SEVEN 3S-RH-I Relative Humidity Ambient Temperature and Pressure Sensor User Manual

Contents

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USER MANUAL

The Relative Humidity, Ambient Temperature, and Pressure Sensor is a professional and intelligent measuring sensor with a digital interface for environmental and industrial applications. It belongs to the SEVEN meteorological sensors range, providing accurate meteorological information.

3S-RH/AT/PS

Relative Humidity, Ambient Temperature and Pressure Sensor

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

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.

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.

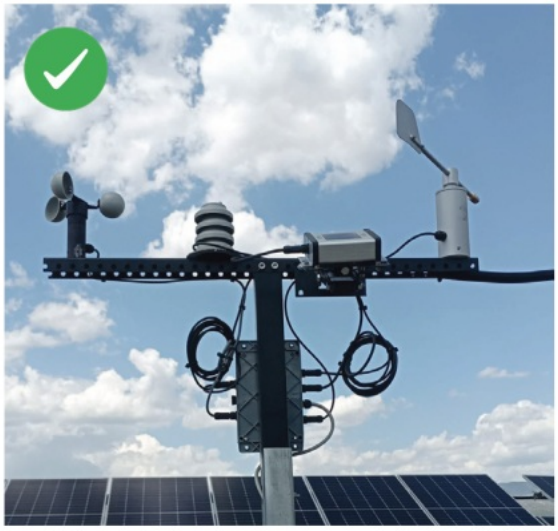

Figure 7 – Correct Installation

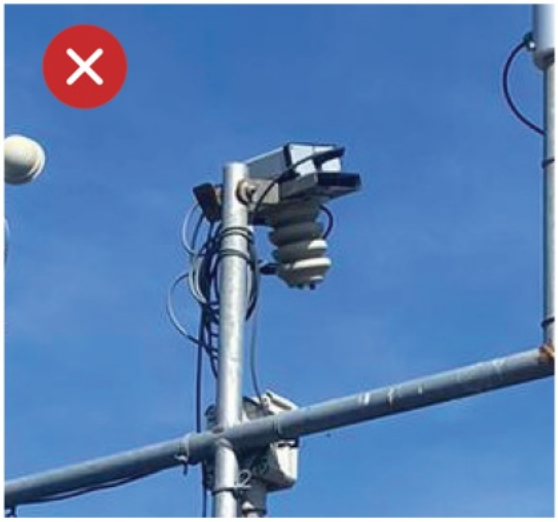

Figure 8 – Incorrect Installation

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

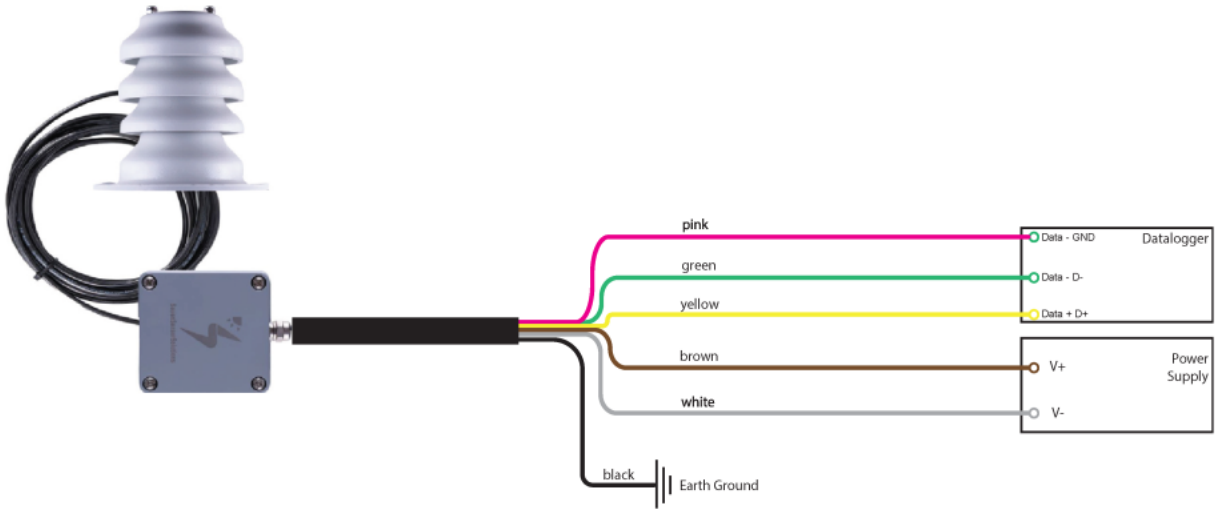

Figure 9 – 3S-RH/AT/PS-MB

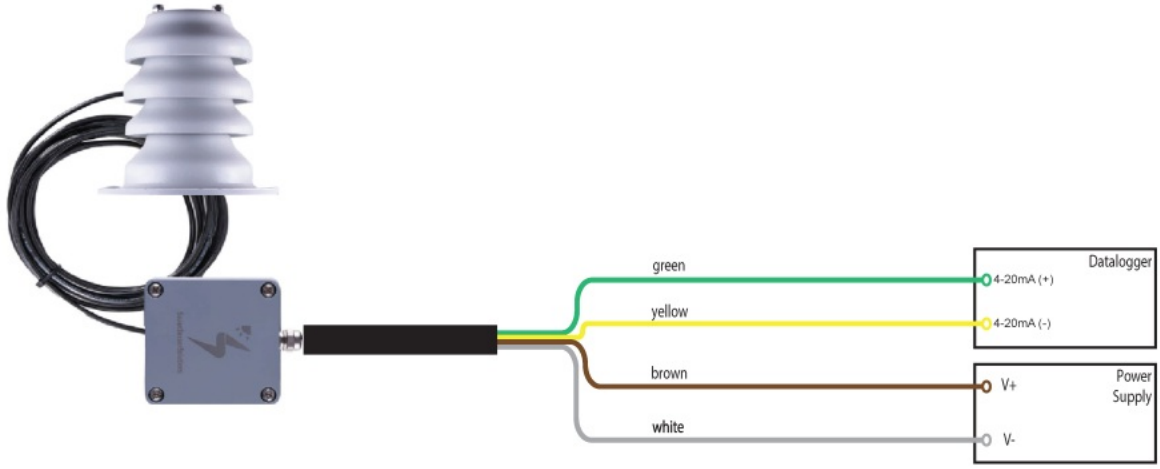

Figure 10 – 3S-RH-I

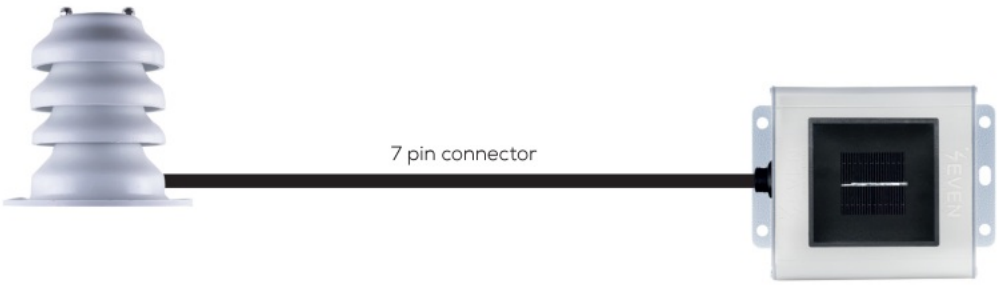

Figure 11 – Connection of the 3S-RH&AT with Irradiance Sensor

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:

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.

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

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

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

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

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

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

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 Firmware	Windows® software for testing, firmware updates and configuration of the device Current device firmware

6. Contact Details

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

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Techical Support +90 553 892 26 70
Emails
Sales Team sales@sevensensor.com
Techical Support teknik@sevensensor.com
Website **www.sevensensor.com**

Specifications

- Product Name: 3S-RH/AT/PS
- Product Type: Relative Humidity, Ambient Temperature, and Pressure Sensor
- Output Types: 3S-RH/AT/PS, 3S-RH/AT/PS-MB, 3S-RH-I

FAQs

Q: Can the sensor be used indoors?

A: While designed for outdoor use, the sensor can be used indoors with proper calibration and placement away from heat sources.

Q: How often should the sensor be calibrated?

A: Calibration frequency depends on usage and environmental conditions. It is recommended to calibrate the sensor annually or as per specific application requirements.

Documents / Resources

	**SEVEN 3S-RH-I Relative Humidity Ambient Temperature and Pressure Sensor** [pdf] User Manual 3S-RH-AT-PS, 3S-RH-AT-PS-MB, 3S-RH-I, 3S-RH-I Relative Humidity Ambient Temperature and Pressure Sensor, Relative Humidity Ambient Temperature and Pressure Sensor, Ambient Temperature and Pressure Sensor, Temperature and Pressure Sensor, Pressure Sensor

References

- Seven Sensor for solar PV plants | Seven Sensor
- User Manual