Process Analytics and Sensors

Here you will find a selection of instruments for process analytics, as well as sensors and monitors, which are suited for laboratory and mini-plant technology.

All sensors are suited for deployment with the Lab- and MSR/PMC managers.

Notice:
In case of interest, please contact us for information regarding special topics such as VIS-, NIR- or US-Spectroscopy.

A	Process Analytics (In-Situ)	
F	Flow Rate (liquid and gas)	
m	mass flow (liquid and gaseous)	
M	Humidity	
L	Filling Level, Phase Limit	
P	Pressure	
Q	Quality (pH, Redox, Turbidity)	
S,G	Rotational Speed and Position	
T	Temperature	

MoleculeEye® ATR-FTIR-Spectroscopy

Online-Monitoring of Reactions via ATR-FTIR Spectroscopy

MoleculeEye ATR-probe in a MultiLab 250 ml reactor

In order to be able to follow reactions, a great number of online-sensors are available. The majority of these however have one great disadvantage: they are not able to deliver substance-specific information. Spectroscopic methods are able to fill this gap. One of these is the Fourier Transformation-Infrared Spectroscopy (FTIR). Due too its very high absorption speed, this represents one of the most effective methods.

IR-spectrometers, both in regard to quality and quantity, deliver outstandingly well evaluable spectrums, which also deliver utilisable information about unknown substances.

Due to the narrow absorption band in the middle infrared band, this method is also suited for multi-component analysis. In addition, it is also able to deliver information about transition conditions of a reaction, regardless whether this concerns an enzyme or a catalyst, via intermediates or transient aggregates. It is even possible to still gain information about individual substances out of multi-component mixtures.

All IR-active substances are detectable. As there are only a few non-IR-active substances (pure elements, a few simple compounds), this method is universally deployable.

To draw samples and to transport them into the laboratory is the classic method – but it is laborious and time-consuming.

With an ATR-probe, the laboratory is virtually directly brought into the reactor. ATR-FTIR-spectroscopy is therefore currently the most effective method for online-evaluation. It allows parallel determination of substances both according to type as well as amount.

Advantages

General:

- Time saving due to online- in-situ measurement methods
- Improvement of the product quality by minimising of by-products
- Easy handling, mechanically robust, portable
- Neither adjusting nor maintenance necessary
- Minute sample amounts, no preliminary sample preparation necessary
- Inert, free of reagents
- No falsification of the sample due to transfer (e.g. as at HPLC)
- Also deployable in small vessels
- No sample wastage

The MoleculeEye within Chemistry:

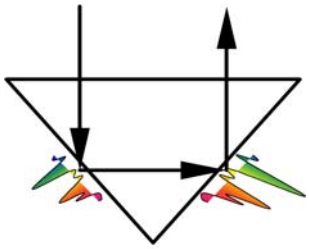
- Fingerprint-Measurements
- Recognition of intermediate products
- Temperature and pressure-resistant
- Chemically robust, explosion-protected

The MoleculeEye within Biotechnology:

- Delivers an exact image of the physiology of the bioprocess
- Early problem detection
- No contamination
- Sterilisable sensor

*The **MoleculeEye*** ATR-Diamond – Probe

The novel fibre-optic ***MoleculeEye*** probe utilises the principle of the attenuated total reflection (ATR).

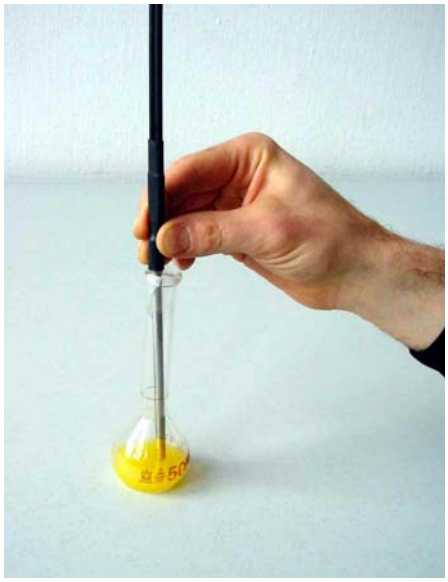


The ATR-Principle with diamond prism

The ATR-crystal is made of diamond and connected to the fixture without seal elements. The ***MoleculeEye*** probe is therefore insensitive in regard to chemical and mechanical influences. A light ray which reaches an optically less dense media out of an optically dense one in a flat angle is reflected at the boundary area. But not exactly at the boundary area: the ray penetrates into the optically less dense media a few µm . Certain frequency components of the light are substance-specifically absorbed in the less dense media. This leads to the generation of absorption spectrums that are registered by the spectrometer.

The ***MoleculeEye*** probe is highly inert, resistant against chemicals, pressure, and high temperatures and can therefore be installed in reactors without any problems. The 6mm probe fits into even the smallest reactors.

The ATR-principle also functions in strongly coloured solutions, in emulsions and highly solid-containing suspensions, as the measurement merely takes place in a very thin layer at the crystal. Substances are partially, depending on their IR-absorption, detectable up to the trace range.



MoleculeEye ATR Hand Probe

The simple technical construction makes the method robust, its speed allows real-time measurement and consequently direct process guidance.

The method is able to measure in the trace range and also delivers information to intermediate products and transition conditions.

For this reason, it is particularly suited for examinations of reaction mechanisms. In comparison to similar effective methods, e.g. mass spectrometry, it is significantly more cost-effective and easier to handle.

The HiTec Zang ***MoleculeEye*** FTIR Spectrometer System disposes of a **fibre-optic ATR-Sensor** with unique properties:

- **Diameter of only 6 mm**
- **Simple Coupling with pin and socket connector**
- **Outstanding long-term Stability**
- **No Adjusting and Compensating necessary**
- **Outstanding Measurement Accuracy and Linearity**
- **Ideal Signal/Disturbance Ratio, consequently high Measurement Sensitivity**
- **Fast Real Time Measurement, high Time Resolution**
- **Several Sensors at one Spectrometer possible (Multiplexer)**
- **Adaptation to spectrometers made by Bruker, Mettler, Nicolet, Perkin-Elmer, Jasco, and others is possible**
- **Coupling to LabManager System is possible**
- **Special Designs/solutions available**

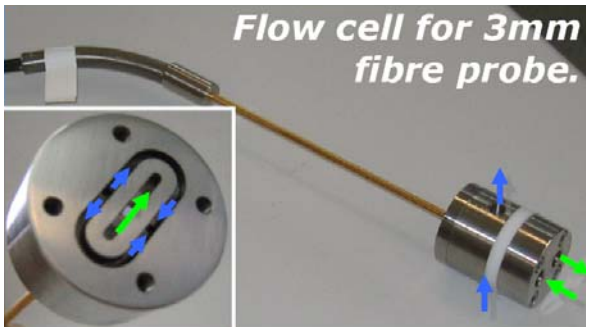
Application Areas

- Chemistry, Biotechnology, Pharmaceutics, Food, Environment ...
- All IR-active substances detectable
- Solid and liquid samples, non-transparent and solid-containing liquids and emulsions

MoleculeEye ATR Probe mounted in a 2 litres LabKit Reaction Plant

Up to 6 probes can be connected to a spectrometer with a multiplexer unit. Parallel experiments are therefore possible without any problem.

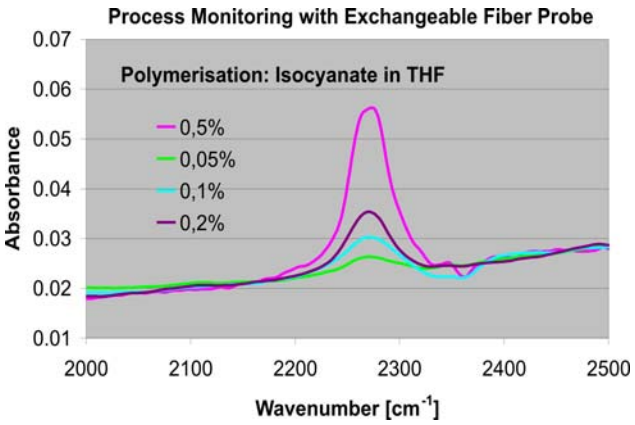
MoleculeEye ATR Probes in the MultiLab Parallel Reactor System



MoleculeEye ATR-flow through cell for MRT plants

Areas of Deployment and Examples

Polymer Analysis: ATR-FTIR delivers both information regarding the chemical composition as well as the molecule size. Naturally, one can also just follow the progression of the reaction.

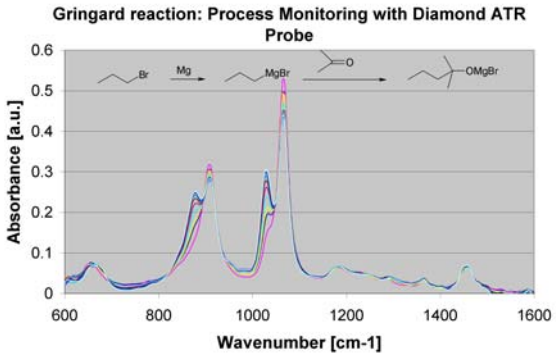


FTIR spectrums of a polymerisation process.

Catalysis: The IR-spectrums of adsorbates and transition conditions of a reaction differ from the spectrums of these substances in solution. These differences are due to the binding of the substrate to the catalyst. In this way, information about such conditions can be gained. Due to the measurement in an extremely thin layer surrounding the crystal, the solids do not interfere with the analysis.

Reaction Technology: Following the reaction progress

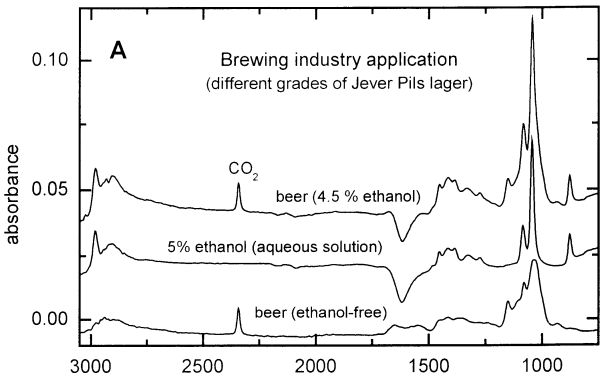
FTIR spectrums in the progression of a Grignard reaction.



Protein Analysis: The normal IR analysis at proteins is strongly disturbed by the high and broad-banded adsorption of the functionally essential water. At ATR- robes, the water hardly causes disturbance, as only a thin layer is transilluminated. Diamond does not adsorb proteins, for which reason the ATR-crystal does not cause any disturbance.

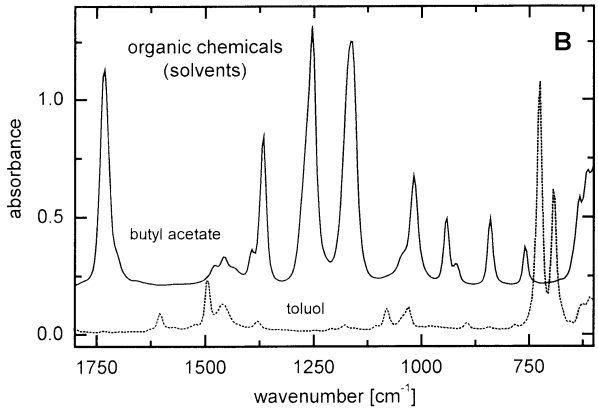
Monitoring of Clarification Plants: Parallel analysis of organic acids, carbonhydrates, carbonate, hydrogencarbonate, phosphate, hydrogenphosphate, carboxlate, and many further parameters in water and clearing sludge.

Food: CO_2 in Beer



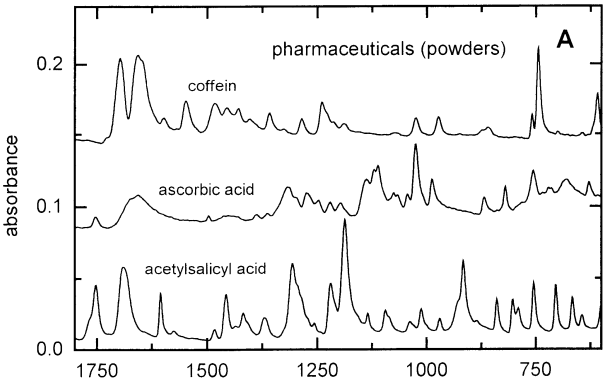
FTIR-spectrums of CO_2 in beer and comparative solutions.

Chemicals: Butylacetate and Toluene compared .

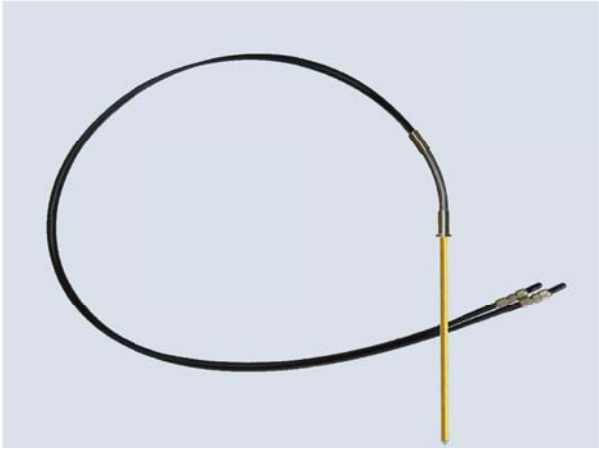


ATR-FTIR-spectrums of Butylacetate and Toluene compared.

Pharmaceuticals: Caffein, Ascorbic Acid, Acetylsalicylic Acid.



ATR-FTIR-spectrums of Caffein, Ascorbic Acid, and Acetylsalicylic Acid compared.



The fibre optic probe with SMA connector

Technical Data

Diamond-ATR MIR Standard Probe	Probe head diameter: 6 mm, Length: 20 cm (extension possible)
Materials	In contact with media: Hastelloy, Gold, Diamond
Length of Light Guide	Standard 150 cm, optional up to 400 cm (with cooled detector)
Measurement Principle	ATR 45 °, double reflection
Spectral Range	Standard probe 3 to 18 µm (at standard length)
Temperature Range	-100 to 150°C
Pressure Range	-1 up to 100 bar (up to 300 bar available upon request)
Spectrometer	FTIR-Spectrometer with light guide coupling, extendable standard software
Detection Sensitivity	< 1% (up to 0.02%)
Detector	MCT (mercury cadmium telluride), nitrogen-cooled, 3 -18 µm (3300 - 600 cm^{-1}), optional thermo-electrical cooling 3 - 8 µm (3300 - 1250 cm^{-1})
Multiplexer	Optional: six-fold Multiplexer, e.g. for parallel reactor systems
Delivery Scope	Compact, robust, FT-IR spectrometer with industry-hardened protective housing. MCT-detector (fl.N2), MIR, 12,000-600 $cm^{-1,}$ typical hold time: 8 h, incl. alignment optics. Diamond-ATR-Probe (MIR) Data System P4 > 3 GHz, 512 MB RAM, > 80 GB HDU, DVD-writer, LAN, 20“-TFT-flat screen monitor, colour printer, Windows XP Professional. Software package for analytics and research.
Extensions	Multiplexer unit for 6 probes Program for the establishment and control of process-relevant settings for cyclic measurements, communication with external process control systems (fieldbus or 4-20 mA interfaces) and visualisation. The run-time component necessary for operation is included in the delivery scope. Communication with process control systems requires further hardware and, possibly, control-system specific programming. Program for the control of cyclic measurements, communication with external process control systems (fieldbus or 4-20 mA interfaces) and visualisation. Software package for quantitative analysis. Software package for chromatography-couplings

Order Code	Description
IS-MOLECULEEYE	MIR Spectrometer system with fibre-optic ATR diamond probe
IS-MOLECULEEYEMUX	Multiplexer unit for 6 probes
IS-MOLECULEEYETEC	Thermo electric cooling unit for detector

Further accessories and extensions are available upon request. HiTec Zang also offers ready-to-use complete systems, individual components and special designs!

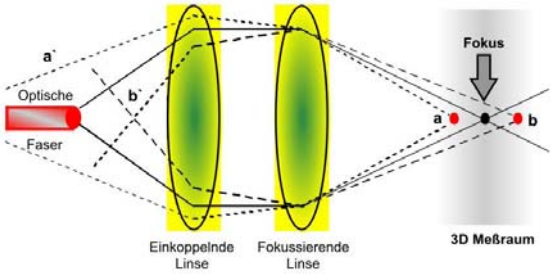
Please consider the combination possibilities with AutoSam or SciBot.

If you have any special questions, our consultant engineer will gladly advise you. Test measurements can be conduced!

ParticleEye™ Particle Sizer

LabKit-rc Reaction Calorimeter with ParticleEye-3D-Probe

The ParticleEye In-Situ Particle Sizer enables the identification of geometrical particle characteristics and their respective changing conditions under test and production conditions already during the reaction.



The unique dynamic focussing allows for an extensive measurement range of 0,5 to 4000 µm due to the continuous focus-depth variance.

Multiple scatterings are not registered due to the patented opto-mechanical construction of the sensors. A laser beam is guided into the measuring probe through a single mode fibre with a diameter of merely 4 µm and dynamically focussed into the product intended for analysis by special optics.

The dynamic focus represents the decisive advantage compared to conventional turbidimetry FBRM® (Registered Mettler-Toledo/Lasentec trademark).

Features:

- High Precision
- Compact Construction
- Robust
- Ideal PAT-Sensor

Options

- In Situ stability control in the production process
- Inline product monitoring in real time
- Online quality control for the prevention of redundant laboratory analyses
- Optimisation of the solid matter quality and purity
- Improvement of productivity at the formulation of new products
- Quality control 24h on 365 days throughout the year
- Most simple function control of the PAT sensors due to the deployment of reticles
- Improved control

Applications

- Crystallisation
- Precipitation
- Release
- Fermentation
- Homogenisation
- Polymerisation
- Agglomerations of Particle Systems
- Dispersion
- Granulation
- Dissolution
- Flocculation
- Optimisation of Grinding Processes
- Stability Analyses at Dispersed Phase Systems

Advantages:

- **All particles are counted and presented as quantity distribution, length distribution, surface distribution, and volume distribution**
- **Highest possible selectivity and sensitivity under original production conditions**
- **Improvement of the safety at the scale up and production**
- **Accelerated product development**
- **High concentrations are possible**
- **Measurement periods from 1 to 300 sec**
- **Temperatures of -120°C to 220°C are possible**
- **The additional option to in-situ sterilise the PAT sensors in deactivated condition up to a temperature of 165°C**

Sensors

Available are dynamic 2D and 3D sensors with different characteristics.

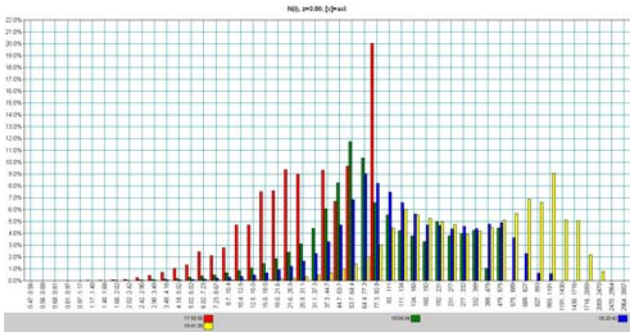
18 mm Static Sensor

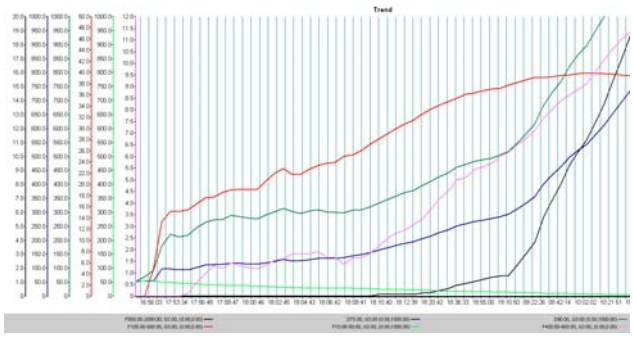
8mm Static Sensor

18 mm 2D- and 3D-Sensor

Data Visualisation and Presentation

The data evaluation can be conducted on the basis of the particle size distribution according to ISO 66141.





Measuring data is available in form of graphics and tables. Up to five distribution diagrams can be presented at the same time.

Reference data, which may derives from previously recorded measurements or any other data which has been entered with the help of an integrated editor, can be faded into the distribution diagrams. For cumulative distributions, it is possible to additionally, or instead of the reference data, to fade in a distribution range of selectable band width.

The presentation is available as cumulative curve or as trend diagram. Up to eight characteristics (of d 01 to d99) can be presented as trend data, e.g. the transition variable according to DIN D0.1 to D99.9, count rate, intensity, fraction ratios, optional analogue signals 0V to 10V or 4 to 20 mA. Any statistical moments from 0 to 3 can be utilised.

Data Storage and Re-evaluation

The distribution, statistical, respectively trend data available as measuring data can be exported to other programmes such as Word, Excel etc., and printed out or used otherwise in this form, via the clipboard.

Measuring data in Excel format can be transported into a customer-related evaluation programme through a continuous data transfer.

Measurable Products

Over 6000 different products have already been measured. Why not take advantage from the experience of our product specialists?

Measurable are all particles and drops that dispose of an optical reflection feature, reaching from aluminium oxide to sugar crystals.

As the particles commence to agglomerate as of a concentration of 1Vol%, the particle collectives are usually at hand as particle systems (PSyA) under process conditions. The respectively generated particular fingerprints therefore represent reproducible characteristics for the PAT control.

Due to the ascertainability of agglomerate structures, you can consequently cover broader particle distributions compared to a laser diffraction spectrometer (PSD). It is possible to present the total scope of your products as variable characteristic via the time.

The measurements with PAT sensors in original concentrated products therefore present fingerprints of the actual particle system distribution under production conditions!

The changes during production are collected and presented in-situ, therefore under original condition, by the PAT sensors.

If the products intended for measurement are diluted online, the sensors will register the particle size distribution of the discretely existent particles continuously as under laboratory conditions.

Application Examples

Process	Particle Change	Evaluation
Drop Formation	Drops of various components are homogenised	Significant shifting of the distribution
Intrusion of pigments in emulsions	Distribution of pigments in the emulsion	After the emulsion is homogeneous, the emulsion raw data are subtracted from the data pigments + emulsion = distribution of the pigments
Distribution of the drop formation during the polymerisation	Drops increase in size and stabilise	Fine fraction reduced in favour of the coarse fraction
Grinding – wet or dry	Reduction of particle size	Change of distribution – higher fine fraction
Germ formation at precipitation	Particles grow out of the nanoscale	Change of distribution – cumulative higher fine fraction
Particle Breakage or Cleavage	Reduction of particle size	Change of distribution – higher fine fraction – reduced coarse fraction
Growth of the Particles	Increase of particle size	Change of distribution – higher coarse fraction
Agglomeration and Coagulation Processes	Particles form particle systems	Change of distribution - higher coarse fraction – reduced fine fraction
Dissolution	Particles dissolve	Reduction of number of counts
Change of form at the Crystallisation	Particles deform	Change of distribution function

Sensor Head with Measuring Window

Technical Data:

Pressure	3 bar, optional to 64 bar
Measuring Medium Temperature	5...85°C, optional -120...20°C, 5° to 125°C, -20..165°C, 5 to 220°C
Parts in contact with Measuring Medium	High Grade Steel 1.4571, sulphur-free, optional Hastelloy C276, Hastelloy C2, Hastelloy C4, Sapphire Glass, Hifluor (FKM)® or Kalrez
Sensor/Probe Length	260 mm, optional 350mm
Sensor Diameter	8mm, 18mm or 22mm
Sensor Cable Length	10m
Sensor Window	Sapphire Glass, Quality Category MIL– PRF-1383B 10-5
Sensor Protection Category	IP 68
Scanner Speed	1 m/s, optional 2m/s

Technical Data:
Configuration Examples

Device Configuration	Characteristics
2D ORM (optical backreflection) passive Signal Capture System >5 µm exclusively based on the duration of the particles in the focus for consistent Reynold numbers.	„Multiscattering“ Signals and turbidity are **not** processed by the patented sensor technology. Counting of all captured particles and their size. Especially designed for rough industrial deployment – no moving parts in the sensor.
2D ORM active Signal Capture System >2µm based on the patented sensor technology (see above) plus runtime-levelling signal capture method.	Upgraded through a dynamic scanning system and a consequently higher count rate.
3D ORM active Signal Capture System >2µm with in-depth focus based on a controlled 3mW laser	Upgraded through in-depth scanning and better resolution.
3D ORM active Signal Capture >0.8µm with in-depth focus + Selective Scanning based on a controlled 5mW laser system and double screening.	Upgraded through dynamic and controlled in-depth scanning and better resolution.
3D ORM IPAS active Signal Capture System >1µm with in-depth focus + Selective Scanning + controlled open signal system based on a 10mW laser system, regulable between1 and 10mW with multiple screening.	Partially open system for R&D tasks based on the APAS system. Input raw signals from the sensor are trapped and are, if required, available to the researchers.
APAS active Multi Capture Signal Capture System >500nm with 3D ORM in-depth focus + Selective Scanning (SMF)+ controlled open signal system based on a 25mW laser system, regulable between1 and 25mW with multiple screening.	Advanced Particle Analysing System. Completely open System for R & D tasks. Input raw signals from the sensor, as well as the signals of the individual processing steps, are trapped and are, if required, available to the researchers.

Order Code	Description
IS-PARTICLEYE-S- l	ParticleEye Particle Measurement System, static; comprises sensor, electronics and software module
IS-PARTICLEYE- 2D-l	ParticleEye Particle Measurement System, dynamic 2D; comprises sensor, electronics and software module
IS-PARTICLEYE- 3D-l-t	ParticleEye Particle Measurement System, dynamic 3D; comprises sensor, electronics and software module
IS-PARTICLEYE-AA6	6 Analogue Outputs 4...20mA for ParticleEye Particle Measurement System
IS-PARTICLEYE-EEX	Ex-Equipment for ParticleEye Particle Measurement System
IS-PARTICLEYE- WV	Maintenance Contract for ParticleEye Particle Measurement System

l: Sensor Length :

t: according to table, only concerns 3D sensor.

Type	Measurement Range in µm	Max. Concentration in %
125	0,5 – 125	80
250	1 – 250	60
500	1 - 500	50
1000	2 - 1000	40
2000	5 - 2000	30
3000	30 - 3000	25
4000	20 - 4000	20

Options:

- Special Materials
- Other Sensor Forms and Diameters
- EEX-Version

Turbidity Probe

Turbidity measurement probe in a high-grade steel protective tube. Probe measures in retro-reflection (backscatter) with IR-light (880nm). The diameter is 12 mm, the length between 120 and 407 mm. The optical window is made of sapphire and sealed with a Kalrez- sealing ring (FDA-conform).

Applications:

- Crystallisation
- Precipitation
- Releasing
- Fermentation

Characteristics:

- High Accuracy
- Compact Construction
- Robust

Technical Data:

Measurement Principle	Retro-reflection (backscatter)
Measured Material Temperature	Temperature –30...130°C Pressure 0...6 bar
Parts in Contact with Measured Material	High-grade steel 1,4404 or 1,4435, sapphire, Kalrez
Probe Tube	Dimensions of probe 12 x 120/205/297/407 mm
Measurement Range	10...4000 FTU (display in other measurement units possible)
Output signal	0/4...20 mA
Operational Voltage	Transmitter 100...240 V AC
Protection Category	Transmitter sealed front-side, resulting protection category dependant of mounting
EEX	EEX probe category 1...3, Zone 0...2, T4...T6

Connection to the LabManager:

The probe is delivered ready to connect with a cable and a Tuchel plug for the direct connection to an analogue input panel AEP8A. Please coordinate the feed with our project department.

Order Code	Description
IS-TRUB-O-ea	Turbidity probe made of high-grade steel 1,4404, for direct connection to an analogue input panel

ea=Electrical Connection:

T	Tuchel plug for LabManager
O	Open ends for MSRmanager

Available upon request:

- Materials: Hastelloy C4
- other probe designs and diameters
- EEX Versions

Order Example:

Turbidity probe made of high-grade steel 1,4571, probe tube 10 mm, with connection 1.5 m for LabManager Panel LP-AEP8A, coordinate the probe length with our project department when placing order.

Order Code: IS-TRUB-O-O

Fibre-Optic Submersible Reflection Probes

With the Superior Optical Material – Sapphire

These reflection submersion probes convince with a robust design and an uncompromising choice of materials regarding all parts in contact with media. With sapphire as optical material, they are virtually absolutely resistant to abrasion and corrosion and therefore also stable when deployed with concentrated acids and bases. They are also resistant against pressure and temperature peaks.

The application range reaches from the simple turbidity measurement in liquids right to the characterisation of solids. All probes are designed for the direct installation into vessels and tubings.

They can be flexibly aligned to individual requirements, due to the diversity of available materials, process connections, pressure and temperature ranges.

Advantages:

- **abrasion and corrosion-free sapphire optics**
- **chemical stability**
- **verifiable process suitability**
- **application range from UV to NIR**
- **compatible with all spectrometer types**
- **varied versions and special designs**
- **robust and extremely stable**

The application range reaches from the simple turbidity measurement with fibre-optic turbidity measurement systems right to the identification and characterisation of solids.

Typical Applications

- Reaction tracing of heterogeneous reactions in the chemical synthesis in the NIR
- determination of residual solvent concentration at solids directly in driers
- Homogeneity of solid compounds directly in the mixer

Our product portfolio is not restricted to fibre-optical probes. It includes everything you may need for the implementation of probes in processes and the coupling to practically every spectrometer type.

You can rely on us to find an ideal solution!

Technical Details

Light Spot	1 mm
Dimension Diameter	6 mm Alternative 12 mm
Submersion Depth	As of 100 mm
Standard Materials	High-grade steel DIN 1,4435/316L, sapphire
Process Connections	DIN or ANSI flanges
Screwings	e.g. Swagelok, PG 13.5, further connections available upon request
Temperature	max. 280°C (continuous operation)
Pressure	0–100 bar

Order Code	Description
IS-TRUB-ORF-ea	Fibre-optic reflection probe

ea=Electrical Connection:

T	Tuchel plug for LabManager
O	Open ends for MSRmanager

Options:

Alternative materials: high-grade steel DIN 1.4571 / SS316Ti, Titanium, Hastelloy, PVDF, PP, PTFE, etc.

Further constructions, dimensions, and specifications available upon request.
Conformity Statement 97/23/EU according to EU Pressure Equipment Directive.

You can find fibre-optic probes for the MIR sector under „MoleculeEye“.

Phase boundary Detector

The HiTec Zang PhaDec is a robust and cost-efficient detector system for the detection of phase boundaries. PhaDec is in particular used for the automatic separation and separate bottling of liquid phases out of reactors or collecting vessels, e.g. after reactions with phase transfer catalysis, after azeotropic distillations or after extractions.

Main Application Areas:

- Extraction
- Extractive Distillation
- Azeotropic Distillation
- Phase Transfer Catalysis

Other Application Areas:

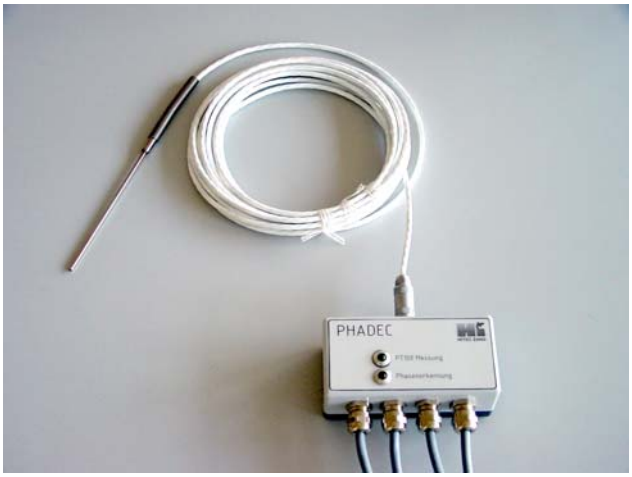
- Filling Level Monitor
- Flow Monitor
- Leakage Monitor

PhaDec utilises the different heat conductivity of the phases to recognise the boundary areas. Therefore, the application of the PhaDec is not limited to transparent or conductive liquids. Deployed as sensor is a special resistance sensor, which can also be used as a temperature sensor.

The sensor can optionally be installed into the base discharge valve, the discharge line or into the reaction vessel from above.

Advantages

- **Robust and cost-effective**
- **Integrateable into any system**
- **Universally applicable for all liquid phases – even at non-transparent and non-conductive fluids**
- **Pressure-resistant and chemically stable**
- **Also deployable as temperature sensor**
- **Inert materials: glass, high-grade steel, Hastelloy, PEEK, PTFE**



PhaDec operates with virtually all fluids, regardless whether liquid or gas, conductive or not conductive, transparent or not. As long as there is a clear phase boundary, the PhaDec will generate evaluable signals.

The sensor is available with all known jacket materials. A preliminary lead time for the discharge of the main part of the lower phase is considered in the basis operation.

The reaction period of the PhaDec depends on the type of sensor deployed. Sensors with a metal jacket and small outer dimensions react most rapidly. For quick response, we recommend an exterior diameter <= 3 mm. It is however also possible to successfully detect with a sensor jacketed with PTFE and an exterior diameter of 6 mm.

PhaDec is therefore universally suited for detection of phase boundaries liquid/liquid and liquid/gas.

The stand alone version Phadec-x is adapted to used Fluids via teach-in. The active (24V) and the status (OC) output switch when a phase change is detected.

Technical Data Phadec

PI-Connectors to	Pt100-Input, Analog Input, Analog Output, Digital output
Cable Length	200 cm (modification possible)
Ambient Temperature	-20 up to +70 °C

Technical Data Phadec-x

Outputs	0/24V for magnetic valve or relais, (max. 500 mA), Status (OC), opt. RS232
Ambient Temperature	-20 up to +70 °C

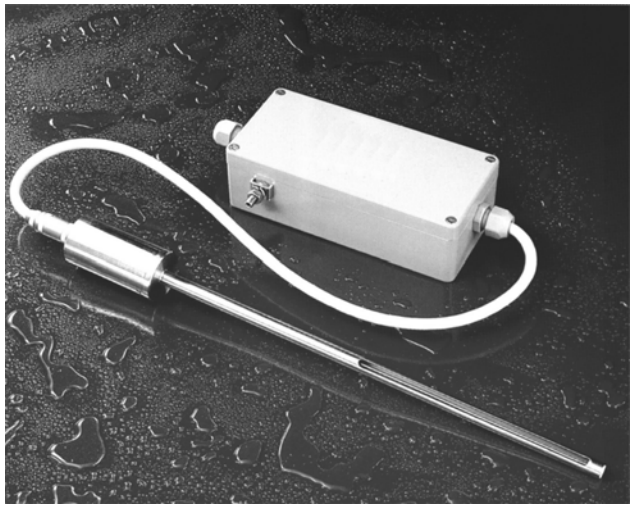
Order Code	Description
IL-PHADEC	PhaDec System for detection of phase boundaries
IL-PHADEC-X	Stand alone System for detection of phase boundaries
IL-PHADEC-SE	PhaDec Sensor element in a high-grade steel tube , diameter 2 mm
IL-PHADEC-PTFE	PhaDec Sensor element in a PTFE tube, diameter 6 mm

Other diameters available upon request. Phase separation system (PhaSep) for laboratory reactors can be found under “Equipment and Components”.

Level Sensor

Robust high-quality level sensor for industrial applications.

- High Accuracy
- Compact Construction
  Conductive Liquids > 1 µScm^{-1}
- Limit Area Detection
  to Liquids < 1 µScm^{-1}



Technical Data:

Measurement Principle	Conductometric via scattering potential
Measurement Media Temperature	Max. 180°C
Parts in Contact with Measurement Media	High-grade steel 1,4571, Hastelloy available upon request
Probe Tube	d = 10 mm
Measurement Range	According to customer specifications
Output Signal	0 - 10 V DC
Supply Voltage	± 15 V DC
Protection Category	IP 54
EEX	Upon request

Connection to the LabManager:

The probe is delivered ready to connect with a cable and a Tuchel plug for the direct connection to an analogue input panel AEP8A. Please coordinate the feed with our project department.

Order Code	Description
IS-L-FA-ea	Level pick-up sensor, conductometric, made of high-grade steel 1,4571, probe tube 10mm, with connection cable 1.5m for LabManager Panel LP-AEP8A

ea=Electrical Connection:

T	Tuchel plug for LabManager
O	Open ends for MSRmanager

Please coordinate the probe length with our project department when placing order!

Order Example:

Level pick-up sensor, conductometric, made of high-grade steel 1,4571, probe tube 10mm, with connection cable 1.5m for LabManager Panel LP-AEP8A

Please coordinate the probe length with our project department when placing order!

Order Code: IS-L-FA-T

available upon request:

- Materials: Hastelloy C4
- other probe designs and diameters
- Float, PTC thermistor, ultrasonic, radar,...flow sensors and monitors
- EEX Versions

Teflon® Flow Sensors

Due to new manufacturing technologies, the parts in contact with media of the Teflon flow sensors are completely made of Teflon® and ruby. The resulting special properties, in particular the excellent resistance against most chemicals, give the sensor the suitability for a wide application range. The ruby bearing minimises friction and wear and guarantees high durability.

Versatile: The One-Way - Click - Sensor (open)

This outstanding product received an award at the „Salon International des Innovations“ in Geneva and is internationally protected by patent.

For the high-pressure range, the sensors are also available in a high-grade steel casing.

The Advantages

- **low cost**
- **maintenance-free**
- **sealless**
- **extremely compact**
- **little pressure decline**
- **great flow range**
- **Ex- version available**
- **high working pressure range**
- **high chemical resistance**
- **sterilisable version (up to 160 °C)**
- **one-way version for hardening materials**
- **optionally, threaded or hose connection**
- **high resolution (up to 110.000 impulses per litre)**
- **high durability and consistency due to ruby bearings**
- **little response time due to low-mass rotor (approx. 15 mg)**

Application Areas

- Chemical Industry
- Pharmaceutical industry
- Bio-Technology
- Food Technology
- Flow Measurement
- Dosing of Feed Tanks
- Continuous Dosing
- Bottling and Charging
- Flow Monitoring
- Consumption Counter
- Heat Counter

The flow generating part of the sensor can easily be exchanged in case of hardening media and sterilised with up to 120 °C.

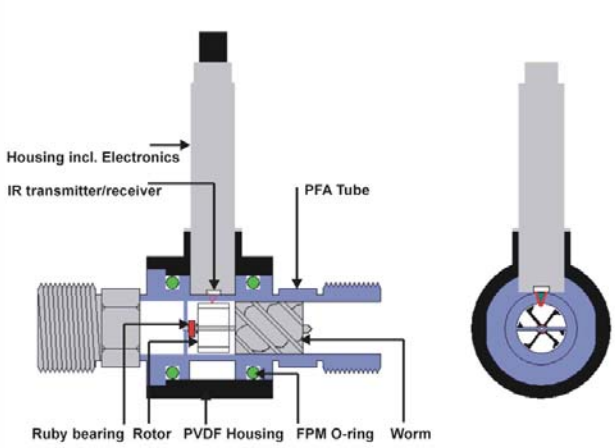
The Functional Principle

The media is put into a rotational motion by a spiral flow former (worm) and actuates the virtually weightless rotor.

The rotor is optically scanned in the course of which a frequency-analogue rectangular signal proportional to the flow speed is generated. This can, if necessary, be transformed to current, voltage or serial signals with one of the available measuring transducers.

As the optical scan, at the light guide models, is conducted via a cable which is up to 40 m long, the sensors are particularly suited for the EX area.

The sensor also operates with turbid media such as ink or diffuse media such as milk. Problems are only to be expected in case of strongly light scattering media such as latex or suspensions with titanium dioxide. Solid particles usually do not interfere. Merely fibres should be removed by a filter.



Available Versions

The sensors are available with the nominal widths 4.5 mm, 8.5 mm and 12.5 mm, respectively with copper or light guide cable connection. The nominal widths 4.5 and 8.5 mm are only available in the standard version or as click-sensor with hose or threaded connection. The nominal width 12.5 mm, in the standard version, is available with threaded connection.

Sensor Type Series S4.5 / 0.1 – 1.5 l / min

The sensors of the type series S4.5 are available with hose and threaded connection. The connection cable of the standard version is cladded with Tefzel, a plastic material with properties similar to Teflon, but better elasticity.

The light-guide version is particularly suited for applications in explosive environments or in case of higher temperatures.

The Click-sensor version enables sterilisation up to 160°C, as well as the exchange of the measuring insert in case of hardened media.

Technical Data

Measurement Range	0.06-2 litres/min
Nominal Width	4.5 mm
Connection for Media	Hose nozzle 7mm or 1/8“ conical outer thread NPT
Working Pressure	20 bar / 2MPa
Pressure Decline	approx. 200 mbar at 75% flow
Max. Temp. Media	80 °C, with plastic light-guide 110 °C, with glass light-guide 180 °C
Viscosity Range	0.8-10mm²/s, higher with calibration
Signal Line	TEFZEL® or light guide
Output Signal	110.000 Impulses = 1l
Output Frequency	100 Hz - 3.1 kHz
Reproducibility	± 0.15 %
Linearity Faults	± 1%
Protection Category	IP 65, Click-Sensor IP 50
Length	52 mm
Max. Diameter	17 mm
Length of Cable Intake	47 mm

* The measurement range, in case of reduced demands to linearity, can be extended.

Special designs for increased linearity in case of very low flows are available upon request. The stated values and measurement values are based on laboratory measurements with water at 20°C, as well as the manufacturer's statements in regard to the properties of the materials. The manufacturer reserves the right to modify/align the specifications to the state of the technology at any time.

Measuring Transducer

Standard version available with:

- Transducer 6100 with different signal outputs
- Flow Calculator 6200
- Dosing Calculator 6500
- Plug for direct connection to HiTec Zang LabManager
- Connections according to customer specifications

The light-guide version requires transducer 6700IR.

For Order Code see the table “Order Codes“.

IS-F-0045.T.H.P.01.DX disposable sensor with tubing connector

Sensor Type Series S8.5 / 0.8 - 20 l / min

The sensors of the type series S8.5 are available with hose and threaded connection. The connection cable of the standard version is cladded with Tefzel, a plastic material with properties similar to Teflon, but better elasticity.

The light-guide version is particularly suited for applications in explosive environments or in case of higher temperatures.

The Click-sensor version enables sterilisation up to 160°C, as well as the exchange of the measuring insert in case of hardened media.

Technical Data

Measurement Range	1.0-20 litres/min
Nominal Width	8.5 mm
Connection for Media	Hose nozzle 12mm or 1/4´´ conical outer thread NPT
Working Pressure	15 bar / 1.5MPa
Pressure Decline	approx. 200 mbar at 75% flow
Max. Temp. Media	80 °C, with plastic light guide 110 °C, with glass light guide 180 °C
Viscosity Range	0.8-10mm²/s, higher calibration
Signal Line	TEFZEL® or light guide
Output Signal	6.350 Impulses/litre = 1Impulss/157µl
Output Frequency	40 Hz - 2.2 kHz
Reproducibility	± 0.15 %
Linearity Fault	± 1.5 %
Protection Category	IP 65, Click-Sensor IP 50
Length	60 mm
Max. Diameter	22 mm
Length of Cable Intake	47 mm

* The measurement range, in case of reduced demands to linearity, can be extended.

Special designs for increased linearity in case of very low flows are available upon request. The stated values and measurement values are based on laboratory measurements with water at 20°C, as well as the manufacturer's statements in regard to the properties of the materials. The manufacturer reserves the right to modify/align the specifications to the state of the technology at any time.

Measuring Transducer

Standard version available with:

- Transducer S6000 u. S6100 with different signal outputs
- Flow Calculator 6200
- Dosing Calculator 6500
- Plug for direct connection to HiTec Zang LabManager
- Connections according to customer specifications

The light-guide version requires transducer 6700 IR.

For Order Code see the table “Order Codes“.

Type IS-F-0085.T.P.01.XX

Sensor- Type Series S12.5 / 2.5 - 40 l / min

The sensors of the type series S 12.5 have a threaded connection. The connection cable of the standard version is cladded with Tefzel, a plastic material with properties similar to Teflon, but better elasticity.

The light-guide version is particularly suited for applications in explosive environments or in case of higher temperatures.

Technical Data

Measurement Range	2-40 litres /min
Nominal Width	12.5 mm
Connection for Media	1/2“´outer thread BSP
Working Pressure	10 bar max.
Working Pressure	approx. 200 mbar at 75% flow
Max. Temp. Media	80 °C, with plastic light guide 110 °C, with glass light guide 180 °C
Viscosity Range	0.8 - 10 mm²/s, higher with calibration
Signal Line	TEFZEL® or Light Guide
Output Signal	2050 Impulses/litre = 1 Impulse/488µl
Output Frequency	22 - 1200 Hz
Reproducibility	± 0.15 %
Linearity Fault	± 3 %
Protection Category	IP 65
Length	72 mm
Max. Diameter	26 mm
Length of Cable Intake	47 mm

* The measurement range, in case of reduced demands to linearity, can be extended.

Special designs for increased linearity in case of very low flows are available upon request. The stated values and measurement values are based on laboratory measurements with water at 20°C, as well as the manufacturer's statements in regard to the properties of the materials. The manufacturer reserves the right to modify/align the specifications to the state of the technology at any time.

Measuring Transducer

Standard version available with:

- Transducers S6000 and S6100 with different signal outputs
- Flow Calculator 6200
- Dosing Calculator 6500
- Plug for direct connection to HiTec Zang LabManager
- Connections according to customer specifications

The light-guide version requires transducer 6700 IR.

For Order Code see the table “Order Code”.

Type IS-F-0125.T.B.P.01.XX with screwing connection

Documentation to the special version up to 200 bars is forwarded upon request!

Signal Connection

For the uncomplicated integration into your automation technology, measuring transducer-power supply units are available with the usual standard signals. The sensors can be directly connected to the HiTec-PIs with HK-DEA16N cards via special cables (IS-F-LABTUC) without a separate measuring transducer. For independent operation, flow calculators and dosing controller- components are available.

The sensors, in the standard version, can also be operated without measuring transducer-power supply unit. The supply voltage is 5 V at approx. 15 mA, the amplitude of the output signal is approx. 3 V at min. load resistance 1 kOhm.

Working Range

The sensors are available for the measurement ranges 0.1 – 1.5l/min, 0.8-18l/min and 2-40l/min. The specifications apply for the viscosity range of 0.8-10 mm²/s (water at 20 °C = 1chour = 1mm²/s, lubricating oil SAE30 at 100°C or ISO VG10 at 40 °C = approx. 10 mm²/s).

The sensors can also be deployed beyond this range, if it is taken into consideration that this leads to a change of the impulse rate and the calibration. The upper limit of the viscosity then accords to the viscosity of liquids with a similar viscosity as shampoo.

Any mounting position is possible.

Special Designs

Upon request, special designs are available. If the standard versions do not meet your demands, do not hesitate to contact us. We will do our best to help you.

Examples

Special designs in high-grade steel up to 200 bar, special connections, special cable materials, modified flow ranges, special dosing and flow controls.

PFA Disposable Turbine Flowmeters - 5-30 V DC power supply series

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.T.H.P.01.DX	PFA turbine flowsensor 4.5 disposable	7 mm hosebarb	0,06 - 2,0
IS-F-0045.T.H.0.00.DX	PFA tube 4.5 only 7 mm hosebarb	7 mm hosebarb	0,06 - 2,0
IS-F-0045.P.X.P.01.DX	Electronics 4.5 only	-	-
IS-F-0045.T.N.P.01.DX	PFA turbine flowsensor 4.5 disposable	1/8" NPT	0,06 - 2,0
IS-F-0045.T.N.0.00.DX	PFA tube 4.5 only 1/8" NPT	1/8" NPT	0,06 - 2,0
IS-F-0045.P.X.P.01.DX	Electronics 4.5 only	-	-
IS-F-0085.T.H.P.01.DX	PFA turbine flowsensor 8.5 disposable	12 mm hosebarb	0,5 - 20,0
IS-F-0085.T.H.0.00.DX	PFA tube 8.5 only 12 mm hosebarb	12 mm hosebarb	0,5 - 20,0
IS-F-0085.P.X.P.01.DX	Electronics 8.5 only	-	-
IS-F-0085.T.N.P.01.DX	PFA turbine flowsensor 8.5 disposable	1/4" NPT	0,5 - 20,0
IS-F-0085.T.N.0.00.DX	PFA tube 8.5 only- 1/4" Thread	1/4" NPT	0,5 - 20,0
IS-F-0085.P.X.P.01.DX	Electronics 8.5 only	-	-

PFA Disposable Turbine Flowmeters; 5 V DC series Low Voltage

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.T.H.P.01.DL	PFA disposable turbine flowsensor 4.5 - 5 Vdc	7 mm hosebarb	0,06 - 2,0
IS-F-0045.T.H.0.00.DX	PFA tube 4.5 only 7 mm hosebarb	7 mm hosebarb	0,06 - 2,0
IS-F-0045.P.X.P.01.DL	Electronics 4.5 only - 5 Vdc	-	-
IS-F-0045.T.N.P.01.DL	PFA disposable turbine flowsensor 4.5 - 5 Vdc	1/8" NPT	0,06 - 2,0
IS-F-0045.T.N.0.00.DX	PFA tube 4.5 only 1/8" NPT	1/8" NPT	0,06 - 2,0
IS-F-0045.P.X.P.01.DL	Electronics 4.5 only - 5 Vdc	-	-
IS-F-0085.T.H.P.01.DL	PFA disposable turbine flowsensor 8.5 - 5 Vdc	12 mm hosebarb	0,5 - 20,0
IS-F-0085.T.H.0.00.DX	PFA tube 8.5 only 12 mm hosebarb	12 mm hosebarb	0,5 - 20,0
IS-F-0085.P.X.P.01.DL	Electronics 8.5 only - 5 Vdc	-	-
IS-F-0085.T.N.P.01.DL	PFA disposable turbine flowsensor 8.5 - 5 Vdc	1/4" NPT	0,5 - 20,0
IS-F-0085.T.N.0.00.DX	PFA tube 8.5 only- 1/4" Thread	1/4" NPT	0,5 - 20,0
IS-F-0085.P.X.P.01.DL	Electronics 8.5 only - 5 Vdc	-	-

PFA Turbine Flowmeters Fixed - 5-30 Vdc power supply series

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.T.H.P.01.XX	PFA turbine flowsensor 4.5	7 mm hosebarb	0,06 - 2,0
IS-F-0045.T.N.P.01.XX	PFA turbine flowsensor 4.5	1/8" NPT	0,06 - 2,0
IS-F-0085.T.H.P.01.XX	PFA turbine flowsensor 8.5	12,5 mm hosebarb	0,5 - 20,0
IS-F-0085.T.N.P.01.XX	PFA turbine flowsensor 8.5	1/4" NPT	0,5 - 20,0
IS-F-0125.T.B.P.01.XX	PFA turbine flowsensor 12.5	1/2" BSP/NPT	2,0 - 40,0

PFA Turbine Flowmeters Fixed; 5 Vdc series Low Voltage

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.T.H.P.01.XL	PFA turbine flowsensor 4.5 - 5 Vdc	7 mm hosebarb	0,06 - 2,0
IS-F-0045.T.N.P.01.XL	PFA turbine flowsensor 4.5 - 5 Vdc	1/8" NPT	0,06 - 2,0
IS-F-0085.T.H.P.01.XL	PFA turbine flowsensor 8.5 - 5 Vdc	12 mm hosebarb	0,5 - 20,0
IS-F-0085.T.N.P.01.XL	PFA turbine flowsensor 8.5 - 5 Vdc	1/4" NPT	0,5 - 20,0
IS-F-0125.T.N.P.01.XL	PFA turbine flowsensor 12.5 - 5 Vdc	1/2" BSP/NPT	2,0 - 40,0

Stainless Steel Turbine Flowmeters - 5-30 Vdc power supply series

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.S.N.P.01.XX	SS Turbine flowsensor 4.5 NPT	1/4" NPT	0,06 - 2,0
IS-F-0045.S.B.P.01.XX	SS Turbine flowsensor 4.5 BSP	1/4"BSP	0,06 - 2,0
IS-F-0085.S.N.P.01.XX	SS Turbine flowsensor 8.5 NPT	3/8" NPT	0,5 - 20,0
IS-F-0085.S.B.P.01.XX	SS Turbine flowsensor 8.5 BSP	3/8" BSP	0,5 - 20,0
IS-F-0125.S.N.P.01.XX	SS Turbine flowsensor 12.5 NPT	1/2" NPT	2,0 - 40,0
IS-F-0125.S.B.P.01.XX	SS Turbine flowsensor 12.5 BSP	1/2"BSP	2,0 - 40,0

PVDF Disposable Turbine Flowmeters 5-30 Vdc

Order Code	Description	Connection	Flowrate l/min
IS-F-0045.P.H.P.01.CX	PVDF Disposable rotor tube 4.5	Hose Barb; Clip mounting	0,03 - 2,0
IS-F-0045.P.H.0.00.CX	PVDF Disposable rotor tube	Hose Barb; Clip mounting	0,03 - 2,0
IS-F-0085.P.H.P.01.CX	PVDF Disposable Turbine Flowmeter 8.5	Hose Barb; 5-30 Vdc; Clip	0,3 - 20,0
IS-F-0085.P.H.0.00.CX	PVDF Disposable rotor tube	Hose Barb; Clip mounting	0,3 - 20,0
IS-F-0000.P.X.P.01.CX	Electronic pick-up; 5 - 30 Vdc	clipmounting	-
IS-F-0045.X.X.X.00.CX	Mounting Clip in behalf of the 4.5 flowmeters	-	-
IS-F-0085.X.X.X.00.CX	Mounting Clip in behalf of the 8.5 flowmeters	-	-

Dosing pumps monitors

In connection with a projected flow through sensor the monitor can measure and validate the flow .

The dosing pump monitors can be controlled via RS232, USB, Ethernet or optionally via an analogue interface.

Order Code	Description
IS-F-S601-P2	Dosing pumps monitors for monitoring of flow rates from 0,06 to 2 l/min
IS-F-S601-P20	Dosing pumps monitors for monitoring of flow rates from 0,5 to 20 l/min
IS-F-S601-P40	Dosing pumps monitors for monitoring of flow rates from 1,5 to 40 l/min

Measuring Transducer

LAB-PI-Connection Cable

The electronics integrated into this connection cable supplies the sensor with current and aligns the frequency-analogue sensor output signal with a digital input with frequency counting options of a Lab-PI. The cable is fixed to the sensor and can be directly connected to a digital input with a 24V DC transducer power supply unit (LP-DEP8A).

Not available for sensors in light guide version!

Technical Data

Supply Voltage	24V DC, via LAB-PI
Current Consumption	< 50 mA
Output signal Level	23 V rectangular
Output Signal	0 – 2.5 kHz (sensor frequency)
Cable Length	200 cm (modification possible)
Ambient Temperature	-20 up to +70 °C

Suited for the sensor type series: S4.5/8.5/12.5PFA-H/T/D-T

Order Code	Description
IS-F-LABTUC	Level converter and supply for flow sensor with Tuchel plug for digital input

Measuring Transducer 6100 D/A

The measuring 6100 D/A supplies the sensor with current and converts the frequency-analogue sensor output signal into the electrical standard signals 0V...10V or 0 / 4 - 20mA for further processing in the automation devices with voltage or current inputs.

The current outputs are passive (without current).

Technical Data

Power supply	12 - 30 V DC or 115 – 240 V DC
Current Consumption	< 50 mA
Output Signal	0 / 4 - 20 mA or 0V ... 10V
Width	71 mm
Height	71 mm
Depth	90 mm
Protection Category	IP30
Ambient Temperature	-20 to +70 °C

Suited for the sensor type series: S4.5/8.5/12.5 cable types P and T

Order Code	Description
IS-F-6300.BA.CON.DC.XX	Measuring transducer 0-10V, 0/4 - 20 mA and supply for flow sensor

Measuring Transducer 6700 D/A for Light Guide Sensors

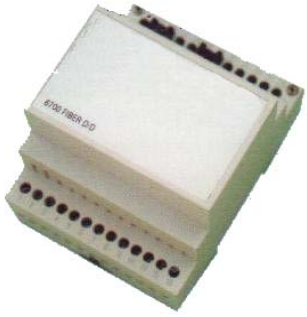
The measuring transducer 6700 D/A supplies the sensor with current and converts the frequency-analogue sensor output signal into the electrical standard signals 0 / 4 - 20mA for further processing in the automation devices with voltage or current inputs.

Technical Data

Supply Voltage	12 - 30V DC
Current Consumption	230 mA
Output Signal	0 / 4 - 20 mA
Width	71 mm
Height	71 mm
Depth	90 mm
Protection Type	IP30
Ambient Temperature	-20 to +70°C

Suited for the sensor type series: S4.5/8.5/12.5 Cable Type F

The current outputs are passive (without current).



Order Code	Description
IS-F-6700-DA-CON-DC	Measuring Transducer and supply for light guide sensors, output 0 - 10V, 0/4 - 20mA

Additional transducers upon request.

Turbine Flow Sensor for Heat carrier Oil

These flow sensors were developed for the measurement of the volume flow of water, fuel, heating oil, heat carrier oil, cooling agents, pharmaceutical, chemical and cryogenic liquids, liquid gases and solvents.

Within the sector of the reaction calorimetry, they are particularly suited for the flow measurement of the heat carrier oil at temperatures of up to 350°C.

They are deployed by default in our heat flow calorimeters. Due to their extremely short response time and the high resolution, they are also extremely well suited for chemical or pharmaceutical bottling and dosing plants. They operate according to the principle of the turbine-type meter.

They operate according to the principle of the turbine-type meter.

Type	Measurement Range in l/min	Impulses / l	Connection G
TDM06	1 to 10	2000	½ inch
TDM09	3 to 30	980	½ inch

The Advantages:

- **compact**
- **maintenance-free**
- **resistant against high temperatures**
- **low pressure decline**
- **high working pressure range**
- **fast response time due to low-mass rotor**

Application Areas

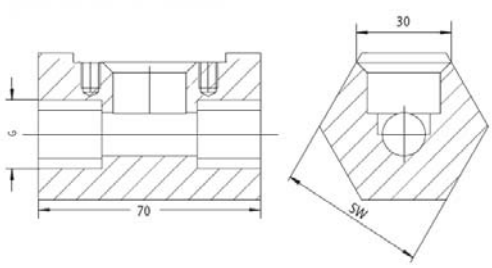
- Chemical Industry
- Pharmaceutical Industry
- Heat Carrier Flow Measurement
- Bottling and Charging
- Flow Monitoring
- Consumption Counter
- Heat Counter

Technical Data

Linearity	±2% v.M.
Reproducibility	±0.5%
MediaTemperature	-20 to 120, 180 or 350°C
Max. Operating Pressure	20 bar
Viscosity	0.1 to 6 mm²/s
Materials	High-grade steel 1,4305 and 1,4122, ceramic
Seal	Viton or graphite

Delivery Scope :	Sensor with mounted impulse amplifier

Order Code	Description
IS-F-TDMtc-tb-sa	Turbine-type flow sensor
ZK-SF-KM01-IA-IA-I-01	LAB-PI connection cable for turbine-type flow sensor, 4..20mA
ZK-SF-KM01-ID-XA-I-01	LAB-PI connection cable for turbine-type flow sensor, NPN-OC



tc = to 10l/min: 06 *alternatively up to* 30l/min: 09

tb = Temperature Range 120, 180 or 350 °C

sa = Output Signal 4..20mA: I
or frequency-analogue NPN-OC: F

Order Example:
Flow sensor for 0-10l/min, max. temperature 180°C, frequency-analogue output, open collector: **IS-F-TDM06-180-F**

Thermal Mass Flowmeters and Controllers

The Advantages:

- **Compact Design**
- **Straight Measuring Tube**
- **Maintenance-Free**
- **Extensive Operational Range**
- **Short Response Time**

The thermal flowmeters serve for the measurement of the mass flow of liquids. They operate on the basis of the calorimetric principle.

The digital LIQUI-FLOW® Series L30 Mass-Flowmeter/controller was developed for measuring ranges between 2 and 20 kg/h (final value). It represents an ideal supplement to the larger measurement ranges of the smaller product family (up to the minute ranges of 30 mg/h). The mass flowmeter is based on a straight 316L high grade steel tube. A temperature sensor and a heating winding are mounted in thin film technology on the exterior side of the tube. The sensor signal is generated by the measurement of the current necessary for a consistent slight increase of the liquid.

Application Areas:

- Chemistry
- Pharmaceutics
- Filling and Bottling
- Flow Monitoring
- Metering

Technical Data

Physical Characteristics	
Accuracy, Standard	±1% of Final Value (at calibration under operational conditions)
Span	2...100%
Reproducibility	0,2% of Final Value typical for H2O
Setting Time	Sensor 1...2 seconds, Controller 4...10 seconds
Max. Operational Pressure	100 bar
Pressure Loss	35...350 mbar (based on 2...20 kg/h H2O)
Operational Temperature	5...70°C
Temperature Sensitivity	±0,2% of Final Value/°C
Position Dependency	Non-sensitive
Heating Period	30 minutes for highest accuracy; 3 minutes for an accuracy of ±2% of Final Value
Mechanical Characterisics	
Material	High Grade Steel 316L, electropolished (parts in contact with media). Other materials are available upon request.
Process Connections	1/4” or 6 mm clamp ring connection; 1/4” vacuum connection, orbital welded. Other connections are available upon request.
Gaskets towards the exterior	Metallic
Baffle Plate (in the Controller Valve)	Kalrez-6375. Others are available upon request.
Protection Class	IP65
Electrical Characteristics	
Supply Voltage	+15...24 Vdc
Output	Measuring Device max. 18,5 Watt; Controller max. 22 Watt
Output/Setpoint Value analogue	0...5 (10) Vdc or 0 (4)...20 mA (active Output Signal)
Output/Setpoint Value digital	Standard RS232, Optional Profibus-DP®, DeviceNet™, Modbus-RTU, FLOW-BUS
Electrical Connection	Analogue/RS232/Supply 8-pole DIN-Connector male, Bus Systems-5-pole M12-Socket female
Calibration	Reference : Verifed by the NKO (National Calibration Service), is based on international standards. Liquid : Standard Calibration Liquid: H2O. For other liquids, please contact us.

Models and Flow Ranges

Mass Flowmeter for Liquids

Model	**Minimum Flow**	**Maximum Flow**
L30 0,0	0,04…2 kg/h	0,4…20 kg/h

Mass Flow Controllers for Liquids

Model	**Minimum Flow**	**Maximum Flow**
L30C2I (Kv-max: 2,37x10-3)	0,04…2 kg/h	0,4…20 kg/h
L30C5I (Kv-max: 6,93x10-2)	0,04…2 kg/h	0,4…20 kg/h

Based on liquids with thermal characteristics equal to H2O.

Delivery Scope:	Sensor with Manual

Order Code	Description
IS-FM-L30 0,0	Thermal Mass Flowmeter 0,04...2 kg/h to 0,4...20 kg/h
IS-FM-L30C2I	Thermal Mass Flowmeter(Kv-max: 2,37x10-3) 0,04...2 kg/h to 0,4...20 kg/h
IS-FM-L30C5	Thermal Mass Flowmeter (Kv-max: 6,93x10-2) 0,04...2 kg/h to 0,4...20 kg/h

Further flowmeters and devices in EX design are available upon request, for example, the µ-FLOW Series for the smallest possible flow amounts with measurement ranges reaching between 1,5...30 mg/h to 0,1...2 g/h equivalent to water.

Coriolis Mass Flowmeters and Controllers

These mass flow sensors serve for the measurement and the control of the mass flow of liquid. They operate according to the Coriolis principle. They offer, compared to all other flowmeters, the great advantage that the mass flow is measured independent of the material characteristics. With them, multiple-phase materials can also be measured on an interference-free basis.

The Advantages:

- **Real Mass Flow Measurement**
- **Suited for Gasses and Liquids**
- **Independent of Material Characteristics**
- **Compact Design**
- **Maintenance-Free**
- **Extensive Operational Range**
- **Low Response Time**

Application Areas

- Chemistry
- Pharmaceutics
- Dosing
- Filling and Bottling
- Flow Monitoring
- Metering

Technical Data

Physical Characteristics	M12 / M13 / M14
Accuracy, Standard	Gases 0.5% p.M. Liquids 0.2% p.M.
Span	
Reproducibility	0.05% v.M. ±1/2 [ZS x 100/flow]% (Digital Output) (ZS = Zero Stability)
Setting Time(Regler)	(<2% of the Setpoint Value) 1 s
Max. Operational Pressure	Meter: 200 bar; Controller: 100 bar
Operational Temperature	
Temperature Sensitivity	Zero Point [g/h°C] ±0.002 / ±0.02 / ±0.8, Range [%Rd./°C] ±0.001
Mechanical Characteristics	
Material (moisted)	High Grade Steel AISI 316 or equivalant
Process Connections	Compression Type (welded) or Face Seal Couplings
Gaskets towards the exterior	Metal
Baffle Plate (in the Controller Valve)	Kalrez-6375. Others are available upon request.
Weight	Meter: 1,2 kg; Controller: 1,7 kg
Protection Class	IP65 (weatherproof)
Pressure Range	Outboard < 2 x 10-9 mbar l/s He
Electrical Characteristics	
Supply Voltage	+15…24 Vdc
Power Consumption	Meter: 3 W; Controller: max. 7 W
Output/Setpoint Value analogue	0…5 (10) Vdc or 0 (4)…20 mA (sourcing output)
Output/Setpoint Value digital	Standard: RS232 Options: DeviceNet™, Profibus-DP®, Modbus-RTU, LonWorks, FLOW-BUS
Electrical Connection	Analog/RS232/Versorgung 8-polige DIN-Connector male, Bus Systems 5-pole M12-Connector female
Calibration	Reference : Verified by the NKO (National Calibration Service) based on international standards. Liquid: Standard Calibration Liquid: H2O. For other liquids, please contact us.

Models and Flow Ranges

Mass Flowmeters for Liquids

Model	Smallest Measurement Range	Nominal	Highest Measurement Range
M12	0.1…5g/h	1…100g/h	2…200g/h
M13	1…50g/h	10…1000g/h	20…2000g/h
M14	0.03…1kg/h	0.1…10kg/h	0.3…30kg/h

Mass Flow Controllers for Liquids

Model	Smallest Measurement Range	Nominal	Highest Measurement Range
M12V1NI	0.1…5g/h	2…100g/h	4…200g/h
M13V1NI	1…50g/h	20…1000g/h	40…2000g/h
M14V1NI	0.03…1kg/h	0.2…10kg/h	0.6…30kg/h

Delivery Scope:	Sensor with Manual

Order Code	Description
IS-FM-M12	Coriolis Mass Flowmeter 1...100g/h
IS-FM-M13	Coriolis Mass Flowmeter 10...1000g/h
IS-FM-M14	Coriolis Mass Flowmeter 0.1...10kg/h
IS-FM-M12V1NI	Coriolis Mass Flowmeter 1...100g/h
IS-FM-M13V1NI	Coriolis Mass Flowmeter 10...1000g/h
IS-FM-M14V1NI	Coriolis Mass Flowmeter 0.1...10kg/h

Further flowmeters and devices in EX design are available upon request.

Laboratory Gas Counter

Drum-Type Gas Counter Wet Gas version

Drum gas counters are universally deployable for volume measurement of flowing gases, in particular in case of minute and medium flow quantities, e.g. in the laboratory sector where utmost precision is demanded.

Correction factors that consider gas type, temperature, humidity, etc. are therefore not required.

Drum gas counters do not require maintenance and no power supply (as long as they are not operated with the option “pulse generator”).

Advantages of the drum gas counter:

- **Housing and measuring drum are made of high quality plastics**
- **Welded measuring drum – not soldered**
- **Housing and measuring drum are resistant in regard to sealing liquid – in case an acid should generate out of the same**
- **Epoxy coating for the measuring drum not required**
- **Magnetic coupling instead of an O-Ring for drum shaft**
- **PVC gas counter made of transparent PVC**
- **4-chamber measuring drum**
- **Totalising roll counting mechanism (8-digit)**
- **Large one-needle instrument dial**
- **Magnetic coupling (between measuring drum and counting mechanism)**
- **Filling level indicator (for adjustment of the sealing liquid level)**
- **Recordings for manometer/thermometer**
- **Viton seal**
- **Circular bubble**
- **Device foots can be levelled**

Performance Data

- Measurement Accuracy:
  ± 0.2% at nominal flow (exact value is stated in calibration certificate),
  approx. ± 0.5% above the measurement range
- Maximum input pressure:
  50 mbar at housings made of thermoplastics,
  500 mbar (0.05 MPa) at housings of high-grade steel

Available Versions (materials):

Housing	Measuring Drum	Version
PVC-transparent	PVC-grey	5
PP-grey	PP-grey	6
PVDF	PVDF	7
PE-el	PE-el	8
1.4571	PVC-grey	1
1.4571	PE-el	2
1.4571	PP-grey	3
1.4571	PVDF	4

In case of any questions regarding the chemical resistance, please contact us. Both plastic and high-grade steel housings are welded.

Available Types

Type	Flow			Display (Standard Version)	
	Minimum [l/h]	Maximum [l/h]	Standard [l/h]	Lowest Resolution [l]	Highest Resolution [l]
TG 01	0.1	30	10	0.0005(1)	999,9999(1)
TG 05	1	60	50	0.002	9,999,999.9
TG 1	2	120	100	0.01	99,999,999
TG 3	5	360	300	0.02	99,999,999
TG 5	10	600	500	0.02	99,999,999
TG 10	20	1200	1000	0.1	99,999,999
TG 20	100	4000	3200	0.2	999,999,990
TG 25	100	7000	5000	0.1	999,999,990
TG 50	200	18000	10000	0.5	999,999,990

(1) Display at the EDU 32

Accessories (optional):

- Thermometer (Gas), Measurement Range 0-60°C
- Thermometer (Sealing Liquid), Measurement Range 0-60°C
- Manometer, Measurement Range 10mbar Differential Pressure
- Digital Display Unit, with Interface RS232 and Analogue Output, (Impulse Generator required in Gas Counter)

Options (installed in Gas Counter):

Impulse Generator (for connection to Digital Display Unit/Computer)

- Standard Version
- Ex Version

Slanted Tube Filling Level Indicator for Sealing Liquid „HPLI“

Roll Counting Mechanism, resettable, 6 -digit (instead of totalising roll counting mechanism)

Order Code	Description
IS-FV-GAS-tc-au	Laboratory gas counter, wet gas version
IS-FV-GAS-IG	Impulse generator for connection to digital display unit/LAB- or PMC-PI
IS-FV-GAS-IGEX	Impulse generator for connection to digital display unit/LAB- or PMC-PI, Ex Version
IS-FV-GAS-THG	Thermometer (Gas), measurement range 0-60°C
ZK-SFV-RI01-ID-XX-I-01	Connection cable for connection to DEP8A
IS-FV-GAS-THS	Thermometer (sealing liquid), measurement range 0-60°C
IS-FV-GAS-MAN	Manometer, measurement range 10 mbar differential pressure
IS-FV-GAS-DISP	Digital display unit, with interface RS232 and analogue output, (impulse generator required in gas counter)

tc = Type code according to table types

au = Version according to table versions (materials)

Order Example: Type TG5 in PVDF with impulse generator for LabManager:

Order Codes: IS-FV-GAS-TG5-7 and IS-FV-GAS-IG

Temperature Sensors

Pt100 Sensors

Pt100 sensors have asserted themselves as standard in laboratories and pilot plants due to their high accuracy. They are available in different versions and dimensions.

Accuracy Categories

DIN Class A = ½ DIN B
DIN B = ±(0.3+ 0.005|ϑ|)°C
1/3 DIN B = ±(0.1+ 0.0016|ϑ|)°C
1/5 DIN B = ±(0.06+ 0.001|ϑ|)°C
1/10 DINB= ±(0.03+ 0.0005|ϑ|)°C

Diameter d = 2/3/6mm, Length l = 50/100/300/600mm

Technical Data

Material: High-grade steel 1,4541 (V4A) (food and chemical resistant with the exception of chlorine)
Temperature Range: -200 to 500°C
Four-wire Technology
Cable: 3 m, individual wires Teflon-isolated
Outer cladding silicone, with bend protection.
Lemo Plug Size 1

The Pt100 sensors are delivered ready to connect with a cable and a Lemo plug for direct connection to a Pt100-Panel PTP8.

Order Code	Description
IS-T-PT100-1/1-VA-d-l	Pt100 Sensor DIN B, high-grade steel cladding 1,4541, with cable for LAB-PI Panel PTP8
IS-T-PT100-1/3-VA-d-l	Pt100 Sensor 1/3 DIN B, high-grade steel cladding 1,4541, with cable for LAB-PI Panel PTP8
IS-T-PT100 1/5-VA-d-l	Pt100 Sensor 1/5 DIN B, high-grade steel cladding 1,4541, with cable for LAB-PI Panel PTP8
IS-T-PT100-1/10-VA-d-l	Pt100 Sensor 1/10 DIN B, high-grade steel cladding 1,4541, with cable for LAB-PI Panel PTP8

Diameter d = 1/1.6mm, Length l = 100/250/1000mm

Order Code	Description
IS-T-PT100-1/1-VA -d-l	Pt100 Sensor DIN B, high-grade steel jacket 1,4541, with cable for LAB-PI Panel PTP8

Special Designs

- Precision Temperature Sensor (see under Precision Measurement Card)
- Temperature Range -200 to 500°C, 600°C
- Other Cladding Materials (Glass, Titanium ...)

Calibration Certificates

Manufacturer's Certificate or DKD certificate (German Calibration Service) upon request.

Accessories

Screwing fixtures with slide function, process connection with G ¼ inch, glass thread GL or standard grinding.

Thermo- Elements

Thermo-elements are available in various materials and dimensions. Especially small diameters are also available. This, in connection with their extremely broad temperature range, makes them indispensable.

Connection to the LabManager:

The cladded thermo-elements are delivered ready to connect with a cable and a Lemo plug for direct connection to a thermo-element Panel (LP-THP8).

Technical Data:

Material Cladding Tube: High-Grade Steel
(food and chemical resistant with the exception of chlorine compounds)
Temperature Range: -200 to 800°C
Lemo-Plug Size 1 for LAB-PI

Available upon request:

- Open cable ends for MSRmanager
- Other Cladding Materials (Glass, Titanium ...)
- Area Sensor
- Special Designs

Order Code	Description
IS-T-NICRNI-d-l	Thermo-element NiCr-Ni with connection cable for LAB-PI Panel THP8

Diameter d = 0.5/1/2mm, Length l = 100/250/500/1000mm

Pressure Transmitters

Standard Pressure Transmitters

Robust high-quality pressure transmitter for industrial deployment. These pressure transmitters can be directly connected to HiTec PIs. We offer three different types of pressure transmitters:

- **Relative Pressure:**
  Atmospheric pressure as reference pressure, e.g. for filtration/vacuum filtration
- **Absolute Pressure:**
  Vacuum reference, in particular for reactors, vacuum, distillation, steam pressure
- **Differential Pressure:**
  2 Connections,
  filling level, pump monitoring...

Properties:

- High Accuracy
- Compact Design
- In Situ Digital Display available
- High Overload Capability
  (5- to 10-fold, dependant of Measurement Range)

Connection to the LabManager

The sensor is delivered ready to connect with a cable and a Tuchel plug for direct connection to an analogue input Panel LP-AEP8A. The power supply is conducted via Pin 5 = +24V and Pin 6 = GND.

Technical Data:

Measurement Principle	Piezo-resistive
Characteristic Line Deviation	0.25% of Range
Reproducibility	0.05 % of Range
Hysteresis Fault	0.1 % of Range
Stability/Year	0.2 % of Range
Response Time (10 - 90%)	1 ms
Temperature Dependency	Usually< 0.2% of Range/10K
Measurement Media Temperature	-30 to +100°C
Ambient Temperature	-20 to +80°C
Parts in Contact with Measurement Media	High-Grade Steel 1,4571, 1,4542
Pressure Connection	G ¼“B (others upon request)
Output Signal	4 - 20mA
Supply Voltage	10 - 30 V DC unregulated, two-wire switching with plug-on display 13 - 30 V DC
Electrical Connection	Angle plug 4-pole, DIN 43 650
Protection Category	IP 65
EEX	Upon request
Dimensions	L approx. 100 mm, D approx. 48 mm with plug

Order Code	Description
IS-P-R-6-ma-ea	Pressure Transmitter 0- 6 bar relative with connection cable 1.5m for LAB-PI Panel LP-AEP8A
IS-P-A-025-ma-ea	Pressure Transmitter 0- 0.25 bar absolute with connection cable 1.5m for LAB-PI Panel LP-AEP8A
IS-P-A-1,6-ma-ea	Pressure Transmitter 0- 1.6 bar absolute with connection cable 1.5m for LAB-PI Panel LP-AEP8A
IS-P-A-2,5-ma-ea	Pressure Transmitter 0- 2.5 bar absolute with connection cable 1.5m for LAB-PI Panel LP-AEP8A
IS-P-A-6-ma-ea	Pressure Transmitter 0- 6 bar absolute with connection cable 1.5m for LAB-PI Panel LP-AEP8A
IS-P-Z-AA	Electronic plug-on display

ma=Media Connection:

GMG1/4	Outer Thread G ¼“
GMG1/2	Outer Thread G ½“

ea=Electrical Connection:

T	Tuchel-plug for LAB-PI
O	Open ends for PMC-PI

Order Example:

Pressure Transmitter 0 – 0.25 bar absolute, G1/2“, with connection cable 1.5 m for LabManager Panel LP-AEP8A

Order Code: IS-P-A-025-GMG1/2-O

Available upon request:

- Materials: Hastelloy C4
- Other Measurement Ranges
- Front-flush Diaphragm
- Differential Pressure
- EEX Versions

Low Dead Space - pressure transducer

This robust pressure transducer is suited for applications where particular low dead spaces are required, e.g. within micro-reaction technology.

The measuring media does not come in contact with any metals.

Features :

- Metal- free Measuring Circuit
- High Precision
- Compact Design
- Digital display available in-situ
- High Overload Capability

The pressure transducer can be directly connected to the HiTec PNCs.

The pressure transducer is available for the measurement of relative and absolute pressure.

Connection to the LabManager

The sensor is delivered in ready-to-connect condition with a cable and a Tuchel plug for the direct connection to an Analogue-Entry-Panel LP-AEP8A. The power supply is conducted via Pin 5 = +24V and Pin 6 = GND.

For connection to a panel without sensor power supply (e.g. LP-AEP8), you additionally require a 24V power supply unit.

Technical Data:

Dead Volume	250µl
Measuring Principle	Piezo-resistive
Characteristics Deviation	0,25% of Range
Reproducibility	0,05 % of Range
Hysteresis Fault	0,1 % of Range
Stability/Year	0,2 % of Range
Response Time (10 - 90%)	1 ms
Temperature Dependency	Usually< 0,2% of Range /10K
Measuring Media Temperature	-0 to +100°C
Ambient Temperature	-20 to +80°C
Parts in Contact with Measuring Media	PFA, PEEK, Kalrez Gaskets
Output Signal	4 - 20mA
Supply Voltage	10 - 30 V DC not controlled, two-wire circuit, with plug-on display 13 - 30 V DC
Electrical Connection	Angle Plug 4-pole, DIN 43 650
Protection Category	IP 65
EEX	Upon Request
Dimensions	L approx. 100 mm, D approx. 48 mm with plug

Order Code	Description
IS-PTOT-R-16-ea	Low Dead Space pressure transducer 0- 16 bar relative with connection cable 1,5m for LAB-PNC Panel LP-AEP8A
IS-PTOT-A-16-ea	Low Dead Space pressure transducer 0- 16 bar absolute with connection cable 1,5m for LAB-PNC Panel LP-AEP8A
IS-P-Z-AA	Electronic Plug-On Display

ea=Electrical Connection:

T	Tuchel-Plug for LAB-PNC
O	Open Ends for MSR-PNC

Example Order:

pressure transducer 0 - 16 bar abs., with connection cable 1,5 m for LabManager Panel LP-AEP8A,

Order Code: IS-PTOT-A-16-T

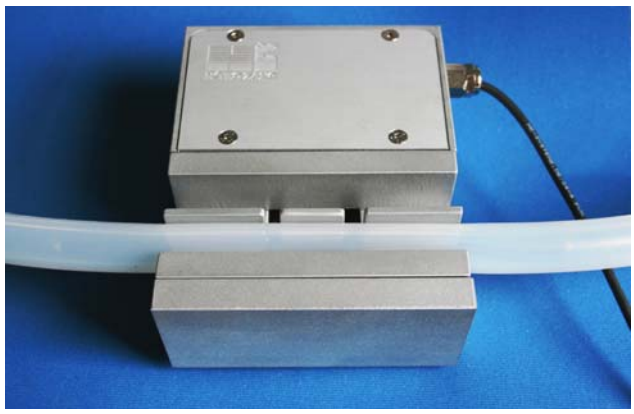
Other Measurement Ranges are available upon request.

Hose Pressure Transmitter

These novel pressure transmitters measure the pressure or the differential pressure at normal hoses from the exterior. For this reason, they are particularly suited for sterile applications. No mounting parts are required in the hose. The plant is completely sterilised and the hose is merely inserted into the sensor after sterilisation. The novel measurement principle is subject to legal protection.

The Advantages:

- **Suited for sterile applications**
- **Media compatibility determined by hose**
- **Subsequent mounting possible**
- **Differential and absolute pressure measurement**
- **The sensor can be operated with all load cell amplifier types**



The sensor can, in particular, be used for pressure measurement and filter monitoring in bio-technical, sterile plants.

Due to the measurement principle, the specification is strongly dependant of the hose (diameter, wall thickness, material). For this reason, the values stated below are only to be considered as guideline values. In particular in case of thin hoses and great wall thicknesses, greater deviations may occur. In practice, in case great care is directed at the calibration, significantly better specifications are usually reached at hose diameters >=10 mm.

Technical Data:

Measurement Principle	Measuring of the hose wall force from the exterior
Resolution	< 1 mbar
Characteristic Line Deviation *	< 50 mbar
Zero Point Stability	< 30 mbar
Reproducibility*	< 20 mbar
Hysteresis Faults*	< 30 mbar
Stability/Year*	< 50 mbar/a
Response Time (10 - 90%)*	approx. 1 sec
Temperature Dependency	Calibration at operating temperature ± 5°C expedient
Measurement Media Temperature *	10 to +50°C
Ambient Temperature	10 to +40 °C
Parts in Contact with Media	Hose material
Hose Diameter	3 to 22 mm
Output Signal	6 conductor-resistance bridge
Electrical Connection	6-pole LEMO-plug Size 1
Protection Category	IP 20
Ex-Protection Equipment	Upon request
Dimensions	140x120x45mm

* with silicone hose 22mm

Order Code	Description
IS-P-TUBE-sd	Pressure Transmitter 0 – 2 bar, for hose diameter of 3mm to 22mm, absolute and differential pressure with connection cable 1.5m for 6-conductor measurement amplifier
HK-GRADOMV1	Measurement amplifier 1 channel, external measurement amplifier for connection to analogue input
HK-AD24DMS4	Measurement system 4 channels, card for HiTec Zang PNC panel *** requires LP-DMS4DA4PTR

sd = Exterior Hose Diameter in mm

Special designs available upon request.

Humidity Sensors

The humidity sensor IS-M-FEU1 has a linear operational range of 0-100%. Trough laser trimming down to 2 %, the sensor can be exchanged in most cases without the need of additional calibration. The sensor is delivered without housing. When installing it, care must be taken that the humidity diffusion to the sensor is not disturbed.

Technical Data:

Measurement Uncertainty	± 2 %, 0-100%, not condensing
Linearity Fault	± 0.5 % typical
Hysteresis Fault	± 0.8 % of range
Reproducibility	± 0.5 %
Stability	± 1 % in 5 years
Response Time 1/e	15 s in slowly agitated air
Operational Range	0 - 100%, not condensing
Working temperature Range	-40 to 85°C
Output Signal	0.8V at 0%, 4V at 100%
Temperature Dependency	0.22%/°C of reading value
Dimensions	6mm x 9mm x 19mm

Connection to the LabManager:

The sensor is delivered ready to connect with a cable and a Tuchel plug for direct connection to an analogue input Panel LP-AEP8A. The power supply is conducted via Pin 5 = +24V and Pin 6 = GND.

For the connection to a panel without sensor supply LP-AEP8, you additionally require an adapter cable with wall power supply ZK-LAB-HI99-IA-XA-Y-0.1.

Scaling of the Analogue Input:

Interface Value	Process Value
0.8 V	0 %
4 V	100%

Under laboratory conditions, the temperature fault is situated within the scope of the measurement uncertainty and does not need to be corrected. Increased temperature range available upon request.

Order Code	Description
IS-M-FEU1	Humidity sensor with connection cable for LabManager Panel LP-AEP8A
ZK-LAB-HI99-IA-XA-Y-0.1	Adapter cable for AEP8 (not actived!) with wall power supply for the sensor 24V DC

Distance and Rotational Speed Measurement

Inductive Proximity Switch

With the help of a proximity switch, the position of an object and the rotational speed at a rotating object can be measured and monitored.

The Sensor generates an impulse at every approach to the optical, respectively magnetic marking. The PI collects the pulse frequency and calculates the rotational speed hereof.

Inductive Proximity Switch as a Rotational Speed Sensor

Order Code	Description
IS-G-REFL1	Infrared reflection sensor, max. switching frequency 100Hz, exterior diameter 12mm
IS-G-IND1	Inductive proximity switch

Suited cards and connection modules: HK-DEA16F with LP-DEP8A or MB-DEB8 with cable adapter.

Weight Measuring and Load Cells

KMZ1000 to KMZ30000

KMZ50k to KMZ1000k

The load cells can be used for:

- Vessel Weighing
- Reactor Content Measurement (see Reactor Weighing)
- Gravimetric Dosing (see also GraviDos)

A load measuring system consists of a load cell IS-W-KMZxxxx, and, optionally, an external measurement amplifier HK-GRADOMV1 or a PI-internal measurement system HK-AD24DMS4 for four channels.

The digital measuring amplifier HK-GRADOMV1D enables the connection to a serial interface.

Technical Data (KMZ1000 to 3000)

Measurement Resolution	Approx. 0.01%
Measurement Uncertainty	Approx. 0.1% p.U.
Dimensions (without rodding)	approx. 195x40x52 mm
Ex-Protection	optional
Connection	6 pole LEMO-plug, Type FFA.11S.306.CLACxx

Technical Data (KMZ50k to 1000k)

Accuracy Classes	D1, C3, C4, C6
Calibratable	Up to 6000 Parts
Approvals	OIML, NTEP, Ex, GOS

Order Code	Description
IS-W-KMZ1000	Load cell, 0 to 1000g, including cable
IS-W-KMZ3000	Load cell, 0 to 3000g, including cable
IS-W-KMZ7500	Load cell, 0 to 7500g, including cable
IS-W-KMZ15000	Load cell, 0 to 15 kg, including cable
IS-W-KMZ30000	Load cell, 0 to 30 kg, including cable
IS-W-KMZ1000D	Load cell, 0 to 1000 g, integrated measurement amplifier, RS232 interface, including cable
IS-W-KMZ3000D	Load cell, 0 to 3000 g, integrated measurement amplifier, RS232 interface, including cable
IS-W-KMZ7500D	Load cell, 0 to 7,5 kg, integrated measurement amplifier, RS232 interface, including cable
IS-W-KMZ15000D	Load cell, 0 to 15 kg, integrated measurement amplifier, RS232 interface, including cable
IS-W-KMZ30000D	Load cell, 0 to 50 kg, integrated measurement amplifier, RS232 interface, including cable
IS-W-KMZ50k	Load cell, 0 to 50 kg, including cable
IS-W-KMZ100k	Load cell, 0 to 100 kg, including cable
IS-W-KMZ200k	Load cell, 0 to 200 kg, including cable
IS-W-KMZ500k	Load cell, 0 to 500 kg, including cable
IS-W-KMZ1000k	Load cell, 0 to 1000 kg, including cable
HK-GRADOMV1	Measurement amplifier 1 channel, external measurement amplifier for connection to analogue input
HK-GRADOMV1D	Digital measurement amplifier 1 channel, external measurement amplifier, RS232 interface
IL-NGSAMP1D-SN	Power supply for digital measuring amplifier HK-GRADOAMP1D, HK-AINAMP1D, HK-PTAMP1D
HK-AD24DMS4	Measuring system 4 channels, Card for HiTec Zang PNC panel
IL-GRADOADV	Adapter-square, manifold measuring cell to square aluminum construction system
IL-GRADOADR12	Adapter-round, manifold measuring cell to 12 mm tube construction systems
IL-GRADOADR14	Adapter-round, manifold measuring cell to 14 mm tube construction systems

Informationen zu den Messverstärkern und weitere Informationen finden Sie in den Kapiteln Labor-automatisierung Hardware, Externe Messverstärker und Laborgeräte und Komponenten, Waagen.

Monitors

Monitors serve for the monitoring of limit values. They usually have a (binary) switching output or a passive switching contact.

For safety reasons, it is in most cases advisable to use a normally closed contact (NCC).

Temperature Monitor and Safety Temperature Limiter

If there is possibility of damage and harm to persons and expensive equipment in case of the breakdown of the automation technology or deployed devices and components, a redundant, certified temperature monitoring, which deactivates the plant, if required, is absolutely compulsory.

The external certified temperature monitor, respectively safety temperature limiter, monitors a temperature which is regulable via a potentiometer.

In the case the set limit value is exceeded, the switching circuit can for example be interrupted via a potential-free switching contact and an alarm could be triggered.

The temperature monitors may only be deployed together with an additional control system such as the LabManager System.

The temperature monitor, respectively safety temperature limiter are intended for mounting on standard rails and must be installed in a control box, respectively control cabinet.

The temperature monitor, respectively safety temperature limiter is integrated into the existing Emergency Stop circuit or deployed in connection with a suited contactor.

The safety temperature limiter accords to the Safety Category SK 3 of DIN/EN 954-1.

Temperature Monitor

If the set temperature limit value is not reached, or should a fault such as a sensor breakage, short circuit or power failure, occur within the permissible temperature range, the device will shut down without delay. As soon as no malfunction is pending, it is necessary to unlock, if the device is set on temperature limiter function (TL). This unlocking can be realised by a push-button on the device or via an external push-button.

Technical Data

Adjustable Sensor Input	Resistance Thermometer (PT100, 3-wire) Thermal Element (Types J, K, T, E, R, S, B)
Measuring Circuit Monitoring	Sensor Breakage Identification Short Circuit Identification (only at PT100)
Output	Relay, Change-over Contact, max. 3A, 250 VAC
Display	LED supply voltage, fault message sensor breakage, lock ON
Resetting	1 push-button on front panel or external push-button
Versions	Smallest Setting Step 1C° **Input** **Measuring Range** PT 100 DIN EN 60751 0... 400°C Fe-CuNi (J) DIN EN 60584 0... 400°C NiCr-Ni (K) DIN EN 60584 0... 400°C Cu-CuNi (T) DIN EN 60584 0... 400°C NiCr-CuNi (E) DIN EN 60584 0... 400°C
Dimensions	Depth: 100 mm Width: 22 mm Height: 102 mm
Mounting	Snap-on mounting on standard 35 mm rail
Power Supply	115/230VAC or 24VDC
Ambient Conditions	10..55°C, max. 85% humidity, no bedewing

Order Code	Description
HP-SITEMPWAE1	External Temperature Monitor for PT100 or Thermal Elements

Safety Temperature Limiter

If the permissible temperature limit is exceeded, or at the occurrence of a malfunction, the STL will, without delay, switch the plant to an operationally safe condition. The device can be deployed in connection with the resistance pick-ups of the type Pt100.

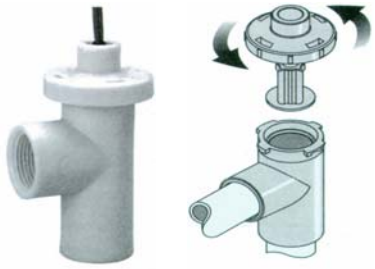
The limit temperature T can be adjusted via a frontally located scaled potentiometer. Unintended, respectively unauthorised setting of the limit value is prevented by a lead-sealable transparent cover.

Technical Data

Sensor Connection	Resistance Thermometer PT 100, 3-wire according to EN 60751/IEC 781
Measuring Circuit Monitoring	Sensor Breakage Identification, Short Circuit Identification
Output	Relay, Change-over Contact, max. 3A, 250 VAC
Display	LED supply voltage, fault message sensor breakage, lock ON
Resetting	1 push-button on front panel or external push-button
Temperature Ranges	Type A: 0...200°C, Type B: 100...300°C, Type C: 200...500°COther Measuring Ranges -200...+700 °C available upon request
Dimensions	Depth: 121 mm, Width: 42 mm, Height: 82 mm
Power Supply	115/230VAC or 24VDC
Mounting	Snap-on mounting on standard 35 mm rail
Ambient Conditions	10..55°C, max. 85% humidity, no bedewing

Order Code	Description
HP-SITEMPBEG1	External Safety Temperature Limiter for Pt100

Flow Monitors



Low-cost flow monitors with fixed switching point.

Robust mechanical flow monitor for monitoring of cooling and heating circuits.

The connection to the LabManager/box is conducted via digital input. The monitor is suited for looping into a monitor chain.

Technical Data:

Switching Point	60 l/h, 120 l/h permanent adjustment
Operational Pressure	7 bar at 20°C, 3.5 bar at 80°C
Measured Media Temperature	Max. +100°C
Ambient Temperature	-25°C to +70°C
Parts in Contact with measurement Media	Housing PP, seal FKM, spring made of high-grade steel
Connection	R ¾“ Inner thread, corner mount version
Stability	Water, silicone oil, in case of chemicals, verification is necessary problematic: some solvents, materials containing chlorine, oxidants
Switching Contact	Normally open contact
Switching Load	Max. 5A AC/ 0.3A DC/ 250 V
EEX	in intrinsically safe electric circuits Zone 1
Dimensions	Length approx. 100 mm, width approx. 64 mm

Order Code	Description
IB-FVGE-60-GMG3/4-ea	Flow monitor 60 l/h, R ¾“, with connection cable 1.5 m for LAB- or PMC-PI
IB-FGVE-120-GMG3/4-ea	Flow monitor 120 l/h, R ¾“, with connection cable 1.5 m for LAB- or PMC-PI

ea=Connection

T	Tuchel plug for LAB-PI
O	Open ends for PMC-PI

Order Example:

Flow monitor 120 l/h, R ¾“, with connection cable 1.5 with open ends for LabManager

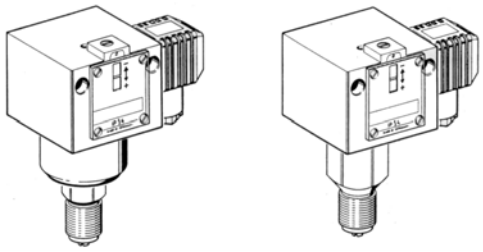
Order Code: IB-FVGE-120-GMG3/4-O

Pressure Monitor

Robust mechanical pressure monitor for industrial application.

- For Pressure Monitoring independent of the Pressure Measurement
- High Overload Capacity

The connection to a LabManager/box is conducted via a digital input. The device is suited for integration into a monitor chain.



Technical Data:

Setting Range	0,5 - 6 bar relative
Hysteresis	Fixed 0,15 bar
Maximum permissible Pressure	16 bar
Measurement Media Temperature	Max +85°C
Ambient Temperature	-25°C to +70°C
Parts in Contact with Measurement Media	High Grade Steel 1.4571 + 1.4104
Pressure Connection	Outside Thread G 1/2“
Resistance	Many chemicals except chloric ones, HCl, oxidants
Switching Contacts	1-pole changeover switch
Switching Capacity	Max. 5A AC, 0,3A DC, 250V AC/DC
Electrical Connection	Angular Connector 4-pole, DIN 43 650
Protection Class	IP 54
EEX	In intrinsically safe electrical circuits Zone 1 Compression-proof enclosed version is available.
Dimensions	L approx. 105 mm, W approx. 112 mm with Jack

Order Code	Description
IB-PRKO-6-ma-ea	Pressure Monitor 0 - 6 bar relative, with connection cable 1,5m for LAB- or MSR-PNC

ma=Media Connection

AG1/2	Screw Socket G ½“

ea=electrical Connection

T	Tuchel-Connector for LAB-PNC
O	Open Ends for MSR-PNC

Available upon request:

- Other Switching Ranges
- Differential Pressure
- EEX Version

Example Order:

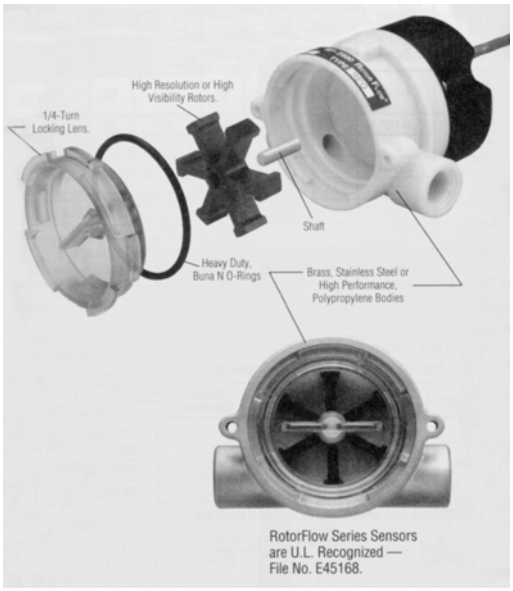
Pressure Monitor 0 - 6 bar rel., G1/2“, with connection Cable 1,5 m with open ends for LabManager

Order Code: IB-PRKO-6-AGG1/2-O

Flow Monitor with visual Flow Control

Robust mechanical flow indicator (rotameter) with adjustable switching point for monitoring of cooling and heating circuits.

The connection to the LabManager/box is conducted via an active digital input with 24V DC power supply. The monitor is suited for looping into a monitor chain.



Technical Data:

Adjustment Range	24 l/h to 1200 l/h
Operational Pressure	max. 7 bar
Repeat Accuracy	2%
Switching Point Accuracy	± 5%
Measured Media Temperature	Max. +80°C
Ambient Temperature	max. +65°C
Parts in Contact with Measured Media	Housing PP, seal BUNA N
Connection	G 1/4“ Inner thread
Stability	Water, silicone oil, in case of chemicals, verification is necessary problematic: some solvents, materials containing chlorine, oxidants
Supply Voltage	24 V DC
Switching Contact	Normally open and closed contact
Switching Load	max. 1 A, 24 V DC
EEX	no
Dimensions	78 x 60 x 61 mm

Order Code	Description
IB-FVGE-1200-GMG1/4-ea	Flow monitor 1200 l/h, G ¼“, with connection cable 1.5 m for LAB- or PMC-PI

ea=connection

T	Tuchel plug for LAB-PI
O	Open ends for PMC-PI

Order Example:

Flow monitor 1200 l/h with visual indicator, G 1/4“, with connection cable 1.5 m with Tuchel plug for LAB-PI

Order Code: IB-FVGE-1200-GMG1/4-T

Available upon request:

- Greater Flow Rates and Connection Diameters
- Materials: Brass, Cr-Ni-Steel
- As Sensor 0-10 V or Impulse Output
- Without Electronics as visual Flow Indicator

Filling Level Monitor

Optically

Optical filling level monitor for monitoring of the filling level in reactors, feed tanks, thermostats, collecting containers.

Features

- No moving parts
- Parts in contact with media made of DURAN-Glass
- Compact design
- Conductive and non-conductive liquids, which absorb IR or are penetrable by IR

The functional principle of these monitors is based on total reflection. The end of the glass rod is slightly grinded at an angle of 45°. As long as the rod is suspended in air, incoming light at the conical end is totally reflected. As soon as the rod end submerges into a more dense material than air, no more reflection occurs and the reflection sensor does not receive anymore light.

The glass rod d = 12 mm can be inserted with standard GL-25 screwings and with according adaptors in grindings NS 29/32.

The monitor is connected at an active digital input of the LabManager/box. The monitor is not suited for looping into a monitor chain.

Technical Data:

Diameter of the Glass Rod (Sensor)	12mm
Glass Rod Lengths	100/250/300mm
Used Light	IR
Parts in Contact with measured Media	DURAN Glass
Installation	Glass rod 12 mm in GL-screwing or similar
Switching Contacts	PNP, normally open and closed contact
Switching Load	Max. 0.2A, 30V DC
Response Time	0.65ms
Supply Voltage	10- 30V DC
Electrical Connection	Cable 2 m
Protection Category	IP 65
EEX	Upon request
Dimensions	Diameter max. approx. 20 mm

Order Code	Description
IB-LWE-100-sk-ea	Opto-electronic level monitor 100 mm, with connection cable 2 m for LAB- or PMC-PI
IB-LWE-250-sk-ea	Opto-electronic level monitor 250 mm, with connection cable 2 m for LAB- or PMC-PI
IB-LWE-300-sk-ea	Opto-electronic level monitor 300 mm, with connection cable 2 m for LAB- or PMC-PI

sk=Switching Contact:

NC	Normally closed contact: opens with rising level
NO	Normally open contact: closes with rising level

ea=Connection

T	Tuchel plug for LAB-PI
O	Open ends for PMC-PI

Thermal

The phase detector PhaDec can also be used as filling level monitor. It functions with all liquids independent of optical or other properties.

You will find further information under PhaDec Phase Limit Detector.

Floaters

Filling level monitor based on a floater mechanism are utilised to monitor the filling levels in feed tanks, thermostats and collecting containers.

- No auxiliary energy necessary
- No special requirements to the media
- Applicable as normally open and closed contact (depending on installation)

The monitor is connected at an active digital input of the LabManager/box. The monitor is not suited for looping into a monitor chain.

Technical Data:

Parts in Contact with measured Media	PVDF
Installation	Vertical
Switching Contact	NOC
Switching Load	25W, 24V
Supply Voltage	Not required
Electrical Connection	Tuchel plug of LAB-PI or open ends for PMC-PI
Protection Category	IP67
EEX	No
Dimensions approx.	Ø 27 mm

Order Code	Description
IB-LWE-250-NC-ea	Filling level monitor based on floater mechanism

ea=Connection

T	Tuchel plug for LAB-PI
O	Open ends for PMC-PI

Order Example:

Level monitor (at limit exceedance), with connection cable 2 m with Tuchel-plug for LAB-PI

Order Code: IB-LWE-250-NC-T

Available upon request:

- Floater, posistor, ultra-sonic, radar...flow sensors and monitors
- EEX versions

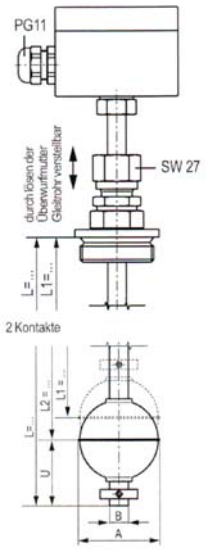
High Pressure Float Monitor

This filling level monitor based on a floater mechanism is suited for applications at very high pressures.

The floater has two switching points.

- No auxiliary energy necessary
- No special requirements to the media
- Applicable both as normally open and closed contact

The monitor is connected at an active digital input of the LabManager/box.



Technical Data:

Connection Casing	Aluminum
Process Connection	Screwing thread G 1/2" in downward direction
HD Version Slide Tube	12 mm (optionally 14 mm) total length: 200 mm
Switching Points	L1 = 60 mm change-over switch, L2 = 155 mm change-over switch
Floater	PN80 Titanium
Density	1000 kg/m¨
Pressure	100 bar
Temperature	150 °C
Measurement Value Transmitter	High-grade steel 1,4571, with connection casing and thread
Connection Casing	Aluminium positioned with 60mm clearance
Process Connection	Screwing thread G 1/2" in downward direction

Order Code	Description
IB-LWDRU-NC-ea	Floater magnetic switch made of high-grade steel 1,4571 with connection casing

ea=Connection

T	Tuchel-plug for LAB-PI
O	Open ends for PMC-PI

Available upon request:

- Floater, posistor, ultra-sonic, radar...flow sensors
- EEX Version

Order Example:

Level monitor (at limit exceedance), with connection cable 2 m with Tuchel-plug for LAB-PI

Order Code: IB-LWDRU-NC-T

Rotational Speed Monitor

The rotational speed monitor is mainly used for the monitoring of stirring drives.

Scanning is mainly conducted inductively.

For this purpose, a small marking in form of an electrically conductive area is placed on the rotating object. The sensor compares the impulse frequency with the set threshold and switches in case of shortfall.

Order Code	Description
IB-SIND	Inductive rotational speed monitor, threshold adjustable 3 - 300 impulses /min, Dimensions M30 thread x 81 mm

Suited cards and connection modules: HK-DEA16N, LP-DEP8A, MB-DEB8

This catalogue, due to the limited space, can only contain an excerpt of the most important products. In case you do not find what you require in the catalogue, please do not hesitate to contact us!

Our experienced project engineers will gladly help you!