FTC130 Transmitter

Fast Thermal Conductivity Analyzer

Operating Manual

Warning!
“Warning” draws attention to application errors or actions that can lead to safety risks including the injury to persons or malfunctions – possibly even destruction of the device.

Note!
“Note” indicates an additional function or hint.

1. Intended Use

Only non-corrosive and condensate-, dust-, aerosol-, oil dust-free gases may be led in the FTC-series gas analyser. Flammable gases require appropriate protective measures. Explosive gases may not be led in the FTC.

The protection class of the FTC130 is IP65. The ambient atmosphere may not be corrosive.

The specifications of the device and its manual have to be observed strictly. Please fill out questionnaire (2.01.1FB180619MPL1) for registration of your measuring task, if your intended use does not comply with intended use described above. Based on the information given in the questionnaire we will examine the measuring task and possibly authorise it.

Note: Please keep this manual for future use.

2. Description

The transmitter FTC130 is a highly precise and stable Thermal Conductivity Detector (TCD).
For indication of the signal two 4mA to 20mA analog outputs are provided. The calibration of the device can be triggered by two protected push buttons on-site. For internal calibration, configuration and digital indication of the signal a RS232 communication is required. Our service program SetApp2.0 for Windows-PCs is available as a download from our homepage free of charge.
The thermal conductivity of a gas mixture depends on the individual gas components and on the composition of the mixture. Under certain conditions, therefore, the concentration of individual gas components can be determined by measuring the thermal conductivity. In other cases, the identification of certain properties of gases is of special interest e.g. for quality control or safety reasons. Often these properties are related to the thermal conductivity and thereby identified. The concentration can be determined with high precision if one of the following conditions is met:

- The gas mixture consists of only two components, for example measuring CO2 in N2 or H2 in N2.
- The gas mixture consists of more than two components but only concentrations of two components vary.
- The thermal conductivity of two of three constituents is similar, e.g. measuring H2 or He in a mixture of O2 and N2.

3. Measuring gases and ranges

Measu-ring Gas	Carrier Gas	Basic range	Smallest range	Smallest suppressed zero range
H_2	N_2 or air	0% - 100%	0% - 0.5%	98% - 100%
H_2	Ar	0% - 100%	0% - 0.4%	99% - 100%
H_2	He	20% - 100%	20% - 40%	85% - 100%
H_2	CH_4	0% - 100%	0% - 0.5%	98% - 100%
H_2	CO_2	0% - 100%	0% - 0.5%	98% - 100%
He	N_2 or air	0% - 100%	0% - 0.8%	97% - 100%
He	Ar	0% - 100%	0% - 0.5%	98% - 100%
CO_2	N_2 or air	0% - 100%	0% - 3%	96% - 100%
CO_2	Ar	0% - 60%	0% - 10%	-
Ar	N_2 or air	0% - 100%	0% - 3%	96% - 100%
Ar	CO_2	40% - 100%	-	80% - 100%
CH_4	N_2 or air	0% - 100%	0% - 2%	96% - 100%
CH_4	Ar	0% - 100%	0% - 1.5%	97% - 100%
O_2	N_2	0% - 100%	0% - 15%	85% - 100%
O_2	Ar	0% - 100%	0% - 2%	97% - 100%
N_2	Ar	0% - 100%	0% - 3%	97% - 100%
N_2	CO_2	0% - 100%	0% - 4%	96% - 100%
NH_3	H_2	0% - 100%	0% - 5%	95% - 100%
CO	H_2	0% - 100%	0% - 2%	99% - 100%
SF_6	N_2 or air	0% - 100%	0% - 2%	96% - 100%

Other gases and ranges on request.

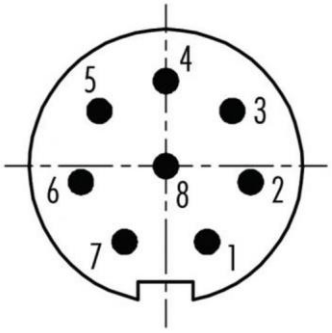
4. Scope of Delivery

- FTC130 TC-Transmitter
- Cable
- Parameter List

5. Electrical Connection

Connector 8-pins

Pin No.	Conductor colouring	Function	Description
1	white	Current Loop 1/2 return	4 to 20mA, floating, isolated ±500V to ground, max. 800 Ohm burden, 16 bit resolution
2	brown	Ground -	GND for pin 4
3	green	Serial Interface RS232	RxD (receive)
4	yellow	Power Supply	+ 24V (18V to 36V), max. 700mA
5	grey	Serial Interface RS232	TxD (transmit)
6	pink	Serial Interface RS232	GND for pin 3, 5
7	blue	Current Loop 2 send	4 to 20mA, floating, isolated ±500V to ground, max. 800 Ohm burden, 16 bit resolution
8	red	Current Loop 1 send	



1 weiß/*white*
2 braun/*brown*
3 grün/*green*
4 gelb/*yellow*
5 grau/*grey*
6 rosa/*pink*
7 blau/*blue*
8 rot/*red*

5.1. Ground

The cable shield should be connected to functional ground. Dependent on the circumstances gas inlet and gas outlet might need to be grounded in addition.

To comply with EN 60204-1, the power supply must be connected to a PE ground conductor (protective ground).

Connections to ground should be made with low-resistant, large diameter, short cables to one neutral point.

6. Pneumatic Connection

Gas inlet and outlet tubes are labelled on the housing. Gas inlet and outlet tubes – as well as the body - are made of stainless steel (LF316ti). The outer diameters of the tubes are 6mm. The gas must not contain dust, condensate and potentially condensing matter. The inner gas duct is heated up to 63°C (hotter versions on demand) depending on mounting, thermal insulation and sample flow and temperature, condensation may occur from the actual ambient temperature up to 63°C. With proper heated lines and connections a dew point up to 55°C is permissible.

!!! Important !!!
Condensate will destroy the sensing element immediately (condensate tolerant version on request).

Optimal flow is in between 60l/h and 80l/h. If the flow is kept stable during measurement as well as during calibration a range from 10l/h to 150l/h is possible.

7. Mounting

The FTC130 is designed for wall fastening. M4 cylinder head bolts fit for the four mounting holes.
See Appendix A for a detailed dimension drawing.

8. Current outputs

The FTC130 is equipped with two current outputs 4mA to 20mA.
They are set up by Messkonzept after the customer requests upon order.

9. Communication with the FTC130 Transmitter

9.1. Remote Control via Serial Communication

The FTC130 is equipped with a RS232-interface. A dedicated manual is available. Please ask Messkonzept for the manual “Remote Control via Serial Communication”.

9.2. SetApp2.0

Messkonzept offers a software for the operation of our devices. It enables monitoring of measuring values and managing the settings of the FTC devices. Especially for the OEM series the SetApp2.0 makes calibration, setting thresholds and other things much easier. The SetApp2.0 can be found on our website in the download section.[1]

10. General Information on calibration

Messkonzept uses gases with the following purities for calibration:

H_2	He	N_2	Ar	O_2	CO_2	CH_4
5.0	5.0	5.0	4.6	4.5	4.5	3.5

The gas purities are selected such that the devices comply with the specifications for the smallest measuring range. Messkonzept recommends gases of same purity for calibration on-site. For differing requirements of one’s own, opt for an appropriate gas purity. Please contact us for advice.

We recommend a calibration or a check of the calibration if one of the following criteria is met:

- After bringing into service
- On a regular cycle, depending on the precision aimed for. To find out the appropriate time between calibrations, we recommend to begin with a more frequent check of the calibration. The time between calibrations can range between
  -several months for a measuring task in the Vol.% range
  -days to weeks for a measuring task in the sub-Vol.% range
  -to directly before every measurement if highest accuracy is needed.
- After a drastic change in pressure, temperature, or flow

The goal of the calibration is that the measured concentration is in agreement with the given test gas concentration.
To obtain this, two calibration parameters that correspond to the gain and the offset of a linear equation are available.
A two-point calibration requires two test gases. Both calibration parameters, offset and gain, are adjusted. The concentration of the test

[1] www.messkonzept.de

gases does not have to meet the beginning and the end of the measuring range, a difference of ±10% is permitted.
The menu sequence is designed such that prior to a gain always an offset calibration has to be done first.
Usually a single point calibration determining a new offset value is sufficient to obtain a good calibration. In this case a test gas of any concentration in the measuring range is feasible.
For two point calibrations it is preferable to use the lower concentration for the offset calibration and the higher concentration for the gain calibration.

11. Calibration via Push-buttons

The transmitter is equipped with two covered push-buttons. Press the button with a narrow object with rounded tip for one second.
The buttons are labelled with “Offset” and “Gain”. Button “Offset” triggers the offset calibration. Button “Gain” triggers the gain calibration. After pressing the buttons, a sampling phase of 10 sec is started. Thus, do not change the gas flow in this time.
Prior to the calibration the concentration of the gas in the mixture used for the offset-calibration and gain-calibration *both* have to be written to the device, or checked respectively. There are two possibilities:
1.) Service program SetApp2.0, see Chapter 10.2 in the manual for the program.
2.) RS232 interface, see Chapter 10.1 in the manual “Remote control via serial communication”.

Note!
Always do an offset calibration first before doing a gain calibration!
Often an offset calibration alone is sufficient for a proper performance of the device.

12. Specifications

Dimensions with connectors; weight	B=144mm, H=50mm, D=50mm; up to 700g
Power supply	24V DC (18V to 36V), 700mA
RS232 - Baudrate / Data	19200 / 8bit
Ambient temperature range	-5°C to 50°C, other on request
Linearity	< 1% of range
Warm up time	Approx. 20min; 1h for small ranges
Flow rate	10l/h-150l/h, recommended 60l/h to 80l/h
T90-time	<1sec at flow rate higher 60l/h
Noise	< 1% of smallest range
Drift at zero point	< 2% of smallest range per week
Repeatability	< 1% of range
Error due to change of ambient temperature	< 1% of smallest range per 10°C
Error due to change of flow at 80l/h	< 1% of smallest range per 10l/h
Gas pressure (absolute)	80kPa (0.8 bar) to 2000kPa (20bar)
Error due to change of pressure (above 800hPa)	< 1% of smallest range per 10hPa

Note: The values given above refer to H2 in N2, they may vary for other gas pairs.

Appendix A Dimension Drawing