

# Digital manometers and display units





## Good reasons for digital piezoresistive manometers

- ✓ Maximum class accuracy and repeatability
- ✓ No material fatigue in the measuring element – Keyword: Long-term stability
- ✓ No plastic deformation in the measuring element – Keyword: Pressure
- ✓ Robust housing, Protection class IP65...66
- ✓ No recalibration required after external damage
- ✓ Can be recalibrated with software
- ✓ Zeroing at the touch of a button
- ✓ No reading errors
- ✓ High reading accuracy
- ✓ Selectable measurement units
- ✓ Backlighting possible
- ✓ Electrical interfaces possible
- ✓ Temperature display possible
- ✓ Signal analyses such as min./max. possible
- ✓ Measurement data recording possible
- ✓ Wide range of pressure ranges up to 2000 bar



LEO 1

0.1%

Peak value detection



LEO 2

0.1%

Good and simple



LEO 3

0.1%

4...20 mA output



LEO 5

0.025%

The flagship



ECO 2

0.5%

Economical



LEX 1

0.025%

Highly accurate



LEO Record

0.05%

The logger

## Calibration, test reports and certificates

At KELLER, all pressure measuring devices are calibrated for pressure and temperature.

The supplied calibration certificate for the LEX 1 and the LEO 5 documents the high accuracy and the low error band over the entire temperature range. In addition, test reports can be displayed, with measurement data recorded at a minimum of 3 temperatures and 4 pressure points.

Various test and calibration certificates as well as material certificates and tracing certificates for the test equipment are available on request.

**Calibration Certificate with 11 Points**

Customer: Mobiltech Projekt en Maintenance BV  
 Order No.: 302031  
 Calibration No.: 302031  
 Serial number: 392  
 Pressure Range: 1...30bar  
 Comp. Temp. Range: 0...25°C  
 Output: 4...20mA  
 Pressure Source: PNEUMONIX Messer 800 (1...17 / 1...35bar)  
 Valid until: 31.03.2016

Pressure	Pressure P	Output	Output P	Error	Max. Allowed Error
0.000	0.000	0.000	0.000	0.000	-0.000
4.000	4.000	4.001	4.000	0.000	-0.000
8.000	8.000	8.001	8.000	0.000	-0.000
12.000	12.000	12.000	12.000	0.000	-0.000
16.000	16.000	16.000	16.000	0.000	-0.000
20.000	20.000	20.000	20.000	0.000	-0.000

Accuracy at room temperature (20°C) 0.025%

Max. error: 0.025%  
 Error band: ±0.025%  
 Serial No.: 392

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 Pressure Source: PNEUMONIX Messer 800 (1...17 / 1...35bar)  
 Valid until: 31.03.2016

Temperature: 20 °C

Accuracy at room temperature (20°C) 0.025%

Max. error: 0.025%  
 Error band: ±0.025%  
 Serial No.: 392

## ATEX / IECEx

The ATEX directives apply in the EU and require the use of products that are suitable for explosion-proof areas.

KELLER produces intrinsically safe manometers with ATEX approval. The LEO Record Ei and LEX 1 Ei also have IECEx approval.

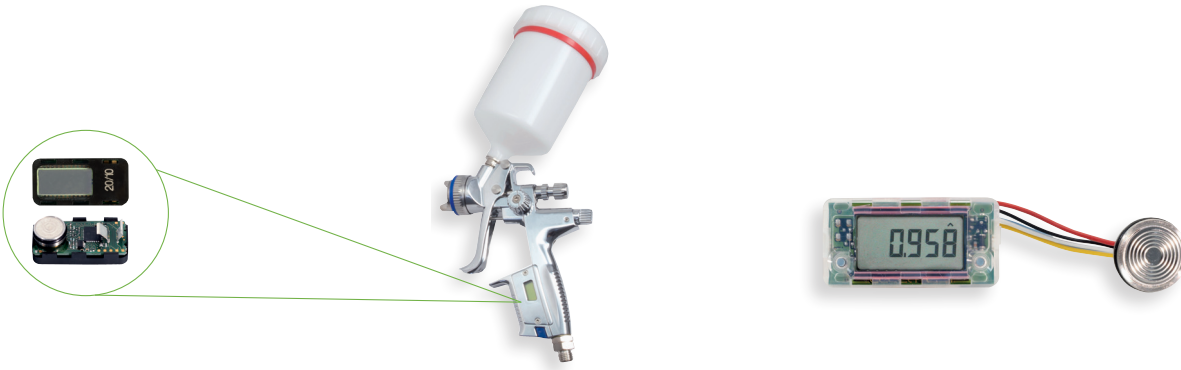
**IMPORTANT:** The intrinsically safe manometers must only be connected to the interfaces outside of the explosive areas.

ATEX: Europe

IECEx: Worldwide



## Customer-specific solutions



Pressure display for paint spray gun (dV-1 module)

dV-2 OEM module



Pressure display with integrated calculation of the shot count-down for competition air pistols (dV-1 module).

dV-2 in durable aluminium housing for control panel installation



dV-1 miniature manometer for large-scale projects

dV-2 in durable steel housing for direct integration in die-casting moulds.

## Customer-specific front foils and options



The front foils of KELLER manometers can be designed and printed according to customer requirements.

Possible options (depending on the device):

- ◆ Various unit conversions and pressure connections
- ◆ Integration of application-specific calculations
- ◆ Special pressure ranges
- ◆ Pressure connection on the back

## Digital manometers – versatile



### The flagship

#### LEO 5

- Pressure ranges -1...3 / 10 / 30 bar rel.  
0...100 / 300 / 700 / 1000 bar; 0...4 / 11 / 31 bar abs.
- Accuracy class 0.025 %FS  
Total error band (0...50 °C) 0.05 %FS
- Precision of 0.01 %FS optionally available

- USB and Bluetooth interfaces
- Backlighting
- Data logger including peak value detection with 5 kHz logging frequency
- Durable steel housing with safety glass and touch operation



### The highly accurate one

#### LEX 1 (Ei)

##### Piezoresistive measuring cell

- Pressure ranges -1...2 / 10 / 20 bar rel.;  
0...100 / 200 / 400 / 700 / 1000 bar; 0...3 / 11 / 21 bar abs.
- Accuracy class 0.025 %FS  
Total error band (0...50 °C) 0.05 %FS
- Precision of 0.01 %FS optionally available
- Resolution up to 100 µbar

##### Capacitive measuring cell

- Pressure ranges 0...30, 100, 300 mbar rel.
- Accuracy class 0.1 %FS  
Total error band (0...50 °C) 0.2 %FS
- Resolution up to 10 µbar

0.01 %FS precision – “Accuracy” is an absolute measurement, “precision” is a relative measurement. Primary maximum class standards in national laboratories indicate the uncertainty of the pressure references under 0.01%. Commercial pressure sources as used in our equipment to calibrate the transmitters and manometers indicate a measurement uncertainty or accuracy of 0.025%. Below this range, KELLER uses the term “precision” for the ability of a pressure transmitter or manometer to be within 0.01% of these commercial standards for every pressure point. These transmitters can be adapted to any standard of your choice by correcting the zero point and amplification with calibration software. A precision of 0.01 %FS is only available for absolute pressure types and for ranges from 10 bar.



### The logger

#### LEO Record (Ei)

- Pressure ranges -1...3 / 10 / 30 bar rel.  
0...100 / 300 / 700 / 1000 bar; 0...4 / 11 / 31 bar abs.
- Higher ranges on request, smaller pressure ranges available with capacitive measuring cell
- Accuracy class 0.05 %FS  
Total error band (0...50 °C) 0.1 %FS

- Up to 28,500 pairs of measured values: Pressure and temperature
- Event-controlled or interval-based recording



### The fast one

#### LEO 1 (Ei)

- Pressure ranges -1...3 / 10 / 30 bar rel.  
0...100 / 300 / 700 / 1000 bar; 0...4 / 11 / 31 bar abs.
- Accuracy class 0.1 %FS /  
Total error band (0...50 °C) 0.2 %FS

- Peak value detection with 5 kHz logging frequency

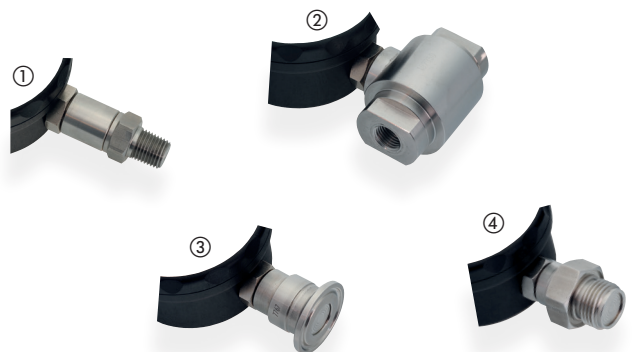


### The transmitter

#### LEO 3

- Pressure ranges -1...3 / 10 / 30 bar rel.  
0...100 / 300 / 700 / 1000 bar; 0...4 / 11 / 31 bar abs.
- Accuracy class 0.05 %FS  
Total error band (0...50 °C) 0.1 %FS

- Analogue output 4...20 mA loop
- External power supply 8...28 VDC



#### Examples of optional pressure connections:

- ① Tapered thread
- ② Differential pressure
- ③ Tri-clamp connector
- ④ Front-flush membrane

## Digital manometers – compact



The simple one  
LEO 2 (Ei)

- ◆ Pressure ranges 0...4 / 11 / 31 bar abs.; 0...300 / 700 bar
- ◆ Accuracy class 0.1 %FS  
Total error band (0...50 °C) 0.2 %FS



The economical one  
ECO 2 / ECO 1 (Ei)

- ◆ Pressure ranges 0...31 bar abs.; 0...300 bar
- ◆ Accuracy class 0.5 %FS  
Total error band (0...50 °C) 1 %FS



Digital manometer for high-volume customer-specific applications

dV-2

- ◆ Pressure ranges between 4 and 700 bar upon consultation
- ◆ Possible accuracy classes  
Gold 0.1 %FS  
Silver 0.2 %FS  
Standard 0.5 %FS

- ◆ Available as an open OEM module
- ◆ Flexible design for customer-specific pressure connections



Digital manometer with programmable switching outputs

dV-2 PS

- ◆ Pressure ranges -1...3 / 30 bar rel.; 0...200 / 700 bar  
0...4 / 31 bar abs.
- ◆ Accuracy class 0.1 %FS  
Total error band (0...50 °C) 0.2 %FS

- ◆ Two switching outputs: PhotoMOS relay 28V / 0.4 A, configurable via internal rotary switch: NPN, PNP, galvanically isolated switch
- ◆ RS485 interface for configuring the
  - Switching points
  - Switching functions: Window / hysteresis, break / make contact
  - Switching delay

## Accessories



Transport case



Rubber cover



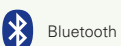
Belt pouch



Various pressure adapters



Spare batteries



Bluetooth



USB



Peak value detection



Data loggers



ATEX



RS485

## Display units



### Level/tank content display unit

#### CA1 "Castello"

- LED display: 5-digit, 14 mm digit height
- Power supply: 9 V block battery or 8...28 VDC ext.
- Inputs: RS485, I2C, 0...5 V
- Outputs: RS485, two PhotoMOS relay 40 V / 0.4 A

- Content calculation implemented for various tank shapes
- Integrated barometer for absolute measurements
- Sturdy die-cast housing with protection class IP65
- Can be combined with almost all level sensor series and pressure transmitter series



### 4...20 mA loop display unit

#### EV-97

- LCD display: 4-digit, 10 mm digit height
- Power supply: from 2L current loop, voltage load approx. 3 V
- Input: 4...20 mA
- Output: Display

- Scaling pre-configurable
- Zero offset and gradient can be corrected
- Sturdy plastic housing with protection class IP65
- Various options available on request: 0...10 V input, button, LED display, etc.



### Mains-operated universal display unit

#### EV-06

- LED display: 4-digit, 13 mm digit height
- Power supply: 230 VAC 50/60 Hz (others on request)
- Inputs: 0...0.05 / 1 / 2 / 10 V; 0 / 4...20 mA
- Outputs: Transmitter supply 24 V / 20 mA, two relays 250 V / 5 A



### Universal display unit

#### EV-94 EB

- LED display: 4-digit, 10 mm digit height
- Power supply: 9...28 VDC
- Inputs: 0...0.05 / 1 / 2 / 10 V; 0 / 4...20 mA
- Outputs: NPN, PNP, push-pull

## Calibrators & hand pumps



### Pressure calibrators

- LPX "Low-pressure": -0.85...10 bar (air)
- MPX "Medium pressure": -0.85...25 bar (air)
- HPX "High-pressure": 0...200 / 400 / 700 bar (hydraulic oil)

- Accuracy class 0.025 %FS
- Total error band (0...50 °C) 0.05 %FS



### Hand pumps

- K/P "Low-pressure": -0.85...25 bar (air)
- HTP1 "High-pressure": 0...700 bar (hydraulic or distilled water)
- P12 "High-pressure": 0...700 bar (hydraulic oil, table mounting)

- Accuracy class in accordance with the ordered manometer



## Interface converters

The interface converters were developed for communication between the measuring device and the computer. KELLER offers various converters for manometers, pressure transmitters and data loggers. Via the devices' digital interfaces, not only can the process values such as pressure and temperature be read off and recorded, but various configurations can also be made. These include, for example: resetting the zero point, selecting units, defining special units, and changing filter settings. All converters provide a half-duplex RS485 interface with the measuring device.



### USB-RS485 interface converter

K-114

- With various electrical connections suitable for the measuring devices
- Analogue measurements possible from 0...10 V and 4...20 mA
- 12 V measuring device supply via USB (ext. DC possible)
- Bias and terminating resistors can be activated by means of a protocol



### K-114 BT

- With additional Bluetooth interface and integrated accumulator
- Wireless connection via Serial Port Profile (SPP)
- 12 V measuring device supply from the converter's internal battery

RS232-RS485 interface converters are optionally available:

- K-102 / K-103 A: compact design: integrated in 9-pole D-Sub connector (f); with screw terminals or Fischer 103 series connector
- K-107: Measuring device supply via internal 9V block battery or DC mains adapter
- K-102: galvanically isolated; 15 V DC mains adapter provided

## Software

KELLER provides licence-free PC applications for the measuring devices. A connection between the PC and the measuring device can be established using a suitable interface converter. The following programs are of use for the manometer range:

### Control Center Series30

Monitoring software for displaying, storing and exporting instantaneous values (mainly pressure and temperature). Up to 128 devices can be interconnected and managed with one KELLER bus system.

### ManoConfig

Allows the configuration of digital manometers (choice of units, calibration etc.).

### Logger 5

Software for reading off and configuring data loggers, the LEO Record and the LEO 5. The measurement data can be presented graphically and exported. The online function shows the current value of the device.

### Pressure Switch Console

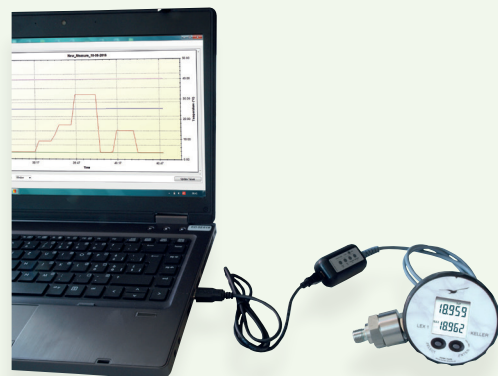
Software for configuring pressure switches and their switching outputs.

### Castello Setup

Software for configuring the tank content calculation for the Castello display unit.

## Reference devices

By combining a pressure transducer, a USB converter and the CCS30 monitoring software, it is possible to put together very user-friendly laboratory equipment. This laboratory equipment can be used as a reference measuring system.



An appropriate degree of accuracy can be achieved, for example, with the 33 X Series pressure transmitter or the LEX 1 digital manometer. The calibration certificate ordered for this purpose guarantees a measurement accuracy of 0.05 %FS, or even a measurement precision of 0.01 %FS. Combined with a minimal measuring interval of 5 ms, pressure curves are recorded and analysed very precisely and at a high resolution both in terms of time and the signal technology.

# Welcome to KELLER AG für Druckmesstechnik. Your Swiss Pressure Sensing Specialist.

KELLER AG für Druckmesstechnik, which has its headquarters in Winterthur, Switzerland, is Europe's leading manufacturer of media isolated pressure transducers and transmitters.

The entire production process, from the manufacturing of the individual components and the calibration of the sensors through to the final quality control of the finished products, takes place at the company's headquarters in Winterthur. This means that all of KELLER AG's products are officially "Made in Switzerland". The application areas for KELLER's pressure transducers are just as broad as KELLER's product range.

KELLER AG für Druckmesstechnik and KELLER Gesellschaft für Druckmesstechnik mbH Jestetten have ISO 9001 certification.

**Founder / Founded in**  
Hannes W. Keller, dipl. Phys. ETH / 1974

**Workforce**  
400 employees

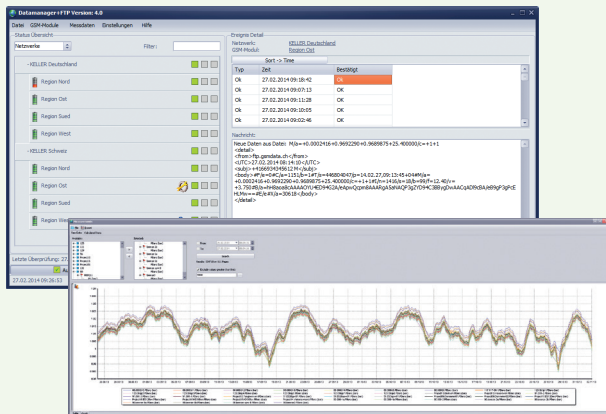
**Turnover**  
CHF 70 million

**Warehouse / Shipping**  
Winterthur (CH), Head Office and Production  
Jestetten (D), EU Logistics Centre

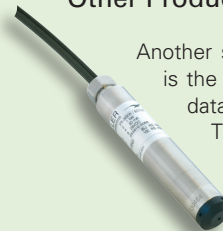
Subsidiaries and sales partners all around the world.

## KELLER Software

KELLER AG für Druckmesstechnik has its own software department. Its comprehensive range of applications is always included with the relevant products. No licence fees are charged.



## Other Product Overviews



Another special area of expertise of KELLER AG is the production and sale of level sensors and data loggers – usually in the water industry. These are presented in the overview of "Hydrostatic pressure measurement for fill levels and gauges".



KELLER has also a strong reputation as an original equipment manufacturer. OEM products such as pressure transducers with compensation electronics and customised solutions for every stage of development are used in a wide range of devices developed by our customers. For example, the Series PRD-33 X was developed for applications that require a high degree of accuracy together with high overload resistance in the low differential pressure range. You can find this product in the overview "Pressure transmitters and pressure transducers".



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