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Document code	Unit
HygroFlex TF5 Temperature Transmitter: **User Guide**	**Instruction Manual**
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HygroFlex TF5
Temperature Transmitter

User Guide

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Applicability:

This manual applies to all instruments of the TF5 series with firmware version 1.x, where 1.x can be 1.0, 1.1, etc. Changes to the last digit of the version number reflect minor firmware changes that do not affect the manner in which the instrument should be operated.

1   Overview

The TF5 transmitter measures temperature based on the data provided by an external PT100 4-wire RTD probe. We offer a wide selection of plug-in RTD probes. In principle, the TF5 can be used with any suitable third party RTD probe. The TF5 series is designed for fixed installation in HVAC and light industrial applications where a high measurement accuracy is required at temperature conditions within the range of -100 to 600°C (-148 to 1,112°F) – depending on the RTD probe model. The electronics operating range is limited to -40…60 °C (-10…60°C with the optional LC display).

The TF5 features a robust housing. Digital signal processing ensures consistent product performance and also facilitates the task of field maintenance with features such as potentiometer free – digital calibration.

Based on the ROTRONIC AirChip 3000 digital technology the TF5 series offers the following functions:

- User configurable settings
- Temperature calibration and adjustment
- Simulator mode
- Fail safe mode
- Data recording

The ability for the user to easily update the AirChip 3000 firmware means that instruments of the TF5 series can be kept up-to-date regarding any future functionality improvement.

TF5 transmitters with analog output signal: two types of electronic circuit are available: TF52: 2-wire, loop powered (4…20 mA current signal) and TF53: 3-wire (voltage or current signal). Both circuit types provide linear analog outputs signals for transmission over a length of cable to a remote display, recorder, controller or data processing unit.

2 Dimensional drawings

Dimensions in mm

2.1 Display and keypad option

The LC display option for the TF53 has a backlight. The LC display option for the TF52 does not have a backlight.

The upper line corresponds to relative humidity or dew / frost point and the bottom line corresponds to temperature.

The display can be configured to show a trend indicator on each line:

▲: increasing value
▼: decreasing value

In the event of an alarm the display shows the symbol **[!]** to the right of the value.

For instructions see the following HW4 manual: **E-M-HW4v2-F2-017**.

3 General description

3.1 Power supply

Depending on the circuit type, the TF5 requires the following power supply:

a) **TF52** (2-wire, loop powered): 10…28 VDC - depending on the load connected to the output. The minimum supply voltage can be determined as follows:

V min = 10 V + (0.02 x Load*)   *Load resistance in ohms.

For the maximum load of 500 Ω, the minimum supply voltage is 10 + (0.02 x 500) = 20 VDC. The maximum current consumption is 20 mA.

b) **TF53** (3-wire with analog outputs): 15 to 40 VDC (see note below) or 12 to 28 VAC. With both output circuits closed, the maximum current consumption is 30 mA.

Note: depending on the type of output signal, the TF53 will operate with the following minimum voltage

0…1 V outputs:	5 VDC or 5 VAC
0…5 V outputs:	10 VDC or 8 VAC
0…10 V outputs:	15 VDC or 12 VAC
0…20 mA or 4 …20 mA outputs:	6 VDC or 5 VAC with 0 Ω load
	15 VDC or 12 VAC with 500 Ω load

3.2 External Pt100 RTD probe and probe connector

The TF5 is equipped with a 4-pin Binder connector series 712 and is compatible with any of the ROTRONIC Pt100 RTD probes (see separate manual **E-M-Pt100-Probes**). In principle, the TF5 can be used with any third party 4-wire Pt100 RTD probe and is shipped together with the necessary connector hardware to accommodate a third party probe
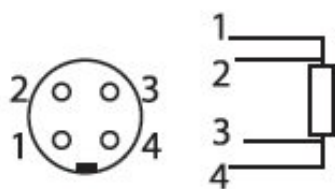
Note: seen from the solder side of the TF5 probe connector

4-wire Pt100

3.3   Analog output signal (TF52 and TF53)

TF52 and TF53

With the ROTRONIC HW4 software the scale of the analog temperature output can be set within the numerical limits of -999.99 and 9999.99.

The D/A converter used to generate the analog output signal features a 16-bit resolution and exhibits a small positive offset at the bottom of the signal range as indicated below:.

Signal type	Maximum offset at range bottom
0…1 V	3 mV
0…5 V	50 mV
0…10 V	90 mV
0…20 mA	4 µA
4…20 mA	No offset

TF52
The analog signal is always 4…20 mA,

TF53
The ROTRONIC HW4 software allows changing the type of output signal to one of the following: 0…20 mA, 4…20 mA, 0…1V, 0…5V or 0…10V. No calibration or adjustment is required after changing the type of output signal.

In the case of a voltage output signal, load requirements apply to the external device or circuit connected to the TF53 transmitter. These requirements are defined in the "Operation" chapter

Communication protocol options
The measurement data can be read without having to use the ROTRONIC HW4 software. Starting with firmware version 1.3, the TF5 offers the following communication protocol options (ASCII) which can be selected by connecting the TF5 to a PC running the ROTRONIC HW4 software (version 2.1.1 or higher):

o   **RO-ASCII:** this is the standard (default) communication protocol used by all AirChip 3000 devices and by the HW4 software. In principle, this protocol supports all of the AirChip 3000 functions but some of the functions require a certain amount of computations to be carried out by an external device such as a PC.

o   **Custom:** this communication protocol can be used to provide compatibility of the TF5 with an existing communication system. The Custom communication protocol is limited to reading measurement data from the TF5. Functions such as device configuration, humidity and temperature adjustment, etc. are not supported. The Custom protocol is applicable to all AirChip 3000 devices with a digital interface and allows RS-485 networking

o   **Modbus:** the Modbus protocol available with the TF5 is limited to reading measurement data from the TF5. Functions such as device configuration, humidity and temperature adjustment, etc. are not supported by the Modbus protocol.

When using either the RO-ASCII or the Custom protocol, the TF5 can be set to send data automatically after each refresh cycle without requiring a data request. When this mode is enabled, the receiving device must be listening at all times in order to get the measurement data.

For details, see document **E-M-AC3000-CP**

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3.4 Service connector

The service connector is a UART digital interface (Universal Asynchronous Receiver Transmitter) with a mini-USB type connector. This allows connecting the TF5 either to a PC running the ROTRONIC HW4 software or to a probe input of another instrument that is compatible with the HygroClip 2 (HC2) probes. In both cases a service cable is required. See "Maintenance" for the location of the service connector and for the type of service cable to be used.

- Connecting the TF5 to a PC is used to configure the TF5, gain access to the TF5 functions such as temperature adjustment, read data from the TF5 on the PC and update the AirChip 3000 firmware.

- Connecting the TF5 to the probe input of another instrument is useful only when the other instrument has its own display and keypad, and has an internal menu equivalent to the menu of the HP23 hand-held calibrator. The connection allows showing the data measured by the TF5 on the other instrument display and also allows using the other instrument internal menu to do for example a temperature adjustment of the TF5.

4 User configurable settings and functions

The TF5 ships configured as specified on the customer order. Models with analog outputs can be installed and used just as any conventional humidity and temperature transmitter and most users will never need to use the TF5 configurable settings and functions. Models with a digital interface generally require some configuration by the user.

Making use of the TF5 configurable settings and functions is entirely up to the user and the appropriate settings depend on the user application. We have provided below a short description of the TF5 functions and also indicated the factory default settings.

4.1 Function overview

MEASUREMENT ACCURACY AND RELIABILITY	
AirChip 3000 Functions	**Description**
► Temperature adjustment	o 1-point or 2-point temperature calibration or adjustment o Generate a time stamp for calibrations and adjustments o Retain and view last adjustment date and adjustment values o Generate calibration and adjustment protocols
► Data recording	The data recording function differs from a true data logging function in the sense that the AirChip 3000 does not time stamp the data. This data recording function can be used to investigate events such as a probe malfunction as well as to retrieve data that would otherwise be lost o Start or stop data recording - up to 2000 temperature values. Starting a recording session erases all previously recorded data o The recording mode and log interval can be specified o When the device is powered off, the recording session is paused but not ended As long as the recording session has not been ended, the device automatically resumes recording data when powered up again o The recorded data can be downloaded to a PC with the HW4 software, time stamped and viewed

MEASUREMENT LOOP VALIDATION	
AirChip 3000 Functions	**Description**
► Simulator mode	Used to make the TF5 generate a fixed temperature value. Can be configured, enabled or disabled

DEVICE SAFEGUARDS	
AirChip 3000 Functions	**Description**
► Device write protection	Used to protect the TF5 with a password to prevent unauthorized digital access by a digital user. Can be configured, enabled or disabled
► Internal menu access from keypad	Used to prevent accidental changes to the TF5 settings and temperature-humidity adjustment by disabling the MENU key on the optional keypad. Can be enabled or disabled

PROCESS PROTECTION / PROTECTION OF OTHER DEVICES	
AirChip 3000 Functions	**Description**
► Out-of-limit value alarm	Used to specify the normal range for temperature, depending on the user application. Can be configured, enabled or disabled Out-of-limit values trigger a digital alarm which can be also be seen on the optional display
► Bad probe alarm	Built-in function. Cannot be disabled A defective temperature probe triggers a digital alarm which can be also be seen on the optional display
► Fail safe mode	Used to specify a "safe" fixed temperature value in the event of a probe failure. Can be configured, enabled or disabled

4.2   Factory default settings

Notes:

o Configuration of the TF5 by the user and access to its functions requires a PC with the ROTRONIC HW4 software (version 2.1.1 or higher) installed. Service cable AC3006 or AC3009 is used to connect the TF5 service connector to a USB port of the PC.
o Settings and functions that can also be either partially or fully accessed from the optional keypad are marked with the letter **K** (see also Operation > Internal Menu).

Configurable Settings		Applicability	Factory default
Unit system (Metric or English)	**K**	TF52, TF53	As per ordering code
Analog signal type (4…20 mA or other)		TF53	As per ordering code
Output 2 parameter, scale and unit (output 1 is not used)		TF52, TF53	Temperature, unit as per ordering code
Display resolution (optional)		TF52, TF53	1 decimal
Display backlight (optional)	**K**	TF53	Always on
Trend indicator (display)		TF52, TF53	Enabled
Communication protocol		TF53 with DI	RO-ASCII
RS-485 address		TF53	0
Device name		TF53	Instrument model

Functions		Applicability	Factory default
Temperature adjustment	**K**	TF52, TF53	
Device write protection		TF52, TF53	Disabled
Menu access from keypad		TF52, TF53	Enabled
Out-of-limit value digital / display alarm		TF52, TF53	Disabled
Data recording	**K**	TF52, TF53	Enabled (loop mode – 10 min. interval)
Fail safe mode		TF52, TF53	Disabled
Simulator mode		TF52, TF53	Disabled

o   For a detailed description of all AirChip 3000 / TF5 main functions see document **E-T-AC3000-DF-V1**

o   Instructions regarding the configuration of the TF5 and access to its functions are provided in the following manuals:

    E-M-HW4v2-F2-017
    E-M-HW4v2-Main (§ 6.5)
    E-M-HW4v2-DR-001
    E-M-HW4v2-A2-001
    E-M-AC3000-CP
    .

o   The factory default setting for dew / frost point calculation is frost point below freezing

5 Mechanical installation

5.1 General guidelines

Relative humidity is extremely dependent on temperature. Proper measurement of relative humidity requires that the probe and its sensors be at exactly the temperature of the environment to be measured. Because of this, the location where you choose to install the probe can have a significant effect on the performance of the instrument. The following guidelines should guarantee good instrument performance:

a) **Select a representative location**: install the probe where humidity, temperature and pressure conditions are representative of the environment to be measured.

b) **Provide good air movement at the probe**: air velocity of at least 200 ft/ minute (1 meter/second) facilitates adaptation of the probe to changing temperature.

c) **Avoid the following:** (1) Close proximity of the probe to a heating element, a cooling coil, a cold or hot wall, direct exposure to sun rays, etc. (2) Close proximity of the probe to a steam injector, humidifier, direct exposure to precipitation, etc. (3) Unstable pressure conditions resulting from excessive air turbulence.

d) **Immerse as much of the probe as possible in the environment to be measured.**

e) **Prevent the accumulation of condensation water at the level of the sensor leads**. Install the probe so that the probe tip is looking downward. If this is not possible, install the probe horizontally.

5.2 TF5 enclosure

The TF5 enclosure consists of a base and a cover held together with 4 screws. To open the enclosure, use a metric 2.5 mm hex key. Prior to re-assembling the enclosure, verify that the red seal is sitting properly in its groove on the base.

Mounting hardware
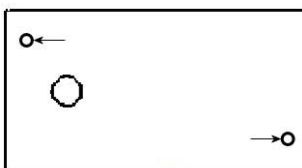
Method 1: The TF5 is supplied with 2 screws, 2 drywall anchors and two rubber washers. The base of the enclosure has 2 screw-wells (see drawing) that are normally closed at the bottom. Use the template provided with the TF5 to drill mounting holes in the wall and insert the drywall anchors. Place a rubber washer on each screw. Insert a screw in each well and push to open the bottom of the well.

Method 2: When a DIN-rail (35 mm / 1 3/8 ") is available use part **AC5002** (not included). This is a DIN-rail mounting kit consisting of 2 clamps that attach to the back of the enclosure with the screws provided.

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6 Electrical installation

6.1 General wiring guidelines

Power supply wiring

Heavy machinery and instrumentation should not share the same power supply wiring. If this cannot be avoided, noise filters and surge protectors should be used. Most UPS devices have those features already integrated.

General guidelines for signal cables

The following guidelines are derived from European Standard EN 50170 for the transmission of signals by copper wires. When planning an installation, the rules provided by EN 50170 should be followed under consideration of local circumstances to determine the position of machines and equipment.

All ROTRONIC products are tested for Electromagnetic Compatibility according to EMC Directive 2004/106/EG and following European standards:

- EN 61000-6-1: 2001, EN 61000-6-2: 2005
- EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11

Whenever the level of electromagnetic interference is expected to be high, both the instruments and signal cables should be placed as far away as possible from the source of interference.

In general, signal cables should be installed in bundles or channels / conduits, separate from other cables as indicated in the table below:

- Bus signals such as RS485 - Data signals for PCs, printers etc. - shielded analog inputs - unshielded direct current (<= 60V) - shielded process signals (<= 25 V) - unshielded alternate current (<= 25V) - coaxial cables for CRT monitors	**in common bundles or channels / conduits**
- direct current from 60 V to 400 V (unshielded) - alternate current from 25V to 400 V (unshielded)	**in separated bundles or channels / conduits, without minimum distance**
- direct and alternate current > 400 V (unshielded) - Telephone lines - lines leading into EX-rated areas	**in separated bundles or channels / conduits, without minimum distance**

Lightning protection

Cabling in areas with a risk of lightning requires a lightning protection. For cabling underground in between buildings, we recommend the use of special fiber optic cables. If this is not possible, use copper cables that are suitable for underground installation.

6.2   Cable grip and cable specifications

The TF5 is supplied either with one M16 sealing cable grip or with a ½" conduit adapter. The M16 cable grip provides effective sealing only with cables having the proper outside diameter. Preferably, use a cable with an outside diameter of 6 to 7 mm (0.236 to 0.275 inch) with 18 AWG wires.

6.3   Wiring

6.3.1 *TF52: 2-wire, loop powered transmitter*

Electrical diagram
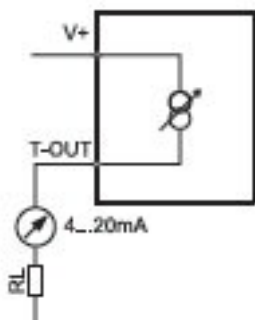
The maximum permissible cable length connecting the TF52 to other devices is determined by the total resistance resulting from the addition of the cable resistance and that of the devices connected in series with the unit. This resistance should not exceed 500 ohms.

Terminal block diagram

Terminals	Description
K2-2: T-OUT	Temperature output (+) OUT-2
K2-1: V+	Power supply: 10…28 VDC (+)
K1-2: H-OUT	Not used
K1-1: V+	Not used

Note: connect the + of the power supply to only one of the V+ terminals. The two terminals marked V+ are internally connected.

6.3.2 *TF53: 3-wire transmitter*

Electrical diagram for voltage outputs
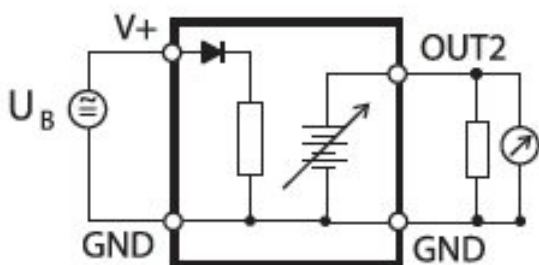
The maximum permissible cable length can be determined under consideration of the voltage drop caused by the current flowing to the devices connected to the unit. The voltage drop in the cable depends both on cable resistance and on the equivalent resistance of the devices connected in parallel to the unit. The total resistance connected to each unit output should be at least 1000 ohms. Cable resistance should not be more than 1/1000 of the load resistance.

Minimum load requirements apply to the external device or circuit connected to the TF5 transmitter. These requirements are defined in the "Operation" chapter
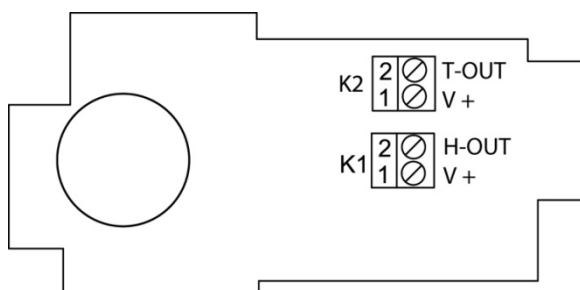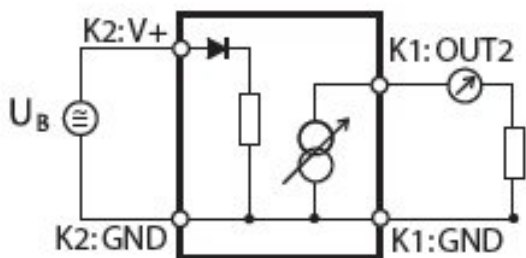
Electrical diagram for current outputs

The maximum permissible cable length, connecting the unit to other devices, is determined by the total resistance resulting from the addition of the cable resistance and that of the devices connected in series with the unit. This resistance should not exceed 500 ohms.

Terminal block diagram

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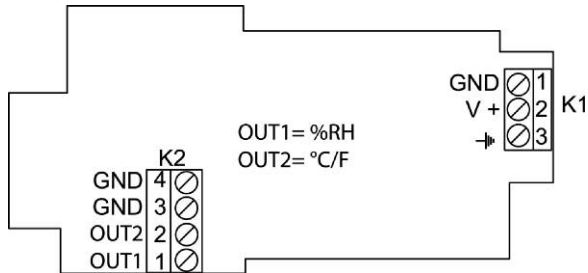
Terminals	Description
K1-1: GND	Power supply (-) or neutral (tied with other GND)
K1-2: V+	Power supply: 15…40 VDC (+) or 12…28 VAC (Phase)
K1-3: -►	Protective ground (see note below)
K2-4: GND	Ground (tied with other GND)
K2-3: GND	Ground (tied with other GND)
K2-2: OUT2	Temperature output (+)
K2-1: OUT1	Not used

Note: Terminals K1-3 or K6-3 (protective or earth ground) are not tied with GND. If so desired, K1-3 or K6-3 can be tied with GND by closing a solder pad on the PCB

Operation

6.4 Minimum load requirements for the TF53 with voltage outputs

The following requirements apply to any external device or circuit connected to the TF53 transmitter with voltage outputs:
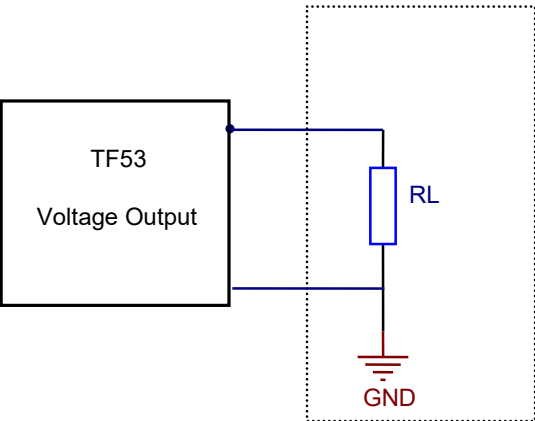

TF53 output signal	Input resistance RL
0…1V	>=1kOhm
0…5V	>=5kOhm
0…10V	>=10kOhm

In the situation where the external device uses an internal pull-up resistor the value of this resistor should meet the requirements shown below. It is also necessary to add a pull-down resistor RL connected to ground in order to be able to read 100% of the range of the TF53 voltage output.
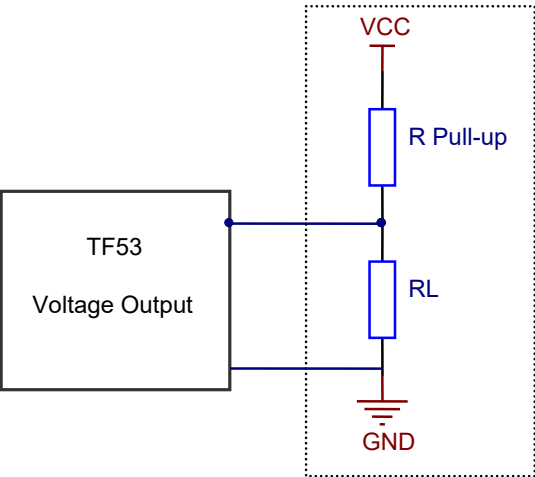
TF53 signal	VCC	R pull-up	RL
0…1V	3.3V	≥ 250 kOhm	1 kOhm

TF53 signal	VCC	R pull-up	RL
0…1V	5.0V	≥ 400 kOhm	1 kOhm
0…5V	5.0V	≥ 400 kOhm	5 kOhm

TF53 signal	VCC	R pull-up	RL
0…1V	10.0V	≥ 1 MOhm	1 kOhm
0…5V	10.0V	≥ 1 MOhm	5 kOhm
0…10V	10.0V	≥ 1 MOhm	10 kOhm

6.5 TF52 and TF53 transmitters (analog outputs)

If so desired, use the HW4 software to configure the TF5. Complete the mechanical and electrical installation and simply power up the TF5.
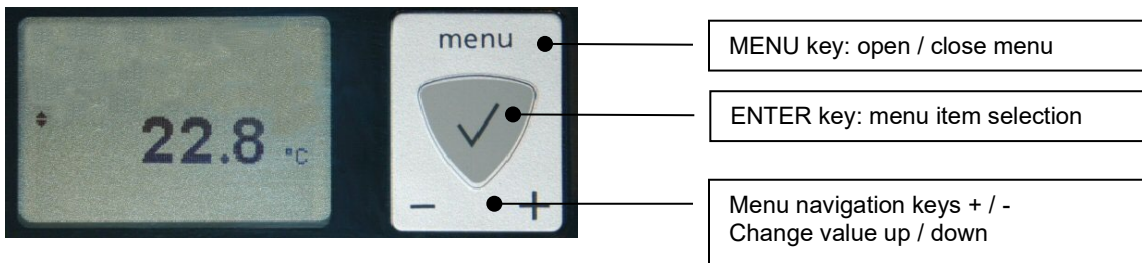
USB network connection

Prior to connecting the TF55 to a USB port you must install the ROTRONIC USB driver on the HW4 PC. For instructions see the HW4 manual **E-M-HW4v2-Main** (§ 6.3)

6.6 Internal menu (optional keypad and display)

Note: Unauthorized access to the menu can be prevented by disabling the "display menu" setting
(use the HW4 software > Device Manager > Display)

MENU key: open / close menu

ENTER key: menu item selection

Menu navigation keys + / -
Change value up / down

Main Menu	Menu Items	Selections / Information	Notes
Settings			
	Unit	°C / °F	Temperature
	Record	On / Off	Data recording (max. 2000 values)
	Back Light	Key Press / On / Off	Display backlight mode
Device Information			
	Version	Firmware version	
	Serial Nbr	Serial number	
	Address	RS-485 address	
	Type	Device type	
	Name	Device name	User defined
	SensorTest	Off	Not applicable to TF5
Temperature Adjust			
	RefValue	Temperature reference value	± 0.1 ˚C steps
	<Adjust>		1-point adjustment only (offset)

o **Record:** both the recording mode (start / stop and the log interval cannot be changed from the menu and are as configured with the ROTRONIC HW4 software

7   Maintenance

7.1   Service cable

- Cable AC3006 is used to connect the TF5 to a USB port of a PC running the ROTRONIC HW4 software.
- As an alternative, cable AC2001 is used to connect the TF5 to a probe input of the HP23 hand-held calibrator. For service purposes, the HP23 offers essentially the same functionality as the HW4 software.

7.2   Location of the service connector (mini USB type)

WARNING: the service connector is a UART interface with a mini-USB connector type. Do not connect the service connector directly to the USB port of a PC or hub.

The service connector can be accessed without opening the enclosure after removing the small red sealing cover.

The service connector is located at the bottom of the enclosure (black arrow)

7.3   Periodic calibration check

a) Procedure for adjusting the TF5 from the optional keypad

The optional keypad of the TF5 allows a 1-point adjustment of temperature against a reference. This has the effect of adding the same offset to all measured values. A 2-point adjustment is not possible from the keypad and requires using either a PC with the HW4 software installed or another instrument such as the HP23 hand-held calibrator.

- When temperature is stable, press the MENU key to show the internal menu on the display
- Use the (-) key to select Temperature Adjust and press the ENTER key
- Make sure that the text line beginning with RefValue is highlighted and press the ENTER key
- Use the (+) or (-) key to change the reference value as desired
- Use the (-) key to highlight the Adjust text line and press the ENTER key
- The TF5 confirms the adjustment with the message "Adjust OK"
- Press the MENU key twice to exit the menu and return the TF5 to normal operation

Notes:

o   The calibration point is automatically deleted from the TF5 memory after an adjustment
o   Because the TF5 has no real time clock, the date of the adjustment is not written to the TF5. If retaining the adjustment date is important, use the HW4 software to adjust the TF5.

b) Procedure for adjusting the TF5 with the ROTRONIC HW4 software:

- Use cable AC3006 to connect the service connector of the TF5 to a USB port of a PC with the HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC as explained in the HW4 manual **E-M-HW4v2-Main**.
- Start HW4 on the PC and search for the TF5 (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the TF5 with HW4, expand the device tree to see the TF5 functions.
  Select Probe Adjustment.
- For further instructions see HW4 manual **E-M-HW4v2-A2-001**

7.4   Validation of the output signals transmission

If so desired, transmission of the TF5 output signals can be validated by using the simulator function. The HW4 software is required to enable and configure this function. When this function is enabled the TF5 generates fixed digital and analog signals as specified by the user. For instructions see document **E-M-HW4v2-F2-017**

8   Firmware updates

Firmware updates will be available on the ROTRONIC website for downloading. Firmware files are given a name that shows both to which device the file applies and the version number of the firmware. All firmware files have the extension HEX. Procedure for updating the firmware:

- Use cable AC3006 to connect the service connector of the TF5 to a USB port of a PC with the ROTRONIC HW4 software installed. Note that the ROTRONIC USB driver must be installed on the PC as explained in the HW4 manual **E-M-HW4v2-Main**.
- Copy the firmware update file from the ROTRONIC website to the PC.
- Start HW4 software on the PC and search for the TF5 (HW4 Main Menu Bar > Devices and Groups > Search for USB Masters).
- After finding the TF5, expand the device tree to see the TF5 functions. Select Device Manager. In the Device Manager menu bar select Tools > Firmware Update. For instructions see document **E-M-HW4v2-F2-017**

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9   Technical data

9.1   Specifications

General	TF52	TF53
Device type	Humidity temperature transmitter with analog output signals	
Circuit type	2-wire, loop powered	3-wire

Power supply and connections	TF52	TF53
Supply voltage (VDD)	10…28VDC V min = 10 V + (0.02 x Load*) *Load resistance in ohms.	15…40 VDC or 12…28 VAC
Nominal current consumption	20 mA	< 30 mA
Electrical connections	Terminal block and M16 cable grip or ½" conduit adapter	
Polarity protection	Protective diode on V+	

Temperature measurement	TF52	TF53
External temperature probe	4-wire Pt100 RTD, IEC 751 1/3 class A or class B (see separate probe manual)	
Maximum measuring range	-100…600 °C / -148…1.112 °F (actual range depends on probe model)	
Measurement accuracy at 23 °C	±0.2 °C (based on an error free Pt100 RTD probe)	
Repeatability (typical)	0.05°C	
Long term stability (typical)	< 0.1°C / year	
Probe time constant	Depends on probe model (see separate probe manual **E-M-Pt100-Probes**)	

Start-up time and data refresh rate	TF52	TF53
Start-up time	3.4s (typical)	1.9s (typical)
Data refresh rate	3.4s (typical)	1.7s (typical)

Configurable analog outputs	TF52	TF53
Output 1	Not used	
Output 2	Temperature	
Factory default scale	As per ordering code	
Signal type	4…20 mA	0…20 mA 4… 20 mA 0… 1 V 0… 5 V 0… 10 V (user configurable)
User configurable scaling limits	-999.99 … +9999.99 engineering units	
Maximum offset at bottom of signal range	no offset	0…1V signal range : 3 mV 0…5 V signal range : 50mV 0…10 V signal range : 90mV 0…20 mA signal range : 4uA 4…20 mA signal range : no offset
Short circuit tolerant	Yes	
Maximum external load	500 Ω	500 Ω (current output)
Minimum external load	0 Ω	1 kΩ (0…1 V output) 5 kΩ (0…5 V output) 10 kΩ (0…10 V output) 0 Ω (current output)

Digital interface	TF55
Interface type	RS-485, USB and RS-485 or Ethernet (TCP/IP) wired or wireless and RS-485

Service connector	TF52	TF53
Interface type	UART(Universal Asynchronous Receiver Transmitter)	
Maximum service cable length	5 m (16.4 ft)	

General specifications	TF52	TF53
Optional display	LC, 1 or 2 decimals resolution, no backlight, trend and alarm indication	LC, 1 or 2 decimals resolution, backlight, trend and alarm indication
Probe material	Polycarbonate	
Probe dust filter material	Polyethylene	
Housing material	ABS	
Housing protection grade	IP 65 (except TF55 – USB or Ethernet)	
Physical dimensions	See dimensional drawings	
Weight	250 g (8.8 oz)	

E-M-TF5-V1_21	Rotronic AG
	Bassersdorf, Switzerland
Document code	Unit
HygroFlex TF5 Temperature Transmitter: User Guide	**Instruction Manual**
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Conformity with standards	TF52	TF53
CE / EMC immunity	EMC Directive 2004/108/EG: EN 61000-6-1: 2001, EN 61000-6-2: 2005 EN 61000-6-3: 2005, EN 61000-6-4: 2001 + A11	
Solder type	Lead free (RoHS directive)	
Fire protection class	Corresponds to UL94-HB	
FDA / GAMP directives	compatible	

Environmental limits	TF52	TF53
Storage and transit	-50…+70 °C / -20...+70 °C (models with display), 0…100 %RH, non condensing	
Operating limits at electronics	-40 … +60 °C / -10….60 °C (models with display), 0…100 %RH, non condensing	
Temperature limits at probe	Depends on probe model (see separate probe manual **E-M-Pt100-Probes**)	

10 Accessories

For accessories and parts such as the HW4 configuration software and service cables, please see documents **E-M-HC2-accessories** and **E-M-Pt100-Probes**

11 Supporting documents

Document File Name	Contents
E-M-Pt100-Probes	Pt100 RTD Probes for AirChip 3000 Temperature Instruments
E-M-HC2-accessories	Accessories and parts for probes, indicators and transmitters
E-T-AC3000-DF-V1	AirChip 3000 Description and Main Functions
E-M-HW4v2-DIR	List of the HW4 manuals
E-M-HW4v2-Main	HW4 software version 2: General instructions and functions common to all devices
E-M-HW4v2-F2-017	HW4 software version 2: TF5 transmitter Device configuration and AirChip 3000 functions
E-M-HW4v2-A2-001	HW4 software version 2: Probe Adjustment function AirChip 3000 devices
E-M-HW4v2-DR-001	HW4 software version 2: Data Recording Function AirChip 3000 Devices
E-M-AC3000-CP	AirChip 3000 Communication Protocol Options
E-DV04-RS485.01	RS485 Network Installation and Start-up Guidelines
E-M-TCPIP-Conf	Configuration procedures for ROTRONIC devices with Ethernet (TCP/IP) interface

Document File Name	Contents
E-M-CalBasics	Temperature and humidity calibration basics

Note: All document file names have an extension corresponding to the document release number (example of a first release: E-M-HW4v2-Main_10). This extension is not shown in the above table.

12   Document releases

Doc. Release	Date	Notes
_20	Mar. 5, 2010	Original release
V1_21	23.07.2015	Actualization as in ordering code