NEW K-BAND RADAR

PiloTREK

NON-CONTACT MICROWAVE
LEVEL TRANSMITTER

3 years warranty • 3 jaren garantie

3 YEARS WARRANTY @ NIVELCO – WHERE ELSE?

NIVELCO

PiloTREK NON-CONTACT MICROWAVE LEVEL TRANSMITTERS FOR LIQUIDS

MAIN FEATURES

- *2-wire K-band Pulse Burst Radar*
- *24 GHz frequency*
- *23 metre (75 feet) measuring range for liquids and slurries*
- *± 3 mm (0.12 inch) accuracy*
- *Easy installation due to small antennas*
- *Horn and enclosed antenna types*
- *Sanitary types for meeting high hygienic requirements*
- *High temperature version*
- *Plug-in graphical display module*
- *Ex version*

INDUSTRY SEGMENTS

- *Water, wastewater*
- *Power generation*
- *Food and beverage*
- *Pharmaceutical*
- *Chemical*

APPLICATIONS

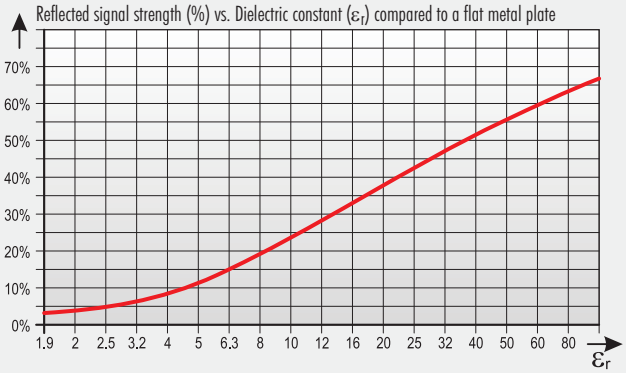
- *Liquids and slurries in general*

GENERAL DESCRIPTION

The 24 GHz (K-band) **PiloTREK** Pulse Radars are regarded the most progressive non-contact level transmitters of the industrial process automation field. Their accuracies are excellent and their short and narrow antennas make their installation simple and low cost. **NIVELCO**'s new K-band radar featuring ±3 mm (0.12 inch) accuracy and short dead band excels with its versatile housing concept lining up plastic, aluminium and stainless steel versions. Its antenna range incorporates stainless steel horn and enclosed plastic tube varieties. The enclosed antenna versions can be replaced without removing the antenna enclosure from the process. Local programming of the **PiloTREK** is aided by a plug-in display module. If on-site reading is not desired this module may not be required thus reducing cost of ownership. The signal processing algorithm of the new **PiloTREK** is based on **NIVELCO**'s 30 years of experience with non-contact level measurement making it an excellent choice for applications simple and challenging alike.

OPERATION

The operation of the non-contact microwave level transmitters is based on the measurement of the time of flight of the microwave burst. The propagation speed of microwave impulses is practically the same in air, gases and in vacuum, independently from the process temperature and pressure, so the measured distance is not affected by the physical parameters of medium to be measured. The level transmitter induces microwave impulses a few nanosecond long in the antenna and a part of the energy of the emitted signals is bounced (reflected) back from the measurement surface depending on the measured media. The time of flight of the reflected signal is measured and processed by the electronics, and then this is converted to distance, level or volume proportional data. The measurability of the level of a specific medium is depending on the signal strength of the reflected microwave impulses. The signal strength of the reflected impulses is considerably depending on the distance to be measured, the relative dielectric constant of the measured medium and the turbulence of the surface. The relative dielectric constant (ε_r) of the medium should be more than 1.9.



Informative ε_r values			
Petroleum	2.1	Acetone	21
Crude oil	2.1	Ethyl alcohol	24
Benzene	2.2	Ethanol	25.1
Gasoline	2.3	Methyl alcohol	33.1
Bitumen	2.6	Methanol	33.7
Carbon disulfide	2.6	Glycol	37
Diesel oil	4	Nitrobenzene	40
Ethers	4.4	Glycerol	41.1
Acetic acid	6.2	Water	80
Ammonia	17-26	Sulphuric acid (T=20 °C)	84

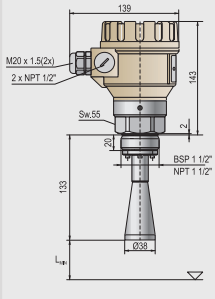
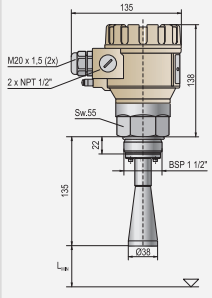
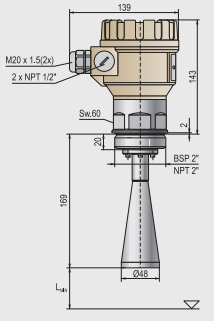
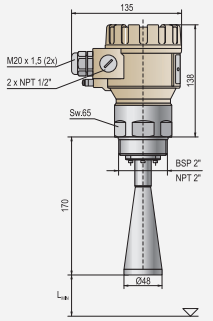
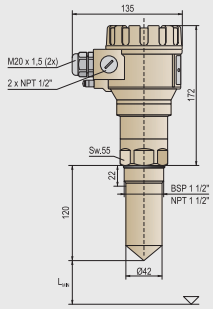
ANTENNA TYPES

Antenna type	Antenna diameter				
	DN40 mm			DN50 mm	DN80 mm
	Process connection				
	1 ½" BSP / NPT	2" TRICLAMP	DN50 MILCH	2" BSP / NPT	DN80 – DN150 flanges
Stainless steel (1.4751 / 316 Ti) horn	■	–	–	■	■
Plastic (PP) enclosure	■	–	–	■	–
Plastic (PTFE) enclosure	–	■	■	–	–

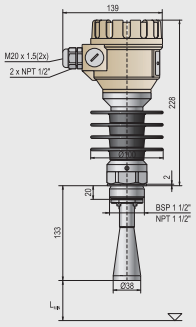
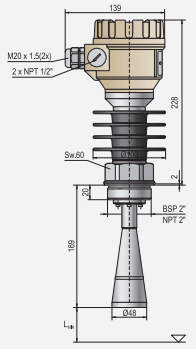
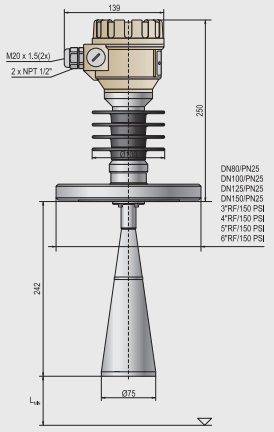
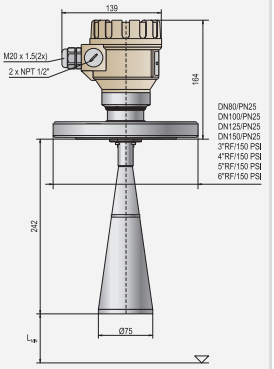
TECHNICAL DATA

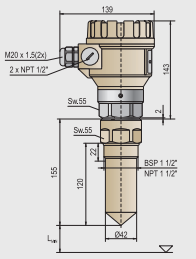
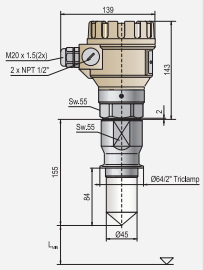
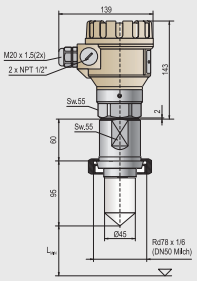
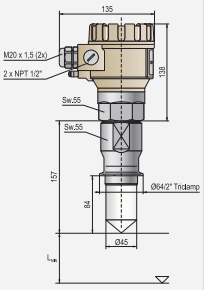
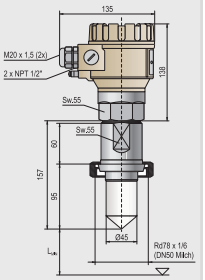
Version		Plastic housing	Aluminium housing	High temperature version
Measured values		Level, Distance; Calculated values: Volume, Mass		
Frequency of the measuring signal		~24 GHz (K-band)		
Measuring range		0.2 m – 23 m (0.6 feet – 75 feet) - (see: special data of the antenna variations)		
Linearity error (as per EN 61298-2)		< 0.6 m (2 feet): ±15 mm (±0.6 inch); 0.6 - 1m (2 – 3.3 feet): ±8 mm (± 0.3 inch); 1 - 10m (3.3 - 33 feet): ±3 mm (± 0.12 inch); > 10 m (33 feet): ±0.04% of the measured distance		
Minimal beam angle		11° (see: special data of the antenna variations)		
Minimal ε_r of the medium		1.9 (depending on the measurement range; see: special data of the antenna variations)		
Resolution		1 mm (0.04 inch)		
Temperature error (as per EN 61298-3)		0.05% FSK / 10 °C (50 °F) (-20 °C ... +60 °C [-4 °F ... +140 °F])		
Power supply voltage		20 V ... 36 V DC		
Output	Digital communication	4-20 mA + HART		
	Display	SAP-300 graphical display unit		
Measuring frequency		10...60 sec as per the application settings		
Antenna diameter		38 mm (1 ½"), 48 mm (2"), 75 mm (3")		
Antenna material		Horn: Stainless Steel; enclosure: PP, PTFE		Horn: Stainless Steel; enclosure: PTFE
Medium temperature		-30 °C ... + 100 °C (-22 °F ... + 212 °F), (up to 120 °C (248 °F) for max. 2 min); with PP antenna enclosure: max.: 80 °C (+ 176 °F)		-30 °C ... + 180 °C (-22 °F ... + 356 °F)
Maximal medium pressure		25 bar (363 psig) at 120 °C (248 °F); with plastic antenna enclosure: 3 bar (44 psig) at 25 °C (77 °F)		
Ambient temperature		-20 °C ... +60 °C (-4 °F ... +140 °F)		
Process connection		Threaded, Flanged or Sanitary connections (as per order codes)		
Ingress protection		IP 67		
Electrical connection		2x M 20 x1.5 cable glands + internal thread for 2x ½" NPT cable protective pipe, cable outer diameter: Ø 7 ... Ø 13 mm (0.3 ... 0.5 inch), wire cross section: max.1.5 mm² (AWG 15)		
Housing material		Plastic (PBT)	Paint coated aluminium	
Sealing		Viton, EPDM		
Approvals		ATEX, IEC Ex, FM (approval is pending)		
Communication certifications		R&TTE, FCC (approval is pending)		
Mass		1 – 1.6 kg (2.2 – 3.5 lb)	2 – 2.6 kg (4.4 – 5.7 lb)	3 – 3.6 kg (6.6 – 7.9 lb)

SPECIAL DATA OF THE ANTENNA VARIATIONS

Type	WES/WGS-140/14N	WEM/WGM-140/14N	WES/WGS-150/15N	WEM/WGM-150/15N	WEP/WGP-140/14N
Name	DN40 (1 ½") stainless steel horn antenna		DN50 (2") stainless steel horn antenna		DN40 (1 ½") PP encapsulated antenna
Housing material	Paint coated aluminium	Plastic (PBT)	Paint coated aluminium	Plastic (PBT)	
Process connection	1½" BSP, 1½"NPT		2" BSP, 2" NPT		1½" BSP, 1½" NPT
Beam angle	19°		16°		–
Measurement range					
ε_r = 1.9 ... 4	0.2 m ... 4.5 m (0.6 ... 14.5 feet)		0.2 m ... 7 m (0.6 ... 23 feet)		–
ε_r = 4 ... 10	0.2 m ... 12 m (0.6 ... 40 feet)		0.2 m ... 18 m (0.6 ... 59 feet)		0.2 m ... 10 m (0.6 ... 33 feet)
ε_r > 10	0.2 m ... 18 m (0.6 ... 59 feet)		0.2 m ... 23 m (0.6 ... 75 feet)		0.2 m ... 16 m (0.6 ... 52.5 feet)
Dimensions (mm)					

SPECIAL DATA OF THE ANTENNA VARIATIONS

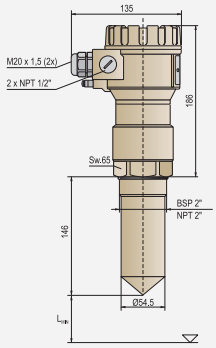
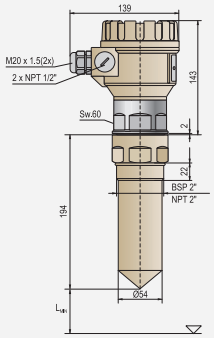
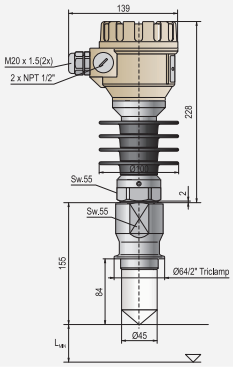
Type	WHS/WJS-140/14N	WHS/WJS-150/15N	WHS/WJS-18□	WES/WGS-18□
Name	High temperature type DN40 (1 ½") stainless steel horn antenna	High temperature type DN50 (2") stainless steel horn antenna	High temperature type DN80 (3") stainless steel horn antenna with flange	DN80 (3") stainless steel horn antenna with flange
Housing material	Paint coated aluminium			
Process connection	1½" BSP, 1½"NPT	2" BSP, 2" NPT	DN80 – DN150 flanges	
Beam angle	19°	16°	11°	
Measurement range				
ε_r = 1.9 ... 4	0.2 ... 4.5 m (0.6 ... 14.5 feet)	0.2 ... 7 m (0.6 ... 23 feet)	0.2 ... 15 m (0.6 ... 49 feet)	
ε_r = 4 ... 10	0.2 ... 12 m (0.6 ... 40 feet)	0.2 ... 18 m (0.6 ... 59 feet)	0.2 ... 23 m (0.6 ... 75 feet)	
ε_r > 10	0.2 ... 18 m (0.6 ... 59 feet)	0.2 ... 23 m (0.6 ... 75 feet)	0.2 ... 23 m (0.6 ... 75 feet)	
Dimensions (mm)				

Type	WES/WGS-140/14N			WEM/WGM-140/14N	
Antenna enclosure	WAP-140-0 / WAP-14N-0	WAT-14T-0	WAT-14R-0	WAT-14T-0	WAT-14R-0
Name	DN40 (1 ½") antenna with PP antenna enclosure	Sanitary type DN40 (1 ½") antenna with PTFE antenna enclosure			
Housing material	Paint coated aluminium			Plastic (PBT)	
Process connection	1½" BSP, 1½"NPT	2" TRICLAMP	DN50 MILCH	2" TRICLAMP	DN50 MILCH
Measurement range					
ε_r = 4 ... 10	0.2 m ... 10 m (0.6 feet ... 33 feet)				
ε_r > 10	0.2 m ... 16 m (0.6 feet ... 52.5 feet)				
Dimensions (mm)					

POLARIZATION

The **PiloTREK** non-contact level transmitters emit linearly polarized microwave impulses. The polarization plane of the emitted impulses can be rotated by 360° in case of **W□S** and **W□M** types. The rotation of the polarization plane can minimize unwanted false reflections from disturbing objects or from the tank wall. The orientation of the polarization plane coincides with the line drawn between the cable glands.

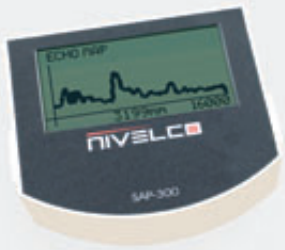
SPECIAL DATA OF THE ANTENNA VARIATIONS

Type	WEP-150/15N	WES/WGS-150/15N	WHS/WJS-140/14N
Antenna enclosure		WAP-150-0 / WAP-15N-0	WAT-14R-0
Name	DN50 (2″) antenna with PP antenna enclosure		High temperature, sanitary type DN40 (1 ½″) antenna with PTFE antenna enclosure
Housing material	Plastic (PBT)	Paint coated aluminium	
Process connection	2" BSP, 2" NPT		2" TRICLAMP
Measurement range			
ε_r = 4 ... 10	0.2 m ... 16 m (0.6 feet ... 52.5 feet)		0.2 m ... 10 m (0.6 feet ... 33 feet)
ε_r > 10	0.2 m ... 20 m (0.6 feet ... 65.5 feet)		0.2 m ... 16 m (0.6 feet ... 52.5 feet)
Dimensions (mm)			

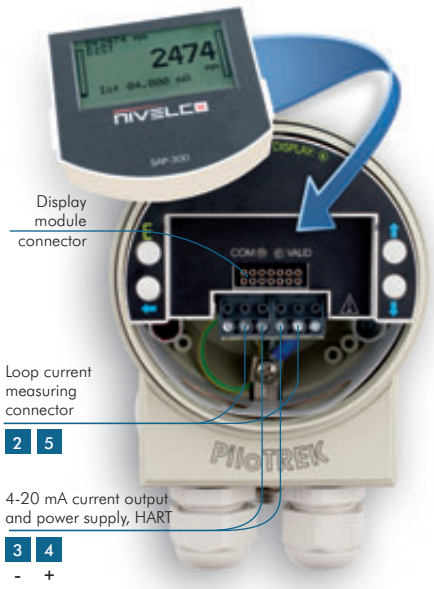
* L_{MIN} is according to the drawings

PROGRAMMING, ECHO MAP

With the help of the SAP-300 plug-in display a simplified full-parameter programming can be accomplished, the parameters of measurement and output can be set using the text-based menu system.
The large LCD dot-matrix display displays the measured values in numerical and bar graph form.
The Echo Map feature helps to detect false reflections and aids the optimization of the measurement configuration.



WIRING

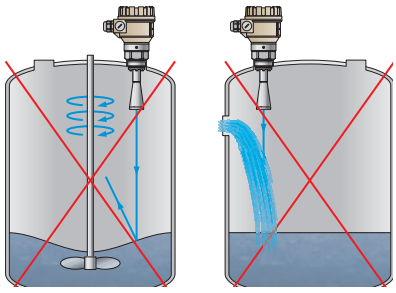


MOUNTING

To avoid unwanted multiple reflections the instrument should not mounted in the middle of the tank or in the vincinity of the filling place or the outlet of the tank. The ideal position for the **PiloTREK** is on the r = (0.3 . . . 0.5) R in case of cylindrical tank. The distance between the sensor and the tank wall should be at least 200 mm (8 inch). The mounting placement should be as far as possible from the disturbing objects inside the tank and from the sources of disturbing effects such as waving, vortex or strong vibrations. The antenna face should be parallel to the medium surface within ± 2-3°. To avoid overheating the instrument should be protected against direct sunshine.

BACKGROUND MAPPING

The background mapping feature provides excellent solution to ignore unwanted false reflections coming from (not-moving) disturbing objects. For this purpose the instrument needs to map the totally empty tank to create a "background image". Then the measurement evaluation software of **PiloTREK** will automatically recognise and ignore the false reflections coming from the disturbing objects inside the tank.

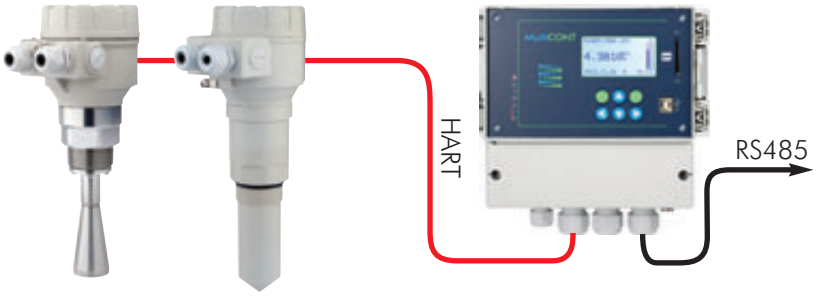


PiloTREK TRANSMITTERS IN SYSTEM WITH A PC

The instruments with **HART** output can be connected to a PC using a **UNICOMM** HART-USB modem. Max. 15 normal instruments can be connected to a single HART loop. All measured values can be visualized and/or the instruments can be remote programmed via digital HART communication. Applicable software:
EView2 configuration software or **NIVISION** process visualization software

PiloTREK TRANSMITTERS IN HART MULTIDROP LOOP

The **MultiCONT** can handle a max. of 15 HART capable (e.g. level, temperature, pressure, pH, dissolved oxygen, etc.) NIVELCO transmitters. The digital (HART) information is processed, displayed and if needed it can be transmitted via RS485 communication line to a PC. Remote programming of the transmitters is also possible. Visualisation on PC can be accomplished with **NIVISION** process visualisation software.



ORDER CODES (NOT ALL COMBINATIONS AVAILABLE)

PiloTREK non-contact microwave level transmitters

PiloTREK W■■-1■■-■ (1)

Function	Code
Transmitter	E
Transmitter + display	G
High temperature transmitter (2)	H
High temperature transmitter + display (2)	J

Antenna / Housing material	Code
Stainless Steel horn antenna / Aluminium housing	S
Stainless Steel horn antenna / Plastic housing	M
PP encapsulated antenna / Plastic housing	P (3)

Output/ Ex	Code
4-20 mA + HART	4
4-20 mA + HART / Ex (4)	8

Antenna diameter / Process connection size	Code
DN40 / 1 ½"	4
DN50 / 2"	5
DN80 / Flange	8

Proc. connection	Code
BSP	0
NPT	N

1.4571 / 316 Ti stainless steel flanges	Code	PP plastic flanges	Code
DN80 PN25	2	DN80	6
DN100 PN25	3	DN100	7
DN125 PN25	4	DN125	8
DN150 PN25	5	DN150	9
3" RF 150 psi	A	3" RF	E
4" RF 150 psi	B	4" RF	F
5" RF 150 psi	C	5" RF	G
6" RF 150 psi	D	6" RF	H
JIS 10K80A	J	JIS 80A	P
JIS 10K100A	K	JIS 100A	R

(1) *The order code of an Ex version should end in "Ex"*
(2) *Only with aluminium housing*
(3) *Only with threaded process connection and DN40, DN50 antenna diameter*
(4) *Approval is pending*

ANTENNA ENCLOSURES

Name	Order code
PP enclosure with 1 ½" BSP proc. connection	WAP-140-0
PP enclosure with 1 ½" NPT proc. connection	WAP-14N-0
PP enclosure with 2" BSP proc. connection	WAP-150-0
PP enclosure with 2" NPT proc. connection	WAP-15N-0
PTFE enclosure with 2" TRICLAMP proc. connection	WAT-14T-0
PTFE enclosure with DN50 MILCH process connection	WAT-14R-0

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