

OBSOLETE

Replacement product:
Model LF-1

Level measurement

Submersible pressure sensor For water and wastewater Model LW-1

WIKA data sheet LM 40.03



HART
COMMUNICATION PROTOCOL

Applications

- Level measurement in rivers and lakes
- Deep well and groundwater monitoring
- Control of sewage lift and pumping stations
- Monitoring of sewage, settling and rainwater retention basins

Special features

- Permanent use even in contaminated media
- An optimised discharge behaviour and a large pressure port prevent the instrument from clogging and ensure a minimum maintenance effort
- Explosion protection selectable in accordance with ATEX or IECEx
- Low-power output signals for battery-operated measuring systems available
- Optional temperature output for density compensation and temperature monitoring

Description

Developed for water and wastewater

The submersible pressure sensor model LW-1 has been developed especially for applications in the water management such as level measurement in fresh and salt water and in wastewater.

The robust design and a large pressure port prevent it from clogging and minimise the application-specific maintenance, even in contaminated media.

Thanks to newly developed special cables, components made of high-alloyed stainless steel and an optional overvoltage protection against lightning, the submersible pressure sensor is ideal for measurement applications in aqueous media.

Temperature measurement and HART® communication

An analogue temperature output for monitoring of the medium temperature is optionally available. It facilitates the



Submersible pressure sensor, model LW-1

documentation of temperature characteristic curves and a compensation of temperature-induced density variations.

The HART® communication can be used for scaling the measuring range and for the parameterisation of unit, error signal, and others.

Optimised electronics for battery operation

The modern electronic system guarantees not only a high accuracy in the long term but also ensures a very long battery life thanks to low power supply, low current consumption, fast response time and low-power output signals.

Safety also in hazardous areas

The optional intrinsically safe electronic system is authorised according to the common international standards and allows a safe worldwide application in explosive gases and vapours.

Measuring ranges

| Gauge pressure | | | | | | | |
|-------------------|-----------|------------|------------|-----------|-----------|-----------|-----------|
| bar | 0 ... 0.1 | 0 ... 0.16 | 0 ... 0.25 | 0 ... 0.4 | 0 ... 0.6 | 0 ... 1 | 0 ... 1.6 |
| | 0 ... 2.5 | 0 ... 4 | 0 ... 6 | | | | |
| inWC | 0 ... 50 | 0 ... 100 | 0 ... 150 | 0 ... 250 | | | |
| psi | 0 ... 5 | 0 ... 10 | 0 ... 15 | 0 ... 25 | 0 ... 50 | 0 ... 100 | |
| mH ₂ O | 0 ... 1 | 0 ... 1.6 | 0 ... 2.5 | 0 ... 4 | 0 ... 6 | 0 ... 10 | 0 ... 16 |
| | 0 ... 25 | 0 ... 40 | 0 ... 60 | | | | |

The given measuring ranges are also available in mbar, kPa and MPa.

Overload pressure limit

≥ 3 times

Temperature measurement (option)

-10 ... +50 °C (14 ... 122 °F)

The temperature output signal corresponds to the selected medium temperature (see operating conditions).

Output signals

| Without temperature measurement | |
|---------------------------------|--|
| Standard | 4 ... 20 mA (2-wire) |
| Option 1 | 4 ... 20 mA + HART® (2-wire) |
| Option 2 | DC 0.1 ... 2.5 V (3-wire, low power) ¹⁾ |

| With temperature measurement | |
|------------------------------|--|
| Standard | 2 x 4 ... 20 mA (2 x 2-wire, galvanically isolated) |
| Option 1 | 2 x DC 0.1 ... 2.5 V (3-wire, low power) ¹⁾ |

¹⁾ Shortening the cable always results in a modification of the voltage signal (see accuracy specifications).

Load

Current output: $\leq (U_+ - (U_{+min} - 0.5 \text{ V})) / 0.023 \text{ A}$

Voltage output: $\leq 1 \text{ mA}$

Additional load of the cable:

$\leq \text{cable length in m} \times 0.084 \ \Omega$

($\leq \text{cable length in ft} \times 0.0256 \ \Omega$)

For voltage outputs, the load must be specified so that the output current does not exceed 1 mA.

Voltage supply

The power supply depends on the selected output signal and the intrinsically safe electronics (Ex approval).
When being operated in hazardous areas, the submersible pressure sensor must be powered via an isolated barrier (see accessories).

Power supply

| Output signal | Standard | With Ex approval |
|---|-----------------|------------------|
| 4 ... 20 mA (2-wire) | DC 8 ... 36 V | DC 9 ... 30 V |
| 4 ... 20 mA + HART® (2-wire) | DC 12 ... 36 V | DC 12 ... 30 V |
| DC 0.1 ... 2.5 V (3-wire, low power) | DC 3.6 ... 36 V | - |
| 2 x 4 ... 20 mA (2 x 2-wire, galvanically isolated) | DC 8 ... 36 V | DC 9 ... 30 V |
| 2 x DC 0.1 ... 2.5 V (3-wire, low power) | DC 3.6 ... 36 V | - |

Low power is optimised for the battery operation.

Current consumption

Current output: max. 25 mA per output

Voltage output: max. 5 mA

Reference conditions (per IEC 61298-1)

Temperature

15 ... 25 °C (59 ... 77 °F)

Atmospheric pressure

860 ... 1,060 mbar (86 ... 106 kPa /12.5 ... 15.4 psig)

Humidity

45 ... 75 % r. h.

Power supply

- DC 24 V with current output
- DC 5 V with voltage output

Mounting position

Calibrated in vertical mounting position with process connection facing downwards.

Accuracy specifications

Accuracy at reference conditions (pressure sensor)

| | Accuracy ¹⁾ | Non-linearity (per IEC 61298-2) BFSL |
|----------|--------------------------|--------------------------------------|
| Standard | $\leq \pm 1$ % of span | $\leq \pm 0.5$ % of span |
| Option | $\leq \pm 0.5$ % of span | $\leq \pm 0.25$ % of span |

1) Including non-linearity, hysteresis, zero offset and end value deviation (corresponds to measured error per IEC 61298-2).

During the adjustment of the voltage signals, the cable length will be compensated. Every shortening of the cable at a later stage results in an offset error of approx. 0.14 % / 10 m (0.13 % / 30 ft).

| Accuracy after turndown 5:1 via HART® | |
|---------------------------------------|----------------------------------|
| Standard | $\leq \pm 1.25$ % of scaled span |
| Option | $\leq \pm 0.75$ % of scaled span |

By setting a turndown of greater than 5:1, a higher measured error applies.

Accuracy (temperature sensor)

$\leq \pm 1.8$ K

Non-repeatability

≤ 0.1 % of span

≤ 0.2 % of span (with voltage output and cable length > 100 m (325 ft))

Long-term stability (per DIN 16086:2006-01)

Measuring range > 0 ... 0.1 bar: $\leq \pm 0.1$ % of span/year

Measuring range ≤ 0 ... 0.1 bar: $\leq \pm 0.2$ % of span/year

Switch-on time

Output signals without HART®: ≤ 150 ms

Output signals with HART®: ≤ 250 ms

Settling time

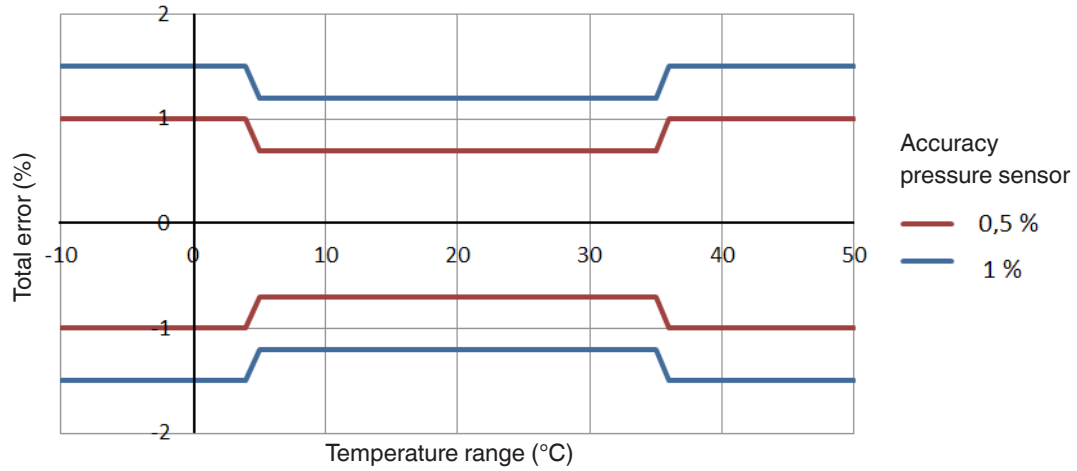
Output signals without HART®: ≤ 100 ms

Output signals with HART®: ≤ 250 ms

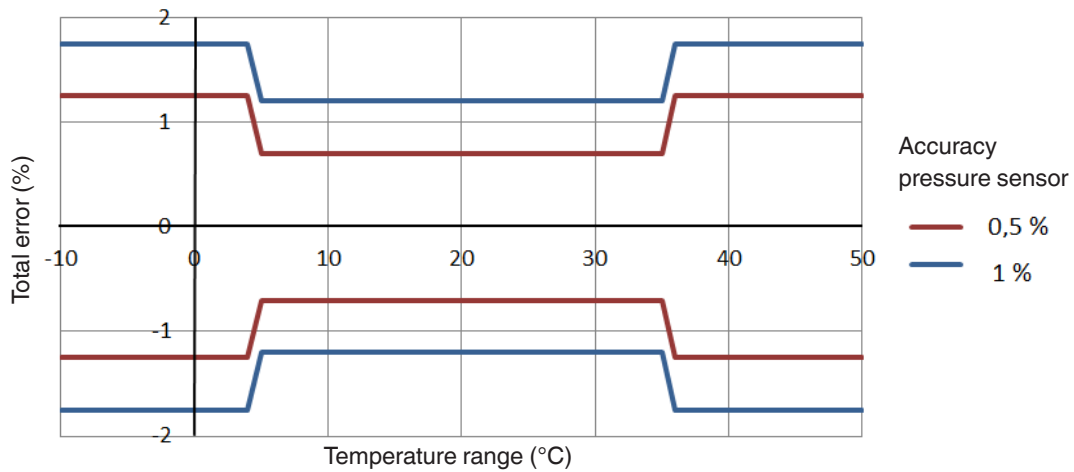
Total error band

The total error band includes the non-linearity, hysteresis, zero point and span error, temperature error and temperature hysteresis.

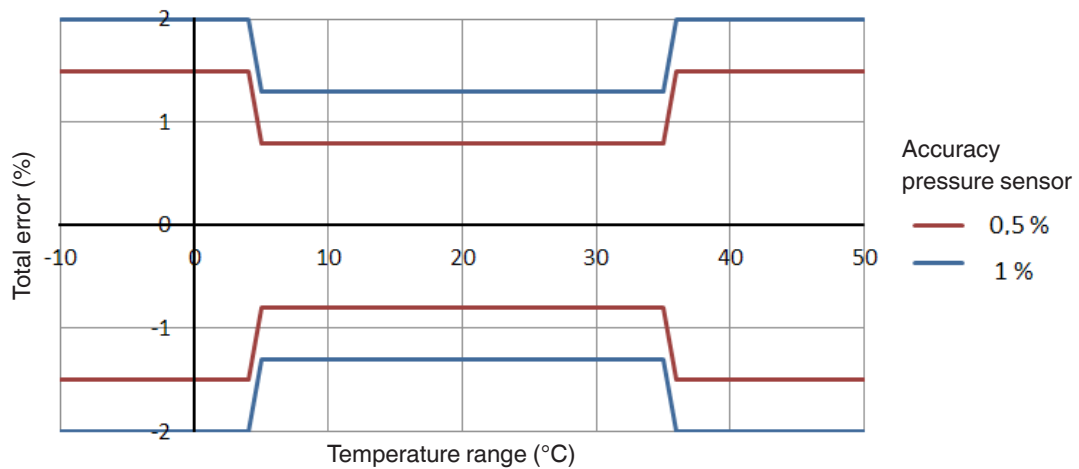
■ Measuring range ≥ 0.6 bar, ≥ 250 inWC, ≥ 10 psi, ≥ 6 mH₂O



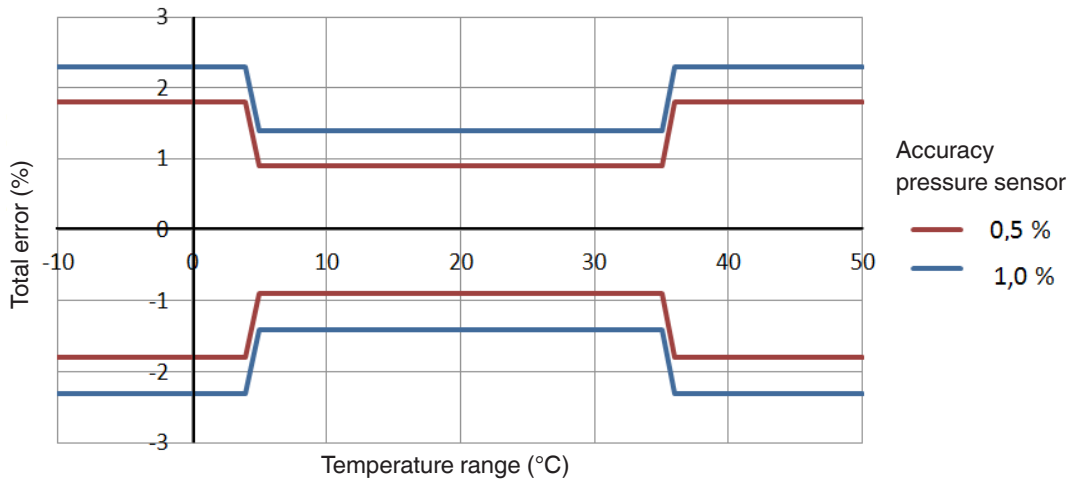
■ Measuring range 0.4 bar, 150 inWC, 4 mH₂O



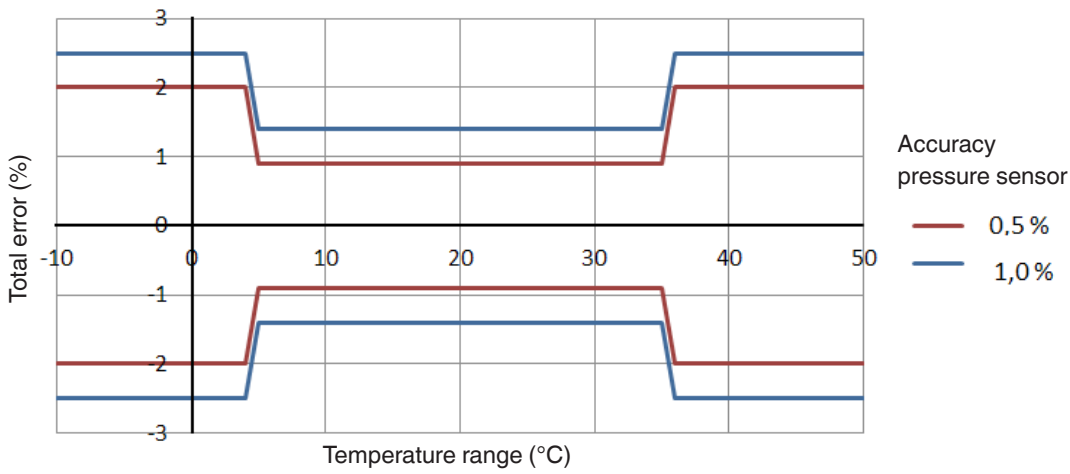
■ Measuring range 0.25 bar, 100 inWC, 5 psi, 2.5 mH₂O



■ Measuring range 0.16 bar, 1.6 mH₂O



■ Measuring range 0.1 bar, 50 inWC, 1 mH₂O



Operating conditions

Ingress protection

IP68

Increased overvoltage protection for lightning strikes (option)

Nominal discharge current: ≥ 10 kA

Rise time: 8/20 μ s

Immersion depth

max. 100 m (325 ft)

Max. tensile force of the cable

1,000 N

Weight

Submersible

pressure sensor: approx. 300 g (0.661 lbs)

Cable: approx. 80 g/m (0.538 lbs/10 ft)

Additional weight: approx. 300 g (0.661 lbs)

Permissible temperature ranges

Medium: -10 ... +50 °C (14 ... 122 °F)

Ambient: -40 ... +80 °C (-40 ... +176 °F)

Storage: -30 ... +80 °C (-22 ... +176 °F)

Explosion protection (option)

| Approval | Marking |
|----------|--|
| ATEX | Zone 0 gas [II 1G Ex ia IIC T4/T5/T6 Ga] Zone 1 gas [II 2G Ex ia IIC T4/T5/T6 Gb] |
| IECEX | Zone 0 gas [Ex ia IIC T4/T5/T6 Ga] Zone 1 gas [Ex ia IIC T4/T5/T6 Gb] |

Permissible ambient temperature ranges in hazardous areas

T4: -40 ... +80 °C (-40 ... +176 °F)

T5: -40 ... +74 °C (-40 ... +165 °F)

T6: -40 ... +59 °C (-40 ... +138 °F)

Materials (wetted)

| | Standard | Option (high-resistance) |
|----------------|----------|--------------------------|
| Case | 316L | 318LN |
| Sensor element | 316L | Hastelloy C276 |
| Cable | PUR | FEP |
| Sealing | FKM | FKM |
| Protection cap | PVDF | PVDF |

Electrical connection

| Cable outlet | |
|--------------|------------------------------|
| Standard | Cable outlet without conduit |
| Option | Cable outlet with conduit |

| Cable lengths | | | | | | | | | | |
|---------------|-----------|---|----|----|----|----|----|-----|-----|-----|
| Standard | Metre (m) | 3 | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 |
| | Feet (ft) | 10 | 20 | 30 | 40 | 50 | 75 | 100 | 125 | 150 |
| Option | Metre (m) | For current output, freely definable up to 1,000 m | | | | | | | | |
| | | For voltage output, freely definable up to 200 m | | | | | | | | |
| | Feet (ft) | For current output, freely definable up to 3,250 ft | | | | | | | | |
| | | For voltage output, freely definable up to 650 ft | | | | | | | | |

Other lengths on request

Short-circuit resistance

S+ vs. U-

Reverse polarity protection

U+ vs. U-

Resistance to overvoltage

DC 40 V

Insulation voltage

Standard: DC 850 V

Increased overvoltage

protection for lightning strikes: DC 50 V

Connection diagrams

| 4 ... 20 mA, 4 ... 20 mA + HART® (2-wire) | |
|---|------------|
| U+ | brown (BN) |
| U- | blue (BU) |
| Shield | grey (GY) |

| DC 0.1 ... 2.5 V (3-wire, low power) | |
|--------------------------------------|------------|
| U+ | brown (BN) |
| U- | blue (BU) |
| S+ | black (BK) |
| Shield | grey (GY) |

| 2 x 4 ... 20 mA (2 x 2-wire, galvanically isolated) | |
|---|------------|
| U+ (pressure sensor) | brown (BN) |
| U- (pressure sensor) | blue (BU) |
| U+ (temperature sensor) | green (GN) |
| U- (temperature sensor) | white (WH) |
| Shield | grey (GY) |

| 2 x DC 0.1 ... 2.5 V (3-wire, low power) | |
|--|------------|
| U+ | brown (BN) |
| U- | blue (BU) |
| S+ (pressure sensor) | black (BK) |
| S+ (temperature sensor) | green (GN) |
| Shield | grey (GY) |





Legend

U+ positive power supply terminal

U- negative power supply terminal

S+ analogue output

Approvals (option)

| Logo | Description | Country |
|--|--|----------------|
|   | EU declaration of conformity <ul style="list-style-type: none"> ■ EMC directive EN 61326 emission (group 1, class B) and interference immunity (industrial application) ■ RoHS directive ■ ATEX directive ¹⁾ Ex i Zone 0 gas [II 1G Ex ia IIC T4/T5/T6 Ga] Zone 1 gas [II 2G Ex ia IIC T4/T5/T6 Gb] | European union |
|   | IECEx ¹⁾ Hazardous areas Ex i Zone 0 gas [Ex ia IIC T4/T5/T6 Ga] Zone 1 gas [Ex ia IIC T4/T5/T6 Gb] | International |

1) Only available with output signals 4 ... 20 mA and 4 ... 20 mA + HART®.

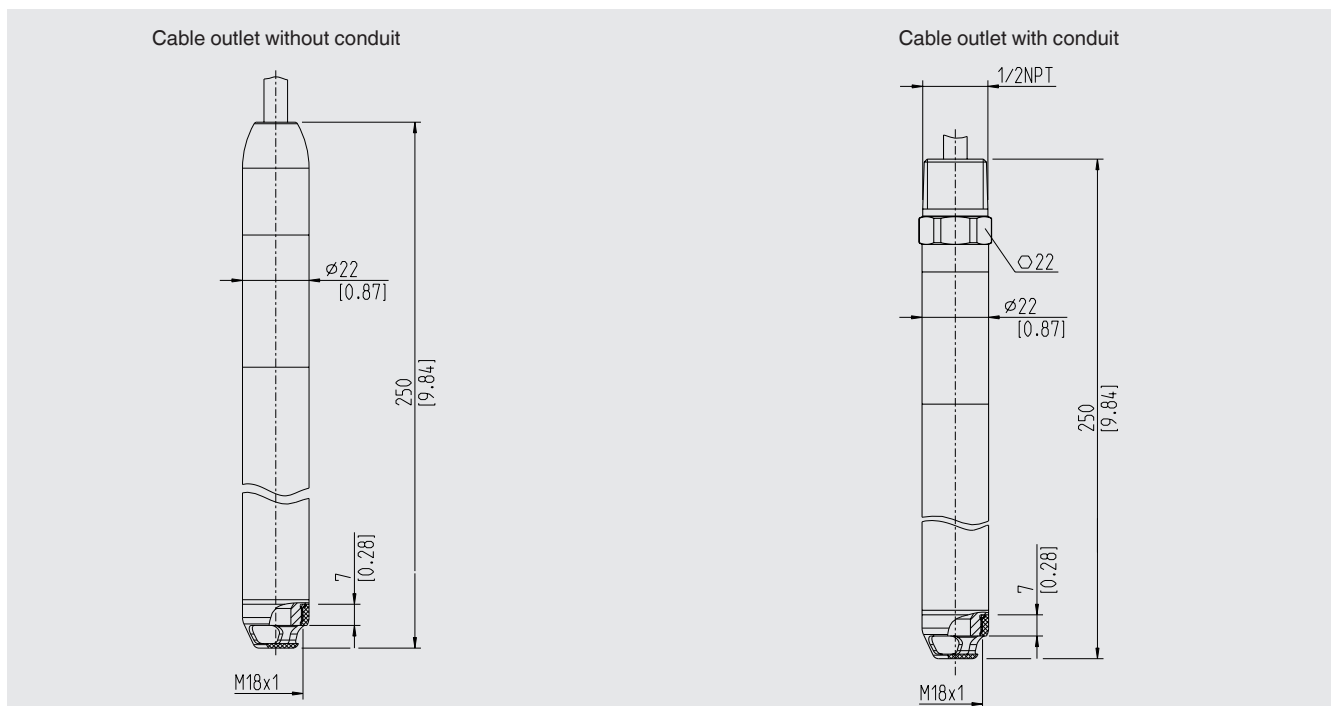
Manufacturer's information and certificates

China RoHS conformity

SJ/T 11364-2014

Approvals and certificates, see website

Dimensions in mm [in]



Accessories

| | Description | Order number |
|---|--|--|
|  | <p>Additional weight The additional weight increases the dead weight of the submersible pressure sensor. It simplifies the lowering in monitoring wells, narrow shafts and deep wells. It effectively reduces negative environmental influences of the measuring medium (e.g. turbulent flows) on the measuring result.</p> <p>Stainless steel 316L, approx. 300 g (0.661 lbs), length 115 mm (4.53 in)</p> | 14131008 |
|  | <p>Cable strain relief clamp The cable strain relief clamp ensures easy and secure mechanical fastening of the submersible pressure sensor's cable. It serves to guide the cable to prevent mechanical damage and to reduce the action of tensile stresses.</p> | 14052336 |
|  | <p>Cable box The terminal box, with IP67 ingress protection and waterproof ventilation element, provides a moisture-free electrical termination for the submersible pressure sensor. It should be mounted in a dry environment, outside any shafts or vessels, or directly in the switch cabinet.</p> <p>Not suitable for hazardous areas!</p> | 14052339 |
|  | <p>Intrinsically safe repeater power supply, model IS Barrier Input 0/4 ... 20 mA, supplying and non-supplying Bidirectional HART® signal transmission</p> <p>For details see data sheet AC 80.14</p> | 14117118 |
|  | <p>Indication and programming module HART® DIH50 and DIH52 5-digit display, 20-segment bar graph, without separate power supply, with additional HART® functionality. Automatic adjustment of measuring range and span. "Secondary-master" functionality: Setting the measuring range and unit of the connected transmitter using HART® standard commands possible. Optionally explosion protection per ATEX.</p> | on request |
|  | <p>HART® modem with USB, RS-232 or Bluetooth® interface For scaling the measuring range using a PC via the HART® protocol, a HART® modem with USB, RS-232 or Bluetooth® interface is available. The modem communicates with all registered HART® field instruments and can be used with the most popular HART®-compatible software programs.</p> | <p>7957522 (RS-232 interface)</p> <p>11025166 (USB interface)</p> <p>11364254 (Bluetooth® interface)</p> |

Ordering information

Model / Measuring range / Output signal / Accuracy / Case material / Cable outlet / Cable material / Cable length / Overvoltage protection / Approval / Accessories

© 12/2016 WIKA Alexander Wiegand SE & Co. KG, all rights reserved.
The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.



WIKAL Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de