

ROCK CREEK WRRF PRIMARY CLARIFIER No. 4 TREATMENT EXPANSION CLEAN WATER SERVICES

APRIL 2025

SECTION 17140 LEVEL MEASUREMENT

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OPTIMAL CONTROL SYSTEMS, INC.

2324 Three Lakes Road SE

Albany, OR 97322

Phone: (541) 967-9323

Fax: (541) 967-9485

Project No. 0523-23SSE

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EQUIPMENT SUPPLIER'S CERTIFICATE OF PROPER INSTALLATION

OWNER Clean Water Services

PROJECT Rock Creek WWRP Primary Clarifier No. 4 Treatment Expansion

CONTRACT NO. 7012

EQUIPMENT SPECIFICATION SECTION 17140

EQUIPMENT DESCRIPTION Submersible Pressure Transmitter

Hoyt Day, Authorized representative of
(Print Name)

WIKA
(Print Manufacturer's Name)

hereby CERTIFY that WIKA Submersible Pressure Transmitter, Model No. LF-1,
(print equipment name and model with serial no.)

Part No. 76201474, Serial No. 1A033ONE72D, Tag No. 300LT1204

installed for the subject project has (have) been installed in a satisfactory manner, has (have) been tested and adjusted, and is (are) ready for final acceptance testing and operation on :

Date: 2024.12.5

Time: 11:00

CERTIFIED BY: 
(Signature of Manufacturer's Representative)

Date: 2024.12.5

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CWS INSTRUMENT CALIBRATION SHEET

Project Name: Rock Creek WWRF Primary Clarifier No. 4 Treatment Expansion	Owner Project No.: 7012
Project Owner: Clean Water Services	Regulatory Agency Project No.:
Project No.:0523-23SSE	Date:2024.12.5
Control Loop No.: RC350LT1204	
Instrument Tag No.: 350LT1204	Transmitter/gauge span: 0-17' H2O
Manufacturer: WIKA	
Model No.: LF-1	
Serial No.: 1A033ONE72D	

TRANSMITTERS AND INDICATORS

	Increasing Input			Decreasing Input		
% of Span	Input 'H2O	Output mA	Error (% of span)	Input 'H2O	Output mA	Error
0%	0	4	Simulated	0	4	Simulated
25%	4.25	8	Simulated	4.25	8	Simulated
50%	8.5	12	Simulated	8.5	12	Simulated
75%	12.75	16	Simulated	12.75	16	Simulated
100%	17	20	Simulated	17	20	Simulated
Other (if applicable)						
Other (if applicable)						

Maximum allowable error (per Contract Documents) 0.075%

Remarks:

CALIBRATION EQUIPMENT UTILIZED

Device Type	MFR/Model No.	Accuracy	Nist Traceability?
Hart Communicator	Emerson 475	N/A	N/A

Certified by: Hoyt Day

Date Certified:2024.12.5

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EQUIPMENT INFORMATION SHEET						Page 1			
EQUIP. DESCRIPTION - Submersible Pressure Transmitter				DATE INSTALLED		DATE STARTED			
EQUIP. TAG - 300LT1204				EST. COST \$1,486		EST. LIFE			
EQUIP. LOCATION - Primary Scum Pit				SPECIFICATION # 17140					
MFR - WIKA						PHONE NUMBERS 888-945-2872			
ADDRESS 1000 Wiegand Boulevard, Lawrenceville, GA 30043									
VENDOR Branom Instrument Co.						206-762-6050			
5610 4th Ave So., Seattle, WA 98108									
MAINTENANCE REQUIREMENTS		LUBE CODE		W	M	Q	S	A	HOURS
Clean the instrument using a soft, damp cloth.				Dependent on operating conditions.					
CODE	LUBRICANT TYPE	MANUFACTURER	CODE	LUBRICANT TYPE	MANUFACTURER				
1									
2									
3									

EQUIPMENT INFORMATION SHEET						Page 2	
RECOMMENDED SPARE PARTS				ELECTRICAL NAMEPLATE DATA			
PART NO.	PART NAME	QUANTITY	EQUIP. Submersible Pressure Transmitter				
			Manufacturer: WIKA				
			SERIAL NO. 1A033ONE72D		ID NO. 300LT1204		
			MODEL NO. LF-1		FRAME NO.		
			HP	VOLT. 12-30VDC	AMP. 4-20mA	HZ	
			Phase	RPM	Service Factor	DUTY	
			CODE	Insulation	Design	TYPE	
			NEMA	Enclosure	Misc. 0-250InWC	RATING IP68	
			MECHANICAL NAMEPLATE DATA				
			EQUIP. Submersible Pressure Transmitter				
			Manufacturer: WIKA				
			SERIAL NO. 1A033ONE72D		ID NO. 300LT1204		
			MODEL NO. LF-1		MOUNTING POS		
			HP	RPM	CAP	SIZE	
			TDH	IMP.SZ	BELT NO.	Output Tor.	
			PSI	NEMA	GEAR RATIO		

Bill of Materials



Project: Rock Creek WRRF Primary Clarifier No. 4 Treatment Expansion
Specification Section(s): Section 17140 – Level Measurement
Date: April 2025

Item No.	Qty.	Tag(s)	Description	Manufacturer	Part Number	Serial Number
001	1	300LT1204	Submersible Pressure Sensor, Model LF-1	WIKA	76201474	1A033ONE72D
002	2	300LT1204	Cable Strain Relief Clamp	WIKA	14052336	—
003	1	300LT1204	Additional Weight	WIKA	14131008	—
004	1	350JB1204	Terminal Box	WIKA	14052339	—
005						
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Test Report

Model: LF-1

Product Number (P#): 76201474
Serial number (S#): 1A033ONE72D
Measuring range: 0...250 InWC
Output signal: 4 ... 20 mA
Accuracy: 0.5 % of span

Pressure [InWC]	Output signal [mA]	Error [%]
0.000	4.005	0.033
62.500	8.001	0.009
125.000	12.001	0.005
187.500	16.002	0.010
250.000	20.003	0.017

Reference conditions (per IEC 61298
-1)

Temperature 15...25 °C (59...77 °F)
Rel. humidity 45...75 % r.F
Atmospheric pressure 860...1060 mbar (86...106 kPA / 12.5...15.4 psig)
Power supply DC 24V
Test person: Alfred Jacobaschke
4D

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Submersible pressure sensor For superior applications Model LF-1

WIKA data sheet LM 40.04



Applications

- Level measurement in vessel and storage systems
- Overfilling and no-load operation monitoring
- Level measurement in rivers and lakes
- Deep well and groundwater monitoring
- Battery-operated level measuring systems

Special features

- Suitable for measurements in contaminated and aggressive media
- An optimised discharge behaviour and a large pressure port prevent the instrument from clogging and ensure a minimum maintenance effort
- Can be used in explosion-protected areas
- Developed for wireless applications



Fig. left: With conduit and FEP cable
Fig. right: With PUR cable

Description

Permanently reliable

Extensive test cycles not only guarantee a permanent resistance and long service life in all commonly used oils and fuels, including aggressive crude oils and biofuels, but also in flowing and stagnant waters and in wastewater treatment applications.

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 perfectly suited for the measurement of liquid levels, also in the outdoor area.

Precise level and temperature measurement with HART® communication

A measurement uncertainty of max. 0.5 %, a long-term drift of 0.1 % and slight temperature errors make the LF-1 a reliable measurement solution for the monitoring of storage tanks and bodies of water.

The additional analogue temperature output facilitates the compensation of a temperature-induced density error especially at temperatures of up to -40 ... +80 °C [-40 ... +176 °F].

The integrated 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				

Absolute pressure							
bar	0 ... 1.6	0 ... 2.5	0 ... 4	0 ... 6			
psi	0 ... 25	0 ... 50	0 ... 100				

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

Overload safety

≥ 3 times

Temperature measurement (option)

Measuring ranges	
Option 1	-10 ... +50 °C [14 ... 122 °F]
Option 2	-40 ... +80 °C [-40 ... +176 °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).

Permissible load in Ω

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:

≤ cable length in m x 0.084 Ω

[≤ cable length in ft x 0.0256 Ω]

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 a repeater power supply (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]

Air 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 measuring deviation applies.

Accuracy (temperature sensor)

-10 ... +80 °C [14 ... 176 °F]: $\leq \pm 1.8$ K

-30 ... -10 °C [-22 ... +14 °F]: $\leq \pm 3.0$ K

-40 ... -30 °C [-40 ... -22 °F]: $\leq \pm 4.5$ K

Non-repeatability

$\leq 0.1 \%$ of span

$\leq 0.2 \%$ 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

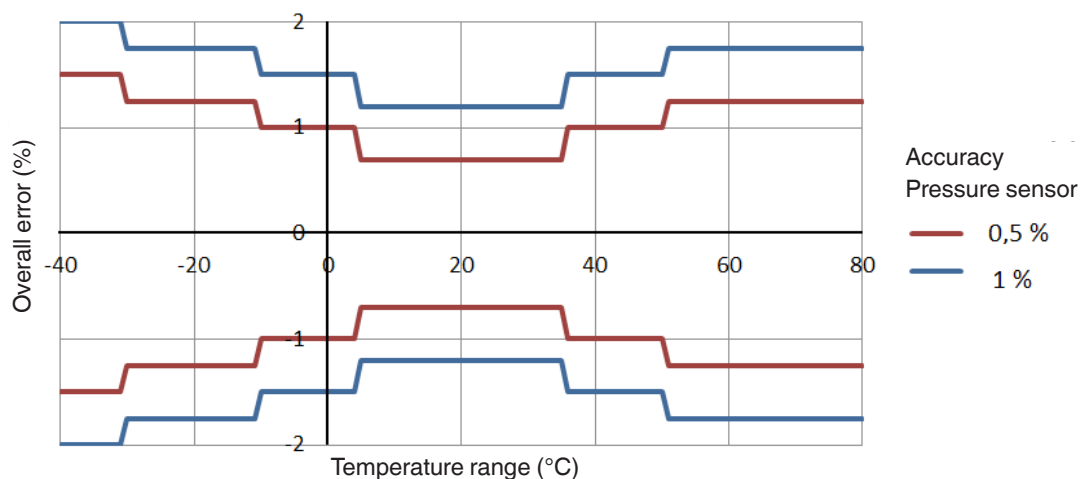
Output signals without HART®: ≤ 100 ms

Output signals with HART®: ≤ 250 ms

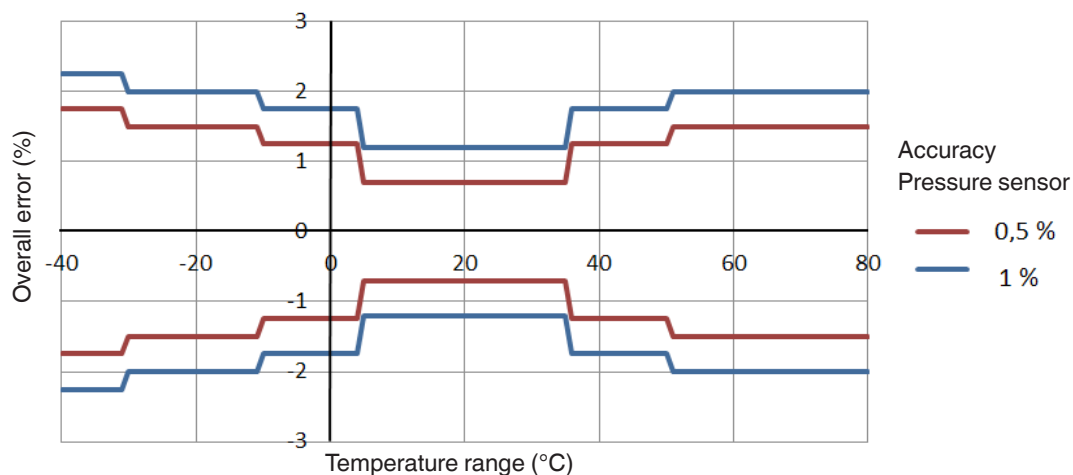
Overall error

Including non-linearity, hysteresis, zero point and span error, temperature error and temperature hysteresis.

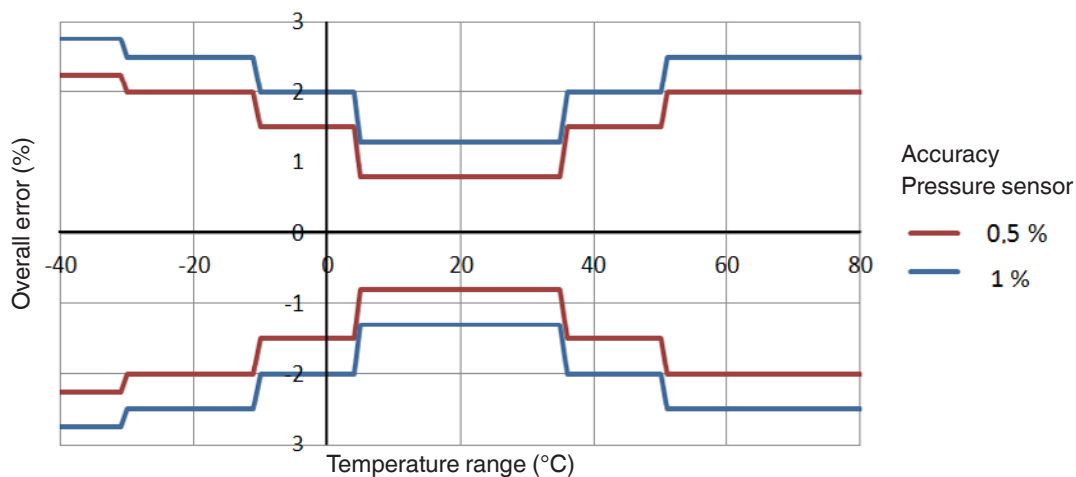
■ Measuring range ≥ 0.6 bar, ≥ 250 inWC, ≥ 10 psi, ≥ 6 mH₂O



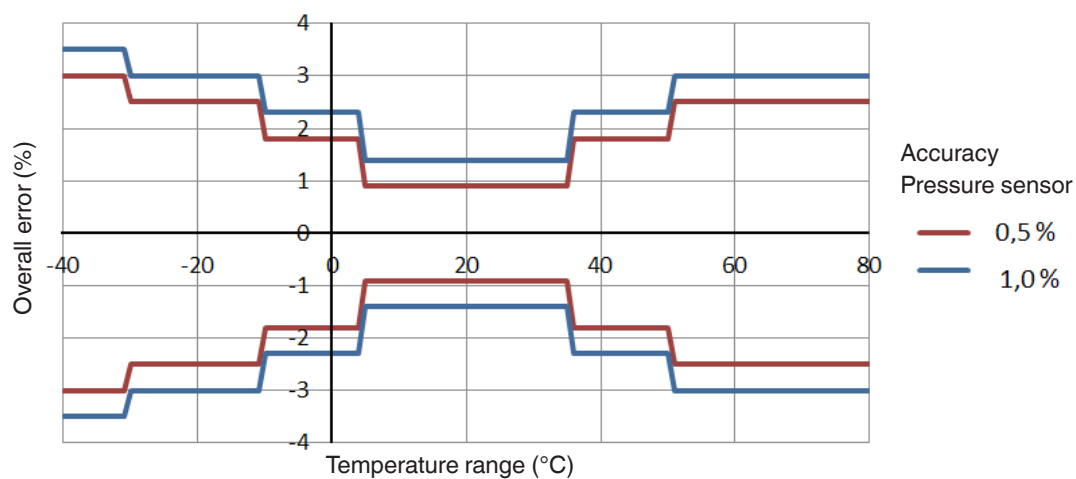
■ Measuring range 0.4 bar, 150 inWC, 4 mH₂O



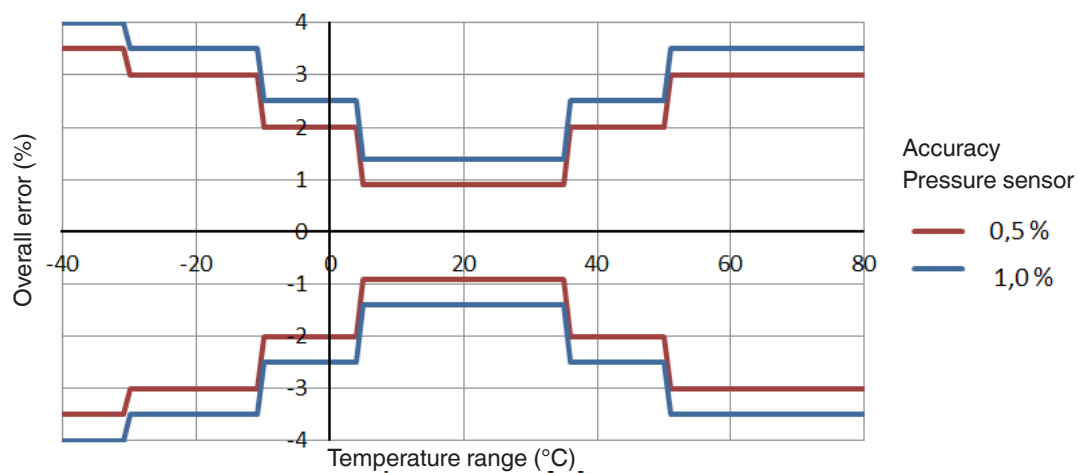
■ Measuring range 0.25 bar, 100 inWC, 5 psi, 2.5 mH₂O



■ 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. tension 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	Standard	-10 ... +50 °C [14 ... 122 °F]
	Option	-40 ... +80 °C [-40 ... +176 °F]
Ambient	Standard	-40 ... +80 °C [-40 ... +176 °F]
Storage	Standard	-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]
CSA	Class I, division 1, groups A, B, C, D Class I, zone 0; A/Ex ia IIC; T6 ... T4 Ga Class I, zone 1; A/Ex ia IIC; T6 ... T4 Gb Class I, zone 2; A/Ex ic IIC; T6 ... T4 Gc (see control drawing 14136138)
FM	Class I, division 1, groups A, B, C, D Class I, zone 0, AEx ia IIC, T6 ... T4 Ga Class I, zone 1, AEx ia IIC, T6 ... T4 Gb Class I, zone 2, AEx ic IIC, T6 ... T4 Gc (see control drawing 14136138)
EACEx	Zone 0 Gas [0ExiaIICT6...T4 X] Zone 1 Gas [1ExiaIICT6...T4 X]

Permissible temperature ranges in hazardous areas (ATEX, IECEX, EACEx)

Ambient and media temperature range (Pi = 600 mW)	Ambient and media temperature range (Pi = 800 mW)	Temperature code
$-40 \leq T_a \leq +59$ °C	$-40 \leq T_a \leq +52$ °C	T6
$-40 \leq T_a \leq +74$ °C	$-40 \leq T_a \leq +67$ °C	T5
$-40 \leq T_a \leq +80$ °C	$-40 \leq T_a \leq +76$ °C	T4 - T1

Permissible temperature ranges in hazardous areas (FM, CSA)

Ambient and media temperature range (Pi = 600 mW)	Temperature code
$-40 \leq T_a \leq +59\text{ °C}$	T6
$-40 \leq T_a \leq +74\text{ °C}$	T5
$-40 \leq T_a \leq +80\text{ °C}$	T4 - T1

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	Metres (m)	3	5	10	15	20	25	30	40	50
	Feet (ft)	10	20	30	40	50	75	100	125	150
Option	Metres (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 ■ EMC directive EN 61326 emission (group 1, class B) and 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
	FM ¹⁾ Hazardous areas Class I, division 1, groups A, B, C, D Class I, zone 0, AEx ia IIC, T6 ... T4 Ga Class I, zone 1, AEx ia IIC, T6 ... T4 Gb Class I, zone 2, AEx ic IIC, T6 ... T4 Gc (see control drawing 14136138)	USA
	CSA ■ Safety (e.g. electr. safety, overpressure, ...) ■ Hazardous areas ¹⁾ Class I, division 1, groups A, B, C, D Class I, zone 0; A/Ex ia IIC; T6 ... T4 Ga Class I, zone 1; A/Ex ia IIC; T6 ... T4 Gb Class I, zone 2; A/Ex ic IIC; T6 ... T4 Gc (see control drawing 14136138)	USA and Canada
	EAC ■ EMC directive ■ Hazardous areas (see approval)	Eurasian Economic Community

¹⁾ Only available with output signals 4 ... 20 mA, 2 x 4 ... 20 mA and 4 ... 20 mA + HART®.

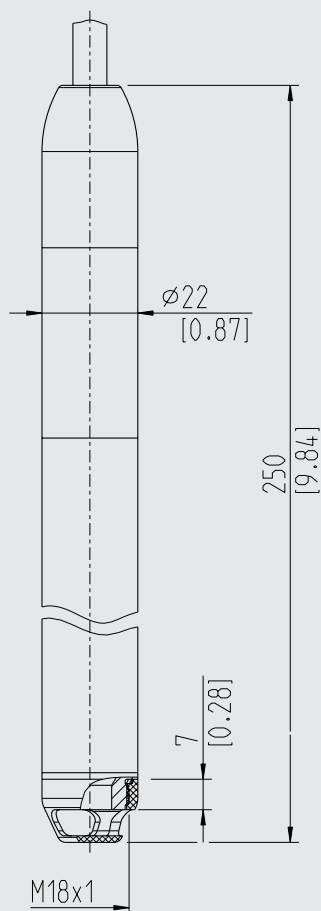
Manufacturer's information and certificates

China RoHS conformity
SJ/T 11364-2014

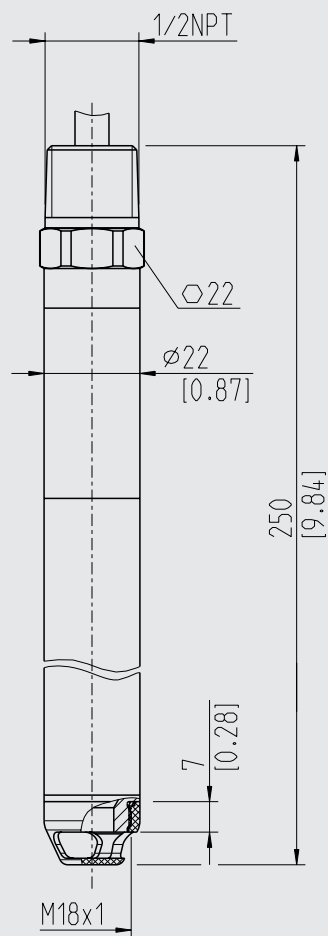
Approvals and certificates, see website

Dimensions in mm [in]

Cable outlet without conduit



Cable outlet with conduit



Accessories

	Description	Order number
	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. Stainless steel 316L, approx. 300 g [0.661 lbs], length 115 mm [4.53 in]	14131008
	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.	14052336
	Cable box The cable socket, 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. Not suitable for hazardous areas!	14052339
	Intrinsically safe repeater power supply, model IS Barrier Input 0/4 ... 20 mA, supplying and non-supplying Bidirectional HART® signal transmission For details see data sheet AC 80.14	14117118
	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.	on request
	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.	7957522 (RS-232 interface)
		11025166 (USB interface)
		11364254 (Bluetooth® interface)

Ordering information

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

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 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.



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Operating instructions

Submersible pressure sensor, model LF-1

EN

CE



Submersible pressure sensor

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WIKA® ist eine geschützte Marke in verschiedenen Ländern.

Prior to starting any work, read the operating instructions!
Keep for later use!

Contents

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EN

Declarations of conformity can be found online at www.wika.com

1. General information

1. General information

Safety instructions for hazardous locations:

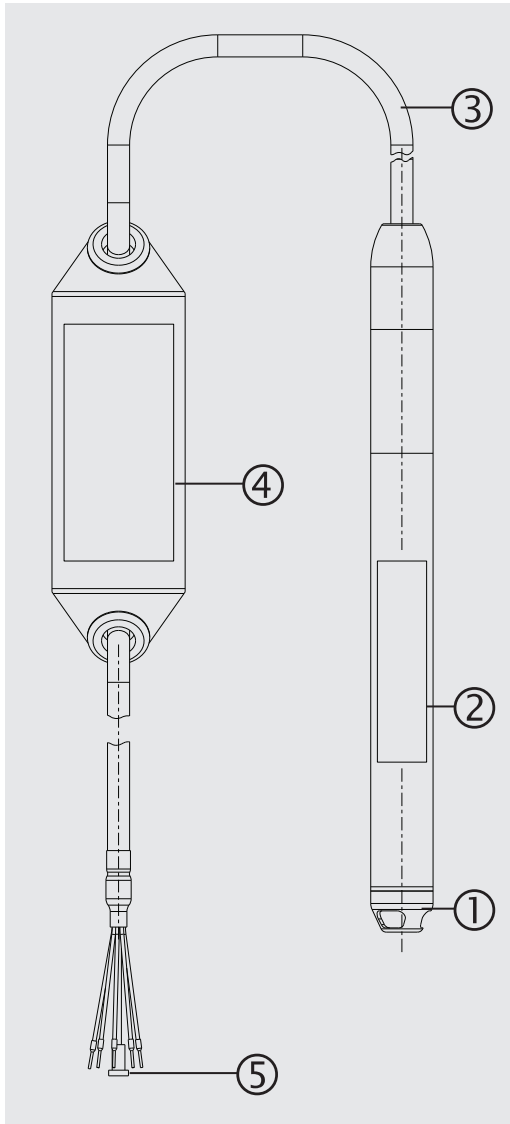
- Take note of the safety instructions for Ex applications. These safety instructions are attached as “Additional instructions” to each instrument with Ex approval and are part of the operating instructions manual.

- The instrument described in the operating instructions has been designed and manufactured using state-of-the-art technology. All components are subject to stringent quality and environmental criteria during production. Our management systems are certified to ISO 9001 and ISO 14001.
- These operating instructions contain important information on handling the instrument. Working safely requires that all safety instructions and work instructions are observed.
- Observe the relevant local accident prevention regulations and general safety regulations for the instrument's range of use.
- The operating instructions are part of the product and must be kept in the immediate vicinity of the instrument and readily accessible to skilled personnel at any time. Pass the operating instructions onto the next user or owner of the instrument.
- Skilled personnel must have carefully read and understood the operating instructions prior to beginning any work.
- The general terms and conditions contained in the sales documentation shall apply.
- Subject to technical modifications.
- Further information:
 - Internet address: www.wika.de / www.wika.com
 - Relevant data sheet: LM 40.04
 - Application consultant: Tel.: +49 9372 132-0
Fax: +49 9372 132-406
info@wika.com

2. Design and function

2. Design and function

2.1 Overview



- ① Protection cap
- ② Product label
- ③ Connection cable
- ④ Measuring point tag with product label
- ⑤ Vent tube with filter element

EN

2. Design and function / 3. Safety

2.2 Functional description

The prevailing hydrostatic pressure is measured at the sensor element through the deformation of a diaphragm. By supplying power, this deformation of the diaphragm is converted into an electrical signal. The output signal from the submersible pressure sensor is amplified and standardised. The output signal is proportional to the measured hydrostatic pressure.

HART® (option)

The instrument version with HART® can communicate with a controller (master).

Measuring range scaling (turndown)

The start and end of the measuring range can be set within the measuring range.
Do not exceed a turndown of 10:1.

2.3 Scope of delivery

- Submersible pressure sensor
- Operating instructions
- Test report
- Measuring point tag for fixing to the cable end
- Further certificates (optional)

Cross-check scope of delivery with delivery note.

3. Safety

3.1 Explanation of symbols



WARNING!

... indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.



CAUTION!

... indicates a potentially dangerous situation that can result in light injuries or damage to property or the environment, if not avoided.

3. Safety



Information

... points out useful tips, recommendations and information for efficient and trouble-free operation.

EN

3.2 Intended use

The submersible pressure sensor is used to convert hydrostatic pressure into an electrical signal.

Only use the submersible pressure sensor in applications that lie within its technical performance limits (e.g. max. ambient temperature, material compatibility, ...).

→ For performance limits see chapter 9 “Specifications”.

For information on use in hazardous areas or with flammable media, refer to Additional Information 14209917.

The instrument has been designed and built solely for the intended use described here, and may only be used accordingly.

The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.3 Personnel qualification

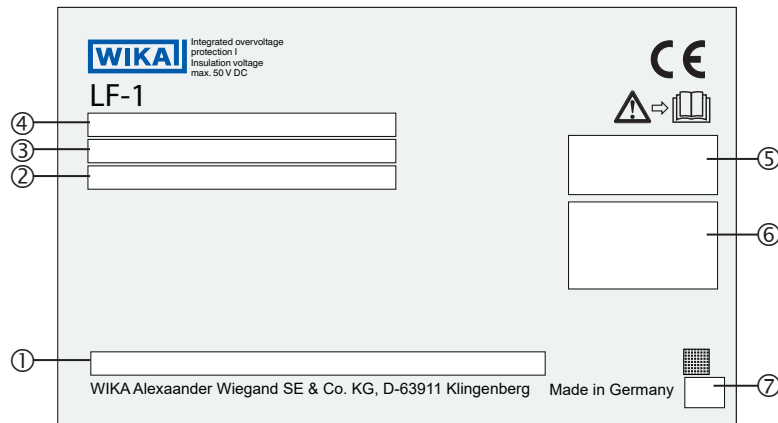
Skilled personnel

Skilled personnel, authorised by the operator, are understood to be personnel who, based on their technical training, knowledge of measurement and control technology and on their experience and knowledge of country-specific regulations, current standards and directives, are capable of carrying out the work described and independently recognising potential hazards.

3. Safety / 4. Transport, packaging and storage

3.4 Labelling, safety marks

Product label



- | | | |
|--|-----------------------------------|-----------------------|
| ① Model code | ④ Measuring range / Output signal | ⑦ Date of manufacture |
| ② P# Article number / S# Serial number | ⑤ Approvals | |
| ③ Supply voltage / Total current consumption | ⑥ Pin assignment | |



Before mounting and commissioning the instrument, ensure you read the operating instructions!



DC voltage

4. Transport, packaging and storage

4.1 Transport

Check the submersible pressure sensor for any damage that may have been caused by transport.

Obvious damage must be reported immediately.

Make sure that the connection contacts are not damaged.

4. Transport, packaging and storage / 5. Commissioning, operation

4.2 Packaging and storage

Do not remove packaging until just before mounting.

Keep the packaging as it will provide optimum protection during transport (e.g. change in installation site, sending for repair).

Prior to storage, clean the submersible pressure sensor thoroughly (→ see chapter 7.3.2 “Cleaning”)

Permissible conditions at the place of storage:

- Storage temperature: -40 ... +80 °C [-40 ... +176 °F]
- Humidity: 45 ... 75 % relative humidity (no condensation)

Avoid exposure to the following factors:

- Direct sunlight or proximity to hot objects
- Mechanical vibration, mechanical shock (putting it down hard)
- Soot, vapour, dust and corrosive gases
- Humid or wet environment
- Hazardous environments, flammable atmospheres

5. Commissioning, operation

5.1 Unpacking

When unpacking, do not use any sharp objects (e.g. cutter knives), as this may damage the cable.

Submersible pressure sensors with cable lengths >100 m are wound on cable drums and wrapped with foil. Unwind the foil manually. The end of the foil is marked with blue tape.

5.2 Suitability for the process conditions

All components of the instrument that are in contact with the process must be suitable for the process conditions that may exist. Included in this are particularly the process pressure, process temperature and also the chemical properties of the media. Prior to commissioning, the suitability of the instrument must be ensured (→ for specifications, see chapter 9 “Specifications” and the product label).

5. Commissioning, operation

5.3 Requirements for mounting point

The mounting point must meet the following conditions:

- The diaphragm is protected from contact with abrasive media and against any impacts.
- The cable contains a capillary for the pressure compensation. Therefore, the cable must be connected in a dry space or a suitable terminal enclosure.
- Sufficient space for a safe electrical installation.
- Permissible ambient and medium temperatures remain within the performance limits.
For performance limits see chapter 9 "Specifications".

5.4 Connecting the instrument

5.4.1 Requirements for supply voltage

→ For supply voltage see product label

5.4.2 Requirements for electrical connection

- Cable diameter matches the cable bushing of the terminal enclosure.
- Cable gland and seals are correctly seated.
- No humidity can ingress at the cable end.

5.4.3 Requirement for shielding and grounding

The submersible pressure sensor must be shielded and grounded in accordance with the grounding concept of the plant.

5. Commissioning, operation

5.4.4 Fitting the measuring point tag

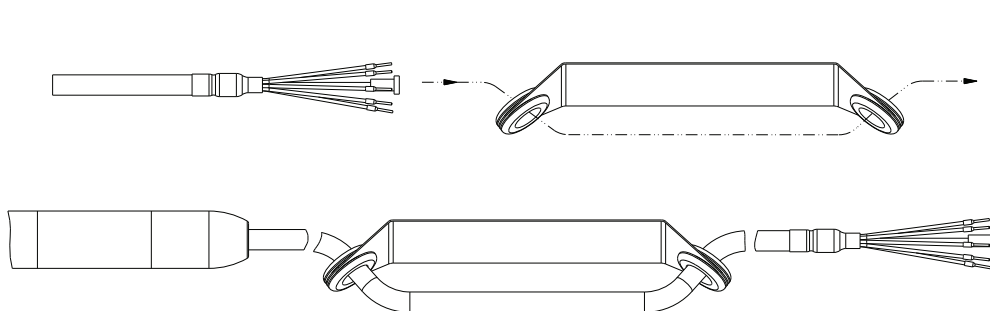
Before the submersible pressure sensor is wired, the measuring point tag must be attached to the cable. The measuring point tag acts to identify the submersed instrument and contains a copy of the product label.

1. Remove the packaging at the cable end



2. Thread the measuring point tag onto the cable.

The rubber stops at the measuring point tag protect the cable and must be undamaged and correct mounted. Position the measuring point tag so that, in the mounted state, it is easily reachable and protected against harsh environmental conditions.



5.4.5 Shortening the cable

The cable can be shortened as required.

With submersible pressure sensors with voltage output, a shortening of the cable results in an offset error:
 $\leq 0.014 \% / \text{m}$ of shortened cable.

After the shortening, provide the wire ends with end splices and position the filter element on the vent tube.

5.4.6 Connecting the instrument to the electric system

- ▶ Connect the cables to the terminals.
- ▶ For voltage outputs, the load must be specified so that the output current does not exceed 1 mA.

5. Commissioning, operation

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:

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

Pin assignment

4 ... 20 mA, 4 ... 20 mA + HART® (2-wire)

U+	Brown (BN)
U-	Blue (BU)
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)

DC 0.1 ... 2.5 V (3-wire, low power)

U+	Brown (BN)
U-	Blue (BU)
S+	Black (BK)
Shield	Grey (GY)

5. Commissioning, operation

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

5.4.7 Mounting the instrument

Prior to commissioning, the submersible pressure sensor must be subjected to a visual inspection.

- Leaking fluid is indicative of damage.
- Only use the submersible pressure sensor if it is in perfect condition with respect to safety.

The protection cap protects the internal diaphragm from damage during transport and during the lowering of the probe. With viscous or contaminated media, the protection cap can be removed in order to ensure trouble-free operation.

When laying the cable, a minimum bending radius of 120 mm must be ensured.

5.5 Configuring via HART® interface

The HART® modem with RS232, USB or Bluetooth interface (→ see Accessories) enables the connection of communicating instruments to the respective interface of a PC. To parameterise these instruments, operating software with COMM DTM HART® and Device DTM Generic HART® (e.g. PACTware®) is needed.



The PACTware® operating software and the required DTMs are available for download at www.wika.com.

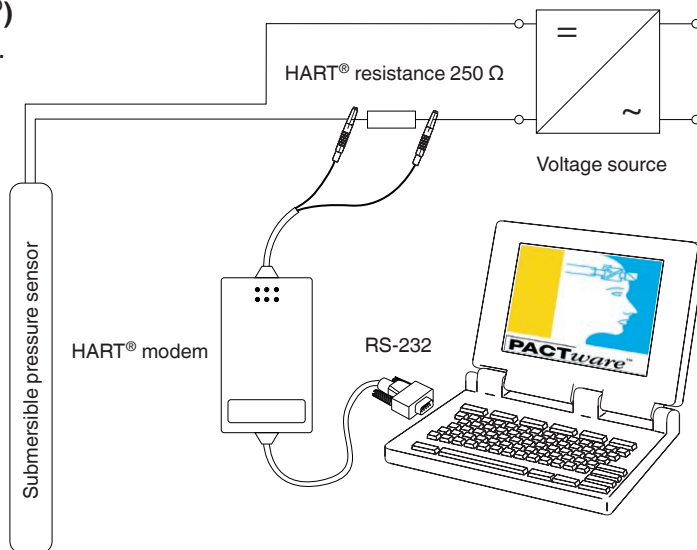
5. Commissioning, operation / 6. Faults

Connecting submersible pressure sensor to PC (HART®)

Any work should only be carried out in a non-hazardous area.

1. Connect HART® modem to submersible pressure sensor.
2. Connect HART® modem to PC or notebook.

With repeater power supplies with integrated HART® resistances (internal resistance approx. $250\ \Omega$), no additional external resistance is necessary.



5.6 External display and control units

The DIH50 and DIH52 display and control units are suitable for measured value display and control of instruments with HART® protocol. The respective control unit is looped into the 4 ... 20 mA + HART® signal line. For sensors without HART® protocol, the control units are suitable for measured value display.

For further information see the operating instructions of the respective display and control unit.

6. Faults



CAUTION!

Physical injuries and damage to property and the environment

If faults cannot be eliminated by means of the listed measures, the submersible pressure sensor must be taken out of operation immediately.

- Ensure that pressure or signal is no longer present and protect against accidental commissioning.
- Contact the manufacturer.
- If a return is needed, please follow the instructions given in chapter 8.2 "Return".

6. Faults



WARNING!

Physical injuries and damage to property and the environment caused by hazardous media

Upon contact with hazardous media (e.g. oxygen, acetylene, flammable or toxic substances), harmful media (e.g. corrosive, toxic, carcinogenic, radioactive), and also with refrigeration plants and compressors, there is a danger of physical injuries and damage to property and the environment.

- ▶ Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.
- ▶ For these media, in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.
- ▶ Wear the requisite protective equipment.



For contact details see chapter 1 “General information” or the back page of the operating instructions.

In the event of any faults, first check whether the submersible pressure sensor is mounted correctly, mechanically and electrically.

If complaint is unjustified, the handling costs will be charged.

Faults	Causes	Measures
No output signal	Cable break	Check the continuity
	Incorrect supply voltage connected	Rectify the supply voltage
Deviating zero point signal	Overpressure limit exceeded	Observe the permissible overpressure limit
	Too high/low working temperature	Observe the permissible temperatures
	Diaphragm damage	Replace instrument; if it fails repeatedly, contact the manufacturer
Zero point varies/inaccurate	Moisture has entered at the cable end	Fit the cable correctly
	Cable damaged	Replace instrument; if it fails repeatedly, contact the manufacturer
Signal span varies/inaccurate	Too high/low working temperature	Observe the permissible temperatures

6. Faults / 7. Maintenance and cleaning

Faults	Causes	Measures
Signal span drops/too small	Mechanical overload caused by overpressure	Replace instrument; if it fails repeatedly, contact the manufacturer
	Diaphragm damage	Replace instrument; if it fails repeatedly, contact the manufacturer
Signal span drops	Moisture has entered at the cable end	Fit the cable correctly
	Cable damaged	Replace instrument; if it fails repeatedly, contact the manufacturer

7. Maintenance and cleaning

7.1 Maintenance

When used in strongly contaminated and adhesive media, the pressure port of the submersible pressure sensor has to be cleaned regularly. The cleaning interval is dependent upon the respective application. The checking and cleaning of the pressure port should thus be added to the maintenance plan.

Since the cleaning intervals are dependent on the operating conditions, no universal time periods can be specified.

Repairs must only be carried out by the manufacturer.

7.2 Cleaning



WARNING!

Physical injuries and damage to property and the environment through residual media

Residual media at the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ With hazardous substances, observe the material safety data sheet for the corresponding medium.
- ▶ Wear the requisite protective equipment.

7. Maintenance and cleaning / 8. Dismounting, return and disposal



CAUTION!

Unsuitable cleaning agents

Cleaning with unsuitable cleaning agents may damage the instrument and the product label.

- ▶ Do not use any aggressive cleaning agents.
- ▶ Do not use any hard or pointed objects.
- ▶ Do not use any abrasive cloths or sponges.

Suitable cleaning agents

- Water
- Conventional dishwashing detergent

Cleaning the instrument

1. Disconnect the submersible pressure sensor from the mains.
2. Wipe the instrument surface using a soft, damp cloth.

8. Dismounting, return and disposal

8.1 Dismounting



WARNING!

Physical injuries and damage to property and the environment caused by hazardous media

Upon contact with hazardous media (e.g. oxygen, acetylene, flammable or toxic substances), harmful media (e.g. corrosive, toxic, carcinogenic, radioactive), and also with refrigeration plants and compressors, there is a danger of physical injuries and damage to property and the environment.

- ▶ Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.
- ▶ Wear the requisite protective equipment.

Dismounting the instrument

1. Disconnect the submersible pressure sensor from the mains.
2. Disconnect the electrical connection.
3. Withdraw the submersible pressure sensor from the medium.

8. Dismounting, return and disposal

8.2 Return

Strictly observe the following when shipping the instrument:

All instruments delivered to WIKA must be free from any kind of hazardous substances (acids, bases, solutions, etc.) and must therefore be cleaned before being returned.



WARNING!

Physical injuries and damage to property and the environment through residual media

Residual media in the dismantled instrument can result in a risk to persons, the environment and equipment.

- ▶ With hazardous substances, include the material safety data sheet for the corresponding medium.
- ▶ Clean the instrument, see chapter 7.2 "Cleaning".

When returning the instrument, use the original packaging or a suitable transport packaging.



Information on returns can be found under the heading "Service" on our local website.

8.3 Disposal

Incorrect disposal can put the environment at risk.

Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.



Do not dispose of with household waste. Ensure a proper disposal in accordance with national regulations.

9. Specifications

9. Specifications

Specifications

Measuring range	See product label
Overload safety	≥ 1.5 times
Temperature measurement (option)	See product label
Output signal	See product label
Load	
Current output	$\leq (U_+ - (U_{+min} - 0.5 \text{ V})) / 0.023 \text{ A}$
Voltage output	≤ 1mA
Additional load of the cable	≤ cable length in m x 0.084 Ω
Supply voltage	See product label
Current consumption	
Current output	Max. 25 mA per output
Voltage output	Max. 5 mA
Accuracy (pressure sensor) (at reference conditions)	<ul style="list-style-type: none"> ■ ≤ ±1 % of span ■ ≤ ±0.5 % of span (option)
Accuracy (temperature sensor)	
-10 ... +80 °C [14 ... 176 °F]:	±1.8 K
-30 ... -10 °C [-22 ... +14 °F]:	±3 K
-40 ... -30 °C [-40 ... -22 °F]:	±4.5 K
Accuracy after turndown 5:1 via HART®	<ul style="list-style-type: none"> ■ ≤ ±1.25 % of scaled span ■ ≤ ±0.75 % of scaled span (option)
Non-linearity per IEC 61298-2	<ul style="list-style-type: none"> ■ ≤ ±0.5 % of span BFSL ■ ≤ ±0.25 % of span BFSL (option)
Non-repeatability	<ul style="list-style-type: none"> ■ ≤ 0.1 % of span ■ ≤ 0.2 % of span (with voltage output and cable length >100 m [325 ft])
Temperature error	See table "Temperature error"

9. Specifications

Specifications

Long-term stability per DIN 16086)

Measuring range > 0 ... 0.1 bar	≤ ±0.1 % of span/year
Measuring range ≤ 0 ... 0.1 bar	≤ ±0.2 % of span/year

Reference conditions

Ambient 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.	
Supply voltage ¹⁾	With current output	DC 24 V
	With voltage output	DC 5 V
Mounting position	Calibrated in vertical mounting position with protection cap thread facing downwards.	

Ingress protection IP68

Insulation voltage

- DC 850 V
- Option of increased overvoltage protection for lightning strikes: DC 50 V

Resistance to overvoltage DC 40 V

Reverse polarity protection U+ vs. U-

Short-circuit resistance S+ vs. U-

Immersion depth Max. 100 m [325 ft]

Max. tensile force of the cable 1,000 N

Weight

Submersible pressure sensor	Approx. 300 g
Cable	Approx. 80 g/m
Additional weight	300 g

Permissible temperature ranges

Medium	<ul style="list-style-type: none"> ■ -10 ... + 50 °C [14 ... 122 °F] ■ Option: -40 ... +80 °C [-40 ... +176 °F]
Ambient	-40 ... +80 °C [-40 ... +176 °F]

¹⁾ CSA approved submersible pressure sensors for general applications must be used with a certified CEC or NEC "Class 2" power supply or alternatively a certified limited power supply in accordance with CSA C22.2 60950-1/UL 60950-1.

9. Specifications

Specifications

Storage	-30 ... +80 °C [-22 ... +176°F]
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
Materials (wetted)	
Case	316L (high-resistance option: 318LN)
Sensor	316L (high-resistance option: Hastelloy C276)
Cable	PUR (high-resistance option: FEP)
Sealing	FKM
Protection cap	PVDF
CE conformity	EMC directive, emission (group 1, class B) and interference immunity (industrial application)

For further specifications see WIKA data sheet LM 40.04 and the order documentation.

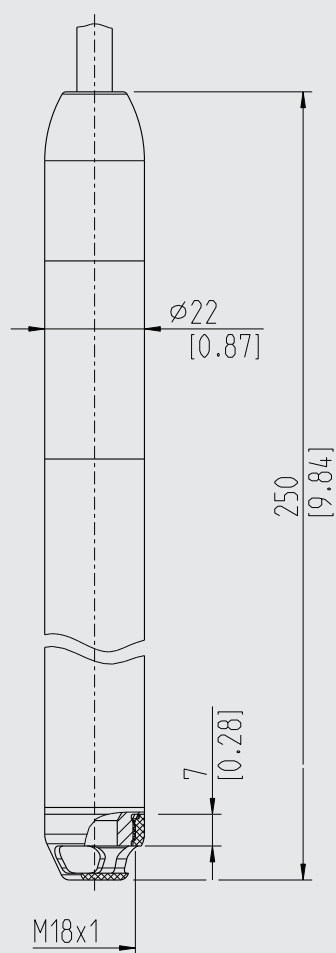
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9. Specifications

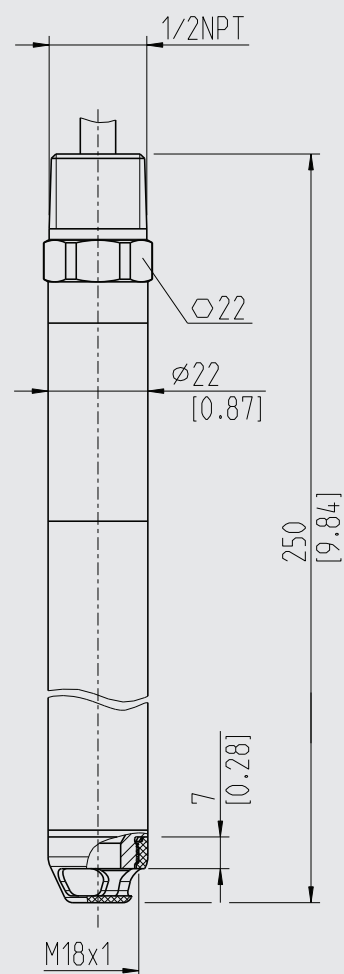
Dimensions in mm [in]

EN

Cable outlet without conduit



Cable outlet with conduit



WIKA subsidiaries worldwide can be found online at www.wika.com.



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Additional information

Additional information for hazardous areas Model LF-1

EN



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WIKA® ist eine geschützte Marke in verschiedenen Ländern.

Prior to starting any work, read the operating instructions!
Keep for later use!

Contents

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Declarations of conformity can be found online at www.wika.com

EN

1. Ex marking

Supplementary documentation:

- This additional information for hazardous areas applies in conjunction with the operating instructions “Submersible pressure sensor, model LF-1” (article number 14141013).

1. Ex marking



DANGER!

Danger to life due to loss of explosion protection

Non-observance of these instructions and their contents may result in the loss of explosion protection.

- Observe the safety instructions in this chapter and further explosion instructions in these operating instructions.
- Observe the information given in the applicable Ex certificate and the relevant regulations for installation and use in hazardous areas (e.g. EN/IEC 60079-11, EN/IEC 60079-14, CEC Part I and NEC Art. 504/505).

Check whether the classification is suitable for the application. Observe the relevant national regulations.

Approval	Marking
ATEX	Zone 0 gas [II 1G Ex ia IIC T6 ... T4 Ga] Zone 1 gas [II 2G Ex ia IIC T6 ... T4 Gb]
IECEx	Zone 0 gas [Ex ia IIC T6 ... T4 Ga] Zone 1 gas [Ex ia IIC T6 ... T4 Gb]
CSA	Class I, Division 1, Groups A, B, C, D Class I, Zone 0; A/Ex ia IIC; T6 ... T4 Ga Class I, Zone 1; A/Ex ia IIC; T6 ... T4 Gb Class I, Zone 2; A/Ex ic IIC; T6 ... T4 Gc (see control drawing no. 14136138)
FM	Class I, Division 1, Groups A, B, C, D Class I, Zone 0, AEx ia IIC, T6...T4 Ga Class I, Zone 1, AEx ia IIC, T6...T4 Gb Class I, Zone 2, AEx ic IIC, T6...T4 Gc (see control drawing no. 14136138)
EACEx	Zone 0 gas [0ExiaIIC T6...T4 X] Zone 1 gas [1ExiaIIC T6...T4 X]

1. Ex marking

Permissible temperature ranges in hazardous areas (ATEX, IECEx, EACEx)

Model code	Ambient and media temperature range (Pi = 600 mW)	Ambient and media temperature range (Pi = 800 mW)	Temperature code
L*-1*****_*****_***_*****2B**_*****_*	$-10 \leq T_a \leq +50 \text{ }^{\circ}\text{C}$	$-10 \leq T_a \leq +50 \text{ }^{\circ}\text{C}$	T6 - T1
L*-1*****_*****_***_*****4G**_*****_*	$-40 \leq T_a \leq +59 \text{ }^{\circ}\text{C}$	$-40 \leq T_a \leq +52 \text{ }^{\circ}\text{C}$	T6
	$-40 \leq T_a \leq +74 \text{ }^{\circ}\text{C}$	$-40 \leq T_a \leq +67 \text{ }^{\circ}\text{C}$	T5
	$-40 \leq T_a \leq +80 \text{ }^{\circ}\text{C}$	$-40 \leq T_a \leq +76 \text{ }^{\circ}\text{C}$	T4 - T1

EN

Permissible temperature ranges in hazardous areas (FM, CSA)

Model code	Ambient and media temperature range (Pi = 600 mW)	Temperature code
L*-1*****_*****_***_*****2B**_*****_*	$-10 \leq T_a \leq +50 \text{ }^{\circ}\text{C}$	T6 - T1
L*-1*****_*****_***_*****4G**_*****_*	$-40 \leq T_a \leq +59 \text{ }^{\circ}\text{C}$	T6
	$-40 \leq T_a \leq +74 \text{ }^{\circ}\text{C}$	T5
	$-40 \leq T_a \leq +80 \text{ }^{\circ}\text{C}$	T4 - T1

2. Safety

2. Safety

2.1 Explanation of symbols



DANGER!

... indicates a potentially dangerous situation in the hazardous area that can result in serious injury or death, if not avoided.

2.2 Intended use

The submersible pressure sensors described here are suitable for level measurement in hazardous areas.

The non-observance of the instructions for use in hazardous areas can lead to the loss of the explosion protection. Adhere to the following limit values and instructions.

2.3 Responsibility of the operator

The responsibility for classification of zones lies with the plant operator and not the manufacturer/supplier of the equipment.

2.4 Personnel qualification

The skilled personnel must have knowledge of ignition protection types, regulations and provisions for equipment in hazardous areas.

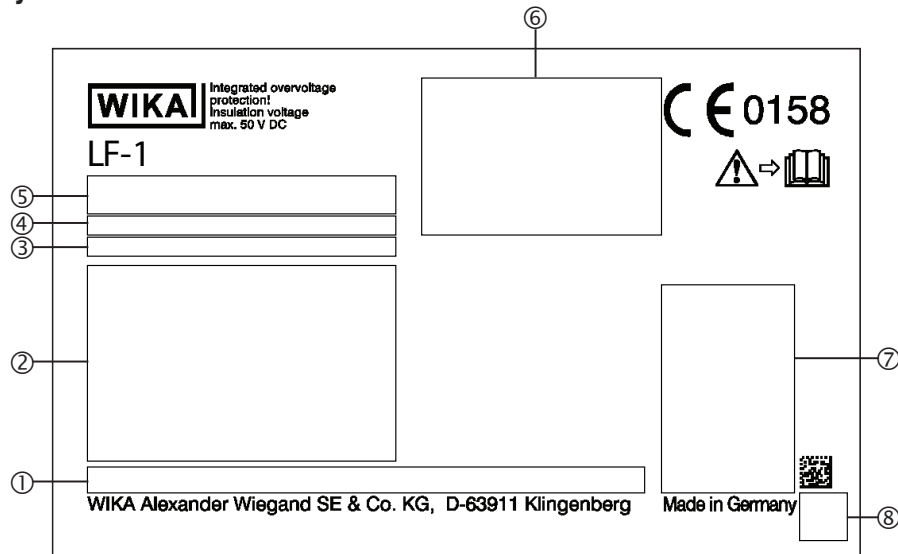
2.5 Special conditions for safe use

- For use in gas group IIC, submersible pressure sensors with cable material FEP must be protected against electrostatic charge. For use in gas group IIB, submersible pressure sensors with cable material FEP must be protected against intensive charge processes.
- For the submersible pressure sensors with overvoltage protection, the intrinsically safe circuits are not separated from earth in accordance with EN 60079-11. Along the intrinsically safe circuits potential equalisation must be ensured.
- If an additional metal measuring point tag is required, it has to be installed outside of the Ex atmosphere.
- Parts of the enclosure may be constructed from plastic. To prevent the risk of electrostatic sparking the plastic surface should be cleaned only with a damp cloth.
- Submersible pressure sensor (level probe) approved in accordance to FM/CSA for use in hazardous location areas shall be installed and operated according to control drawing 14136138.

2. Safety

2.6 Labelling, safety marks

Product label



- | | |
|----------------------------------|-----------------------------------|
| ① Model code | ⑤ Measuring range / Output signal |
| ② Approval data | ⑥ Safety-related maximum values |
| ③ P# Article no. / S# Serial no. | ⑦ Pin assignment |
| ④ Power supply / Current supply | ⑧ Date of manufacture |



Before mounting and commissioning the instrument, ensure you read the operating instructions!



DC voltage

3. Commissioning, operation

3. Commissioning, operation

3.1 Suitability for the process conditions

All components of the instrument that are in contact with the process must be suitable for the process conditions that may exist. Included in this are particularly the process pressure, process temperature and also the chemical properties of the media. Prior to commissioning, the suitability of the instrument must be ensured (→ for specifications see operating instructions “Submersible pressure sensor, model LF-1” (article number 14141013)).

3.2 Safety inspection

Only use the submersible pressure sensor if it is in perfect condition with respect to safety.

Prior to commissioning, the submersible pressure sensor must be subjected to a visual inspection.

- ▶ Check the diaphragm for damage. Leaking fluid is indicative of damage.
- ▶ Check the cable for damage.

3.3 Mechanical mounting

- The protection cap protects the internal diaphragm from damage during transport and during the lowering of the submersible pressure sensor.
- Protect the diaphragm from abrasive media and impacts. With a damaged diaphragm, explosion protection cannot be guaranteed.
- The measuring point tag must only be mounted in a non-hazardous area.
- In hazardous location in accordance to FM/CSA, variation with ½ NPT thread for conduit connection, a sealing resp. sealing fitting according to CEC/NEC listed for the location shall be used.

3.4 Electrical mounting



DANGER!

Danger to life from damaged cable

If a cable is damaged, the explosion protection is no longer guaranteed.

- ▶ Unpack the instrument as described.
- ▶ Check the cable for damage.

Requirements for voltage supply

- Voltage supply is intrinsically safe (Ex ia). Realisation possible via repeater power supply (e.g. model IS Barrier).
- For power supply see product label

3. Commissioning, operation

Electrical connection values

Electrical connection values	
Voltage U_i	DC 30 V
Current I_i	130 mA
Power P_i (at the sensor)	600 mW or 800 mW (permissible temperature ranges see chapter 1)
Effective internal capacitance C_i	13.4 nF + 0.13 nF/m cable
Effective internal inductance L_i	375 μ H + 0.87 μ H/m cable

The internal inductance (L_i) and capacitance (C_i) are found on the product label and they should be taken into account when connecting to an intrinsically safe voltage supply.

Requirement for shielding and grounding



DANGER!

Danger to life from incorrect instrument grounding

Missing or incorrect instrument grounding can lead to a risk of explosion due to compensating currents between different potentials.

► Ground the instrument.

- The instrument must be shielded and grounded in accordance with the grounding concept of the plant.
- No potential differences should exist between medium/vessel and terminal enclosure when the shield of the cable is being connected.
- Ground the instrument, if the lines are longer than 30 m or leave the building.

3. Commissioning, operation

Load

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

Additional load of the cable: $\leq \text{cable length in m} \times 0.084 \Omega$

Pin assignment

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

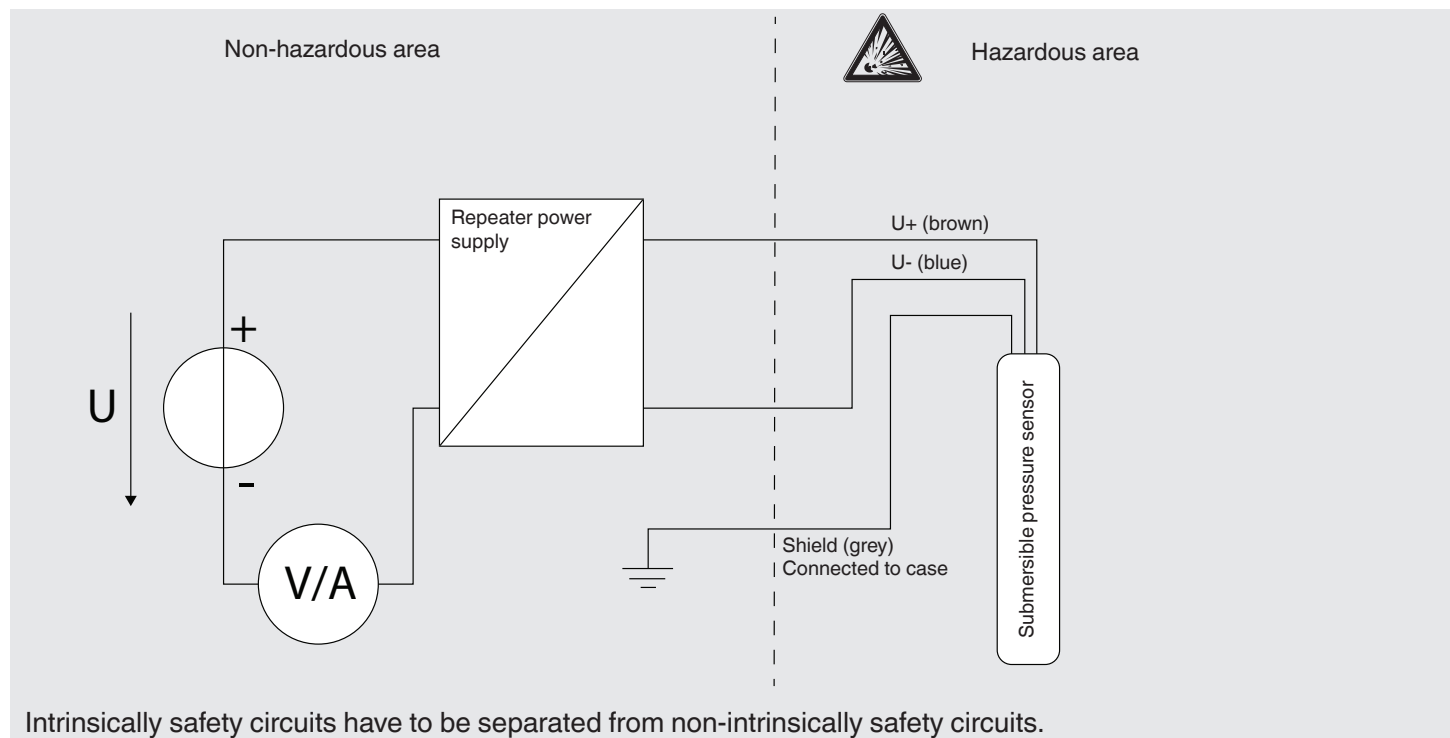
Legend

U+ Positive power supply terminal

U- Negative power supply terminal

S+ Analogue output

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)



3. Commissioning, operation

3.5 Configuring via HART® interface

The HART® modem with RS-232, USB or Bluetooth interface (→ see accessories) enables the connection of communicating instruments to the respective interface of a PC. To parameterise these instruments, operating software with COMM DTM HART and Device DTM Generic HART (e.g. PACTware®) is needed. If the submersible pressure sensor has to be configured during operation in a hazardous area, the HART® modem must be designed for hazardous areas.



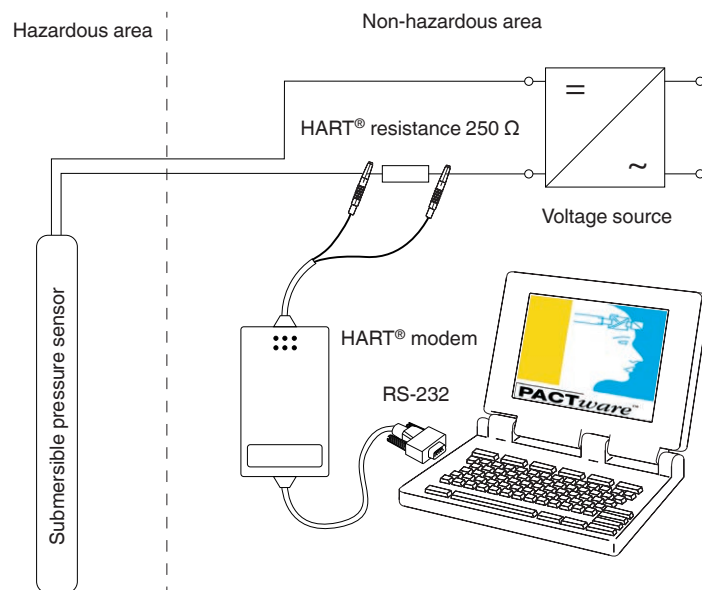
The PACTware® operating software and the required DTMs are available for download at www.wika.com.

Connecting submersible pressure sensor to PC (HART®)

Any work should only be carried out in a non-hazardous area.

1. Connect HART® modem to submersible pressure sensor.
2. Connect HART® modem to PC or notebook.

With repeater power supplies with integrated HART® resistances (internal resistance approx. $250\ \Omega$), no additional external resistance is necessary.



Appendix 1: EU Declaration of conformity



EU-Konformitätserklärung EU Declaration of Conformity

Dokument Nr.: 14209906.03
Document No.:

Wir erklären in alleiniger Verantwortung, dass die mit CE gekennzeichneten Produkte
We declare under our sole responsibility that the CE marked products

Typenbezeichnung: LF-1
Type Designation:

Beschreibung: Pegelsonde
Description: Submersible pressure sensor

gemäß gültigem Datenblatt: LM 40.04
according to the valid data sheet:

mit den nachfolgenden relevanten Harmonisierungsvorschriften der Union
übereinstimmen:
are in conformity with the following relevant Union harmonisation
legislation:

Angewandte harmonisierte Normen
Applied harmonised standards

2011/65/EU Gefährliche Stoffe (RoHS)
Hazardous substances (RoHS)
2014/30/EU Elektromagnetische Verträglichkeit (EMV)
Electromagnetic Compatibility (EMC)
2014/34/EU Explosionsschutz (ATEX) ⁽²⁾
Explosion protection (ATEX) ⁽²⁾

EN IEC 63000:2018
EN 61326-1:2013
EN 61326-2-3:2013



II 1G Ex ia IIC T6...T4 Ga
II 2G Ex ia IIC T6...T4 Gb

⁽¹⁾
EN IEC 60079-0:2018
EN 60079-11:2012

⁽¹⁾ EU-Baumusterprüfbescheinigung BVS 16 ATEX E 116 X von DEKRA Testing and Certification GmbH (Reg.-Nr. 0158).
EU type-examination certificate BVS 16 ATEX E 116 X of DEKRA EXAM Testing and Certification GmbH (Reg. No. 0158).

⁽²⁾ Nicht für Modelle L*-1Z*, L*-1I*, L*-1E*, L*-1F*, L*-1C*, L*-1L*, L*-14*, L*-15*
Not for models L*-1Z*, L*-1I*, L*-1E*, L*-1F*, L*-1C*, L*-1L*, L*-14*, L*-15*

Unterzeichnet für und im Namen von / Signed for and on behalf of

WIKA Alexander Wiegand SE & Co. KG
Klingenberg, 2021-08-05

Fokko Stuke, Director of Operations Transmitters
Industrial Instrumentation

Steffen Schlesiona, Director Quality Management
Industrial Instrumentation

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Kommanditgesellschaft: Sitz Klingenberg -
Amtsgericht Aschaffenburg HRA 1819

Komplementärin:
WIKA International SE - Sitz Klingenberg -
Amtsgericht Aschaffenburg HRB 10505
Vorstand: Alexander Wiegand
Vorsitzender des Aufsichtsrats: Prof. Dr. Roderich C. Thümmel
21AR-03935

WIKA subsidiaries worldwide can be found online at www.wika.com.



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Terms and Conditions of Sale WIKA USA

I. General

These Terms and Conditions apply to purchases from WIKA Instrument, LP, WIKA Mobile Control, LP; WIKA Sensor Technology, LP; and Phase IV Engineering Inc. ("Seller"), on all orders for products and/or services.

- A. Buyer Purchase Orders are not binding until confirmed by written acceptance by Seller, and are subject to these Terms and Conditions.
- B. Prices are based on the WIKA USA Terms and Conditions of Sale; which are effective from date of publication and are subject to change without notice.
- C. The Parties may exchange orders, payments, acknowledgements, invoices, remittance notices, and other records ("Data") electronically, in place of tangible documents, and unless otherwise agreed shall exchange such Data in accordance with the American National Standards Institute Accredited Standards Committee X12 transaction sets (ANSI X12 Standards), and shall reasonably cooperate with requests to do so (including by providing documentation necessary to establish EDI). All Data transmitted pursuant to this clause shall be deemed to be a "writing" or "in writing" for purposes of the Uniform Commercial Code. Any such Data containing or having affixed to it a signature shall be deemed for all purposes to: (i) to have been "signed" and "executed," and (ii) to constitute an "original" when printed from electronic files or records established and maintained in the normal course of business. Data shall be exchanged by direct electronic or computer systems communication between Seller and Buyer or by indirect communications using a third party service provider to translate, forward and/or store such Data. Each Party shall be responsible for the cost(s) and associated cost(s) of any such third party service provider with which it contracts.

II. Amendments in Scope

No change will be made to the scope of work unless Buyer & Seller agree to change order in writing with agreement on changes in schedule, prices or any other T&C changes. If any new laws, regulations, codes, standards and/or requirements are implemented or invoked, Seller reserves the right to initiate a change order in order to compensate for any changes in price or time to performance.

III. Payment Terms and Sales Tax

- A. Standard Payment Terms are Net 30 days from invoice date.
- B. Buyer is responsible for all freight charges, taxes, and service fees.
- C. Seller reserves the right to revoke any credit extended to Buyer if Buyer fails to pay for any shipments when due. If, in Seller's opinion, there is any adverse change in Buyer's financial condition, Seller shall have the right to suspend further shipments until receipt of adequate assurance of Buyer's ability to pay therefore.
- D. Payment terms are specified on the invoice. Any invoice not paid when due is subject to a late payment charge of 1.5% per month, or if such rate is greater than the maximum rate permitted by applicable law, then at the highest rate allowed by applicable law. In the event that Buyer fails to make full payment when due and Seller employs an attorney or collection agency to assist in collection of the account, Buyer agrees to pay all of Seller's reasonable cost of collection, including collection agency fees and court costs.
- E. Unless otherwise stated, prices do not include sales, use, excise, and similar taxes applicable to either the products or the materials used in the manufacture of products or services. All such taxes and charges shall be shown on Seller's invoices.
- F. Seller reserves the rights to make deliveries in installments. All such installments shall be separately invoiced and paid for when due, without regard to subsequent deliveries.

IV. Transportation

- A. All shipments are Ex Works, (INCOTERMS 2020), Seller's loading dock, except as expressly provided below.
- B. Each shipment is deemed accepted and in good condition by the common carrier and title and all risk of loss or damage shall transfer to Buyer at this point.
- C. Freight, handling, insurance, and storage charges:
 - 1. Prepaid Shipments: All freight, handling, and insurance charges shall be invoiced to Buyer.
 - 2. Collect Shipments via UPS or FedEx: All freight and handling charges shall be billed to the collect account number provided. Collect shipments are NOT insured. Buyer must request coverage if required and the insurance cost will be added to the freight charge. All uninsured shipments are the responsibility of the Buyer. Seller assumes no responsibility for any such loss or damage.
 - 3. In the event that Buyer will not accept delivery of product on agreed upon date, Seller reserves the right to charge storage fees at the sole discretion of the Seller.
- D. All shipments are made by carriers of Seller's choice. Any special arrangements requested by Buyer will be at Buyer's additional expenses.
- E. Buyer shall report any quantity shortages, incorrect items, or billing errors in writing to the Seller within fifteen (15) days of delivery. Sales order and invoice numbers are to be furnished on all claims.

V. Returns

No return shall be accepted without a Seller-furnished Return Material Authorization (RMA #). Please reference the Seller Return Material Authorization (RMA) Policy for Seller Products.

VI. Limited Warranties

- A. Unless otherwise agreed to in writing, Seller warrants that Seller's products, when shipped, will meet Seller's published specifications and that Seller's work (including services and installation) will be performed in a workmanlike manner. All claims under this warranty must be made in writing immediately upon discovery and except as noted below, within 1 year from installation date or eighteen (18) months from shipment. All claims for services and/or installation must be made in writing immediately upon discovery and within one-year after shipment of applicable work by Seller. Any product which is determined by Seller to be defective and returned to Seller shall be, as Buyer's sole and exclusive remedy, repaired, replaced or credited, at Seller's option. Normal erosion, corrosion due to use, or any damage caused by modifications made by Buyer's, improper handling during transit, storage, or installation, are not covered by this warranty.
- B. THE FOREGOING LIMITED WARRANTIES ARE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF TITLE, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF SELLER, AND SELLER NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT, ANY OTHER LIABILITY IN CONNECTION WITH THE SALE HEREUNDER. SELLER DISCLAIMS ANY LIABILITY FOR PRODUCT DEFECTS THAT ARE DUE TO PRODUCT MISUSE, IMPROPER USE, DAMAGE, IMPROPER PRODUCT SELECTION OR MISAPPLICATION.

VII. Indemnification

Buyer shall indemnify, defend and hold harmless Seller from any third party claims related to the use of the product including any claims related to product misuse, improper use, damage from improper product selection, or misapplication. Seller agrees to give prompt notice of an indemnified claim to Buyer (in all cases within a time period that does not prejudice Buyer) and Buyer shall have the right to provide and control the defense. Buyer shall not make any admission prejudicial to the Seller.

VIII. Confidentiality; General

Except as otherwise permitted herein, Buyer will not disclose to any third party, or make any use of the Seller's Confidential Information. Buyer will use at least the same standard of care to maintain the confidentiality of the Seller's Confidential Information that it uses to maintain the confidentiality of its own Confidential Information, but in no event less than a reasonable degree of care. Except in connection with any software purchased by Buyer, the non-disclosure and non-use obligations of this Agreement will remain in full force with respect to each item of Confidential Information for a period of five (5) years after Buyer's receipt of that item. However, Buyer's obligations to maintain purchased software as confidential will survive in perpetuity. "Confidential Information" means non-public information of Seller that is identified as or would be reasonably understood to be confidential and/or proprietary. Confidential Information of Seller includes, without limitation, the Software, pricing, and technical product information. Confidential Information does not include information that: (i) is or becomes known to the public without fault or breach of the Buyer; (ii) Seller regularly discloses to third parties without restriction on disclosure; (iii) Buyer obtains from a third party without restriction on disclosure and without breach of a non-disclosure obligation; or (iv) is independently developed by Buyer without access to Seller's Confidential Information.

Terms and Conditions of Sale

WIK A USA

IX. Confidentiality; Intellectual Property, Patents, & Copyrights

In addition to Seller's rights in the Software, Seller reserves all other rights in all Seller intellectual property, including without limitation offer documents, particular illustrations, drawings, calculations, brochures, catalogs, models, samples, and tools. Such documents must not be made available to third parties without written consent from Seller. Buyer, upon Seller's request, will return all offer documents that are no longer necessary in the ordinary course of business. For orders according to Buyer specifications, Buyer is liable for third-party rights or property rights and indemnifies Seller against such claims.

Seller agrees to indemnify, defend and hold harmless Buyer against any claims, suits, actions or proceedings claiming the infringement of intellectual property rights by any Seller designed product. Seller agrees, at its choice, to either pay for costs of such defense, including reasonable legal fees, provide a non-infringing replacement, or refund to Buyer the amount that Buyer paid Seller for the infringing product (including any Software). The foregoing is Buyer's sole and exclusive remedy for a claim of infringement of intellectual property by any Seller designed product.

X. Limitation of Liability

UNLESS APPLICABLE LAW OTHERWISE REQUIRES, SELLER'S TOTAL LIABILITY TO BUYER, BUYER'S CUSTOMERS OR TO ANY OTHER PERSON, RELATING TO ANY ORDER OR PURCHASE OF ANY PRODUCTS (INCLUDING ANY SOFTWARE) OR SERVICES, FROM THE USE OF THE PRODUCTS FURNISHED OR SERVICES RENDERED OR FROM ANY ADVICE, INFORMATION OR ASSISTANCE PROVIDED BY SELLER (BY ANY METHOD, INCLUDING A WEBSITE), IS LIMITED TO THE PRICE RECEIVED BY SELLER FOR THE PRODUCTS OR SERVICES GIVING RISE TO THE CLAIM. BUYER'S FAILURE TO TIMELY SUBMIT A CLAIM HEREUNDER SHALL WAIVE ALL CLAIMS FOR DAMAGES OR OTHER RELIEF INCLUDING BUT NOT LIMITED TO CLAIMS BASED ON LATENT DEFECTS. NEITHER SELLER NOR ITS VENDORS SHALL BE LIABLE FOR ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PENAL DAMAGES (INCLUDING, BUT NOT LIMITED TO BACK-CHARGES, LABOR COSTS, COSTS OF REMOVAL, REPLACEMENT, TESTING OR INSTALLATION, LOSS OF EFFICIENCY, LOSS OF PROFITS OR REVENUES, LOSS OF USE OF THE PRODUCTS OR ANY ASSOCIATED PRODUCTS, DAMAGE TO ASSOCIATED PRODUCTS, LATENESS OR DELAYS IN DELIVERY, UNAVAILABILITY OF PRODUCTS, COST OF CAPITAL, COST OF SUBSTITUTE PRODUCTS, FACILITIES OR SERVICES, DOWNTIME, OR CLAIMS FROM BUYER'S CUSTOMERS OR OTHER PARTIES). IF SELLER FURNISHES BUYER WITH ADVICE OR OTHER ASSISTANCE WHICH CONCERNS ANY PRODUCTS SUPPLIED HEREUNDER, OR ANY SYSTEM OR EQUIPMENT IN WHICH ANY SUCH PRODUCTS MAY BE INSTALLED, THE FURNISHING OF SUCH ADVICE OR ASSISTANCE IS GRATUITIOUS AND WILL NOT SUBJECT SELLER TO ANY LIABILITY, WHETHER BASED ON CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE) OR OTHER GROUNDS.

XI. Cancellation Charges

Unless otherwise agreed to, Seller may impose cancellation charges equal to the cost of raw materials purchased by Seller and labor and materials costs incurred plus reasonable profit (and not otherwise mitigated), dedicated to cancelled products prior to the date of Buyer's cancellation notice. A 25% cancellation fee will be assessed against the cancelled items if engineering calculations and drawings (if needed) are completed prior to the date of Buyer's cancellation notice.

XII. Force Majeure

Seller shall not be liable for failure to deliver or delay in delivery of the services occasioned by causes beyond Seller's control, including without limitation, strikes, lockouts, fires, embargoes, pandemics, epidemics, quarantines, terrorist attacks, war or other breakouts of hostilities, acts of God, inability to obtain shipping, space, machinery breakdowns, delays of carriers, raw material providers or other suppliers or subcontractors, and domestic or foreign governmental acts or regulations.

XIII. Arbitration; Controlling Law; Jurisdiction and Venue

- A. Except for actions to protect intellectual property rights and to enforce an arbitrator's decision hereunder, all disputes, controversies, or claims arising out of or relating to this Agreement, or a breach thereof shall be submitted to and finally resolved by arbitration under the rules of the American Arbitration Association ("AAA") then in effect. There shall be one arbitrator, and such arbitrator shall be chosen by mutual agreement of the parties in accordance with AAA rules. The arbitration shall take place in Atlanta, Georgia, USA. The arbitrator shall apply the laws of the State of Georgia, to all issues in dispute. The controversy or claim shall be arbitrated on an individual basis, and shall not be consolidated in any arbitration with any claim or controversy of any other party. The findings of the arbitrator shall be final and binding on the parties, and may be entered in any court of competent jurisdiction for enforcement. Enforcements of any award or judgment shall be governed by the United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards.
- B. This Agreement shall be governed, controlled, interpreted and defined by and under the laws of the State of Georgia without regard to conflicts of law provisions thereof. The parties agree that the courts of Fulton County in the State of Georgia, and the U.S. District Court for the Northern District of Georgia, Atlanta Division shall be the exclusive jurisdiction and venue for all legal proceedings that are not arbitrated under these Terms and Conditions and RMA Policy

XIV. Assignment

An order shall not be assigned by either party without the written consent of the other. Consent will not be required, however, for internal transfers and assignments as between either party and its affiliates under common ownership, and nothing herein shall limit either party's right to factor or sell receivables.

XV. Export Compliance

Buyer acknowledges that the product is subject to U.S. export control laws, rules and regulations including, but not limited to: Export Control Reform Act of 2018 (50 U.S.C. 4801-4852); The Arms Export Control Act of 1976 (22 U.S.C. § 2751 et seq.); The Export Administration Regulations (15 C.F.R. § 730 et seq.); The International Traffic in Arms Regulations (22 C.F.R. § 120 et seq.); and The International Emergency Economic Powers Act (50 U.S.C. § 1701 et seq.). Buyer shall comply with all applicable export control and trade embargo laws, rules and regulations and shall not resell, export, re-export, distribute, transfer or dispose of the product, directly or indirectly, without first obtaining all necessary written consents, permits and authorizations and completing such formalities as may be required by any such laws, rules and regulations. Buyer acknowledges that any diversion of these commodities contrary to the afore-mentioned laws, rules and regulations is prohibited. Failure by Buyer to comply with all applicable export control and trade embargo laws, rules and regulations shall constitute a material breach of these Terms and Conditions of Sale. Seller assumes no responsibility or liability for Buyer's failure to obtain required authorizations. Buyer agrees to impose this same compliance requirement in its contracts with third parties pertaining to the product.

XVI. No Russia Clause

- (1) The customer shall not, at any time,
 - sell, and/or
 - export and/or
 - re-export,directly or indirectly, to the Russian Federation and/or to territories occupied by Russian Federation and/or for use in the Russian Federation and/or to territories occupied by Russian Federation any products supplied under or in connection with this Agreement.
- (2) The customer shall undertake its best efforts to ensure that the purpose of paragraph (1) is not frustrated by any third parties further down the commercial chain, including by possible resellers.
- (3) The customer shall set up and maintain an adequate monitoring mechanism to detect conduct by any third parties further down the commercial chain, including by possible resellers, that would frustrate the purpose of paragraph (1).
- (4) Any violation of paragraphs (1), (2) or (3) shall constitute a material breach of an essential element of this Agreement and the WIK A shall be entitled to seek appropriate remedies, including, but not limited to:
 - i. termination of this Agreement; and/or
 - ii. a penalty of 10 % of the total value of this Agreement or price of the products exported, whichever is higher.
- (5) The customer shall immediately inform WIK A about any problems in applying paragraphs (1), (2) or (3), including any relevant activities by third parties that could frustrate the purpose of paragraph (1). The customer shall make available to WIK A Information concerning compliance with the obligations under paragraph (1), (2) and (3) within two weeks of the simple request of such information.

Terms and Conditions of Sale

WIKA USA

XVII. Compliance

The provisions of this Section XV shall apply to the extent that US manufacturing facilities are utilized for the purpose of a purchase order and as otherwise required by applicable law. To the extent not exempt, Buyer shall abide by the requirements of 41 C.F.R. §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity or national origin. Moreover, these regulations require that the covered parties take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, protected veteran status or disability. To the extent Executive Order 13496 applies to these terms and conditions, the text of 29 C.F.R. Part 471, Appendix A to Subpart A (as amended, modified, restated or supplemented from time to time) is hereby incorporated by reference into this agreement as if set forth fully herein. Buyer and Seller shall comply with all requirements set forth in 29 C.F.R. Part 471, Appendix A to Subpart A., and all promulgated regulations applicable thereto.

XVIII. Miscellaneous

These Terms and Conditions constitute the entire understanding of the parties with respect to the subject matter of this agreement and merges all prior communications, understandings, and agreements. These Terms and Conditions may be modified only by a written agreement signed by the parties. Seller objects to and rejects any terms between Buyer and any other party, and no such terms, including but not limited to any government regulations or "flow-down" terms, shall be a part of or incorporated into any order from Buyer to Seller, unless agreed to in writing by an authorized representative of Seller.

The failure of either party to enforce at any time any of the provisions hereof shall not be a waiver of such provision, or any other provision, or of the right of such party thereafter to enforce any provision hereof. If any provision of These Terms and Conditions are declared invalid or unenforceable, such provision shall be deemed modified to the extent necessary and possible to render it valid and enforceable. In any event, the unenforceability or invalidity of any provision shall not affect any other provision of these Terms and Conditions, and these terms shall continue in full force and effect, and be construed and enforced, as if such provision had not been included, or had been modified as above provided, as the case may be.

WARNING: Seller's products may contain chemicals known to the State of California to cause cancer and/or reproductive harm.

XIX. Survival

The term and provisions of this Agreement that by their nature are intended to survive shall survive the termination or expiration of this Agreement and the delivery and performance of any product, Software, and/or service hereunder.

XX. Additional Terms and Conditions

In the event that Buyer purchases services or software from the Seller, the following Appendices shall be applicable in addition to the Terms and Conditions of Sale container herein:

1. [Annex A – Services](#)
2. [Annex B – Software](#)

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