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Instruction for use

020727/06/15

Hygro-ThermoTransmitter-compact

RS485 / MODBUS-RTU

1.1005.54.780 / 781/ 782

ADOLF THIES GmbH & Co. KG

Hauptstraße 76 37083 Göttingen Germany
Box 3536 + 3541 37025 Göttingen
Phone +49 551 79001-0 Fax +49 551 79001-65
www.thiesclima.com info@thiesclima.com

Safety Instructions

- Before operating with or at the device/product, read through the operating instructions.
  This manual contains instructions which should be followed on mounting, start-up, and operation.
  A non-observance might cause:
  - failure of important functions
  - endangerment of persons by electrical or mechanical effect
  - damage to objects
- Mounting, electrical connection and wiring of the device/product must be carried out only by a qualified technician who is familiar with and observes the engineering regulations, provisions and standards applicable in each case.
- Repairs and maintenance may only be carried out by trained staff or **Adolf Thies GmbH & Co. KG**. Only components and spare parts supplied and/or recommended by **Adolf Thies GmbH & Co. KG** should be used for repairs.
- Electrical devices/products must be mounted and wired only in a voltage-free state.
- **Adolf Thies GmbH & Co KG** guarantees proper functioning of the device/products provided that no modifications have been made to the mechanics, electronics or software, and that the following points are observed:
- All information, warnings and instructions for use included in these operating instructions must be taken into account and observed as this is essential to ensure trouble-free operation and a safe condition of the measuring system / device / product.
- The device / product is designed for a specific application as described in these operating instructions.
- The device / product should be operated with the accessories and consumables supplied and/or recommended by **Adolf Thies GmbH & Co KG.**
- Recommendation: As it is possible that each measuring system / device / product may, under certain conditions, and in rare cases, may also output erroneous measuring values, it is recommended using redundant systems with plausibility checks for **security-relevant applications**.

Environment

- As a longstanding manufacturer of sensors Adolf Thies GmbH & Co KG is committed to the objectives of environmental protection and is therefore willing to take back all supplied products governed by the provisions of "*ElektroG*" (German Electrical and Electronic Equipment Act) and to perform environmentally compatible disposal and recycling. We are prepared to take back all Thies products concerned free of charge if returned to Thies by our customers carriage-paid.

- Make sure you retain packaging for storage or transport of products. Should packaging however no longer be required, please arrange for recycling as the packaging materials are designed to be recycled.

Documentation

- © Copyright **Adolf Thies GmbH & Co KG**, Göttingen / Germany
- Although these operating instruction has been drawn up with due care, **Adolf Thies GmbH & Co KG** can accept no liability whatsoever for any technical and typographical errors or omissions in this document that might remain.
- We can accept no liability whatsoever for any losses arising from the information contained in this document.
- Subject to modification in terms of content.
- The device / product should not be passed on without the/these operating instructions.

Contents

1 Models available

Hygro-Thermo Transmitters with serial Interface:

Order-No.	Measuring Range	Electrical Output	Operating Voltage	Sensor protective filter	Construction / Connection
1.1005.54.780	0...100% r. F. -40... +85°C	RS 485 MODBUS RTU	5...30V DC	ZE20	- H-T-Transmitter with plug and mating plug.
1.1005.54.781	0...100% r. F. -40... +85°C	RS 485 MODBUS RTU	5...30V DC	ZE20	- H-T-Transmitter plug connection. - Mating plug with 5m cable and wire end.
1.1005.54.782	0...100% r. F. -40... +85°C	RS 485 MODBUS RTU	5...30V DC	ZE20	- H-T- Transmitter plug connection. - Mating plug with 10m cable and wire end.

2 Application

The Hygro-Thermo Transmitters of our compact series are designed to measure relative humidity, the temperature of the air and other non-aggressive gases.

The use of capacitive humidity sensors is a guarantee for:

- A high degree of long-term stability.
- Nearly linear characteristics.
- Good dynamic behaviour.
- Dewing stability.
- Low temperature coefficients.
- Low hysteresis.

The hygro-thermo transmitter is equipped with a protective filter for the sensors.

Type: Membrane-filter with gauze ZE20 (order-no. 1.1005.54.901) for protection against dust in case of field application.

Remark:

For field work, it is advisable to use a „Weather and Thermal Radiation Shield“. It is optionally available as accessory.

3 Storage

As a consequence of storing the Hygro-Thermo Transmitter at constant ambient temperature the polymer used in the humidity sensor becomes inert, i.e. it loses the characteristic of responding quickly to changing ambient humidity. This effect is reversible. When the humidity sensor undergoes alternately a high and low air humidity the humidity sensor is regenerated, and takes again measurements in the specified speed.

After longer storage, and before application or calibration the sensor should undergo twice an alternating air humidity from 20...90 % r.h., at least 48 hours before application.

4 Mounting

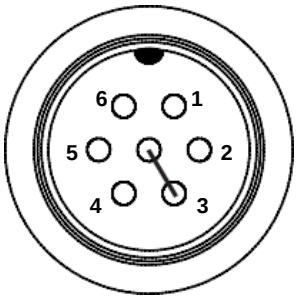
For correct measurements, the Hygro-Thermo Transmitter should be mounted at a site in the room which is representative of the climate within the room. The mounting position itself is arbitrary. Mount the sensor such that water cannot penetrate the inside of the sensor. Dewing and sprinkling water do not damage the sensor.

Moreover, please make sure to keep the operating voltages as well as a good recirculation ventilation of the instrument. Deviations might lead to measurement errors (for example: due to instrument warming).

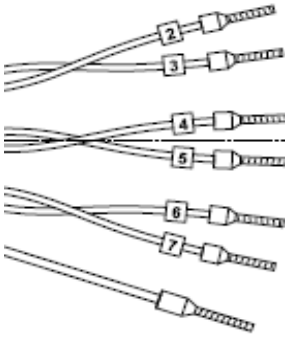
Preferably, the sensor should be mounted vertically facing downwards to a wall (indoor application), and should be mounted horizontally facing backwards in canals.

5 Connection

5.1 Connector Pin Assignment

Pin	Description	Function	Postion of connections at the sensor
1	TX		
2	D0/A/Data+	MODBUS RS485 Data+.	
3	D1/B/Data-	MODBUS RS485 Data-.	
4	Vcc	Supply voltage +.	
5	GND	Supply voltage 0V.	
6	TX		
7	Termination	Termination active, when Pin 3 and Pin 7 connected.	

5.2 Cable Assignment

Code ring	Lead color	Description	Function	Lead color marking
2	Brown	D0/A/Data+	MODBUS RS485 Data+.	
3	Black	D1/B/Data-	MODBUS RS485 Data-.	
4	Red	Vcc	Supply voltage +.	
5	Black	GND	Supply voltage 0V.	
6	Orange	D0/A/Data+	MODBUS RS485 Data+.	
7	Black	D1/B/Data-	MODBUS RS485 Data-.	
--	Green/yellow	shield		

6 Maintenance

The Hygro-Thermo Transmitter is supplied already adjusted and its characteristics remain stable for years.
Dust does not damage the humidity sensor but does influence the dynamic behaviour negatively. If the instrument is very dirty, the sensor element can be cleaned or carefully rinsed in distilled water. Make sure you do not touch the highly-sensitive sensor element.
Before cleaning the sensor elements please remove the protecting filter; it should be cleaned, as well or should be replaced.

Attention:

The instrument housing with the electronics included should be opened only in the factory.

7 Notes on sensors with MODBUS-RTU

7.1 Serial interface

With the data transmission via EIA-485 interface of the Modbus sensors the following settings are possible:

- Baud rate: 19200 / 9600 / 4800 / 2400 / 1200 / 600.
- Data bits: 8.
- Parity: N / E / O.
- Stop bits: 1 / 2.

Factory Setting: 19200@8N1

7.2 Access on MODBUS Register

In order to guarantee compatibility with all Modbus masters, all available registers can be read through the function code 03hex (Read Holding Register) as well as through the function code 04hex. Registers with additional write permission can be written through the function code 06hex (Write Holding Register). All registers available with Modbus sensors are listed in table 1:

Register-no.	format	definition	entitlement
0-1	float (32bit)	Temperature in °C.	Read-only.
2	unit (16bit)	Alarm code temperature.	
3-4	float (32bit)	Humidity in % r.h.	
5	unit (16bit)	Alarm code humidity.	
6-7	float (32bit)	Serial number sensor.	
205	unit (16bit)	MODBUS address.	Read and writeable.

Table 1: MODBUS Register

The storing organization for the measuring values of temperature and air humidity as well as for the serial number is Little Endian, i.e. in the lower register there is the low-order word, and in the higher register there is the high-order word.

Alarm code:

Temperature channel (Reg.No.2):	Humidity channel (reg.No.5):
0 = no alarm, the temperature value is within the limits.	0 = no alarm, the humidity value is within the limits.
1 = temperature measurement range exceeded.	1 = humidity meas. range exceeded (=100% r.h.).
2 = below temperature measurement range.	2 = below humidity meas. range (= 0% r.h.).
3 = no sensor signal.	3 = no sensor signal.
4 = short circuit at PT1000 (resistance < 500Ω).	4 = humidity sensor defective.

Table 2: alarm codes humidity and temperature

7.3 Configuration of MODBUS address

The Modbus address can be changed anytime by a write access to the address register (reg.-no. 205). Permitted slave addresses are within the range from 1…247 (**factory setting = 1**). On the address 0 broadcasts can be transmitted in the network (all slaves with respective broadcast functions do carry them out, however do not confirm the successful action). The use of address 0 as slave address is inadmissible. The addresses in the 248…255 are reserved for special Modbus services, and their use as slave address is inadmissible, as well.

When the Modbus address has been changed, this is immediately effective, and the sensor confirms the command already by using the new address.

It is recommended to select the query interval not below 2s, as also the internal measuring value update operates with this period, and otherwise, the power consumption would increase unnecessarily. A reasonable and energy-efficient query-setup is as follows:

1. Query of the temperature (reg.-no. 0 and 1).
2. 20ms break.
3. Query of the air humidity (reg.-no. 3 and 4).
4. 20ms break.
5. Query of the serial number (reg.-no. 6 and 7).
6. 5s break.
7. Go on with 1.

At the same time:

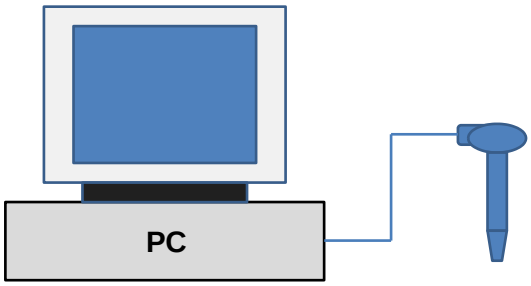
1. Query of the temperature alarm code (reg.-no. 2).
2. 20ms break.
3. Query of the air humidity alarm code (reg.-no. 5).
4. 20ms break.
5. Query of the serial number (reg.-no. 6 and 7).
6. 1min break.
7. Go on with 1.

When the linking of serial number and sensor address is known, one should do without the cyclic query of the serial number.

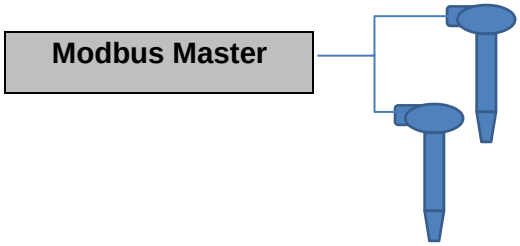
7.4 Operation of the Sensor

On PC

- Recommendable at incoming inspection.
- Requires PC with RS485 interface and Modbus-master software (e.g.: Modbus Poll) or a Modbus-master system.



In the Network

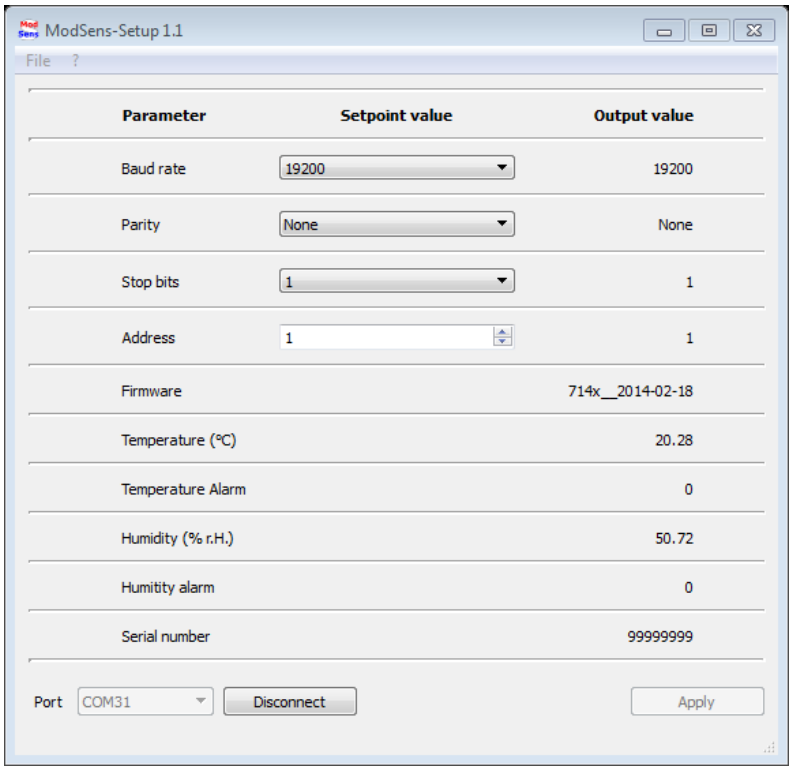


7.5 Configuration of the Sensor

The address can be set by the manufacturer at the Modbus sensors in delivery status – as per description.

More configurations are possible by using the **service cable and SW- tool** (optional accessory), suitable each for the respective sensor.

Figure 1 shows the user interface in operation. The **service cable** is connected first to an USB interface of the PC.
Under Windows7 the driver installation occurs automatically. Under WindowsXP the current FTDI-driver must be downloaded from the homepage of the manufacturer (http://www.ftdichip.com/ftdrivers.htm), and must be installed. The service cable is then available as virtual COM-interface (in fig. 1 COM31) and is respectively selectable in ModSens-Setup. The button „Connect“ / „Disconnect“ connects or separates the interface. The sensor configuration comprises the baud rate, the parity, number of stop bits, and the Modbus address. After a change of parameter the button „Apply“ sets the parameters in the sensor. In addition, all available measuring values are displayed, also the serial number, and the version status of the firmware of the sensor.



7.6 Termination

In order to minimize the heating of the sensor, and the measurement errors related to this, it is recommended to use **external termination.** The required termination resistance can be attached to the 2. data line pair of the connecting cable (with 1.1005.54.781/782). When an external termination is not possible, an **internal DC-termination** of 135Ω can be used with MODBUS sensors. At the rod sensors the termination can be activated by bridging pin3 and pin7 in the screw bushing of the connecting cable.

More recommendations

- Install your network acc. to the general recommendations for RS485 networks, that means among others:
  - Perform the bus as line structure (no junctions).
  - Terminate the first and the last bus sharing unit.
  - Use a shielded and twisted twin wire for the data lines.
- Keep the query rate in the total network above 2s.
- If an F/T sensor is the last bus sharing unit, prefer a termination at the second data line pair of the connecting cable against an internal termination.
- Select the baud rate as slowly as necessary (the energy requirement rises with falling baud rate).

8 Technical Data

Humidity	
Measuring element	Capacitive
Measuring range	0...100% rel. humidity
Accuracy @ meas. range 10...90% rel.h. bei 23°C @ meas. range <10% rel.h. >90% rel.h.	 ± 1,5% rel. humidity ± 2% rel. humidity
Response Time (T 90)	<20s (at v = 1,5m/s) w/o filter
Response Time (T 90)	<1,5min. (at v = 1,5m/s) with Membrane filter ZE 20
Response Time (T 90)	<1,5min. (at v = 1,5m/s) with Sinter filter ZE 21
Temperature	
Measuring element	Pt 1000 Class B, 1/3 DIN tolerance
Measuring range	-40...+85°C
Accuracy @ 23°C	± 0,2K
Response time (T 90)	<20s (at v = 1,5m/s) w/o filter
Response time (T 90)	<1,5min. (at v = 1,5m/s) with Membrane filter ZE 20
Response time (T 90)	<1,5min. (at v = 1,5m/s) with Sinter filter ZE 21
Additional Specifications	
Ambient temperature	-40...+85°C
Degree of protection sensor	IP 30
Degree of protection sensor with filter	IP 54
Degree of protection electronics	IP 67
Operating voltage	5...30V DC
Current requirement	Approx. < 5mA
Dimension to model 1.1005.54.780	
Diameter	20mm
Length w/o plug	126mm
Length with plug	Approx. 145mm

9 Accessories / spare part (optional)

Weather and Thermal Radiation Shield The use of the Weather and Thermal Radiation Shield in an appropriate combination with suitable temperature and humidity sensors reduces to a minimum the possibility of influencing the data in a negative manner by radiation, precipitation or damage. More exactly measuring results are achieved by using the ventilated Weather and Thermal Radiation Shield (mod. 1.1025.55.10x with ventilation). The ventilation reduces those errors which might occur during the measurements in a weather hut caused by the so-called „proper climate“.	1.1025.55.00x .10x .xx0 .xx1	w/o ventilator. With ventilator 12V DC / 2W , incl. 5m cable. For mast tube mounting ∅ 30 - 50mm. For mast tube mounting ∅ 55 – 60mm. Dimensions: ∅ 120 x 290mm.
Membrane-filter with gauze ZE20 The filter serves for protecting the sensor elements of the Hygro-thermo transmitter against dust in case of field application.	1.1005.54.901	Material: PTFE / stainless steel. Dimensions: ∅ 20 x 25mm.
Service cable Modbus – USB, Software on request		

10 EC-Declaration of Conformity

Document-No.: 000702 **Month: 11 Year: 16**

Manufacturer: **A D O L F T H I E S G m b H & C o. K G**
Hauptstr. 76
D-37083 Göttingen
Tel.: (0551) 79001-0
Fax: (0551) 79001-65
email: Info@ThiesClima.com

This declaration of conformity is issued under the sole responsibility of the manufacturer

Description of Product: **Hygro – Thermo Transmitter Compact**

Article No.	**1.1005.49.960**	**1.1005.51.600**		
1.1005.54.000	**1.1005.54.150**	**1.1005.54.160**	**1.1005.54.161**	**1.1005.54.173**
1.1005.54.241	**1.1005.54.300**	**1.1005.54.441**	**1.1005.54.448**	**1.1005.54.460**
1.1005.54.461	**1.1005.54.700**	**1.1005.54.701**	**1.1005.54.703**	**1.1005.54.741**
1.1005.54.761	**1.1005.54.773**	**1.1005.54.780**	**1.1005.54.781**	**1.1005.54.782**
1.1005.54.800	**1.1005.54.941**	**1.1005.54.961**	**1.1005.64.000**	**1.1005.64.161**
1.1005.64.174	**1.1005.64.701**	**1.1005.64.241**		

specified technical data in the document: **020874/06/13; 021659/04/11; 021660/04/11; 021661/04/11; 021687/01/12; 021691/01/12; 020726/06/15**

The indicated products correspond to the essential requirement of the following European Directives and Regulations:

2014/30/EU DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

2014/35/EU DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

552/2004/EC Regulation (EC) No 552/2004 of the European Parliament and the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation)

2011/65/EU DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

2012/19/EU DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE)

The indicated products comply with the regulations of the directives. This is proved by the compliance with the following standards:

EN 61000-6-2 Electromagnetic compatibility
Immunity for industrial environment

EN 61000-6-3 Electromagnetic compatibility
Emission standard for residential, commercial and light industrial environments

EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Part 1: General requirements

EN 50581 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Place: Göttingen Date: 15.11.2016
Signed for and on behalf of:

Legally binding signature: issuer:

Thomas Stadie, General Manager

Joachim Beinhorn, Development Manager

This declaration certificates the compliance with the mentioned directives, however does not include any warranty of characteristics.
Please pay attention to the security advises of the provided instructions for use.

ADOLF THIES GmbH & Co. KG
Hauptstraße 76 37083 Göttingen Germany
P.O. Box 3536 + 3541 37025 Göttingen
Phone +49 551 79001-0 Fax +49 551 79001-65
www.thiesclima.com info@thiesclima.com