

## 1 Introduction

This document is an instruction manual for the XEN-5320 UART thermal conductivity sensor. This manual is compatible with hardware version 1.0.

## 2 Commands

To control the sensor commands can be given to the sensor. A complete list can be found in table 1.

Command	Meaning	Chapter
a	get measurement data	2.1
b	Keep sending measurement data	2.2
d	get device info and calibration values	2.3
e	get device names and firmware version	2.4
m	enter custom curve 1-4	2.5
n	get custom curve 1-4	2.6
t	change measurement mode	2.7
u	get device names, firmware and gain	2.8
x	perform zero calibration	2.9
y	perform 100% calibration	2.10
z	change device name	2.11

Table 1 – List with commands which can be used with the XEN-5320 UART sensor

### 2.1 Command a

Command a will ask the sensor the latest available measurement data. The sensor will send back a string with the following structure:

**a**(output)**b**(transfer)**c**(temperature PT100)**d**(temperature sensirion)**e**(rel humidity)**f**(abs humidity)**g**(corrected transfer)**h**(thermocouple)**i**(heater current)**j**(heater voltage)**k**(heater power)**l**(system voltage)

Example:

**a**122582.200000**b**21.116573**c**29.727631**d**29.973877**e**28.400940**f**1.200099**g**0.742561**h**0.019967**i**0.001260**j**0.750727**k**0.000946**l**3.275543

Value	Description
Output	Output of the sensor (ppm)
Transfer	Transfer (V/W)
Temperature PT100	Temperature measured by the PT100 sensor (°C)
Temperature sensirion	Temperature measured by the Sensirion sensor (°C)
Rel humidity	Relative humidity (%)
Abs humidity	Absolute humidity (kPa)
Corrected transfer	Corrected transfer (-)
Thermocouple	Thermocouple output of the thermal conductivity sensor (V)
Heater current	Heater current of the thermal conductivity sensor (A)
Heater power	Heater power of the thermal conductivity sensor (W)
System voltage	System voltage (V)

Table 2 – Description command a

## 2.2 Command b

Command b will ask the latest available measurement data from the sensor and it will keep sending data as soon as new measurement data is available. The sensor will stop sending data as soon as char “s” is received.

## 2.3 Command d

Command d will ask the device info and calibration values from the sensor with the following structure:

**START**(device name)**NAME**(factory ID)**FID**(firmware)**SOFT**(measurement mode)**MODE**(cal value 1)**CAL**(cal value 2)**CAL**(cal value 3)**CAL**(cal value 4)**CAL**(cal value 5)**CAL**(cal value 6)**CAL**(cal value 7)**CAL**(cal value 8)**CAL**(gain)**GAIN**

Example:

**START02E001NAME02E001FIDU.2.0SOFTH2MODE-1.930000CAL250.000000CAL-0.002450CAL0.000075CAL-0.000000CAL0.997990CAL28.441448CAL32.472130CAL1.022632GAIN**

Value	Description
Device name	Sensor name
Factory ID	Factory given name
Firmware	Firmware version
Measurement mode	Measurement mode of sensor
Cal value 1	H2 Coefficient
Cal value 2	TC Comp
Cal value 3	a1
Cal value 4	a2
Cal value 5	a3
Cal value 6	Y_AH
Cal value 7	Transfer Calibration
Cal value 8	Temperature Calibration
Gain	Gain value

Table 3 – Description command d

## 2.4 Command e

Command e will ask the device info from the sensor with the following structure:

**o**(device name)**NAME**(factory ID)**FID**(firmware)**SOFT**

Example:

**o02E001NAME02E001FIDU.2.0SOFT**

Value	Description
Device name	Sensor name
Factory ID	Factory given name
Firmware	Firmware version

Table 4 – Description command e

## 2.5 Command m

Command m is used to enter a custom curve into the sensor.

After the command m is given the sensor will ask the following “Enter custom curve number (1-4)”. Enter here the custom curve number which should be updated (number 1 to 4).

Next the sensor will ask the following “Enter new custom curve name”. Enter here a name for the custom curve followed by a carriage return (maximum of 10 characters).

Next the sensor will ask for 23 values to fill in the look-up table. Each position of the look up table consist of a gas fraction value (in %) and a normalized transfer value. After each value a carriage return should be given. The decimal separator is a “.”.

## 2.6 Command n

Command n is used to read a custom curve from the sensor.

After the command n is given the sensor will ask the following “Enter custom curve number (1-4)”. Enter here the custom curve number which should be read (number 1 to 4).

Next the sensor will send back a string with the following structure:

**Custom**(curstom curve number)(custom curve name)**NAMEa1b**(gas fraction value)**c**(normalized transfer value)**da2b**(gas fraction value)**c**(normalized transfer value)**da3b**(gas fraction value)**c**(normalized transfer value)**da4b**(gas fraction value)**c**(normalized transfer value)**da5b**(gas fraction value)**c**(normalized transfer value)**da6b**(gas fraction value)**c**(normalized transfer value)**da7b**(gas fraction value)**c**(normalized transfer value)**da8b**(gas fraction value)**c**(normalized transfer value)**da9b**(gas fraction value)**c**(normalized transfer value)**da10b**(gas fraction value)**c**(normalized transfer value)**da11b**(gas fraction value)**c**(normalized transfer value)**da12b**(gas fraction value)**c**(normalized transfer value)**da13b**(gas fraction value)**c**(normalized transfer value)**da14b**(gas fraction value)**c**(normalized transfer value)**da15b**(gas fraction value)**c**(normalized transfer value)**da16b**(gas fraction value)**c**(normalized transfer value)**da17b**(gas fraction value)**c**(normalized transfer value)**da18b**(gas fraction value)**c**(normalized transfer value)**da19b**(gas fraction value)**c**(normalized transfer value)**da20b**(gas fraction value)**c**(normalized transfer value)**da21b**(gas fraction value)**c**(normalized transfer value)**da22b**(gas fraction value)**c**(normalized transfer value)**da23b**(gas fraction value)**c**(normalized transfer value)**d**  
**Done**

Example:

**Custom2N2-**

**CO2NAMEa1b**1.050000**c**0.650000**da2b**1.000000**c**0.742700**da3b**0.950000**c**0.749000**da4b**0.900000**c**0.754800**da5b**0.850000**c**0.766500**da6b**0.800000**c**0.778100**da7b**0.750000**c**0.790200**da8b**0.700000**c**0.802700**da9b**0.650000**c**0.815400**da10b**0.600000**c**0.828300**da11b**0.550000**c**0.841400**da12b**0.500000**c**0.854800**da13b**0.450000**c**0.868500**da14b**0.400000**c**0.882300**da15b**0.350000**c**0.896400**da16b**0.30000**c**0.910500**da17b**0.250000**c**0.925200**da18b**0.200000**c**0.940000**da19b**0.150000**c**0.954900**da20b**0.100000**c**0.970100**da21b**0.050000**c**0.985500**da22b**0.000000**c**1.000000**da23b**-0.050000**c**1.100000**d**  
**Done**

## 2.7 Command t

Command t is used to change the measurement mode of the sensor.

After the command t is given the sensor will ask the following “Enter mode”. Enter here the desired mode of the sensor. Valid modes can be found in table 5.

Mode	Description
0	Hydrogen (H2)
1	Helium (He)
6	Custom curve 1
7	Custom curve 2
8	Custom curve 3
9	Custom curve 4

Table 5 – Description command t

## 2.8 Command u

Command u is used to read the device names, firmware, measurement mode and gain. After the command u is given the sensor will send back a string with the following structure:

**START(device name)NAME(factory ID)FID(firmware)SOFT(measurement mode)MODE(gain)GAIN**

Example:

**START0000000000NAME0000000000FIDU.2.0SOFTH2MODE1.022632GAIN**

Value	Description
Device name	Sensor name
Factory ID	Factory given name
Firmware	Firmware version
Measurement mode	Measurement mode of sensor
Gain	Gain value

Table 6 – Description command u

## 2.9 Command x

Command x is used to perform a zero calibration. The sensor should be placed in an environment which represents the 0 % output value. After the command x is given the zero calibration is performed, and a carriage return is send once the zero calibration is finished.

## 2.10 Command y

Command y is used to perform a gain calibration. The sensor should be placed in an environment which represents the 100 % output value. After the command y is given the gain calibration is performed, and the tekst “Done” is send once the zero calibration is finished or “Error” when an error occurred.

*Note 1: The gain calibration is only valid for the currently selected measurement mode, each mode should perform their own gain calibration.*

*Note 2: The gain calibration is only valid if at the start of the gain calibration the output is between 97 and 103 %.*

## 2.11 Command z

Command z is used to change the name of the sensor. After the command z is issued the sensor will return the text “Enter device ID”. The sensor will then wait for a name followed by a carriage return. Maximum 10 characters are allowed for the name. Once the name has been entered the sensor will return “Device name saved” or “Too many char, device name not saved!”.

## 3 Connections

Table 3 shows the connections of the board. Note that either the 3.3V or the 5.0V UART connections are supposed to be used, they cannot be used at the same time. The connections which are not used should be left floating.

The connector is of the Molex MicroClasp OTS 15136 Series, 6 pin. Connectors are available on Farnell, for example order code: 2747287.

Connection name	Usage
TX3V3	UART TX 3.3 V level
RX3V3	UART RX 3.3 V level
GND	Ground
+5V	Power supply +5V
TX5V	UART TX 5.0 V level
RX5V	UART RX 5.0 V level

Table 7 – Description connections sensor board

## 4 Serial port settings

The serial port settings can be found in Table 8.

Serial port setting	Value
Baud rate	9600
Data	8 bit
Parity	none
Stop	1 bit
Flow control	none

Table 8 – Serial port settings

## 5 Software availability

For this board is a LabVIEW read-out program available (XEN-5320-UART v2). This software requires a standard USB-UART converter which creates a virtual COM-port and is available on request.

