SEVEN
SENSOR SOLUTIONS



RH/AT/PS or MB

Relative Humidity, Ambient Temperature and Pressure Sensor

USER MANUAL

USER MANUAL TABLE OF CONTENTS

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1. Introduction

Relative Humidity, Ambient Temperature and Pressure Sensor is a product from the SEVEN meteorological sensors range of professional and intelligent measuring sensors with digital interface for environmental and industrial applications.



Figure 1 – RH/AT/PS



Figure 2 – 3S-RH/AT/PS- MB and 3S-RH-I

Sensor & Output Types	
3S-RH/AT/PS	Digital
3S-RH/AT/PS -MB	ModBus – RS485
3S-RH-I	Analog – 4-20mA

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The version with digital output has SDA, SCL pins which are I2C communication outputs. It is connected to the irradiance sensor box communicating with the I2C communication protocol via these pins. The user can easily connect it to the irradiance box with only a 7-pin connector. In the version with 4-20mA output, data is transferred to data loggers and receiving units capable of analogue measurement. In the version with ModBus output, all measured meteorological data is transferred to data loggers and receiving units via a 2-wire RS485 bus with Modbus RTU protocol.

SEVEN products use reliable and high-quality instruments to provide accurate meteorological information in environmental and industrial applications.

***Note:** : SEVEN reserves the right to make changes in this entire document without prior notice.*

2. Relative Humidity, Ambient Temperature and Pressure Sensor Installation

It is suggested that the system be operated at ground level to make sure that all components are working properly prior to installation. A general diagram of the progress of the installation steps is given below.



Figure 3 – Installation Process

2.1. Unpacking and Control

Upon receipt of the product, it must be carefully checked whether the package content is complete. SEVEN Sensor Solutions must be contacted if any of the components are missing, damaged or defective.



Figure 4 – 3S-RH/AT/PS



Figure 5 – 3S-RH/AT/PS-MB and 3S-RH-I

***Note:** : Quantity and content of the received material may be different based on customer confirmed order.*

2.2. Site Requirements and Considerations

Each site is different and has its own unique challenges. For this reason, the installation of the product may differ in each site. First of all, it should be decided where the product will be installed. Ambient temperature can be affected by obstructions, shading source and local topography.

Relative Humidity, Ambient Temperature and Pressure Sensor should be placed away from any dark or reflective and heat-absorbing surfaces.

When the Relative Humidity, Ambient Temperature and Pressure Sensor is to be mounted on a rooftop, it should preferably be mounted on the prevailing wind side of the building. It should also be avoided to place the sensor near any heat source such as chimneys or ventilation.

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Note: *To facilitate the maintenance of the Relative Humidity, Ambient Temperature and Pressure Sensor must be installed in an easily accessible location, especially for rooftop projects.*

2.3. Preparation of Materials to be Used in Installation

The materials needed during installation are provided by SEVEN. The user should only prepare the following hand tools and personal protective equipment.



Figure 6 – Materials to be Used in Installation

2.4. Installation

3S-RH/AT/PS Relative Humidity, Ambient Temperature and Pressure Sensor installation can be handled in 2 steps. Firstly, the Relative Humidity, Ambient Temperature and Pressure Sensor mounting structure must be installed. Then the sensors must be fixed to the mounting structure. The installation can be easily completed by a qualified electrician by following SEVEN instructions.

2.5. Mounting Structure

Relative Humidity, Ambient Temperature and Pressure Sensor is not requiring any maintenance or changing of spare parts.

Fastener tightness and cable conditions, looking for damage, deterioration, or disconnection of sensors and electrical enclosures, evidence of moisture or vermin in enclosures, loose wiring connections, embrittlement of attachments and other potential problems, should be checked periodically.

According to IEC 61724-1:2021, the monitoring system should be inspected at least annually and preferably at more frequent intervals.

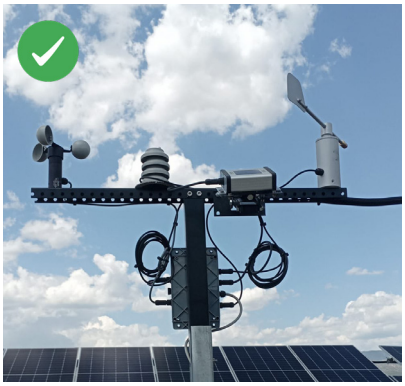


Figure 7 – Correct Installation

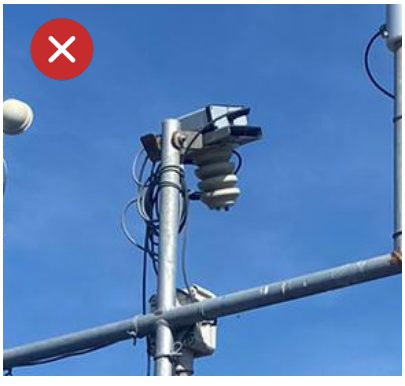


Figure 8 – Incorrect Installation

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3. Connections

The sensor junction box has waterproof and UV-resistant connectors. All cable colours and their connection names are indicated in the cable connections section. The minimum bending radius of the cables is 5 mm.

The supply voltage for the Relative Humidity, Ambient Temperature and Pressure Sensor is 12 - 30 V DC. Operation with a supply voltage of 24 V is recommended.

The Relative Humidity, Ambient Temperature and Pressure Sensor has an electrically isolated, half-duplex, 2 wire RS485 interface for configuration, communication and the firmware update.

The communication and power cable of Relative Humidity, Ambient Temperature and Pressure Sensor should be always laid separated from AC/DC cables.

Note: *The installation and electrical connections of SEVEN sensors should be carried out by a qualified electrician.*

3S-RH/AT/PS-MB	
RS485 A / Data (+)	Green
RS485 B / Data (-)	Yellow
RS485 Data Ground	Pink
Positive Supply Voltage	Brown
Supply Voltage Ground	White
Earth Ground	Black
3S-RH-I	
4-20mA (+)	Green
4-20mA (-)	Yellow
Positive Supply Voltage	Brown
Supply Voltage Ground	White

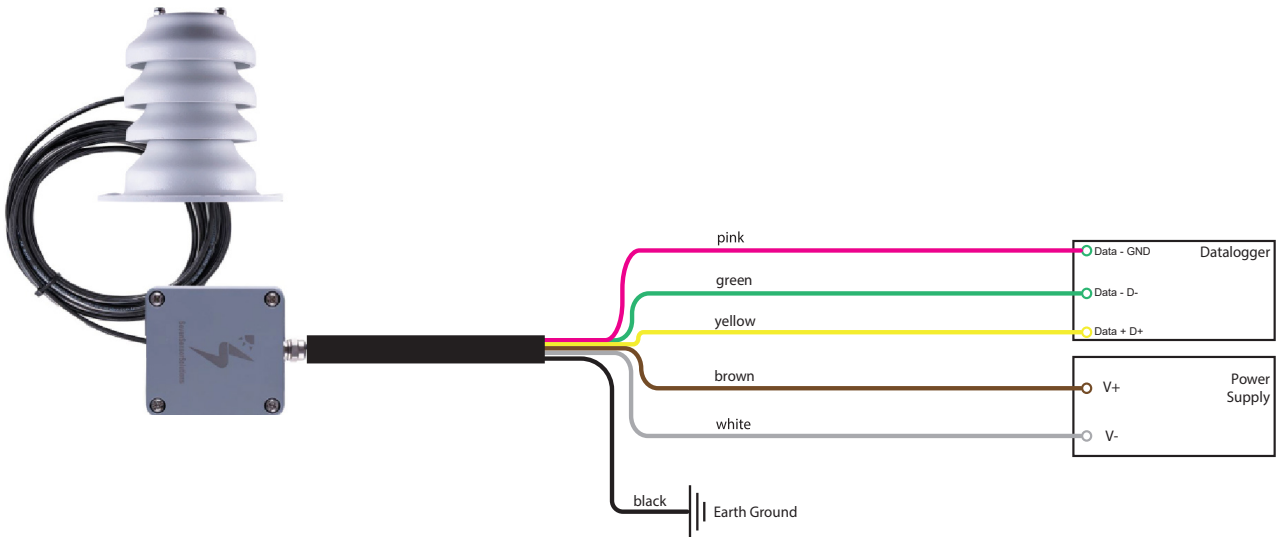


Figure 9 – 3S-RH/AT/PS-MB

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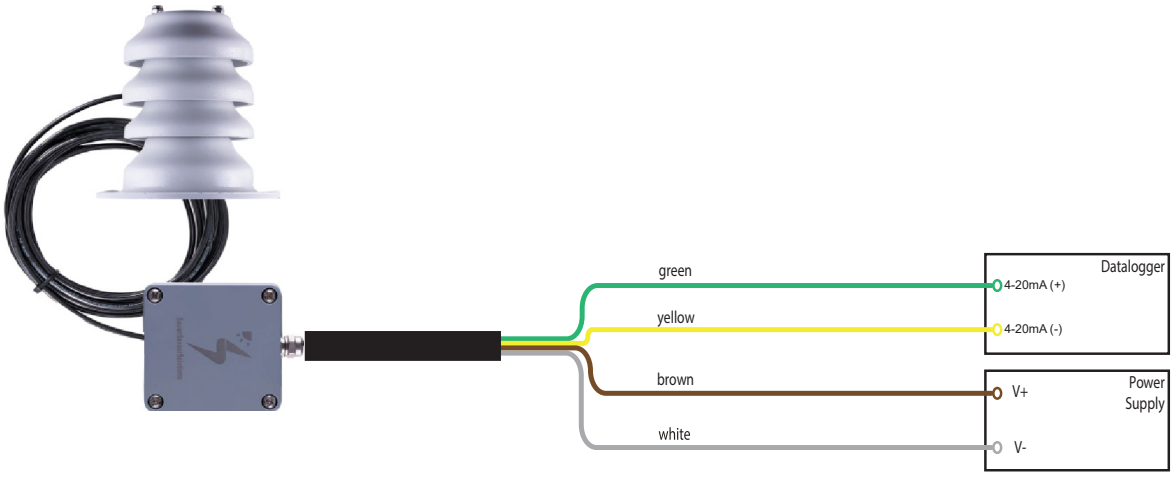


Figure 10 – 3S-RH-I

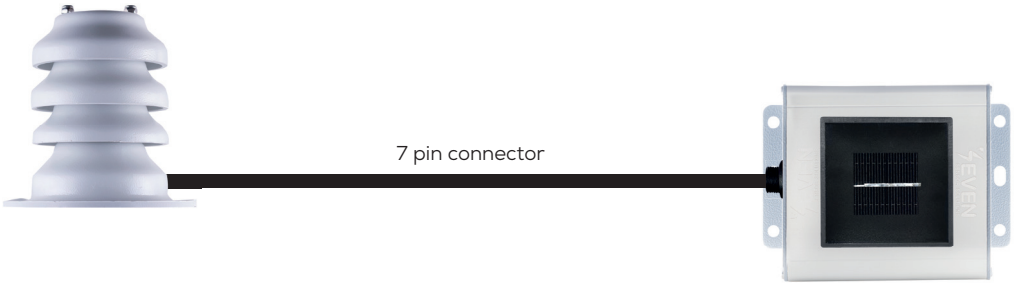


Figure 11 – Connection of the 3S-RH&AT with Irradiance Sensor

4. 3S-RH/AT/PS-MB Configuration and Communication

Once the Relative Humidity, Ambient Temperature and Pressure Sensor(3S-RH/AT/PS-MB) has been installed and connected correctly, the sensor begins autonomously to take measurements.

Attention must be paid to the following points:

- A measurement request should be made to the Relative Humidity, Ambient Temperature and Pressure Sensor with the 3S CWS Configuration Tool and it should be checked whether it correctly operation in the site.
- If several Modbus Devices are operated on a network, a unique device ID must be assigned to each device.

Follow SEVEN instructions to configure the Relative Humidity, Ambient Temperature and Pressure Sensor on dataloggers

4.1. 3S Configuration Tool

3S-CWS Configuration Tool v3.0 is a software tool for testing communication and adjusting Modbus parameters on the Relative Humidity, Ambient Temperature and Pressure Sensor(3S-RH/AT/PS-MB).

A Windows® PC with a serial bus interface set as a serial COM port, 3S-CWS Configuration Tool v3.0 software, and USB to RS485 Converter are required for configuration and testing purposes.

Follow the instructions in 3S-CWS Configuration Tool User Manual:
https://www.sevensensor.com/files/d/en/3S-CWS_Configuration_Tool_v3.0.pdf

4.2. Modbus RTU Specifications

4.2.1. Supported Bus Protocol

The Relative Humidity, Ambient Temperature and Pressure Sensor is equipped with an RS-485 communication port that supports Modbus RTU commands. The Relative Humidity, Ambient Temperature and Pressure Sensor can be configured to operate in different communication parameters. The table that follows describes each supported bus protocol.

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Baud Rate	4800, 9600, 19200, 38400
Parity	None, Even, Odd
Stop Bit	1, 2 (only at None parity)
Factory Default	9600, 8N1, address: 1

4.2.2. Supported Function Codes

The Relative Humidity, Ambient Temperature and Pressure Sensor supports a specific subset of Modbus RTU commands. The table that follows lists each supported function code.

0x03	Read Holding Registers
0x04	Read Input Registers
0x46	Read & Change Parameters
0x08	Reset Communication Command

Note : *All checksums of the Modbus protocol are omitted in this document. These checksums must always be calculated and sent during communication.*

4.2.2.1. Read Holding Registers (0x03)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x03
Start Register	2 Byte (Big Endian)	see the register table below
Number of Registers	2 Byte (Big Endian)	see the register table below

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x03
Number of Bytes	1 Byte	0 to 255 (2xN) N = Number of Registers
Data	2 Byte x N (Big Endian)	see the register table below

Holding Register Map

The 3S-RH/AT/PS-MB holding register map is based on the **"SunSpec Alliance"** communication standards. There is no valid value for ambient temperature and relative humidity.

Start	End	Value	Type	Units	Scale Factor	Constant
40000	40001	**SunSpec ID**	uint32	N/A	N/A	**"SunS"**
40002	40002	**SunSpec Device ID**	uint16	N/A	N/A	**0x0001**
40003	40003	**SunSpec Length**	uint16	Registers	N/A	**65**
40004	40019	**Manufacturer**	String (32)	N/A	N/A	**"SevenSensor"**
40020	40035	**Model**	String (32)	N/A	N/A	**"3S-RH/AT/PS"**
40036	40043	**Hardware Version**	String (16)	N/A	N/A	**"1.1"**
40044	40051	**Software Version**	String (16)	N/A	N/A	**"2.0"**
40052	40067	**Serial Number**	String (32)	N/A	N/A	**"23.12.345.65.0013"**
40068	40068	**Device ID**	uint16	N/A	N/A	**1**

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Sunspec Device Model Measurement Registers						
40069	**40069**	**Block ID**	int16	N/A	N/A	**307**
40070	**40070**	**Length**	int16	Registers	N/A	**11**
40071	**40071**	**Air Temperature**	int16	°C	0.1	**Measured**
40072	**40072**	**Relative Humidity**	int16	%	0	**Measured**
40073	**40073**	**Barometric Pressure**	int16	hPa	0	**Measured**
Irradiance Model Registers						
40082	**40082**	**Block ID**	int16	N/A	0	**302**
40083	**40083**	**Length**	int16	Registers	0	**5**
Back of Module Temperature Registers						
40089	**40089**	**Block ID**	int16	N/A	N/A	**303**
40090	**40090**	**Length**	int16	Registers	N/A	**9**
40091	**40091**	**Modul Temp**	int16	°C	0.1	**Measured**
40092	**40092**	**Modul Temp 1**	int16	°C	0.1	**N/A**
40093	**40093**	**Modul Temp 2**	int16	°C	0.1	**N/A**
40094	**40094**	**Modul Temp 3**	int16	°C	0.1	**N/A**
40095	**40095**	**Modul Temp 4**	int16	°C	0.1	**N/A**
40096	**40096**	**Modul Temp 5**	int16	°C	0.1	**N/A**
40097	**40097**	**Modul Temp 6**	int16	°C	0.1	**N/A**
40098	**40098**	**Modul Temp 7**	int16	°C	0.1	**N/A**
40099	**40099**	**Ambient Temp (SHT)**	int16	°C	0.1	**N/A**
Device Model Measurement Registers						
40100	**40100**	**Block ID**	int16	N/A	N/A	**308**
40101	**40101**	**Length**	int16	Registers	N/A	**5**
40102	**40102**	**Plane of Array**	int16	W/m²	0.1	**N/A**
40103	**40103**	**Modul Temp**	int16	°C	0.1	**Measured**
40104	**40104**	**Ambient Temp (SHT)**	int16	°C	0.1	**N/A**
40105	**40105**	**Wind Speed**	int16	m/s	0.1	**Measured**
40106	**40106**	**Air Temperature**	int16	°C	0.1	**Measured**
End of Block Registers						
40107	**40107**	**End of SunSpec Block**	uint16	N/A	N/A	**0xFFFF**
40108	**40108**	**Length**	uint16	Registers	0	**0**
Device Address Read/Write Register						
40109	**40109**	**Modbus ID – Write Register**	uint16	N/A	N/A	**1**

4.2.2.2. Read Input Registers (0x04)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x04
Start Register	2 Byte (Big Endian)	see the register table below
Number of Registers	2 Byte (Big Endian)	see the register table below

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x04
Number of Bytes	1 Byte	0 to 255 (2xN) N = Number of Registers
Data	2 Byte x N (Big Endian)	see the register table below

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Input Register Map

A standard input register map has been created for all SEVEN Modbus devices. The following Modbus data can be read individually or in blocks.

ID-Dec	ID-Hex	Value	Range	Resolution
30032	0x20	Ambient Temperature (SHT)	-40…+85 °C	0.1°C
30033	0x21	Relative Humidity (SHT)	0…100%	0.1%
30035	0x23	Air Pressure	260 – 1260 hPa	0.1%

Additionally, the following internal data can be read individually or in blocks.

ID-Dec	ID-Hex	Value		Range
30301	0x12D	Hardware Version		Manufacturer Parameters Read Only
30302	0x12E	Software Version		
30342	0x156	Serial Number	Production Year	
30343	0x157		Production Code	
30344	0x158		Cell Serial Number	
30345	0x159		Board Serial Number	
30346	0x15A		Box Serial Number	
30347	0x15B		Sensor Serial Number	
30348	0x15C	Production Date	Production Day	
30349	0x15D		Production Month	
30350	0x15E		Production Year	

4.2.2.3. Read & Change Parameters (0x46)
Sub Function (0x04): Write Device Address

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x04
New Address	1 Byte	1 to 247

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Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x04
New Address	1 Byte	1 to 247

Sub Function (0x06): Write Communication Parameters

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x06
New Baud Rate	1 Byte	0 to 3, see table below
New Parity / Stop Bit	1 Byte	0 to 3, see table below

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x06
New Baud Rate	1 Byte	0 to 3, see table below
New Parity / Stop Bit	1 Byte	0 to 3, see table below

Note : *When the "Write Communication Parameters" command is used, the "Write Device Address" command must also be used before the restart communication command.*

Communication Parameter Settings

Parameter changes will take effect after restarting of the sensor by power on reset or restarting the communication command.

Baud Rate	Value	Parity / Stop Bit	Value
4800	**0**	**None/1**	**0**
9600	**1**	**None/2**	**1**
19200	**2**	**Odd**	**2**
38400	**3**	**Even**	**3**

Sub Function (0x07): Read Hardware & Software Versions

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Restart Code	1 Byte	0x07

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Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x07
Hardware Version	2 Byte (Little Endian)	0 to 65535
Software Version	2 Byte (Little Endian)	0 to 65535

Sub Function (0x08): Read Serial Number - Production Date - Calibration Date

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x08

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x46
Sub Function Code	1 Byte	0x08
Production Year	1 Byte	0 to 99
Production Code	1 Byte	0 to 99
Box Serial Number	1 Byte	0 to 99
Sensor Serial Number	2 Byte (Big Endian)	0 to 9999
Production Day	1 Byte	1 to 31
Production Month	1 Byte	1 to 12
Production Year	1 Byte	0 to 99

4.2.2.4. Diagnotics (0x08)

Master Request:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x08
Restart Code	4 Byte	0x00000000

Slave Response:

Address	1 Byte	1 to 247
Function Code	1 Byte	0x08
Restart Code	4 Byte	0x00000000

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5. Additional Documents and Software

Please feel free to contact us if you face any difficulties during installation or configuration.

User Manual	This document
Datasheet	3S-RH/AT/PS brochure
3S-CWS Configuration Tool	Windows® software for testing, firmware updates and configuration of the device
Firmware	Current device firmware

6. Contact Details

Please feel free to contact us if you face any difficulties during installation or configuration.

Phone Number	
Sales Team	+90 530 889 80 19
Techical Support	+90 553 892 26 70
Emails	
Sales Team	sales@sevensensor.com
Techical Support	teknik@sevensensor.com
Website	www.sevensensor.com

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