

PiLoTREK WE-200

COMPACT 80 GHz (W-BAND) RADAR
FOR LIQUIDS & SOLIDS

5 YEARS WARRANTY



NIVELCO

LEVEL TRANSMITTERS

The **PiloTREK WE-200** non-contact radar level transmitters use the most advanced industrial measurement technology, the 80 GHz FMCW radar. The most fundamental advantage of 80 GHz radar compared to lower frequencies (5...12 GHz and 25 GHz) is the smaller antenna size, better focusability, and narrow beam angle. It uses the latest technology to measure liquids, masses, emulsions and other chemicals widely used in the water, food, energy, pharmaceutical and chemical industries, providing measurement results with millimeter accuracy. It is also excellent for measuring substances that tend to vaporize and liquids with a gas blanket or for free flowing solids.

In addition to the level, volume, and weight measurement functions, this product family also inherits the open channel flow measurement functions and the threshold functions to eliminate false and interfering echoes. Since no medium is required for millimeter waves to propagate, it can also be used in a vacuum.

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

FEATURES

- 2-wire 80 GHz (W-band) radar
- Accuracy of ±2 mm
- Small antenna diameter for easy installation
- Plug-in graphic display module
- Horn and plastic encapsulated antennas
- Compact design with IP66/IP67 protection
- User-friendly threshold management
- Configuration via Bluetooth® with MobileEView app
- PACTware™ compatible
- NIFLANGE weldable stainless steel flange options
- High-temperature version
- 5 years warranty
- Ex versions

- For materials that tend to vaporize
- 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
- FM Class I, Division 1 (*XP*) (*in prep.*)

AREAS OF APPLICATION

- Water and Wastewater Industry
- Energy / Utilities
- Food & Beverage
- Chemical & Pharmaceutical
- Agriculture
- Construction Materials
- Heavy Industry
- Packaging Industry

APPLICATIONS

- For level measurement 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*)



WGS-215-B



WEP-214-4



WGB-225-B



WGT-214-8Ex



WHS-214-B



WEK-224-E

LINEARITY ERROR

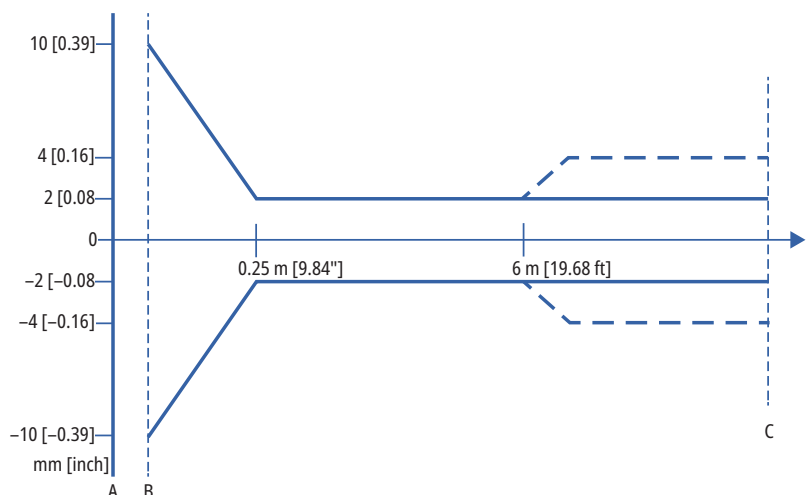
Legend:

- W□□-212-□ / W□□-213-□
- W□□-214-□ / W□□-215-□ / W□□-224-□ / W□□-225-□

A - Plane of the device's process connection.

B - Minimum measurement distance (X_{M1}) is at the position of the tip of the antenna.

C - Maximum measurement distance (X_M).



OPERATING PRINCIPLE

The reflection of the millimeter-waves is highly dependent on the dielectric constant of the medium. Therefore relative dielectric constant of the measured media (ϵ_r) must be over 1,9 for measurement using millimeter wave length measuring signal. The measurement principle of a level transmitter with a millimeter-waves signal is based on the measurement of the total time of flight

Informative ϵ_r values							
Butane (C ₄ H ₁₀)	1.4	Ethers	4.4	Gasoline	2.3	Methyl alcohol (CH ₃ OH)	33.1
LP gas	1.6...1.9	Acetic acid (CH ₃ COOH)	6.2	Bitumen	2.6	Glycol (C ₂ H ₆ O ₂)	37
Kerosene	2.1	Limestone	6.1...9.1	Carbon disulfide (CS ₂)		Nitrobenzene (C ₆ H ₅ NO ₂)	40
Crude Oil		Ammonia (NH ₃)	17...26	Clinker	2.7	Glycerin (C ₃ H ₈ O ₃)	41.1
Diesel Oil	2.2	Acetone (C ₃ H ₆ O)	21	Resin	2.4...3.6	Water (H ₂ O)	80
Benzol (C ₆ H ₆)		Ethyl alcohol (C ₂ H ₅ OH)	24	Cereal Grain	3...5	Sulphuric acid (H ₂ SO ₄) (T = 20 °C (68 °F))	84

of the measuring microwave signal. The speed of propagation of millimeter-waves signals in the air, gases, and vacuum is almost constant regardless of temperature and medium pressure, so the measured distance does not depend on the physical parameters of the intermediate medium. The **PiloTREK WE-200** level transmitter works on continuous-wave frequency modulated radar (FMCW) principle operating at 80 GHz (W-band). A portion of the millimeter-wave continuous wave energy radiated by the level transmitter antenna is reflected from the measured surface, depending on the material to be measured. The distance of the reflecting surface is calculated with high accuracy by the electronics from the frequency shift of the reflected signal and converted into a distance, level, mass or volume signal by the electronics.

TECHNICAL DATA

		PiloTREK W□□-200	
Measured values		Distance; calculated values: level, volume, mass, flow	
Signal frequency		77...81 GHz (W-band)	
Measuring range ⁽¹⁾		0...30 m (0...98.5 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); $R_{Lmax} = (U_S - 12 \text{ V}) / 0.02 \text{ A}$	
	Digital	Bluetooth® LE 6.0 (optional), HART® interface (loop resistance $\geq 250 \Omega$)	
	Display	SAP-300 – graphic display unit	
	Service interface	Compatible with SAT-506-0	
	Relay (optional)	SPDT 30 V / 1 A DC; 42 V / 0.5 A AC	
Measuring frequency		~1/s	
Antenna material ⁽¹⁾		1.4571 (316Ti) stainless steel, or plastic antenna enclosure (PP / PVDF / PTFE)	
Process temperature		-40...+80 °C (-40...+176 °F), High-temperature version: -40...+200 °C ⁽²⁾ (-40...+400 °F)	
Ambient temperature		-40...+70 °C (-40...+158 °F), with display -20...+70 °C (-4...+158 °F)	
Process pressure		PP, PVDF, PTFE antenna: -1...3 bar (-14.5...43.5 psi); Stainless steel antenna: -1...40 bar (-14.5...580 psi)	
Seal		EPDM for PP and stainless steel (1.4571 (316Ti SS)) antenna, FPM (Viton®) for PVDF and PTFE antenna. Optional: EPDM, FFKM Perfluoroelastomer (Kalrez® 6375)	
Process connection		1", 1½" BSP/NPT, TriClamp, prepared for welded flange (NIFLANGE)	
Ingress protection		IP66/IP67 (NEMA 4X and NEMA 6 equivalent)	
Electrical connection		2× M20×1.5 cable glands + 2× internally threaded ½" NPT connection, cable outer diameter: Ø6...12 mm (Ø0.24...Ø0.47") (shielded cable is recommended), wire cross section: 0.5...1.5 mm ² (20...16AWG)	
Electrical protection		Overvoltage Class 1; (Class III [SELV])	
Housing material ⁽¹⁾		Fiberglass-reinforced plastic (PBT)	Painted aluminum Stainless steel 1.4571/1.4404 (316Ti/316L eq.)
Weight		0.6...0.8 kg (1.3...1.8 lb)	1.1...2 kg (2.4...4.4 lb) 2.4...2.9 kg (5.3...6.4 lb)

⁽¹⁾According to order code.

⁽²⁾High temperature version with metal housing and stainless steel or PTFE encapsulated antenna only.

TYPE-DEPENDENT DATA

	Encapsulated Antenna (W□P, W□V, W□F)			Lens-antenna (W□C, W□E, W□G)			Stainless Steel Antenna (W□S, W□M, W□K)		
	W□□-212-□, W□□-213-□	W□□-214-□, W□□-215-□	W□□-224-□, W□□-225-□	W□□-212-□, W□□-213-□	W□□-214-□, W□□-215-□	W□□-224-□, W□□-225-□	W□□-212-□, W□□-213-□	W□□-214-□, W□□-215-□	W□□-224-□, W□□-225-□
Antenna material	PP, PVDF, PTFE			PTFE			Stainless Steel 1.4571/1.4404 (316Ti/316L eq.)		
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)	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")		≤6 m (19.7 ft): ±2 mm (±0.08"); >6 m: ±4 mm (±0.16")	±2 mm (±0.08")	
Antenna insertion length ⁽⁴⁾	56 mm (2.2")	70 mm (2.76")		28 mm (1.1")	46 mm (1.8")		80 mm (3.15")	90 mm (3.54")	
Process pressure	-1...3 bar (-14.5...43.5 psi)						-1...25 bar (-14.5...362.6 psi)		
Beam angle (-3 dB)	12°	7°		12°	7°		12°	7°	
Process connection	1" BSP/NPT	1½" BSP/NPT		1" BSP/NPT	1½" BSP/NPT		1" BSP/NPT	1½" BSP/NPT	

⁽¹⁾ From the tip of the antenna, if dielectric constant (ϵ_r) < 80.

⁽²⁾ May be limited for media with low dielectric constants or non-vertical or non-planar surfaces.

⁽³⁾ With an ideal reflecting surface, according to IEC 62828-1, an accuracy of ±2 mm (±0.079") is not guaranteed for Region 3 and Region 4 settings.

⁽⁴⁾ From process connection.

Ex INFORMATION

Application group		IIC	IIIC
Standard version		WE□-2□□-8 Ex, WG□-2□□-8 Ex	
Ex marking (ATEX)		⊕ II 1G Ex ia IIC T6 Ga	⊕ II 1D Ex ia IIIC T85°C Da
Ex marking (INMETRO)		Ex ia IIC T6 Ga	Ex ia IIIC T85°C Da
High-temperature version		WH□-2□□-8 Ex, WJ□-2□□-8 Ex ⁽⁵⁾	
Ex marking (ATEX)		⊕ II 1G Ex ia IIC T6...T3 Ga	⊕ II 1D Ex ia IIIC T85°C...T180°C Da
Ex marking (INMETRO)		Ex ia IIC T6...T3 Ga	Ex ia IIIC T85°C...T180°C Da
Ex power supply, intrinsically safety data ⁽⁶⁾		$U_i = 30 \text{ V}$, $I_i = 100 \text{ mA}$, $P_i = 0.75 \text{ W}$ $C_i \leq 12 \text{ nF}$, $L_i \leq 250 \mu\text{H}$	$U_i = 30 \text{ V}$, $I_i = 140 \text{ mA}$, $P_i = 1 \text{ W}$ $C_i \leq 12 \text{ nF}$, $L_i \leq 250 \mu\text{H}$
Supply voltage		12...30 V DC	
Electrical connection	Cable entry	2× M20×1.5 cable glands + 2× internally threaded ½" NPT connection	
	Cable outer diameter	Ø6...12 mm (Ø0.25...0.5")	
	Wire cross-section	0.5...1.5 mm ² (AWG20...15)	

⁽⁵⁾ Under development.

⁽⁶⁾ In IIB applications, Ex power supply data for IIIC can be used.

TEMPERATURE DATA FOR Ex CERTIFIED MODELS

Temperature data	Standard version WE□-2□□ / 3□□-8 Ex, WG□-2□□ / 3□□-8 Ex	High-temperature version WH□-2□□-8 Ex / WH□-3□□-8 Ex, WJ□-2□□-8 Ex / WJ□-3□□-8 Ex			
	Ex ia IIC, Ex ia IIIC	Ex ia IIC, Ex ia IIIC			
Temperature class	T6 T85°C	T6 T85°C	T5 T100°C	T4 T135°C	T3 T180°C
Highest process temperature	+80 °C (+176 °F)	+100 °C (+158 °F)		+135 °C (+275 °F)	+180 °C (+356 °F)
Highest surface temperature at the process connection	+70 °C (+158 °F)			+135 °C (+275 °F)	
Highest ambient temperature	+70 °C (+158 °F)			+60 °C (+140 °F)	

POLARIZATION

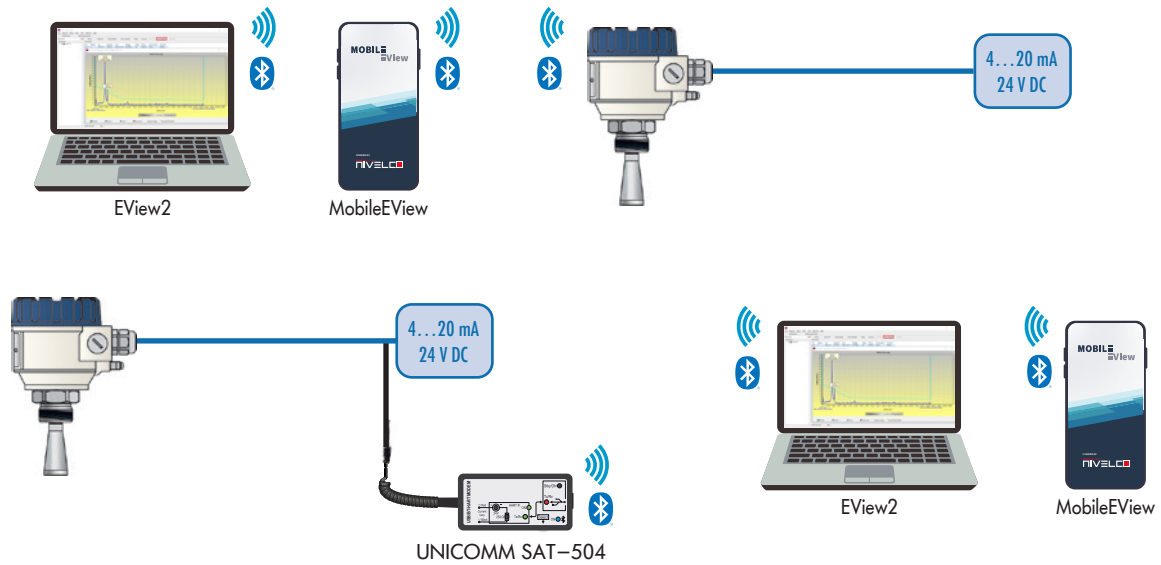
The PilotREK W-200 80 GHz radar is much less sensitive to installation conditions, both in terms of polarization and clutter sensitivity, due to its narrow and nearly circular beamwidth.

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.

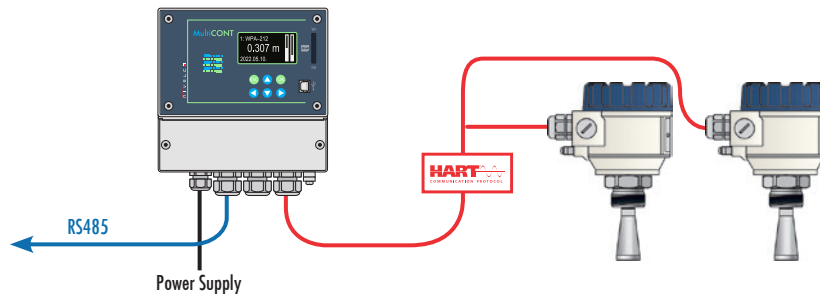
Bluetooth® CONNECTIVITY

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.

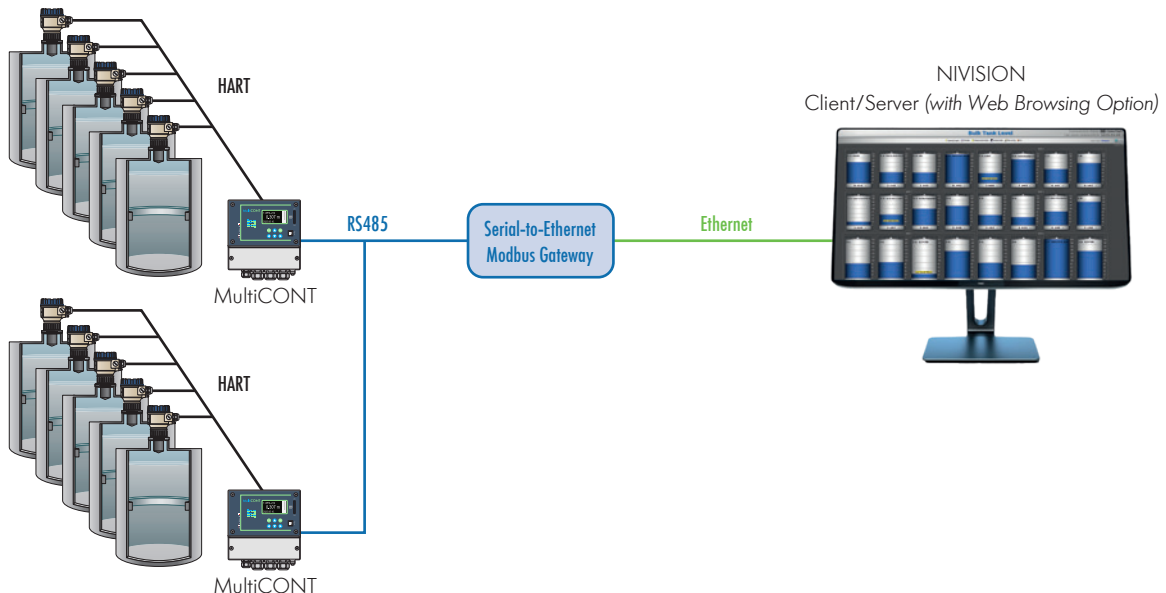


PiLoTREK TRANSMITTERS IN HART® MULTIDROP LOOP

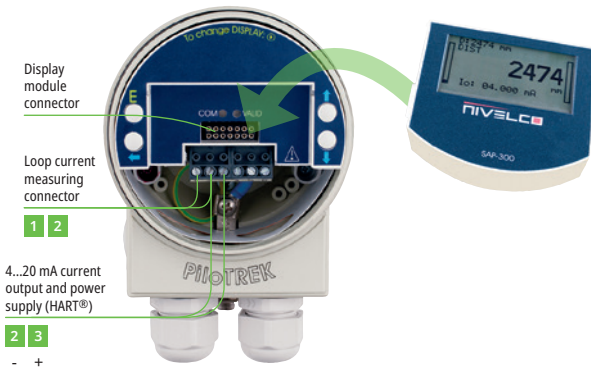
MultiCONT multi-channel remote controllers process, display, and transmit data from NIVELCO's HART®-equipped transmitters in a multidrop loop. Up to 15 of these connected transmitters can be programmed and maintained from MultiCONT, which supports data-logging tasks. MultiCONT provides programmable relay 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 NIVISION inventory monitoring system.



WIRING



WJT-215-B

PROGRAMMING, ECHO MAP

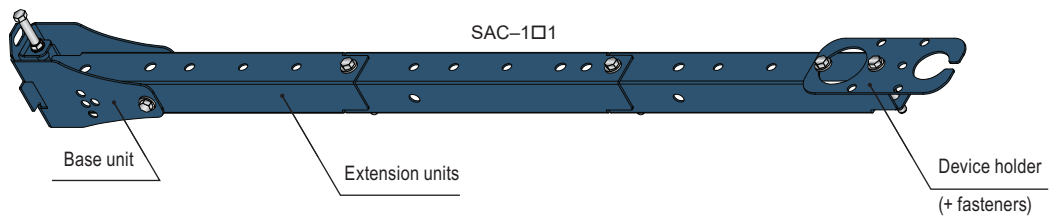
All parameters can be programmed via the optional UNIDISP SAP-300 plug-in display; measurement and output parameters can be set using a text-based menu system. Measured values are displayed as numbers and bar graphs on the dot-matrix screen. The echo map helps detect false reflections and optimizes measurement configuration.

MOUNTING

The device must be mounted far as possible from interfering objects inside the tank and from sources of interference, such as waves, vortices or strong vibrations. The antenna axis must be perpendicular to the surface of the measured medium within $\pm 2...3^\circ$. For outdoor use, we recommend using an aluminum housing. In regions with extremely hot climates, we recommend protecting the device from direct sunlight to avoid exceeding the ambient temperature limits of the housing. For this purpose, we recommend using the UNIMOUNT SAB sunshield.

SAC-1□1 - MOUNTING ASSEMBLY

We recommend our new universal mounting bracket designed for level transmitters and level switches. The complete set includes the base unit, one or more extension modules, the 1" suspension element, adapter plates for 1", 1 1/2" and 2" process connections, as well as the full fastening screw kit. All components can be assembled according to the user's installation requirements. The bracket is manufactured from painted aluminum and stainless steel and is rated for a maximum load of 5 kg. It features a length adjustable between 250...1000 mm, leveling possibility, and both horizontal and vertical pivoting options, ensuring broad applicability in industrial environments.



APPLICATIONS



DIMENSIONS*

Plastic housing (W□M, W□P, W□V, W□F)

Stainless steel antenna		PVDF encapsulated antenna	
W□M-212-□ / -213-□	W□M-214-□ / -215-□	W□□-212-□ / -213-□	W□□-2□4-□ / -2□5-□

Aluminum housing (W□A, W□B, W□S, W□T)

Stainless steel antenna		PVDF encapsulated antenna	PTFE encapsulated antenna
W□S-212-□ / -213-□	W□S-214-□ / -215-□	W□T-224-B	W□B-224-B

Stainless steel housing (W□K)

Stainless steel antenna		PTFE encapsulated antenna	
W□K-212-□ / -213-□	W□K-214-□ / -215-□	W□L-213-□	W□L-215-□

Aluminum housing

High-temperature version

PTFE encapsulated antenna

W□T-213-□	W□T-215-□	WHT-215-□	WHL-21C-□

*Please note that not all versions of the units are shown in the Dimensions section. The dimensions are in millimetres.

ORDER CODES (NOT ALL COMBINATIONS AVAILABLE)

Advanced 80 GHz Radar Level Transmitters

PiloTREK W ■ ■ - 2 ■ ■ - ■ (1)

Version	Code	Antenna / Housing	Code	Measurement range	Code	Process connection	Code	Output / Certificates	Code
Transmitter	E	Plastic (PBT)	P	10 m (33 ft)	1	1" BSP ⁽⁴⁾	2	4...20 mA + HART [®] Ex ia IIC + Bluetooth [®] + Bluetooth [®] / Ex ia GD + Relay + Relay + Bluetooth [®]	4
Transmitter + display	G	Aluminum	A	20 m (66 ft)	2	1" NPT ⁽⁴⁾	3		8
Transmitter, high-temp. version ⁽²⁾	H	Stainless steel	D	30 m (100 ft) ⁽³⁾	3	1½" BSP ⁽⁵⁾	4		B
Transmitter + display, high-temp. version ⁽²⁾	J	Stainless steel	Plastic (PBT)	M	1½" NPT ⁽⁵⁾	1½" TriClamp ^{(6) (4)}	5		E
			Aluminum	S					C
Stainless steel	PVDF	Stainless steel	K	2" TriClamp ⁽⁶⁾	3" TriClamp ⁽⁶⁾	4" TriClamp ⁽⁶⁾	D		D
		Plastic (PBT)	V						E
		Aluminum	B						F
PTFE	Lens-antenna	Stainless steel	W	Ø75 mm (2½") ^{(3) (7)}	Prepared for welded flange ⁽⁸⁾	S	R		
		Plastic (PBT)	F						
		Aluminum	T						
		Stainless steel	L						
		Plastic (PBT)	C						
		Aluminum	E						
		Stainless steel	G						

⁽¹⁾ For explosion-proof devices, the article number is followed by "Ex" on the data plate. ⁽²⁾ Max. +200 °C (+400 °F). High-temperature version with metal housing and stainless-steel or PTFE encapsulated antenna only. ⁽³⁾ Under development. ⁽⁴⁾ Only for 10 m (33 ft) measuring range. ⁽⁵⁾ For 10 m (33 ft) and 20 m (66 ft) measuring range. ⁽⁶⁾ Only for PTFE antenna version. ⁽⁷⁾ Only 30 m (98.5 ft) and encapsulated types, flanges available from size DN80 should be ordered separately. ⁽⁸⁾ Only for 10 m (33 ft) and 20 m (66 ft) ranges, with 1½" stainless steel antenna, flange type MF□-□□□-L to be ordered separately.

PROCESS CONNECTIONS⁽⁹⁾

Carbon steel, PTFE lined carbon steel, polypropylene (PP), and stainless steel, DIN, ANSI, and JIS flanges

NIFLANGE MFT-□□□-□

EPDM, FPM, FFKM available for all types

⁽⁹⁾ The above process connections and special seals are ordered separately and must be specified in the text part of the order.



MultiCONT
PRN-200



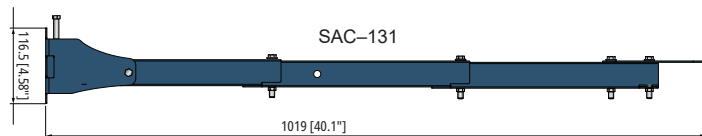
MonoCONT
PDF-410-2

ACCESSORIES

Graphic plug-in display module	UNIDISP SAP-300-0
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-□

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).



Mounting brackets for level transmitters	UNIMOUNT SAC-1□□1-0
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 [®]	



Use the NIVELCO Selector to configure your PiloTREK to best suit your application.

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