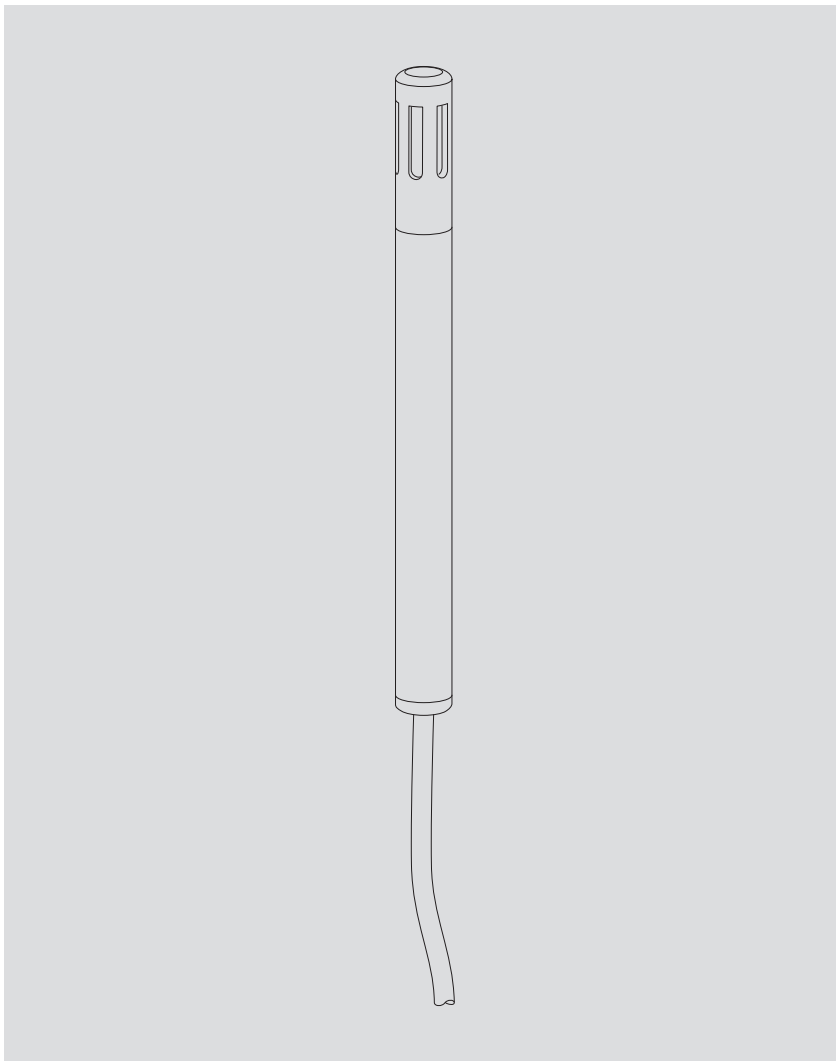




Technical Documentation
SDI-12 Commands
Temperature/Humidity Sensor
OTT TRH



English

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1 SDI-12 Commands and Responses

For communication, the OTT TRH unit uses a standardized SDI-12 serial interface. This Technical Documentation provides a detailed description of the implemented SDI-12 commands of the SDI-12 communications protocol.

For more information on the SDI-12 basic commands, please refer to the document titled „SDI-12; A Serial-Digital Interface Standard for Microprocessor-Based Sensors, Version 1.3“ (please visit www.sdi-12.org).

Any extended manufacturer-specific SDI-12 commands used within the OTT TRH unit are prefixed by „X“. These commands are designed e.g. to use a datalogger transparent mode to configure the OTT TRH unit.

1.1 SDI-12 Command Overview

Basic Commands

- ▶ **a!** Acknowledgement active
- ▶ **aI!** Send identification
- ▶ **aAb!** Change address
- ▶ **?!** Query address; factory setting: 0
- ▶ **aM!** Start measurement
- ▶ **aD0!** Send data
- ▶ **aR0!** Send data in continuous measuring mode
- ▶ **aMC!** Start measurement and request CRC
- ▶ **aC!** Start concurrent measurement
- ▶ **aCC!** Start concurrent measurement and request CRC
- ▶ **aV!** Start verification

Extended Commands (manufacturer-specific)

- ▶ **aXCOT<value>!** Set temperature sensor calibration value
- ▶ **aXCOT!** Read temperature sensor calibration value
Factory setting: +00.00
- ▶ **aXCOH<value>!** Set humidity sensor calibration value
- ▶ **aXCOH!** Read humidity sensor calibration value
Factory setting: +00.00
- ▶ **aXST<value>!** Set unit for temperature and dew point
- ▶ **aXST!** Read unit for temperature and dew point
Factory setting: +0 → °C
- ▶ **aXOB!** Read hardware and assembly index
- ▶ **aXOV!** Read firmware version
- ▶ **aXSM<value>!** Enable/disable continuous measuring mode
Factory setting: 1 → enabled
- ▶ **aXSI<value>!** Set sample interval
Factory setting: 02 → 2 seconds
- ▶ **aXSN<value>!** Set number of measured values the OTT TRH uses for calculating a sliding mean value
Factory setting: 30 → 30 measured values
- ▶ **aXQM!** Read settings for continuous measuring mode, sample interval, and number of measured values
Factory settings for output: 0, 1, 2 . 30
0: → sensor address 0
1: → continuous measurement mode enabled (aXSM<1>!)
2: → 2 seconds sample interval (aXSI<02>!)
30: → sliding mean based on 30 measured values (aXSN<30>!)

1.2 Basic Commands

Command	Response	Description
a!	a<CR><LF>	Acknowledgment active a – sensor address; factory setting = 0
aI!	allccccccmmmmmm vvvxxxxxxxxxxxxx<CR><LF>	Send identification a – sensor address 11 – SDI-12 protocol version ccccccc – manufacturer identification (company name) mmmmmm – sensor model vvv – sensor version (Firmware) xxxxxxxxxxxxx – serial number Example: 013_ADCON__TR02__001023054478901<CR><LF>
aAb!	b<CR><LF>	Change address a – old sensor address b – new sensor address
?!	a<CR><LF>	Query address a – sensor address
aM!	atttn<CR><LF> and a<CR><LF> after 1 second	Start measurement a – sensor address ttt – time in seconds until the sensor will have determined the measurement result OTT TRH response = 001 n – number of measured values OTT TRH response = 5 a<CR><LF> – service request
aD0! * * after aM!, aMC!, aC!, aCC!	a<value1><value2><value3>... ...<value4><value5><CR><LF>	Send data a – sensor address <value1> – temperature, [°C] or [°F]; measured format: pbbb.ee range: -40.00 ... +80.00 °C -40.00 ... +176.00 °F <value2> – relative humidity [%]; measured format: pbbb.ee range: +0 ... +100.00 % <value3> – absolute humidity [g/m ³]; calculated format: pbbbb.ee range: +0 ... +1000.00 g/m ³ <value4> – dew point [°C] or [°F]; calculated format: pbbb.ee range: -40.00 ... +80.00 °C -40.00 ... +176.00 °F <value5> – mixing ratio [g/kg]; calculated format: pbbbb.ee range: +0 ... +1000.00 g/kg p – sign (+,-) b – digit (before the decimal point) output without leading zeros! e – digit after the decimal point Example: 0+21.54+41.80+7.88+8.01+6.65<CR><LF>

Command	Response	Description
aMC!	atttn<CR><LF> and a<CR><LF> after 1 second	Start measurement and request CRC; for details, refer to aM! command. The response to the following aD0! command is extended by a CRC value: a<value1><value2><value3><value4><value5> <CRC><CR><LF> Example: 0+22.15+42.56+8.31+8.33+7.03Goa<CR><LF>
aC!	atttn<CR><LF>	Start concurrent measurement; for details, refer to aM! command. The number of measured values in the response to this command has two digits: nn = 05.
aCC!	atttn<CR><LF>	Start concurrent measurement and request CRC; for details, refer to aM! command. The number of measured values in the response to this command has two digits: nn = 05. The response to the following aD0! command is extended by a CRC value: a<value1><value2><value3><value4><value5> <CRC><CR><LF> Example: 0+22.63+65.59+13.16+15.85+11.23GZv<CR><LF>
aR0!	a<value1><value2><value3>... ...<value4><value5><CR><LF>	Send data in continuous measuring mode For details refer to aD0! (after aM!, aMC!, ...).
aV!	atttn<CR><LF> and a<CR><LF> after 1 second	Start verification a – sensor address ttt – time in seconds until the sensor provides the result of the system test. OTT TRH response = 001 n – number of measured values OTT TRH response = 1 a<CR><LF> – service request
aD0! * * after aV!	a<value><CR><LF>	Send data a – sensor address <value> – result of the verification +0 = no hardware error found +128 = correction table corrupted +256 = watchdog error +512 = memory failed +1024 = sensor element failed +2048 = A/D converter failed Example: 0+0<CR><LF> → no hardware error found

Please note:

When the OTT TRH is in continuous measuring mode (aXSM<1>!), the command to be used for requesting the data is aR0!.

When a datalogger nevertheless starts a measurement (aM!, aMC!, ...), the measurement result is available immediately and not after one second only. In such a case, the OTT TRH unit will output the measurement result of the continuous measurement (within the factory setting, this will be a sliding mean value based on 30 measured values).

1.3 Extended Commands

Command	Response	Description						
▶ Set/read temperature sensor calibration value								
aXCOT<value>!	a<CR><LF>	Set temperature sensor calibration value						
aXCOT!	a<value><CR><LF>	Read temperature sensor calibration value						
		a – sensor address <value> – temperature sensor calibration value, [°C] or [°F]; format: pbb.ee range: -01.00 ... +01.00 °C or °F p – sign (+,-) b – digit (before the decimal point) input/output including leading zero! e – digit after the decimal point This command may be used to calibrate the temperature sensor when a highly precise temperature reference value is available at the measuring station after the OTT TRH unit has been installed. For this purpose, a calibration value (difference between OTT TRH measured value and reference value) must be set. After this, the OTT TRH unit will use this value for all measurements as an offset, i.e. add/subtract this calibration value. Example: <table style="margin-left: 20px;"> <tr> <td>- measured value</td> <td>+20.76</td> </tr> <tr> <td>- calibration value</td> <td>-00.15</td> </tr> <tr> <td>- output</td> <td>+20.61</td> </tr> </table>	- measured value	+20.76	- calibration value	-00.15	- output	+20.61
- measured value	+20.76							
- calibration value	-00.15							
- output	+20.61							
▶ Set/read humidity sensor calibration value								
aXCOH<value>!	a<CR><LF>	Set humidity sensor calibration value						
aXCOH!	a<value><CR><LF>	Read humidity sensor calibration value						
		a – sensor address <value> – humidity sensor calibration value, [%]; format: pbb.ee range: -10.00 ... +10.00 % p – sign (+,-) b – digit (before the decimal point) input/output including leading zero! e – digit after the decimal point For details, refer to „Set/read temperature sensor calibration value“. <table style="margin-left: 20px;"> <tr> <td>- measured value</td> <td>+45.20</td> </tr> <tr> <td>- calibration value</td> <td>+01.50</td> </tr> <tr> <td>- output</td> <td>+46.70</td> </tr> </table>	- measured value	+45.20	- calibration value	+01.50	- output	+46.70
- measured value	+45.20							
- calibration value	+01.50							
- output	+46.70							
▶ Set/read unit for temperature and dew point								
aXST<value>!	a<value><CR><LF>	Set unit						
aXST!	a<value><CR><LF>	Read unit						
		a – sensor address <value> – +0 = °C; factory setting +1 = °F						
▶ Read hardware and assembly Index								
aXOB!	acd<CR><LF>	Read hardware and assembly index						
		a – sensor address * 0 c – hardware index * 1 d – assembly index * b Example* 01b<CR><LF>						

Command	Response	Description
▶ Read firmware release aXOV!	av.vv.vv<CR><LF>	Read firmware release a – sensor address * 0 v.vv.v – firmware release * 1.00.1 Example*: 01.00.1<CR><LF>
▶ Enable/disable continuous measuring mode aXSM<value>! a<CR><LF>		a – sensor address <value> – 0 = continuous measuring mode disabled 1 = continuous measuring mode enabled Factory setting = 1 (enabled) When the continuous measuring mode is enabled, the OTT TRH will use the sample intervals set to capture measured values (aXSI<value>!). Depending on the particular settings, it then uses a number of selectable measured values to calculate a sliding mean value (aXSN<value>!). These measured values are queried using the aR0! command.
▶ Set sample interval aXSI<value>! a<CR><LF>		Set sample interval a – sensor address <value> – bb b – digit input/output including leading zero! Value range: 01 ... 99 Factory setting: 02
▶ Set number of measured values the OTT TRH uses for calculating a sliding mean value aXSN<value>! a<CR><LF>		Set the number of measured values a – sensor Address <value> – bb b – digit input/output including leading zero! Value range: 01 ... 50 Factory setting: 30
▶ Read settings for continuous measurement mode, sample interval, and number of measured values aXQM!	a<value><CR><LF>	Read settings a – sensor Address * 0 <value> – , b , bb.bb b – digit output without leading zeros! Example*: 0,1,2.30<CR><LF> Continuous Measurement Mode is enabled. Every 2 seconds, the OTT TRH captures a temperature and humidity measured value and uses 30 measured values to calculate a sliding mean value.

Document number
70.701.004.S.E 01-0914



OTT Hydromet GmbH

Ludwigstrasse 16
87437 Kempten · Germany
Phone +49 831 5617-0
Fax +49 831 5617-209

info@ott.com · www.ott.com