External SCPI Command Specification CTR3000

GB

WIKA
Part of your business

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Further languages can be found at www.wika.com.

Prior to starting any work, read the operating instructions!
Keep for later use!

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Declarations of conformity can be found online at www.wika.com.

1. General Information

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- The instrument described in the operating instructions has been designed and manufactured using state-of-the-art technology. All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001 and ISO 14001.

- These operating instructions contain important information on handling the multi-functional precision thermometer CTR3000. Working safely requires that all safety instructions and work instructions are observed.

- Observe the relevant local accident prevention regulations and general safety regulations for the range of use of the multi-functional precision thermometer CTR3000.

- The operating instructions are part of the instrument and must be kept in the immediate vicinity of the multi-functional precision thermometer CTR3000 and readily accessible to skilled personnel at any time.

- Skilled personnel must have carefully read and understood the operating instructions, prior to beginning any work.

- The general terms and conditions, contained in the sales documentation, shall apply.

- Subject to technical modifications.

- Factory calibrations/DKD/DAkkS calibrations are carried out in accordance with international standards.

- Further information:
  - Internet address: www.wika.de / www.wika.com
  - Relevant data sheet: CT 60.15
  - Application consultant: Tel.: +49 9372 132-0
    Fax: +49 9372 132-406
    info@wika.de

Abbreviations, definitions

3-wire	Two connection lines are used for the voltage supply. One connection line is used for the measurement signal.
4-wire	Two connection lines are used for the voltage supply. Two connection lines are used for the measurement signal.
(S)PRT/RTD	Resistance thermometer
TC	Thermocouple

2. Design and function or Short overview

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2.1 Overview

❶ Input for resistance thermometers or thermistors (5-DIN plug)
❷ Input for thermocouples (standard miniature plug)
❸ User interface, touchscreen
❹ Front end USB: Upload and download function
❺ Power on/off

2.2 Description

The model CTR3000 precision thermometer provides a complete measurement and control interface for users wishing to make high-accuracy temperature measurements or calibrate thermometers. It supports a wide range of thermometer types including 25 Ω SPRTs, 100 Ω PRTs, thermistors and thermocouples.
The CTR3000 is a high-accuracy instrument designed for laboratory and industrial temperature measurement and calibration applications.

2.3 Scope of delivery

- Model CTR3000 multi-functional precision thermometer incl. power cord
- Choice of model CTP5000/CTP9000 temperature probes, when ordered

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3. Safety

3.1 Explanation of symbols

DANGER!
... indicates a directly dangerous situation resulting in serious injury or death, if not avoided.

WARNING!
... indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.

CAUTION!
... indicates a potentially dangerous situation that can result in light injuries or damage to property or the environment, if not avoided.

DANGER!
... identifies hazards caused by electrical power. Should the safety instructions not be observed, there is a risk of serious or fatal injury.

Information
... points out useful tips, recommendations and information for efficient and trouble -free operation.

3.2 Intended use

Application
The model CTR3000 precision thermometer provides a complete measurement and control interface for users wishing to make high-accuracy temperature measurements or calibrate thermometers. It supports a wide range of thermometer types including 25 Ω SPRTs, 100 Ω PRTs, thermistors and thermocouples.
The CTR3000 is a high-accuracy instrument designed for laboratory and industrial temperature measurement and calibration applications.

Functionality
The instrument will operate with all 3- and 4-wire (S)PRTs (25 Ω, 100 Ω) platinum resistance thermometers as well as most standard international thermocouple types and NTC thermistors. The following temperature measurement units are selectable: °C, °F, K. Base measuring units mV and Ω are also displayed. The temperature values will be calculated through common conversion of the base measurement.

Due to the wide range of this instrument it makes individual instruments needless and makes the calibration cost-effective.

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Features included:

- Dual capability for both thermocouple and resistance thermometer measurements
- Input channels can be expanded up to 44
- Large graphic touchscreen for temperature measurement values as well as configuration settings and statistical results
- Logger and log-data transfer to USB stick or communication interface
- Scan function with a live screen and graph
- Communication interfaces available for automated monitoring and calibration applications

This instrument is not permitted to be used in hazardous areas!

The instrument has been designed and built solely for the intended use described here, and may only be used accordingly.

The technical specifications contained in these operating instructions must be observed. Improper handling or operation of the instrument outside of its technical specifications requires the instrument to be taken out of service immediately and inspected by an authorised WIKA service engineer.

Handle electronic precision measuring instruments with the required care (protect from humidity, impacts, strong magnetic fields, static electricity and extreme temperatures, do not insert any objects into the instrument or its openings). Plugs and sockets must be protected from contamination.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.3 Improper use

WARNING!
Injuries through improper use
Improper use of the instrument can lead to hazardous situations and injuries.
► Refrain from unauthorised modifications to the instrument.
► Do not use the instrument within hazardous areas.
► Do not use the instrument with abrasive or viscous media.

Any use beyond or different to the intended use is considered as improper use.

3.4 Responsibility of the operator

The CTR3000 multifunctional precision thermometer is a high accuracy instrument designed for laboratory and industrial temperature measurement and calibration applications.
The operator is therefore responsible for legal obligations regarding safety at work.
The safety instructions within these operating instructions, as well as the safety, accident prevention and environmental protection regulations for the application area must be maintained.

The operator is obliged to maintain the product label in a legible condition.

To ensure safe working on the instrument, the operating company must ensure
- that suitable first-aid equipment is available and aid is provided whenever required.
- that the operating personnel are regularly instructed in all topics regarding work safety, first aid and environmental protection and know the operating instructions and in particular, the safety instructions contained therein.
- that the instrument is suitable for the particular application in accordance with its intended use.
- that personal protective equipment is available.

3.5 Personnel qualification

WARNING!
Risk of injury should qualification be insufficient
Improper handling can result in considerable injury and damage to equipment.
► The activities described in these operating instructions may only be carried out by skilled personnel who have the qualifications described below.

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Skilled personnel

Skilled personnel, authorised by the operator, are understood to be personnel who, based on their technical training, knowledge of measurement and control technology and on their experience and knowledge of country-specific regulations, current standards and directives, are capable of carrying out the work described and independently recognising potential hazards.

Special operating conditions require further appropriate knowledge, e.g. of aggressive media.

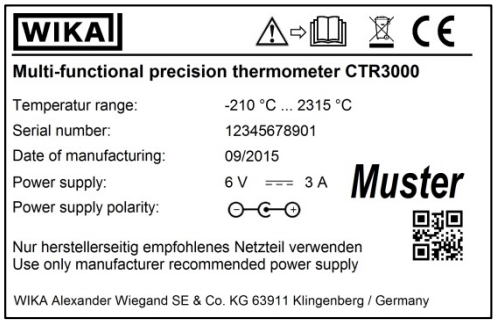
3.6 Personal protective equipment

The personal protective equipment is designed to protect the skilled personnel from hazards that could impair their safety or health during work. When carrying out the various tasks on and with the instrument, the skilled personnel must wear personal protective equipment.

Follow the instructions displayed in the work area regarding personal protective equipment!

3.7 Labelling, safety marks

Product label



Symbols

Before mounting and commissioning the instrument, ensure you read the operating instructions!

CE, Communauté Européenne

Instruments bearing this mark comply with the relevant European directives.

This marking on the instruments indicates that they must not be disposed of in domestic waste. The disposal is carried out by return to the manufacturer or by the corresponding municipal authorities (see EU directive 2012/19/EU).

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4. Interface commands

The manual of the CTR3000 is still valid!

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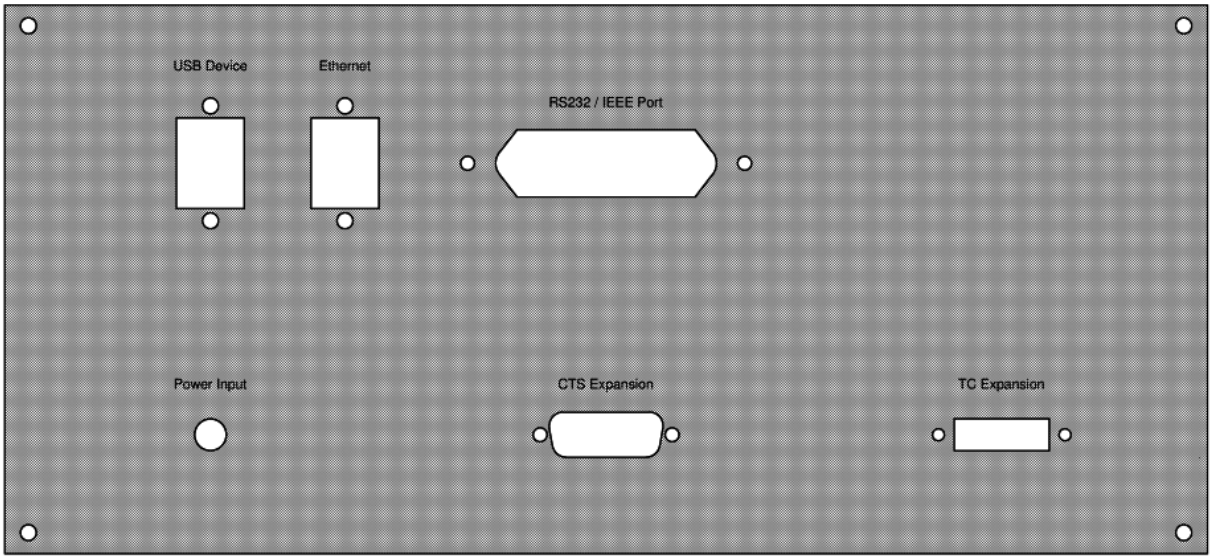
4.1 Rear panel



4.1.1 USB interface (standard)

The USB connector is fitted as standard. Communication requires the installation of the USB driver on a PC.
The instrument can be controlled through simple SCIPI commands and can transmit SCIPI result-data, which may be recorded using a simple terminal program.
Please refer to section **Fehler! Verweisquelle konnte nicht gefunden werden.**2 **Fehler! Verweisquelle konnte nicht gefunden werden.**>> for further details.

4.1.2 Ethernet interface

The Ethernet function allows the user to set the following by inputting a numeric value in each separate field:

IP
Netmask
Gateway
Port
DHCP settings

Set the Ethernet communication parameters as described in Section **Fehler! Verweisquelle konnte nicht gefunden werden.**2 **Fehler! Verweisquelle konnte nicht gefunden werden.**>>.

4.1.3 RS232 Communication interface card

Optional RS232 communication interface card slot. A blanking plate is fitted if there is no communication interface card.
The CTR3000 may (optionally) be fitted with one of these interfaces. Operation is similar for all communication interfaces. Please refer to section **Fehler! Verweisquelle konnte nicht gefunden werden.**2 **Fehler! Verweisquelle konnte nicht gefunden werden.**>> for further details.

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4.2 Application <<Remote>>

This application <<Remote>> allows to operate the device with SCIPI commands (command set available in a separate document) over a rear panel USB/Ethernet or RS232 connection.
With the Remote Settings application users can select the remote command set for all interfaces.
The Ethernet network parameters and Serial parameters can also be set here.

*As a RS232 card is connected more functions will be displayed.

USB

The USB PC interface will be installed as a virtual COM driver. The communication protocol is:

- Bits per second 9600
- Data bits 8
- Stop bits 1
- Parity none
- Flow control none

Ethernet

The Ethernet function allows the user to set the following by inputting a numeric value in each separate field:

- IP
- Netmask
- Gateway
- Port
- DHCP settings

The Ethernet communication parameters are set as a default.
Before using Ethernet communication, four parameters must be set up: IP, Netmask, Gateway, and Port.

Please contact the network administrator for proper settings.

Please consult the computer resources department prior to connecting this instrument to your network to verify there are no conflicts with existing IP addresses.

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4.3 Command syntax

The command language is based on the SCPI command format.
Commands consist of one or more command strings containing some or all of the following –

Colon ':'	Separates command words
Question mark '?'	Command requiring a response
Space ' '	Separates the command word from the first parameter (shown as <space> in the examples)
Comma ','	Separates the parameters list
Parameter <parameter list>	Parameters list separated by commas
Terminator <cr> or <cr><lf>	Terminates the line and the command

For example, the units may be set by sending the string –
UNIT:TEMP CEL<cr>
i.e. <command><:><command><space><parameter><,><parameter><terminator(s)>

It is important to remember the space between the end of TEMP and CEL.
Additional or extra arguments after a valid command will be ignored.

Case sensitivity
Command words are not case sensitive; you can use upper or lower case characters or any combination.

For example, the following are all valid –
SYSTEM:REMOTE
system:remote

Long form short form commands
Command words can have a long form and short form the short form version is indicated by upper case characters in subsequent sections, either form may be used.

The following are identical –

SYSTem:REMote	(long form)
SYST:REM	(short form)

Command terminators <cr> or <cr><lf>
All commands sent to the instrument must be terminated with a carriage return <cr> character or a combination of <cr><lf> - carriage return line feed.

Remote mode
The instrument must be set to remote mode before any other command is sent. It is not possible to control the instrument over its touch screen and a remote program simultaneously.

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4.4 Command set

4.4.1 System Command

4.4.1.1 **IDN?*

Reads the instrument's identification code consisting of the manufacturer name, instrument model number, serial numbers, firmware version and date.

Command	*IDN?	
Returns	<manufacturer>,<model no>,<serial no instrument>,<manuf. date>,<serial no user interface>,<firmware version user interface>,<serial no measurement PCB>< firmware version meas. system>	
Parameters	<manufacturer>	WIKA
	<model no>	CTR3000
	<serial no instrument>	Serial number of measurement PCB
	<manuf. date>	Manufacturing date (format dd/MM/yyyy)
	<serial no user interface>	Serial number of user interface
	<firmware version user interface>	User interface firmware version
	<serial no meas. PCB>	Serial number of measurement system
	<firmware version meas .>	Current meas. firmware version and date (format dd/MM/yyyy)

Example

Command	Response
*IDN?<cr>	WIKA,CTR3000,C2468,01/01/2016,20CD39F5D6C2,0.1.0.4711,001/123456,V0.01,19/03/2015 <cr><lf>

4.4.1.2 *SYSTem:REMOte*

Places the instrument in remote mode for interface control. Displays icon on the CTR3000. The icon will be displayed permanently when the CTR3000 is in remote mode. Locks out the instrument's front panel keys.

Command	SYST:REMO
	SYSTEM:REMOTE
Returns	None (or ACK if set on)

4.4.1.3 *SYSTem:LOCAl*

Returns the instrument to local mode and enables the instrument's front panel keys.

Command	SYST:LOCA
	SYSTEM:LOCAL
Returns	None (or ACK if set on)

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4.4.1.4 *SYSTem:ACKNowledge <state>*

Sets or clears the acknowledge command response. Commands that do not have a response may use this command to force a positive response by the CTR3000.

Command	SYST:ACKN <state>
	SYSTEM:ACKNOWLEDGE <state>
Parameters	0 Turn acknowledge response OFF
	1 Turn acknowledge response ON
Returns	ACK

Example

Command	Response
SYST:ACKN 1	(Sets acknowledge response ON)

4.4.1.5 *SYSTem:CALIbrated?*

Returns the calibration status.

Command	SYST:CALI?
	SYSTEM:CALIBRATED?
Returns	System calibrated status

Example

Command	Response
SYST:CALI?<cr>	1<cr> (the system is calibrated)

4.4.1.6 *SYSTem:SWITchbox :TYPE? <number>*

Returns the switchbox type.

Command	SYST:SWIT:TYPE? <number>		
	SYSTEM:SWITCHBOX:SNUMBER?		
Parameters	<number>	1-4	Switchbox position from CTR3000
Returns	<type>	0	not fitted
		1	Thermocouple 8 channels
		2	Thermocouple 16 channels
		3	PRT/Thermistor 8 channels
		4	PRT/Thermistor 16 channels

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4.4.1.7 *SYSTem:DATE?*

Returns the instrument system date.

Command	SYSTem:DATE? SYSTEM:DATE?
Returns	System date (day, month, year)

4.4.1.8 *SYSTem:TIME?*

Returns the instrument system time.

Command	SYST:TIME? SYSTEM:TIME?
Returns	System time (hour, minute)

4.4.1.9 *SYSTem:SCREenshot*

Saves a screenshot of the current screen on the device.

Command	SYST:SCRE SYSTEM:SCREENSHOT

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4.4.2 Measurements

4.4.2.1 *MEASure:CURRent?*

Returns the last reading on currently selected channel. The values are always returned with the maximum number of decimal places.

Command MEAS:CURR?
MEASURE:CURRENT?

Parameters Units are returned as follows:

Unit	return string
Ohm	R
°C	°C
°F	°F
Kelvin	K
Millivolts	mV

Returns Last reading on currently selected channel electrical value for probe type (Voltage for TC else resistance) and selected temperature units.

Errors E14 Can be returned after channel switching, because the system needs some time to produce a reading

Example

Command	Response
MEAS: CURR?<cr>	109.73R,25.0°C<cr> (Assuming probe = PT100 and units= °C returns with 109.73R,25°C)

4.4.2.2 *MEASure:SCAN?<interval>,<channel list>*

Returns one complete cycle of measurements as defined in <channel list>.

Command MEAS:SCAN ?<interval>,<channel list>

Parameters <Interval> Time in seconds (minimum 3) between each reading

Returns In sequence as defined in “channel list” electrical value for probe type (Voltage for Tc else resistance) and selected temperature units for each channel

Errors E14 Can be returned for one or more channels instead of a measured value.

Examples

Command	Response
MEAS:SCAN?(10),(@16:20)<cr>	(measurements for channels 16 through 20 at 10 second intervals)
MEAS:SCAN ? (5),(@1,2,16,17)<cr>	(measurements for channels 1,2,16,17 at 5 second intervals)

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4.4.3 Configuration

4.4.3.1 *CONFigure:CHANnel <channel>*

Sets the instrument to the channel specified.

Command CONF:CHAN <channel>
CONFIGURE:CHANNEL <channel>
Returns None (or ACK if set on)

Example

Command	Response
CONF:CHAN<space>03<cr>	(Makes channel 03 the currently active channel)

4.4.3.2 *CONFigure:CHANnel?*

Returns the currently selected channel, and source channels ‘X’ and ‘Y’ for derived channels when applicable (channels 9-13).

Command CONF:CHAN?
CONFIGURE:CHANNEL?
Returns Currently selected channel

Example

Command	Response
CONF:CHAN?<cr>	03<cr> Returns with the active channel of 03
CONF:CHAN?<cr>	10,1,2<cr> returns with the channel 10 for x=1 and y=2)

4.4.3.3 *CONFigure:CHANnel:FUNCtion <channel> <@A,@B>*

Sets the input channels for derived function channel.

Command CONF:CHAN:FUNC <channel><@A,@B>
Parameters

<channel>	9	1/A
	10	A+B
	11	A-B
	12	AxB
	13	A/B

Where A and B are the specified channel numbers.
Returns None (or or ACK if set on)

Example

Command	Response
CONF:CHAN:FUNC <space>10,@1,@2 <cr>	(Sets channel 10 inputs as 1 and 2)

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4.4.3.4 *CONFigure:CHANnel:SMARt?*

Returns the Smart Probe status for the current channel.

Command	CONF:CHAN:SMAR?
	CONFIGURE:CHANNEL:SMART?
Returns	0 = No Smart Probe
	1 = Smart Probe

Example

Command	Response
CONF:CHAN:SMAR?<cr>	1<cr> (a Smart Probe is attached to the current channel)

4.4.3.5 *CONFigure:CHANnel:UNITs <units>*

Sets the active channel's units. If Ohm or Millivolt is set, the temperature is returned in °C.

Command	CONF:CHAN:UNITs <units>	
	CONFIGURE:CHANNEL:UNITS <units>	
Parameters	<units>	
	1	Celsius
	2	Fahrenheit
	3	Kelvin
	4	Ohm
	5	Millivolt
Returns	None (or ACK if set on)	
Errors	E6	Ohm is only valid for PRT channels, Millivolt for TC channels

4.4.3.6 *CONFigure:CHANnel:UNITs?*

Returns the active channel measurement units.

Command	CONF:CHAN:UNIT?	
	CONFIGURE:CHANNEL:UNITS:?	
Parameters	<units>	
	1	Celsius
	2	Fahrenheit
	3	Kelvin
	4	Ohm
	5	Millivolt
Returns	<units><cr><lf>	

Example

Command	Response
UNIT:TEMP?<cr><lf>	3<cr><lf> (active channel's units is Kelvin)

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4.4.4 Logger

4.4.4.1 *LOGGer:MODE <mode>*

Sets the log mode. Automatic mode: data are automatically written to a logfile in a defined interval. Manual mode: data are written to a logfile when command LOGGer:WRITe is issued.

Command	LOGG:MODE <mode>	
	LOGGer:MODE <mode>	
Parameters	<mode>	1=automatic
		2=manual
Returns	None (or ACK if set on)	

4.4.4.2 *LOGGer:MODE?*

Returns the logger mode.

Command	LOGG:MODE?	
	LOGGer:MODE?	
Returns	Logger mode	1=automatic
		2=manual

4.4.4.3 *LOGGer:INTErval <seconds>*

Defines the interval used for writing data to the logfile. Use "." as decimal separator. Interval can be defined in 0.5s steps.

Command	LOGG:INTE <seconds>	
	LOGGer:INTErval <seconds>	
Parameters	<seconds>	Logger interval (0.5 – 3600)
	Use "." as decimal separator. Interval can be defined in 0.5s steps.	
Returns	None (or ACK if set on)	

4.4.4.4 *LOGGer:WRITe*

Writes a dataset to the logfile. Only valid if the logger is in manual mode. If the logger is not started or automatic mode is active, the command does nothing.

Command	LOGG:WRIT	
	LOGGer:WRITe	
Returns	None (or ACK if set on)	
Errors	E15	Logger not active or in manual mode

4.4.4.5 *LOGGer:RUNNing <active>*

Activates or deactivates the logger.

Command	LOGG:RUNN <active>	
	LOGGer:RUNNing <active>	
Parameters	<active>	1=active
		0=inactive
Returns	None (or ACK if set on)	

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4.4.4.6 *LOGGer:RUNNing?*

Returns if the logger is active or not.

Command	LOGG:RUNN?
	LOGGer:RUNNing?
Returns	1=active, 0=inactive

4.4.4.7 *LOGGer:FILEs?*

Returns a list of all logfiles which are stored on the instrument. A logfile name is required as parameter for the LOGGer:DOWNload and LOGGer:ERASe command.

Command	LOGG:FILE?
	LOGGer:FILEs?
Returns	Comma-separated list of logfiles which are stored on the instrument
Errors	E12 No logfile exists.

4.4.4.8 *LOGGer:DOWNload <logfile>*

Reads the specified logfile and transfers its content over the interface. To avoid confusion with the <cr><lf> message terminator, each line of the logfile is terminated with a record separator character (ASCII code 0x1E).

Command	LOGG:DOWN <logfile>
	LOGGer:DOWNload <logfile>
Returns	None (or ACK if set on)
Errors	E12 Requested file does not exist.
	E16 Requested file currently in use.

4.4.4.9 *LOGGer:ERASe <logfile>*

Deletes the specified logfile.

Command	LOGG:ERAS <logfile>
	LOGGer:ERASe <logfile>
Returns	None (or ACK if set on)
Errors	E12 Requested file does not exist
	E16 Requested file currently in use

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4.4.5 Passive Probes (PRT)

4.4.5.1 *PROBe:LIST?*

Returns a list of all PRT probes.

Command	PROB:LIST?
	PROBE:LIST?
Returns	List of probes: <nr>:<name>,<nr>:<name>,…<cr>

4.4.5.2 *PROBe:ASSIgn <probe>,<channel>*

Assigns the probe to the specified channel. To un-assign a probe, assign it to channel 0.

Command	PROB: ASSI <probe>,<channel>	
	PROBE: ASSIGN <probe>,<channel>	
Parameters	<probe>	1 to 72 Probe number
	<channel>	1 to 80 Channel number
Returns	None (or ACK if set on)	
Errors	E9	Probe does not exist

Example

Command	Response
CONF: ASSI <space>2,1<cr>	(assign probe 2 to channel 1)

4.4.5.3 *PROBe:ASSIgn? <probe>*

Returns the probe assignment status for the specified channel. Returns 0 if the probe is unassigned.

Command	PROB:ASSI? <probe>		
	PROBE:ASSIGN? <probe>		
Parameters	<probe>	1 to 72	Probe number
Returns	Probe assignment status		
Errors	E9	Probe does not exist	

Example

Command	Response
PROB:ASSI? 5<cr><lf>	2<cr><lf> (Probe 5 is assigned to channel 2)

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4.4.5.4 *PROBe:IDENtifier <probe>,<identifier>*

Sets the probe identifier to the specified string

Command PROB: IDEN <probe>,<identification>
PROBE: IDENTIFIER <probe>,<identification>
Parameters <probe> 1 to 72 Probe number
<identifier> 0 to 10 long string. Identifiers less than 10 characters will be padded with trailing spaces.
Returns None (or ACK if set on)
Errors E14 Channel or probe not available

Example

Command	Response
PROB: IDEN <space>2,abcDEFG1<cr><lf>	(sets probe 2 identifier to abcDEFG1)

4.4.5.5 *PROBe: IDENtifier? <probe>*

Returns the probe Identifier string

Command PROB: IDEN? <probe>
PROBE: IDENTIFIER? <probe>
Parameters <probe> 1 to 72 Probe number
Returns Probe Identifier string
Errors E9 Probe does not exist

Example

Command	Response
PROB: IDEN? 5<cr><lf>	abbbb12343<cr><lf> (Probe 5 identifier is abbbb12343)

4.4.5.6 *PROBe:TMAX <probe>,<temperature>*

Sets the probe Tmax to the specified temperature in degrees Celsius.

Command PROB:TMAX <probe>,<temperature>
PROBE:TMAX <probe>,<temperature>
Parameters <probe> 1 to 72 Probe number
<temperature> valid floating point temperature (°C)
Returns None (or ACK if set on)
Errors E9 Probe does not exist
E14 Channel or probe not available

Example

Command	Response
PROB: TMAX <space>2,501.5<cr><lf>	(sets probe 5 Tmax = 501.5 °C)

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4.4.5.7 *PROBe: TMAX? <probe>*

Returns the probe Tmax setting in degrees C

Command	PROB: TMAX? <probe>	
	PROBE: TMAX? <probe>	
Parameters	<temperature>1 to 72	Probe number
Returns	Probe Identifier string	
Errors	E9 Probe does not exist	

Example

Command	Response
PROB: TMAX? 5<cr><lf>	501.5<cr><lf> (Probe 5 is Tmax is set to 501.5 °C)

4.4.5.8 *PROBe: TMIN <probe>,<temperature>*

Sets the probe Tmin to the specified temperature in degrees Celsius.

Command	PROB: TMIN <probe<temperature>	
	PROBE: TMIN <probe>,<temperature>	
Parameters	<probe>	1 to 72 Probe number
	<temperature>	valid floating point temperature (°C)
Returns	None (or ACK if set on)	
Errors	E9 Probe does not exist	
	E14 Channel or probe not available	

Example

Command	Response
PROB: TMIN <space>2,-102.0<cr><lf>	(sets probe 2 Tmin to -102.0 °C)

4.4.5.9 *PROBe: TMIN? <probe>*

Returns the probe Tmin setting in degrees C

Command	PROB: TMIN? <probe>	
	PROBE: TMIN? <probe>	
Parameters	<temperature>1 to 72	Probe number
Returns	Probe Identifier string	
Errors	E9 Probe does not exist	

Example

Command	Response
PROB: TMIN? 5<cr><lf>	-102.0<cr><lf> (Probe 5, Tmin is set to -102.0 °C)

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4.4.5.10 ***PROBe:CONVersion <probe>,<type>***

Sets the probe conversion to the specified type.

Command	PROB: CONV<probe>,<type>		
	PROBE:CONVERSION<probe>,<type>		
Parameters	<probe>	1 to 72	Probe number
	<type>	1 to 4	Conversion type (see below)
		1	EN60751
		2	CVD
		3	ITS90
		4	Data Pairs
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

Example

Command	Response
PROB:CONV <space>2,1<cr><lf>	(sets probe 2 to EN60751)

4.4.5.11 ***PROBe:CONVersion? <probe>***

Returns the probe conversion.

Command	PROB:CONV? <probe>		
	PROBE:COVERSION? <probe>		
Parameters	<probe>	1 to 72	Probe number
Returns	Conversion type		
Errors	E9	Probe does not exist	

Example

Command	Response
PROB: CONV? 5<cr><lf>	3<cr><lf> (Probe 5 is type ITS90)

EN

4.4.5.12 ***PROBe:COEFficient <probe>,<identifier>,<value>***

Set the specified probe's coefficient to the number supplied.
Only valid coefficients for the probe conversion can be set.

Command PROB: COEF <probe>,<identifier><value>
PROBE: COEFFICIENT <probe>,<identifier>,<value>

Parameters <probe> 1 to 72 Probe number
<identifier> 1 to 7, As table below

	CvD	ITS90
1	R0	R0.01
2	A	A
3	B	B
4	C	Ap
5	-	Bp
6	-	Cp
7	-	Dp

<value> Scientific notation, five decimal places eg 3.90830e-03
R0 as a decimal, four decimal places eg 100.1234

Returns None (or ACK if set on)

Errors E9 Probe does not exist
E10 Coefficient not available
E14 Channel or probe not available

Example

Command	Response
PROB:COEF<space>3,2, +3.90730e-03<cr><lf>	(sets probe 3's A coefficient to +3.90730x10-03)

4.4.5.13 ***PROBe:COEFficient? <probe>,<identifier>***

Returns the probe coefficient for the specified probe. Only valid coefficients for the probe conversion will be returned.

Command PROB:COEF? <probe>,<identifier>
PROBE:COEFFICIENT? <probe>,<identifier>

Parameters <probe> 1 to 72 Probe number
<identifier> 1 to 7 (see table above)

Returns Coefficient for specified probe and coefficient number.

Errors E9 Probe does not exist
E10 Coefficient not available

Example

Command	Response
PROB:COEF? 3, 2<cr><lf>	+3.90830e-03<cr><lf> (Probe 3's A coefficient is +3.90830x10-03)

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4.4.5.14 ***PROBe:REFErence <probe>,<argument>***

Sets the selected probe to use this reference resistor.

Command	PROB:REFE <probe>,<argument>		
	PROBE:REFERENCE <probe>,<argument>		
Parameters	<probe>	1-72	Probe number
	<argument>	1-3	reference resistor
		1	Automatic selection
		2	25 ohm reference
		3	100 ohm reference
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

Example

Command	Response
PROB:REF<space>1,2<cr>	(sets probe 1 to use 25 ohms reference)

4.4.5.15 ***PROBe:REFErence? <probe>***

Returns selected probe reference resistor.

Command	PROB:REFE? <probe>		
	PROBE:REFERENCE? <probe>		
Parameters	<probe>	1-72	Probe number
Returns	Reference used on selected probe		
Errors	E9	Probe does not exist	

Example

Command	Response
PROB:REFE? 1<cr>	2<cr> (25 ohms reference is used for probe 1)

EN

4.4.5.16 ***PROBe:CURRent <probe>,<argument>***

Sets the selected probe to use this Current.

Command	PROB:CURR <probe>,<argument>		
	PROBE:CURRENT <probe>,<argument>		
Parameters	<probe>	1-72	Probe number
	<argument>	1	default current
		2	current x √2
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

Example

Command	Response
PROB:CURR<space>1,2<cr>	(sets probe 1 to use current x √2)

4.4.5.17 ***PROBe:CURRent? <probe>***

Returns selected probe excitation current.

Command	PROB:CURR? <probe>			
	PROBE:CURRENT? <probe>			
Parameters	<probe>	1-72	Probe number	
Returns	Current used for selected probe:		1	1 mA
			2	2 mA
			3	1 mA x √2
			4	2 mA x √2
Errors	E9	Probe does not exist		

Example

Command	Response
PROB:REFE? 1<cr>	2<cr> (Current for probe 1 is 2mA)

4.4.5.18 ***PROBe:CAL:DATE?<probe>***

Query the calibration date for the selected probe.

Command	PROB:CAL:DATE?		
	PROBE:CALIBRATION:DATE?		
Parameters	<probe>	1-72 Probe number	
Return	<year>,<month>,<day>		
	<year>	4 digit numerical string	
	<month>	01 to 12 for month	
	<day>	01 to 31 for day	
Errors	E9	Probe does not exist	

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4.4.5.19 ***PROBe:TERMinal<probe>,<argument>***

Set the connection wiring for the selected probe. This is only valid for resistance thermometers.

Command	PROB:TERMinal <probe>,<argument>		
	PROBE:TERMINAL <probe>,<argument>		
Parameters	<probe>	1-72	Probe number
	<argument>	1	3-Wire
		2	4-Wire
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.5.20 ***PROBe:TERMinal?<probe>***

Query the connection wiring for the selected probe. This is only valid for resistance thermometers.

Command	PROB:TERM:?	<probe>	
	PROBE:TERMINAL? <probe>		
Parameters	<probe>	1-72	Probe number
Return	<type>	1	3-Wire
		2	4-Wire
Errors	E9	Probe does not exist	

4.4.5.21 ***PROBe:STATus:REFErence <probe>, <reference>***

Sets reference probe status.

Command	PROB:STAT:REFE <probe>,<reference>		
	PROBE:REFERENCE <probe>,<reference>		
Parameters	<probe>	1-72	Probe number
	<reference>	0	No
		1	Yes
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.5.22 ***PROBe:STATus:REFErence? <probe>***

Query reference probe status.

Command	PROB:STAT::REFE?		
	PROBE:STATUS:REFERENCE?		
Parameters	<probe>	1-72	Probe number
Return	(reference)	0	No
		1	Yes
Errors	E9	Probe does not exist	

EN

4.4.5.23 ***PROBe:TYPE <probe>, <type>***

Sets probe type. This is only valid for resistance thermometers.

Command	PROB:TYPE <probe>,<type>		
	PROBE:TYPE <probe>,<type>		
Parameters	<probe>	1-72	Probe number
	<type>	0	PT25
		1	PT100
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.5.24 ***PROBe:TYPE? <probe>***

Query reference probe type. This is only valid for resistance thermometers.

Command	PROB:TYPE?		
	PROBE:TYPE?		
Parameters	<probe>	1-72	Probe number
Return	(type)	0	PT25
		1	PT100
Errors	E9	Probe does not exist	

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4.4.6 SMART Probes

To update a Smart probe, the Smart probes must be enabled, must be unlocked and the system password active where appropriate.

4.4.6.1 *SENSe:FRTD:CAL:DATE?*

Query the calibration date for the selected smart probe.

Command	SENS:FRTD:CAL:DATE?	
	SENSE:FRTD:CALIBRATION:DATE?	
Return	<year>,<month>,<day>	
	-222	No smart probe detected
Parameters	<year>	4 digit numerical string
	<month>	01 to 12 for month
	<day>	01 to 31 for day

4.4.6.2 *SENSe:FRTD:CAL:NEXT?*

Query the next calibration date for the selected smart probe.

Command	SENS:FRTD:CAL:NEXT?	
	SENSE:FRTD:CALIBRATION:NEXT?	
Return	<year>,<month>,<day>	
	-222	No smart probe detected
Parameters	<year>	4 digit numerical string
	<month>	01 to 12 for month
	<day>	01 to 31 for day

4.4.6.3 *SENSe:FRTD:CAL:SOURce?*

Query the calibration source reference code for the selected smart probe. Password protected command.

Command	SENS:FRTD:CAL:SOUR?	
	SENSE:FRTD:CALIBRATION:SOURCE?	
Return	<source>	
Parameters	<source>	17 byte maximum ASCII string.
Errors	E13	Access to password protected area denied

4.4.6.4 *SENSe:FRTD:STANdard?*

Query the selected temperature conversion method. Smart probe input query the smart probe.

Command	SENS:FRTD:STAN?		
	SENSE:FRTD:STANDARD?		
Return	<standard>		
Parameters	<standard>	1	<reserved>
		2	CvD
		3	ITS90
		4	<reserved>

EN

4.4.6.5 *SENSe:FRTD:REFErence?*

Query the selected channel reference resistor.

Command	SENS:FRTD:REFE?		
	SENSE:FRTD:REFERENCE?		
Return	Reference resistor for Smart probe (current selected channel)		
Parameters	<reference resistor>	1	25 ohms
		2	100 ohms

4.4.6.6 *SENSe:FRTD:COEFficient? <coefficient>*

Query the selected Smart probe specified coefficient value.

Command	SENS:FRTD:COEF? <coefficient>			
	SENSE:FRTD:COEFFICIENT? <coefficient>			
Parameters	<identifier>	1 to 7, As table below		
			CvD	ITS90
		1	R0	R0.01
		2	A	A
		3	B	B
		4	C	Ap
		5	-	Bp
		6	-	Cp
		7	-	Dp
Return	<value>	Scientific notation, five decimal places eg 3.90830e-03		
		R0 as a decimal to four decimal places eg 100.1234		

4.4.6.7 *SENSe:FRTD:IDENtification?*

Query the identification number for the selected smart probe.

Command	SENS:FRTD:IDEN?	
	SENSE:FRTD:IDENTIFICATION?	
Return	<identification>	
Parameters	<identification>	19 byte maximum ASCII string

4.4.6.8 *SENSe:FRTD:RANGe?*

Query the working range and working history of the smart probe.

Command	SENS:FRTD:RANG?	
	SENSE:FRTD:RANGE?	
Return	<rmax>,<rmin>	smart probe working range
	<rmax>,<rmin>	recorded value outside working range since last cal
	<rmax>,<rmin>	recorded value outside working range ever
Parameters	<rmax>	0 to 500 ohms
	<rmin>	0 to 500 ohms

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4.4.6.9 *SENSe:FRTD:LOCK <state>*

Set the smart probe data protection state.

Command	SENS:FRTD:LOCK <state>		
	SENSE:FRTD:LOCK <state>		
Parameters	<state>	0	Smart probe data unlocked
		1	Smart probe data locked
Returns	None (or ACK if enabled)		

4.4.6.10 *SENSe:FRTD:LOCK?*

Query the smart probe data protection lock state.

Command	SENS:FRTD:LOCK?		
	SENSE:FRTD:LOCK?		
Return	<state>		
Parameters	<state>	0	Smart probe data unlocked
		1	Smart probe data locked

4.4.6.11 *SENSe:FRTD:ENABle <parameter>*

Sets the CTR3000 Smart Probe enable mode.

Command	SENS:FRTD:ENAB <parameter>		
	SENSE:FRTD:ENABLE <parameter>		
Parameters	<parameter>	0	Set Smart Probes OFF
		1	Set Smart Probes ON
Returns	None (or ACK if enabled)		

Example

Command	Response
SENSE:FRTD:ENAB<space>0<cr><lf>	(sets Smart Probes OFF)

4.4.6.12 *SENSe: FRTD:ENABle?*

Returns the CTR3000 Smart Probe enable setting.

Command	SENS:FRTD:ENAB?		
	SENSE:FRTD:ENABLE?		
Returns	<parameter><cr><lf>		
Parameters	<parameter>	0	Set Smart Probes OFF
		1	Set Smart Probes ON

Example

Command	Response
SENSE:FRTD:ENAB?<cr><lf>	0<cr><lf> (Smart Probes disabled)

EN

4.4.6.13 ***SENSe:FRTD:STATus:REFErence <is_reference>***

Sets the reference probe status.

Command	SENS:FRTD:STAT:REFE <is_reference>		
	SENSE:FRTD:STATUS:REFERENCE <is_reference>		
Parameters	<is_reference>	0	No
		1	Yes
Returns	None (or ACK if set on)		

4.4.6.14 ***SENSe:FRTD:STATus:REFErence?***

Query reference probe status.

Command	SENS:FRTD:STAT:REFE?		
	SENSE:FRTD:STATUS:REFERENCE?		
Returns	<is_reference>	0	No
		1	Yes

4.4.7 Thermocouples

Probe parameters to be stored in Flash memory.

4.4.7.1 *SENSe:TCouple:LIST?*

Returns a list of all thermocouple probes.

Command	SENS:TC:LIST?	
	SENSE:TCOUPLE:LIST?	
Returns	List of probes:<nr>:<name>,<nr>:<name>,…<cr>	

4.4.7.2 *SENSe:TCouple:IDENtification <probe>,<identification>*

Store the probe identification name or number.

Command	SENS:TC:IDEN <probe>,<identification>	
	SENSE:TCOUPLE:IDENTIFICATION <probe>,<identification>	
Parameters	<probe>	1-72 Probe number
	<identification>	19 byte maximum ASCII string
Returns	None (or ACK if enabled)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

4.4.7.3 *SENSe:TCouple:IDENtification? <probe>*

Query the probe identification name or number.

Command	SENS:TC:IDEN? <probe>	
	SENSE:TCOUPLE:IDENTIFICATION? <probe>	
Parameters	<probe>	1-72 Probe number
Returns	<identification>	19 byte maximum ASCII string
Errors	E9	Probe does not exist

4.4.7.4 *SENSe:TCouple:REFErence <probe>, <reference>*

Sets probe reference type status.

Command	SENS:TC:REFE <probe>,<reference>		
	SENSE:TCOUPLE:REFERENCE <probe>,<reference>		
Parameters	<probe>	1-72	Probe number
	<reference>	0	No
		1	Yes
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

EN

4.4.7.5 *SENSe:TCouple:REFErence? <probe>*

Query probe reference status.

Command	SENS:TC:REFE?		
	SENSE:TCOUPLE:REFERENCE?		
Parameters	<probe>	1-72	Probe number
Return	(reference)	0	No
		1	Yes
Errors	E9	Probe does not exist	

4.4.7.6 *SENSe:TCouple:TYPE <probe>,<type>*

Sets the thermocouple “type for selected probe”.

Command	SENS:TC:TYPE <probe>,<type>		
	SENSE:TCOUPLE:TYPE <probe>,<type>		
Parameter	<probe>	1-72 Probe number	
	<type>	1	<reserved>
		2	<reserved>
		3	‘B’
		4	<reserved>
		5	<reserved>
		6	‘E’
		7	‘J’
		8	‘K’
		9	‘N’
		10	‘R’
		11	‘S’
		12	‘T’
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

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4.4.7.7 *SENSe:TCouple:TYPE ? <probe>*

Query the thermocouple “type”.

Command	SENS:TC:TYPE ? <probe>		
	SENSE:TCOUPLE:TYPE ? <probe>		
Parameter	<probe>	1-72	Probe number
Return	<type>	1	<reserved>
		2	<reserved>
		3	‘B’
		4	<reserved>
		5	<reserved>
		6	‘E’
		7	‘J’
		8	‘K’
		9	‘N’
		10	‘R’
		11	‘S’
		12	‘T’
Errors	E9	Probe does not exist	

4.4.7.8 *SENSe:TCouple:COMPensation <probe>,<type>,<channel>*

Sets reference cold junction compensation for probe , when <channel> is a valid TC channel.

Command	SENS:TC:COMP <probe>,<type>,<channel>		
	SENSE:TCOUPLE:COMPENSATION <probe>,<type>,<channel>		
Parameters	<probe>	1-72	Probe number
	<type>	0	Internal
		1	External (ice point)
		2	Channel
	<channel>	Channel of probe used for CJC	
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

Example

Command	Response
sens:tc:comp 1,0	(sets probe 1 to internal CJC)
sens:tc:comp 1,2,1	(sets probe 1 to use channel 1 as CJC)

EN

4.4.7.9 *SENSe:TCouple:COMPensation? <probe>*

Query compensation for probe. When the probe is assigned to a channel, the channel number is also sent.

Command	SENS:TC:REFE? <probe>		
	SENSE:TCOUPLE:REFERENCE? <probe>		
Parameters	<probe>	1-72	Probe number
Return	<type>	0	Internal
		1	External (Ice point)
		2	Channel
Errors	E9	Probe does not exist	

4.4.7.10 *SENSe:TCouple:ASSIgn<probe>,<channel>*

Set the channel where the probe has to be assign to. To unassign a probe set the <channel> to 0.

Command	SENS:TC:ASSI<probe>,<channel>		
	SENSE:TCOUPLE:ASSIGN <probe>,<channel>		
Parameters	<Probe>	1 to 72	Probe number
	<Channel>	1 to 80	Channel number
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.7.11 *SENSe:TCouple:ASSIgn?<probe>*

Query the channel probe where the probe is assigned to.

Command	SENS:TC:ASSI?<probe>		
	SENSE:TCOUPLE:ASSIGN? <probe>		
Parameters	<Probe>	1 to 72	Probe number
Return	Channel		
Errors	E9	Probe does not exist	

4.4.7.12 *SENSe:TCouple:TMAX <probe>,<temperature>*

Sets the probe Tmax to the specified temperature in degrees Celsius.

Command	SENS:TC:TMAX <probe>,<temperature>	
	SENSE:TCOUPLE:TMAX <probe>,<temperature>	
Parameters	<probe>	1 to 72 Probe number
	<temperature>	valid floating point temperature (°C)
Returns	None (or ACK if set on)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

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4.4.7.13 ***SENSe:TCouple:TMAX? <probe>***

Returns the probe Tmax setting in degrees C .

Command	SENS:TC:TMAX? <probe>	
	SENSE:TCOUPLE:TMAX? <probe>	
Parameters	<probe>	1 to 72 Probe number
Returns	Probes maximum temperature	
Errors	E9	Probe does not exist

4.4.7.14 ***SENSe:TCouple:TMIN <probe>,<temperature>***

Sets the probe Tmin to the specified temperature in degrees Celsius.

Command	SENS:TC:TMIN <probe>,<temperature>	
	SENSE:TCOUPLE:TMIN <probe>,<temperature>	
Parameters	<probe>	1 to 72 Probe number
	<temperature>	valid floating point temperature (°C)
Returns	None (or ACK if set on)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

4.4.7.15 ***SENSe:TCouple:TMIN? <probe>***

Returns the probe Tmin setting in degrees C.

Command	SENS:TC:TMIN? <probe>	
	SENSE:TCOUPLE:TMIN? <probe>	
Parameters	<probe>	1 to 72 Probe number
Returns	Probes minimum temperature.	
Errors	E9	Probe does not exist

4.4.7.16 ***SENSe:TCouple:CAL:DATE?<probe>***

Query the calibration date for the selected probe.

Command	SENS:TC:CAL:DATE?<probe>	
	SENSE:TCOUPLE:CALIBRATION:DATE?<probe>	
Parameters	<probe>	1-72 Probe number
	<year>	4 digit numerical string
	<month>	01 to 12 for month
	<day>	01 to 31 for day
Return	<year>,<month>,<day>	
Errors	E9	Probe does not exist

EN

4.4.7.17 ***SENSe:TCouple:CONVersion <probe>,<conversion>***

Sets the conversion for probe.

Command	SENS:TC:CONV<probe>,<conversion>		
	SENSE:TCOUPLE:CONVERSION <probe>,<conversion>		
Returns	None (or ACK if set on)		
Parameters	<probe>	1 to 72	Probe number
	<conversion>	1	IEC585
		2	TC polynomial
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.7.18 ***SENSe: TCouple:CONVersion? <probe>***

Returns the conversion for probe.

Command	SENS:TC:CONV? <probe>		
	SENSE:TCOUPLE:CONVERSION? <probe>		
Parameters	<probe>	1 to 72	Probe number
	<conversion>	1	IEC585
		2	TC polynomial
		3	Data pairs
Returns	Probe conversion		
Errors	E9	Probe does not exist	

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4.4.7.19 ***SENSe:TCouple:COEFficient <probe>,<identifier>,<value>***

Set the specified probe's coefficient to the number supplied. Only valid coefficients for the probe type can be set.

Command	SENS:TCouple:COEF <probe>,<identifier><value>		
	SENSE:TCOUPLE:COEFFICIENT <probe>,<identifier>,<value>		
Parameters	<probe>	1 to 72	Probe number
	<identifier>	1 to 18	Coefficient number:
			1 = Ta min
			2 = Ta max
			3 = a0
			4 = a1
			5 = a2
			6 = a3
			7 = Tb min
			8 = Tb max
			9 = b0
			10 = b1
			11 = b2
			12 = b3
			13 = Tc min
			14 = Tc max
			15 = c0
			16 = c1
			17 = c2
			18 = c3
	<value>	Scientific notation, to five decimal places eg 3.90830e-03	
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E10	Coefficient not available	
	E14	Channel or probe not available	

EN

4.4.7.20 ***SENSe:TCouple:COEFficient? <probe>,<identifier>***

Returns the probe coefficient for the specified probe. Only valid coefficients for the probe type will be returned.

Command	SENS:TC:COEF? <probe>,<identifier>		
	SENSE:TCOUPLE:COEFFICIENT? <probe>,<identifier>		
Parameters	<probe>	1 to 72	Probe number
	<identifier>	1 to 18	Coefficient number:
			1 = Ta min
			2 = Ta max
			3 = a0
			4 = a1
			5 = a2
			6 = a3
			7 = Tb min
			8 = Tb max
			9 = b0
			10 = b1
			11 = b2
			12 = b3
			13 = Tc min
			14 = Tc max
			15 = c0
			16 = c1
			17 = c2
			18 = c3
Returns	Coefficient for specified probe and coefficient number		
Errors	E9	Probe does not exist	
	E10	Coefficient not available	

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4.4.8 Thermistors

Probe parameters to be stored in Flash memory

4.4.8.1 *SENSe:THERmistor:LIST?*

Returns a list of all thermistor probes.

Command	SENS:THER:LIST?	
	SENSE:THERMISTOR:LIST?	
Returns	List of probes: <nr>:<name>,<nr>:<name>,…<cr>	

4.4.8.2 *SENSe:THERmistor:IDENtification <probe>,<identification>*

Store the probe identification name or number.

Command	SENS:TC:IDEN <probe>,<identification>	
	SENSE: THERmistor:IDENTIFICATION <probe>,<identification>	
Parameters	<probe>	1-72 Probe number
	<identification>	19 byte maximum ASCII string
Returns	None (or ACK if enabled)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

4.4.8.3 *SENSe:THERmistor:IDENtification? <probe>*

Query the probe identification name or number.

Command	SENS:THER:IDEN? <probe>	
	SENSE: THERMISTOR:IDENTIFICATION? <probe>	
Parameters	<probe>	1-72 Probe number
Returns	<identification>	19 byte maximum ASCII string
Errors	E9	Probe does not exist

4.4.8.4 *SENSe:THERmistor:REFErence <probe>, <reference>*

Sets probe reference status.

Command	SENS:THER:REFE <probe>,<reference>		
	SENSE: THERMISTOR:REFERENCE <probe>,<reference>		
Parameters	<probe>	1-72	Probe number
	<reference>	0	No
		1	Yes
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

EN

4.4.8.5 *SENSe:THERmistor:REFErence? <probe>*

Returns the probe reference status.

Command	SENS:THER:REFE? <probe>		
	SENSE: THERMISTOR:REFERENCE <probe>		
Parameters	<probe>	1-72	Probe number
Return	<reference>	0	No
		1	Yes
Errors	E9	Probe does not exist	

4.4.8.6 *SENSe:THERmistor:RANGe? <probe>*

Returns the probe range.

Command	SENS:THER:RANG? <probe>		
	SENSE: THERMISTOR:RANGE <probe>		
Parameters	<probe>	1-72	Probe number
Return	<reference>	0	0-450 Ω
		1	400-45K Ω
		2	40K-500K Ω
Errors	E9	Probe does not exist	

4.4.8.7 *SENSe:THERmistor:CURRent? <probe>*

Returns the source current for the selected probe.

Command	SENS:THER:CURR? <probe>		
	SENSE: THERMISTOR:CURRENT <probe>		
Parameters	<probe>	1-72	Probe number
Return	<current>	0	1mA
		1	10µA
		2	3µA
Errors	E9	Probe does not exist	

4.4.8.8 *SENSe:THERmistor:ASSign <probe>, <channel>*

Assigns the probe to “Channel”.

Command	SENS:THER:ASSI <probe>,<channel>		
	SENSE: THERMISTOR:ASSIGN <probe>,<channel>		
Parameters	<probe>	1-72	Probe number
	<channel>	0-80	Channel number
Return	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

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4.4.8.9 *SENSe:THERmistor:ASSIgn? <probe>*

Returns the channel assignment for the selected probe.

Command	SENS:THER:ASSI? <probe>		
	SENSE: THERMISTOR:ASSIGN <probe>		
Parameters	<probe>	1-72	Probe number
Return	<channel>	0-80	Channel number
Errors	E9	Probe does not exist	

4.4.8.10 *SENSe:THERmistor:TMAX <probe>,<temperature>*

Sets the probe Tmax to the specified temperature in degrees Celsius.

Command	SENS:THER:TMAX <probe>,<temperature>	
	SENSE:THERMISTOR:TMAX <probe>,<temperature>	
Parameters	<probe>	1 to 72 Probe number
	<temperature>	valid floating point temperature (°C)
Returns	None (or ACK if set on)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

4.4.8.11 *SENSe:THERmistor:TMAX? <probe>*

Returns the probe Tmax setting in degrees C.

Command	SENS:THER:TMAX? <probe>	
	SENSE:THERMISTOR:TMAX? <probe>	
Parameters	<probe>	1 to 72 Probe number
Returns	Probes maximum temperature	
Errors	E9	Probe does not exist

4.4.8.12 *SENSe:THERmistor:TMIN <probe>,<temperature>*

Sets the probe Tmin to the specified temperature in degrees Celsius.

Command	SENS:THER:TMIN <probe>,<temperature>	
	SENSE:THERMISTOR:TMIN <probe>,<temperature>	
Parameters	<probe>	1 to 72 Probe number
	<temperature>	valid floating point temperature (°C)
Returns	None (or ACK if set on)	
Errors	E9	Probe does not exist
	E14	Channel or probe not available

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4.4.8.13 ***SENSe:THERmistor:TMIN? <probe>***

Returns the probe Tmin setting in degrees C.

Command	SENS:THER:TMIN? <probe		
	SENSE:THERMISTOR:TMIN? <probe>		
Parameters	<probe>	1 to 72	Probe number
Returns	Probes minimum temperature		
Errors	E9	Probe does not exist	

4.4.8.14 ***SENSe:THERmistor:CAL:DATE?<probe>***

Query the calibration date for the selected probe.

Command	SENS:THER:CAL:DATE?<probe>		
	SENSE:THERMISTOR:CALIBRATION:DATE?<probe>		
Parameters	<probe>	1-72	Probe number
	<year>	4 digit numerical string	
	<month>	01 to 12	for month
	<day>	01 to 31	for day
Return	<year>,<month>,<day>		
Errors	E9	Probe does not exist	

4.4.8.15 ***SENSe:THERmistor:CONVersion <probe>,<conversion>***

Sets the conversion for probe.

Command	SENS:THERM:CONV<probe>,<conversion>		
	SENSE:THERMISTOR:CONVERSION <probe>,<conversion>		
Parameters	<probe>	1 to 72	Probe number
	<conversion>	1	None
		2	Steinart-Hart
		3	Polynomial
Returns	None (or ACK if set on)		
Errors	E9	Probe does not exist	
	E14	Channel or probe not available	

4.4.8.16 ***SENSe:THERmistor:CONVersion? <probe>***

Returns the conversion for probe.

Command	SENS:THER:CONV? <probe>		
	SENSE:THERMISTOR:CONVERSION? <probe>		
Parameters	<probe>	1 to 72	Probe number
Returns	<conversion>	1	None
		2	Steinhart-Hart
		3	Polynomial
Errors	E9	Probe does not exist	

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4.4.8.17 ***SENSe:THERmistor:COEFficient <probe>,<identifier>,<value>***

Set the specified probe's coefficient to the number supplied. Only valid coefficients for the probe type can be set.

Command	SENS:THER:COEF <probe>,<identifier><value>			
	SENSE:THERMISTOR:COEFFICIENT <probe>,<identifier>,<value>			
Parameters	<probe>	1 to 72 Probe number		
	<identifier>	1 to 4, As table below		
			Steinhart-Hart	Polynomial
		1	a	c0
		2	b	c1
		3	c	c2
		4	-	c3
	<value>	Scientific notation, to five decimal places eg 3.90830e-03		
Returns	None (or ACK if set on)			
Errors	E9	Probe does not exist		
	E10	Coefficient not available		
	E14	Channel or probe not available		

4.4.8.18 ***SENSe:THERmistor:COEFficient? <probe>,<identifier>***

Returns the probe coefficient for the specified probe. Only valid coefficients for the probe type will be returned.

Command	SENS:THER:COEF? <probe>,<identifier>			
	SENSE:THERMISTOR:COEFFICIENT? <probe>,<identifier>			
Returns	Coefficient for specified probe and coefficient number			
Parameters	<probe>	1 to 72 Probe number		
	<identifier>	1 to 4 Coefficient number		
			Steinhart-Hart	Polynomial
		1	a	c0
		2	b	c1
		3	c	c2
		4	-	c3
Errors	E9	Probe does not exist		
	E10	Coefficient not available		

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4.4.9 Error codes

Error codes can be generated by the instrument for a variety of reasons –

Error code	Meaning / Cause
E1	Balance error/No PRT, PRT open circuit / Ratio over range
E2	Temperature over range? Although max & min T covered in probe settings.
E3	Not used
E4	IEEE/RS232 error / Unrecognized instruction sent
E5	IEEE/RS232 error / Illegal argument sent
E6	Incompatible unit
E7	Not used
E8	Not used
E9	Probe does not exist
E10	Coefficient not available
E11	Probe already assigned to a channel
E12	Requested file does not exist
E13	Access to password protected area denied
E14	Channel or probe not available
E15	Logger not active or in manual mode
E16	Requested file currently in use
E17	Memory full
E18	Failed to store calibration data
E19	Failed to get calibration data
E203	Not used
E222	No Smart probe detected
E223	Smart probe disabled
E224	Smart probe locked

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