NIVETEC Instrumentação e Controle

Catálogo

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NIVETEC

PiloTREK WP–200

INTEGRATED 80 GHz (W-BAND) RADAR

FOR LIQUIDS & SOLIDS

NIVELCO

LEVEL TRANSMITTERS

The **PiloTREK WP–200** non-contact radar level transmitters employ the most advanced industrial measurement technology: 80 GHz FMCW radar. Compared to lower-frequency radars *(5…12 GHz and 25 GHz)*, the key advantages of 80 GHz technology are a smaller antenna size, improved focusing capability, and a narrower beam angle.

The PiloTREK WP–200 applies the latest technology to measure liquids, bulk solids, emulsions, and chemicals across the water, food, energy, pharmaceutical, and chemical industries, delivering millimeter-accurate results. It is also well suited for vapor-prone substances, liquids with a gas blanket, and large-particle bulk solids. Beyond level, volume, and weight measurement, the product family also includes open-channel flow measurement and threshold functions to suppress false and interfering echoes. Since millimeter waves require no medium to propagate, the transmitter can also operate in a vacuum.

The device can also be used with HART® compliant NIVELCO **EView2**, **MultiCONT** universal process controller, **MonoCONT** smart field display & data logger, and PACTware™ software, or configured via Bluetooth® communication using the **MobileEView** application.

FEATURES

- 2-wire 80 GHz *(W-band)* radar
- Accuracy of ±2 mm
- Easy to install due to small antenna diameter
- 1", 1½" encapsulated antenna
- Submersible – integrated design with IP66/IP68 protection
- User-friendly threshold management
- Configuration via Bluetooth® with MobileEView app
- PACT*ware*™ compatible
- 5 years warranty
- Ex variant

APPLICATIONS

- For measuring the level of liquids, emulsions, and other media
- For free flowing solids
- Storage tanks, chemical tanks, open pits, sumps, wells
- Measurement through a plastic tank roof *(only in case of higher dielectric constant liquid)*
- For material prone to vapor formation
- For measuring liquids with a gas blanket
- It can also be used in a vacuum
- Open-channel flow measurement

CERTIFICATES

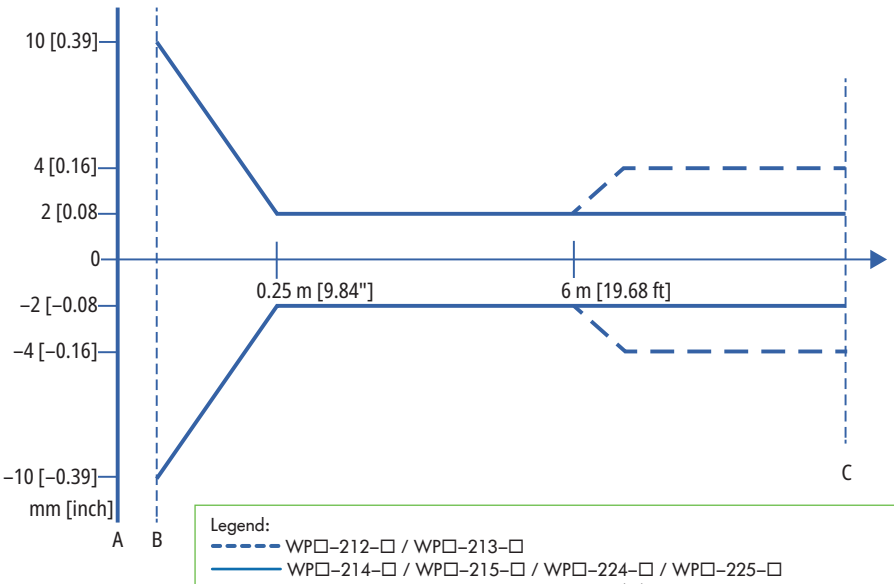
- ATEX *(Ex ia GD)*
- IECEx *(Ex ia GD) (in prep.)*
- INMETRO *(Ex ia GD),*
- ANATEL

AREAS OF APPLICATION

- Water and wastewater industry
- Energy industry / Plant utilities
- Food & Beverage
- Pharmaceutical industry
- Chemical industry
- Marine applications
- Agriculture
- Construction materials
- Heavy industry
- Packaging industry

WP☐–2☐4–4

LINEARITY ERROR



Legend:
- WP☐–212–☐ / WP☐–213–☐
- WP☐–214–☐ / WP☐–215–☐ / WP☐–224–☐ / WP☐–225–☐

A – Plane of the device's process connection. **B** – Minimum measurement distance (X_m) is at the position of the tip of the antenna. **C** – Maximum measurement distance (X_M).

Smaller, smarter

PiloTREK WP

Coming soon!

WPC–2☐4–4

OPERATING PRINCIPLE

The reflection of millimeter waves is highly dependent on the dielectric constant of the medium. Therefore, the dielectric constant of the measured medium (ε_r) must be above 1.9 for millimeter-wave level measurements. The measurement principle of a level transmitter using a millimeter-wave signal is based on measuring the time of flight of the reflection.
The speed of propagation of millimeter-wave signals in air, gases, and vacuum is almost constant regardless of temperature and pressure of the medium, so the measured distance does not depend on the physical parameters of the intermediate medium.

Informative ε_r values							
Butane (C_4H_{10})	1.4	Ethers	4.4	Gasoline	2.3	Methyl alcohol (CH_3OH)	33.1
LP gas	1.6…1.9	Acetic acid (CH_3COOH)	6.2	Bitumen	2.6	Glycol ($C_2H_6O_2$)	37
Kerosene	2.1	Limestone	6.1…9.1	Carbon disulfide (CS_2)		Nitrobenzene ($C_6H_5NO_2$)	40
Crude Oil		Ammonia (NH_3)	17…26	Clinker	2.7	Glycerin ($C_3H_8O_3$)	41.1
Diesel Oil		Acetone (C_3H_6O)	21	Resin	2.4…3.6	Water (H_2O)	80
Benzol (C_6H_6)	2.2	Ethyl alcohol (C_2H_5OH)	24	Cereal Grain	3…5	Sulphuric acid (H_2SO_4) (T = 20 °C (68 °F)	84

The **PiloTREK WP–200** level transmitter is a frequency-modulated continuous-wave radar *(FMCW)* operating at 80 GHz *(W-band)*. The most obvious advantages of 80 GHz radars over lower-frequency *(5…12 and 25 GHz)* radars are smaller antenna size, better focus, and a narrower beam angle. A portion of the continuous millimeter-wave energy radiated by the level transmitter antenna is reflected from the measured surface, depending on the material being measured. The distance to the reflecting surface is calculated by the electronics with high accuracy from the frequency shift of the reflected signal and converted by the electronics into distance, level, or volume signals.

TECHNICAL DATA

		PVDF housing	PP housing
		WPB, WPT, WPC–2☐☐–☐	WPA–2☐☐–☐
Measured values		Distance; Calculated values: level, volume, mass, flow	
Signal frequency		77…81 GHz (W-band)	
Measuring range[1]		0…30 m (0…100 ft)	
Lowest ε_r of medium		1.9	
Resolution		0.1 mm (0.004")	
Supply voltage		12…36 V DC	
Output	Analog	4…20 mA (3.9…20.5 mA); $R_{Lmax} = (U_S - 12\ V) / 0.02\ A$	
	Digital	Bluetooth® LE 6.0 (optional), HART® interface (loop resistance ≥250 Ω)	
	Service interface	SAT–504–3 compatible; galvanically isolated; 3.3 V LVDS; max. 100 mA	
	Relay *(optional)*	SPDT 30 V / 1 A DC; 42 V / 0.5 A AC	
Measuring frequency		~1/s	
Antenna material[1]		Encapsulated horn antenna (PP / PVDF / PTFE)	
Process temperature		–40…+80 °C (–40…176 °F)	–30…+80 °C (–22…176 °F)
Ambient temperature			
Process pressure		–1…3 bar (–14.5…43.5 psi)	
Seal		FPM (Viton®)	EPDM
		Optional: EPDM, FFKM Perfluoroelastomer (Kalrez® 6375)	
Process connection		1", 1½" BSP / NPT	
Ingress protection		IP66 / IP68 (NEMA 4X and NEMA 6P equivalent)	
Electrical connection		4× 0.5 mm² shielded Ø6 mm cable × 5 m (up to 30 m); For relay option: 7× 0.5 mm² shielded cable (4× 22 AWG shielded Ø0.24" cable × 16.4 ft [up to 100 ft]); For the relay option: 7× 22 AWG) shielded cable	
Electrical protection		Class I Overvoltage Protection; (Class III [SELV])	
Weight		~600 g (1.3 lb)	

[1] Depending on order code.

TYPE-DEPENDENT DATA

	Encapsulated antenna (WPA, WPB, WPT)			Lens-antenna (WPC)		
	WP□–212–□ / WP□–213–□	WP□–214–□ / WP□–215–□	WP□–224–□ / WP□–225–□	WPC–212–□ / WPC–213–□	WPC–214–□ / WPC–215–□	WPC–224–□ / WPC–225–□
Antenna material	PP, PVDF, PTFE			PTFE		
Dead zone[1]	0 m (0 ft)					
Maximum measuring range[2]	10 m (33 ft)		20 m (66 ft)	10 m (33 ft)		20 m (66 ft)
Accuracy[3]	≤6 m (19.7 ft): ±2 mm (±0.08"); >6 m: ±4 mm (±0.16")	±2 mm (±0.08")		≤6 m (19.7 ft): ±2 mm (±0.08"); >6 m: ±4 mm (±0.16")	±2 mm (±0.08")	
Beam angle *(–3 dB)*	12°	7°		12°	7°	
Antenna insertion length[4]	56 mm (2.2")	70 mm (2.75")		28 mm (1.1")	46 mm (1.8")	
Lower process connection	1" BSP/NPT	½" BSP/NPT		1" BSP/NPT	½" BSP/NPT	
Upper process connection	1" BSP					

[1] Measured from the tip of the antenna, for < 80 DC (ε_r).
[2] May be limited in the case of low dielectric constant or non-perpendicular or non-planar media.
[3] In the case of an ideal reflecting surface, according to IEC 62828-1.
[4] Measured from the seal plane of the process connection.

Ex INFORMATION

	WP□–2□□–8 Ex, WP□–2□□–E Ex	
ATEX certificate number	BKI24ATEX001 X	
Ex marking	⟨Ex⟩ II 1 G Ex ia IIC T5 Ga	⟨Ex⟩ II 1 D Ex ia IIIC T95°C Da
INMETRO certificate number	DNV 24.0166 X	
Ex marking	Ex ia IIC T5 Ga	Ex ia IIIC T95°C Da
Ex power supply, intrinsically safety data[6]	U_i = 30 V, I_i = 100 mA, P_i = 0.75 W	U_i = 30 V, I_i = 140 mA, P_i = 1 W
	C_i ≤ 12 nF + 0.12 nF/m cable, L_i ≤ 238 µH + 0.65 µH/m cable with standard 5 m cable: C_i ≤ 12.5 nF, Li ≤ 242 µH	
Supply voltage	12…30 V DC	

[6] In IIB applications, Ex power supply data for IIIC can be used.

TEMPERATURE DATA FOR Ex CERTIFIED MODELS

	WP□–2□□–8 Ex, WP□–2□□–E Ex	
	Hazardous gas atmospheres	Explosive dust atmospheres
Temperature data	**Ex ia IIC**	**Ex ia IIIC**
Temperature class	**T5**	**T95°C**
Highest ambient temperature	+80 °C (176 °F)	
Highest surface temperature of the device[7]		

[7] Conducted or radiated heat transferred by medium, ambient or process connection.

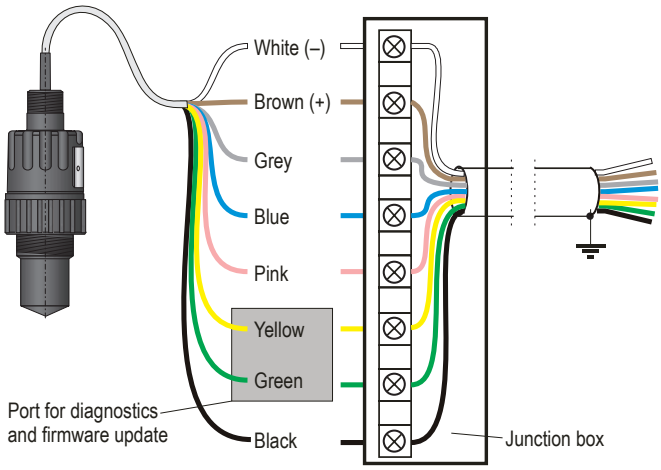
POLARIZATION

The **PiloTREK W–200** 80 GHz radar is much less sensitive to installation conditions, both in terms of polarization and clutter sensitivity, due to its narrow and nearly circular beamwidth.

BACKGROUND MAPPING

Thanks to its 80 GHz FMCW technology, it is much less sensitive to the presence of clutter than previous generation radars. It now has an easy-to-use, flexible threshold management *(EView2)* that allows echoes from clutter in the tank to be easily masked if necessary. The threshold curve is designed to mask unwanted echoes from the measurement. Echo peaks below the threshold are not included in the evaluation.

WIRING



WPT–214

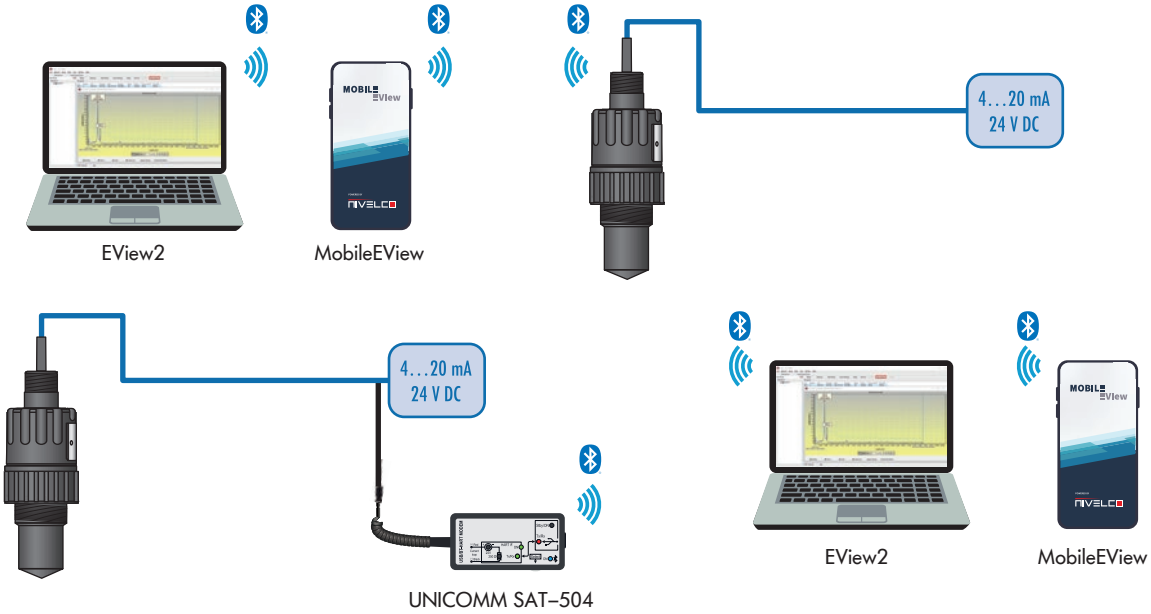
The **BROWN** (+) / **WHITE** (–) wires are the 4…20 mA output or power supply. The **GREY**, **BLUE** and **PINK** wires are for relay output and are only available in relay version. The **YELLOW** and **GREEN** wires are for servicing purposes only and are hidden by default. The **BLACK** is the cable shielding.

MOUNTING

The device must be mounted far as possible from interfering objects inside the tank and sources of interference, such as waves, vortex or strong vibrations. The antenna axis must be perpendicular to the surface of the measured medium within ±2…3°. In regions with extremely hot climates, we recommend protecting the device from direct sunlight to avoid exceeding the ambient temperature limits of the housing.

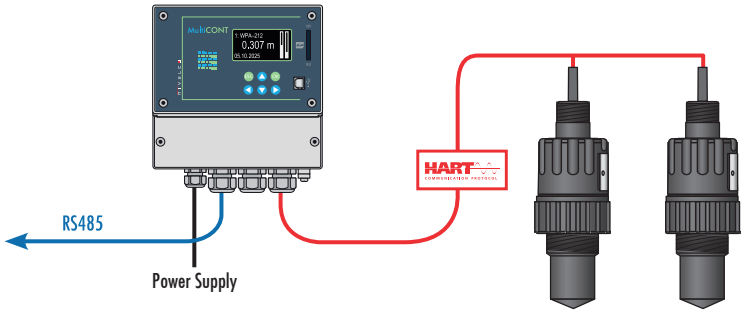
Bluetooth® CONNECTIVITY

The Bluetooth® option on the **PiloTREK W–200** Series allows for convenient device setup and diagnostics via the NIVELCO **MobileEView** app for Android or iOS or the free **EView2** software download for laptops.

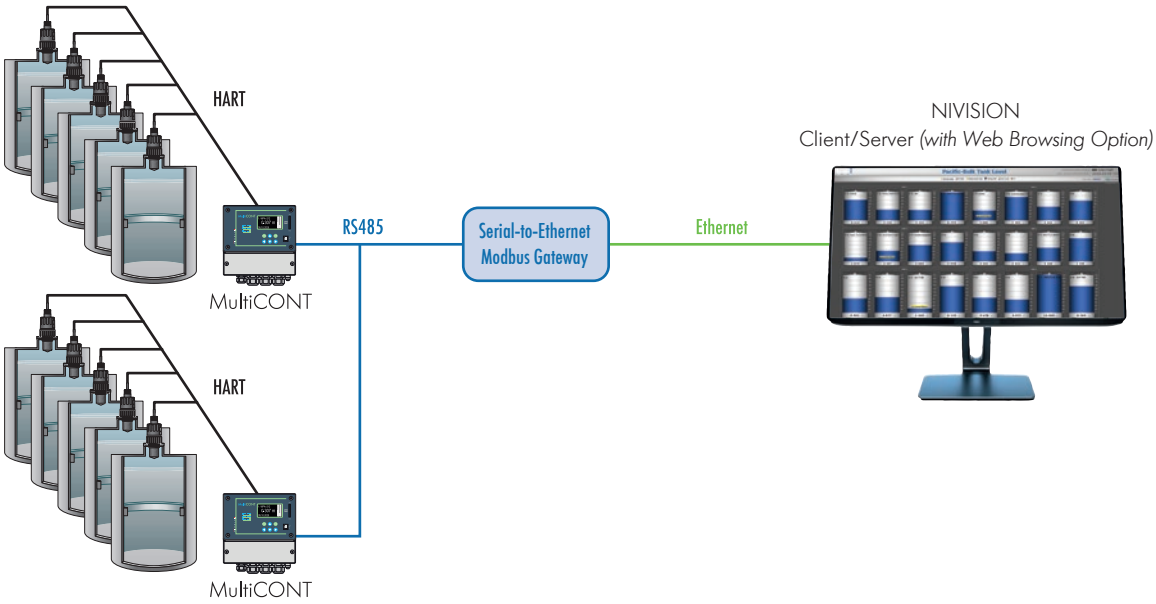


PiloTREK TRANSMITTERS IN HART® MULTIDROP LOOP

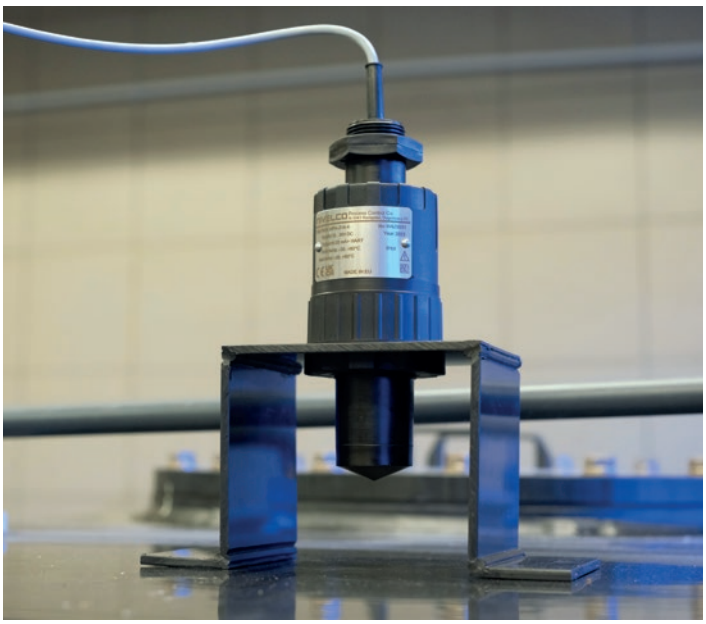
MultiCONT multi-channel remote controllers process, display, and transmit data from NIVELCO's HART®-equipped transmitters in a multidrop loop. Up to 15 of these connected transmitters can be programmed and maintained from MultiCONT, which supports data-logging tasks. MultiCONT provides programmable relay outputs, while 4…20 mA outputs are available through remote I/O modules.

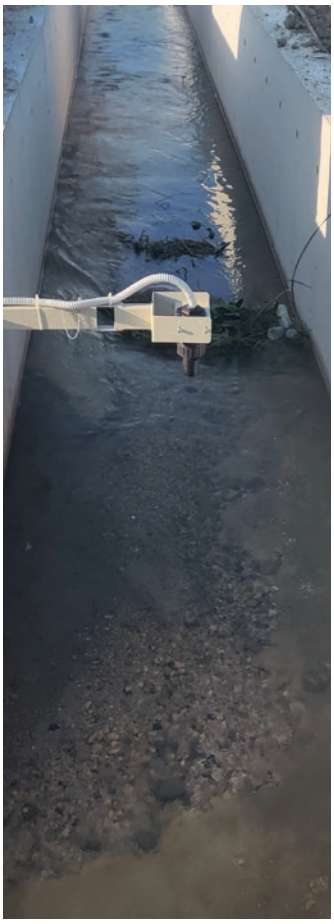


MultiCONT can send measurement data via RS485 to PLCs, computers running third-party SCADA systems, or the NIVELCO **NIVISON** inventory monitoring system.



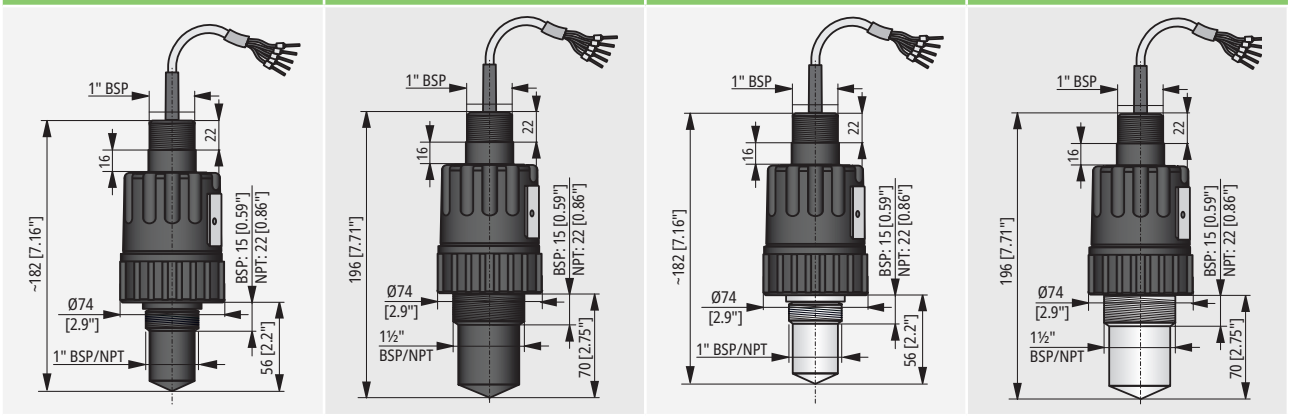
APPLICATIONS





DIMENSIONS

PP/PVDF housing		PVDF housing	
PP antenna	PVDF antenna	PTFE antenna	
WPA–212–☐ / –213–☐	WPB–214–☐ / –215–☐	WPT–212–☐ / –213–☐	WPT–214–☐ / –215–☐



ORDER CODES *(NOT ALL COMBINATIONS AVAILABLE)*

Advanced 80 GHz radar level transmitters

PiloTREK W P ☐ – 2 ☐ ☐ – ☐ (1)

Antenna / Housing material	Code
PP / PP	A
PVDF / PVDF	B
PTFE / PVDF	T
PTFE/PVDF (lens-antenna version)	C

Measurement range	Code
10 m (33 ft)	1
20 m (66 ft)	2
30 m (100 ft) (2)	3

Process connection – lower / upper	Code
1" BSP / 1" BSP (3)	2
1" NPT / 1" BSP (3)	3
1½" BSP / 1" BSP (4)	4
1½" NPT / 1" BSP (4)	5
2" BSP / 1" BSP (2) (5)	6
2" NPT / 1" BSP (2) (5)	7
Ø75 mm (2½") / 1" BSP (2) (6)	8

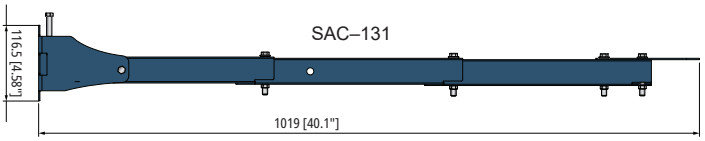
Output / Ex		Code
		4
4...20 mA + HART®	Ex ia GD	8
	+ SPDT Relay	H
	+ Bluetooth®	B
	Bluetooth® / Ex ia GD	E
	+ SPTD Relay + Bluetooth®	R
	+ Bluetooth®, 10 m (33 ft) cable	T

(1) For explosion-proof devices, the article number is followed by "Ex" on the data plate. (2) Under development.
(3) Only for 10 m *(33 ft)* measuring range. (4) Only for 10 m *(33 ft)* or 20 m *(66 ft)* measuring range.
(5) Only for 20 m *(66 ft)* measuring range. (6) Only for 30 m *(100 ft)* measuring range.

ACCESSORIES

Flanges	NIVOSONAR SFA–3☐☐–0
HART®–USB/Bluetooth® modem for remote programming	UNICOMM SAT–504–☐
HART®–USB/RS485 modem for remote programming with PC, DIN rail mountable	UNICOMM SAK–305–☐
Mounting brackets for level transmitters	UNIMOUNT SAC–1☐1–0

UNIMOUNT SAC
Mounting bracket available separately for level transmitters, level switches, with a 1" suspension element and mounting plates for 1", 1½" and 2" connections. Made of painted aluminum and stainless steel, suitable for a maximum load of 5 kg (11 lb).



Aiming device, 500 mm (19.7"), aluminum, Pg9, drilled as DN50 PN16	UNIMOUNT SAA–102–0
Multichannel process controller and display unit	MultiCONT PRW–2☐☐–☐
Smart Field Display & Data Logger	MonoCONT P☐F–☐1☐–☐
24 V DC power supply, DIN rail mountable	NIPOWER PPK–431–☐
Intrinsically safe isolator module, DIN rail mountable	UNICONT PGK–301–☐ Ex
EView2 configuration software for remote programming with PC	FREE download
MobileEView – free mobile application communicating with devices via Bluetooth®	Download on the App Store / GET IT ON Google Play

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