SMC-520
TEMPERATURE & HUMIDITY SENSOR
USER GUIDE

Notice

The information in this User Guide is subject to change without notice.

Not all the features described in this manual are available in all hardware and firmware versions. Please check with SMC for details of model specific features such as measurement parameters and Protocol support.

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1 INTRODUCTION

The SMC-520 Temperature and Humidity sensor is an accurate, reliable and cost effective way to measure the air temperature and humidity for many applications.
The data transmitted from the SMC Temperature and Humidity sensor is in a standard NMEA sentence format over RS232 and RS485 that can be used by many systems as well as SMCs Monitoring System applications for graphical presentation and data logging, listed below.

- SMChms, Helideck Monitoring System
- SMCems, Environmental Monitoring System
- SMCwms, Weather Monitoring System

The SMC-520 is produced to be used in outdoor applications. The optional SMC-560 Solar radiation shield provides accurate temperature readings also in sunny environments. The SMC-520 uses a PT1000 element for the temperature measurements.

1.1 RECEIVING THE TEMPERATURE AND HUMIDITY SENSOR

Unpack the equipment and remove all the packaging materials and shipping carton.

The SMC-520 sensor is delivered in a cardboard box designed to protect it from damage during transit.

When the sensor has been received, it must be inspected for damage during shipment. If damage has occurred during transit, all the shipping cartons and packaging materials should be stored for further investigation. If damage is visible, a claim for shipping damage must be filed immediately.

**Standard Delivered Items**

- Temperature and Humidity Sensor
- Calibration Certificate
- SMC Instruments Configuration software and User Manual
- Cable with M12 connector, 5 m cable standard

Optional Items

- SMC-560 Solar Radiation Shield including Pole mounting brackets
- M12, 8 pin connector on a 10m cable

1.2 SMC-520 DIMENSIONS

All dimensions are in mm


Ø30

Ø24

184

20.50

247.50
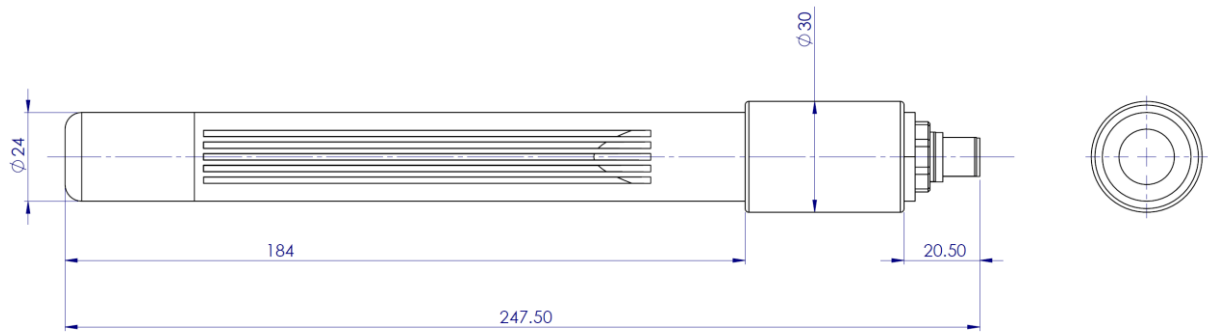
1.3 INSTALLATION

SMC highly recommend that the SMC-520 Temperature and Humidity sensor is deployed on site inside a solar radiation shield such as the SMC-560 to achieve the optimum performance from the sensor.
The sensor can also be installed without the shield inside a Stevenson screen.
It is *not* recommended to mount the sensor outside unshielded.
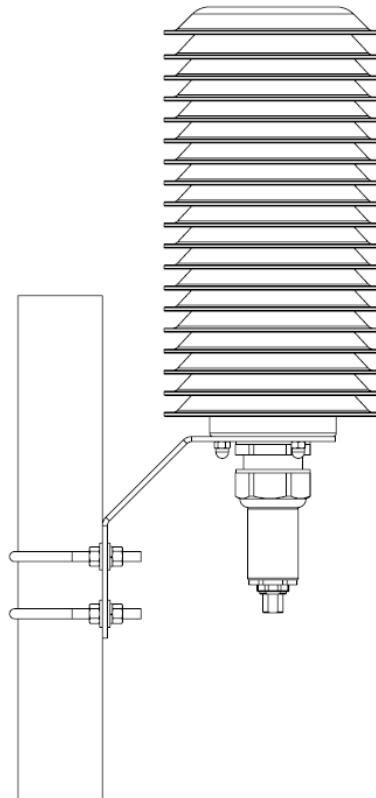
SMC-560 Solar Radiation Shield

1.3.1 INSTALLATION LOCATION RECOMMENDATIONS

Install the SMC-520 Temperature and Humidity sensor in an area with free air flow. Avoid positioning the sensor in position that would not be representative of the area to be measured. Where possible the sensor should be mounted away from heat sources, either direct such as exhausts or reflected such as building walls. Placing the sensor to close to the ground may lead to inaccurate measurements.

1.4 MOUNTING INSTRUCTIONS USING SOLAR RADIATION SHIELD

The SMC-560 Solar radiation shield is designed to be mounted on a pole of 30 to 60mm diameter.

After the shield has been attached to the pole, the Temperature and Humidity sensor is to be fitted into the shield until the wider part of the sensor reach the compression fitting. Tighten the compression fitting to hold the sensor in place. It is normally enough to tighten the fitting by hand. After mounting in the shield connect the cable to the sensor.

Ø 129

114

375

259

126

62
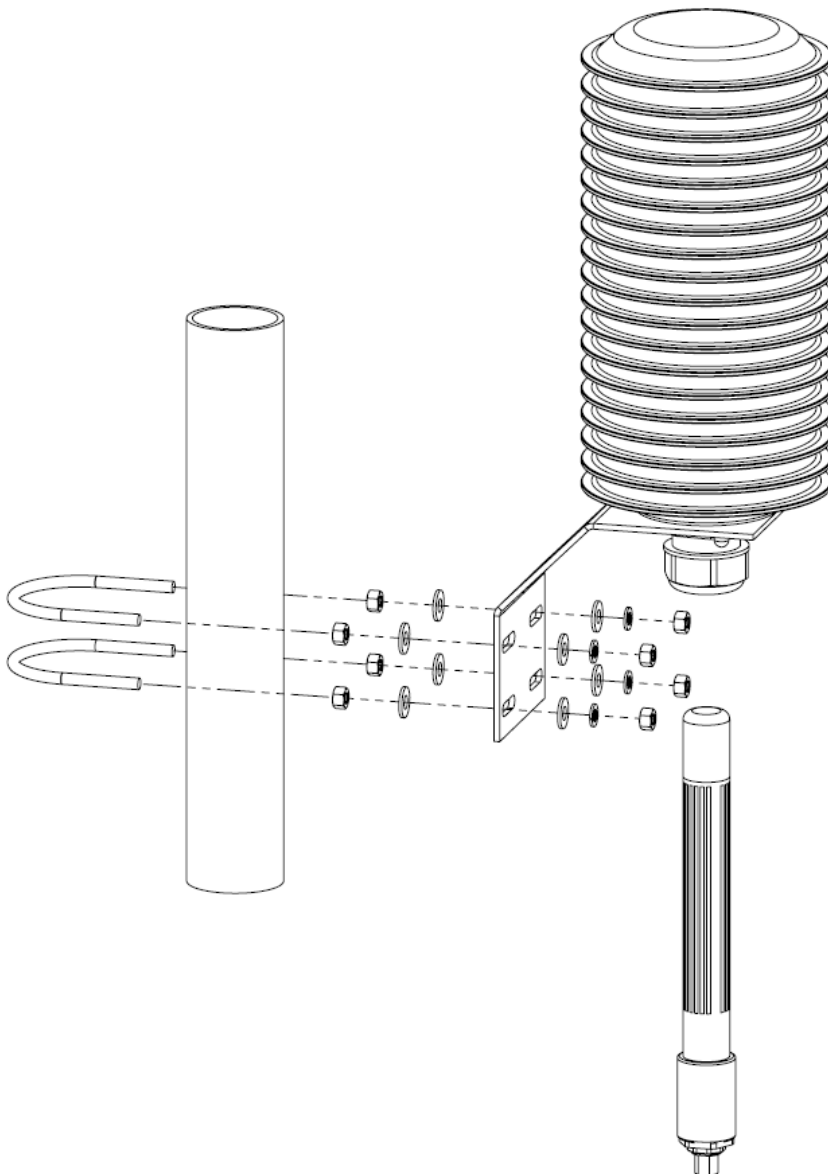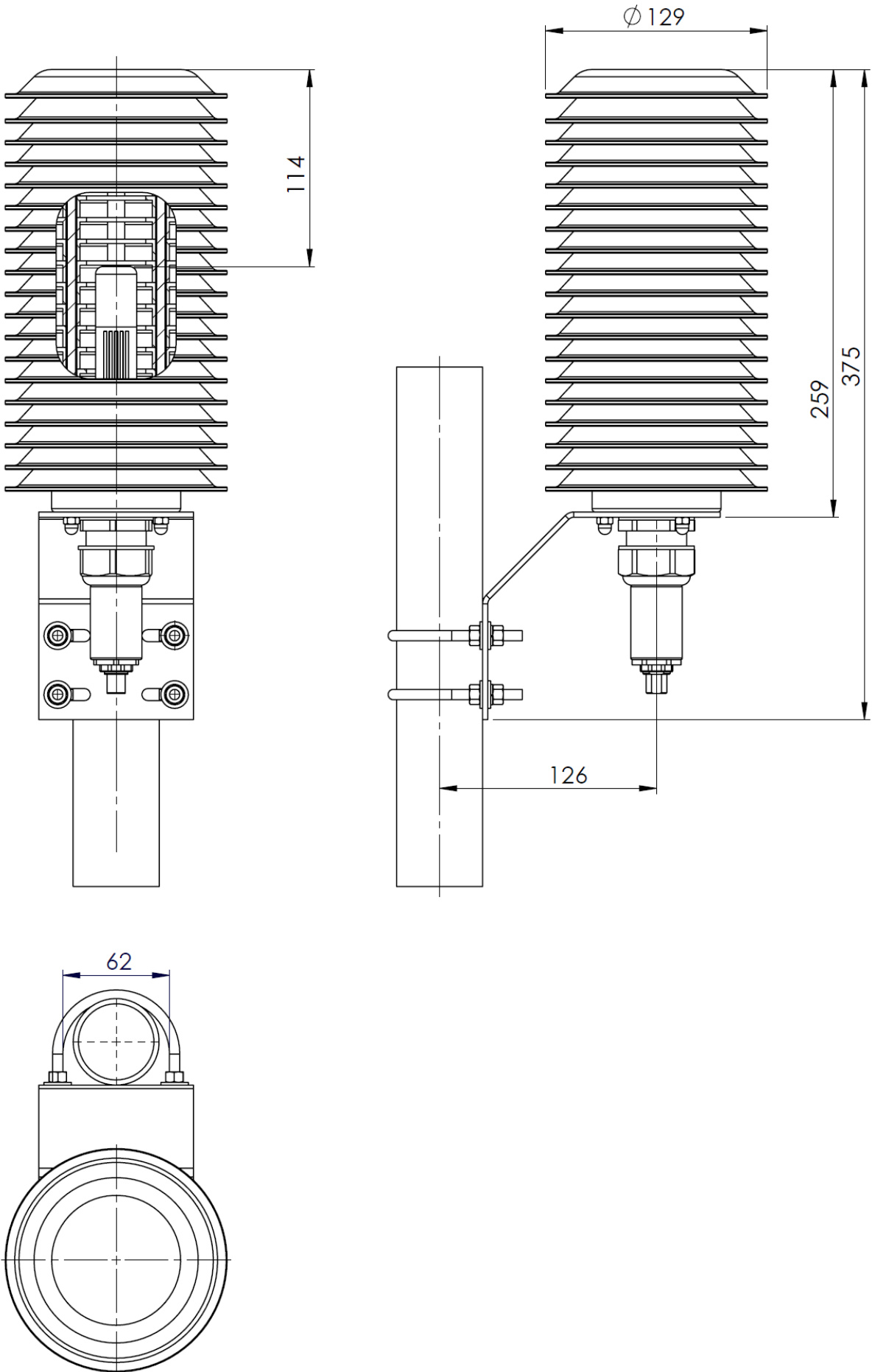
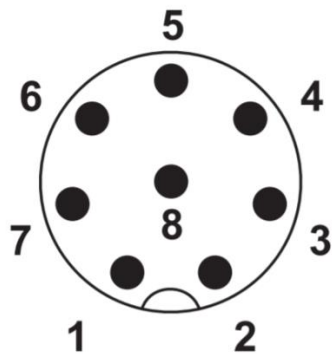## 1.5 ELECTRICAL COMMUNICATION

M12, 8 pin male connector on the SMC-520 schematic layout

Pin	Free cable end wire color	Sensor function	Details
1	White	Signal Ground	
2	Brown	RS232 Tx	default 38400 8N1
3	Green	RS232 Rx	
4	Yellow	Ground	
5	Gray	VDC -	
6	Pink	RS485 Data+	default 38400 8N1
7	Blue	RS485 Data-	
8	Red	VDC+	Power input 12…30 VDC

**Note:** Please pay special attention to the SMC-520 wire colours, as applying voltage to the data wires may damage the sensor.

The serial communication over RS232 and RS485 can be configured for the following baudrates 4800, 9600, 19200, 38400 and 57600 bps from the SMC Configuration software. The SMC-520 is set to automatically output the strings in the selected data format in the selected output rate.

1.6 SMC INSTRUMENTS CONFIGURATION SOFTWARE

The SMC configuration software is a PC application, after the sensor serial communication has been connected the SMC Configuration Software can be used to set the sensor configuration and communication parameters according to requirements.

The settings entered in the SMC Configuration software are written to the sensor. The settings are stored in flash memory inside the sensor and are not dependent on power supply or battery power.
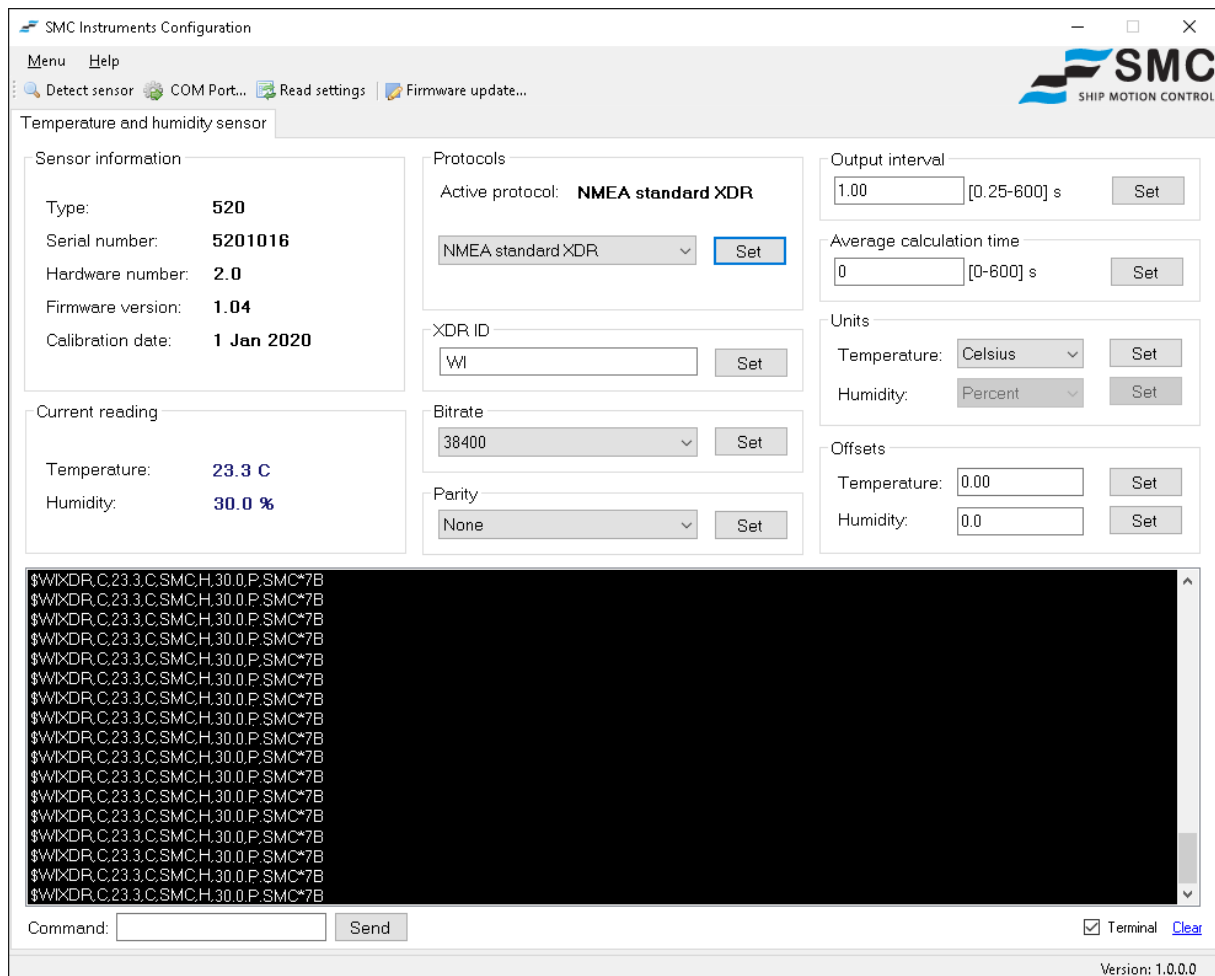
1.6.1 DEFAULT SETTINGS AT THE FACTORY

The sensor is delivered from SMC with a set of default parameters which can be changed from the SMC Configuration Software.

The factory default communication settings are as follows.
Baud Rate 38400
8 Databits
No parity
1 stop bits

1.6.2 GENERAL INFORMATION CONFIGURATION SOFTWARE

Menu
Select to choose from the options: Detect Sensor, COM Port settings, Read settings, Firmware update or to exit the software.

Help > About
Displays the SMC Instruments Configuration software version and contact details for SMC.

Menu button selections:
Detect Sensor
The software will search all the COM ports of the PC to find output data from a sensor, useful for a PC with multiple COM ports from multiport serial cards.
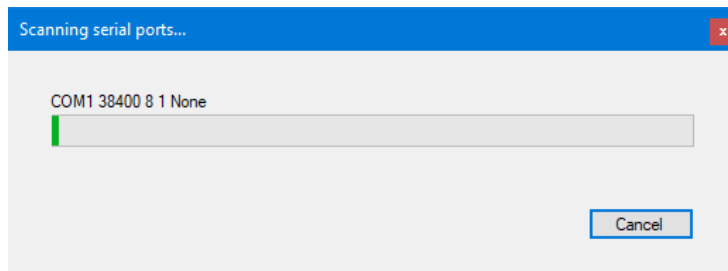
COM Port settings
The COM port to which the sensor is attached.
If the COM port the sensor is connected to is known, this option allows a quicker connection setup to the sensor.
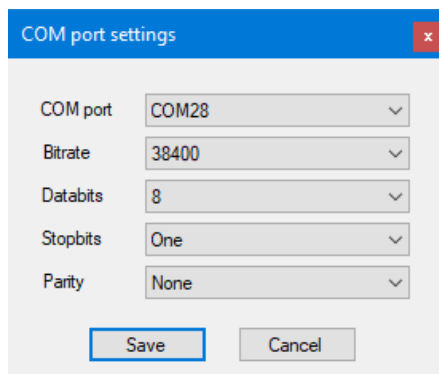
Read settings
The software will read or re-read the sensor settings.

Firmware update
The sensor firmware can be updated from the configuration software. The update is done over RS232 serial communication and should only be updated with guidance from SMC.

Main window sections:

Sensor Information
Shows the sensor Type, Serial Number, Hardware version, Firmware version and Calibration date.

Current reading
Displays the current Temperature and Humidity values.

Protocols
Choose the Active protocol from a drop down selection

Transducer Name
Sets the device name of the transducer in the $WIXDR string

Bitrate
Select from a drop down the bitrate of the data output. The same baudrate applies for both serial ports. Available baudrates 4800, 9600, 19200, 38400 or 57600 bps.

Parity
Sets the parity on the serial output string on both serial outputs to Odd, Even or None

Output Interval
The automatic string output rate can be set between 0.25 and 600 seconds

Average calculation time
Sets the temperature and humidity calculation average between 0 and 600 seconds. 0 means no average set for the output.

Units
Use the drop down to select a unit for the Temperature of Celsius, Fahrenheit or Kelvin. The unit output for humidity is in percent.

Offsets
Add an offset to the Temperature or Humidity to compensate for certain conditions.
Note, offsets should not be used in place of a full recalibration.

Command
Commands such as changing the data output rate can be sent to the sensor via this input window.

Terminal
Use the check box to enable or disable the display of incoming data in the terminal window.
Click on clear to clear the data in the terminal window.

2 SERIAL OUTPUT STRINGS

2.1.1 WIXDR

Example
$WIXDR,C,23.3,C,SMC,H,30.0,P,SMC*7B

Description	Form
Start Characters	$WIXDR
Transducer type (C)	C for temperature
Temperature (23.3)	Temperature in degrees, resolution 0.1°
Unit (C)	Unit for temperature, C=Celsius, F=Fahrenheit K=Kelvin
Name of transducer (SMC)	Default SMC, user configurable
Transducer type (H)	H for Humidity
Humidity (30.0)	Humidity in percent, resolution 0.1%
Unit (P)	Unit for humidity, P=Percent
Name of transducer (SMC)	Default SMC, user configurable
Checksum (*7B)	XOR checksum
Termination Characters	<CR><LF>

2.1.2 VAISALA HMP155 FORMAT

Example
RH= 7.8 %RH T= 23.1 'C

Description	Form
Transducer type (RH=)	RH=Relative Humidity
Humidity (7.8)	Humidity in percent, resolution 0.1%
Unit (%RH)	Unit for humidity, % Relative Humidity
Transducer type (T=)	T=Temperature
Temperature (23.1)	Temperature in degrees, resolution 0.1°
Unit ('C)	Unit for temperature, 'C=Celsius, 'F=Fahrenheit 'K=Kelvin
Termination Characters	<CR><LF>

Note: The Vaisala HMP155 string is a position based string and not comma separated

3 CONFIGURATION COMMANDS

If the SMC configuration software is preferred not to be used the following commands can be used to setup the instrument instead using the serial command prompt over both RS232 and RS485

All commands lines should be followed by a [CR] [LF]

Commands format	Description
$upiset,1	Sensor output rate in seconds where "1" is 0.25s to 600s
$btrset,9600	The bitrate of the output. Accepted output rates are 4800, 9600, 19200, 38400, 57600 bps
$parset,n	Sets the parity of the serial output where n = none o = odd e = even
$avgset,0	Sets the average time of the temperature and humidity output. Can be set to 0 to 600s as integer values
$prtset,2	Output string format where 2 = WIXDR string format 3 = Vaisala HMP155 format
$un1set,1	Sets the unit for the temperature output 1 = Celsius 2 = Kelvin 3 = Fahrenheit
$cldget	To receive the sensor factory calibration date
$op1set,1.00	Sets the offset for the temperature sensor
$op2set,1.00	Sets the offset for the humidity sensor
$xdrset,SMC	Sets the name of the transducer in the WIXDR string

3.1 REPLIES FROM THE SMC-520

The sensor will reply with a confirmation when the command is accepted in the format as *$upians,1* where the three first letters are identical to the command and the three last letters in the identifier are replaced with "ans".

In case the command is not accepted the sensor will reply with *$ans cmd error*. In case of a problem to store the information to the built-in flash memory of the sensor the device will reply with *$ans mem err*. If a parameter is set outside the available range the sensor will return the message *$ans range err*.

4 MAINTENANCE

Filter
The SMC-520 is equipped with a sintered teflon filter to protect the sensing elements from water and dirt. The filter which is located at the end of the sensor should be inspected periodically, every 6 to 12 months depending on the environmental conditions such as dust or exhaust emissions and replaced when necessary.
Care must be taken when removing the filter, it is a screw fit and should be removed by hand so not to crush the filter and the components it covers. Avoid touching the filter with your fingers to avoid dirt on the Teflon area of the filter.

Cleaning
Clean the probe with a soft cloth and mild detergent, any other chemical cleaner may damage the sensor and void any warranty.

Calibration
SMC recommends to recalibrate the temperature sensor once a year. The sensor must be sent to SMC for recalibration. Contact support@shipmotion.eu for return details, quoting the serial number of the sensor.

General
Check the cable, connector and the installation for potential damage in a regular interval.

5 SERVICE AND WARRANTY

All products are inspected prior to shipment and SMC manufactured products are guaranteed against defective material or workmanship for a period of two (2) calendar years after delivery date of purchase.

SMC liabilities are limited to repair, replacement, or refund of the factory quoted price (SMC's option). SMC must be notified and provided with sufficient time to remedy any product deficiencies that require factory attention. This time period may include but is not limited to standard production lead times, travel time and raw material lead times. SMC will not be responsible for any charges related to repair, installation, removal, re-installation, or any actual, incidental, liquidated, or consequential damages. All claims by the buyer must be made in writing. All orders returned to SMC must have an issued RMA number supplied by the SMC prior to shipment. Only SMC shall have the authority to issue RMA numbers.

Any products manufactured by others supplied with and/or installed with SMC's products are covered by the original manufacturers' warranty and are excluded from SMC's warranty

SMC manufactured product must be sent to SMC for repair or replacement.

Please read the SMC Ship Motion Control terms and conditions for complete information.

5.1.1 LIABILITY

SMC shall have no liability under the warranties in respect of any defect in the Products arising from: specifications or materials supplied by the Buyer; fair wear and tear; wilful damage or negligence of the Buyer or its employees or agents; abnormal working conditions at the Buyer's premises; failure to follow SMC's instructions (whether oral or in writing); misuse or alteration or repair of the Products without SMC's approval; or if the total price for the Products has not been paid.

SMC shall in no event be liable for any indirect or consequential, or punitive damages or cost of any kind from any cause arising out of the sale, use or inability to use any product, including without limitation, loss of profits, goodwill or business interruption. In case of failure in the product the company is not liable to compensate the buyer with anything exceeding the cost of the product sold by SMC.

The exclusion of liability in these Terms & Conditions shall not apply in respect of death or personal injury caused by SMC's negligence.

SMC shall not be bound by any representations or statements on the part of its employees or agents, whether oral or in writing, including errors made in catalogues and other promotional materials.

Please read the SMC Ship Motion Control terms and conditions for complete information.

5.1.2   RESTRICTION OF WARRANTY

The warranty does not cover malfunction of the sensor generated from

- If the sensor case has been opened by the customer in an attempt to carry out repair work
- If the sensor has been fed with an over voltage in the power supply wires or the signal wires

The sensor electronics are shielded in a case of UV protected ABS plastic with O ring seals to prevent damage from moisture.
The sensor should not be opened as this could affect the warranty on the unit. All operations inside the sensor must be carried out by SMC personnel.

5.2 TECHNICAL SUPPORT

If you experience any problem, or you have a question regarding your sensor please contact your local agents or SMC directly.

Refer to the SMC website at https://www.shipmotion.eu/

Please have the following information available
•   Equipment Model Number
•   Equipment Serial Number
•   Fault Description

Worldwide Service contact
Telephone: +46 8 644 50 10 (CET 8am – 5pm)
E-mail: support@shipmotion.eu

Return Procedure

If this is not possible to solve the problem a Ship Motion Control technician will issue a Return Material Authorization Number (RMA#). Please be ready to provide the following information.
•   Name
•   Address
•   Telephone, E-mail
•   Equipment Model Number
•   Equipment Serial Number
•   Installation Date

If the Sensor is under warranty, repairs are free.

Pack the sensor in its original packaging, or suitable heavy packaging.
Mark the RMA# on the outside of the package
Return the Sensor, prepaid carrier to SMC

6 TECHNICAL SPECIFICATIONS SMC-520

Performance	Temperature Accuracy 0.2° Celsius Temperature Range -40 to +60° Celsius Temperature Long Term stability <0.1° Celsius per Year Humidity Accuracy 1.5% in the range 0...90%, 2% in the range 90...100% Humidity Range 0...100% Humidity Long Term Stability 0.25% per year typical
Communication	Com1: RS232 Com2: RS485 SMC Configuration software included User selectable Output Protocols
Physical	Housing Material UV resistant ABS plastic Dimensions (H x ØW) 245 x 35mm excl. connector Weight 0.2 kg Cable connector 8 pins, M12 connector. 3 meter shielded PUR cable included
Environmental	Operating Temperature -40° to +60° Celsius MTBF (computed) 50 000 hours IP66
Electrical	Power requirements 12 - 30 VDC; 0.6 W Complies with the IEC 60945
Warranty & Support	2-year Limited Hardware & Software Warranty Free Technical & Hardware support

7 FAQ AND SUPPORT

If no communication is seen or bad data is displayed, please refer to the FAQs below which cover the most common configuration problems.

Configuration

Is the unit sending data with RS485 or RS232?

The sensor is *always on* and sends data over an RS485 serial channel.
Check the wiring as per the Electrical configuration guide to see which output is being used.

Data is being received but is either seen as bad data or wrong data.

Check which serial mode your sensor has been wired for, RS232 or RS485. The receiving comport would have to match the sending data.

Verify that there is a signal ground connected for RS232, if not the data would not be readable.

Parameters changed in the configuration software are not being set in the sensor.

If after pressing the *Set* button the parameters set in the sensor are not changing, check if the sensor Serial number, Hardware number, Firmware version and Calibration date are displayed in the configuration software.
If not, press the *Read Settings* button. If the data is still not showing this is typically due to the lack of two-way communication to the sensor. The Receive data lines are connected but not the Transmit data lines. Check the wiring through to the sensor.

Are the cables connected correctly?

No communication with the sensor

Check the cable connection and disconnect and reconnect is necessary.
Is the sensor powered up? Voltage should be 12 to 30 VDC

Check what Baud Rate and Output Rate should be used or has been set up. Use the *Detect sensor* button to scan all available ports.

The default baud rate set when the sensor is shipped from SMC is 38400 and the standard output rate is set to 1Hz.

If there is a chance that the baud rate has been changed and the *Detect sensor* button does not find the sensor, systematically check each baud rate option in the SMC sensor Configuration Software until the correct rate is found.