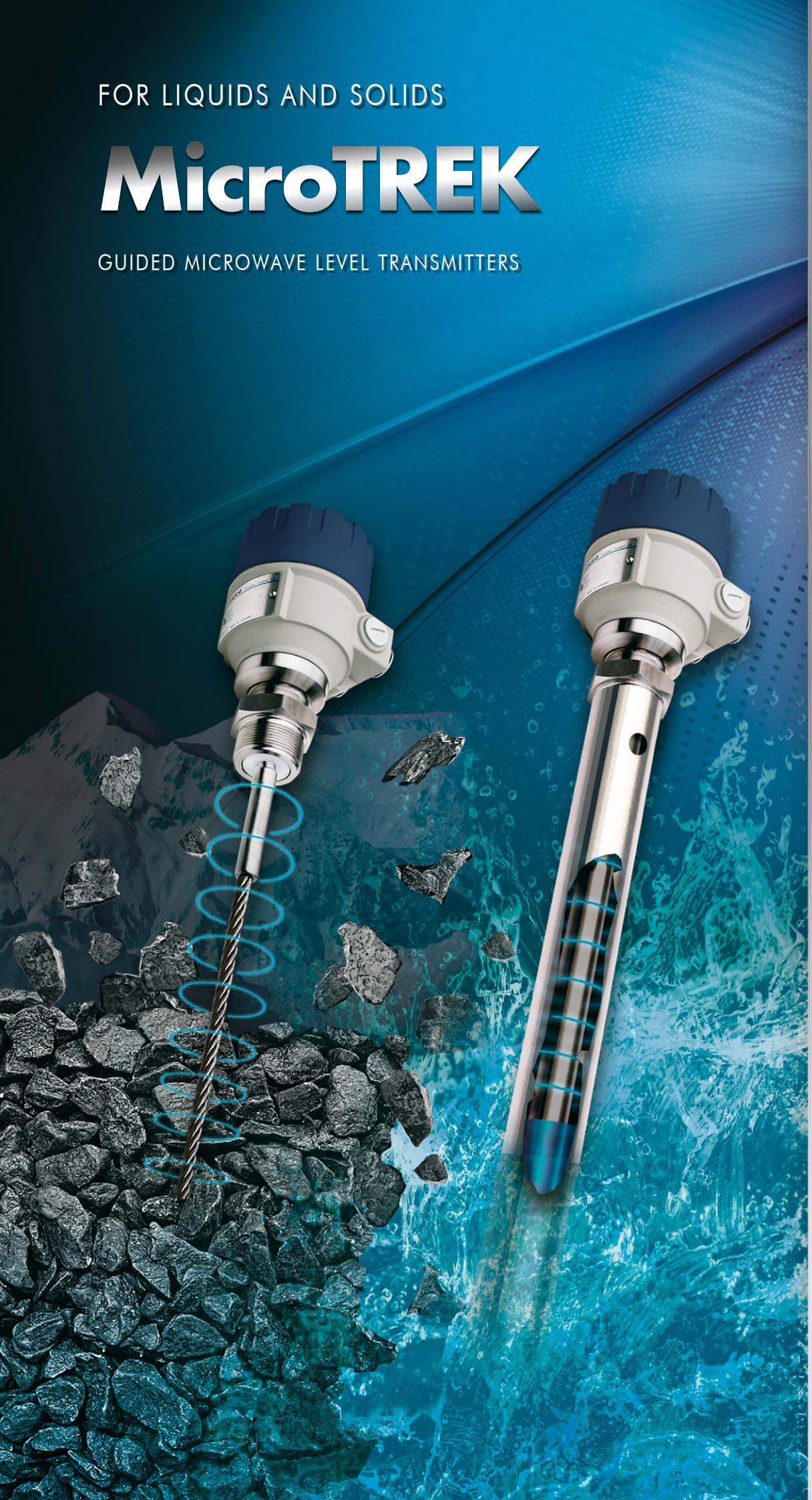
FOR LIQUIDS AND SOLIDS

# MicroTREK

GUIDED MICROWAVE LEVEL TRANSMITTERS



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NIVELCO

LEVEL TRANSMITTERS

# MicroTREK LEVEL TRANSMITTERS FOR LIQUIDS AND SOLIDS

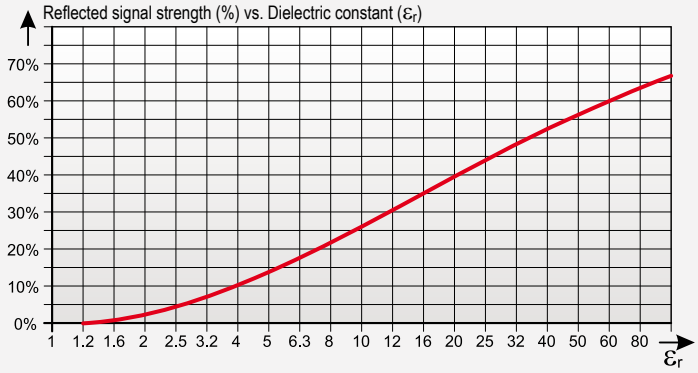
## MAIN FEATURES

- *Measuring range up to 24 m (80 feet)*
- *Accuracy: ± 5 mm (0.2 inch)*
- *Measurement is independent of dielectric constant, temperature, pressure and density variations*
- *Rod, cable and coaxial probes*
- *Segmented rod probe version*
- *Minimum $\varepsilon_r \geq 1.4$*
- *2-wire version*
- *Graphic display*
- *4-20 mA + HART output*
- *Medium temperature range: –30 °C…+200 °C (–22 °F…+392 °F)*
- *Maximum process pressure: 40 bar (580 psig)*
- *IP67 protection*

## GENERAL DESCRIPTION

The **MicroTREK** Guided Wave Radar level transmitter is designed for continuous level measuring of conductive or non-conductive liquids, pulps and solids. **MicroTREK** level gauge operates based on the well-known TDR (Time Domain Reflectometry) principle. Micropulses are sent along a probe guide at the speed of light. As soon as the impulse reaches the surface of the medium, it is reflected back to the electronic module. Level distance is directly proportional to the flight time of the impulse.
The reflected signal is dependent on the dielectric constant of the material, the feasibility of the measurement is $\varepsilon_r \geq 1.4$.
The TDR technology is unaffected by the properties of the medium as well as that of the space above it. Measurement is also unaffected by the change in the physical properties of the materials such as temperature, pressure, dielectric constant.

### The measurability of the medium and the reflected signal strength depends on the relative dielectric constant of the medium.




| Informative $\varepsilon_r$ values | | | |
|---|---|---|---|
| Butane | 1.4 | Grain | 3-5 |
| Cement | 1.5-10 | Edible oil | 3.9 |
| LPG | 1.6-1.9 | Limestone | 6.1-9.1 |
| Kerosene | 1.8-2.1 | Acetone | 21 |
| Crude oil | 2.1 | Ethanol | 24 |
| Diesel oil | 2.1 | Methanol | 33.1 |
| Benzene | 2.3 | Glycol | 37 |
| Asphalt | 2.6 | Nitrobenzene | 40 |
| Clinker | 2.7 | Water | 80 |
| Resin | 2.4-3.6 | Sulphuric acid (T=20 °C) | 80 |

## APPLICATIONS

### Mono cable / Mono rod Mono segmented rod

- Cement, limestone, fly ash, alumina, carbon black
- All high-viscosity liquids
- Mineral powders
- Clean and contaminated liquids
- For stilling wells (calibration required)
- Aggressive mediums with plastic coated probes
- Slightly conductive foams
- High temperature applications
- Bypass applications

### Twin cable

- Tank parks with solvents, oil or fuels
- Water storage tanks
- Plastic granules
- For products with low dielectric constant ($\varepsilon_r > 1.8$)
- For any liquids, light granules
- For narrow tanks
- Where minimum dead-zone is needed
- Mounting close to tank wall is possible

### Twin rod

- Plastic granule vessels
- Coated tanks
- Clean and contaminated liquids
- Fine powders
- Where minimum dead-zone is needed
- For narrow tanks
- For mediums with low dielectric constant and slightly moving products

### Coaxial Pipe

- Small vessels or tanks with max. 6 m (20 feet) height
- Solvents, liquefied gases
- LPG, LNG
- For clean liquids with low dielectric constant
- Agitated or flowing liquids – the probe acts as a stilling well
- Liquid or vapour spray near the probe
- Can be heated
- Contact possible with metallic object or tank wall
- Where no dead-zone allowed

## TECHNICAL DATA

| Version | | Plastic housing | Metal housing | High temperature version |
|---|---|---|---|---|
| Measured values | | Distance, level; calculated values: volume, mass | | |
| Measuring range | | Depends on the probe type and dielectric constant ($\varepsilon_r$) of the measured medium | | |
| Probe types | | Mono cable, twin cable, mono rod, twin rod, coaxial pipe and segmented rod | | |
| Accuracy | Linearity error (1) | For liquids: ± 5 mm (0.2 inch), if probe length ≥ 10 m (32 feet): ± 0.05 % of the probe length<br>For solids: ± 20 mm (0.75 inch), if probe length ≥ 10m (32 feet): ± 0.2 % of the probe length | | |
| | Resolution | ± 3 µA | | |
| Minimal $\varepsilon_r$ of the medium | | 1.4 (depending on the probe type) | | |
| Power supply | | 18 V ... 35 V DC | | |
| Output | Digital communication | 4-20 mA + HART | | |
| | Display | SAP-300 graphical display unit | | |
| Medium temperature | | -30 °C ... +90 °C (-22 °F...+194 °F) | | -30 °C ... +200 °C (-22 °F...+392 °F) |
| | | With plastic coated probes see: Technical data of the coated probes | | |
| Maximal medium pressure | | 4 MPa (40 bar g/ 580 psi g); with plastic lined flange: max. 2.5 MPa (25 bar g/ 363 psi g);<br>with coaxial pipe probe: max. 1.6 MPa (16 bar g/ 232 psi g) | | |
| Ambient temperature | | -20 °C ... +60 °C (-4 °F ... +140 °F) | -30 °C ... +60 °C (-22 °F...+140 °F), with display: -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 M20x1.5 cable glands + internal thread for 2x ½" NPT cable protective pipe,<br>cable outer diameter: Ø 7 ... Ø 13 mm (0.3 ... 0.5 inch), wire cross section: max.1.5 mm² (AWG 15) | | |
| Electrical protection | | Class III. | | |
| Housing material | | Plastic (PBT) | Paint coated aluminium | |
| Sealing | | FPM (Viton®), optional: FFKM (Kalrez®), EPDM | | |
| Explosion protection | | — | see: Special data for Ex certified models | |
| Mass (head unit) | | 1.5 kg (3.3 lb) | 2 kg (4.4 lb) | 2.5 kg (5.5 lb) |

(1) Under reference conditions and stabilized temperature

## SPECIAL DATA FOR Ex CERTIFIED MODELS

| Type | | H□□-4□□-8 Ex | | H□□-4□□-6 Ex |
|---|---|---|---|---|
| | | Probe without coating | Coated probe | |
| Protection type | | ia | | iaD |
| Ex marking | ATEX | ⟨Ex⟩ II 1 G Ex ia IIC T6...T3 | ⟨Ex⟩ II 1 G Ex ia IIB T6...T3 | ⟨Ex⟩ II 1 D iaD A20/A21 IP65 T100°C |
| | IEC Ex | Ex ia IIC T6...T3 Ga | Ex ia IIB T6...T3 Ga | Ex ia IIB T6...T3 Da |
| Intrinsically safe data | | Ui = 30 V, Ii = 150 mA, Pi = 1 W, Ci = 10 nF, Li = 10 µH | | |
| Power supply | | 18 V... 28 V DC | | |
| Electrical connection | | 2x M20x1.5 metal cable glands, cable outer diameter: Ø 7...Ø 13 mm (0.3...0.5 inch), wire cross section: max.1.5 mm² (AWG 15) | | |
| Ambient temperature | | -30 °C ... +60 °C (-22 °F...+140 °F), with display: -20 °C...+60 °C (-4 °F...+140 °F) | | |

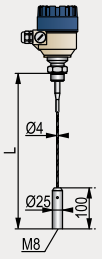
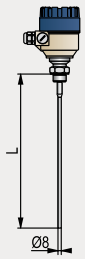
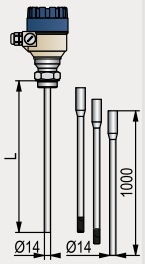
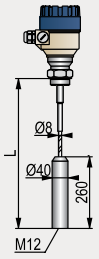
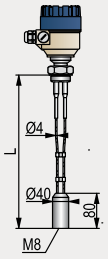
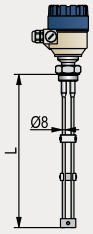
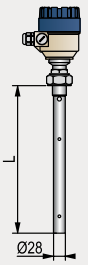
## PROBE SELECTION

**Reliable microwave measurement depends on the correct selection of probes taking into consideration the properties of the medium and other vessel conditions.**

| Probe type | Max. measuring range | Dead-zone (2) | | Process connection | $\varepsilon_r$ min. |
|---|---|---|---|---|---|
| | | Upper (t) / lower (b) $\varepsilon_r$ = 80 | Upper (t) / lower (b) $\varepsilon_r$ = 2.4 | | |
| Mono cable Ø 4 mm (0.15 inch) | 24 m (80 feet) | 300 / 20 mm (12 / 0.75 inch) | 400 / 100 mm (16 / 4 inch) | 1"; 1 1/2" | 2.1 |
| Mono cable Ø 8 mm (0.3 inch) | | | | 1 1/2" | |
| Mono rod Ø 8 mm (0.3 inch) | 3 m (10 feet) | | | 1" | |
| Mono / segmented rod Ø 14 mm (0.55 inch) | 6 m (20 feet) | | | | |
| Twin cable Ø 4 mm (0.15 inch) | 24 m (80 feet) | 150 / 20 mm (6 / 0.75 inch) | 300 / 100 mm (12 / 4 inch) | 1 1/2" | 1.8 |
| Twin rod Ø 8 mm (0.3 inch) | 3 m (10 feet) | | | | |
| Coaxial pipe Ø 28 mm (1.1 inch) | 6 m (20 feet) | 0 / 10 mm (0 / 0.4 inch) | 0 / 100 mm (0 / 4 inch) | 1"; 1 1/2" | 1.4 |
| Coated cable Ø 6 mm (0.225 inch) | 24 m (80 feet) | 300 / 20 mm (12 / 0.75 inch) | 400 / 100 mm (16 / 4 inch) | 1"; 1 1/2" TriClamp; DN40 MILCH, DN50 | 2.4 |
| Coated rod Ø 12 / 16 mm (0.45 / 0.65 inch) | 3 m (10 feet) | | | DN50 | |

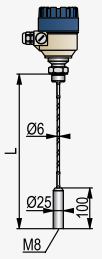
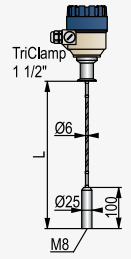
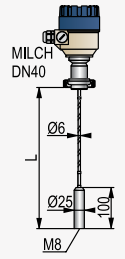
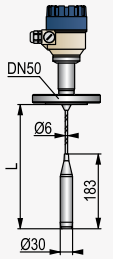
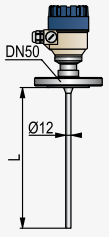
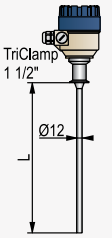
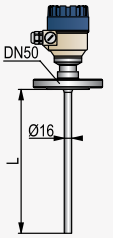
(2) The unmeasurable upper and lower part of the tank, the lower dead-zone is extended with the length of the counterweight (cable versions only)

## TECHNICAL DATA OF THE PROBES

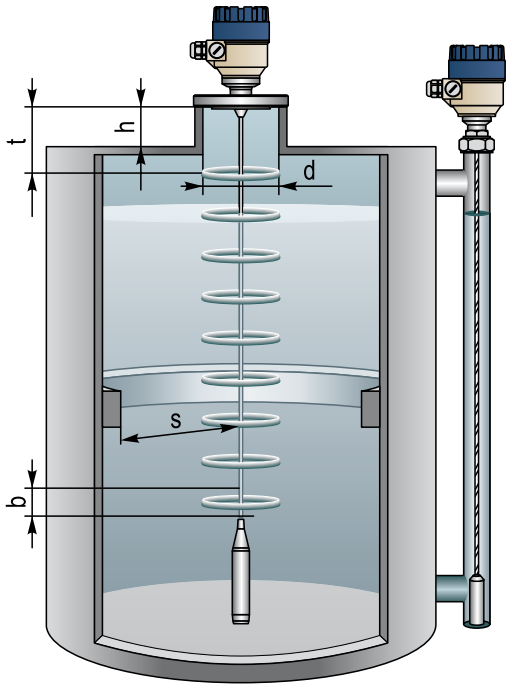
| Type | H□K, H□L H□V, H□W | H□R, H□P | H□S, H□Z | H□N, H□J | H□T, H□U | H□D, H□E | H□A, H□B H□C, H□H |
|---|---|---|---|---|---|---|---|
| Denomin. | Cable | Rod | Rod / Segmented rod | Cable | Twin cable | Twin rod | Coaxial |
| Max. meas. dist. | 24 m (80 feet) | 3 m (10 feet) | 6 m (20 feet) | 24 m (80 feet) | | 3 m (10 feet) | 6 m (20 feet) |
| Min. meas. dist. ($\varepsilon_r$=80 / $\varepsilon_r$= 2.4) | 0.3 m / 0.4 m (1 feet / 1.3 feet) | | | | 0.15 m / 0.3 m (0.5 feet / 1 feet) | | 0 m (0 feet) |
| Minimal medium $\varepsilon_r$ | 2.1 | | | | 1.8 | | 1.4 |
| Sensing space around the probe | Ø 600 mm (2 feet) | | | | Ø 200 mm (0.65 feet) | | 0 mm (0 feet) |
| Process connection | 1" BSP; 1"NPT | 1" BSP | 1 1/2" BSP | | | | 1" BSP; 1"NPT |
| | 1 1/2" BSP; 1 1/2" NPT | 1"NPT | 1 1/2" NPT | | | | 1 1/2" BSP; 1 1/2" NPT |
| Probe material | 1.4401 (316) | 1.4571 (316 Ti) | | 1.4401 (316) | | 1.4571 (316 Ti) | |
| Probe nominal Ø | 4 mm (0.15 inch) | 8 mm (0.3 inch) | 14 mm (0.55 inch) | 8 mm (0.3 inch) | 4 mm (0.15 inch) | 8 mm (0.3 inch) | 28 mm (1.1 inch) |
| Mass | 0.12 kg/m (0.08 lb/ft) | 0.4 kg/m (0.25 lb/ft) | 1.2 kg/m (0.8 lb/ft) | 0.4 kg/m (0.25 lb/ft) | 0.24 kg/m (0.16 lb/ft) | 0.8 kg/m (0.5 lb/ft) | 1.3 kg/m (0.85 lb/ft) |
| Separator material[3] | – | | | | PFA, welded on the cable | PTFE-GF25 | PTFE |
| Weight dimensions | Ø 25x100 mm (1x4 inch) | – | | Ø 40x260 mm (1.5x10 inch) | Ø 40x80 mm (1.5x3 inch) | – | |
| Weight material | 1.4571 (316 Ti) | – | | 1.4571 (316 Ti) | | – | |
| Dimensions (mm) |  |  |  |  |  |  |  |

*(3) There is no separator below 1.5 m (5 feet) length*

## TECHNICAL DATA OF THE COATED PROBES

| Type | H□F, H□G | H□X | H□Y | H□M | H□Q | H□O | H□I |
|---|---|---|---|---|---|---|---|
| Denomin. | FEP coated cable | | | | PFA coated rod | | PP coated rod |
| Max. meas. dist. | 24 m (80 feet) | | | | 3 m (10 feet) | | |
| Min. meas. dist. ($\varepsilon_r$=80 / $\varepsilon_r$= 2.4) | 0.3 m / 0.4 m (1 feet / 1.3 feet) | | | | | | |
| Minimal medium $\varepsilon_r$ | 2.4 | | | | | | |
| Sensing space around the probe | Ø 600 mm (2 feet) | | | | | | |
| Process connection | 1" BSP; 1"NPT | 1 1/2" TriClamp | DN 40 MILCH | DN 50 PN25 flange | | 1 1/2" TriClamp | DN 50 PN25 |
| Max. medium temp. | +150 °C (302 °F) | | | | | | +60 °C (140 °F) |
| Probe material | 1.4401 (316) | | | | 1.4571 (316 Ti) | | |
| Probe coat. material | FEP | | | | PFA | | PP |
| Probe nominal Ø | Ø 6 mm (0.225") | | | | 12 mm (0.45") | | 16 mm (0.65") |
| Fillet coating mater. | – | | | PFA | | | PP |
| Weight material | 1.4571 (316 Ti) | | | 1.4571 (316 Ti) + PFA coating | – | | |
| Mass | 0.16 kg/m (0.1 lb/ft) | | | | 0.5 kg/m (0.33 lb/ft) | | 0.6 kg/m (0.4 lb/ft) |
| Dimensions (mm) |  |  |  |  |  |  |  |

## INSTALLATION

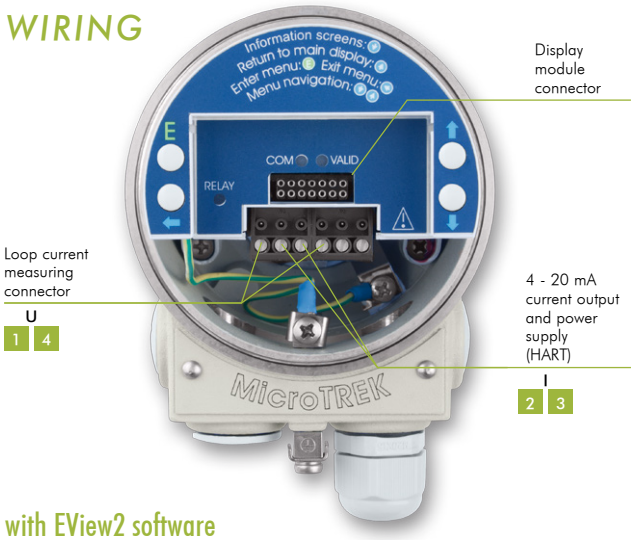



Except the plastic coated and the coax types the probes can be removed from the head unit by the user.

*s = minimum distance from the internal disturbing objects. Objects that are parallel to probe do not disturb the measurement.*

| | | |
|---|---|---|
| *Mono probe* | *s > 300 mm* | *h ≤ d* |
| *Twin probe* | *s > 100 mm* | *t = upper dead-zone* |
| *Coaxial probe* | *s = 0 mm* | *b = lower dead-zone* |

## WIRING

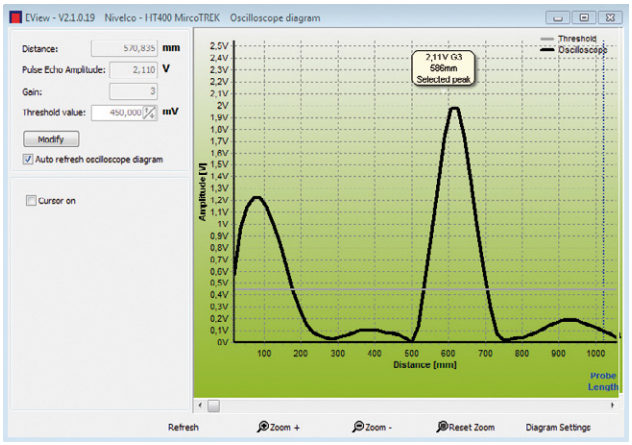



## SETUP, PROGRAMMING

### with SAP-300 display unit


With the help of the **SAP-300** plug-in display a simplified programming can be accomplished which covers most of the applications. The basic parameters of measurement and output can be set using the text-based menu system of the **SAP-300**. The large LCD dot-matrix display displays the measured values in numerical and bar graph form.

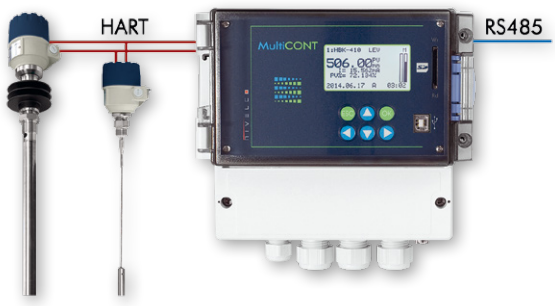
### with EView2 software




The **EView2** configuration software can be downloaded free of charge. All user-modifiable parameters of the **MicroTREK** can be set and all values can be queried through **EView2**. Other features are: continuous "echo-map" reading, trend monitoring, data logging, data saving.

## MicroTREK TRANSMITTERS IN HART MULTIDROP LOOP

The **MultiCONT** can handle a max. of 6 standard (or 2 Ex certified) HART capable **MicroTREK** GWR 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.




## MicroTREK 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.

# ORDER CODES (NOT ALL COMBINATIONS AVAILABLE)

## MicroTREK Guided Wave Radar level transmitters

MicroTREK H■■-■■■-■ (1)

| Type | Code |
|---|---|
| Transmitter | T |
| Transmitter + display | B |
| High temp. transmitter | H |
| High temp.trans. + display | P |

| Housing | Code |
|---|---|
| Aluminium | 4 |
| Plastic | 5 (2) |

| Probe / Proc. conn. | Code |
|---|---|
| Coaxial / 1″ BSP | A |
| Coaxial / 1″ NPT | B |
| Coaxial / 1 1/2″ BSP | C |
| Coaxial / 1 1/2″ NPT | H |
| Rod / 1″ BSP | R |
| Rod / 1″ NPT | P |
| Rod / 1 1/2″ BSP (3) | S |
| Rod / 1 1/2″ NPT (3) | Z |
| Twin rod / 1 1/2″ BSP | D |
| Twin rod / 1 1/2″ NPT | E |
| 4 mm cable / 1″ BSP | K |
| 4 mm cable / 1″ NPT | L |
| 4 mm cable / 1 1/2″ BSP | V |
| 4 mm cable / 1 1/2″ NPT | W |
| 8 mm cable / 1 1/2″ BSP | N |
| 8 mm cable / 1 1/2″ NPT | J |
| 4 mm twin cable / 1 1/2″ BSP | T |
| 4 mm twin cable / 1 1/2″ NPT | U |
| 4 mm FEP coat. cable / 1″ BSP | F |
| 4 mm FEP coat. cable / 1″ NPT | G |
| 4 mm FEP coat. cable / DN 50 PN 25 flange | M |
| 4 mm FEP coat. cable / 1 1/2″ TriClamp | X |
| 4 mm FEP coat. cable / DN 40 Milch | Y |
| PFA coated rod / DN 50 PN 25 | Q |
| PFA coated rod / 1 1/2″ TriClamp | O |
| PP coated rod / DN 50 PN 25 | I |

| Code | Length | | Code |
|---|---|---|---|
| Coaxial, Rod, Twin rod | | | |
| 0 | 0 m | 0 m | 0 |
| 1 | 1 m | 0.1 m | 1 |
| 2 | 2 m | 0.2 m | 2 |
| 3 | 3 m | 0.3 m | 3 |
| 4 | 4 m | 0.4 m | 4 |
| 5 | 5 m | 0.5 m | 5 |
| 6 | 6 m | 0.6 m | 6 |
| | | 0.7 m | 7 |
| | | 0.8 m | 8 |
| | | 0.9 m | 9 |
| Cable | | | |
| 0 | 0 m | 0 m | 0 |
| 1 | 10 m | 1 m | 1 |
| 2 | 20 m | 2 m | 2 |
| | | 3 m | 3 |
| | | 4 m | 4 |
| | | 5 m | 5 |
| | | 6 m | 6 |
| | | 7 m | 7 |
| | | 8 m | 8 |
| | | 9 m | 9 |

| Output / Ex | Code |
|---|---|
| 4 - 20 mA + HART | 4 |
| 4 - 20 mA + HART / Ex iaD | 6 |
| 4 - 20 mA + HART / Ex ia | 8 |

*(1) The order code of an Ex version should end in "Ex"*
*(2) Ex version not available*
*(3) Segmented probe version should be given in the text of the order*


# ACCESSORIES

| Accessories | Order Code |
|---|---|
| Plug-in graphical display module | SAP-300 |
| Multichannel process controller and display unit | MultiCONT P-200 |
| 24V DC power supply, DIN rail mountable | NIPOWER PPK-331 |
| Intrinsically safe isolator module, DIN rail mountable | UNICONT PGK-301 Ex |
| HART- USB/RS485 modem for remote programming with PC, DIN rail mountable | UNICOMM SAK-305 |
| HART- USB modem for remote programming with PC | UNICOMM SAT-304 |
| EView2 configuration software for remote programming with PC | FREE download! |



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