



**Anton Paar**

# L-DENS 7000

# DENSITY SENSOR SERIES

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Member of the New Generation of  
Concentration Measurement

# New Generation | Configuration



## Instrument

### Sensor with Evaluation Unit



Electronics Housing +  
Sensor Electronics

Sensing Element



mPDS 5  
Option: Davis 5

### Sensor with Transmitter



Electronics Housing +  
Sensor Electronics +  
Transmitter Pico 3000

Sensing Element

### Sensor with Transmitter incl. HMI



Electronics Housing +  
Sensor Electronics +  
Transmitter Pico 3000 +  
Human Machine Interface Pico 3000 HMI

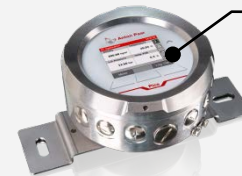
Sensing Element

### Sensor with Remote Control incl. Transmitter and HMI



Electronics Housing +  
Sensor Electronics

Sensing Element



Remote Control:  
Transmitter Pico 3000 +  
Pico 3000 RC Housing  
incl. Pico 3000 HMI

# L-Dens 7000 Series | Introduction



The L-Dens 7000 density sensor series represents the new generation of Anton Paar's process density sensors and is offering two accuracy classes – 4-digit accuracy **L-Dens 7400** and 5-digit accuracy **L-Dens 7500**.

The Sensors consist of an oscillating U-shaped tube in a outer diameter of 7 mm, an excitation and pick-up system, and temperature sensors. The sensor electronics is built into the electronics housing.

The density is directly calculated by the sensor electronics and can either be transferred to the new Process instrumentation Controller **Pico 3000** which can be directly installed in the electronics housing or the **mPDS 5**.



**L-Dens 7400**



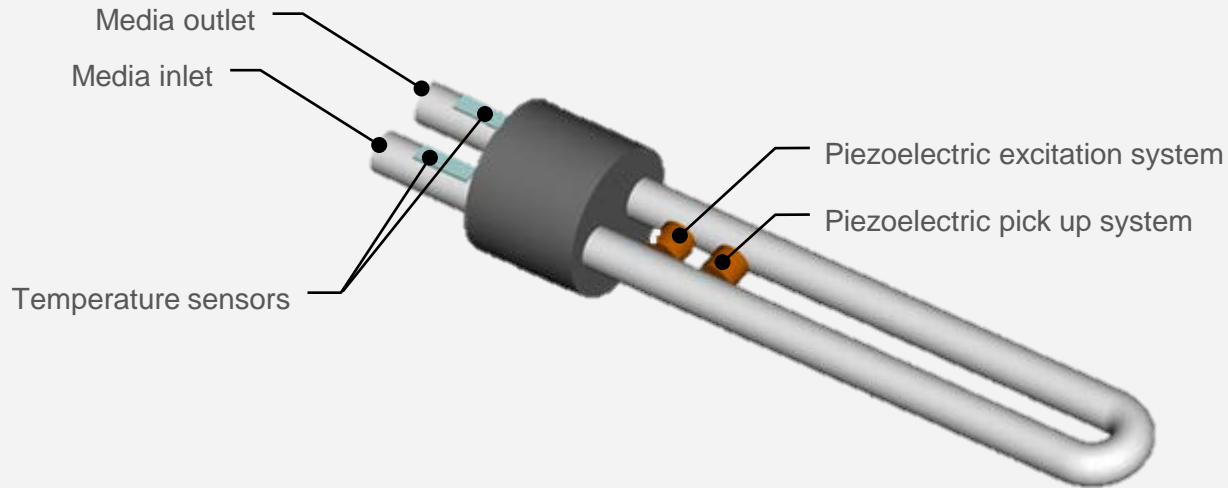
**L-Dens 7500**

# L-Dens 7000 Series | Introduction



## Measuring Principle

The medium flows through the U-tube which oscillates at its natural frequency. The natural frequency depends on the density of the medium. It is measured and used for the density calculation together with the measured temperature.



# L-Dens 7000 Series | Designation



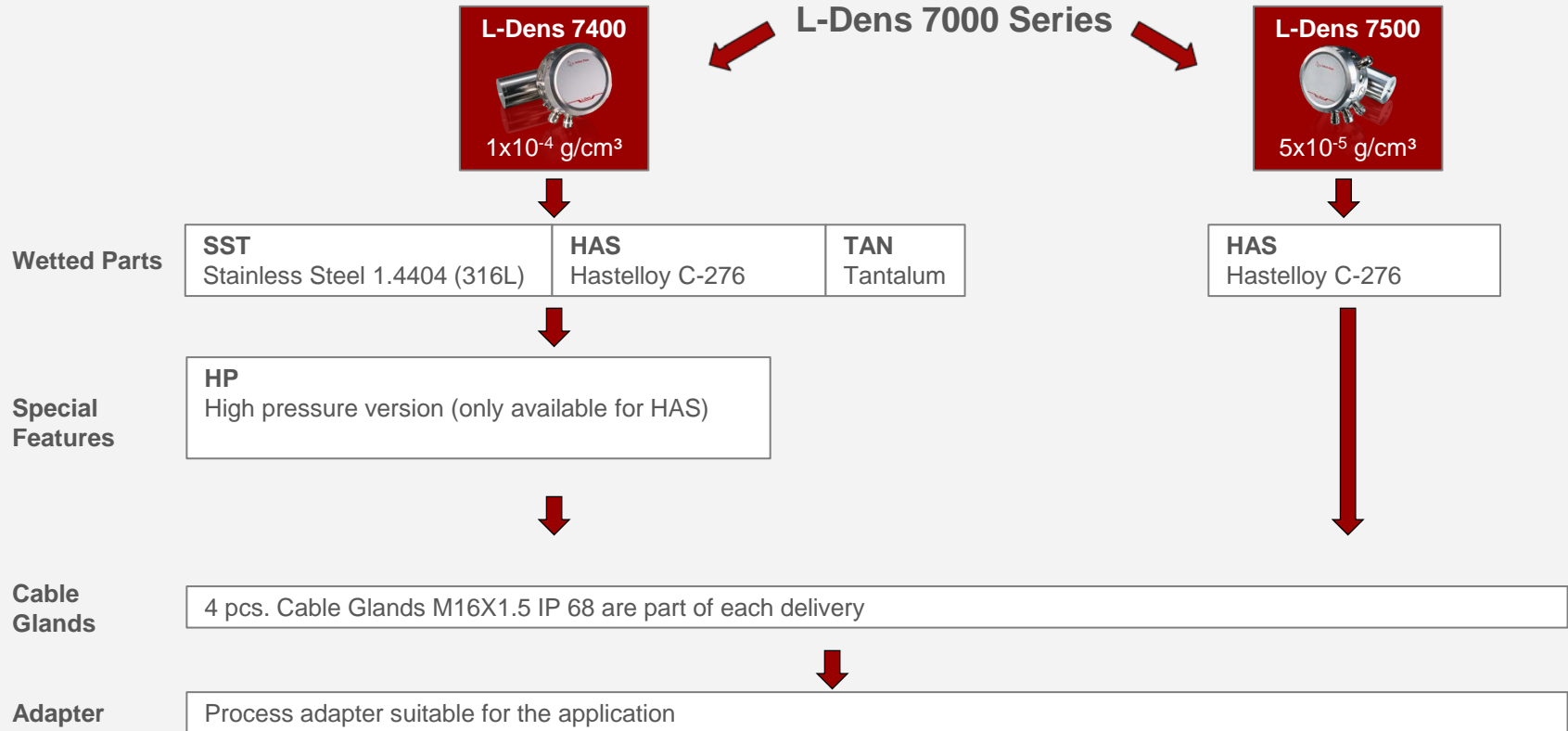
L-Dens 7000 Series	
7	Outer diameter of the oscillating tube 7 mm
Feature	
4	Accuracy $1 \times 10^{-4}$ g/cm <sup>3</sup>
5	Accuracy $5 \times 10^{-5}$ g/cm <sup>3</sup>
Generation	
00	Generation 1

Versions	
Material of the wetted parts	
SST	Stainless steel 1.4404 (316L)
HAS	Hastelloy C-276
TAN	Tantalum
Special Feature	
HP	High pressure version

## Example:

L-Dens 7400 VERSION HAS HP

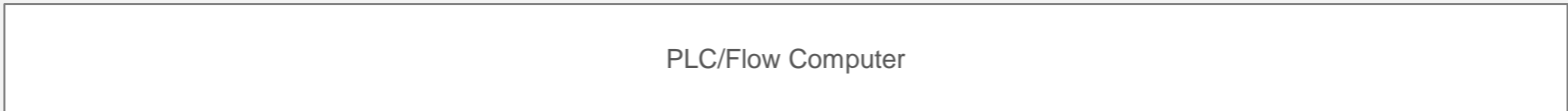
# L-Dens 7000 Series | Overview and mechanical Configuration



# L-Dens 7000 Series | Communication



## L-Dens 7000 Series



User Interface

Communication





## L-Dens 7000 Series | Features



Highest precision –  
reliable measurement under changing process conditions

- Powerful digital signal processing
- Integrated high-precision temperature sensors
- Hermetically sealed U-tube





## L-Dens 7000 Series | Features



### Minimized integration efforts and costs

- Compact and modular design
- Full flow, inline, bypass or tank installation for
- The L-Dens 7000 density sensor series with its wetted parts and adapters is prepared for:
  - The petroleum, chemical, pharmaceutical, ethanol, or beverage industry
  - Full flow, inline, bypass, or tank installation





## L-Dens 7000 Series | Features

The simple operating concept with Pico 3000 saves your time and training expenses

- New Pico 3000 transmitter integrated at the sensor or as separate remote control unit
- Human machine interface Pico 3000 HMI
- Common industrial fieldbus standards supported:  
HART, Modbus RTU, PROFIBUS DP
- Backup and restore function
- Data and error log function
- USB interface at the electronics housing for configuration with a laptop





## L-Dens 7000 Series | Features



### Fit and forget



- Configured and adjusted in the factory
- Application formulas integrated
- Quick start-up and commissioning



## L-Dens 7000 Series | Features



### Operating cost at a minimum

- Maintenance-free
- Stainless steel housing
- No consumables



# L-Dens 7000 Series | Technical Specifications



	L-Dens 7400	L-Dens 7500
<b>Process density</b>	max. 3000 kg/m <sup>3</sup>	max. 2000 kg/m <sup>3</sup>
<b>Standard adjustment range</b>	600 kg/m <sup>3</sup> to 1200 kg/m <sup>3</sup>	
<b>Material of the wetted parts</b>	Stainless steel 1.4404 (316L) Hastelloy C-276 Tantalum	Hastelloy C-276
<b>Accuracy in adjusted range:</b>		
<b>Repeatability</b>	0.02 kg/m <sup>3</sup> (2 x 10 <sup>-5</sup> g/cm <sup>3</sup> )*	0.01 kg/m <sup>3</sup> (1 x 10 <sup>-5</sup> g/cm <sup>3</sup> )
<b>Density measurement</b>	0.1 kg/m <sup>3</sup> (1 x 10 <sup>-4</sup> g/cm <sup>3</sup> )**	0.05 kg/m <sup>3</sup> (5 x 10 <sup>-5</sup> g/cm <sup>3</sup> )
<b>Temperature</b>	0.1 °C	0.1 °C
<b>Process temperature</b>	-40 °C to 125 °C	
<b>CIP/SIP temperature and duration</b>	145 °C for max. 30 min.	
<b>Ambient temperature (for non Ex versions)</b>	-40 °C to 70 °C without HMI -40 °C to 65 °C with HMI	
<b>Process pressure absolute</b>	max. 50 bar High-pressure version max. 180 bar (only available in Hastelloy C-276)	max. 50 bar
<b>Recommended flow rate</b>	100 L/h to 500 L/h	
<b>Communication</b>	Pico 3000: Analog, HART, Modbus RTU, PROFIBUS DP, Frequency mPDS 5: PROFIBUS DP, PROFINET IO, Devicenet, Ethernet/IP, Modbus TCP, I/O Board	
<b>Process connections</b>	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"	
<b>Dimensions:</b>		
<b>Non-Ex version (L x W x H)</b>	245 mm x 145 mm x 185 mm	190 mm x 145 mm x 185 mm
<b>Ex version (L x W x H)</b>	245 mm x 160 mm x 205 mm	190 mm x 160 mm x 205 mm

\* Tantalum 0.05 kg/m<sup>3</sup> (5 x 10<sup>-5</sup> g/cm<sup>3</sup>)

\*\* Tantalum 0.5 kg/m<sup>3</sup> (5 x 10<sup>-4</sup> g/cm<sup>3</sup>)

Explosion-proof versions according to ATEX / IECEx / FM

# Pico 3000 | Introduction



## Pico 3000 – The new Transmitter for process sensors

- Pico 3000 integrated or as separate remote control unit Pico 3000 RC
- Human machine interface Pico 3000 HMI
- Common industrial fieldbus standards supported
  - Modbus RTU, HART, PROFIBUS DP
- Backup and restore function
- Data and error log function
- USB interface for configuration via Pico 3000 Software



# Pico 3000 | Designation and interfaces for L-Dens 7000 series



Pico – Transmitter Type	
3	For integration in the sensor electronics housing or remote control housing
Transmitter Type	
0	Standard Version
Generation	
00	Generation 1

Versions (different input and output interfaces)	
AO	2 x analog out, 1 x analog in, 2 x digital in, 1 x relay
AO Eco	2 x analog out
HART	HART and 1 x analog out
Modbus RTU	Modbus RTU
PROFIBUS DP	PROFIBUS DP and 1 x relay
Frequency	Frequency and analog out

## Example:

Pico 3000 VERSION AO Eco



## Pico 3000 | Software

### Pico 3000 Software

- Download of Software from the Anton Paar website
- Available for all Pico 3000 versions with or without HMI





### Capability of the Pico 3000 Software

- Adjustment and configuration of the instrument
- Backup and restore the configuration
- Read and export the measured data
- Read and export the logging information
- Read and export the error log
- Firmware updates



## Human Machine Interface Pico 3000 HMI

- Displays up to 4 values
- Capacitive keys
- TFT color display

No Application		14:17:03
Density	Temperature	 
896.00 kg/m <sup>3</sup>	20.03 °C	
L-D Pressure	Temp PCB	 
12.50 bar	6.3 °C	
Menu		Log Out

## Remote Control Pico 3000 RC

- ▶ Consisting of:
  - ▶ Pico 3000
  - ▶ Pico 3000 RC housing incl. HMI
- ▶ Options for mounting:
  - ▶ wall mounting
  - ▶ cabinet mounting



**Pico 3000 RC wall mounting**

# L-Dens 7000 series | Typical Applications



## Industries

- Beverage
- Petroleum
- Chemical
- Pharmaceutical
- Ethanol

## Determined Parameters

- ▶ Online concentration measurement
- ▶ Online measurement of density (at measuring temperature) and temperature-compensated density
- ▶ Determination of mass flow by upgrading an existing flow meter with a density sensor
- ▶ Product detection
- ▶ Interface detection
- ▶ Product blending
- ▶ Fiscal measurement

## L-Dens 7000 series | Typical Applications

### Liquids to be measured

- ▶ **Low-viscous liquids** to which the oscillator is resistant
- ▶ **Fuels** (regular-grade petrol, premium, diesel, extra light heating oil, Jet-A1...)
- ▶ **Low viscous petroleum products**, intermediate and end products of refineries (e.g. LPG)
- ▶ **Chemicals** (acetic acid, citric acid, formic acid, calcium hydroxide, acetone, glycerin, ammonium nitrate, ammonia, boric acid, hydrogen peroxide, acetone, sodium carbonate ...)
- ▶ **Ethanol / Bioethanol**

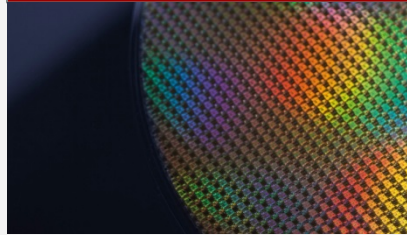
## L-Dens 7000 series | Typical applications by industry

### Petroleum Industry



- ▶ Tank Farm | Pipeline | Ship unloading
- ▶ Custody transfer
- ▶ Upgrade volume to mass low
- ▶ LPG
- ▶ Product detection
- ▶ Drilling fluid monitoring
- ▶ Multiproduct pipeline
- ▶ Aircraft fuelling

### Chemical Industry



- ▶ Acids
- ▶ Bases
- ▶ Salts
- ▶ Solvents
- ▶ Interface detection

### Refrigerants Ethanol / Bioethanol



- ▶ Refrigerants:
  - ▶ OCR measurement
- ▶ Ethanol / Bioethanol:
  - ▶ after distillation column
  - ▶ after molecular sieve

# L-Dens 7000 series | Typical applications by industry



- ▶ Extract at lauter tun
- ▶ Hot wort measurement
- ▶ Cold wort measurement



- ▶ Syrup concentration
- ▶ Blending control



- ▶ After distillation column before spirit safe
- ▶ Distillation monitoring
- ▶ Dilution control
- ▶ Final blending monitoring
- ▶ Before bottling

# L-Dens 7000 series | Typical Applications for each wetted part



L-Dens 7400/L-Dens 7500 (only HAS)

<b>SST</b> Stainless steel		<b>HAS</b> Hastelloy C-276	<b>TAN</b> Tantalum	<b>INC*</b> Incoloy 825
Boric acid	Ethanol	Sodium carbonate	Sulfuric Acid	Caustic Soda
Calcium hydroxide	Petroleum	Acetic acid	Hydrochloric acid	Sodium Chloride
Ammonia	Naphtha	Formic acid	Phosphoric Acid	
Glycerin	Gasoline	Citric acid	Nitric Acid	
Hydrogen peroxide	Diesel	Ethanol		
Ammonium nitrate	Fuels	Calcium chloride		
Urea		Acetone		

\* Incoloy 825 not available yet

[www.anton-paar.com](http://www.anton-paar.com)