# PiloTREK WE–200

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


5 YEARS WARRANTY

NIVELCO

LEVEL TRANSMITTERS

The new **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, and PACTware™ software, or programmed via Bluetooth® communication with the new **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 version

## 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
- 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


WES–214–4


WGS–215–B


WEP–214–4

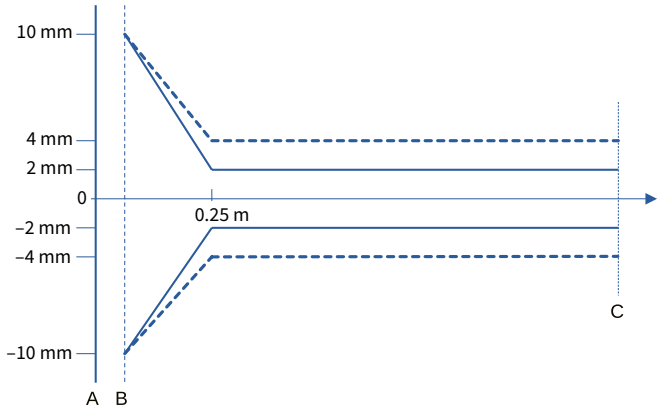

WGB–225–B


WGT–214–8Ex


WHS–214–B


WEK–224–E

## LINEARITY ERROR




Legend:
- W□□–21□–□
- W□□–22□–□ / W□□–238–□

**A** – Plane of the device's process connection.

**B** – The minimum measurement distance ($X_m$), below which the radar cannot measure, due to the insertion length of the antenna.

**C** – Maximum measurement distance ($X_M$).

## OPERATING PRINCIPLE

The reflection of millimeter waves is highly dependent on the dielectric constant of the medium. Therefore, the dielectric constant ($\varepsilon_r$) of the medium to be measured must be greater than 1.9 for millimeter-wave level measurement.

| Informative $\varepsilon_r$ 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 | Sulfuric acid ($H_2SO_4$) (T = 20 °C) | 84 |

The measurement principle of a level transmitter with a millimeter wave signal is based on measuring the reflection's time of flight. The propagation speed of millimeter wave signals in air, gases and vacuum is almost constant regardless of the temperature and pressure of the medium, so the measured distance is independent of the physical parameters of the intermediate medium. The **PiloTREK WE–200** level transmitter is a frequency modulated continuous wave *(FMCW)* radar 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

| | | 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 $\varepsilon_r$ 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) | | |
| | 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) | | |
| Standard version | Process temperature | –40…+80 °C (–40…+176 °F) | | |
| | Ambient temperature | –40…+70 °C (–40…+158 °F), with display –20…+70 °C (–4…+158 °F) | | |
| High-temperature version | Process temperature | –40…+200 °C[2] (–40…+400 °F) | | |
| | Ambient temperature | –40…+60 °C (–40…+140 °F), with display –20…+60 °C (–4…+140 °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) 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 | | |
| 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 mm² (20…16AWG) | | |
| Electrical protection | | Overvoltage Class 1; (Class III [SELV]) | | |
| Housing material[1] | | Fiberglass-reinforced plastic (PBT) | Painted aluminum | Stainless steel 1.4571 (316Ti) |
| 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

| | W□□–212–□<br>W□□–213–□ | W□□–214–□<br>W□□–215–□ | W□□–224–□<br>W□□–225–□ |
|---|---|---|---|
| Dead zone[1] | 0 m | | |
| Maximum measuring range[2] | 10 m (33 ft) | | 20 m (66 ft) |
| Accuracy[3] | ±4 mm (±0.157") | | ±2 mm (±0.078") |
| Beam angle *(–3 dB)* | 12° | 7° | |
| Antenna insertion length[4] | 80 mm (3.15") | 92 mm (3.62") | |
| Process connection | 1" BSP / NPT | 1½" BSP / NPT | |

[1] Measured from the tip of the antenna.
[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.
[4] Measured from the seal plane of the process connection.

## Ex INFORMATION

| Application group | | IIC | IIIC |
|---|---|---|---|
| **Standard version** | | **WE□–2□□–8 Ex, WG□–2□□–8 Ex** | |
| Ex marking (ATEX) | | ⟨Ex⟩ II 1G Ex ia IIC T6 Ga | ⟨Ex⟩ 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) | | ⟨Ex⟩ II 1G Ex ia IIC T6…T3 Ga | ⟨Ex⟩ 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 V, $I_i$ = 100 mA, $P_i$ = 0.75 W<br>$C_i$ ≤ 12 nF, $L_i$ ≤ 250 µH | $U_i$ = 30 V, $I_i$ = 140 mA, $P_i$ = 1 W<br>$C_i$ ≤ 12 nF, $L_i$ ≤ 250 µH |
| 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 mm² (AWG20…15) | |

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

## TEMPERATURE DATA FOR Ex CERTIFIED MODELS

| | Standard version<br>WE□–2□□ / 3□□–8 Ex,<br>WG□–2□□ / 3□□–8 Ex | High-temperature version<br>WH□–2□□–8 Ex / WH□–3□□–8 Ex,<br>WJ□–2□□–8 Ex / WJ□–3□□–8 Ex | | | |
|---|---|---|---|---|---|
| Temperature data | Ex ia IIC, Ex ia IIIC | Ex ia IIC, Ex ia IIIC | | | |
| Temperature class | **T6<br>T85°C** | **T6<br>T85°C** | **T5<br>T100°C** | **T4<br>T135°C** | **T3<br>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

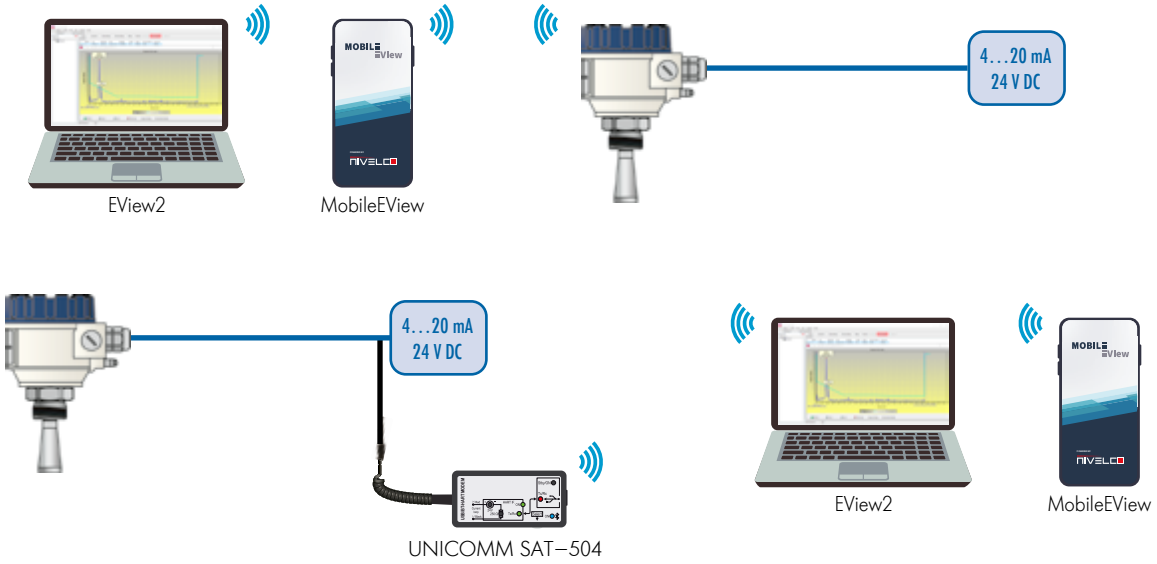
The **PiloTREK W–200** 80 GHz radar is much less sensitive to installation conditions, both in terms of polarization and clutter sensitivity, due to its narrow and nearly circular beamwidth.

## 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.

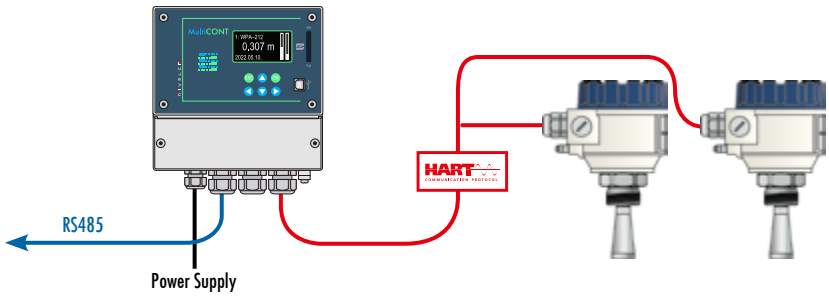
## Bluetooth® CONNECTIVITY

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.

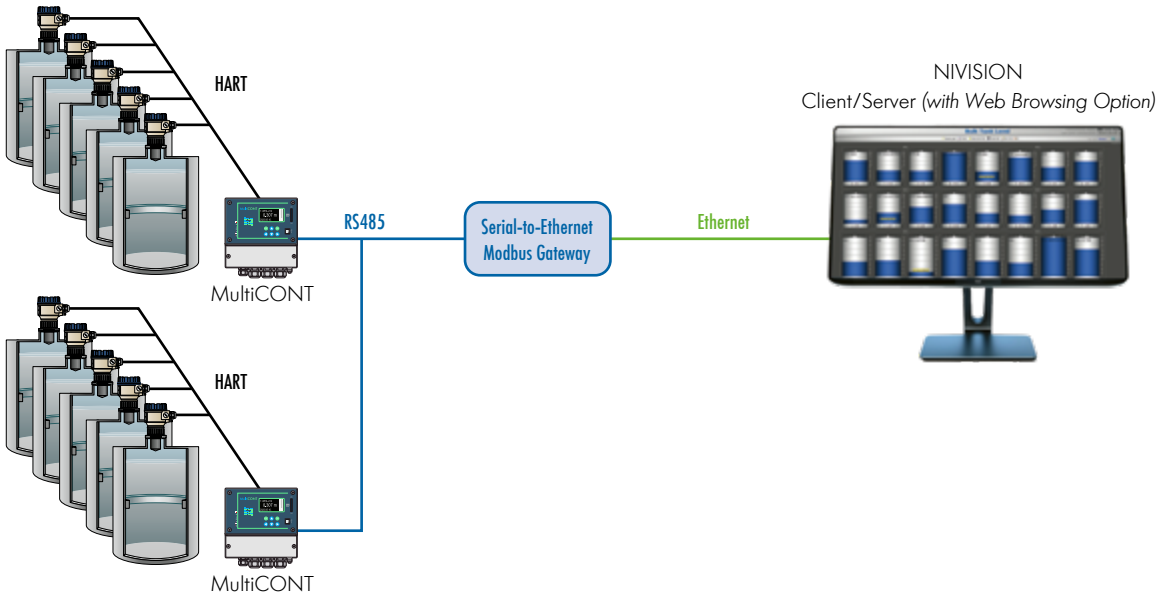



## PiloTREK TRANSMITTERS IN HART® MULTIDROP LOOP

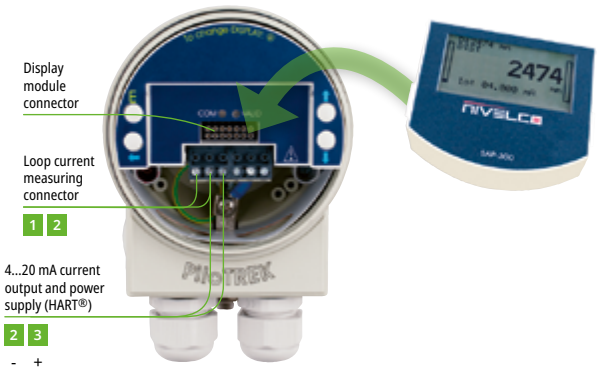
**MultiCONT** multi-channel remote controllers process, display, and transmit data from NIVELCO's HART®-equipped transmitters in a multidrop loop. Up to 15 of these connected transmitters can be programmed and maintained from MultiCONT, which supports data-logging tasks. MultiCONT provides programmable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



## WIRING



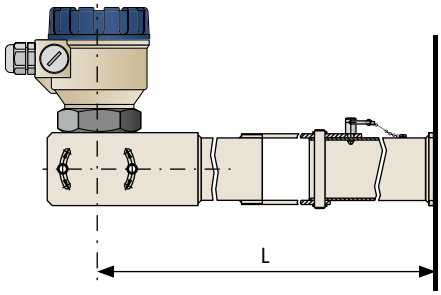

WJT–215–B

## 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 cover must be parallel to the measured surface within ±2…3°.
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.




| Mounting brackets for ultrasonic level transmitters. Material: Plastic / Metal. | NIVOSONAR SAA |
|---|---|
| L = 200 mm (7") | SAA–107–☐ |
| L = 500 mm (19") | SAA–108–☐ |
| L = 700 mm (27") | SAA–109–☐ |
| For 1" BSP threaded process connection | SAA–10☐–0 |
| For 2" BSP threaded process connection | SAA–10☐–3 |
| For 1½" BSP threaded process connection | SAA–10☐–4 |
| For 2" NPT threaded process connection | SAA–10☐–5 |
| For 1½" NPT threaded process connection | SAA–10☐–6 |

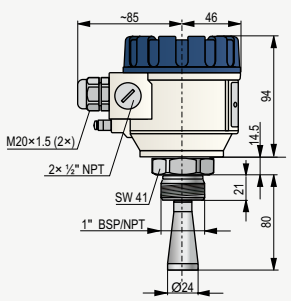
## APPLICATIONS

## DIMENSIONS*

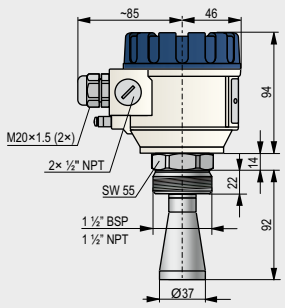
### Plastic housing (W□M, W□P, W□V, W□F)

#### Stainless steel antenna

W□M–212–□ / –213–□

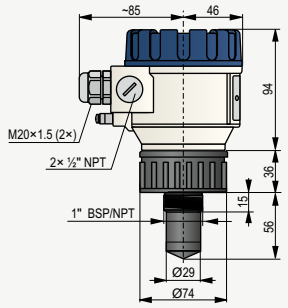



W□M–214–□ / –215–□

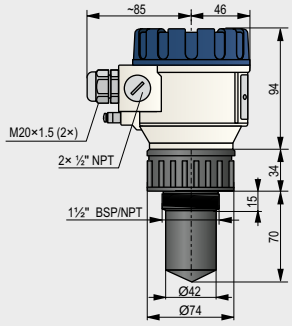



#### Encapsulated antenna

W□□–212–□ / –213–□



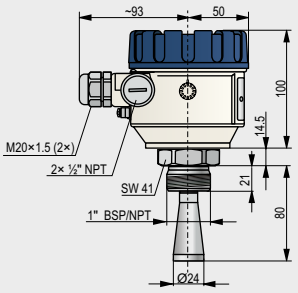

W□□–2□4–□ / –2□5–□



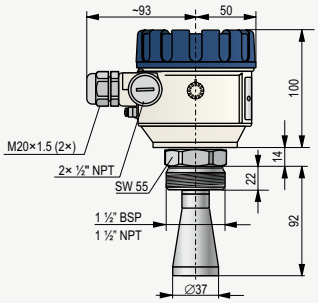

### Aluminum housing (W□A, W□B, W□S, W□T)

#### Stainless steel antenna

W□S–212–□ / –213–□

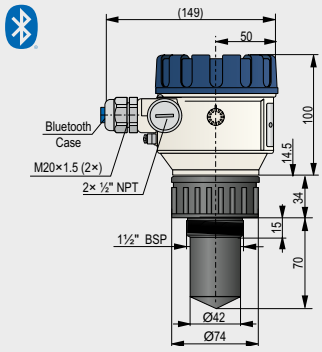



W□S–214–□ / –215–□



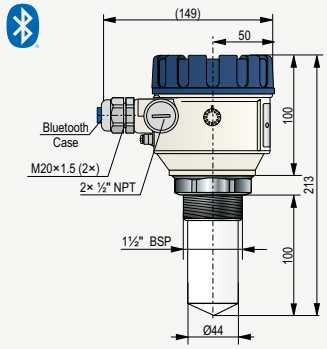

#### PTFE encapsulated antenna

W□T–224–B




#### PVDF encapsulated antenna

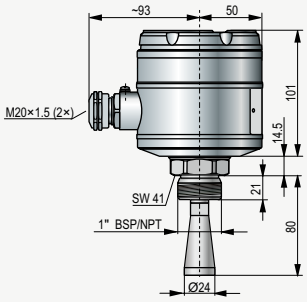
W□B–224–B



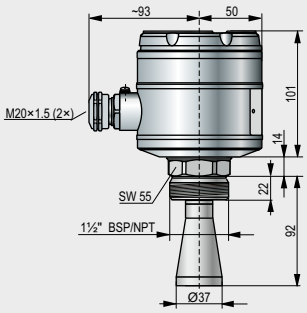

### Stainless steel housing (W□K)

#### Stainless steel antenna

W□K–212–□ / –213–□

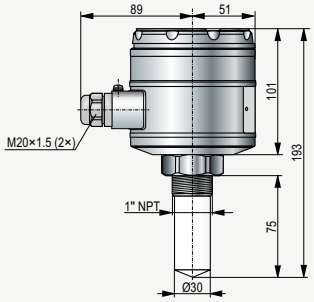



W□K–214–□ / –215–□

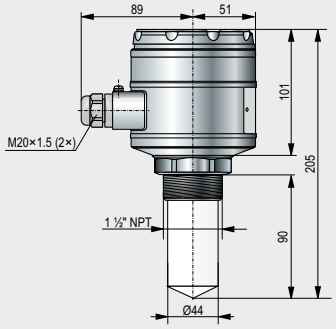



#### PTFE encapsulated antenna

W□L–213–□



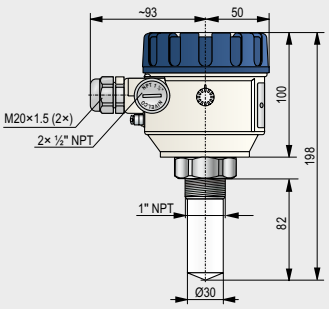

W□L–215–□



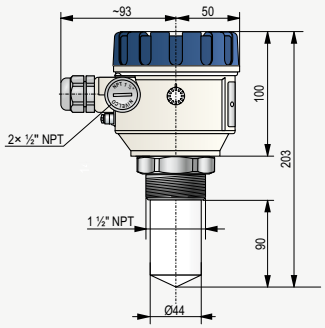

### Aluminum housing

#### PTFE encapsulated antenna

W□T–213–□



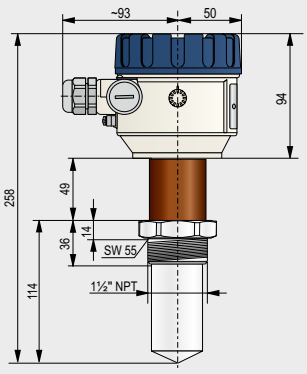

W□T–215–□



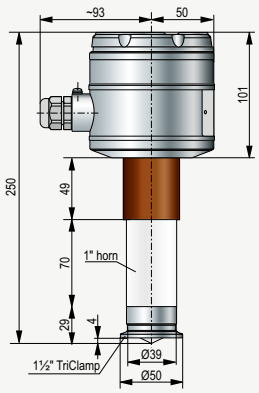

### High-temperature version

#### PTFE encapsulated antenna

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 |
|---|---|
| Transmitter | E |
| Transmitter with plug-in display | G |
| Transmitter, high temp. version [2] | H |
| Transmitter with plug-in display, high temp. version [2] | J |

| Antenna / Housing | | Code |
|---|---|---|
| PP | Fiberglass-reinforced plastic (PBT) | P |
| | Painted aluminum | A |
| | Stainless steel | D |
| 1.4571 | Fiberglass-reinforced plastic (PBT) | M |
| | Painted aluminum | S |
| | Stainless steel | K |
| PVDF | Fiberglass-reinforced plastic (PBT) | V |
| | Painted aluminum | B |
| | Stainless steel | W |
| PTFE | Fiberglass-reinforced plastic (PBT) [3] | F |
| | Painted aluminum [3] | T |
| | Stainless steel [3] | L |

| Measurement range | Code |
|---|---|
| 10 m (33 ft) | 1 |
| 20 m (66 ft) | 2 |
| 30 m (98.5 ft) [4] | 3 |

| Process connection | Code |
|---|---|
| 1" BSP [5] | 2 |
| 1" NPT [5] | 3 |
| 1½" BSP [6] | 4 |
| 1½" NPT [6] | 5 |
| 1½" TriClamp [7] | C |
| 2" TriClamp [7] | D |
| 3" TriClamp [7] | E |
| 4" TriClamp [7] | F |
| Ø75 mm (2½") [4] [8] | 8 |
| Prepared for welded flange [9] | S |

| Output / Certificates | | Code |
|---|---|---|
| 4...20 mA + HART® | – | 4 |
| | Ex ta D [4] | 5 |
| | Ex ia GD | 8 |
| | + Bluetooth® | B |
| | + Bluetooth® / Ex ta D [4] | C |
| | + Bluetooth® / Ex ia GD | E |
| | + Relay | H |
| | + Relay / Ex ta D [4] | F |
| | + Relay + Bluetooth® | R |
| | + Relay + Bluetooth® / Ex ta D [4] | J |

[1] For explosion-proof devices, the article number is followed by "Ex" on the data plate. [2] High temperature version with metal housing and stainless steel or PTFE encapsulated antenna only. [3] Up to 20 m (66 ft) measuring range. [4] Under development. [5] Only for 10 m (33 ft) measuring range. [6] Only for 10 m (33 ft) or 20 m (66 ft) measuring range. [7] Only for 1.4571 or PTFE antenna version, based on individual quote. [8] Prepared for flange, only 30 m (98.5 ft) and encapsulated types, flanges available from size DN80 should be ordered separately. [9] Only for 10 m (33 ft) or 20 m (66 ft) ranges, with ½" stainless steel antenna, flange type MF□–□□□–L to be ordered separately.

## ACCESSORIES

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

MonoCONT PDF–410–2

MultiCONT PRN–200

## PROCESS CONNECTIONS [10]

| | |
|---|---|
| Carbon steel, PTFE lined carbon steel, polipropylene (PP), and stainless steel, DIN, ANSI, and JIS flanges | NIFLANGE MFT–□□□–□ |
| EPDM, FPM, FFKM available for all types | |

[10] *The above process connections and special seals are ordered separately and must be specified in the text part of the order.*

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**PiloTREK WE–200 – CONFIGURATION & REQUEST FOR QUOTE**

National Research, Development and Innovation Office Hungary

PROJECT FINANCED FROM THE NRDI FUND

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