



# TIME DOMAIN REFLECTOMETRY (TDR)

# WHY TDR TECHNOLOGY FOR LEVEL MEASUREMENT?

## INSENSITIVE TO CHANGES IN

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

## THE ADVANTAGES ARE

- ♦ Measuring ranges up to 40m
- ♦ Versatile technology for Liquids, Slurries, Pastes and Solids.
- ♦ Display of Level, Distance or Volume
- ♦ Interface detection on liquids (eg, oil on water).
- ♦ 2 wire loop powered 24vdc or 4 wire 110/230vac
- ♦ Hazardous area 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 configuration
- ♦ Suitable for detecting levels through surface foam
- ♦ Sealed Flange system maintains system integrity

## SUITABLE FOR ALL INDUSTRIES

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

## TDR FOR A VARIETY OF APPLICATIONS

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

## COST EFFECTIVE REPLACEMENT FOR

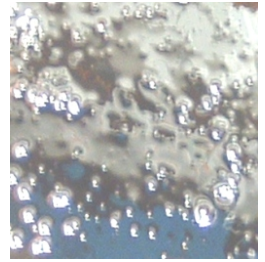
- ♦ Capacitance transmitters
- ♦ Hydrostatic transmitters
- ♦ Differential pressure transmitters
- ♦ Displacers

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



Various units on final assembly and ready to go for test.

The quality of all Hycontrol products is strictly monitored to conform with our strict ISO quality requirements.



Acids



Plastics



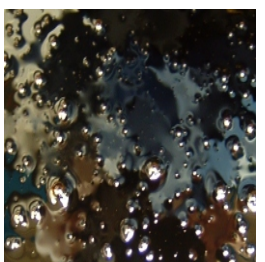
Grain



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 seven probe types.

## COST EFFECTIVE TDR WITH DISPLAY

### Reflex VF2 TDR

- ◆ HART protocol standard
- ◆ Multiple probe options
- ◆ Accuracy +/- 10mm (Opt. +/- 3mm)
- ◆ DPR (Dynamic Parasite Rejection)
- ◆ Remote display options up to 100m
- ◆ Range- 40m (solids) and 20m (liquids)
- ◆ 12 - 30V DC Two Wire
- ◆ Pressure up to 40bar
- ◆ ATEX EExia/EEExd Flameproof
- ◆ Flange temperature from -50°C to 300°C



## GENERAL PURPOSE TDR

### Reflex VF03 TDR

- ◆ 24m measuring range
- ◆ 24V DC loop powered
- ◆ 4/20mA Output
- ◆ HART protocol standard
- ◆ Multiple probe options
- ◆ ATEX Eexia intrinsically
- ◆ Flange temperature up to 200°C
- ◆ Pressure up to 40 Bar
- ◆ 316 stainless steel probe
- ◆ FEP coating options
- ◆ Liquids and Solids
- ◆ Accuracy +/- 5mm



## HIGH ACCURACY TDR

### Reflex VF7 TDR

- ◆ 35m measuring range
- ◆ E24V DC 2 wire Loop Powered
- ◆ 4/20mA Output
- ◆ HART protocol options
- ◆ Flange temperature up to 250°C
- ◆ Pressure up to 40 Bar
- ◆ Wide range of Process connections
- ◆ Liquids and Solids measurement
- ◆ Low interface measurement
- ◆ Wide range of Process connections
- ◆ Minimal blanking zone
- ◆ High accuracy of +/- 3mm



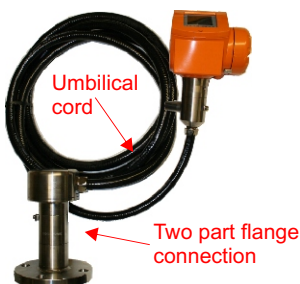
## OPERATING PRINCIPLE

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.

TDR guided radar can be used in two different modes :

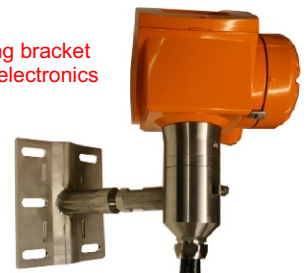
a) Level Measurement & b) Interface measurement

## REMOTE ELECTRONICS / HOUSING OPTION FOR VF7



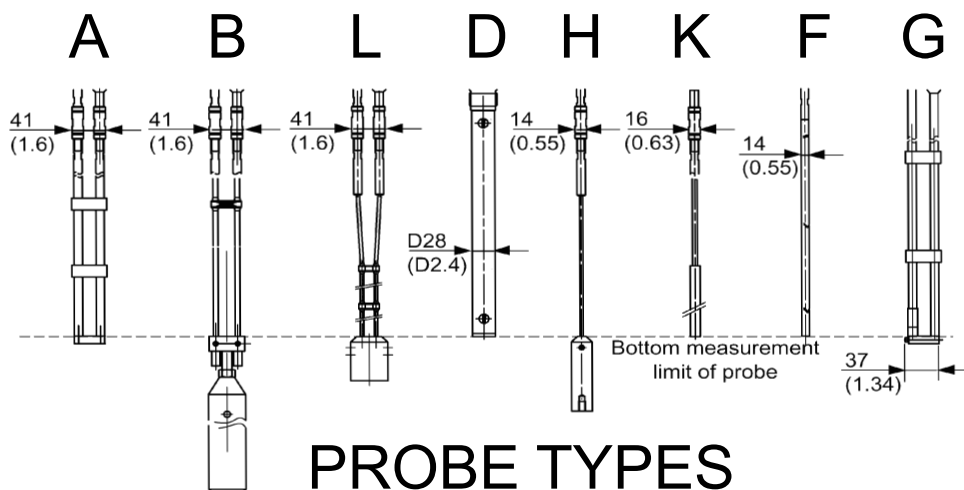
The remote housing option is useful for displaying the contents of the vessel at ground level or for demanding applications where the electronics are best kept away from the tank. An example of this is in Nuclear applications where the electronics can be detached from the mechanical probe and placed outside of the high radiation area. Also applies where there is high vibration in the tank.

Mounting bracket to hold electronics in place



# TDR PRODUCT SELECTOR

MODEL	VF2	VF03	VF7
Probe Type	A,B,D,F,H,L,K	F,H,D,L,K	A,D,F,G,H,K
Process Connection (inch)	½"	1"	½"
Maximum Range (m)	40	24	35
Weight Without Probe	1.6Kg	2Kg	3.3Kg
Probe Materials			
F = 1 Rod	AISI 316L, Hastelloy C-22	AISI 316L	AISI 316L, Hastelloy C-22
B/E = 2 or 1 flexible cable	AISI 316L, Hastelloy C-22	AISI 316L, FEP coated AISI 316	AISI 316L, Hastelloy C-22
C = Coaxial	AISI 316L, Hastelloy C-22	AISI 316L	AISI 316L, Hastelloy C-22
Product Measured	Liquids	Liquids	Liquids
	Solids	Solids	Solids
Measurement Principle	Level	Level	Level
	Distance	Distance	Distance
	Volume	Volume	Volume
	-	-	Interface
Materials of Construction			
Housing	Aluminium with Orange epoxy housing	Aluminium with Orange epoxy housing	Aluminium with Orange epoxy housing
Wetted Parts	Stainless Steel 316L / Hastelloy C-22	Stainless Steel 316L / 316, PTFE	Stainless Steel 316L / Hastelloy C-22
Gaskets	Viton, optional Kalrez 4079	Viton, optional Kalrez 4079	Viton, optional Kalrez 4079
Operating. Mode	Direct/TBF	Direct	Direct/TBF
Accuracy +/- mm (Liquids)	3mm	5mm	3mm
Accuracy +/- mm Solids	20mm	20mm	20mm
Minimum Dielectric (Single Probe)	1.6	2.1	1.4
Minimum Dielectric TBF Mode	1.1	n/a	1.1
Minimum Dielectric (Coaxial)	1.6	1.4	1.4
Repeatability	1mm	2mm	1mm
Max Pressure (bar)	40	40	300
Maximum Temperature Flange(C)	-50°C to +300°C	-30 to +90°C Std 200°C Optional	-40°C to +200°C
Maximum Temperature Product(C)	-50 to +150°C	-50 to +600°C	-40°C to +85°C
Ambient Temperature			
Standard	-40°C to +80°C	-30 to +55°C	-40°C to +80°C
Ex Version	-40°C to +60°C	-20 to +55°C	-40°C to +60°C
Power Supply 24V DC	Yes	Yes	Yes
2-Wire Device	Yes	Yes	Yes
Output (4-20mA)	Yes	Yes	Yes*2
Protection Category	IP66/67	IP66/67	IP66/67
HART	Yes	Yes	Yes
PACTWARE	Yes	No	Yes
Profibus PA	No	No	No
Fieldbus	No	No	No
ATEX EExia	Yes	Yes	Yes
ATEX EExd	Yes	No	Yes
EMC	Yes	Yes	Yes
HMI	Yes	No	Yes



## PROBE TYPES