:	A start voltage value between -30 V and +30 V with an optional unit. Valid units: UV, MV, V, KV, MAV Default unit: V	
QUERY FORM:	SOURce:VOLTage:START?	
RESPONSE:	A start value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:TCOuple:START

DESCRIPTION:	A start temperature value is set for ramp 1	
SYNTAX:	SOURce:TCOuple:START <parameter>	
PARAMETERS:	A start temperature value with an optional unit. Value range: 0 to 3000 K Valid units: K, F or FAR, C or CEL Default unit: Dependent on the setting.	
QUERY FORM:	SOURce:TCOuple:START?	
RESPONSE:	A start value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode - in the absence of a TC option

SOURce:CURRent:STOP

DESCRIPTION:	A final current value is set for ramp 1	
SYNTAX:	SOURce:CURRent:STOP <parameter>	
PARAMETERS:	A final current value between -52/-22 mA und +52/+22 mA with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A	
QUERY FORM:	SOURce:CURRent:STOP?	
RESPONSE:	A final value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode	

SOURce:VOLTage:STOP

DESCRIPTION:	A final voltage value is set for ramp 1.	
SYNTAX:	SOURce:VOLTage:STOP <parameter>	
PARAMETERS:	A final voltage value between -30/-60 V and +30/+60 V with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A	
QUERY FORM:	SOURce:CURRent:STOP?	
RESPONSE:	A final value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:TCouple:STOP

DESCRIPTION:	A final temperature value is set for ramp 1.	
SYNTAX:	SOURce:TCouple:STOP <parameter>	
PARAMETERS:	A final temperature value with an optional unit. Value range: 0 to 3000 K Valid units: K, F or FAR, C or CEL Default unit: Dependent on the setting.	
QUERY FORM:	SOURce:TCouple:STOP?	
RESPONSE:	A final value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
COMMENTS:		
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode - in the absence of a TC option

SOURce:CURRent:STEP

DESCRIPTION:	A current delta value is set for ramp 1.	
SYNTAX:	SOURce:CURRent:STEP <parameter>	
PARAMETERS:	A current delta value between 0 mA and +104 mA with an optional unit. Valid units: UA, MA, A, KA, MAA Default unit: A	
QUERY FORM:	SOURce:CURRent:STEP?	
RESPONSE:	A delta value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.	
RESTRICTIONS:	This instruction is not permissible	- in the calibration mode - in the ramp mode

SOURce:VOLTage:STEP

DESCRIPTION:	A voltage delta value is set for ramp 1.
SYNTAX:	SOURce:VOLTage:STEP <parameter>
PARAMETERS:	A voltage delta value between 0 V and +60 V with a optional unit. Valid units: UV, MV, V, KV, MAV Default unit: V
QUERY FORM:	SOURce:VOLTage:STEP?
RESPONSE:	JA delta value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible- in the calibration mode - in the ramp mode

SOURce:TCouple:STEP

DESCRIPTION:	A temperature delta value is set for ramp 1.
SYNTAX:	SOURce:TCouple:STEP <parameter>
PARAMETERS:	A temperature delta value with an optional unit. Value range: 0 to 3000 K Valid units: K, F or FAR, C or CEL Default unit: Dependent on the setting.
QUERY FORM:	SOURce:TCouple:STEP?
RESPONSE:	JA delta value is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible- in the calibration mode - in the ramp mode - in the absence of a TC option

SOURce:LIST:WAVeform

DESCRIPTION:	The waveform for ramp 2 is set.
SYNTAX:	SOURce:LIST:WAVeform <parameter>
PARAMETERS:	TRiangle -> Triangular waveform SAWTooth -> If a sawtooth waveform has been set.
QUERY FORM:	SOURce:LIST:WAVeform?
RESPONSE:	TRI -> Triangular waveform SAWT -> If a sawtooth waveform has been set.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible- in the calibration mode - in the ramp mode 1

SOURce:LIST:COUNT

DESCRIPTION: The number of repetitions for ramp 2 is set.

SYNTAX: **SOURce:LIST:COUNT** <parameter>

PARAMETERS: Number of repetitions: 0 to 99
0 means continuous operation.

QUERY FORM: **SOURce:LIST:COUNT?**

RESPONSE: The set number of repetitions: 0 to 99.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:POINTs

DESCRIPTION: The number of active steps for ramp 2.

SYNTAX: **SOURce:LIST:POINTs** <parameter>

PARAMETERS: The number of active steps (2 to 31).

QUERY FORM: **SOURce:LIST:POINTs?**

RESPONSE: The current number of active steps (2 to 31)

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:NUMBER

DESCRIPTION: A list number of ramp 2 is sent to the device. There are a total of 31 value pairs (transmission value and Δ -time) in the list of ramp 2. The value pair corresponding to this list number can be set via the interface using additional instructions.

SYNTAX: **SOURce:LIST:NUMBER** <parameter>

PARAMETERS: A list number (1 to 31).

QUERY FORM: **SOURce:LIST:NUMBER?**

RESPONSE: The currently set list number (1 to 31)

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:DWELi

DESCRIPTION: The delta time of a list element of ramp 2 corresponding to the current list number is set. The current list number must be set beforehand with the instruction SOURce:LIST:NUMBer.

SYNTAX: **SOURce:LIST:DWELi <parameter>**

PARAMETERS: The Δ -time in hh,mm,ss.s.
hh -> Hours, 0 to 99
mm -> Minutes, 0 to 59
ss.s -> Seconds, 0 to 59.9

QUERY FORM: **SOURce:LIST:DWELi?**

RESPONSE: The set Δ -time in hh,mm,ss.s.
hh -> Hours, 0 to 99
mm -> Minutes, 0 to 59
ss.s -> Seconds, 0 to 59.9

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:VALue?

DESCRIPTION: The transmission value of a list element of ramp 2 corresponding to the current list number is requested. The current list number must be set beforehand with the instruction SOURce:LIST:NUMBer.

SYNTAX: **SOURce:LIST:VALue?**

PARAMETERS: No parameters

QUERY FORM: **Query form only**

RESPONSE: The transmission value of the current list element is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:CURRent

DESCRIPTION: The current (I) value of the list element of ramp 2 corresponding to the current list number is set. The current list number must be set beforehand with the instruction SOURce:LIST:NUMBer.

SYNTAX: **SOURce:LIST:CURRent <parameter>**

PARAMETERS: A current value between -52mA and +52mA with an optional unit.
Valid units: UA, MA, A, KA, MAA
Default unit: A

QUERY FORM: **SOURce:LIST:CURRent?**

RESPONSE: The transmission value of the current list element is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:VOLTage

DESCRIPTION: The voltage value of the list element of ramp 2 corresponding to the current list number is set. The current list number must be set beforehand with the instruction SOURce:LIST:NUMBer.

SYNTAX: **SOURce:LIST:VOLTage <parameter>**

PARAMETERS: A voltage value between -30V and + 30V with an optional unit.
Valid units: UV, MV, V, KV, MAV
Default unit: V

QUERY FORM: **SOURce:LIST:VOLTage?**

RESPONSE: The transmission value of the current list element is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SOURce:LIST:TCOuple

DESCRIPTION: The TC temperature value of the list element of ramp 2 corresponding to the current list number is set. The current list number must be set beforehand with the instruction SOURce:LIST:NUMBer.

SYNTAX: **SOURce:LIST:TCOuple <parameter>**

PARAMETERS: A temperature value ranging between 0 and 3000 K with an optional unit.
Valid units: K, F or FAR, C or CEL
Default unit: Dependent on the setting

QUERY FORM:	SOURce:LIST:TCOUple?
RESPONSE:	The transmission value of the current list element is returned in accordance with the setting. It can comprise either a current value, voltage value or temperature value (TC) with a corresponding unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode

SOURce:VOLTage:DIVider

DESCRIPTION:	The voltage divider is set.
SYNTAX:	SOURce:VOLTage:DIVider <parameter>
PARAMETERS:	A voltage division factor between 1.0 and 1010.0
QUERY FORM:	SOURce:VOLTage:DIVider?
RESPONSE:	The currently set division factor.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode

SOURce:VOLTage:DIVider:STATE

DESCRIPTION:	The voltage divider is turned on or off.
SYNTAX:	SOURce:VOLTage:DIVider:STATE <parameter>
PARAMETERS:	1 or ON -> The voltage divider is turned on. 0 or OFF -> The voltage divider is turned off.
QUERY FORM:	SOURce:VOLTage:DIVider:STATE?
RESPONSE:	1-> If the voltage divider has been turned on. 0-> If the voltage divider has been turned off.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - in the calibration mode - in the ramp mode

5.4.4 SENSE Subsystem

SENSe:TCOuple:REFJunction

DESCRIPTION:	The model of reference junction is set for TC transmission.
SYNTAX:	SENSe:TCOuple:REFJunction <parameter>
PARAMETERS:	RJ-MAN -> A manual reference junction is set. RJ-EXT -> An external reference junction is set.
QUERY FORM:	SENSe:TCOuple:REFJunction?
RESPONSE:	RJ-MAN -> If a manual reference junction has been set. RJ-EXT -> If an external reference junction has been set.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option

SENSe:TCOuple:REFJunction:TMAN

DESCRIPTION:	The temperature of a manual reference junction is set.
SYNTAX:	SENSe:TCOuple:REFJunction:TMAN <parameter>
PARAMETERS:	A temperature value between 0 and 3000 K. If the parameter only consists of a numeric value, the default unit is used. However, a unit can also be explicitly specified. However, a unit can also be explicitly specified. C or CEL for Celsius, F or FAR for Fahrenheit, K for Kelvin
QUERY FORM:	SENSe:TCOuple:REFJunction:TMAN?
RESPONSE:	The currently set value of the manual reference junction temperature is returned with the preselected unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option

SENSe:TCOuple:REFJunction:TEMPerature?

DESCRIPTION:	The reference junction temperature can be requested.
SYNTAX:	SENSe:TCOuple:REFJunction:TEMPerature?
PARAMETERS:	No parameters
QUERY FORM:	Query form only
RESPONSE:	The reference junction temperature with the preselected unit.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option

5.4.5 RAMP Subsystem

RAMP:START

DESCRIPTION:	The ramp is started.
SYNTAX:	RAMP:START
PARAMETERS:	No parameters
QUERY FORM:	No query form
RESPONSE:	-
COMMENTS:	
RESTRICTIONS:	This instruction is only permissible when the device is in the ramp mode.

RAMP:STOP

DESCRIPTION:	The ramp is stopped.
SYNTAX:	RAMP:STOP
PARAMETERS:	No parameters
QUERY FORM:	No query form
RESPONSE:	-
COMMENTS:	
RESTRICTIONS:	This instruction is only permissible when the device is in the ramp mode.

RAMP:STEP

DESCRIPTION:	The ramp is executed in steps.
SYNTAX:	RAMP:STEP <parameter>
PARAMETERS:	UP -> The ramp is advanced by one step. DOWN-> The ramp is reversed by one step.
QUERY FORM:	No query form
RESPONSE:	-
COMMENTS:	
RESTRICTIONS:	This instruction is only permissible when the device is in the ramp mode.

5.4.6 CONFigure Subsystem

CONFigure:TEMPerature:TCOuple

DESCRIPTION:	The TC type is selected.
SYNTAX:	CONfigure:TEMPerature:TCOuple <parameter>
PARAMETERS:	The designation of the TC type: K, N, R, S, B, J, T, E, C, D, G2, M, U, L
QUERY FORM:	CONfigure:TEMPerature:TCOuple?
RESPONSE:	The designation of the TC type: K, N, R, S, B, J, T, E, C, D, G2, M, U, L
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option.

CONFigure:TEMPerature:SCALE

DESCRIPTION:	The temperature scale for determining the TC temperature is set.
SYNTAX:	CONFigure:TEMPerature:SCALE? <parameter>
PARAMETERS:	IPTS68 -> A temperature scale in compliance with ITS90 is selected. TS90 -> A temperature scale in compliance with ITS90 is selected.
QUERY FORM:	CONFigure:TEMPerature:SCALE?
RESPONSE:	IPTS68 -> If the temperature scale in compliance with IPTS68 has been selected. ITS90 -> If the temperature scale in compliance with ITS90 has been selected
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option.

5.4.7 UNIT Subsystem

UNIT:TEMPerature:TCOuple

DESCRIPTION:	The temperature unit for TC transmission is set.
SYNTAX:	UBIT:TEMPerature:TCOuple <parameter>
PARAMETERS:	K -> A Kelvin unit is set. C, CEL -> A Celsius unit is set. F, FAR -> A Fahrenheit unit is set.
QUERY FORM:	UNIT:TEMPerature:TCOuple?
RESPONSE:	K -> If a Kelvin unit has been set C, CEL -> If a Celsius unit has been set F, FAR -> If a Fahrenheit unit has been set
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option.

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5.4.8 SCALE Subsystem

SCALE:PT100

DESCRIPTION:	The Pt100 coefficients are set.
SYNTAX:	SCALE:PT100 <parameter>
PARAMETERS:	Ro, A, B, C, t100: These 5 parameters are governed by the following formulae: -200 °C to 0 °C: $R_t = R_o[1 + At + Bt^2 + C(t - t_{100})t^3]$ 0 °C to 850 °C: $R_t = R_o(1 + At + bt^2)$
QUERY FORM:	SCALE:PT100?
RESPONSE:	Ro, A, B, C, t100: The current settings of the 5 parameters.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option.

SCALE:PT100:DIN?

DESCRIPTION:	The DIN EN values of the Pt100 coefficients are set.
SYNTAX:	SCALE:PT100:DIN?
PARAMETERS:	No parameters
QUERY FORM:	Query form only
RESPONSE:	100, 0.0039083, -5.775e-7, -4.183e-12, 100 in the sequence Ro, A, B, C, t100 in accordance with the following formulae: -200 °C to 0 °C: $R_t = R_o[1 + At + Bt^2 + C(t - t_{100})t^3]$ 0 °C to 850 °C: $R_t = R_o(1 + At + bt^2)$
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible - when the device is in the calibration mode - in the absence of a TC option.

5.4.9 MEMory Subsystem

MEMory:STATe.DEFine

DESCRIPTION:	An ID is assigned to a memory number (device setting).
SYNTAX:	MEMory:STATe:DEFine <ID>,<number>
PARAMETERS:	ID: A 10 position alphanumeric character sequence Number: A memory number between 1 and 33
QUERY FORM:	MEMory:STATe:DEFine? <ID>
RESPONSE:	The memory number related to the ID is returned: 1 to 33
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode

MEMory:STATe:NAME?

DESCRIPTION:	The ID related to a memory number (device setting) is returned.
SYNTAX:	MEMory:STATe:NAME? <number>
PARAMETERS:	A memory number between 1 and 33
QUERY FORM:	Query form only
RESPONSE:	The 10-position ID related to the memory number
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode

5.4.10 DISPlay Subsystem

DISPlay:CONTrast

DESCRIPTION:	The contrast for the LCD is set.
SYNTAX:	DISPlay:CONTrast <parameter>
PARAMETERS:	A value between 0 and 1 1 -> Maximum contrast 0 -> Minimum contrast
QUERY FORM:	DISPlay:CONTrast?
RESPONSE:	The set contrast. A value between 0 and 1.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode

DISPlay:MENU[:NAME]

DESCRIPTION: 1. The display for status line 2 is selected.
2. An upper case display is selected.

SYNTAX: **DISPlay:MENU[:NAME] <parameter>**

PARAMETERS:	DX->	Status display with Δx and limit.
	RJTEMP->	Status display with TC model and RJ temperature.
	UT->	Status display with TC model and U(t). U(t): Voltage with TC transmission.
	U0->	Status display with TC type and U(0). U(0): Voltage with TC transmission, based on 0 °C.
	SOUR, SOURCE->	Display of the transmission value in upper case.
	PT100->	Display of the Pt100 temperature in upper case.

QUERY FORM: **No query form**

RESPONSE:

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

5.4.11 CALCulate Subsystem

CALCulate:TCouple:UT?

DESCRIPTION: The TC voltage U(T) is requested.

SYNTAX: **CALCulate:TCouple:UT?**

PARAMETERS: No parameters

QUERY FORM: **Query form only**

RESPONSE: The TC voltage U (T) as a numeric value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - when the device is in the calibration mode.
- in the absence of a TC option.

CALCulate:TCouple:U0?

DESCRIPTION: The TC voltage U (0) (based on 0 °C) is requested.

SYNTAX: **CALCulate:TCouple:U0?**

PARAMETERS: No parameters

QUERY FORM: **Query form only**

RESPONSE: The TC voltage U (0) (based on 0 °C) as a numeric value with a unit.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - when the device is in the calibration mode.
- in the absence of a TC option.

5.4.12 ACCess Subsystem

ACCess:SOURce

DESCRIPTION: Access to the transmitter (source) functions (entry of transmission values, POL+, POL-, STDBY, $\Delta+$, $\Delta-$) is enabled or disabled.

SYNTAX: **ACCess:SOURce <parameter>**

PARAMETERS: 1 or ON -> Access to the transmitter (source) functions is enabled.
0 or OFF -> Access to the transmitter (source) functions is disabled.

QUERY FORM: **ACCess:SOURce?**

RESPONSE: 1 -> f access to the transmitter (source) functions has been enabled.
0 -> If access to the transmitter (source) functions has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:RAMP

DESCRIPTION: Access to the ramp function is enabled or disabled.

SYNTAX: **ACCess:RAMP <parameter>**

PARAMETERS: 1 or ON -> Access to the ramp function is enabled.
0 or OFF -> Access to the ramp function is disabled.

QUERY FORM: **ACCess:RAMP?**

RESPONSE: 1 -> If access to the ramp function has been enabled.
0 -> If access to the ramp function has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:SWEep:CONFigure

DESCRIPTION: Access to the configuration menu for ramp 1 is enabled or disabled.

SYNTAX: **ACCess:SWEep:CONFigure <parameter>**

PARAMETERS: 1 or ON -> Access to the configuration menu for ramp 1 is enabled.
0 or OFF -> Access to the configuration menu for ramp 1 is disabled.

QUERY FORM: **ACCess:SWEep:CONFigure?**

RESPONSE: 1 -> If access to the configuration menu for ramp 1 has been enabled.
0 -> If access to the configuration menu for ramp 1 has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:LIST:CONFigure

DESCRIPTION:	Access to the configuration menu for ramp 2 is enabled or disabled.
SYNTAX:	ACCess:LIST:CONFigure <parameter>
PARAMETERS:	1 or ON -> Access to the configuration menu for ramp 2 is enabled. 0 or OFF -> Access to the configuration menu for ramp 2 is disabled.
QUERY FORM:	ACCess:LIST:CONFigure?
RESPONSE:	1 -> If access to the configuration menu for ramp 2 has been enabled. 0 -> If access to the configuration menu for ramp 2 has been disabled.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:DELTA

DESCRIPTION:	Access to the menu for specifying ΔX is enabled or disabled.
SYNTAX:	ACCess:DELTA <parameter>
PARAMETERS:	1 or ON -> Access to the menu for specifying ΔX is enabled. 0 or OFF -> Access to the menu for specifying ΔX is disabled.
QUERY FORM:	ACCess:DELTA?
RESPONSE:	1 -> If access to the menu for specifying ΔX has been disabled. 0 -> If access to the menu for specifying ΔX has been disabled.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:STORe

DESCRIPTION:	Access to the store function (for saving transmission and delta values) is enabled or disabled.
SYNTAX:	ACCess:STORe <parameter>
PARAMETERS:	1 or ON -> Access to the store function is enabled. 0 or OFF -> Access to the store function is disabled.
QUERY FORM:	ACCess:STORe?
RESPONSE:	1 -> If access to the store function has been enabled. 0 -> If access to the store function has been disabled.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:RECall

DESCRIPTION: Access to the recall function (for loading transmission and delta values) is enabled or disabled.

SYNTAX: **ACCess:RECall <parameter>**

PARAMETERS: 1 or ON -> Access to the recall function is enabled.
0 or OFF -> Access to the recall function is disabled.

QUERY FORM: **ACCess:RECall?**

RESPONSE: 1 -> If access to the recall function has been enabled.
0 -> If access to the recall function has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:SENSe

DESCRIPTION: Access to the sensor setting menu is enabled or disabled.

SYNTAX: **ACCess:SENSe <parameter>**

PARAMETERS: 1 or ON -> Access to the sensor setting menu is enabled.
0 or OFF -> Access to the sensor setting menu is disabled.

QUERY FORM: **ACCess:SENSe?**

RESPONSE: 1 -> If access to the sensor setting menu has been enabled
0 -> If access to the protection menu has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:PROTection

DESCRIPTION: Access to the protection menu (for setting current and voltage limits) is enabled or disabled.

SYNTAX: **ACCess:PROTection <parameter>**

PARAMETERS: 1 or ON -> Access to the protection menu is enabled.
0 or OFF -> Access to the protection menu is disabled.

QUERY FORM: **ACCess:PROTection?**

RESPONSE: 1 -> If access to the protection menu has been enabled.
0 -> If access to the protection menu has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:RANGe

DESCRIPTION:	Access to the range selection menu (automatic or manual range selection) is enabled or disabled.
SYNTAX:	ACCess:RANGe <parameter>
PARAMETERS:	1 or ON -> Access to the range selection menu is enabled. 0 or OFF -> Access to the range selection menu is disabled.
QUERY FORM:	ACCess:RANGe?
RESPONSE:	1 -> If access to the range selection menu has been enabled. 0 -> If access to the range selection menu has been disabled.
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:DIVider

DESCRIPTION:	Access to the divider menu (for setting the voltage divider) is enabled or disabled.
SYNTAX:	ACCess:DIVider <parameter>
PARAMETERS:	1 or ON -> Access to the divider menu is enabled. 0 or OFF -> Access to the divider menu is disabled.
QUERY FORM:	ACCess:DIVider?
RESPONSE:	1 -> If access to the divider menu has been enabled. 0 -> If access to the divider menu has been disabled.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:TCOuple

DESCRIPTION:	Access to the TC settings (TC type and temperature scale) in the thermocouple / temperature menu is enabled or disabled.
SYNTAX:	ACCess:TCOuple <parameter>
PARAMETERS:	1 or ON -> Access to the TC settings is enabled. 0 or OFF -> Access to the TC settings is disabled.
QUERY FORM:	ACCess:TCOuple?
RESPONSE:	1 -> If access to the TC settings has been enabled. 0 -> If access to the TC settings has been disabled.
COMMENTS:	
RESTRICTIONS:	This instruction is not permissible in the calibration mode.

ACCess:REFJunction

DESCRIPTION: Access to the RJ settings (RJ type and RJ temperature) in the thermocouple / temperature menu is enabled or disabled.

SYNTAX: **ACCess:REFJunction <parameter>**

PARAMETERS: 1 or ON -> Access to the RJ settings is enabled.
0 or OFF -> Access to the RJ settings is disabled.

QUERY FORM: **ACCess:REFJunction?**

RESPONSE: 1 -> If access to the RJ settings has been enabled.
0 -> If access to the RJ settings has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:SCALE

DESCRIPTION: This enables/disables to the scaling menu.

SYNTAX: **ACCess:SCALE <parameter>**

PARAMETERS: 1 or ON -> Enables access to the scaling menu.
0 or OFF -> Disables access to the scaling menu.

QUERY FORM: **ACCess:SCALE?**

RESPONSE: 1 -> If access to the scaling menu is enabled.
0 -> If access to the scaling menu is disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:CONFigure:STORe

DESCRIPTION: Access to device configuration storage is enabled or disabled.

SYNTAX: **ACCess:CONFigure:STORe <parameter>**

PARAMETERS: 1 or ON -> Access to device configuration storage is enabled.
0 or OFF -> Access to device configuration storage is disabled.

QUERY FORM: **ACCess:CONFigure:STORe?**

RESPONSE: 1 -> If access to device configuration storage has been enabled.
0 -> If access to device configuration storage has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:CONFigure:RECall

DESCRIPTION: Access to device configuration recall is enabled or disabled.

SYNTAX: **ACCess:CONFigure:RECall <parameter>**

PARAMETERS: 1 or ON -> Access to device configuration recall is enabled.
0 or OFF -> Access to device configuration recall is disabled.

QUERY FORM: **ACCess:CONFigure:RECall?**

RESPONSE: 1 -> If access to device configuration recall has been enabled.
0 -> If access to device configuration recall has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:COMMunicate

DESCRIPTION: This enables/disables access to the interface menu.

SYNTAX: **ACCess:COMMunicate <parameter>**

PARAMETERS: or ON -> Enables access to the interface menu.
0 or OFF -> Disables access to the interface menu.

QUERY FORM: **ACCess:COMMunicate?**

RESPONSE: 1 -> If access to the interface menu is enabled.
0 -> If access to the interface menu is disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:CONTRast

DESCRIPTION: This enables/disables access to the contrast-setting menu.

SYNTAX: **ACCess:CONTRast <parameter>**

PARAMETERS: 1 or ON -> Enables access to the contrast-setting menu.
0 or OFF -> Disables access to the contrast-setting menu.

QUERY FORM: **ACCess:CONTRast?**

RESPONSE: 1 -> If access to the contrast-setting menu is enabled.
0 -> If access to the contrast-setting menu is disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:STATe

DESCRIPTION: This enables/disables access to the status-display menu.

SYNTAX: **ACCess:STATe <parameter>**

PARAMETERS: 1 or ON -> Enables access to the status-display menu.
0 or OFF -> Disables access to the status-display menu.

QUERY FORM: **ACCess:STATe?**

RESPONSE: 1 -> If access to the status-display menu is enabled.
0 -> If access to the status-display menu is disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

ACCess:LANGuage

DESCRIPTION: Access to the language selection menu is enabled or disabled.

SYNTAX: **ACCess:CONTRast <parameter>**

PARAMETERS: 1 or ON -> Access to the language selection menu is enabled.
0 or OFF -> Access to the language selection menu is disabled.

QUERY FORM: **ACCess:CONTRast?**

RESPONSE: 1 -> If access to the language selection menu has been enabled.
0 -> If access to the language selection menu has been disabled.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

5.4.13 INSTRument Subsystem

INSTRument:CATalog?

DESCRIPTION: Indicates whether a Pt100 option is available.

SYNTAX: **INSTRument:CATalog?**

PARAMETERS: No parameters

QUERY FORM: **INSTRument:CATalog? (query form only)**

RESPONSE: 1 -> If the Pt100 option is available.
0 -> If the Pt100 option is not available.

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

5.4.14 IEEE 488.2 Commands

*CLS

DESCRIPTION: The device is set to the Operation-Complete-Idle state.
The device is set to the Operation-Query-Idle state.
The error buffer is deleted.
The Operation-Event-Status-Register is reset.
The Status Byte is reset.

SYNTAX: ***CLS**

PARAMETERS: No parameters

QUERY FORM: Query form only

RESPONSE: —

COMMENTS:

RESTRICTIONS: None

*ESE

DESCRIPTION: The Standard-Event-Status-Enable-Register is set.

SYNTAX: ***ESE <parameter>**

PARAMETERS: A value between 0 and 255. The decimal value corresponds to the bit combination of the 8 bit register.

QUERY FORM: **ESE?**

RESPONSE: The current setting mask of the Standard-Event-enable-Register is returned.

COMMENTS:

RESTRICTIONS: None

*ESR?

DESCRIPTION: The Standard Event Status Register is read out and then reset.

SYNTAX: ***ESR?**

PARAMETERS: No parameters

QUERY FORM: Query form only

RESPONSE: A decimal value between 0 and 255 is returned, in accordance with the contents of the register.

COMMENTS:

RESTRICTIONS: None

*IDN?

DESCRIPTION:	The requests the ID of the device. <ul style="list-style-type: none">- Company name- Device name- Serial number- Device version /SW version)- Calibration status
SYNTAX:	*IDN?
PARAMETERS:	No parameters
QUERY FORM:	Query form only
RESPONSE:	BURSTER,DIGISTANT 4462 SNsssssss,rrrrrr,Vxxxx,Cyyyy SNsssssss: Serial Number of the device rrrrrr: Serial Number of the reference junction Vxxxx: Software version Cyyyy: Count of calibration
COMMENTS	
RESTRICTIONS:	None

*OPC

DESCRIPTION:	The device is set to the Operation Complete Activt state (OCAS). In the OCAS, the Operation-Complete bit in the Standard-Event-Register is set when an operation is completed.
SYNTAX:	*OPC
PARAMETERS:	No parameters
QUERY FORM:	The query form of the command has a different function. For this reason, the query form is described separately.
RESPONSE:	— — —
COMMENTS:	
RESTRICTIONS:	None

*OPC?

DESCRIPTION:	The device is set to the Operation-Complete-Active state (OCAS). In the OCAS, the device writes a 1 to the output buffer following the execution of a command.
SYNTAX:	*OPC?
PARAMETERS:	No parameters
QUERY FORM:	Only query form. The same command without a query form has a different function and is described separately.
RESPONSE:	1, following execution of the command.
COMMENTS:	
RESTRICTIONS:	

*RST

DESCRIPTION: The device is set to a defined initial state. The interface settings remain unchanged, and the remote mode.

SYNTAX: ***RST**

PARAMETERS: No Parameter

QUERY FORM: Query form only

RESPONSE: —

COMMENTS:

RESTRICTIONS:

*SRE

DESCRIPTION: The Service-Request-Enable-Register is set.

SYNTAX: ***SRE <parameter>**

PARAMETERS: A decimal value between 0 and 255, corresponding to the bit combination of the 8 bit register.

QUERY FORM: ***SRE?**

RESPONSE: The present setting mask of the Service-Request-Enable-Register.

COMMENTS:

RESTRICTIONS: None

*STB?

DESCRIPTION: The Status Byte is read out (a 488.2 register with 8 summary bits).

SYNTAX: ***STB?**

PARAMETERS: No Parameter

QUERY FORM: Query form only

RESPONSE: A decimal value between 0 and 255, corresponding to the present contents of the 8 bit register.

COMMENTS:

RESTRICTIONS: None

*TST?

DESCRIPTION: Self-test query command. This command is recognized by the device, but has no additional function.

SYNTAX: ***TST?**

PARAMETERS: No Parameter

QUERY FORM: Query form only

RESPONSE: A 1 is returned

COMMENTS:

RESTRICTIONS: None

*WAI

DESCRIPTION: This command sets a device so that all commands are processed sequentially this command does not have a function in the case of the DIGISTANT® 4462, as commands are always processed sequentially by this device. Thus, the command is simply recognized by the 4462.

SYNTAX: ***WAI**

PARAMETERS: No Parameter

QUERY FORM: Query form only

RESPONSE:

COMMENTS:

RESTRICTIONS: None

*SAV

DESCRIPTION: This stores a device setting. Up to 32 settings can be stored.

SYNTAX: ***SAV <parameter>**

PARAMETERS: A number between 0 and 31

QUERY FORM: Query form only

RESPONSE: -

COMMENTS:

RESTRICTIONS: None

*RCL

DESCRIPTION: A stored device setting is loaded. 33 different setting can be loaded (0-32). 32 is the default setting.

SYNTAX: ***RCL <parameter>**

PARAMETERS: A number between 0 and 32 is the default setting.

QUERY FORM: Query form only

RESPONSE: -

COMMENTS:

RESTRICTIONS: None

5.4.15 Standard Event Status Register

Bits used	Meaning
Bit 0 Operation Complete	This bit is set in response to the *OPC command. It indicates that the previous command has been executed.
Bit 2 Query Error	This bit indicates that either 1. Data were requested although none are present, or 2. Data in the output buffer were lost.
Bit 3 Device Dependent Error	If an internal device error has occurred.
Bit 4 Execution Error	An error has occurred during execution of an SCPI command.
Bit 5 Command Error	An SCPI command was not recognized by the interpreter.

5.4.16 Questionable Status Register

Bits used	Meaning
Bit 0 VOLTage	Error at simulation voltage
Bit 1 CURRent	Error at simulation current
Bit 3 POWer	15 V analog not ok
Bit 4 TEMPerature	Error at simulation TC
Bit 8 CALibration	Error at adjustment
Bit 9 PT100	Error at Pt100 measurement

5.4.17 Operation Status Register

Bits used	Meaning
Bit 0 CALibrating	The device is in the calibration mode.
Bit 8 VALue available	A measured value is available

5.4.18 DISPlay:STATe

DISPlay:STATe

DESCRIPTION: The LCD display can be switched on or off here. With the LCD off, only REMOTE is indicated; the LCD does not offer any functionality otherwise. The LCD is activated when the device is turned on.

SYNTAX: **DISPlay:STATE <parameter>**

PARAMETERS: 1 or ON -> The LCD is active.
0 or OFF -> The LCD is inactive.

QUERY FORM: **DISPlay:STATw?**

RESPONSE: 1 -> If the LCD is active
0 -> If the LCD is inactive

COMMENTS:

RESTRICTIONS: This instruction is not permissible in the calibration mode.

5.5 SCPI-Short Commands

SC

DESCRIPTION: A current value is output.

SYNTAX: **SC <parameter>**

PARAMETERS: The current value with an optional unit.

Value range: - 52 mA to 52 mA
Valid units: UA, MA, A, KA, MAA
Default unit: A

QUERY FORM: **SC?**

RESPONSE: If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. A unit is supplied in each case.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

SV

DESCRIPTION: A voltage value is output.

SYNTAX: **SV <parameter>**

PARAMETERS: The voltage value with an optional unit.

Value range: - 30V to 30V
(variable in the case of manual range selection)

Valid units: UV, MV, V, KV, MAV

Default unit: V

QUERY FORM: **SV?**

RESPONSE: If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. A unit is supplied in each case.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode

ST

DESCRIPTION: A temperature value for a thermocouple is simulated.

SYNTAX: **ST <parameter>**

PARAMETERS: The temperature value with an optional unit.

Value range: dependent on the type of the thermocouple.

Valid units: C or CEL, F or FAR, K

Default unit: Set in the device.

QUERY FORM: **ST?**

RESPONSE: If current transmission has been set, the instantaneous current value is returned. If voltage transmission has been set, the instantaneous voltage value is returned. If TC transmission has been set, the instantaneous temperature value is returned. A unit is supplied in each case.

COMMENTS:

RESTRICTIONS: This instruction is not permissible - in the calibration mode
- in the ramp mode
- in the absence a TC option.

Programming example for the RS232 interface

```

                                4462scpi.bas
Rem*****
Rem
Rem  Filename      :  scptest.bas      Version:  0.0  4462
Rem
Rem  Entwickelt von :  CS              am 22.02.2011
Rem  Geändert von  :                   am XX.XX.XXX
Rem
Rem  Sprache       :  QBASIC          Betriebssystem: MS-DOS 5.00
Rem
Rem  Funktion      :  Testprogramm fuer ANSI Protokoll x3.28 Subcategory 2.1,
A3
Rem                Bedienung Ueber die RS232 Schnittstelle
Rem
Rem*****
Rem
Open "COM1:19200,N,8,1" For Random As #3      ' RS232 INITIALISIEREN
Cls                                           ' BILDSCHIRM LOESCHEN
Print "          DEMOPROGRAMM "
Print "          burster                "
Print "Steuerung Ueber RS232 Schnittstelle "
Print "Uebertragungsprotokoll: ANSI X3.28 A4"
Print
Print "EXIT mit #"
Dim an$(100)
Dim befehl$(100)
Dim stri$(300)
Rem  Sonderzeichen werden definiert
STX$ = Chr$(2)
etx$ = Chr$(3)
EOT$ = Chr$(4)
ENQ$ = Chr$(5)
ACK$ = Chr$(6)
NAK$ = Chr$(21)
CR$ = Chr$(13)
lf$ = Chr$(10)
ESC$ = Chr$(27)

while befehl$ <> "#"                'solange keine ESC Taste
LOCATE 10, 1
befehl$ = ""

  LINE INPUT "Bitte Befehl eingeben: "; befehl$
  If (befehl$ = "") Then befehl$ = "*idn?"
  If (befehl$ = "#") Then End

query = 0
length = Len(befehl$)
For i = 1 To length
  If Mid$(befehl$, i, 1) = "?" Then
    query = 1
  End If
  If Mid$(befehl$, i, 1) = "#" Then
    Mid$(befehl$, i, 1) = ","
  End If
Next i
LOCATE 19, 1
Print "
"
LOCATE 20, 1
Print "
"
LOCATE 21, 1
Print "
"
LOCATE 22, 1
Print "

```

4462scpi.bas

```

GoSub SENDBEFEHL
LOCATE 10, 1
Print "
"
Wend

Cls                               'Bildschirm loeschen
End                                 'Programm Ende
System                             'Kontrolle an Betriebssystem

SENDBEFEHL:                         'Subroutine Aussenden des Befehls
LOCATE 15, 1
Print "
"

LOCATE 15, 1
Print "Gesendeter Befehl: ", befehl$
Print #3, "STX$ + befehl$ + if$ + etx$ ' Start Befehl senden
ant$ = " "                          'Antwortstring loeschen
ant$ = Input$(1, #3)                 'Antwort einlesen
LOCATE 17, 1
If (ant$ <> ACK$) Then               'Wenn nicht ACK
Print "Ger,t antwortet mit NAK "     'Fehlermeldung anzeigen
Else                                  'ansonsten " " 'wurde Befehl verstanden
Print "
End If
If query = 1 Then GoSub getpar
Return

getpar:                              'Subroutine zum Abholen eines Parameters

Print #3, EOT$
mk1:
ant$ = ""                            'Antwortstring loeschen
stri$ = ""                            'Messwertstring loeschen
ant$ = Input$(1, #3)

while (ant$ <> etx$) And (ant$ <> EOT$) 'Solange kein ETX und EOT empfangen
If ant$ >= Chr$(32) Then              ' Wenn keine Sonderzeichen
stri$ = stri$ + ant$                 'Messwertstring bilden
End If
ant$ = Input$(1, #3)                 'Zeichen von RS232 einlesen
wend

If (ant$ = EOT$) Then                 'Wenn EOT empfangen
LOCATE 22, 10                        'Zeile 18, Spalte 1
Rem PRINT "Kein weiterer Parameter" 'Meldung anzeigen

Else
LOCATE 19, 1                          'Zeile 20, Spalte 1
Rem PRINT "Empfangener Parameter: "; stri$ 'Empfangener Messwert anzeigen
Print stri$
Print #3, ACK$
GoTo mk1
End If

Return

```

6. Maintenance and customer service

6.1 Maintenance

The DIGISTANT® Type 4462 does not require any maintenance by the user. Repairs which might be required must only be performed by the manufacturer.

6.2 Customer service

Enquires

Please indicate the serial number of your device when sending technical enquiries to the manufacturer. This will make it possible to identify the hardware and software versions and allow rapid remedy. The serial number is indicated on the type plate.

Shipping notes

When sending the DIGISTANT® to the manufacturer for repair, please observe the following packaging and shipping guidelines:

Prepare a note briefly describing the fault and attach it to the housing of the device.

Adding your name and department as well as a phone and fax number to this information will help us process your complaint more quickly.

burster präzisionsmesstechnik gmbh & co kg

Talstraße 1-5

DE-76593 Gernsbach

Box 1432

DE-76587 Gernsbach

Tel.: 0049/7224/645-0 Fax: 0049/7224/645-88

E-Mail: info@burster.de

6.3 Manufacturer's guarantee

burster guarantees the reliable operation of the device for a period of 24 months following its delivery.

Repairs required within this period will be performed free-of-charge.

This guarantee does not cover damage arising from improper handling of the device.

Furthermore, the manufacturer cannot be held liable for any model of consequential damage.

Technical data are subject to change without notice.

6.4 Cleaning the device

To clean the front panel and housing of the device, only use water-soluble detergent, not benzene.

6.5 Batteries

The device contains Lithium Batteries for buffering the data.

The batteries bond on a Recycling symbol and it must disposed separate!

6.6 Disposal

Battery disposal

As an end user, you are required by law (battery ordinance) to return all used batteries and rechargeable batteries; the disposal through household waste is prohibited. By buying the herein described device you are concerned by this law. Please dispose of your batteries and rechargeable batteries correctly. Hand them to waste disposal sites either at your premises or at our company or at any place where batteries/rechargeable batteries are sold.

Equipment Disposal

Please fulfill your legal obligations and dispose of unserviceable equipment in accordance with applicable legal requirements. Thus you contribute to environmental protection.



7. Technical Data

7.1 Voltage/current source, thermocouple simulation

Voltage source

Range ±	Reso- lution	Error limits at 23°C ± of reading			TC with resp. to 23 °C
30 V	0.1 mV	0.003%	(to ± 4.5 V) (> ± 4.5 V)	+200 μV +1.1 mV	8 ppm/K +10 μV/K
3 V	10 μV	0.003%	(to ± 450 mV) (> ± 450 mV)	+20 μV +110 μV	8 ppm/K +1 μV/K
300 mV	1 μV	0.003%	(to ± 45 mV) (> ± 45 mV)	+3 μV +11 μ	8 ppm/K +0.35 μV/K

Option: 60 V (Range 30 V will be dropped)

Range ±	Reso- lution	Error limits at 23°C ± of reading			TC with resp. to 23 °C
60 V	0.2 mV	0.003%	(to ± 9 V) (> ± 9 V)	+500 μV +2.2 mV	8 ppm/K +10 μV/K

Output current: 52 mA max. at 30 V, source resistance < 10 mΩ
(22 mA max. at 60 V, model -VXX1)

Current source

Range ±	Reso- lution	Error limits at 23°C ± of reading			TC with resp. to 23 °C
52 mA 22 mA	200 nA	0.007%	(bis ± 7.5 mA) (> ± 7.5 mA)	+0.6 μA +3 μA	10 ppm/K +10 nA/K

Burden voltage: max. 30 V at 52 mA, source resistance > 500 mΩ
Confidence coefficient for the specified errors: 95% (K=2).
Burden voltage: max. 60 V at 22 mA, model -V2X1)

Option: Thermocouple simulation

Model	Range	Error (K)*
R	- 50.0 °C ... 1768 °C	0.4 (+ 250 ... +1768 °C)
S	- 50.0 °C ... 1768 °C	0.4 (+ 350 ... + 1768 °C)
B	0.0 °C ... 1820 °C	0.5 (+ 800 ... + 1820 °C)
J	- 210 °C ... 1200 °C	0.2 (- 210 ... + 900 °C)
T	- 270 °C ... 400 °C	0.2 (-170 ... + 400 °C)
E	- 270 °C ... 1000 °C	0.2 (- 220 ... + 1000 °C)
K	- 270 °C ... 1372 °C	0.1 (- 50 ... + 800 °C)
U	- 200 °C ... 600 °C	0.3 (- 100 ... + 600 °C)
L	- 200 °C ... 900 °C	0.2 (- 100 ... + 750 °C)
N	- 270 °C ... 1300 °C	0.2 (- 120 ... 1200 °C)
M	- 50 °C ... 1410 °C	0.1 (- 50 ... + 900 °C)
C	0.0 °C ... 2315 °C	0.2 (+ 100 ... + 900 °C)
D	0.0 °C ... 2315 °C	0.2 (300 ... + 1100 °C)
G2	0.0 °C ... 2315 °C	0.3 (300 ... + 2100 °C)

*The errors are defined at „manual“ reference junction 0 °C.

Reference junction

EXTERNAL: The temperature is measured with an external Pt100 sensor.

MANUAL: The reference junction temperature is entered manually.

Temperature recording in an external reference junction or temperature measurement with Pt 100

Range	Resolution	Current (mA)	Tolerance
- 200 ... 850 °C	0.01 °C	approx. 0.6 mA	0.00006*x °C + 0.045

Impedance: Voltage source < 10 mΩ
Current source > 500 MΩ

Warm-up time: 30 minutes, until specified error limit

External divider: 1 to 1010

An external voltage divider can be connected. In this case the divider function is activated and the division factor of the external divider is entered. Then the source value is entered as the value that should be present at the divider's output.

Current limit: at voltage U up to 30/60 V 1 mA ... 50/24 mA

Voltage limit: at current I up to 50/22 mA 1 V ... 30/60 V

Display: graphics LCD display with LED illumination

Visual field: 56.3 mm x 38 mm, resolution 128 x 64 dots

Sockets: + output, - output, + sensor, - sensor,
, gold-plated 4 mm-terminals and
a 6-pin LEMO socket 1B for the optional
Pt100 connection

Potential to ground: ≤ 50 V between analog ground and ground

Relative humidity: 80 % up to 31 °C above linear: decreasing
that temperature to 50 % at T_{max}, no condensation

Device construction: Metal housing in protection class I
in accordance with DIN EN 61010 part1

Power supply: 230 V ± 10 %, 45 Hz ... 65 Hz,
can be changed on device to 115 V

Power requirement: approx. 30 VA

7.2 Interference-suppression class

The Interference-suppression class B according to VDE 0871.

7.3 Long-term stability

Long-term stability:	U-Drift	< 20 ppm / year	+ 2	μV / year (300 mV)
	U-Drift	< 20 ppm / year	+ 6	μV / year (3 V)
	U-Drift	< 20 ppm / year	+ 10	μV / year (30/60 V)
	I-Drift	< 70 ppm / year	+ 0.5	μA / year

7.4 Influencing variables

Operating temperature range:	5 ... <u>23</u> ... 40 °C
Storage temperature:	-10 ... 60 °C

7.5 Interface RS232

Standard	RS232 interface:	9 pin subminiature D-socket Baud rate 300 - 38400 Protocol ANSI X 3.28 1976 Subcategory 2.1, A3
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7.6 Interface IEEE488

Optional	IEEE488 interface:	24 in, Open collector outputs (E1) SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0 SCPI, Version 1997.0
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Instruction language:

7.7 Housing

Aluminium housing	Dimensions (LxWxH):	237x285x151 mm
Weight		approx. 6 kg

7.8 Accessories

7.8.1 External reference junction model 4485-V001

APPLIKATION:

The external reference junction was developed for precision thermocouple simulation. Thermoelectric wire or compensation lead, including subminiature connector, are connectable. The external reference junction will be connected to the DIGISTANT® 4462. The external reference junction has to be stick up. A 6-pin LEMO socket is for the Pt100 connection.

DESCRIPTION:

The external reference junction is thermally stable in the interior through constructive measures. The temperature on the transition point is measured by a Pt100 sensor. Through these measures the thermo voltage is compensated.

