# Expertise in process analytics

Process. Anton Paar.

Your goals are to achieve the highest product quality, to minimize production and maintenance costs, and to react immediately to deviations in the production line. To meet these goals, the continuous control and analysis of your process and product are essential. Process sensors which give you an accurate picture of your process in real time allow you to optimize your product quality.

Anton Paar's process sensors provide the required transparency at many different measuring points, and for critical production steps, e.g. in the beverage, petroleum, chemical, pharmaceutical, and ethanol industries.

Optical and mechanical sensors

Driven by ingenious minds, Anton Paar's process sensor portfolio is steadily increasing and broadening in range, covering mechanical, acoustical as well as optical sensors. Sensor versions for use in hazardous areas or hygienic production and for measuring chemically aggressive media are available.
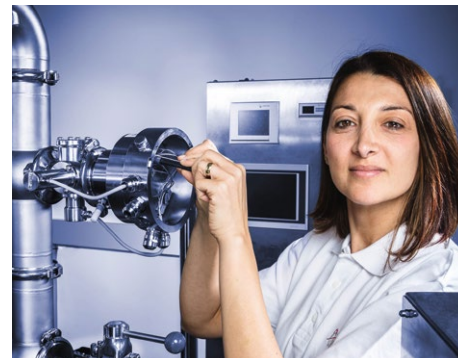
Global sales and service network

We are close to customers in more than 110 countries. Experts help you determine the best position for the sensor and provide full support for installation and integration into your workflow. You can rely on seamless service and support for the whole life of the sensor.

Looking to the future

Based on our longstanding knowledge of process measurements and customer requirements, Anton Paar is continuously working on innovations, including the Pico 3000 transmitter. This platform for Anton Paar's density and sound velocity sensors enables you to display and manage measurement values directly at the sensor.

Density, sound velocity, and combined sensors

Half a century ago, Anton Paar introduced the oscillating U-tube principle for high-accuracy density measurements. Anton Paar still relies on this novel measuring principle for its L-Dens density sensors. As well as the world-renowned L-Dens density sensors, Anton Paar provides robust sound velocity sensors for fast determination of concentration and sound velocity. These L-Sonic sensors are available as fork-type and tube-type versions to suit your installation and flow conditions. The clever combination of both density and sound velocity sensors in the L-Com sensor make the concentration of 3-component mixtures measurable.

Anton Paar's sensors are available with the innovative process instrumentation controller Pico 3000 – a high-performance transmitter which is either installed in the electronics housing of the sensor or in a separate housing for remote control. It provides an optional simple user interface and the possibility to configure all sensor parameters with the additional Pico 3000 software directly at the sensor. The modular design with several configuration possibilities enables easy integration into the PLC system. Data and diagnostics information plus error management result in higher plant availability.

Density sensors

- L-Dens 7300 Petro
  L-Dens 7400 and L-Dens 7500
- L-Dens 3300
- L-Dens 2300

Benefits
- Outstanding accuracy up to 5 x 10^{-5} g/cm^3 depending on the sensor type
- Independent of temperature fluctuations
- Fit for a long life without maintenance
- Applicable for homogenous fluids and light slurries with low to medium viscosity
- Designed for use in demanding environments; for non-agressive or agressive liquids

Sound velocity sensors

- L-Sonic 5100
- L-Sonic 6100

Benefits
- Insensitive to fluctuations in temperature, flow rates, viscosity and pressure; highly tolerant to bubbles

- Have provided stable results over decades and requires no maintenance
- The optional transmitter Pico 3000 makes L-Sonic a simple stand-alone sensor
- Can be installed directly in the main line or in a tank

Combined density and sound velocity sensors

- L-Com 5500
- L-Com 5500 Ex d

Benefits
- Clever combination of process density and process sound velocity sensors enables the concentration measurement of 3-component mixtures
- Highest accuracy on the market: 5 x 10^{-5} g/cm^3 for density and 0.1 m/s for sound velocity
- Fit for measurement of aggressive products
- The optional transmitter Pico 3000 makes L-Com a simple stand-alone sensor and allows the direct monitoring of the measuring values at the sensor

L-Dens 7300 Petro, L-Dens 7400/7500
density sensors

The L-Dens 7000 density sensor series delivers the highest-accuracy density measurements. All sensors have a tube size of 7 mm outer diameter and 6.3 mm inner diameter. L-Dens 7500 has wetted parts made of Hastelloy C-276. L-Dens 7300 Petro is certified for explosion-proof areas and is made of stainless steel, L-Dens 7400 is available in stainless steel (1.4404), Hastelloy C-276, Incoloy 825, and Tantalum to suit a wide range of process media and industrial applications. The sensor can be equipped with process connections for full flow, bypass, inline, or tank installation (in combination with various media pump units).

The sensors work without time-consuming commissioning and on-site adjustments. Pre-configured in the factory, they come with the right sensor setup and application formulas. The L-Dens 7000 sensor series is completely maintenance-free and can be easily integrated into the process environment. Enjoy the peace of mind of knowing that the sensor has been delivering results with the highest accuracy on the market for decades. Compact and modular, the sensors of the L-Dens 7000 series can be mounted in tightest space conditions and meet system requirements within the beverage, petroleum, chemical, pharmaceutical, or ethanol industry.

**The highest accuracy on the market:
up to 5 x 10⁻⁵ g/cm³**

The L-Dens 7000 series is available in 2 accuracy classes – 4-digit accuracy L-Dens 7300 Petro and L-Dens 7400, and 5-digit accuracy L-Dens 7500. Depending on the application, both sensors control your process liquid at the utmost accuracy to detect small fluctuations in your specifications as early as possible for fiscal measurements, determination of concentration, and interphase recognition.

Compact, stand-alone solution

The Pico 3000 transmitter, which can be integrated at the sensor or used as a separate remote control unit, makes the sensor a simple stand-alone solution. Pico 3000 provides analog or frequency signals and connection to common fieldbus standards such as PROFIBUS DP, PROFINET IO ModBus RTU, or HART.

No tube blocking with particles up to 1 mm

Due to a tube size of 6.3 mm (inner diameter), the measurement is not disturbed by particles in the process solution. The design of the oscillating U-tube follows the requirements of hygienic applications. L-Dens 7300, L-Dens 7400, and L-Dens 7500 have one-piece oscillating tubes (U-shaped in L-Dens 7300 and L-Dens 7400, W-shaped in L-Dens 7500).

Determined parameters:

- True density
- Density at reference temperature
- Density at reference temperature of petroleum products according to API
- Concentration of sugar, alcohol, and many other chemicals
- Customer-specific concentration values

	L-Dens 7400	L-Dens 7500
Process density	max. 3000 kg/m³	max. 2000 kg/m³
Standard adjustment range	600 kg/m³ to 1200 kg/m³	
Material of the wetted parts	Stainless steel 1.4404 (316L), Hastelloy C-276, Incoloy 825, Tantalum	Hastelloy C-276
Accuracy in adjusted range		
Repeatability	0.02 kg/m³ (2 x 10⁻⁵ g/cm³)*	0.01 kg/m³ (1 x 10⁻⁵ g/cm³)
Density measurement	0.1 kg/m³ (1 x 10⁻⁴ g/cm³)**	0.05 kg/m³ (5 x 10⁻⁵ g/cm³)
Temperature	0.1 °C	0.1 °C
Process temperature	-40 °C to +125 °C	
CIP/SIP temperature and duration	145 °C for max. 30 min.	
Ambient temperature (for non-Ex versions)	-40 °C to +70 °C without HMI, -20 °C to +60 °C with HMI	
Process pressure absolute	max. 50 bar High-pressure version (only available in Hastelloy C-276): max. 180 bar @ T_process ≤70 °C max. 140 bar @ T_process ≤145 °C CRN max. 170 bar	max. 50 bar
Recommended flow rate	100 L/h to 500 L/h	
Communication	Pico 3000: PROFIBUS DP, PROFINET IO, Modbus RTU, HART, Frequency, Analog mPDS5: PROFIBUS DP, ModBus TCP, PROFINET IO, Ethernet/IP, DeviceNet, IO Board	
Process connections	Options for integration: Full flow, inline, bypass | Flange: DIN/EN, ANSI, Tri-Clamp, VARIVENT® N | Tube end: OD 12 mm, OD 1/4" | Thread: G 3/8"	
Dimensions		
Non-Ex version (L x W x H)	245 mm x 145 mm x 185 mm	190 mm x 145 mm x 185 mm
Ex version (L x W x H)	245 mm x 160 mm x 205 mm	190 mm x 160 mm x 205 mm

Explosion-proof versions according to ATEX / IECEx / FM / CSA
* Tantalum 0.05 kg/m³ (5 x 10⁻⁵ g/cm³)
** Tantalum 0.5 kg/m³ (5 x 10⁻⁴ g/cm³)

L-Dens 3300 density sensor

The L-Dens 3300 sensors have an oscillating tube and are an all-in-one solution consisting of an integrated controller, a high-quality display with user interface, and capacitive keys. They enable continuous measurement of the process density and concentration in lab reactors, pilot plants, and production plants. The wide range of implemented application programs makes these sensors extremely versatile for the petroleum, chemical, and beverage industries, as well as for public research institutes.

The economical sensor for process density monitoring

L-Dens 3300 is a stand-alone sensor consisting of an integrated controller, a high-quality TFT display with user interface and capacitive keys, and a wide range of implemented application programs – so there are no additional expenses for integration. It provides an affordable way of continuously monitoring the density and concentration of your process liquids with an accuracy of 1×10^{-3} g/cm^3.

Extremely versatile sensors for low flow rates

L-Dens 3300 is specially designed to deliver highly accurate measurements, even under low flow conditions. It manages flow rates below 80 L/h and is ideal for process monitoring in lab reactors, pilot plants, and production plants.

Determined parameters:

- True density
- Density at reference temperature
- Concentration of sugar, alcohol, sulfuric acid, and many different chemicals
- Customer-specific concentration values

	L-Dens 3300	
Version	GLS	SST
Process density range	500 kg/m³ to 2000 kg/m³	
Material of the wetted parts	Borosilicate glass	Stainless steel 1.4571
Accuracy in adjusted range		
Density measurement	1 kg/m³ (1×10^{-3} g/cm³)	
Process temperature	-10 °C to +60 °C	10 °C to +80 °C
CIP/SIP temperature and duration	-	95 °C for max. 30 min.
Process pressure absolute	max. 6 bar	max. 16 bar
Ambient temperature	-10 °C to +40 °C	
Flow rate	10 L/h to 70 L/h	10 L/h to 80 L/h
Communication	2 x analog, RS-485, RS-232, error and limit relay for all versions	
Process connection	G 1/8" & corresponding adapters	
Dimensions (L x W x H)	165 mm x 155 mm x 91 mm	

L-Dens 2300 density sensor

L-Dens 2300 is the cost-effective solution for integrated density measurement. The sensor and the process board are a compact unit easily integrated into different systems and instruments, with minimum space requirements – starting at only 88 mm x 37 mm x 34 mm. It delivers 3-digit accuracy and requires only low flow rates. L-Dens 2300 is available with hygienically designed one-piece U-shaped tubes made of stainless steel or W-shaped tubes made of glass.

Flexible and small OEM sensor modules

The L-Dens 2300 OEM sensor has a one-piece oscillating tube either made of stainless steel (with an inner diameter of 2.1 mm) or made of glass (with an inner diameter of 2.0 mm). It works with flow rates lower than 80 L/h to deliver accurate results. The measuring signal is made available for external utilization via an RS-232 interface.

Applications

Production control of industrial inkjet printers, soldering machines, fuel measuring systems, and measurement of sulfuric acid.

The right material for both non-corrosive and aggressive process liquids

The L-Dens 2300 series is available in borosilicate glass to withstand aggressive process liquids, and in stainless steel for non-corrosive process liquids.

Determined parameters:

- True density
- Temperature-compensated density

	L-Dens 2300		
Version	GLS	SST	SST E
Process density range	500 kg/m³ to 2000 kg/m³		
Material of the wetted parts	Borosilicate glass	Stainless steel 1.4571	
Process density range	500 kg/m³ to 2000 kg/m³		
Accuracy in adjusted range			
Density measurement	1 kg/m³ (1×10^{-3} g/cm³)		
Process temperature	-10 °C to +60 °C	10 °C to +80 °C	-10 °C to +60 °C
CIP/SIP temperature and duration	-	95 °C for max. 30 min.	-
Process pressure absolute	max. 6 bar	max. 16 bar	
Ambient temperature	-10 °C to +50 °C		
Flow rate	10 L/h to 70 L/h	10 L/h to 80 L/h	
Communication	RS-232		
Process connection	Flange plate & adapters		
Dimensions (L x W x H)	99 mm x 34 mm x 34 mm	88 mm x 37 mm x 34 mm	134 mm x 64 mm x 64 mm

L-Sonic 5100/6100 sound velocity sensors

The L-Sonic sound velocity sensors have provided stable results over decades and require no maintenance once integrated into your process line or tank. This reduces your overheads and results in a minimum total cost of ownership.

L-Sonic sensors are virtually insensitive to fluctuations in temperature, flow rates, viscosity, and pressure. They detect the smallest changes in the process liquid and have a high tolerance to bubbles.

Moreover, the prevention of errors in the measurement is supported by low thermal inertia.

With the sound velocity sensors, you have the choice of two types of sensing elements to suit your application:
- a fork-type sensor – L-Sonic 5100 – for inline installations.
- a tube-type sensor – L-Sonic 6100 – for full flow or bypass installations.

Robust sensor for virtually all process liquids

L-Sonic 5100 comes with a choice of wetted parts: versions made of stainless steel, HASTELLOY® HYBRID-BC1® alloy, Monel 400, and a rhodium-coated version cover a wide range of applications – from material-friendly non-corrosive media in the food and beverage industry, to highly aggressive acids and bases such as sulfuric acid or strong alkaline solutions.

L-Sonic 5100 – fork-type sensor for inline installation

L-Sonic 5100 is ideal for insertion into pipes or tanks in which only a portion of the product flows past the sensor. Besides VARIVENT® or milk pipe flange connections, EN or ANSI flange connections can be adapted to your requirements. The length of the fork can also be customized for use in the chemical industry. The L-Sonic 5100 with VARIVENT® connection is EHEDG-certified and therefore suitable for hygienic applications in the beverage and pharmaceutical industries.

L-Sonic 6100 – tube-type sensor for full flow and bypass installation

L-Sonic 6100 is installed in smaller pipes in which the entire flow passes through the sensor. For higher flow rates, the sensor can be installed in a bypass. An application example for L-Sonic 6100 is its use for OCR measurements.

Compact and highly accurate stand-alone solution

The optional transmitter Pico 3000 is integrated at the sensor or used as a separate remote control unit, and can be equipped with a human machine interface. It turns the sensor into a simple stand-alone solution. An outstanding repeatability of 0.005 m/s (fork-type) is obtained due to digital signal processing – without averaging. A temperature-compensated crystal oscillator provides the most accurate time base on which to measure.

Determined parameters:

- Sound velocity
- Temperature-compensated sound velocity
- Concentration

	L-Sonic 5100	L-Sonic 6100
Process sound velocity range	800 m/s to 2500 m/s	200 m/s to 1000 m/s
Material of the wetted parts	Stainless steel 1.4404 (316L) HASTELLOY® HYBRID-BC1® alloy Monel 400 Rhodium-coated Fork length: 56 mm, 125 mm, customer-specific	Stainless steel 1.4404 (316L)
Accuracy in adjusted range:		
Reproducibility, sound velocity	0.1 m/s	
Reproducibility, temperature	0.02 °C	
Repeatability	0.005 m/s	0.01 m/s
Process temperature	-25 °C to +125 °C	
CIP/SIP temperature and duration	145 °C for max. 30 min.	
Ambient temperature (for non-Ex versions)	-25 °C to +65 °C without HMI, -20 °C to +55 °C with HMI	
Process pressure absolute	According to flange specification	up to 70 bar at 125 °C / 100 bar at 50 °C
Recommended flow rate	>0 m/s to 6 m/s	
Communication	Pico 3000: PROFIBUS DP, PROFINET IO, ModBus RTU, HART, Analog	
Process connections	VARIVENT® N | VARIVENT® G | DIN 11851 EN 1092-1 | ANSI B16.5	Tube end: OD 12 mm
Dimensions		
Non-Ex version (L x W x H)	Depending on model	150 mm x 145 mm x 175 mm
Ex version (L x W x H)	Depending on model	160 mm x 160 mm x 190 mm

L-Com 5500 combined density and sound velocity sensor

Easy integration

For the utmost flexibility, several versions are available: For full-flow, inline, bypass, and direct tank installations, L-Com 5500 is available in combination with various media pump units to ensure constant flow through the sensor and guarantee stable measurement values. For full-flow, inline, and bypass installations, standard process adapters without the need for a media pump are available.

A single solution saves you money

With sensor dimensions of 260 mm x 145 mm x 200 mm, L-Com 5500 can be mounted in the tightest spaces. Anton Paar provides in-house concentration formula development for your application, and is available after installation for application support.

Compact, stand-alone solution

The transmitter Pico 3000, which is integrated at the sensor or used as a separate remote control unit, makes the sensor a simple stand-alone solution. Pico 3000 provides analog signals and connection to common fieldbus standards such as PROFIBUS DP, PROFINET IO, ModBus RTU, or HART.

Determined parameters:

- True density
- Temperature-compensated density
- Sound velocity
- Temperature-compensated sound velocity
- Concentration

Measuring both density and sound velocity simultaneously provides you insight into the concentrations in 3-component solutions such as formaldehyde-methanol-water, ethanol-sugar-water, and alcohol-extract-water. L-Com 5500 combines density and sound velocity measurement to give you the best of both worlds. It consists of a W-shaped piezo-excited U-tube which is expanded with a sound velocity module.

Density and sound velocity values are determined in one cycle and under the same process media conditions. Unrivalled accuracy, of 5×10^{-5} g/cm^3 for density and 0.1 m/s for sound velocity, is achieved. Various process connections and electrical interfaces suit applications in the beverage or chemical industry.

L-Com 5500 Version Ex is the explosion-proof version and specially designed for the measurement of flammable liquids in hazardous environments.

	L-Com 5500
Process density range	max. 2000 kg/m³
Process sound velocity range	800 m/s to 2000 m/s
Standard adjustment range	700 kg/m³ to 1200 kg/m³
Wetted parts	Hastelloy C-276
Ex version	ATEX: Ex II 2G Ex db IIB T4/T5 Gb | IECEx: Ex db IIB T4/T5 Gb CSA/UL/FM: Class I Division 1 | Gr CD T4/T5 | Ex db IIB T4/T5 Gb Class I Zone 1, AEx db IIB T4/T5 Gb
Accuracy in adjusted range:	
Repeatability	density: 0.01 kg/m³ (1 x 10⁻⁵ g/cm³) | sound velocity: 0.01 m/s
Measurement	density: 0.05 kg/m³ (5 x 10⁻⁵ g/cm³) | sound velocity: 0.1 m/s
Temperature	density: 0.1 °C | sound velocity: 0.02 °C
Process temperature	-25 °C to +125 °C
CIP/SIP temperature and duration	145 °C for max. 30 min.
Ambient temperature (for non-Ex version)	-25 °C to +60 °C without HMI, -20 °C to +55 °C with HMI
Process pressure absolute	50 bar
Flow rate	100 L/h to 500 L/h
Communication	Pico 3000: Analog, HART, Modbus RTU, PROFIBUS DP, PROFINET IO mPDS 5: Pico 3000: PROFIBUS DP, ModBus RTU, HART, Analog mPDS 5: PROFIBUS DP, ModBus TCP, PROFINET IO, Ethernet/IP, Devicenet, I/O Board
Process connections	Options for integration: Full flow, inline, bypass | Flange: DIN/EN, ANSI, Tri-Clamp, VARIVENT® N | Tube end: OD 12 mm, OD 1/4" | Thread: G 3/8"
Dimensions (L x W x H)	260 mm x 145 mm x 200 mm

Optical sensors

Anton Paar's optical sensors bring new levels of certainty when you are monitoring your production line. Real-time results delivered directly from the inline installation allow you to react immediately to any deviations. These optical sensors start measuring right out of the box with no manual adjustment necessary. They are all maintenance-free and certified according to hygienic standards (EHEDG Type EL Class I).

Oxygen sensor

- Oxy 5100
- CO_2 Purity Monitor

Benefits
- One sensor covers both the trace range and the wide range
- Automatic detection of measuring range and factory adjustment with Toolmaster™
- Convenient exchange of sensor caps
- Immediately back to work after CIP/SIP
- Predictable cap exchange with lifetime estimator

Inline refractometers

- L-Rix 4100
- L-Rix 5100/5200

Benefits
- No seals to be maintained
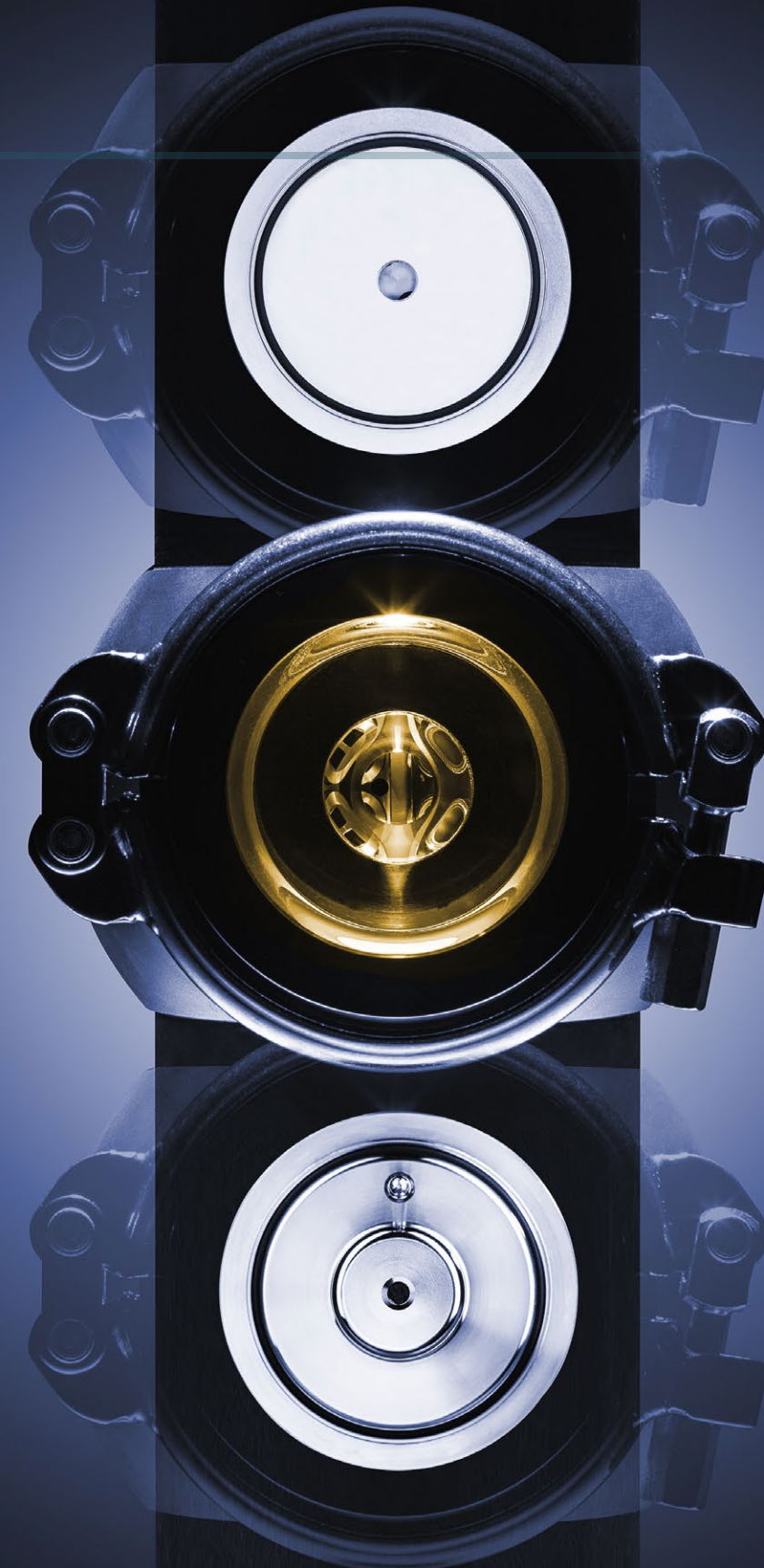- Lifetime factory adjustment
- Immediately back to work after CIP/SIP

CO_2 sensor

- Carbo 6100
- Carbo 6300

Benefits
- Maintenance-free for zero downtime in production
- Easy installation inline
- Linear, drift-free readings of the entire measuring range from 0 g/L to 12 g/L
- Immediately back to work after CIP/SIP
- Product-independent measurement with the single setup of Carbo 6300

Oxy 5100 oxygen sensor

Hassle-free sensor cap exchange

With Oxy 5100, you save time by avoiding initial zero- or two-point calibration. Instead, Anton Paar's Toolmaster™ technology enables auto-detection of the sensor cap in use, and the automatic transfer of all calibration parameters to the sensor – including precise factory adjustment.

Predictable cap exchange with lifetime estimator

As the sensor caps are consumables, you want to know when it is time to replace them. To simplify this, the lifetime estimator estimates the remaining cap life of your sensor cap in days and informs you when a cap exchange is required.

Sensor caps ready for harsh process solutions

The broad variety of sensor caps provides a reliable measuring solution, even for harsh process conditions.

Ultimate comparability

Anton Paar uses the same technology for dissolved oxygen measurement in its process and laboratory equipment, so you can directly compare your inline results to your reference. Oxy 5100 can easily be combined with additional process sensors to meet all future production and quality control requirements.

EHEDG-certified

Oxy 5100 is certified to comply with EHEDG Type EL Class I hygienic standards and design guidelines.

CIP ready

Oxy 5100 is designed for cleaning and steaming at temperatures up to 130 °C. The sensor is back to work within specifications only a few minutes after cleaning.

Oxy 5100 is an inline oxygen sensor which measures dissolved oxygen (DO) in real time. It uses the optical principle called fluorescence phase shift. The sensor delivers results independent of the medium and other dissolved gases. With Oxy 5100 you only need one sensor to cover the complete liquid range portfolio, starting from trace range (0 ppb to 2000 ppb) up to wide and ultra-wide range (0 ppm to 45 ppm). You switch between the ranges by simply changing the sensor caps. This reduces the diversity of sensors in your process and the associated costs.

Oxy 5100 delivers immediate and reliable results at any location and provides full connectivity by fieldbus communication such as PROFIBUS, ModBus TCP, PROFINET, and EtherNet/IP.

CO_2 Purity Monitor features a compact system for inline monitoring of the O_2 content in pressurized CO_2. Oxy 5100 in combination with the integrated pressure sensor for automatic pressure compensation makes the CO_2 Purity Monitor a solid stand-alone solution.

Sensor caps	Ultra-trace range	Trace range *	Wide range	Ultra-wide range
Measuring range (dissolved O_2 in liquids)	- (Gas phase only)	0 ppb to 2000 ppb	0 ppm to 22.5 ppm	0 ppm to 45 ppm
Measuring range (gas phase O_2 in CO_2)	0 to 200 ppmv (0 to 0.2 hPa)	0 to 4.2 % O_2 (0 to 40 hPa)	0 to 50 % O_2 (0 to 500 hPa)	0 to 100 % O_2 (0 to 1000 hPa)
Accuracy for liquids (the larger value is valid)	- (Gas phase only)	≤ ±1 ppb or ±3 %	≤ ±0.042 ppm or ±3 %	≤ ±0.1 ppm or ±5 %
Accuracy in gas phase (the larger value is valid)	≤ ±2 ppmv or ±5 %	≤ ±25 ppmv or ±3 %	≤ ±0.1 % O_2 or ±3 %	≤ ±0.2 % O_2 or ±5 %
Sample temperature (non-freezing)	0 °C to +40 °C	-5 °C to +65 °C	-5 °C to +65 °C	-5 °C to +40 °C
CIP/SIP temperature	Not suitable for CIP/SIP	max. 99 °C, max. 130 °C (max. 30 min)		
Line Pressure	max. 12 bar abs. (174 psi abs.), max. 5 bar abs. (72 psi abs.) for measurements in gas phase			
Certifications	-	EHEDG (Type EL - Class I)		
Measuring Interval	1 to 60 s			
Ambient temperature / Humidity	-5 °C to +50 °C / 0 % rH to 90 % rH (non-condensing)			

* Special sensor cap type available for harsh process conditions. Contact your Anton Paar representative.

L-Rix 4100/5100/5200 inline refractometers

Maintenance-free, no adjustments required

L-Rix 4100/5100/5200 use industry-leading optics, which dramatically extends their service life, increases reliability and safety, and reduces costs. These inline refractometers can operate for more than 100,000 hours without requiring any maintenance. Once adjusted at Anton Paar's headquarters, L-Rix 4100/5100/5200 operate with the stored adjustment values for their entire lifetimes.

Three sensors do it all

L-Rix 4100 gives you high accuracy up to 80 % mass, while the L-Rix 5100 provides the full measuring range from 0 % mass to 100 % mass. For high-precision measurements L-Rix 5200 provides a range from 0 % mass to 65 % mass and an accuracy of ±0.050 % mass and delivers the perfect solution for low-concentration samples.

Hygienic and CIP/SIP-ready

L-Rix 4100/5100/5200 are suitable for hygienic applications such as measurements on pharmaceuticals, milk, sugar solutions, syrups, fruit juices, foods and beverages containing pulp, and other viscous liquids. They are designed for cleaning and sterilization at temperatures up to 145 °C. The sensor is back to work within specifications only a few minutes after cleaning.

L-Rix 4100/5100/5200 are durable and maintenance-free inline refractometers for real-time concentration measurements and production control of raw, intermediate, and final products. The sensor continuously displays the refractive index or sugar concentration at the process temperature, allowing 24-hour production control. As the sensor is not influenced by stray light, it can be used in production lines with see-through windows.

No special training is required to set up and operate the instrument. L-Rix 5100 and L-Rix 5200 are set up quickly and easily using the touchscreen interface of the built-in evaluation unit, via the Pico 3000 software, or mPDS 5 evaluation unit, while L-Rix 4100 comes ready with analog outputs and touchscreen interface.

Refractive index is used to identify a particular substance, determine its purity, or measure concentration. It is common practice to measure the refractive index, e.g. of a beverage or food, and derive the °Brix value.

	L-Rix 4100	**L-Rix 5100**	**L-Rix 5200**
Refractive Index	Range: 1.3100 to 1.4910 equivalent to 0 % to 80 % mass) Accuracy: nD ±0.0002 (equivalent to ±0.1 % mass) Repeatability: nD ±0.0001 (equivalent to ±0.05 % mass)	Range: 1.3100 to 1.5400 equivalent to 0 % to 100 % mass) Accuracy: nD ±0.0002 (equivalent to ±0.1 % mass) Repeatability: nD ±0.0001 (equivalent to ±0.05 % mass)	Range: 1.3100 to 1.4600 (equivalent to 0 % to 65 %) Accuracy: nD ±0.0001 (equivalent to ±0.05 % mass) Repeatability: nD ±0.00005 (equivalent to ±0.025 % mass)
Calibration	Anton Paar's proprietary calibration routine using high-purity water and commercial nD references		
Material of the wetted parts	Stainless steel 1.4404, PEEK, Sapphire (Al2O3 – 99.997%), O-ring 60x3 (VARIVENT N) EPDM 70		
Ambient temperature	0 °C to +50 °C	-20 °C to +60 °C	
Process temperature	0 °C to +100 °C	-20 °C to +120 °C	0 °C to +105 °C
	CIP/SIP up to 145 °C for 30 minutes		
Process pressure absolute	100 mbar to 10 bar	100 mbar to 16 bar (10 bar @ > 120 °C)	
Detector	CMOS line sensor; 2048 elements		
Light source	LED 589 nm		
Temperature compensation	Automatic temperature compensation; integrated Pt-100		
Process connections	Tuchenhagen VARIVENT® Type N	Tuchenhagen VARIVENT® Type N, Tri-Clamp® 3"	
Degree of protection	IP65; IP67 / NEMA 6P		
Communication	Analog	Analog, Analog/Digital, Modbus RTU, Modbus TCP, PROFIBUS DP, PROFINET IO, EtherNet/IP	

Carbo 6100/6300 optical CO$_2$ sensors

Ready to measure immediately to save you time

The optical Carbo 6300 requires no product-specific adjustment and is easily installed inline. It works immediately. In direct contact with your sample.

Carbo 6100 and Carbo 6300 provide linear, drift-free CO$_2$ readings over the entire measurement range from 0 g/L to 12 g/L. The faster your measurement, the faster you can react – for optimized control and efficiency. To help you achieve this goal, measurement values are updated every 4 seconds.

Minimizing your TCO

You can count on an entirely maintenance-free, hygienic, and robust inline sensor – a truly "fit and forget" system that works and simply keeps on working, minimizing your total cost of ownership (TCO). Since no external purging gas or external compressed air is required to operate Carbo 6100/6300, there are no supply valves to control.

Product-independent measurement with a single setup using the premium sensor Carbo 6300

Whatever your beverages' turbidity, color, sugar composition, or foreign gas level, nothing influences your CO$_2$ readings. Even difficult samples like fruit juices with pulp are reliably measured.

Back to work quickly after CIP/SIP to reduce your downtimes

Both Carbo sensors are EHEDG-certified and return quickly to measuring right after CIP/SIP. The sensors are constructed without any moving parts or dead space, and are thus suitable for aseptic applications. Additionally, the premium sensor Carbo 6300 can be used for CIP/SIP temperatures up to 130 °C for 30 minutes.

Carbonation is a key element in the taste and perceived freshness of a beverage. Having the right concentration of dissolved CO$_2$ in the beverage is therefore essential. To guarantee taste and quality due to the correct carbon dioxide content in different beverages, an accurate monitoring and testing system is required throughout production as well as for the final product.

With the optical Carbo 6100/6300 you always know the actual CO$_2$ concentration of all beverages in your process. This optical measurement system provides drift-free results of unrivaled accuracy. The basis of this breakthrough: a cutting-edge optical measuring principle called ATR (attenuated total reflection).

The premium sensor Carbo 6300 contains a patented internal sugar/extract compensation for exact measurement of different beverage types.

	Carbo 6100	Carbo 6300
CO$_2$		
Measuring range	0 to 12 g/L (0 to 6 vol)	
Accuracy*	±0.05 g/L (0.025 vol)	
Repeatability	±0.01 g/L (0.005 vol)	
Resolution	<0.01 g/L (0.005 vol)	
Temperature		
Sample temperature	-3 to +40 °C, non-freezing	
CIP/SIP	CIP up to +95 °C (max. 4 h)	CIP up to +95 °C (max. 4 h) CIP/SIP up to 130 °C (max. 30 min)
Ambient temperature range	-20 °C to +50 °C	
Process pressure relative	max. 10 bar rel. (145 psi)	
Measuring interval	min. 4 sec	
Self-diagnosis	Compliant with NAMUR NE 107 (self-monitoring and diagnosis)	
Degree of protection	IP 65 and IP 67	
Process connection	Tuchenhagen VARIVENT® Type N	
Certifications	EHEDG Type EL Class I	
Communication (optional)	Several fieldbuses and analog interfaces are available depending on the used version/mPDS 5 board.	

*product-specific adjustment required for Carbo 6100

Mechanical sensors

Alongside the optical Carbo sensors – Carbo 6100/6300 – Anton Paar offers another well-established sensor which is based on Anton Paar's volume-expansion impeller method.

Anton Paar's famous inline viscometer based on a unique mechanical principle allows you to monitor the rheological behavior of Newtonian and non-Newtonian liquids during production.

CO_2 sensors

Carbo 5100 configuration options:
-   in combination with Anton Paar's mPDS5 evaluation unit
-   with Pico 3000 and optional HMI
-   with Pico 3000 remote control (RC))

Benefits of Carbo 5100
-   Proven measuring technology with decades of experience
-   Long service intervals and extremely easy maintenance for minimum downtime in production
-   Results updated every 15 seconds

Inline viscometers

-   L-Vis 510
-   L-Vis 520 Ex

Benefits
-   Robust sensor installed in the line or the stirring tank
-   Not influenced by drops in pressure or flow rate

Carbo 5100 CO$_2$ sensor

On the pulse of time, with decades of experience

Many years of experience are the fundament of this long-term proven technology. Its continuous development according to newest technology standards as well as customer requirements lead to innovations such as Anton Paar's new Pico 3000 transmitter. Anton Paar provides a well-established technology with thousands of installations worldwide, meeting today's requirements.

For hygienic and pharmaceutical measurements

Anton Paar's Carbo 5100 sensors are designed according to the European Hygienic Engineering & Design Group (EHEDG) guidelines and contain FDA-compliant wetted parts. All Carbo 5100 sensors provide self-diagnosis via alarms, and error or maintenance messages in compliance with the NAMUR recommendation NE107.

Long service intervals and super-easy maintenance

All the sensors are designed and built to withstand even harsh process environments and to run for years with a minimum of maintenance. When using the optional cut-off valve adapter, the sensor can quickly be removed from the production line without interrupting the production process.

Carbo 5100 keeps your beverage quality on target by continuously monitoring the CO$_2$ content. With this sensor you can rely on an accuracy of 0.05 g/L and drift-free measurements within seconds.

The sensor's measurement principle is based on Anton Paar's patented volume-expansion impeller method. This results in the highest accuracy and repeatability, even under stop-go conditions and directly after production start and cleaning.

	Carbo 5100
Measuring range	0 g/L to 20 g/L (0 vol to 10 vol)
Accuracy	0.05 g/L (0.025 vol)
CIP/SIP temperature and duration	121 °C (250 °F) for max. 30 min
Measuring interval	15 seconds
Measuring temperature range	-5 °C to +40 °C (23 °F to 104 °F)
Material	FDA-compliant
Process pressure, relative	max. 10 bar (145 psi)
Compressed air	4 bar to 7 bar (58 psi to 102 psi) dry and clean air
Degree of protection	IP 65 and IP 67
Process connection	Tuchenhagen VARIVENT N
Self-diagnosis	Complies with NAMUR recommendation NE107

L-Vis 510, L-Vis 520 Ex inline viscometers

Anton Paar's L-Vis inline viscometry solution combines unique inline process technology with the know-how of the world leader in lab rheology. Applying the lowest shear rates in the process industry allows for best-in-class correlation of results with those of lab instruments. This enables reliable inline measurement, especially for samples with shear-dependent behavior, such as sanitary ceramic, shampoos, viscose, and dough, resulting in higher product quality and lower lab time.

Installation in the process line or stirring tank enables 24-hour monitoring. In particular the non-Newtonian viscosity of heterogeneous mixtures is an important material property that contributes to a fluid's performance and is often the main source of problems.

Stable results – even under adverse flow conditions

L-Vis Smart Sensors are specifically designed for process applications and operation under harsh conditions. The sensors' fluid dynamic measuring principle ensures maximum stability. Drops in pressure or flow rate do not affect the measurement.

Various process installation and communication possibilities

The robust L-Vis Smart Sensor can be installed in a stirring tank, in the main line, and in a bypass line. The innovative measuring principle always forces a proper sample exchange. For communication to your PLC/DCS, all relevant fieldbuses as well as an analog 4-20 mA signal are available.

Unmatched intelligence for your viscosity monitoring

Anton Paar's process viscometers provide user-friendly diagnostics according to the NAMUR NE107 standard. They are easily adapted to support any number of changing communication protocols and display types.

Best-in-class analysis of shear-dependent samples

Get more meaningful and detailed information on your sample's properties by applying low shear rates down to 10 s^{-1}. The influence of temperature variations is minimized due to temperature-compensated viscosity values.

	L-Vis 510	L-Vis 520 Ex
Viscosity range	1 mPa.s to 50,000 mPa.s	
Accuracy	1 %	
Ex approval	No	ATEX/IECEx: II 2 G Ex d IIB T6 Gb Class I, DIV 1, Groups C and D, T6 (USA) Class I, DIV 1, Groups C and D, T6 (Canada)
Process temperature	-5 °C to +200 °C	-5 °C to +195 °C
Process pressure, absolute	0 bar to 25 bar	
Material of the wetted parts	Stainless steel No. 1.4542, diamond-coated SiC seal, Viton O-ring seal	
Degree of protection	IP65	
Communication	PROFIBUS DP, ModBus TCP, PROFINET, Ethernet/IP, DeviceNet	

Evaluation units, data acquisition software, and accessories

Designed for continuous density and concentration measurement in industrial processes, Anton Paar's mPDS 5 evaluation units connect to all previous and present Anton Paar sensors, such as L-Dens, L-Sonic, L-Com, and Carbo 5100, optical Carbo 6100/6300, Oxy 5100, L-Vis 510/520 Ex, and L-Rix 5000/5100/5200.

The Davis 5 data acquisition software optionally provides you with additional ease of operation and the possibility to monitor and control the production process from any PC in the network. Inline Pump 520 supplies Anton Paar sensors with a constant flow of sample from the main line, if required.

Software for Anton Paar's process sensors

- Davis 5

Benefits

- Real-time values and graphical trends can be viewed on a remote screen anywhere in the production environment or laboratory
- Target values and alarm limits can be programmed for up to 999 beverages

Evaluation unit for Anton Paar's process sensors

- mPDS 5

Benefits

- Converts raw values from the sensors into company-specific and application-specific concentration results (°Brix, °Plato, % alcohol, API gravity, etc.)
- Alerts you to prevent out-of-spec production

Accessory for Anton Paar's process sensors

- Inline Pump 520

Benefits

- EHEDG-certified (Type EL Class I)
- FDA-compliant wetted parts

The following adapters for process connection are available

- Options for full flow, inline, bypass as well as tank installation
- Flanges: DIN/EN, ANSI, Tri-Clamp, VARIVENT®
- Tube ends: OD 12 mm, OD 1/4"
- Thread: G 3/8"

Benefits

- Easy integration
- The Inline Pump 520 is suitable for non-corrosive media and non-flammable liquids
- FDA-compliant wetted parts
- Customized solutions possible

Davis 5 software

Davis 5 is Anton Paar's comprehensive data acquisition and visualization software. It can be connected via Ethernet to any personal computer throughout your organization so you can analyze the key performance indicators in real-time.

Production starts/stops, out-of-range values, trends, statistics and more can be viewed, downloaded, and printed at any time. Values can be checked, configurations changed, and production can be stopped, whenever necessary, directly from the desktop.

Protected by product-specific alerts

You can specify production settings, limits, and alarms/alerts for individual products. Whenever measured values fall outside the acceptable range, Davis 5 highlights them by changing the screen's background color and, as an extra measure of protection, an audible alarm is activated so your production team is quickly alerted and can make the necessary adjustments. Any number of products can be transferred from one production line to another directly from the office's desktop. Furthermore, your created product database can be transferred to any other production line to be set up with identical product-specific production parameters.

Calibration and adjustment at the push of a button

As lab analyzing systems are directly connected via the Davis 5 evaluation software with Anton Paar's inline beverage analyzers, calibration and adjustment are automated and documented, which saves time and avoids errors.

	Davis 5
Statistics	Starts and stops, out-of-range values, trends, mean value, min. and max., standard deviation, operating times, line downtimes, bottle and can numbers, history of adjustments, and quality data (Cp, Cpk, and Quality Index)
Documentation	All calibrations, adjustments, comments, and measured values outside the product specifications
Data storage	Every second, if required, up to 50 different measurement values can be recorded
Database technology	SQL, client/server software
Data transfer	To LIMS, smartphone, tablet, PC
Report format	PDF, XML

mPDS 5 evaluation unit | Inline Pump 520

Evaluation unit with graphical color touchscreen

The mPDS 5 evaluation unit is a partner for all Anton Paar's online and inline density and concentration meters. It continuously calculates the density and concentration of liquids and gases based on values delivered by the sensor. Numerous user programs are integrated: extract, alcohol, and original extract of beer; alcohol measurement in distilleries; measurement of °Brix and sweetener in beverages; CO_2 in beer and soft drinks; density; specific gravity; API gravity of petroleum products, and density measurement of gases. Using customer-specific polynomials and special programs you can create your own solutions.

User-friendly operation is guaranteed:
- Intuitive operation
- Flexible connectivity using Ethernet (LAN), analog and digital outputs, and various fieldbuses
- Enhanced usability with an intuitive human-machine interface and several choices of main screen layout

An accessory to guarantee stable measurements

Inline Pump 520 is an accessory which guarantees stable measurements. It ensures that Anton Paar's process instruments receive a constant flow of sample from the main line to the sensor to guarantee stable measurement results.

The pump is maintenance-free and provides self-diagnosis of errors, complying with the NAMUR recommendation NE107. The modular design and various connection sets allow use with many sensors and process fittings. Inline Pump 520 is EHEDG-certified (Type EL Class I) and suitable for CIP/SIP. All wetted parts are FDA-compliant.

Inline Pump 300 is a small sample pump for non-corrosive, low-viscosity liquids. It provides a constant process media flow to enable the highest accuracy and stability, independent of process flow conditions.

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