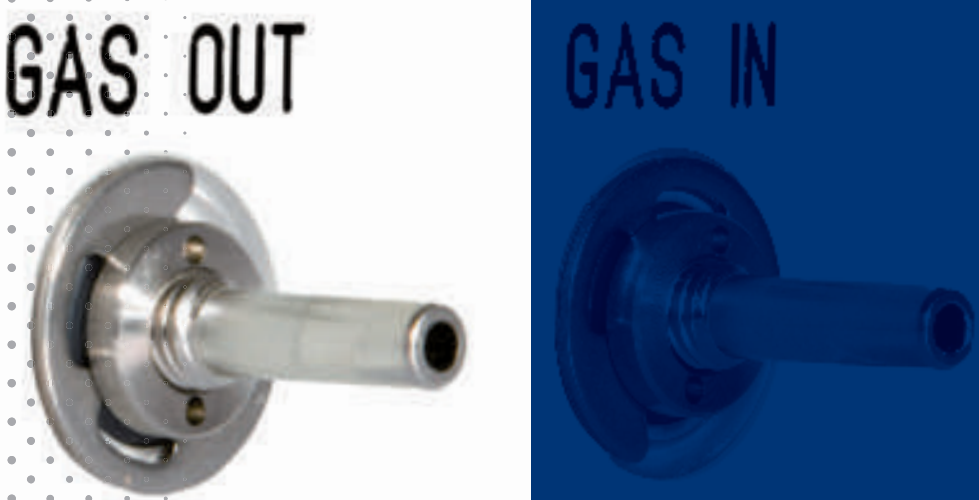
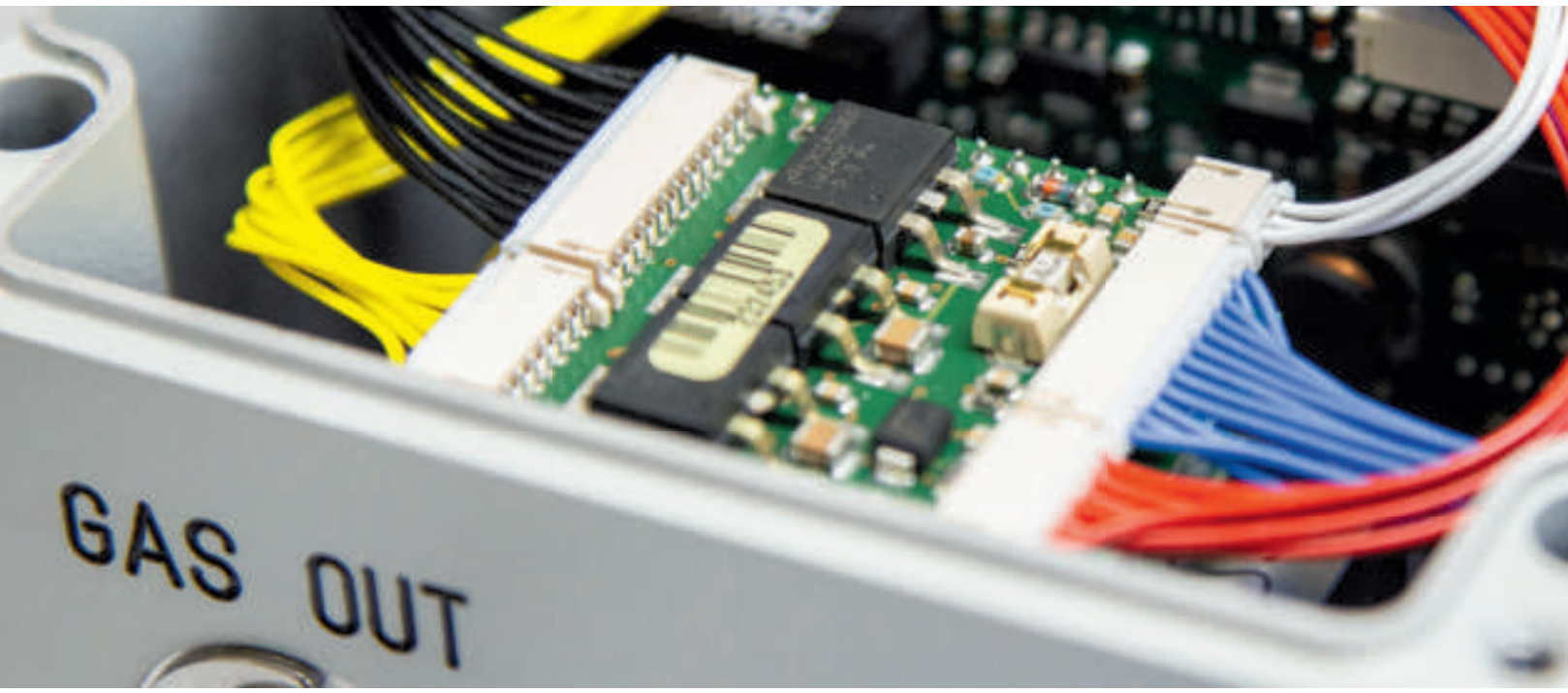
messkonzept
ANALYTICAL TECHNOLOGY



GAS ANALYSIS



Messkonzept – gas analysis since 2000

- High level of quality and good service at a reasonable cost
- All devices are low-maintenance and simple to operate
- Detailed documentation
- Competent consultation and support
- Well-equipped application laboratory
- Experienced employees prepare short-term, customer-specific solutions
- Experts with superb application knowledge
- Fast reaction on inquiries
- Competent technical consulting and assistance
- Customized development

Areas of application

Our analyzers, OEM's and transmitters are used in many sectors and for different applications

- Process monitoring in chemical and process engineering
- Development and operation of fuel cells
- Power-to-Gas processes
- Filling of pure gases and gas mixtures
- Incoming goods inspection of gases
- Monitoring and verification of gas mixers
- Monitoring of turbo-generators
- Air separation
- Atmosphere monitoring in heat-treatment furnaces
- Atmospheres in fruit storage facilities
- Feed-in ring lines
- Analysis of complex gas mixtures
- Optimization of catalyzers
- Measurement in combined heat and power units
- Detection in elementary analyzers
- Recovery of helium
- Medical applications

Measurement components and ranges

Measurement components and ranges for FTC400, FTC300, FTC160 and FTC130

Note: All measuring ranges are given in Vol.%

Measurement Component	Carrier Gas	Basic Range	Smallest Range	Smallest Range with suppressed Zero Point	Multi Gas Mode MGM
H_2	N_2 or air	0% - 100%	0% - 0.5%	98% - 100%	Yes
O_2	N_2	0% - 100%	0% - 15%	85% - 100%	Yes
He	N_2 or air	0% - 100%	0% - 0.8%	97% - 100%	Yes
CO_2	N_2 or air	0% - 100%	0% - 3%	96% - 100%	Yes
N_2	Ar	0% - 100%	0% - 3%	97% - 100%	Yes
O_2	Ar	0% - 100%	0% - 2%	97% - 100%	Yes
H_2	Ar	0% - 100%	0% - 0.4%	99% - 100%	Yes
He	Ar	0% - 100%	0% - 0.5%	98% - 100%	Yes
CO_2	Ar	0% - 60%	0% - 10%	-	Yes
Ar	CO_2	40% - 100%	-	80% - 100%	Yes
CH_4	N_2 or air	0% - 100%	0% - 2%	96% - 100%	Yes
CH_4	Ar	0% - 100%	0% - 1.5%	97% - 100%	Yes
Ar	O_2	0% - 100%	0% - 3%	96% - 100%	Yes
N_2	H_2	0% - 100%	0% - 2%	99.5% - 100%	Yes
O_2	CO_2	0% - 100%	0% - 3%	96% - 100%	Yes
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%	
SF_6	N_2 or air	0% - 100%	0% - 2%	96% - 100%	
NO_2	N_2 or air	0% - 100%	0% - 5%	96% - 100%	
H_2	O_2	0% - 100%	0% - 4%	97% - 100%	
Ar	Xe	0% - 100%	0% - 3%	99% - 100%	
Ne	Ar	0% - 100%	0% - 1.5%	99% - 100%	
Kr	Ar	0% - 100%	0% - 2%	96% - 100%	
R125	N_2 or air	0% - 100%	0% - 4%	98% - 100%	

Table 1

Measurement components and measuring ranges for FTC300HT (High Temperature)

Measurement Component	Carrier Gas	Basic Range	Smallest Range	Smallest Range with suppressed Zero Point	Multi Gas Mode MGM
CO_2	Ar	0% - 100%	0% - 8%	70% - 100%	Yes
NH_3	N_2	0% - 70%	0% - 3%	55% - 70%	Yes
C_2H_4	N_2	0% - 100%	0% - 10%	60% - 100%	Yes
H_2O	N_2	0% - 20%	0% - 4%	16% - 20%	

Table 2

In addition all measurement and carrier gases given in table 1 are also available

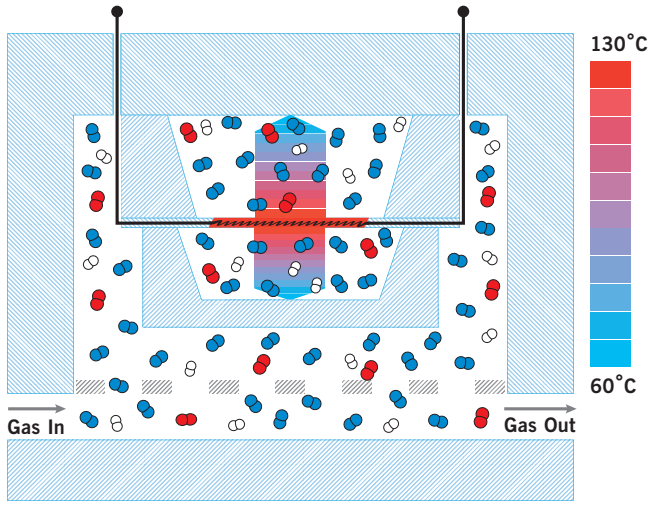
Gas analysis with the thermal conductivity technology

A mixture of gases with different thermal conductivity has a thermal conductivity dependent on the concentration of the components. The measurement of the thermal conductivity of the mixture provides the concentrations of the individual gases.

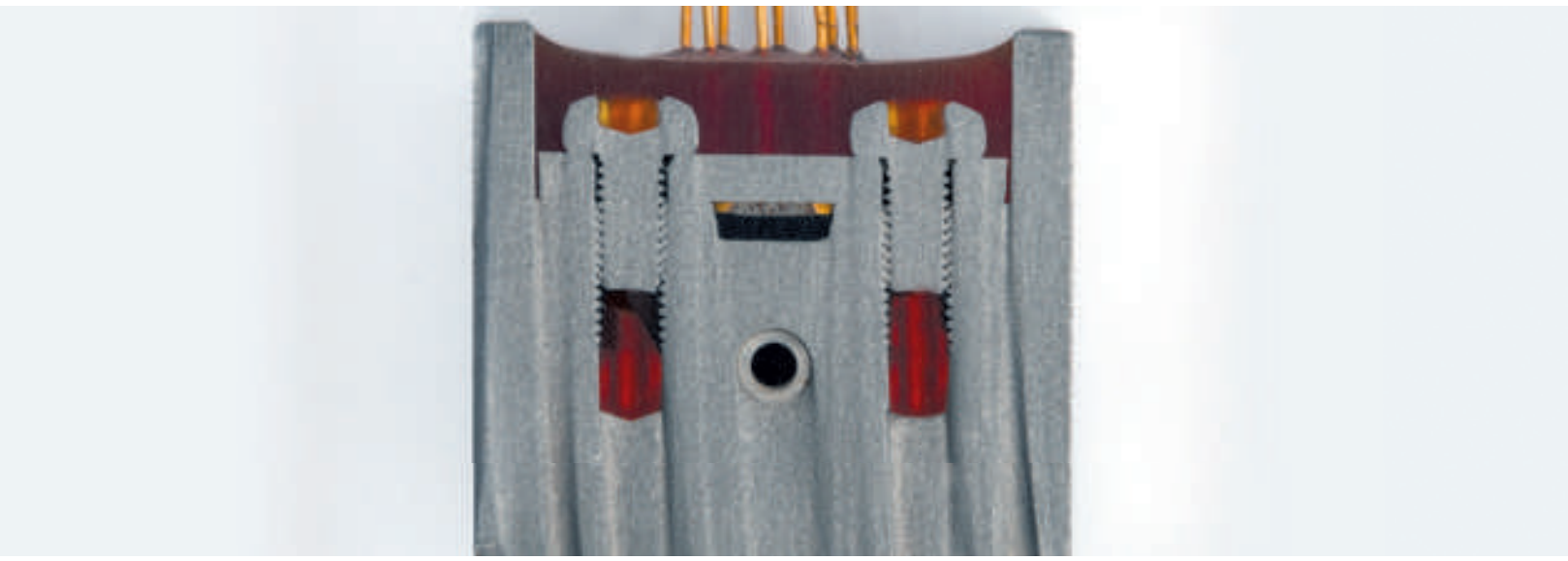
Today the thermal conductivity detector (TCD) is employed in particular for the determination of homonuclear gases (H_2, N_2 etc.) and rare gases (He, Ar, Ne, Kr etc.), which are not accessible to other simple and rugged online analysis procedures.

This method works best for gases with a wide difference in thermal conductivity and in addition, when one of the three following criteria is met:

1. The gas mixture includes only two components (binary mixture), for example the measurement of CO_2 in N_2 or H_2 in N_2.
2. The gas mixture includes more than two components, but only the concentrations of two components of the gas mixture vary.
3. The thermal conductivity of two or more component parts are similar, e.g. measurement of H_2 or He in a mixture such as air, which consists of O_2 and N_2 (quasi-binary gas mixtures).



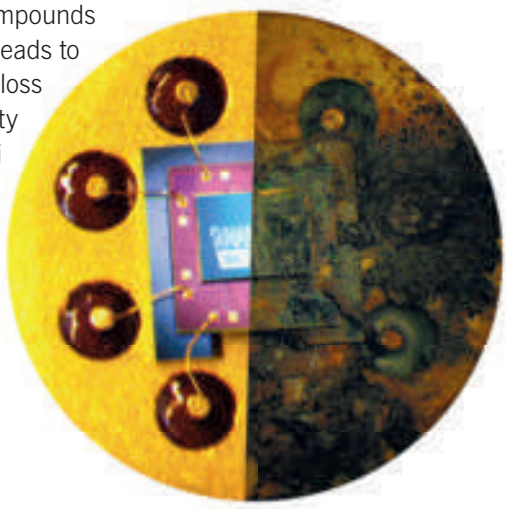
Options and knowledge



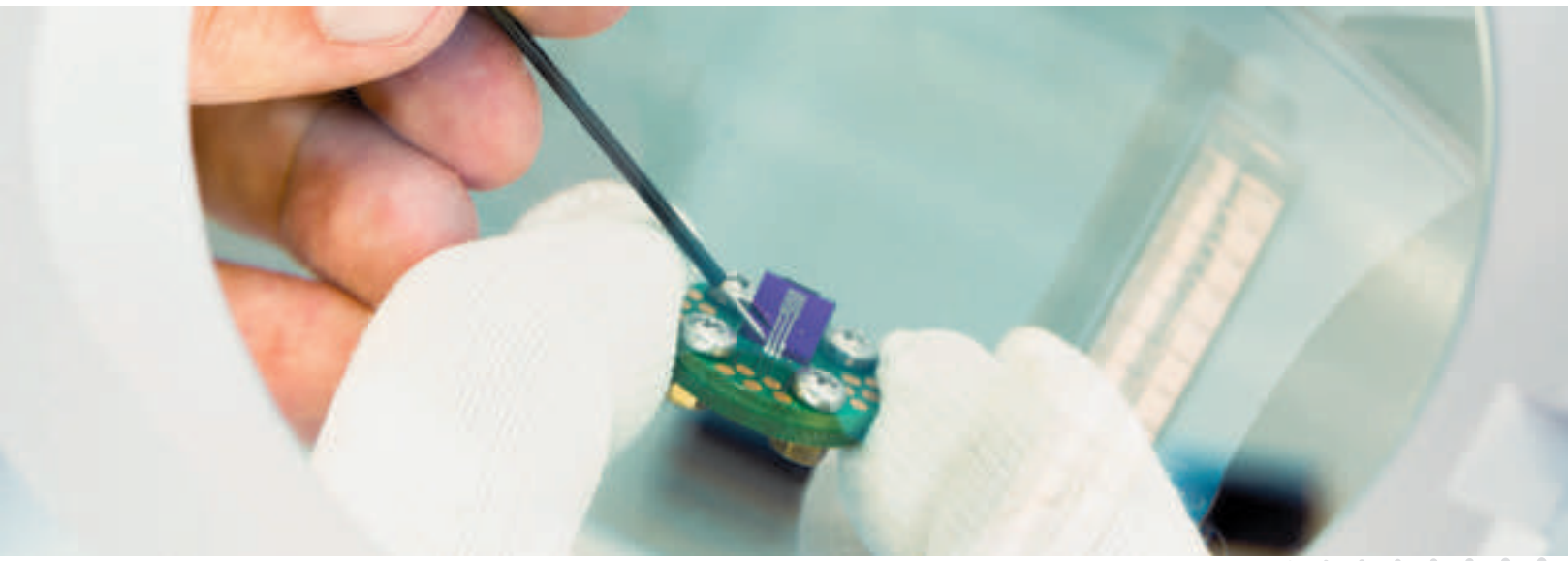
Corrosion protection

Only high-quality materials, such as stainless steel 316Ti and ceramics, as well as inert polymers, are exposed to the measurement gas

In particular, together with humidity, some gases form compounds which can cause corrosion of parts in the gas path. This leads to impaired measurement accuracy and possibly even to the loss measurement capability. Therefore only very high-quality materials are used, such as rust-free stainless steel 316Ti and O-ring of highly-resistant fluoroelastomers. However, the micro-mechanical sensor element offers gases with high corrosion potential a contact surface. To prevent this, Messkonzept has developed an effective coating which is used for applications with corrosive gases.

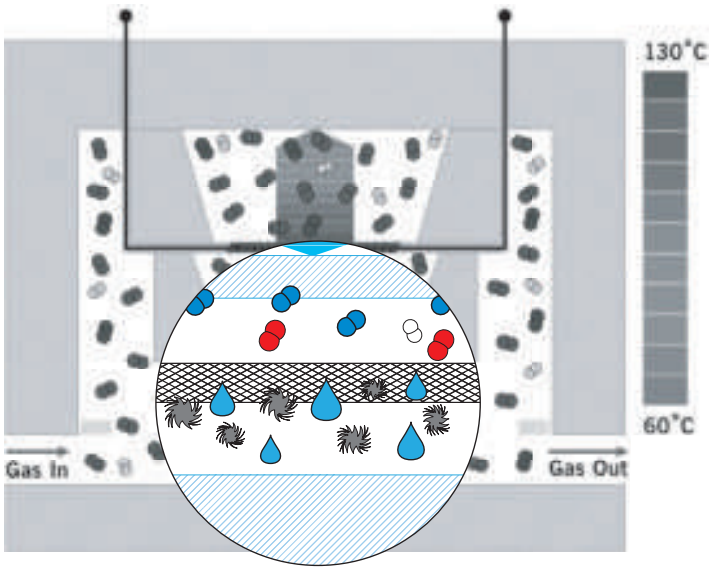


Options and knowledge



Condensate and dust protection

The sensor element is separated from the actual sample flow with a hydrophobic filter with pore size in the µm range, which is impermeable to condensate and dust. The gas exchange of atoms and molecules of the measurement gas occurs by diffusion, almost without delay.

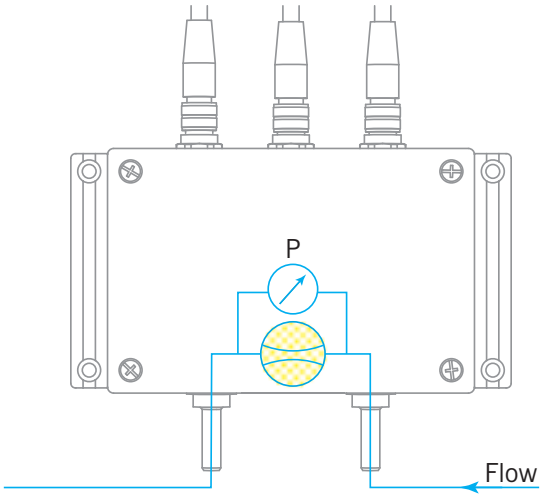


Options and knowledge

Integrated flow rate metering

Flow measurement, independent of gas type, for binary mixtures in the range 0 to 130l/h

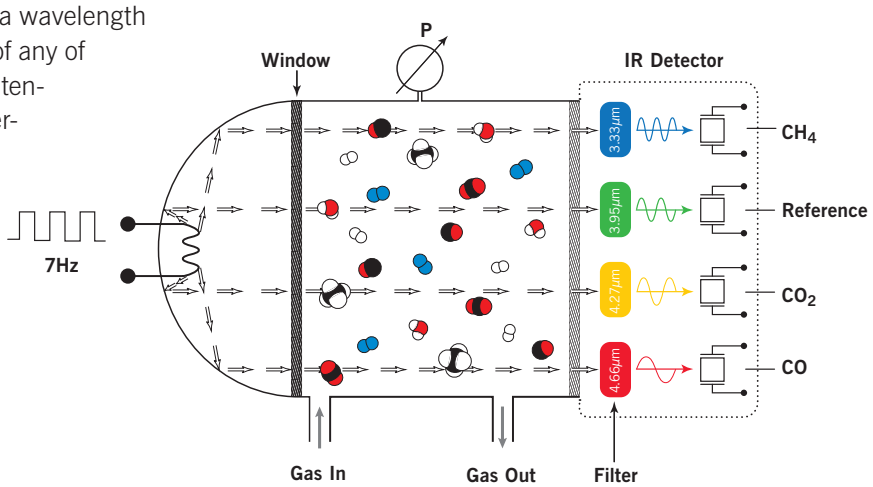
A very sensitive measurement of the pressure drop over a laminar flow-restrictor provides a measurement of the gas flow. This pressure drop, however, also depends on the type of gas. Since the composition of the gas is known from the thermal conductivity measurement, the gas dependence of the flow measurement is compensated by calculation. In this way, a flow-through measurement is provided which no longer depends on the type of gas.



Integrated infrared measurement

Selective measurement of infrared-active gases

Molecules like CO_2, CH_4, C_2H_6, CO, NO, SO_2 and H_2O absorb infrared radiation. The range of absorption in the wavelength spectrum is a “fingerprint” for the identification of the sort of molecules. The level of absorption is a measure of the concentration of the gas concerned. The selective measurement of up to three infrared-active gases in one mixture is enabled by a detector, which tests the absorption with three interference filters at three different wavelengths. The selection of the interference filters thus determines which gases are analyzed. A fourth measurement channel is in a wavelength range where no absorption of any of the gases occur. Thus the intensity of the IR radiator is determined and serves as a reference. The combination of the IR measurement with the thermal conductivity measurement enables the complete determination of complex gas mixtures in many cases.

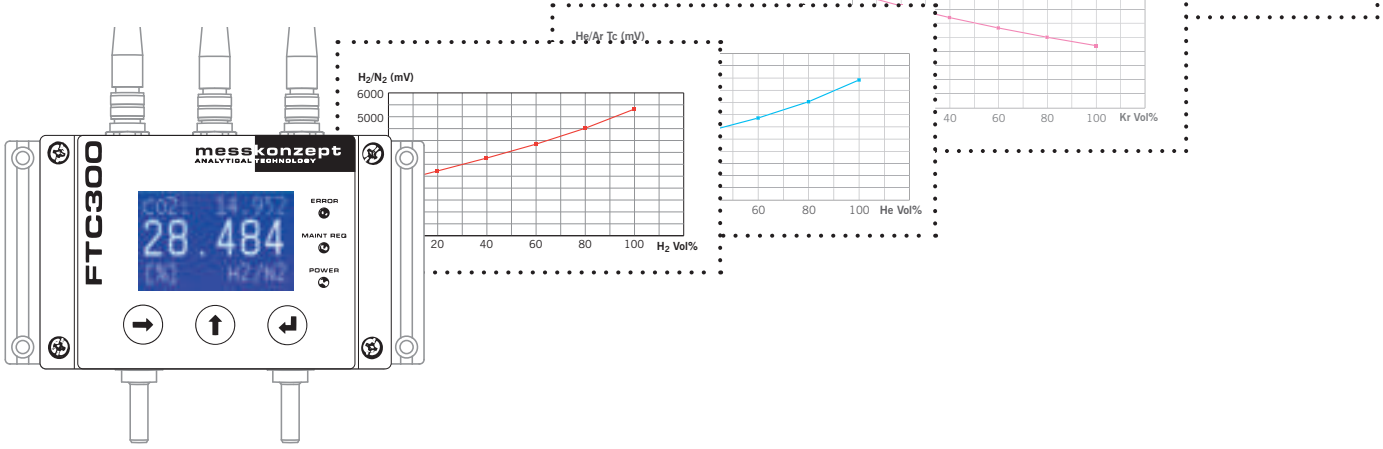


Options and knowledge

Multi Gas Mode

Each device can be enabled to measure up to 16 different (quasi-) binary mixtures, easy adaption to the one of interest

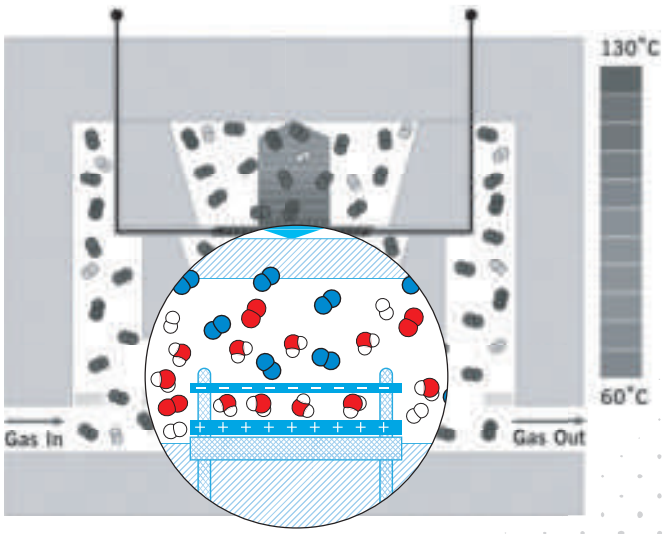
Often it is desirable to cover different measurement tasks – such as the measurement of different gases and gas mixtures – with one measuring device. The so-called Multi Gas Mode (MGM) has been developed for this type of application. The linearization and calibration data are stored for up to 16 gas pairs. Simple changeover on the operating panel or by remote control activates the respective gas pair and the measurement is implemented. Binary gases marked with MGM in Table 1 and 2 are stored as standard in FTC devices. New Customer-specific applications can be added.



Integrated humidity measurement

Moisture measurement with a capacitive sensor in the range 0-20Vol.%

Frequently gases which are to be measured in analysis technology are loaded with humidity. If the humidity content is not of interest and remains relatively constant, its influence on the reading can be taken into account by proper calibration. However, if humidity itself is of interest as a measurement value or if a fluctuating humidity content induces a cross sensitivity, the capacitive humidity sensor should be integrated. Its reading can be used for cross sensitivity compensation.



Options and knowledge

Glass bead filling, measurement of inflammable gases

The hollow spaces in the enclosure are filled with small glass beads in order to minimize the available volume

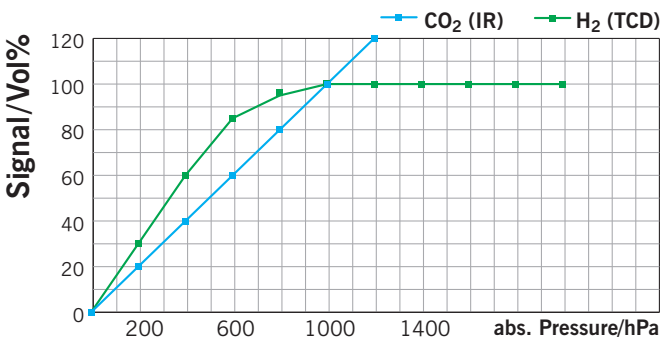
The safe handling of inflammable gases and the appliance of installations suitable for this are the responsibility of the system builder and the operator of the system. In particular, the measurement gas path is to be checked for sealing before the operational startup of the analyzer. If inflammable gases should be routed into an analyzer of the Co. Messkonzept, we urgently recommend to selecting the glass bead filling option. These 0.6mm diameter beads are shaken up so that all hollow spaces within the housing are filled. In the unlikely event of leakage in the interior gas path of the analyzer, there is only a minimum free remaining volume present within the housing.

Integrated pressure compensation

Any influence induced by fluctuating measurement-gas pressure is corrected

The IR signal changes naturally in proportion to the absolute pressure. Below 800hPa absolute, the thermal conductivity signal (TCD) has a strongly increasing pressure dependence as well. In order to compensate for this influence, a measurement of the absolute pressure can be integrated. Using the pressure influence experimentally determined beforehand, the influence is then corrected.

Pressure Dependence



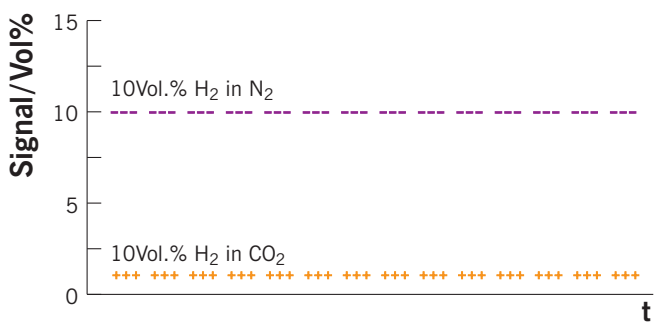
Options and knowledge

Cross-sensitivity compensation

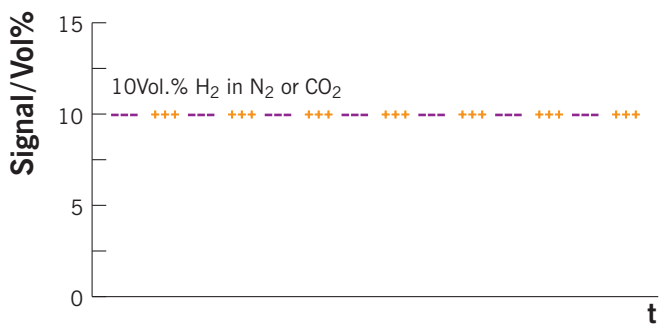
Modeling of the cross sensitivity and additional measurements allow the complete determination of complex gas mixtures

The thermal conductivity measuring method, combined with other gas-analysis methods, provides the input signals for a computational compensation process which was modeled beforehand in an experiment. Up to now, systems with several analyzers were to determine the various input signals. By means of the integrated IR and humidity measurement, as well as the internal computing capacity, an integrated solution for the determination of homonuclear and noble gases in complex gas mixtures is achieved.

Signal without Compensation



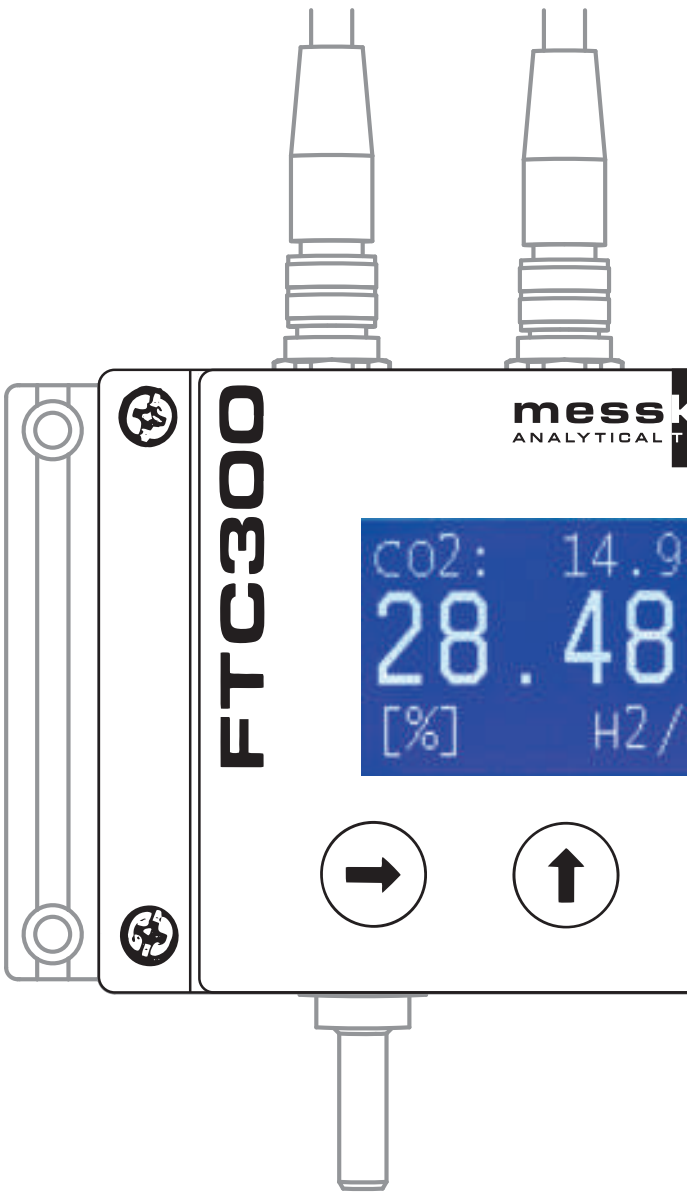
Signal with Compensation



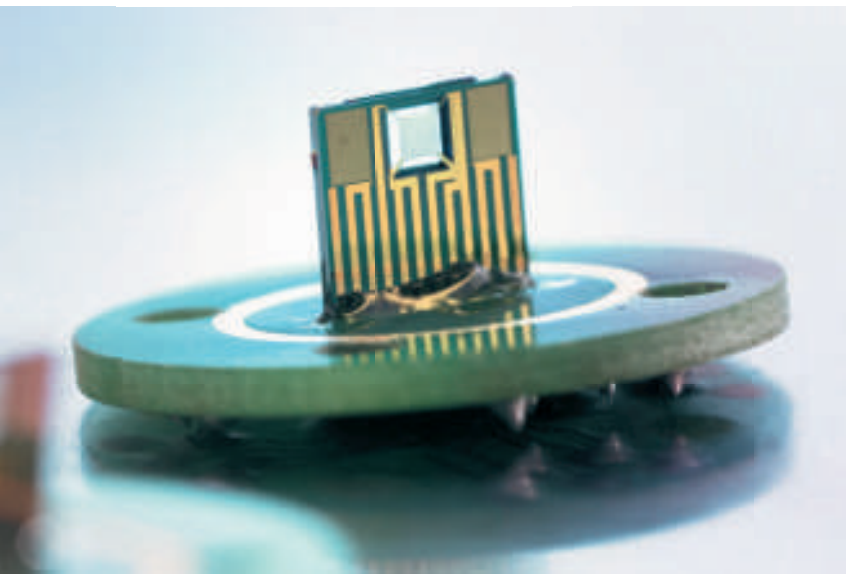
FTC300

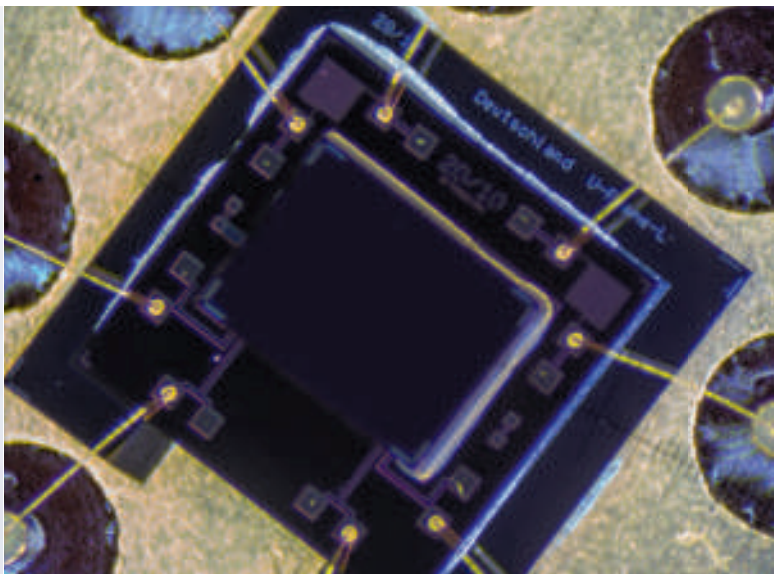
Precise analysis of (quasi-) binary gas mixtures

- Analysis by means of thermal conductivity for up to 16 (quasi-) binary mixtures in one device, easy adaption to a new measurement task
- Thermal conductivity analyzer with exceptional characteristics
- High measurement accuracy and stability
- Convenient operating menu provides e.g. simple calibrations and the adjustment of alarms



Measuring devices





FTC300HT

H_2O

Version of the FTC300 with higher measurement gas temperature

- Analysis by means of thermal conductivity for up to 16 (quasi-) binary mixtures in one device, easy adaption to a new measurement task
- As a result of measurement with increased gas temperature, the measurement characteristics of the device are improved for some applications such as **C_2H_4 in N_2 | CO_2 in Ar | NH_3 in N_2 | H_2O in N_2** *see Table 2.*
- The higher temperature of the gas path reduces the relative humidity. Condensation and corrosion are thereby diminished.

FTC300flow

Analyzer with gas-type-independent flow rate metering

It has the measurement characteristics of the FTC300 and additionally offers a flow measurement

- Analysis by means of thermal conductivity for up to 16 (quasi-) binary mixtures in one device, easy adaption to a new measurement task
- The precisely measured gas composition is used for the correction of a gas-type-dependent flow measurement
- The flow monitoring guarantees that the gas in the analyzer actually corresponds to the process gas
- The measured flow can also be used for the flow control

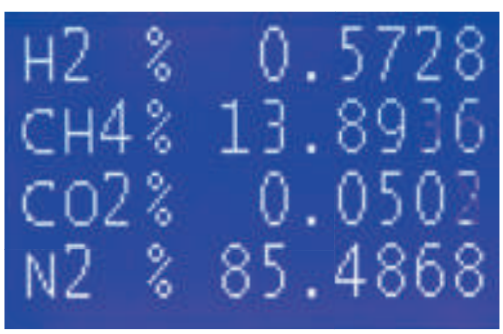
There are two versions with identical hardware:

Flow measurement: Precise measurement of the gas flow through individual adjustment.

Flow monitor: Monitoring whether a proper gas flow is present. Less accurate, since it is not individually adjusted.

Measuring devices

FTC400



Online analysis of complex gas mixtures

The analysis of the thermal conductivity is combined with an integrated multi-channel infrared measurement

Technology used:

Thermal conductivity for
H_2, N_2, He, Ar, Ne, Kr, Xe...

Infrared for
CO_2, CO, CH_4, H_2O, NO, SO_2, SF_6, HC...

- Up to 3 infrared active gases are to be measured and indicated
- Cross-sensitivity compensation for up to 2 IR-active gases
- IR measuring ranges on request

FTC130

Transmitter for extractive gas analysis

Precise analysis of (quasi-) binary gas mixtures

- Easily operated using RS232 interface
- Analysis by means of thermal conductivity for up to 16 (quasi-) binary mixtures in one device, easy adaption to a new measurement task
- Output current 4-20mA, potential free
- With covered push-buttons for calibration in the field

FTC160

Transmitter for non-extractive gas analysis

Precise analysis of (quasi-) binary gas mixtures

- For direct attachment to a tank or line (M30x1,5), the process gas diffuses in the detector
- Easily operated using RS232 interface
- Analysis by means of thermal conductivity for up to 16 (quasi-) binary mixtures in one device, easy adaption to a new measurement task
- Output current 4-20mA, potential free

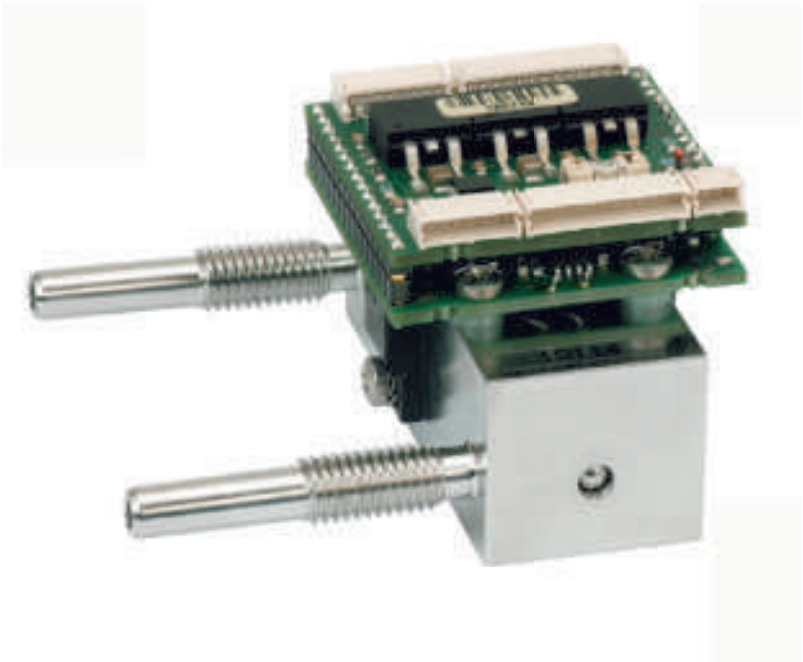
OEM

The FTC200 and FTC200-flow analyzers are also available as OEM versions.

- The FTC200-OEM is the OEM version of the FTC300
- The FTC200flow-OEM is the OEM version of the FTC300flow

The characteristics of the OEM devices are similar to corresponding analyzers, *see table 3*. Differences in the characteristics are given below:

- Dimensions WxHxD: 64x40x75mm^3
- Weight: 350g
- No relays
- No output current
- Option for inflammable gases unavailable
- No protection class



SetApp2.0

SetApp2.0 is a service program for the operation of all our devices. It can be download from our homepage for free.

SetApp2.0 offers:

- Logging of the concentration of the measurement component
- Calibration of the measurement component
- Fault and alarm management
- Upload and download of file with the device setting data for update and backup copy

In addition to the device settings, this file contains many measurement values and intermediate steps of the analysis. Values are often very helpful for us and allow on-site diagnostics for troubleshooting.

Comparison of the devices

Product	FTC400	FTC300	FTC300flow	FTC160	FTC130
General:					
Measurement process	Thermal conductivity, 3xIR, measurement gas pressure	Thermal conductivity	Thermal conductivity, measurement gas flow	Thermal conductivity	Thermal conductivity
Sampling	Analyzer extractive	Analyzer extractive	Analyzer extractive	Transmitter non-extractive	Transmitter extractive
Connection	6mm pipe	6mm pipe	6mm pipe	M30x1,5	6mm pipe
Dimensions (WxHxD in mm³)	145x80x85	145x80x85	145x80x85	max. 53x53x53	144x50x50
Protection class	IP 65	IP 65	IP 65	IP 65	IP 65
Pressure-proof to	2bar absolute	20bar absolute	2,5bar absolute	20bar absolute	20bar absolute
Power supply	18V to 36V DC/700mA	18V to36V DC/700mA	18V to 36V DC/700mA	18V to 36V DC/700mA	18V to 36V DC/700mA
Ambient temperature range	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C
Weight	to 1800g	to 1800g	to 1800g	to 500g	to 700g
T90 time at 60 l/h	<1sec	<1sec	<1sec	2s bis 6s[1]	<1sec
Communication					
RS232	Yes	Yes	Yes	Yes	Yes
Current output	1x, 0/4-20mA	1x, 0/4-20mA	1x, 0/4-20mA	1x, 0/4-20mA	2x, 0/4-20mA
Voltage output	2x, 0-10V	2x, 0-10V	2x, 0-10V	--	--
Display	Yes	Yes	Yes	--	--
Relays	3x	3x	3x	--	--
Service program SetApp2.0	Yes	Yes	Yes	Yes	Yes
Calibration on site	Yes	Yes	Yes	Yes	Yes
Options					
Flow measurement	--	--	Yes	--	--
Flow monitor	--	--	Yes	--	--
Infrared measurement	Yes	--	--	--	--
Multi Gas Mode	Yes	Yes	Yes	Yes	Yes
Protection against corrosion	limited	Yes	limited	Yes	Yes
Protection against condensate and dust	limited	Yes	limited	Yes	Yes
Suitable for inflammable gases	Yes	Yes	Yes	Yes	Yes
Moisture measurement	--	Yes	--	--	--
Cross-sensitivity compensation	Yes, integrated	Yes, external signal required	Yes, limited, external signal required	--	--

Table 3

[1] *Depending on the type of gas*

Specifications gas analysis

	For all devices: Thermal conductivity measurement	FTC400: Infrared measurement
Noise	< 1% of smallest range	< 1% of smallest range
Drift at zero point per week	< 2% of smallest range	< 2% of smallest range
Repeatability	< 1% of smallest range	< 1% of smallest range
Non-linearity	< 1% of range	< 1% of range
Measuring error with ambient temperature change per 10°K	< 1% of smallest range	< 1% of smallest range
Measuring error at flow change (Gas flow=60l/h) per 10l/h	< 1% of smallest range	< 1% of smallest range
Fault with measurement gas change (Pabs > 800 hPa) per 10 hPa	< 1% of smallest range	< 1% of smallest range

Table 4

Flow specification

	FTC300flow: Flow measurement	FTC300flow: Flow monitor
Measuring range (MB)	0-130l/h	0-130l/h
Noise	<2% of range	<2% of range
Drift weekly	<±1% of range	<±1% of range
Repeatability	<1% of range	<1% of range
Non-linearity	<3,5% of range	<10% of range
Measuring error in case of change-temperature modification per 10°K	<0,1% of range	<0,1% of range
Fault with pressure change measurement gas per 10 hPa	<0,1% of range	<0,1% of range
T90-time	5sec	5sec

Table 5

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ANALYTICAL TECHNOLOGY

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