# Integrated Non-Contact Microwave Level Transmitters

The new **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 liquids, masses, emulsions, and other chemicals widely used in, for example, 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<sup>®</sup> compliant NIVELCO EView2, MultiCONT universal process controller, and PACTware<sup>TM</sup> software, or programmed via Bluetooth<sup>®</sup> communication with the new 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
- PACTware<sup>™</sup> 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
- 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



WPD-2D4-4







WPD-2D2-4

### OPERATING PRINCIPLE

The reflection of the millimeter-waves is highly dependent on the dielectric constant of the medium. Therefore, the measured medium's dielectric constant ( $\epsilon_r$ ) must be over 1.9 for millimeter-wave level measurement. The measurement principle of a level transmitter with a millimeter-waves signal is based on measuring the reflection's time of flight.

Informative E <sub>r</sub> values							
Butane (C <sub>4</sub> H <sub>10</sub> )	1.4	Ethers	4.4	Gasoline	2.3	Methyl alcohol (CH <sub>3</sub> OH)	33.1
LP gas	1.61.9	Acetic acid (CH <sub>3</sub> COOH)	6.2	Bitumen	24	Glycol (C <sub>2</sub> H <sub>6</sub> O <sub>2</sub> )	37
Kerosene		Limestone	6.19.1	Carbon disulfide (CS <sub>2</sub> )	2.0	Nitrobenzene (C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub> )	40
Crude Oil	2.1	Ammonia (NH <sub>3</sub> )	1726	Clinker	2.7	Glycerin (C <sub>3</sub> H <sub>8</sub> O <sub>3</sub> )	41.1
Diesel Oil		Acetone (C <sub>3</sub> H <sub>6</sub> O)	21	Resin	2.43.6	Water (H <sub>2</sub> O)	80
Benzol (C <sub>6</sub> H <sub>6</sub> )	2.2	Ethyl alcohol (C <sub>2</sub> H <sub>5</sub> OH)	24	Cereal Grain	35	Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ) (T = 20 °C )	84

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 WP-200** level transmitter is a continuous-wave frequency modulated radar (*FMCW*) operating at 80 GHz (*W-band*). The most obvious advantages of 80 GHz radars over lower frequency (5...12 & 25 GHz) radars are smaller antenna size, better focus, and smaller beam angle. 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, 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 fre	quency	7781 GHz (W-band)			
Measuring	g range <sup>(1)</sup>	030 m			
Lowest $\boldsymbol{\epsilon}_{r}$	of medium	1.9			
Resolution	1	0.1 mm			
Supply vo	ltage	1236 V DC			
	Analog	420 mA (3.920.5 mA); I	$R_{Lmax} = (U_{s} - 12 \text{ V}) / 0.02 \text{ A}$		
Output	Digital	Bluetooth <sup>®</sup> LE 5.1 (optional), HART <sup>®</sup> interface (loop resistance ≥250 Ω)			
Output	Service interface	SAT-504-3 compatible; galvanically isolated; 3.3 V LVDS; max. 100 mA			
	Relay (optional)	SPDT 30 V / 1 A DO	C; 42 V / 0.5 A AC		
Measuring	g frequency	~1/s			
Antenna r	naterial <sup>(1)</sup>	Encapsulated horn antenna (PP / PVDF / PTFE)			
Process te	mperature		00.00.00		
Ambient temperature		-40+80 °C	-30+80 °C		
Process p	ressure	-13 bar			
Seal		FPM (Viton®). Optional: EPDM, FFKM Perfluoroelastomer (Kalrez® 6375)	EPDM		
Process connection		1", 1½" BSP / NPT			
Ingress protection		IP66 / IP68			
Electrical connection		$4 \times 0.5 \text{ mm}^2$ shielded Ø6 mm cable $\times 5$ m (up to 30 m); For relay option: $7 \times 0.5 \text{ mm}^2$ shielded cable			
Electrical protection		Overvoltage Class 1; (Class III [SELV])			
Weight		~ 600 g			
<sup>(1)</sup> Depending on order code.					



### TYPE-DEPENDENT DATA

	WP□-212-□ WP□-213-□	WP□-214-□ WP□-215-□	WP□-224-□ WP□-225-□
Dead zone <sup>(2)</sup>		0 m	
Maximum measuring range <sup>(3)</sup>	10	m	20 m
Accuracy <sup>(4)</sup>	±4	mm	±2 mm
Beam angle (–3 dB)	12°	7	0
Antenna insertion length <sup>(5)</sup>	56 mm	70	mm
Lower process connection	1" BSP / NPT	11⁄2" BS	P / NPT
Upper process connection		1" BSP	
<sup>(2)</sup> Maggurad from the tip of the antenna	<sup>(3)</sup> May be	limited in the case of low dielectric constant	or pop-porpondicular or pop-planar modia

<sup>(3)</sup> In the case of an ideal reflecting surface.

<sup>(3)</sup> May be limited in the case of low dielectric constant or non-perpendicular or non-planar media.
<sup>(3)</sup> Measured from the seal plane of the process connection.

#### **Ex INFORMATION**

	₩P□-2□□-8 Ex,	WP🗆–2🗆 🗆 – E Ex	
ATEX certificate number	BKI24AT	EX001 X	
Ex marking (ATEX)	๎ଢ II 1 G Ex ia IIC T5 Ga	₪ II 1 D Ex ia IIIC T95°C Da	
INMETRO certificate number	DNV 24	.0166 X	
Ex marking (INMETRO)	Ex ia IIC T5 Ga	Ex ia IIIC T95°C Da	
<b>F</b> 1	$U_{i} = 30 \text{ V}, I_{i} = 100 \text{ mA}, P_{i} = 0.75 \text{ W}$	$U_i = 30 \text{ V}, I_i = 140 \text{ mA}, P_i = 1 \text{ W}$	
ex power supply, intrinsically safety data <sup>(6)</sup>	C <sub>i</sub> ≤ 12 nF + 0.12 nF/m cable, L <sub>i</sub> ≤ 238 µH + 0.65 µH/m cable with standard 5 m cable: C <sub>i</sub> ≤ 12.5 nF, Li ≤ 242 µH		
Supply voltage	1230 V DC		

<sup>(6)</sup> 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	Т5	T95°C	
Highest ambient temperature	+80 °C		
Highest surface temperature of the device <sup>(7)</sup>			

<sup>(7)</sup> 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.



### PIIoTREK TRANSMITTERS IN HART® MULTIDROP LOOP

**MultiCONT** multi-channel remote controllers process, display, and transmit data from NIVELCO's HART<sup>®</sup>-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.







## 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 cover must be parallel to the measured surface within  $\pm 2...3^{\circ}$ . 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<sup>®</sup> CONNECTIVITY

The Bluetooth<sup>®</sup> 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.





# Integrated Non-Contact Microwave Level Transmitters

## PiloTREK WP-200

S
2
ш
н.
н.
=
≥
S
Z
7
2
<u>e</u>
-
- <b>1</b>
ш.
>
ñi.

PiloTREK WP-200 80 GHz Integrated 5 years				
2-wire integrated pulse burst radar level transmitter with PP or PVDF sensor, ingress protection: IP68				
Version				
W 🗆 – 2 🗾 –				
Р	Integrated transmitter			
Antenna / Housing				
W P 🗖 – 2 📕 – 📕				
Α	PP / PP			
В	PVDF / PVDF			
T	PIFE / PVDF			
Measurement range				
W P – 2 🗆 – 📕	40			
1	10 m			
2 *	20111 30 m			
Dreases connection low				
Process connection – low	ver / upper			
W P = - Z =	1" RSP / 1" RSP (only for 10 m measuring range)			
2	1" NPT / 1" BSP (only for 10 m measuring range)			
4	1½" BSP / 1" BSP (only for 10 m or 20 m measuring range)			
5	1½" NPT / 1" BSP (only for 10 m or 20 m measuring range)			
6 *	2" BSP / 1" BSP (only for 20 m measuring range)			
7 *	2" NPT / 1" BSP (only for 20 m measuring range)			
8 *	Ø75 mm (2½") / 1" BSP (only for 30 m measuring range)			
Output / Certificates				
W P 🔳 – 2 🔳 🗖 – 🗖				
4	420 mA + HART®			
8	420 mA + HART <sup>®</sup> / Ex ia GD			
Н	420 mA + HART® + relay			
В	420 mA + HART® + Bluetooth®			
E	420 mA + HARI® + Bluetooth® / EX la GD			
* Under development	420 MA + HARTS + Teldy + BlueloothS			
Cable				
Maximum length 30 m: sold by	, the meter over the standard 5 m			
Accessories sold separat	elv: see relevant nage for details			
necessories sold separat				
	ridiyes HADT® USB/Bluataath® madam			
SAI - SU4 -	HART®-IISR/RS485 modem			
SAR - 30	Mounting brackets			
J A A - I V	in our ling brockets			



WPD-212-D, WPD-213-D



WPD-2D4-D, WPD-2D5-D



SAA-102





SFA – 3 📕 🗖 – 0	Flanges
SAT – 504 – 🔳	HART <sup>®</sup> -USB/Bluetooth <sup>®</sup> modem
SAK – 305 – 📕	HART <sup>®</sup> -USB/RS485 modem
SAA – 10 🔳 – 📕	Mounting brackets
P 🔳 F – 🔳 1 🔳 – 🔳	Smart Field Display and Data Logger
P 📕 F – 📕 0 1 – 📕	Loop Display
SAA-102-0	Aiming device, 500 mm, aluminum, Pg9, drilled as DN50 PN16
Process seal material	

#### ss seal material

- Factory default: EPDM for PP housing, FPM for PVDF and PTFE housing

- Optional: EPDM, FPM, FFKM available for all types

Process seals are ordered separately and must be specified in the text part of the order. Other seals are also available.