HYCONTROL

## *Level Measurement*

## *With*

# *REFLEX RADAR*

# Why Radar Technology for Level Measurement ?

## INSENSITIVE TO CHANGES IN

- Dielectric
- Dust
- Pressure
- Viscosity
- Vacuum
- Foam
- Humidity
- Temperature

## THE ADVANTAGES ARE

- Measuring ranges up to 40m (option for 100m special).
- Versatile technology for Liquids, Slurries, Pastes and Solids.
- Display of Level, Distance or Volume.
- Interface detection on liquids.
- 2 wire loop powered 24vdc or 4 wire 110/230vac.
- Hazardous area ATEX, EExd and EExia.
- HART, Profibus (PA) and Foundation Fieldbus.
- Suitable for narrow tanks with minimum fixed beam diameter.
- Unaffected by dust during fill or empty conditions.
- Immune to fill noise on solid products such as stone.
- Simple to install and retrofit with wide range of process connections.
- Suitable for corrosive and acidic atmospheres.
- High temperature and pressure options are available.
- Remote or local programming and commissioning.
- Suitable for detecting levels through surface foam.
- Sealed Flange system allows removal in process

## SUITABLE FOR ALL INDUSTRIES

- Petrochemical
- Water & Waste
- Power Generation
- Food
- Cement
- Steel
- Chemical
- Asphalt
- Quarrying
- Paint
- Minerals
- Powder

## RADAR FOR A VARIETY OF APPLICATIONS

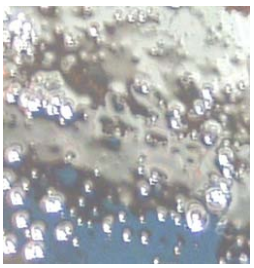
- Level Measurement
- Interface Measurement
- Distance Measurement
- Volume Measurement

## COST EFFECTIVE REPLACEMENT FOR

- Capacitance transmitters
- Differential pressure transmitters
- Hydrostatic transmitters
- Displacers

## MANUFACTURED TO ISO9001-2000 Q.M.S.

**Various units on final assembly and ready for test.**
**The quality of all Hycontrol products is strictly monitored to conform to the ISO certification requirements.**



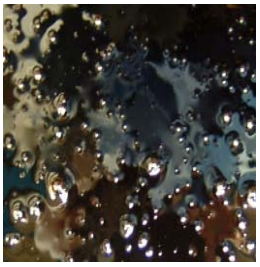
Acids

Plastics

Grain

Powders

Flakes



Oils

# Reflex VF Series Two Wire TDR

**The Reflex VF Series range of TDR products is ideal for the measurement of liquids, powders and granules to a range of 35m. Unaffected by pressure, temperature, viscosity, vacuum, foam, dust, changes in dielectric constant or coating of the probe, the VF Series can measure virtually any product in either Direct or TBF mode utilising any one of its six probe types. (See page 4 for full option details).**

## ADVANTAGES OF TDR

- 35m Measuring Range
- 24 VDC 2 wire Loop Powered
- 4/20mA Output
- Pressure up to 40 Bar
- Flange temperature up to 200°C
- HART Protocol options
- ATEX EExia and EExd options
- Wide range of Process connections
- Liquids and Solids measurement
- Interface measurement to less than 50mm
- Simple programming with set-up wizard
- Capable of measuring low dielectric product (1.4)
- Clear Alpha-numeric display with tank illustrations
- Minimal Blanking Zone
- High accuracy of ±3mm
- Corrosion resistant construction

## OPERATING PRINCIPLE

Pulses of low power microwaves are sent along conductors. At the point where the waves meet the product surface, they are reflected by the product. The intensity of the reflection depends on the dielectric constant of the product. The higher the dielectric constant, the stronger the reflection will be, e.g. Up to 80% reflection for water. The instrument measures the time between emission and reception which is proportional to the distance.

For TDR guided radar there are two different categories of product:

### 1 - Products with a dielectric constant $\varepsilon_r \geq 1.4$

**These applications work in "Direct Mode", which means that the reflection from the product surface is used directly for the measurement of the level. Two different applications are possible:**

**a) Level Measurement**

**The wave is reflected from the first product surface and is received by the receiver on the top of the tank. The wave travels along the conductor above the product at the speed of light and the return time of the wave pulse is directly proportional to the distance between the top of the tank and the surface of the product (level).**

**b) Interface measurement**

**Interface measurement can only be made if the first layer has a lower dielectric constant than the second and if the difference between the two dielectric constants is greater than 10.**

**For measuring interface level we use the residual wave after the first reflection. This part of the wave moves further down the conductors through the first product layer until reflected on the interface level. The speed of this wave depends on the dielectric constant of the first product. This means that we have to know the dielectric ($\varepsilon_r$) of this first layer to determine the interface level.**

### 2 - Products with a dielectric constant $\varepsilon_r < 1.4$

**To measure the level of low dielectric products we use the Tank Bottom Following principle (TBF). The downward wave will first pass through the air at a known speed and then through the product at a speed depending on the dielectric constant of the product.**

**Since the return in air is calibrated; the difference in the two times is directly proportional to the product level in the tank.**

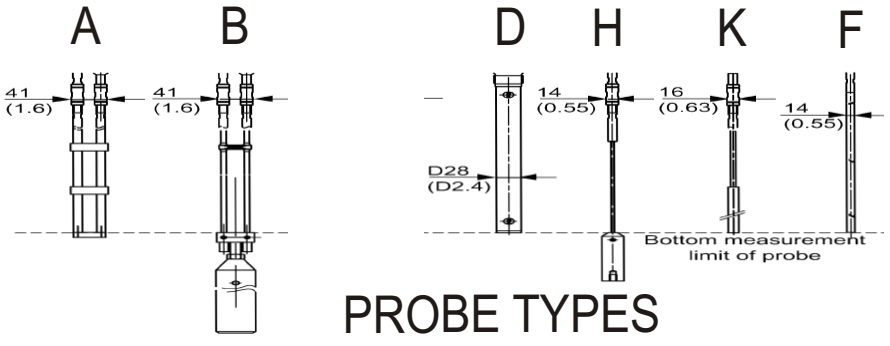
**As we are largely dependent on the dielectric constant, this method is less accurate than the direct mode method.**

# TDR Product Selector

| Model | VF7000 | VF7001 | VF7002 | VF7003 | VF7004 | VF7005 |
|---|---|---|---|---|---|---|
| **Probe type** | F | A | D | H | K | B |
| **Principle** | TDR | TDR | TDR | TDR | TDR | TDR |
| **Process** | Liquids | Liquids | Liquids | Liquids | Liquids | Liquids |
| **Medium** | Solids | Solids | | Solids* | Solids | Solids |
| **Range** | 3m | 3m | 6m | 35m | 35m | 35m |
| **Application** | Level | Level | Level | Level | Level | Level |
| | Distance | Distance | Distance | Distance | Distance | Distance |
| | Volume | Volume | Volume | Volume | Volume | Volume |
| | Interface | Interface | Interface | Interface | Interface | Interface |
| **Mode** | Direct TBF | Direct TBF | Direct TBF | Direct TBF | Direct TBF | Direct TBF |
| ***Accuracy*** | | | | | | |
| **Liquids** | +/-3mm | +/-3mm | +/-3mm | +/-3mm | +/-3mm | +/-3mm |
| **Solids** | +/-20mm | +/-20mm | | +/-20mm | +/-20mm | +/-20mm |
| **Min Dielectric** | 1.8 | 1.6 | 1.4 | 1.8 | 1.8 | 1.6 |
| **Repeatability** | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm |
| **Max Press. Bar** | 40 | 40 | 40 | 40 | 40 | 40 |
| **Max Temp. ºC** | 200 | 200 | 200 | 200 | 200 | 200 |
| ***Power Supply*** | | | | | | |
| **24 VDC** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Two Wire** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Four Wire** | No | No | No | No | No | No |
| **4/20 HART** | Yes | Yes | Yes | Yes | Yes | Yes |
| **RS485** | No | Yes | No | No | No | Yes |
| **Profibus PA** | | Yes | No | No | No | Yes |
| **Fieldbus** | | Yes | No | No | No | Yes |
| **Approvals** | | | | | | |
| **ATEX EExia** | Yes | Yes | Yes | Yes | Yes | Yes |
| **ATEX EExd** | Yes | Yes | Yes | Yes | Yes | Yes |
| **Integral LCD** | Optional | Optional | Optional | Optional | Optional | Optional |
| **Min Process Con** | 3/4" BSP | 2"ANSI | 3/4" BSP | 3/4" BSP | 1.5" BSP | 2"ANSI |

***Note:**

Hycontrol advise the use of 8mm cable for Solids applications due to the high loads and abrasive wear usually associated with these applications. However, for short cable length and light powders such as flour, 4mm may be acceptable, up to 10m.




PROBE TYPES

# Reflex VG5XX 10GHz FMCW Radar

## THE ADVANTAGES OF FMCW RADAR

- **Non-contact**
- **Aggressive liquids, hydrocarbons, toxic liquids and slurries**
- **Granulated material and most solids**
- **Range up to 40 metres (option for 100 metres)**
- **Unaffected by pressure, temperature, viscosity, foam or dust**
- **Available with Horn Wave Guide or Wave Stick antenna**
- **ATEX EExia intrinsically safe or EExd flameproof housings**
- **TBF mode available for low dielectric products**
- **ETS mode damps out unwanted reflection**
- **1mm accuracy option**

## OPERATING PRINCIPLE

A radar signal is generated via an antenna, reflected by the target surface and received after a delay time t.

**FMCW: Frequency Modulated Continuous Wave**

FMCW radar uses a high frequency signal (~10GHz) which increases linearly by 1GHz during the measurement (frequency sweep) (1). The signal is emitted, reflected from the target surface and received at a time-delayed (2) frequency.

The difference, $\Delta f$, is calculated from the actual transmit frequency and the receive frequency (3). The difference is directly proportional to the distance measured i.e. a large frequency difference corresponds to a large distance, and vice versa.

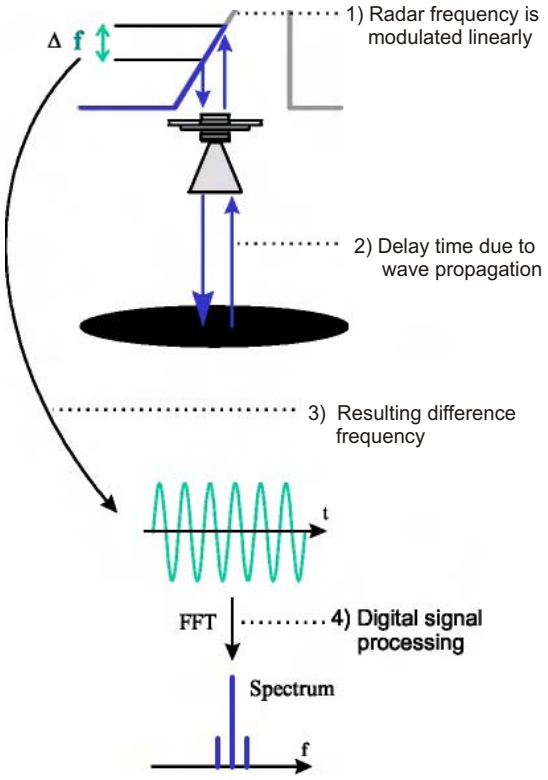
The frequency difference is transformed via a Fast Fourier Transformation (FFT) into a lower frequency spectrum and then the distance is calculated from this spectrum. The level results from the difference between the tank height and distance.

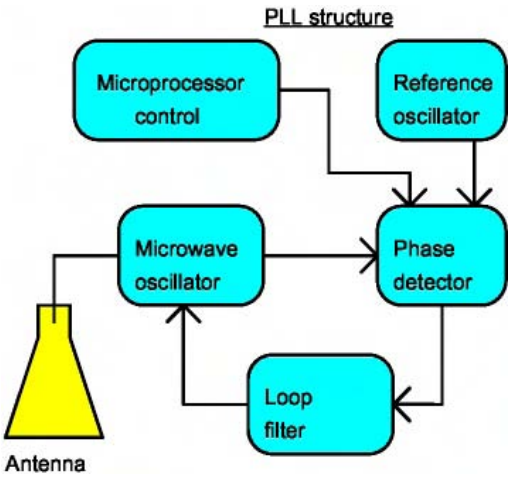
**Linearity of frequency sweeps**

The measuring accuracy of FMCW radar is determined from the linearity of the frequency sweeps and their reproducibility. The linearity correction is deduced via reference measurement of the oscillator. The non-linearity is corrected up to 98% (VG50/51/VG500). An immediate frequency regulation using PLL (phase locked loop) technology is necessary with the VG502 device because of the higher demand on the measuring accuracy.

**Advantages of FMCW principle compared to Pulse Radar:**

- Better reflection separation
- Reliable noise reduction
- Smaller beam angle
- Fewer disturbing reflections
- Smaller antenna diameter for same measuring range



# Reflex VG7 26GHz FMCW Radar

## ADVANTAGES OF VG7 SERIES

- Non-contact level measurement
- Aggressive liquids, hydrocarbons, toxic liquids, slurries
- Granulated material and most solids
- Measuring range up to 40 metres
- Unaffected by pressure, temperature, viscosity, foam or dust
- ATEX EExia intrinsically safe or EExd flameproof approvals
- TBF mode available for low dielectric products
- ETS mode damps out unwanted reflection
- High accuracy of ±3mm as standard
- Low dielectric products measured (1.4)
- Simple and easy programming with set-up wizard
- Small Blanking Zone
- Wide range of mounting flange and thread options
- Corrosion resistant construction

## OPERATING PRINCIPLE

The VG7 High frequency FMCW Radar operates on exactly the same proven principle of the lower frequency 10GHz FMCW Radar. The main technical advantages of the Reflex VG7 are:

- **High average transmit frequency of 25 GHz.**
- **Larger bandwidth of 2 GHz.**
- **Dynamic range of more than 100 dB.**
- **Highly stable, fully crystal-controlled transmit frequency.**

In addition to the above , a digital signal processor provides the system with a very high computing capacity and complex evaluation algorithms ensure reliable and precise calculation of measured values.

Given the same size of antenna, and compared to lower frequencies, 10 GHz for the VG5xx, the high average transmit frequency of 25 GHz allows better concentration of the microwave signals. This allows better focusing of the target and improves accuracy of the measured value, stability of the measurement, and increases insensitivity to tank internals.

The 2 GHz bandwidth is one of the most important factors for accurate and stable measurements. A large bandwidth makes it easier to distinguish between unwanted and wanted signals, and the measured values can be evaluated with greater accuracy.

Another very important factor is the dynamic range of more than 100 dB that is attained when using the FMCW principle. The dynamic range determines the ratio between the strongest signals that the system can sense and the weakest possible signals in the form of fundamental noise.

# Reflex VG Series Two & Four Wire FMCW Radar

The Reflex VG Series of FMCW Radar products are unaffected by pressure, temperature, viscosity, vacuum, foam, dust or changes in dielectric constant. They can measure virtually any product in either Direct or TBF mode utilising either Horn, Wave Guide or Wave Stick antenna.

The unique Tank Bottom Following (TBF) mode in all the VG Series enables products with dielectric constants as low as 1.1 to be measured. For process vessels with complex internal structures the unique Empty Tank Spectrum (ETS) can be utilised to damp out all unwanted reflections from pipes, heating coils and agitators.

## TWO WIRE FMCW RADAR

### *VG50 HORN - Range 20m*

- EExia two wire
- HART
- Steam
- Foam
- Agitation
- Temperature up to 250°C
- Pressure up to 64 Bar
- Viscous liquids
- Dielectric greater than 2

### *VG51 WAVE STICK - Range 20m*

- EExia two wire
- HART
- Small nozzle
- Corrosive liquids
- Clean liquids
- Temperature up to 150°C
- Pressure up to 16 Bar
- Dielectric greater than 4

## FOUR WIRE FMCW RADAR

### *VG500 HORN - Range 40m (option 100m)*

- Liquids & Solids
- EExd four wire
- HART & Profibus
- Foundation Fieldbus
- Steam & Foam
- Agitation
- Temperature up to 250°C
- Pressure up to 64 Bar
- Viscose liquids
- Dielectric greater than 2

### *VG510 WAVE STICK - Range 20m*

- EExd four wire
- HART
- Profibus
- Foundation Fieldbus
- Small Nozzle
- Corrosive Liquids
- Clean Liquids
- Temperature up to 150°C
- Pressure up to 16 Bar
- Dielectric greater than 4

## HIGH ACCURACY FMCW

### *VG502 HORN - 1mm accuracy*

- Liquids
- EExd four wire
- HART
- Profibus
- Foundation Fieldbus
- Temperature up to 250°C
- Pressure up to 64 Bar
- Viscous liquids
- Dielectric greater than 2
- 1mm Accuracy

### *REFLEX VG7 HORN - 3mm accuracy*

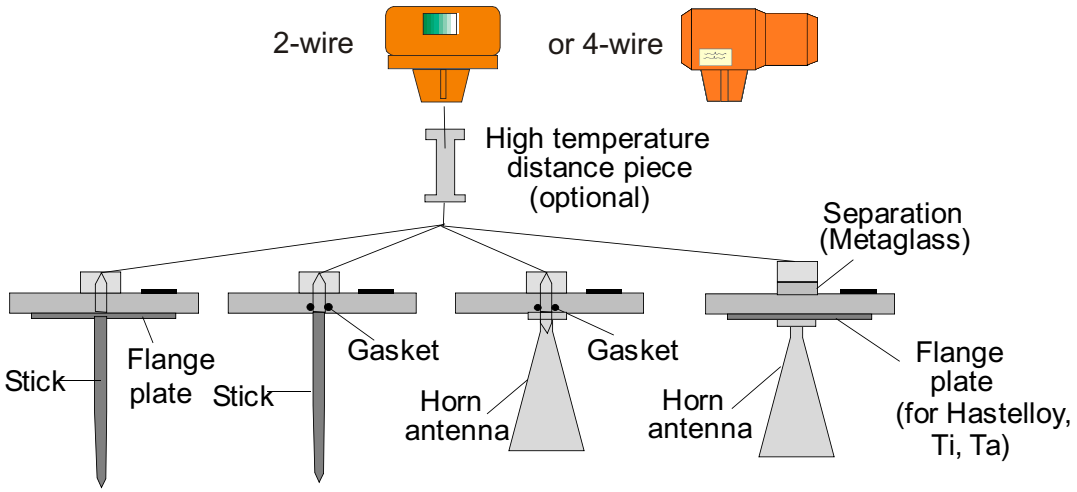
- Liquids and Solids
- EExia and EExd four wire
- 4-20mA Ouptut
- Pressure to 40 bar
- Flange temperature 200°C
- HART Protocol
- Viscous liquids
- Dielectrics greater than 2
- Antenna DN40 - DN80
- 3mm Accuracy

# FMCW Product Selector

| Model | VG50 | VG50 | VG51 | VG500 | VG500 | VG502 | VG502 | VG510 | VG7 |
|---|---|---|---|---|---|---|---|---|---|
| **Antenna Type** | Horn | Waveguide | Wavestick | Horn | Waveguide | Horn | Waveguide | Wavestick | Horn |
| **Principle** | FMCW | FMCW | FMCW | FMCW | FMCW | FMCW | FMCW | FMCW | FMCW |
| **Process** | Liquids | Liquids | Liquids | Liquids | Liquids | Liquids | Liquids | Liquids | Liquids |
| **Medium** | | | | Solids | | | | | Solids |
| **Range** | 20m | 6m | 20m | 40m | 6m | 35m | 6m | 20m | 40m |
| **Application** | Level | Level | Level | Level | Level | Level | Level | Level | Level |
| | Distance | Distance | Distance | Distance | Distance | Distance | Distance | Distance | Distance |
| | Volume | Volume | Volume | Volume | Volume | Volume | Volume | Volume | Volume |
| **Mode** | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF | Direct.TBF |
| ***Accuracy*** | | | | | | | | | |
| **Liquids** | +/- 0.3% | +/- 0.3% | +/- 0.3% | +/- 0.3% | +/- 0.3% | +/- 1mm | +/- 1mm | +/- 0.3% | +/- 3mm |
| **Solids** | No | No | No | * | No | No | No | No | Yes |
| **Min Dielectric** | 2 | 1.5 | 4 | 2 | 1.5 | 2 | 1.5 | 4 | 2 |
| **Repeatability** | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm | +/- 1mm |
| **Max Press. Bar** | 64 | 64 | 16 | 64 | 64 | 64 | 64 | 16 | 40 |
| **Max Temp. ºC** | 250 | 250 | 150 | 250 | 250 | 250 | 250 | 150 | 200 |
| ***Power Supply*** | | | | | | | | | |
| **24 VDC** | Yes | Yes | Yes | No | No | No | No | No | Yes |
| **24 VAC/DC** | No | No | No | Yes | Yes | Yes | Yes | Yes | No |
| **110/230 AC** | No | No | No | Yes | Yes | Yes | Yes | Yes | No |
| **Two Wire** | Yes | Yes | Yes | No | No | No | No | No | Yes |
| **Four Wire** | No | No | No | Yes | Yes | Yes | Yes | Yes | No |
| **4/20 HART** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **RS485** | No | No | No | Yes | Yes | Yes | Yes | Yes | No |
| **Profibus PA** | No | No | No | Yes | Yes | Yes | Yes | Yes | Option |
| **Fieldbus** | No | No | No | Yes | Yes | Yes | Yes | Yes | Option |
| **ATEX Approval** | EExia | EExia | EExia | EExde | EExde | EExde | EExde | EExde | EExia/EExde |
| **Integral LCD** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Min Process Con** | 3" ANSI | 3" ANSI | 1.5" BSP | 3" ANSI | 3" ANSI | 8" ANSI | 3" ANSI | 1.5" BSP | 1.5" BSP |

*Consult Hycontrol

# FLEXIBILITY BY MODULAR DESIGN




**COMPLETELY SEALED FLANGE SYSTEM ALLOWS REMOVAL OF ELECTRONIC HEADS IN SERVICE.**

# Applications

*VG500. Iron Ore.*
*15m. Steel*

*VF7. Bentonite. 11m. Steel*

*VG50 Crude Oil. 18m. Petrochemical*

*VF7. Salt. 8m. Food*

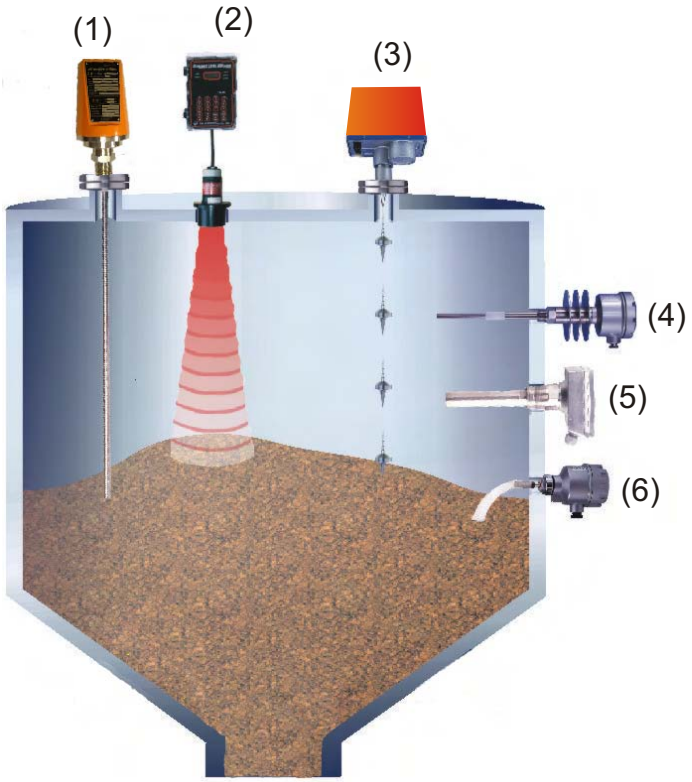
*VG7. Wood Chips. 12m. Furniture*

*VG7. Chemical Waste. 5m. Chemical*

# *HYCONTROL LEVEL TECHNOLOGIES*

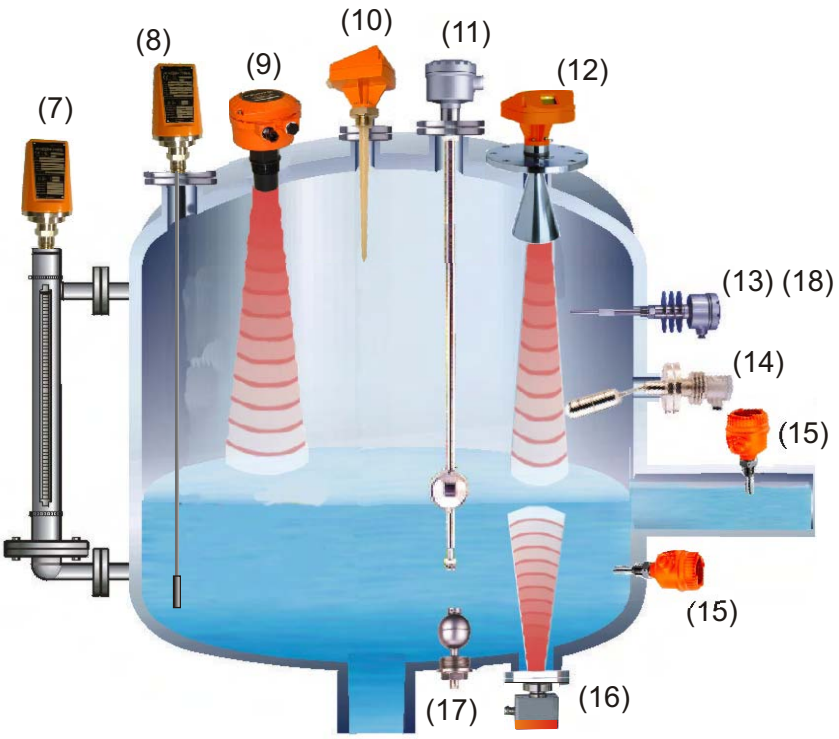
Level product range includes :-

(1) TDR Radar for solids
(2) Ultrasonic, 'through air'
(3) Continuous 'servo' level indicator
(4) Capacitance level switch
(5) Vibrating probe level switch
(6) Rotating paddle level switch
(7) By-pass level indicator with radar
(8) TDR Radar for liquids
(9) 2 wire Ultrasonic transmitter
(10) FMCW 2 wire 'wavestick' Radar
(11) Magnetic Float switches
(12) FMCW 'Horn' Radar 2 wire
(13) Capacitance level switch
(14) Side mounting 316 SS float switch
(15) Vibrating fork level switch
(16) Ultrasonics 'through wall'
(17) Mini magnetic float level switch
(18) RF Admittance level switch




**SOLIDS**

**IF YOU ARE UNSURE WHICH TECHNOLOGY TO USE FOR YOUR APPLICATION PLEASE CONSULT HYCONTROL INSTRUMENT ENGINEERS FOR APPLICATION ADVICE OR A FREE SITE LEVEL SURVEY.**




**LIQUIDS**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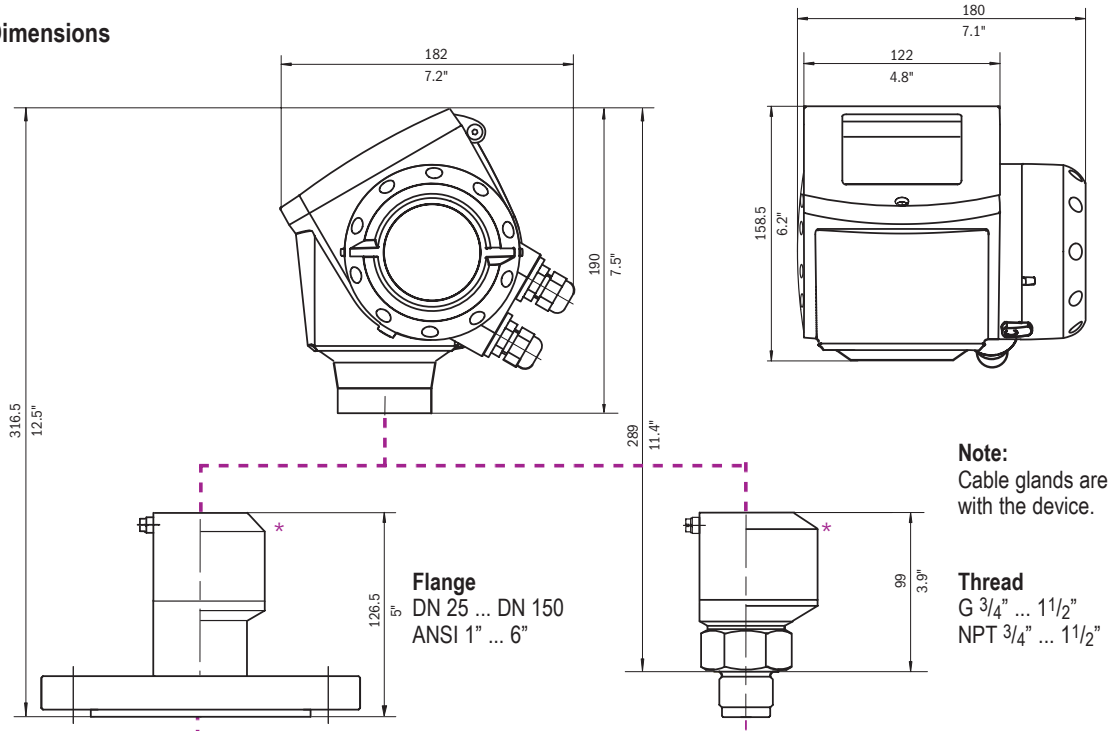
# REFLEX VF SERIES EXTENDED RANGE TDR

## Technical Data Sheet - Type VF7

| | | |
|---|---|---|
| **Input** | | |
| Function | | Time Domain Reflectometry (TDR ) |
| Parameter | | Level, distance, volume and/or interface |
| Max. measuring range | Double rod Ø8 mm / 0.3" | 4 m / 13 ft |
| | Single rod Ø8 mm / 0.3" | 4 m / 13 ft |
| | Coaxial Ø22 mm / 0.9" | 6 m / 20 ft |
| | Double cable Ø4 mm / 0.15" | 35 m / 115 ft |
| | Single cable Ø4 mm / 0.15" | 35 m / 115 ft |
| | Single cable Ø8 mm / 0.3" | 35 m / 115 ft |
| **Output** | | |
| Output signal | Output 1 | 4 ... 20 mA HART® or 3.8 ... 20.5 mA acc. to NAMUR NE 43 |
| | Output 2 (option) | 4 ... 20 mA (no HART® signal) or 3.8 ... 20.5 mA acc. to NAMUR NE 43 |
| Accuracy | | 0.05% (rel. 20 mA; 20°C / 70°F) |
| Resolution | | ±2 µA |
| Temperature drift | | Typically 50 ppm/K |
| Error signal | | High: 22 mA; Low: 3.6 mA acc. to NAMUR NE 43 |
| Max. Load | | 350 ohm |
| **Measuring accuracy** | | |
| Reference conditions | Temperature | +20°C ±5°C / +68°F ± 9°F |
| acc. to IEC770 | Pressure | 1013 mbar abs. ±20 mbar / 14.69 psig ±0.29 psig |
| | Relative air humidity | 60% ±15% |
| Resolution | | ±1 mm / ±0.04" |
| Accuracy (in direct mode) | Liquids | ±3 mm / 0.12", when L < 10 m / 33 ft; ±0.03% of measured distance, when L > 10 m / 33 ft |
| | Powders | ±20 mm / ±0.8" |
| | Interface | ±10 mm ($\varepsilon r$ constant) |
| **Application conditions** | | |
| Temperature | Ambient temperature | -40...+80°C / -40...+175°F; EExi: -40...+60°C / -40...+140°F |
| | Storage temperature | -40...+85°C / -40...+185°F |
| | Flange temperature | -40...+200°C / -40...+300°F (Ex: refer to relevant device's approval and temperature class) |
| Thermal shock resistance | | 100°C / min |
| Process conditions | Operating pressure | -1...40 bar / -14.5...580 psig; subject to process connection used and flange temperature |
| | Dielectric constant | ≥1.4 for coaxial probe; ≥1.6 for single and double probes |
| Vibration resistance | | IEC 68-2-6 and prEN 50178 (10...57Hz: 0.075 mm / 57...150 Hz: 1 g) |
| Protection category | | IP 66/67 equiv. to NEMA 6-6X |
| **Mechanical data** | | |
| Material | Housing | Aluminium |
| | Single rod | Stainless steel (1.4404 / 316 L); Hastelloy C-22 (2.4602) |
| | Double rod | Stainless steel (1.4404 / 316 L); Hastelloy C-22 (2.4602) |
| | Coaxial | Stainless steel (1.4404 / 316 L); Hastelloy C-22 (2.4602) |
| | Single cable | Stainless steel (1.4401 / 316 ); Hastelloy C-22 (2.4602) (only cable Ø4 mm / 0.15") |
| | Double cable | Stainless steel (1.4401 / 316) |
| | Process fitting | Stainless steel (1.4404 / 316 L); Hastelloy C-22 (2.4602) |
| | Gaskets | Viton (-40...+150°C / -40...+300°F); Kalrez 6375 (-20...+150°C / -5 ...+300°F) |
| Process connection | Thread | G 3/4"...1 1/2"; NPT 3/4"...1 1/2" |
| | Flange | DN 25...DN 150 (PN 40 / PN 16); 1"...8" (150 lb / 300 lb); 10 K (40...100A) |
| **Electrical connection** | | |
| 2-wire power supply | Terminals output 1 | |
| | Non-Ex/ EEx i | 24 V DC (14...30 V DC) |
| | EEx d | 24 V DC (20...36 V DC) |
| | Terminals output 2 | |
| | Non-Ex/ EEx i/ EEx d | 24 V DC (10...30 V DC) |
| Cable entry | | M20x1.5; NPT 1/2"; G 1/2" |
| Terminals | | 0.5...1.5 mm² |
| **Human machine interface** | | |
| Display | | 9 lines, 160x160 pixels in 8-step greyscale with 4-button keypad |
| Operating languages | | English (UK), German, French, Italian, Spanish, Portugese, Japanese, Chinese (Mandarin), Russian |
| **Approvals** | Overfill protection | WHG |
| | ATEX | ATEX II G/D 1, 1/2, 2 EEx ia IIC T6; ATEX II G/D 1/2, 2 EEx d ia IIC T6 |
| | FM | IS class I Div. 1 Gr. A...G; XP class I Div. 1 Gr. A...G |
| | CSA | IS class I Div. 1 Gr. A...G; XP class I Div. 1 Gr. A...G |

## Dimensions




**Note:**
Cable glands are not delivered with the device.

**Flange**
DN 25 ... DN 150
ANSI 1" ... 6"

**Thread**
G $^3/_4$" ... 1$^1/_2$"
NPT $^3/_4$" ... 1$^1/_2$"

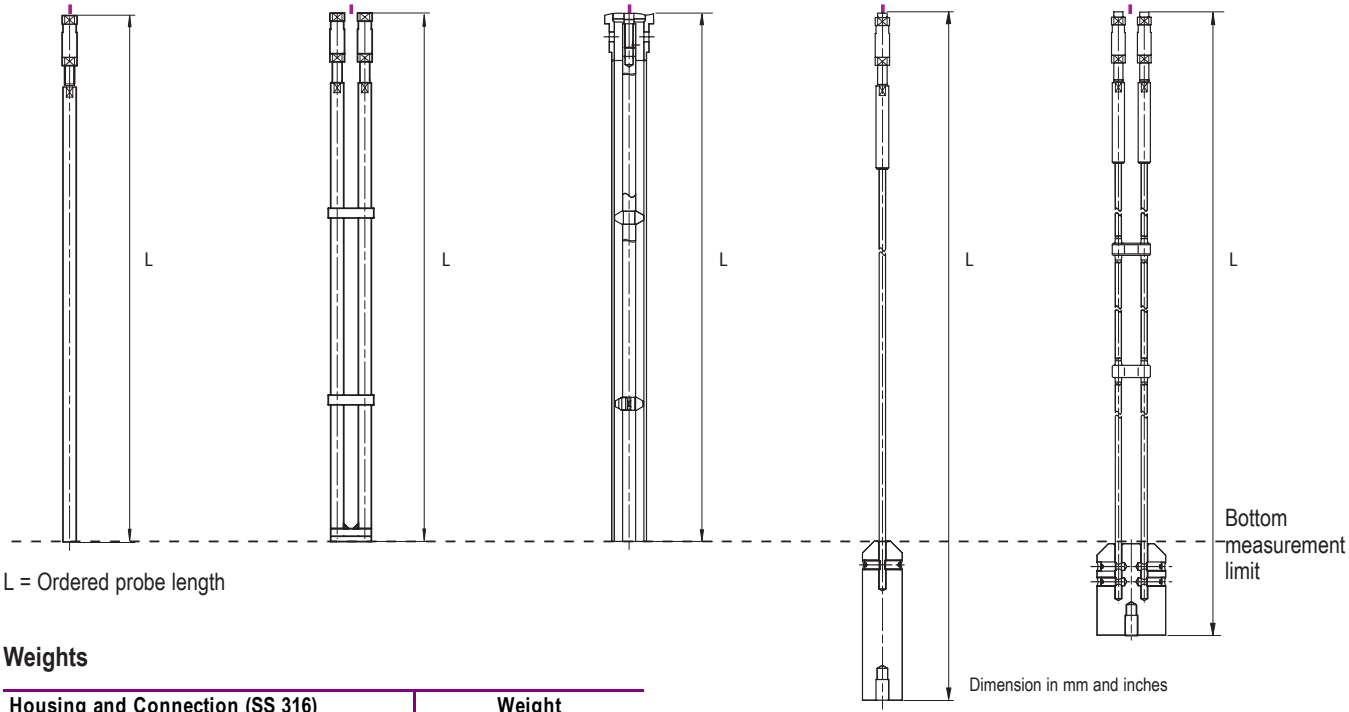
**Single rod**
ø 8 mm /ø 0.3"

**Double rod**
ø 8 mm / ø 0.3"

**Coaxial**
ø 22 mm / ø 0.9"

**Single cable**
ø 4 mm /ø 0.15"
ø 8 mm /ø 0.3"

**Double cable**
ø 4 mm / ø 0.15"




L = Ordered probe length

Dimension in mm and inches

## Weights

| Housing and Connection (SS 316) | Weight | |
|---|---|---|
| | [kg] | [lb] |
| Housing | 3.3 | 7.3 |
| Flange connection DN 25…80 / ANSI 1"…3" | 4…7 | 8.8…15.4 |
| Flange connection DN 100…150 / ANSI 4"…6" | 7…12 | 15.4…26.5 |
| Thread connection | 3 | 6.6 |
| **Probes** | **[kg / m]** | **[lb / ft]** |
| Single cable Ø4 mm / 0.15 | 0.12 | 0.08 |
| Single cable Ø8 mm / 0.3" | 0.41 | 0.28 |
| Double cable Ø4 mm / 0.15" | 0.24 | 0.16 |
| Single rod Ø8 mm / 0.3" | 0.41 | 0.28 |
| Double rod Ø8 mm / 0.3" | 0.82 | 0.56 |
| Coaxial Ø22 mm / 0.9" | 0.79 | 0.53 |

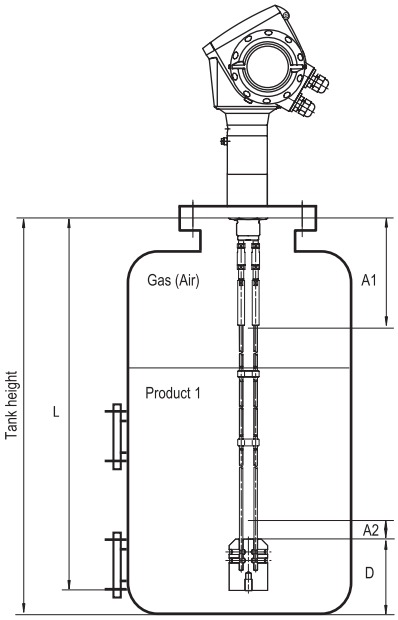
**Note:**
Wide range of counterweights and anchoring solutions available.
Contact HYCONTROL for further information.

* Only single cable Ø 8 mm / Ø 0.3" (solids application)

## Measurement limits

| Probes | Top dead zone εr = 80* [mm / inch] | Bottom dead zone εr = 80* [mm / inch] | Top dead zone εr = 2.3* [mm / inch] | Bottom dead zone εr = 2.3* [mm / inch] |
|---|---|---|---|---|
| **Double rod** | 125 / 4.9 | 10 / 0.4 | 165 / 6.5 | 50 / 1.95 |
| **Single rod** | 200 / 7.9 | 10 / 0.4 | 250 / 9.9 | 50 / 1.95 |
| **Coaxial** | 10 / 0.4 | 10 / 0.4 | 10 / 0.4 | 50 / 1.95 |
| **Double cable** | 125 / 4.9 | 10 / 0.4 | 165 / 6.5 | 50 / 1.95 |
| **Single cable Ø8 mm / Ø0.3"** | 200 / 7.9 | 10 / 0.4 | 250 / 9.9 | 50 / 1.95 |
| **Single cable Ø4 mm / Ø0.15"** | 200 / 7.9 | 10 / 0.4 | 250 / 9.9 | 50 / 1.95 |

* 80 is εr of water; 2.3 is εr of oil




**A1, Top dead zone**
Min. distance from flange to top limit of measuring range.

**A2, Bottom dead zone**
Length at end of probe, where measurement is not possible.

**D, non measurement zone**
Zone where measurement cannot be taken.

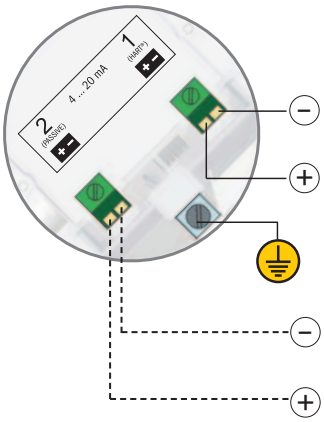
**L, Probe length**
Length specified by customer in the order.

## Probe selection

| | Double rod | Single rod | Coaxial | Double cable | Single cable Ø 8 mm / 0.3" | Single cable Ø 4 mm / 0.15" |
|---|---|---|---|---|---|---|
| **Maximum tank height** | | | | | | |
| 4 m / 13 ft | ◆ | ◆ | | | | |
| 6 m / 20 ft | | | ◆ | | | |
| 35 m / 115 ft | | | | ◆ | ◆ | ◆ |
| **Liquids** | | | | | | |
| Liquid application | ◆ | ◆ | ◆ | ◆ | | ◆ |
| LPG, LNG | ◆ | | ◆ | ◆ | | |
| Highly viscous liquids | | ◆ | | | | ◆ |
| Highly crystallising liquids | | ◆ | | | | ◆ |
| Highly corrosive liquids | ◆ | ◆ | ◆ | | | ◆ |
| Foam | | ◆ | ◆ | | | ◆ |
| Agitated liquids | ◆ | | ◆ | ◆* | | ◆* |
| Spray in tank | | | ◆ | | | |
| Storage tanks | ◆ | ◆ | ◆ | ◆ | | ◆ |
| Installation in bypass chamber | ◆ | ◆ | ◆ | ◆ | | ◆ |
| Small diameter nozzles | ◆ | | ◆ | ◆ | | |
| Long nozzles | ◆ | | ◆ | ◆ | | |
| Stilling wells | ◆ | ◆ | ◆ | ◆ | | ◆ |
| Interface measurement | ◆ | | ◆ | ◆ | | |

* with anchor fitting

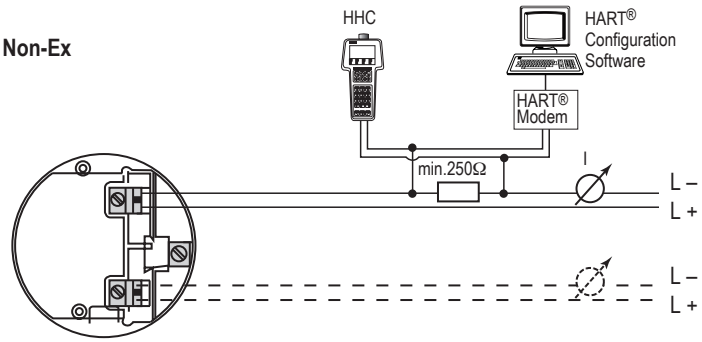
## Electrical connection



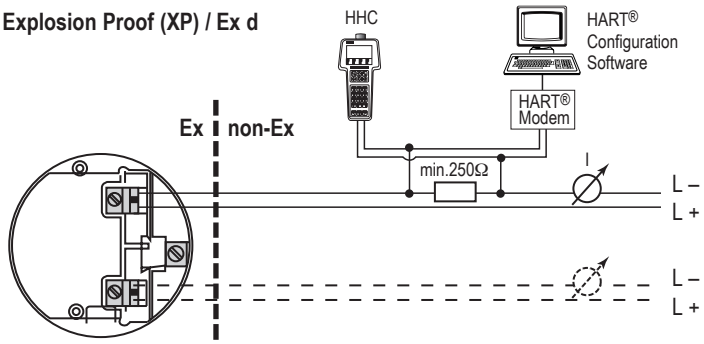

**Output 1**
4 ... 20 mA/HART
or
3.8 ... 20.5 mA/HART
acc. to NAMUR NE 43

**Output 2 (Option)**
4 ... 20 mA
or
3.8 ... 20.5 mA
acc. to NAMUR NE 43

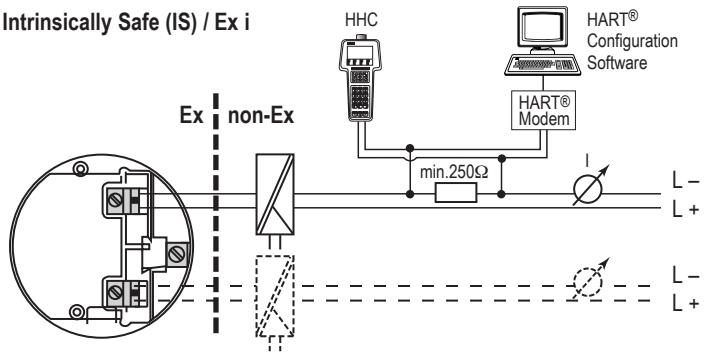
**Non-Ex**




**Explosion Proof (XP) / Ex d**




**Intrinsically Safe (IS) / Ex i**




**Note:** Other options how to connect the HHC (Hand Held Communicator) and modem to the HART® loop are available.

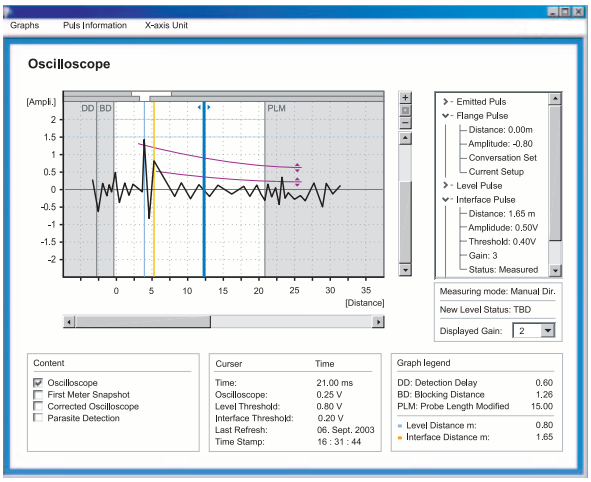
## State-of-the-art with PACTware

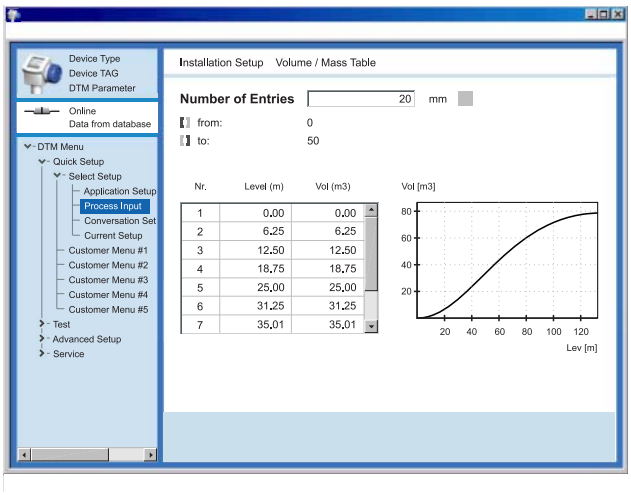
The VF7 is PACTware-ready. Each device is supplied ex-factory with the appropriate DTM.
A DTM (Device Type Manager) is a device driver making available the device functionality independent from the FIELDBUS protocol and providing a graphical user interface optimized for device operation and configuration.

Simple on-screen and intuitive setup procedure for devices without a display, or for set up from the Central Control Room. Summarized setup provides perfect control of initial input, and a guarantees  perfect results.

All features of PACTware are fully supported:

- Online device setup
- Displays measured values
- Records measured information during operation
- Shows status of device
- Gives stepwise setup with on-screen progress check
- Displays summary of setup selection for final supervision





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