PiloTREK WP–200

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



5 YEARS WARRANTY

NIVELCO

LEVEL TRANSMITTERS

The **PiloTREK WP–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 radars 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 for measuring level of liquids, masses, emulsions, and other chemicals widely used in the water industry, food industry, energy industry, pharmaceutical industry, and chemical industry, which provides measurement results with millimeter accuracy. It is also excellent for measuring substances prone to vapor formation and liquids with gas blanket or large-particle bulk 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, and PACT*ware*™ software, or programmed via Bluetooth® communication with the **MobileEView** app.

FEATURES

- 2-wire 80 GHz *(W-band)* radar
- Accuracy of ±2 mm
- Easy to install due to small antenna diameter
- 1", 1½" encapsulated horn 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 versions

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
- 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

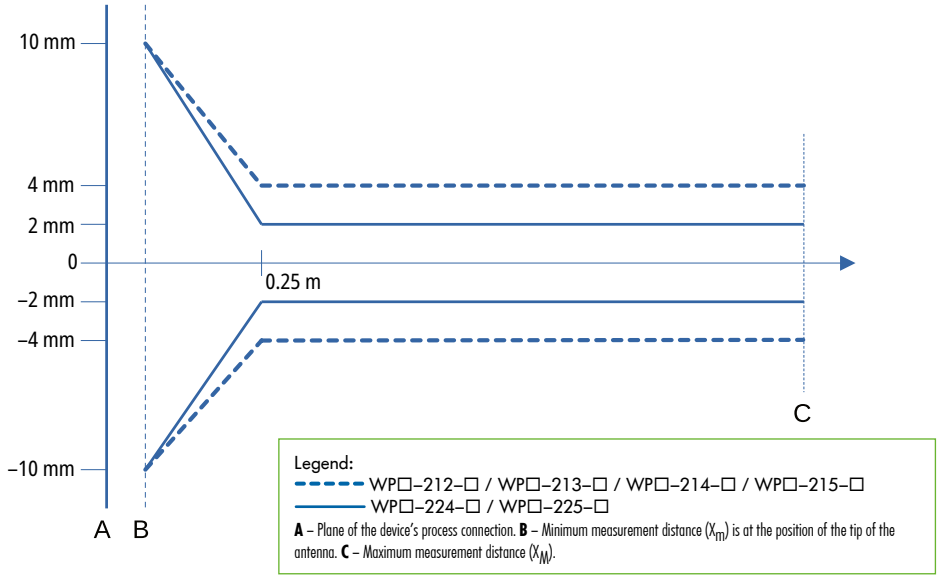
AREAS OF APPLICATION

- 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
WP☐–2☐5–4

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).



WP☐–212–4
WP☐–213–4

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 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.

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 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

		PVDF housing WPB, WPT–2☐☐–☐	PP housing 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 5.1 (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

	WP□–212–□ WP□–213–□	WP□–214–□ WP□–215–□	WP□–224–□ WP□–225–□
Dead zone[2]	0 m		
Maximum measuring range[3]	10 m (33 ft)		20 m (66 ft)[1]
Accuracy[4]	±4 mm (0.16")		±2 mm (0.08")
Beam angle *(–3 dB)*	12°	7°	
Antenna insertion length[5]	56 mm (2.2")	70 mm (2.76")	
Lower process connection	1" BSP / NPT	1½" BSP / NPT	
Upper process connection	1" BSP		

[1] 30 m, (100 ft) for good reflective products, e.g.watered solutions.
[2] Measured from the tip of the antenna.
[3] May be limited in the case of low dielectric constant or non-perpendicular or non-planar media.
[4] In the case of an ideal reflecting surface.
[5] 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
	$C_i \leq$ 12 nF + 0.12 nF/m cable, $L_i \leq$ 238 µH + 0.65 µH/m cable with standard 5 m cable: $C_i \leq$ 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.*

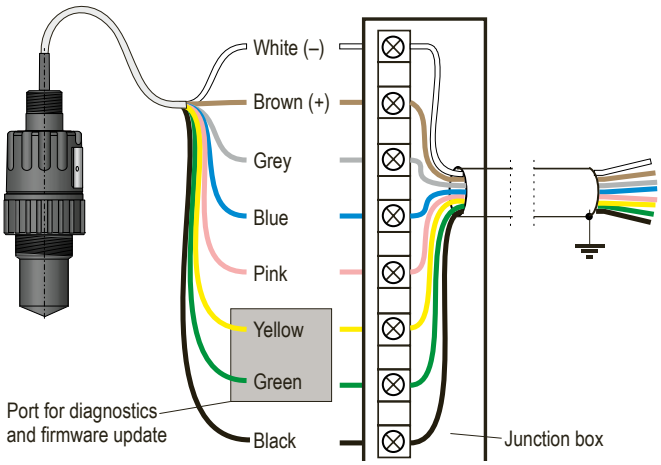
POLARIZATION

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



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

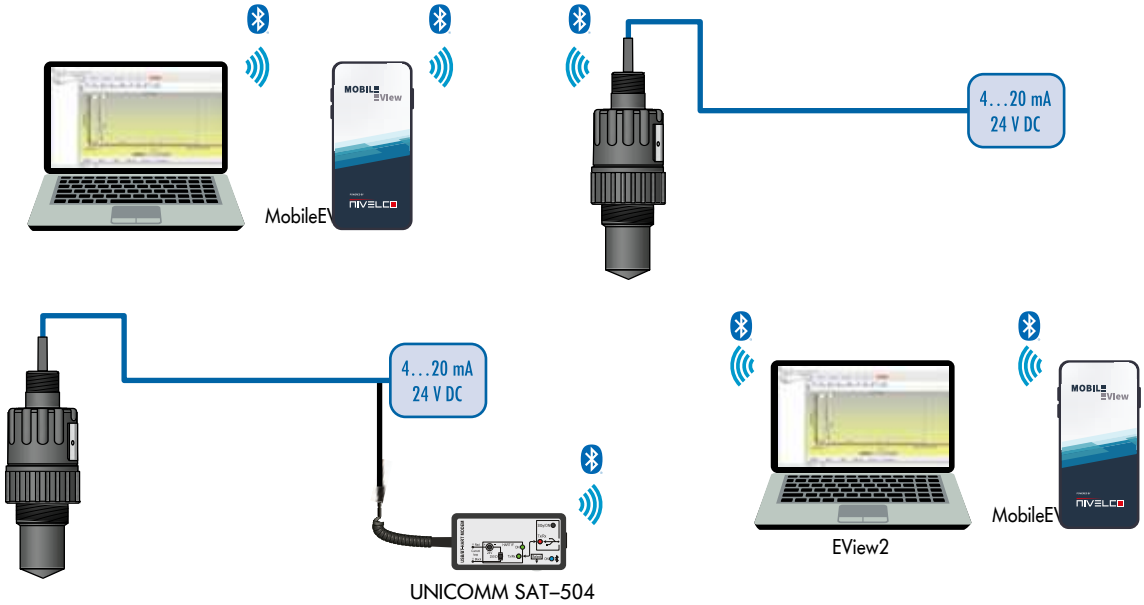
The device must be mounted far as possible from interfering objects inside the tank and sources of interference, such as waves, vortex or strong vibrations. The antenna axis must be perpendicular to the surface of the measured medium within ±2…3°. In regions with extremely hot climates, we recommend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





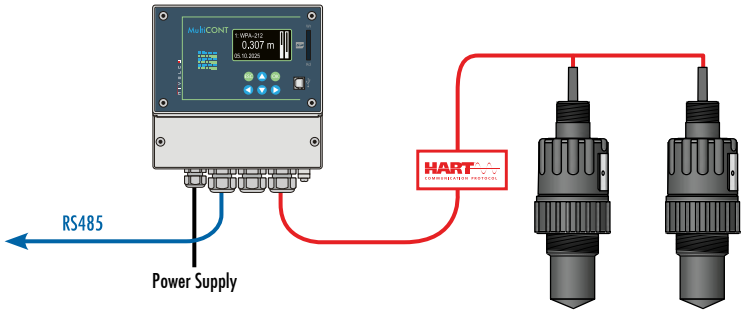
Bluetooth® CONNECTIVITY

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.

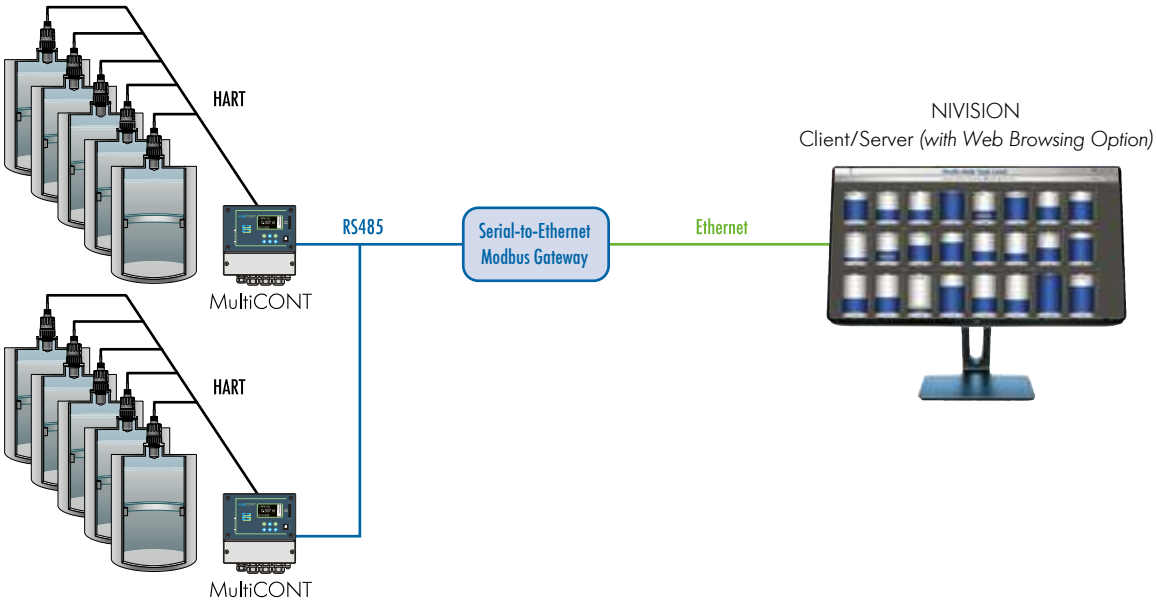


PiloTREK TRANSMITTERS IN HART® MULTIDROP LOOP

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.

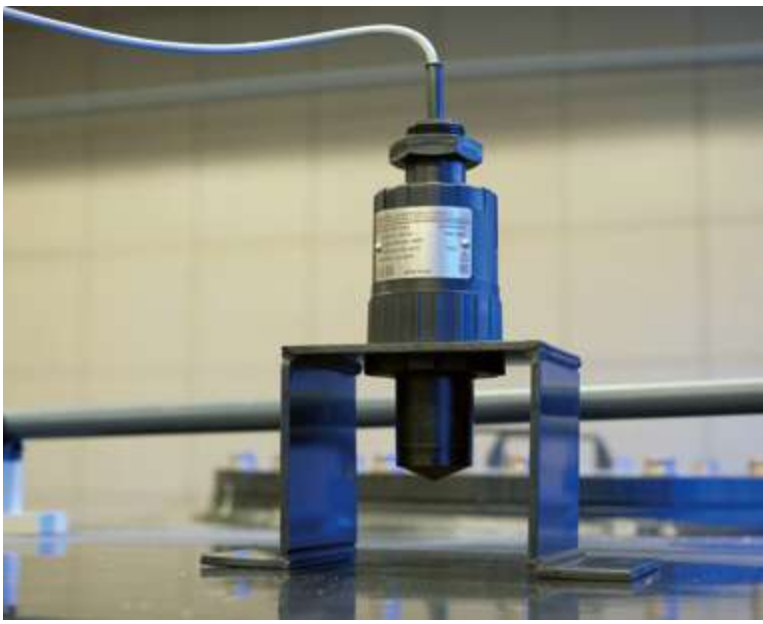


MultiCONT can send measurement data via RS485 to PLCs, computers running third-party SCADA systems, or the NIVELCO **NIVISON** inventory monitoring system.





APPLICATIONS





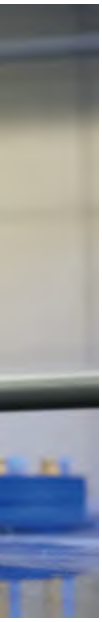






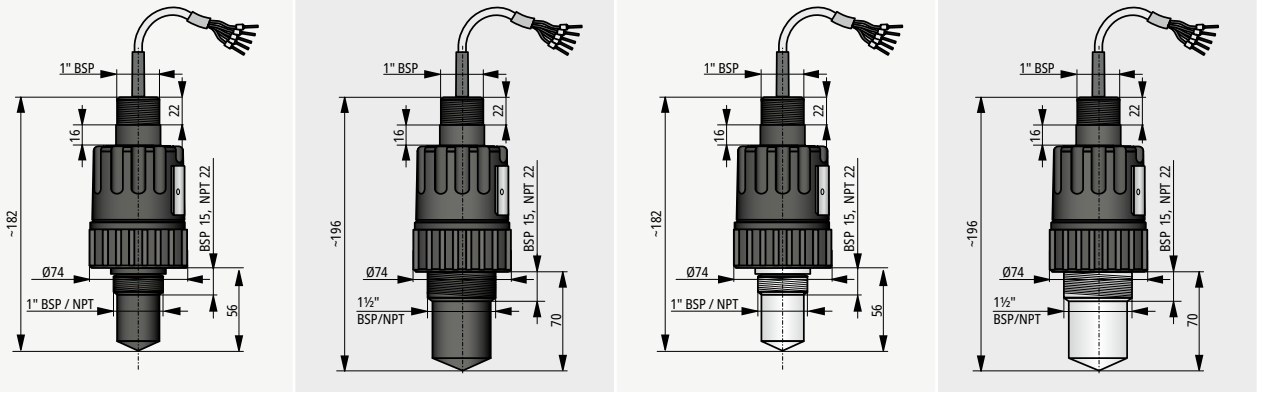






DIMENSIONS

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)

Integrated type

Antenna / Housing material	Code
PP / PP	A
PVDF / PVDF	B
PTFE / PVDF	T

80 GHz

Measurement distance	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

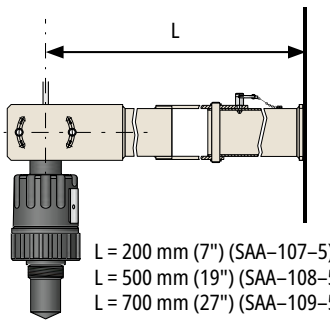
Output / Ex		Code
4...20 mA + HART®	–	4
	Ex ia	8
	+ Relay	H
	+ Bluetooth®	B
	Bluetooth® / Ex ia GD	E
	+ Relay + Bluetooth®	R

(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

HART®–USB/Bluetooth® modem for remote programming	UNICOMM SAT–504–☐
eLink module	UNICOMM SAT–506–☐
HART®–USB/RS485 modem for remote programming with PC, DIN rail mountable	UNICOMM SAK–305–☐
Multichannel process controller and display unit	MultiCONT PRW–2☐☐–☐
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
Smart Field Display & Data Logger	MonoCONT P☐F–☐1☐–☐
Mounting brackets for level transmitters	NIVOSONAR SAA–10☐–☐
Flanges	NIVOSONAR SFA–3☐☐–0

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



L = 200 mm (7") (SAA–107–5)
L = 500 mm (19") (SAA–108–5)
L = 700 mm (27") (SAA–109–5)

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National Research, Development and Innovation Office Hungary

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wpa20025en06b // Information is accurate to the best of NIVELCO'S knowledge. We reserve the right to change specifications at any time. The general tolerance on the dimensions shown on the outline drawings is ± 1 mm. We reserve the right to make changes to the dimensions.

#NivelcoDevices