## developing solutions







# Operating manual

FT80

Humidity and temperature measuring device ECO-LINE ®





## Masthead

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Subject to technical amendments.



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#### **Version history**

Rev. ST4-A 03/22	Version 1 (first edition)
Rev. ST4-B 04/23	Version 2 (change product number key; Mounting the screw plug)
Rev. ST4-C 10/23	Version 3 (change sensor, FF12 replaces FF80)
Rev. ST4-D 03/24	Version 3 (Editorial revision of measurement accuracy)

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## **1** Safety instructions

#### 1.1 General

This operating manual contains basic instructions for the installation, operation and maintenance of the device that must be followed without fail. It must be read by the installer, the operator and the responsible specialist personnel before installing and commissioning the device.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

#### **1.2 Personnel Qualification**

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

#### 1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

#### 1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

#### 1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

#### 1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

#### 1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

#### 1.8 Pictogram explanation



## 

Type and source of danger

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

1. Avoid danger by observing the valid safety regulations.



## 

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

1. Avoid danger by observing the valid safety regulations.



## 

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

1. Avoid danger by observing the valid safety regulations.



## NOTICE

#### Note / advice

This indicates useful information of advice for efficient and smooth operation.

## 2 Product and functional description

#### 2.1 Delivery scope

- Humidity and temperature measuring device FT80
- FF12 humidity and temperature sensor
- Locking screw (included in the device)
- Mounting flange for duct sensor version
- · Mounting material not included
- Operating Manual

#### 2.2 Intended use

The FT80 is suitable for the measurement of humidity and temperature in non-condensing air.

The device may only be used for the purpose stipulated by the manufacturer. The manufacturer will not be liable for damage arising from incorrect or improper use.

#### 2.3 Function diagram



Fig. 1: Function diagram

#### 2.4 Design and mode of operation

The temperature and humidity measurement is based on a sensor chip with a digital I2C bus interface. The analogue measurement data is digitally converted and linearised. The transmitted data is evaluated by the integrated electronics and then output via an optional display, analogue outputs or via the optional Modbus output.

#### 2.5 Device versions



Fig. 2: Device versions

#### 2.5.1 Process connection NOTICE! The sensor can also be mounted remotely with an M12 cable.





Fig. 3: Process connections

#### Option B: Option A: M12 plug connection Cable screw connection Cable screw connection M16 x 1.5 5-pin Fig. 4: Electric connections 2.5.3 Type plate 9 **C€**¦¦KEA[ D-32107 Bad Salzuflen 2 Туре Channel 2 (rH Channel 1 (T) ₽**₫**₽**#** 3 6... 7 M# -20 °C ≤ Tamb ≤ 70 °C Made in Germany 8 Key to symbols Input Input signal $(\rightarrow)$ Output Output signal P# Production No. Serial number M# Customer No. Customer article number Fig. 5: Type plate 1 2 Device type (order code) Conformity 3 Measuring range (adjustable) 4 Output signal (adjustable) 5 Auxiliary energy 6 Serial number Customer article number (op-7 8 Special features tional) (e.g. silicone-free) 9 Circuit diagram

#### 2.5.2 Electrical connection

## **3** Installation

#### 3.1 General

The device is designed for installation on assembly plates or wall surfaces. For this purpose, the device has two fastening lugs integrated into the side. The attachment screws are not included in the delivery.

#### NOTICE! The locking screw is located in a plastic bag inside the device.





Alternatively, the device can be equipped with mounting feet for 35 mm top-hat rail mounting.

In the duct sensor version, the device is equipped with a mounting flange for ventilation ducts.

The enclosure protection type IP 65 is only guaranteed, if a suitable power supply cable is used (see accessories).

#### (a) Opening the casing

To open the casing, first remove the screw plug (if present). Then the casing can then be unlocked. To do this, use a suitable slotted screwdriver to press the locking lug at the designated point.

#### (b) Closing the casing

Close the cover until the latch clicks into place. Protection class IP54 is achieved with the snap-in connection alone.

#### NOTICE! The screw plug included must be used to achieve IP65.

Please contact the manufacturer if the screw is missing. It is a special screw for thermoplastics. Protection class IP65 cannot be achieved with another screw as a replacement.

#### (c) Mounting the screw plug

The installation of the locking screw ensures that the release is blocked and the cover is held in position. It is a self-tapping screw for polycarbonate.

During installation (1), a screw-in torque  $[M_E]$  of maximum 1.2 Nm is required to form the thread and overcome the friction. Heat is generated during this process.

## WARNING! Always mount the screw by hand. Do not use a cordless screwdriver.

As soon as the screw head is in contact (2), the installation is complete. Further tightening torque  $[M_A]$  to apply a pretensioning force is not necessary, as the function of the screw is already fulfilled in this position.

Please note that if the screw is turned further, the overtorque  $[M_{\ddot{U}}]$  will quickly be reached and the thread destroyed (3).



Fig. 7: Permissible torques

#### 3.2 Mechanical installation and mounting

The device is equipped with an FF12 sensor for humidity and temperature. The sensor is factory-mounted on the device.



Fig. 8: Permissible installation position

#### 3.2.1 Installation of the sensor

It is possible to connect the humidity and temperature sensor to the FT80 with an M12 cable and to mount it separately from the device. For this purpose, the corresponding connection cables and a mounting clip for installation on flat surfaces and pipes are available as accessories.

A mounting flange is factory-mounted on the duct sensor, which is suitable for rectangular ventilation ducts. Since the air duct material can be quite different, no mounting screws are supplied. The sensor can also be mounted remotely in the case of duct sensors.



#### 3.3 Electrical connection

- By authorized and qualified specialized personnel only.
- When the device is connected, national and international electrotechnical regulations must be observed.
- Disconnect the system from the mains before electrically connecting the device.
- Do not connect the device when it is live.

## NOTICE! In the version with cable screw connection, the M12 connector shown is omitted.



Fig. 10: Electrical connection, 3-conductor

#### **3-conductor with Modbus**



Fig. 11: Electrical connection of a 3-conductor with Modbus

#### Connection to an existing Modbus RTU network



Fig. 12: Modbus RTU network

## 4 Start-up

#### 4.1 General

All electrical supply, operating and measuring lines, and the pressure connections must have been correctly installed before commissioning. All supply lines are arranged so that there are no mechanical forces acting on the device.

#### 4.2 Display

Optionally, the device can be delivered with a LC display. After switching on the auxiliary voltage, the following start screen appears for a few seconds.



Fig. 13: Start screen

After that, the current measured values appear on the display.



Fig. 14: Meas. data display

#### 4.3 Config select

When configuring the FT80 devices, a distinction is made between devices with analogue output and devices with Modbus.

#### 4.3.1 Devices with analogue output



Fig. 15: Control elements for configuration





Fig. 17: Measuring range of temperature

#### 4.3.1.1.2 Humidity (channel 2)







Fig. 19: Measuring ranges

#### 4.3.1.2 Output signal

The switch position always affects both analogue outputs.



Fig. 20: Analogue output

#### 4.3.1.3 Description of functions

The DIP switch is used to configure the two measuring channels and the output signal.

Configure the device by moving switches S1 to S8 to the desired position. The switch position is sensed continuously. This means that the device can also be configured when it is switched off.

#### 4.3.2 Device with Modbus

NOTICE! In this section you will learn how to configure a Modbus device. Further information can be found in the Modbus manual.





If the button is pressed for several seconds, an information window with the currently set BUS configuration appears on the display (if available).



Fig. 22: Bus configuration

#### 4.3.2.1 Modbus address

NOTICE! Address 0 is reserved for the broadcast. For this reason, a decimal 1 is added to each set address.

ON		~	~~	~~	~ ~	~-	~~	07	0.0	F	<b>A</b> al al an a a
		51	52	53	54	55	56	5/	20	2	Address
	Binary Decimal	2° 1 +	21 2 +	2² 4 +	2³ 8 +	2⁴ 16+	2° 32+	2° 64		= 127	Sum +1
		0	0	0	0	0	0	0	0	0	1
ON=1 OFF=0	)	1	0	0	0	0	0	0	0	1	2
		0	1	0	0	0	0	0	0	2	3
					•						
		1	1	1	1	1	1	1	0	127	128

Fig. 23: Setting the Modbus address

#### 4.3.2.2 Interface

ON 1 2 3 4 5 6 7 8	Binary Decimal	<b>S1</b> 2° 1 +	<b>S2</b> 21 2 +	<b>S3</b> 2² 4					S8	<b>Σ</b> = 7	Baud rate
		0	0	0					1	0	2400
		1	0	0					1	1	4800
		0	1	0					1	2	9600
		1	1	0					1	3	14400
		0	0	1					1	4	19200
		1	0	1					1	5	38400
		0	1	1					1	6	57600
		1	1	1					1	7	115200
ON					S4	S5			S8		Parity
					0	0			1		without
					1	0			1		even
12343070					0	1			1		uneven
ON							S6		S8		Stop bit
							0		1		1 Bit
1 2 3 4 5 <b>6</b> 7 8							1		1		2 Bits
								S7	S8		Byte order
								0	1		MSB LSB
1 2 3 7 8 6 <b>7</b> 8								1	1		LSB MSB

Fig. 24: Configuring the interface

#### 4.3.2.3 Description of functions

#### **DIP** switches

The Modbus is configured with the DIP switch.

There are two settings areas. They are divided into interface and address configurations. Switch S8 allows you to switch between the two setting areas.

As soon as the BUS configuration is changed using the DIP switches, an information window appears on the display (if available) with the currently set BUS configuration.

For complete configuration, the following procedure is recommended:

- First switch on the device and then set all DIP switches to the OFF position. Now use S1 to S7 to select the desired MODBUS address.
- Next, set switch S8 to ON. Now you can configure the baud rate, parity, number of stop bits and byte order.
- Moving each switch results in a configuration change. The configuration is saved after each change. If the operator changes the switch position while the device is switched off, this does not change the bus parameters.

#### Button

If the button is pressed for several seconds, an information window with the currently set BUS configuration appears on the display (if available).

#### Status LED

The status LED flashes quickly and evenly when the device is sending data to the master via Modbus.

## 5 Servicing

#### 5.1 Maintenance

The instrument is maintenance-free. We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the function in combination with downstream components.
- Check the electrical connections.

The exact test cycles need to be adapted to the operating and environmental conditions. In combination with other devices, the operating instructions for the other devices also need to be observed.

#### 5.2 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

#### 5.3 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.



## 

#### Process media residues

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

Return the device in the original packaging or a suitable transport container.

#### 5.4 Disposal

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or reuse them.

## 6 Technical data

#### 6.1 General

Type designatio	n	FT80	
Measuring varia	ble	Humidity	
		Temperature	
Measurement principle	Humidity	Capacitive	
	Temperature	Band gap	
Remote sensor		5 m max. cable length (between sensor and device)	
Installation posit	lion	Sensor with filter side in the range ver- tical down to horizontal	
Reference conditions (acc. to IEC 61298-1)			
	•		

Temperature	+15 to +25 °C	
Relative humidity	45 75%	
Air pressure	86 to 106 kPa	860 to 1060 mbar

#### 6.2 Input variables

	Sensor assembly	Temperature me	asuring range				
Basic measuring	On device	-20 to +70 °C					
range	Offset	-40 to +95 °C					
Adjustable via DIP		-20 to +80 °C	0 200 °F				
switch		0 to +50 °C	+40 to +140 °F				
		-40 to +60 °C	-40 to +160 °F				
		-15 to +35 °C	0 +100 °F				
		Humidity measu	ring range				
Adjustable via DIP	Relative humidity	0 +100 % rH					
switch	Enthalpy	0 +85 kJ/kg					
	Absolute humidity	0 +50 g/m <sup>3</sup>	0 +80 g/m <sup>3</sup>				
	Dew point	0 to +50 °C	-20 to +80 °C				
		+40 to +140 °F	0 +200 °F				

#### 6.3 Output sizes

A DIP switch can be used to switch the analogue outputs between 0 ... 20 mA / 0 ... 10 V and 4 ... 20 mA / 2 ... 10 V (Live Zero).

#### Temperature analogue output, 3-conductor

Output signal 1	0 to 20 mA 4 to 20 mA	0 10 V 2 10 V
Signal range	0.0 to 21.5 mA	0.0 to 10.75 V
Load impedance $R_{L}$	≤ 600 Ω	≥ 2 kΩ

#### Humidity analogue output, 3-conductor

Output signal 2	0 to 20 mA 4 to 20 mA	0 10 V 2 10 V
Signal range	0.0 to 21.5 mA	0.0 to 10.75 V
Load impedance $R_L$	≤ 600 Ω	≥ 2 kΩ

#### 6.4 Measuring accuracy

#### 6.4.1 Humidity



Fig. 25: Measurement deviation over the entire temperature range

Measurement deviation	see diagram
Hysteresis	± 1.0 % rH
Typical repeatability	± 0.21 % rH
Long-term stability	≤ 0.25 % rH/year

If the sensor is operated continuously at a humidity of over 80 % rH, the measurement error can still exceed the specified maximum value for a while after the humidity has been quickly reduced.

#### 6.4.2 Temperature



Fig. 26: Typical measurement error of temperature

Measurement deviation	see diagram
Typical repeatability	± 0.15 °C
Long-term drift	< 0.3 °C/year

## 6.5 Digital interfaces

#### Modbus RTU interface

interface	RS 485
Report	Modbus RTU
Modbus specification	Application Protocol Specification V1.1b3 (April 26, 2012)
Address	1 128
Baud rate	2400 … 115200 Baud
Parity	Even, uneven, parity
Stopbits	12

#### 6.6 Auxiliary energy

Rated voltage	24 V AC/DC
Admissible operating voltage $U_{b}$	19.2 to 28.8 V AC/DC
Absorbed power	< 2W

## 6.7 Operating conditions

Ambient temperature range	-20 to +70 °C
Storage temperature range	-20 to +70 °C
Protection	IP54
	IP65 with enclosed screw plug
EMC	EN IEC 61326-1:2021 EN IEC 61326-2-3:2021
RoHS	EN IEC 63000:2018
REACH	There are no SVHC substances in the FT80 product.
Other applied standards	DIN EN 60730-1:2021-06 (EN 60730-1:2016 + A1:2019)

## 6.8 Display

Display	Full graphic LC display
Resolution	128 x 64 Pixel
Back lighting	None
Meas. data display	Display format depends on the measuring range

#### 6.9 Construction design

Electrical connection	3-conductor	Modbus RTU
Cable screw connection	PCB terminal	PCB terminal
M16x1.5	No. of pins 5	No. of pins 5
M12 plug connection	5-pin	5-pin
	male	male
Temperature/	4-pin female	4-pin female
Humidity sensor		
Installation position	Vertical dov	vn to horizontal
Dimensions (without connections and s	92 x 45 x 83 mm sensor)	
Weight	Max. 200 g	

#### 6.9.1 Materials

Casing	Polycarbonate PC
Temperature sensor	FR4, polycarbonate PC, solder resist, silicon, tin, copper, nickel, silver, ceramic, PBT (20% GF)

#### 6.9.2 Dimension drawings

All dimensions in mm unless otherwise stated

#### Model with cable screw connection



#### Design with M12 plug connection



**Remote sensor** 



Fig. 27: Mounting clip

#### **Duct sensor**





Fig. 29: Stainless steel mounting flange (12.2 mm)



Fig. 30: Sensor extension



Fig. 31: Plastic mounting flange (16 mm)



#### Measurement range:

[3.4]	Measuring range	Sensor
10	Humidity 0100 % rH Temperature -20 +70 °C remote sensor -40 +95 °C	Plastic with stainless steel filter
40	Humidity 0100 % rH Temperature -20 +70 °C remote sensor -40 +95 °C	Plastic with PTFE filter

#### **Combined code**

[7-10]		
AL00	Output signal Operating voltage Measured value display	0/420 mA, 0/210 V, 3-conductor 24 V AC/DC without
AL0C	Output signal Operating voltage Measured value display	0/420 mA, 0/210 V, 3-conductor 24 V AC/DC Full graphic LC display
ML00	Output signal Operating voltage Measured value display	Modbus RTU, RS485, 3-conductor 24 V AC/DC without
ML0C	Output signal Operating voltage Measured value display	Modbus RTU, RS485, 3-conductor 24 V AC/DC Full graphic LC display

#### **Electrical connection**

#### [11]

- E Cable screw connection
- M M12 plug connection

#### Installation

_		
	[12]	
	Κ	Duct sensor
	D	Assembly of the mounting rails (also enclosed)
	S	Assembly of the mounting rails (pre-mounted)
	W	Wall mounting
		lata

#### Type plate

- [15]
  - 0 With Fischer logo

#### 7.1 Accessories

#### • M12 connection cables

Call sign	No. of pins	Length	Order no.
PUR connection cable with M12 coupling, A-coded (Modbus)	5-pin	2m	06401995
		5 m	06401996
		10 m	06401573

#### • Connection cables for humidity and temperature sensor

Call sign	No. of pins	Length	Order no.
M12 coupling/M12 straight connector,	4 pins	2m	09011363
A-coded		5 m	09011364

#### • Modbus

Call sign	Order no.
T-distributor unshielded	04451213
Y-distributor shielded	04451217
Field attachable connector (M12 coupling)	04459067
Field attachable connector (M12 plug)	04459065
Modbus termination resistor 120 Ohm (M12 socket)	06411280
Modbus termination resistor 120 Ohm (M12 plug)	06411279

#### • Spare and assembly parts

Call sign	Order no.
Smooth sensor made from plastic	FF12 FK
Smooth sensor made of plastic with PTFE filter	FF12 FE
Sensor extension	06405232
Mounting clip for remote sensor	09004662
Mounting flange Ø16 mm (plastic)	06051065
Mounting flange Ø12.2 mm (stainless steel 1.4571)	06402713
Screw plug (casing)	01001758



The devices bear the following marking:

CE

Bad Salzuflen 27 Feb 2023 T. Malischewski General manager R&D



Fig. 32: CE\_DE\_FT80

1/1





#### **UKCA Declaration of Conformity**

For the product described as follows

#### Product designation

Type designation

Humidity and temperature measuring device **FT80** 

is hereby declared to comply with the essential requirements, specified in the following UK regulations:

Statutory regulation No.	Description
2016 No. 1091	The Electromagnetic Compatibility Regulations 2016
2021 No. 422	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (Amendment) Regulations 2021
2022 No. 1647	The Hazardous Substances and Packaging (Legislative Functions and Amendment) (EU Exit) Regulations 2020

The products have been tested according to the following standards.

#### Electromagnetic compatibility (EMC):

BS EN IEC 61326-1:2021-06-07	Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
BS EN IEC 61326-2-3:2021-06-10	Electrical equipment for measurement, control and laboratory use. EMC requirements. Par- ticular requirements. Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

#### Restriction of Hazardous Substances (RoHS):

BS EN IEC 63000:2018-12-10

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

The sole responsibility for drawing up this declaration of conformity in relation to the fulfilment of the essential requirements and the preparation of the technical documentation lies with the manufacturer.

#### Manufacturer

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following marking:



ppa.

Bad Salzuflen 27 Feb 2023 T. Malischewski General manager R&D



Fig. 33: UKCA\_DE\_FT80

#### Notes





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