

## Product Information D3

## FOOD

# Differential Pressure and Level Sensor D3



## Range of applications

- Hydrostatic level measurement in environments with temperature fluctuations
- Differential pressure measurement in tanks up to 110 °C (230 °F)
- Hydrostatic level, volume and mass measurement in pressure vessels

## Application examples

- Hygienic differential pressure and level monitoring for processes in breweries, dairies and the food and beverage industry
- Pressure drop measurement in diaphragms

## Hygienic design/Process connection

- Use of Negele weld-in sleeve EMZ-352 or build-in system EHG-.../1" results in a hygienic installation situation that is free of gaps and dead space and is easy to sterilize.
- Conforming to 3-A Sanitary Standard 74-06 with DIRECTadapt
- CIP-/SIP-cleaning up to 130 °C (266 °F) for 60 minutes max.
- All materials in contact with the product have FDA approval
- Sensor completely made of stainless steel
- Further process connections available through CLEANadapt

## Features

- Electronic differential pressure measurement with 2 analog outputs (differential pressure and top or total pressure as required)
- The intuitive user interface makes setup and configuration easy
- Due to the modular system, sensor components can be replaced in the field
- Improved temperature compensation enables temperature-independent differential pressure and level measurement
- Configuration using integrated display or HART protocol - including turndown of 10:1 and units of measure
- Direct display of volume and mass measurement values as required
- Pre-defined and customer-specific tank geometries and product characteristics can be adjusted
- Protection class IP 69 K through patented, dual o-ring seals
- Dual loop output with HART 7.0 communication and graphical LCD display
- Large selection of measurement ranges

## Options/Accessories

- Optional remote kit provides a separate version of the sensor and display
- Optional M12 molded cordset available

## Measuring principle of the pressure sensor

In the D3 system, each sensor uses an internal piezo-electric signal converter and a temperature sensor to measure the pressure and temperature of the capillary fill. The electrical signal of the pressure converter and the resistance of the temperature sensor are measured and converted to a compensated pressure value in the pressure fitting. Both signals are transferred digitally to the head. They are then output in a standardized 4...20 mA and HART 7.0 signal for the differential pressure and in a 4...20 mA signal for the top or total pressure.

## Authorizations



## Differential pressure sensor D3 with one remote pressure transmitter



## Differential pressure sensor D3 with two remote pressure transmitters



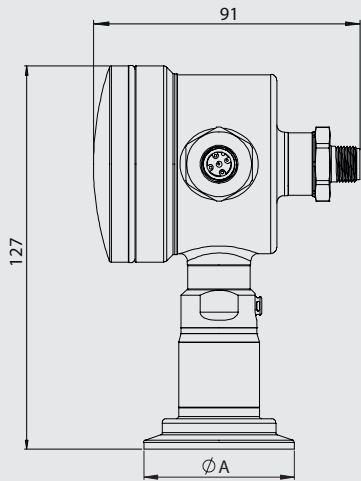
Specification		
<b>Measurement range [bar]</b>	Relative	0...0.4; -1...2; -1...7; -1...35
<b>Measurement range [psi]</b>	Relative	0...6; 30 "Hg/0/30; 30 "Hg/0/100; 30 "Hg/0/500
<b>Turndown</b>	Max. 10:1	of upper range limit (see also measurement accuracy)
<b>Overpressure strength</b>	Factor	1.5 x nominal pressure of measurement element
<b>Measurement accuracy</b>	Differential error	±0.15 % of the calibrated measurement range (top pressure + differential pressure)
	Top or total pressure	±0.15 % of the calibrated measurement range
	Reproducibility	0.05 %
	Long-term stability	0.2 % URL every 2 years
<b>Temperature drift</b>	Process	< 0.016 % of the calibrated measurement range/5.5 °C (10 °F)
	Ambient	< 0.016 % of the calibrated measurement range/5.5 °C (10 °F)
<b>Temperature range</b>	Process	-18...110 °C (0...230 °F), bei $t_{\text{ambient}} \leq 71 \text{ °C}$ (160 °F)
	CIP/SIP cleaning	130 °C (266 °F) / max. 60 Min., bei $t_{\text{ambient}} \leq 60 \text{ °C}$ (140 °F)
	Ambient	-18...71 °C (0...160 °F)
<b>Response time</b>		< 0.2 seconds
<b>Sample rate</b>		< 0.05 seconds
<b>Materials</b>	Connection head	Stainless steel, AISI 304 (1.4301), $R_a \leq 0.8 \mu\text{m}$ (32 microinch)
	Metal cover	Stainless steel, AISI 304 (1.4301), $R_a \leq 0.8 \mu\text{m}$ (32 microinch)
	Plastic cover	Polycarbonate
	Threaded connector	Stainless steel, AISI 304 (1.4301), $R_a \leq 0.8 \mu\text{m}$ (32 microinch)
	Wetted parts	Stainless steel, AISI 316L, $R_a \leq 0.64 \mu\text{m}$ (25 microinch)
	Diaphragm	Stainless steel, AISI 316L, $R_a \leq 0.64 \mu\text{m}$ (25 microinch)
	Diaphragm seal/oil filling	Medical white oil/mineral oil/paraffin oil FDA approval number 21CFR172.878, 21CFR178.3620, 21CFR573.680 Neobee M20 (optional)
<b>Process connection</b> Not 3-A-compliant	CLEANadapt	G1" with clamping bolt, G1" fixed thread
	Milk coupling DIN 11851	DN40, DN50
	DRD flange	65 mm
	SMS Liner (female)	38 mm, 51 mm
	Tri-Clamp®	1½", 2"
	CPM	Standard fitting
3-A-compliant	Endress & Hauser	Universal adapter - short, Universal adapter - long
<b>Electrical connection</b>	Cable gland	M16x1.5
	Plug-in connection	M12 plug (1.4305), 5-pin
<b>Protection class</b>		IP 67 (with cable gland)/NEMA 4X IP 69 K (with plug-in connection)
<b>Supply voltage</b>		18...36 V DC
<b>Output</b>	Current loop 1 (differential pressure)	analog 4...20 mA and HART 7.0
	Current loop 2 (top or total pressure)	analog 4...20 mA
<b>Tightening torque</b>	For the assembly of all D3 components	27 Nm (20 ft-lbs)
<b>Weight</b>		approx. 1300 g

## Conventional usage

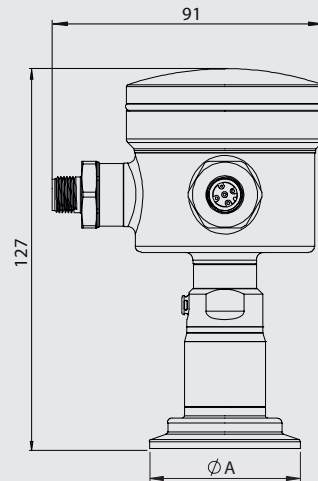
- Not suitable for applications in potentially explosive areas.
- Not suitable for applications in safety-relevant system parts (SIL).



D3 / Tri-Clamp with horizontal enclosure



D3 / Tri-Clamp with vertical enclosure



Tri-Clamp size

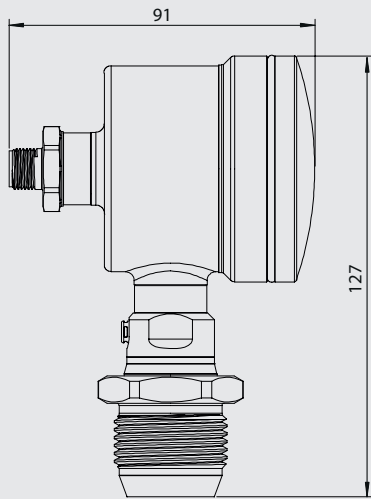
Type	Ø A
004	50.5 mm
005	64.0 mm

Information

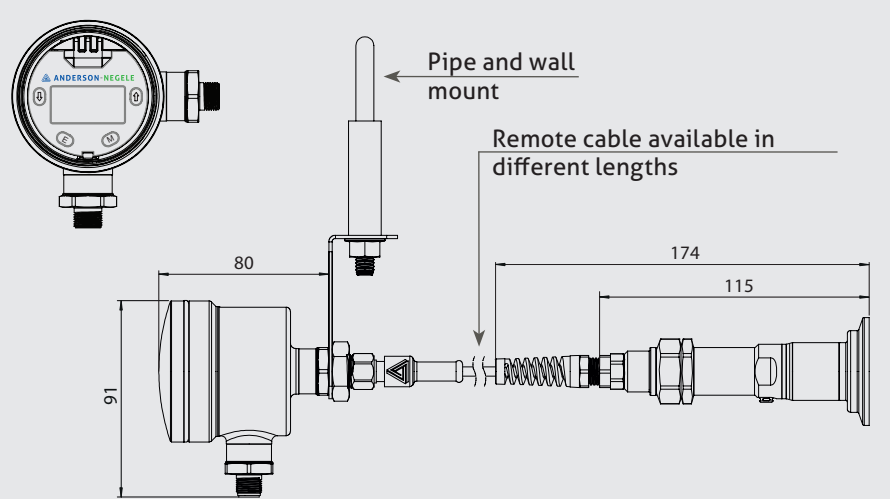


The tube/wall bracket is already included in the model with 2 remote sensors.

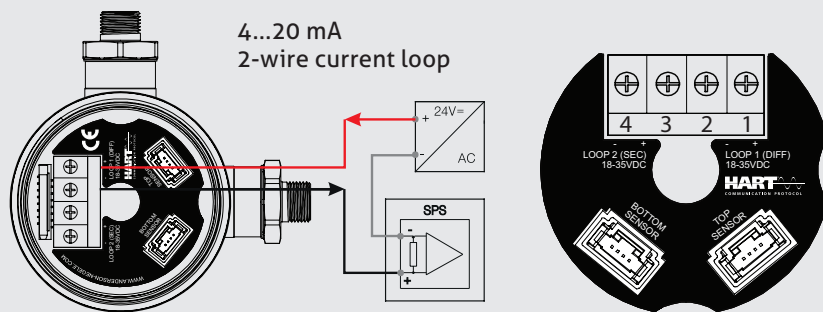
D3 / G1" with horizontal head



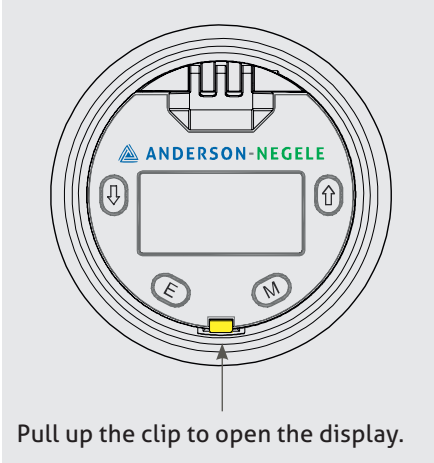
D3 with remote pressure transmitter



Electrical connection with cable gland

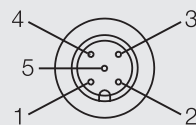


D3 with open cap



Electrical connection with M12 plug

1: red	+ supply voltage (differential pressure)
2: black	- supply voltage 4...20 mA (differential pressure)
3: green	+ supply voltage (top or total pressure)
4: blue	- supply voltage 4...20 mA (top or total pressure)
5:	not occupied



## Order code of fully assembled sensor

## D3 (Modular differential pressure sensor)

## Capillary fill

- 1 (Mineral oil/FDA approved)
- 5 (Neobee/FDA approved)

## Top sensor fitting

## Measurement range of the sensor fitting

- 5 (0...6 psi; 0...0.4 bar)
- 6 (30 "Hg/0/30 psi; -1...2 bar)
- 7 (30 "Hg/0/100 psi; -1...7 bar)
- 8 (30 "Hg/0/500 psi; -1...35 bar)

## Process connection (without 3-A TPV approval)

- 160 (CLEANadapt G1" with clamping bolt)
- 182 (CLEANadapt G1" fixed thread)
- 115 (Milk coupling DIN 11851 DN40)
- 124 (Milk coupling DIN 11851 DN50)
- 189 (DRD flange 65 mm)
- 109 (38 mm SMS Liner (female))
- 110 (51 mm SMS Liner (female))

## Process connection (with 3-A TPV approval as per standard 74-06)

- 004 (Tri-Clamp 1½")
- 005 (Tri-Clamp 2")
- 123 (CPM Standard Fitting)
- 154 (Endress & Hauser Universal Adaptor - Short)
- 155 (Endress & Hauser Universal Adaptor - Long)

## Sensor model

- O (Compact version)
- A (Remote model with 1.5 m (= 5') cable)
- B (Remote model with 3.0 m (= 10') cable)
- C (Remote model with 4.5 m (= 15') cable)
- D (Remote model with 6.0 m (= 20') cable)
- E (Remote model with 7.5 m (= 25') cable)
- F (Remote model with 15.0 m (= 50') cable)

## Bottom sensor fitting

## Measurement range of the sensor fitting

- 5 (0...6 psi; 0...0.4 bar)
- 6 (30 "Hg/0/30 psi; -1...2 bar)
- 7 (30 "Hg/0/100 psi; -1...7 bar)
- 8 (30 "Hg/0/500 psi; -1...35 bar)

## Process connection (without 3-A TPV approval)

- 160 (CLEANadapt G1" with clamping bolt)
- 182 (CLEANadapt G1" fixed thread)
- 115 (Milk coupling DIN 11851 DN40)
- 124 (Milk coupling DIN 11851 DN50)
- 189 (DRD flange 65 mm)
- 109 (38 mm SMS Liner (female))
- 110 (51 mm SMS Liner (female))

## Process connection (with 3-A TPV approval as per standard 74-06)

- 004 (Tri-Clamp 1½")
- 005 (Tri-Clamp 2")
- 123 (CPM Standard Fitting)
- 154 (Endress & Hauser Universal Adaptor - Short)
- 155 (Endress & Hauser Universal Adaptor - Long)

## Sensor model

- O (Compact version)
- A (Remote model with 1.5 m (= 5') cable)
- B (Remote model with 3.0 m (= 10') cable)
- C (Remote model with 4.5 m (= 15') cable)
- D (Remote model with 6.0 m (= 20') cable)
- E (Remote model with 7.5 m (= 25') cable)
- F (Remote model with 15.0 m (= 50') cable)

D3 1 7 004 0 7 004 B

## Order code of fully assembled sensor (continued)

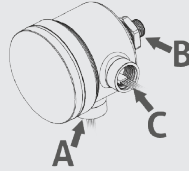
## Enclosure

## Enclosure cap

- 2 (Clear plastic)  
3 (Closed stainless steel)

## Housing orientation

	Electr. connect.	Top sensor	Bottom sensor
1	A	B	C
2	A	C	B
3	B	A	C
4	B	C	A
5	C	A	B
6	C	B	A



## Electrical connection

- A (M12 plug 1.4305)  
C (Cable gland M16x1.5)

## Top pressure units

- B (bar)  
L (mbar)  
P (psi)

## Top pressure calibration range

- XXX (Presetting as per table; see page 6)  
999 (Factory setting as per customer specification)  
000 (Unrestricted measurement range as per sensor fitting)

## Differential pressure units

- B (bar)  
L (mbar)  
P (psi)

## Differential pressure calibration range

- XXX (Presetting as per table; see page 6)  
999 (Factory setting as per customer specification)  
000 (Unrestricted measurement range as per sensor fitting)

## Certificate

- X (No certificate)  
Z (3.1 Material certificate)

2 1 A B 056 B 056 Z

## Information on order code



The order code is composed of both tables entitled "Order code of fully assembled sensor".

Example of a complete sensor:

**D3 1 7 004 0 7 004 B 2 1 A B 056 B 056 Z**

Calibration range Bar	
Code	Range
251	(-1...1)
286	(-1...2.5)
217	(-1...3)
056	(-1...4)
304	(-1...7)
501	(0...1.2)
428	(0...1.5)
057	(0...2)
235	(0...3)

Calibration range Bar	
Code	Range
192	(0...4)
060	(0...6)
309	(0...7)
061	(0...10)
502	(0...18)
065	(0...20)
066	(0...30)
224	(0...35)

Calibration range mbar	
Code	Range
224	(0...35)
067	(0...40)
068	(0...50)
069	(0...60)
206	(0...70)
071	(0...100)
294	(0...140)
073	(0...150)
074	(0...160)
075	(0...200)
077	(0...300)
078	(0...350)

Calibration range mbar	
Code	Range
079	(0...400)
503	(0...415)
504	(0...480)
081	(0...500)
505	(0...830)
084	(0...1000)
499	(0...1200)
506	(0...1385)
507	(0...1600)
086	(0...2000)
508	(0...3300)
089	(0...4000)

Calibration range PSI	
Code	Range
025	(30 "Hg/0)
304	(30 "Hg/0/7)
028	(30 "Hg/0/15)
029	(30 "Hg/0/30)
031	(30 "Hg/0/60)
032	(30 "Hg/0/100)
314	(30 "Hg/0/200)
501	(0...1,2)
428	(0...1,5)
057	(0...2)
235	(0...3)
192	(0...4)
060	(0...6)
309	(0...7)
061	(0...10)
502	(0...18)
065	(0...20)
066	(0...30)
224	(0...35)
067	(0...40)
068	(0...50)
069	(0...60)
206	(0...70)
071	(0...100)
294	(0...140)
073	(0...150)
074	(0...160)
075	(0...200)
077	(0...300)
078	(0...350)
079	(0...400)
503	(0...415)
504	(0...480)
081	(0...500)

Order code of sensor head

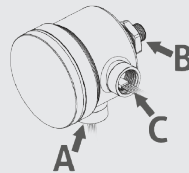
D3E (Sensor head)

Enclosure cap

- 2 (Clear plastic)
- 3 (Closed stainless steel)

Housing orientation

	Electr. connect.	Top sensor	Bottom sensor
1	A	B	C
2	A	C	B
3	B	A	C
4	B	C	A
5	C	A	B
6	C	B	A



Electrical connection

- A (M12 plug 1.4305)
- C (Cable gland M16x1.5)

Top pressure units

- B (bar)
- L (mbar)
- P (psi)

Calibration range

000 (Measurement range as per top sensor fitting)

Differential pressure units

- B (bar)
- L (mbar)
- P (psi)

Calibration range

000 (Measurement range as per bottom sensor fitting)

D3E 2 1 A B 000 B 000

## Order code of sensor stem

L35 (Sensor stem)

## Measurement range

- 5 (0...6 psi; 0...0.4 bar)
- 6 (30 "Hg/0/30 psi; -1...2 bar)
- 7 (30 "Hg/0/100 psi; -1...7 bar)
- 8 (30 "Hg/0/500 psi; -1...35 bar)

Process connection  
(without 3-A TPV approval)

- 160 (CLEANadapt G1" with clamping bolt)
- 182 (CLEANadapt G1" fixed thread)
- 115 (Milk coupling DIN 11851 DN40)
- 124 (Milk coupling DIN 11851 DN50)
- 189 (DRD flange 65 mm)
- 109 (38 mm SMS Liner (female))
- 110 (51 mm SMS Liner (female))

## Capillary fill

- 1 (Mineral oil/FDA approved)
- 5 (Neobee/FDA approved)

## Sensor model

- 0 (fixed value)

## Certificate

- X (No certificate)
- Z (3.1 Material certificate)

## Process connection

## (with 3-A TPV approval as per standard 74-06)

- 004 (Tri-Clamp 1½")
- 005 (Tri-Clamp 2")
- 123 (CPM Standard Fitting)
- 154 (Endress & Hauser Universal Adaptor - Short)
- 155 (Endress & Hauser Universal Adaptor - Long)

L35 5 004 1 0 X

Transport/Storage 

- No outdoor storage
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protect against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature -55...+90 °C
- Relative humidity max. 98%

Reshipment 

- Sensors and process connection must be clean and must not be contaminated with hazardous media and/or heat-conductive paste. Note the cleaning information!
- To avoid damage of the equipment, use suitable transport packaging only.

Cleaning/Maintenance 

- When using a pressure washer, do not point the nozzle directly at the electrical connections and gaskets!

Standards and guidelines 

- Compliance with the applicable regulations and directives is mandatory.

Notice on conformity 

- Applicable guidelines:  
Electromagnetic Compatibility Directive 2014/30/EC
- The CE label confirms compliance of this product with the applicable EC directives.
- The operator is responsible for ensuring compliance with the directives that are applicable to the overall system.

Disposal 

- Electrical devices should not be disposed of with household trash. They must be recycled in accordance with national laws and regulations.
- Take the device directly to a specialized recycling company and do not use municipal collection points.

**D3 / L3 Remote-Kit**

Complete accessories to convert compact version into remote version, including:

- M12 remote adaptor with nut
- Stem adaptor
- Wall mount
- Pipe mount

**Note:**

The remote cable is not part of the remote kit and must be ordered separately.

**Remote cable for D3 / L3****Pre-assembled remote cable for D3 / L3**

<b>L3 R-CABLE / 4-15</b>	PVC cable, 4-pin, length 1.5 m
<b>L3 R-CALBE / 4-30</b>	PVC cable, 4-pin, length 3.0 m
<b>L3 R-CABLE / 4-45</b>	PVC cable, 4-pin, length 4.5 m
<b>L3 R-CABLE / 4-60</b>	PVC cable, 4-pin, length 6.0 m
<b>L3 R-CABLE / 4-75</b>	PVC cable, 4-pin, length 7.5 m
<b>L3 R-CABLE / 4-150</b>	PVC cable, 4-pin, length 15.0 m

**Remote cable for D3 / L3****Accessories for D3 / L3****PVC cable with M12 connection made of 1.4305, IP 69 K, unshielded**

<b>M12-PVC / 4-5 m</b>	PVC cable, 4-pin, length 5 m
<b>M12-PVC / 4-10 m</b>	PVC cable, 4-pin, length 10 m
<b>M12-PVC / 4-25 m</b>	PVC cable, 4-pin, length 25 m

**PVC cable with M12 connection, nickel-plated brass, IP 67, shielded**

<b>M12-PVC / 4G-5 m</b>	PVC cable, 4-pin, length 5 m
<b>M12-PVC / 4G-10 m</b>	PVC cable, 4-pin, length 10 m
<b>M12-PVC / 4G-25 m</b>	PVC cable, 4-pin, length 25 m

**Remote kit**

<b>L3 R-Kit</b>	Complete accessories incl. wall mount
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**Cap / Gaskets**

<b>L3 C-GASKET</b>	Replacement silicone gaskets for cap (6 pieces)
<b>L3 C-CLEAR</b>	Clear plastic cap (incl. gasket)
<b>L3 C-STEEL</b>	Stainless steel cap without control window (incl. gasket)

**PVC cable with M12 connection****Options**

<b>CERT / 2.2 / D3</b>	factory certificate 2.2 acc. to EN 10204 (only product contacting surface)
<b>CAL / D3</b>	factory calibration certificate with 3 calibration points (0 %, 50 %, 100 %)
<b>CAL / D3 / MP</b>	factory calibration certificate with 5 calibration points (0 %, 25 %, 50 %, 75 %, 100 %)