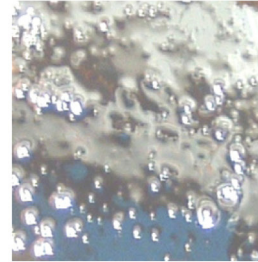


# HYCONTROL

## PRODUCT



# TIME DOMAIN REFLECTOMETRY(TDR) REFLEX VF7 Series



Acids



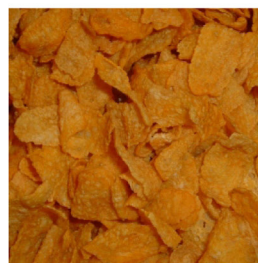
Plastics



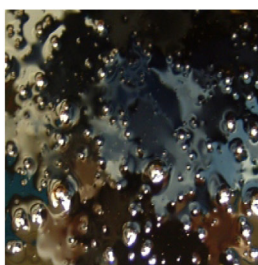
Grain



Powders



Flakes



Oils

## WHY RADAR TECHNOLOGY FOR LEVEL MEASUREMENT?

### INSENSITIVE TO CHANGES IN

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

### THE ADVANTAGES ARE

- ◆ Measuring ranges up to 80m (option for 100m special)
- ◆ 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 ATEX, EExd and EEXia
- ◆ 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

### RADAR 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.



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Reflex VG6
Reflex VG7
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Reflex VF7
레벨스위치
액체형vibration
분체형vibration
Microwave

## 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.

### REFLEX VF03 TWO WIRE TDR

- ◆ 24m Measuring Range
- ◆ 24 VDC Loop Powered
- ◆ 4/20mA Output
- ◆ Pressure up to 40 Bar
- ◆ Process Temperature to 600°C
- ◆ HART Protocol standard
- ◆ ATEX EExia Intrinsically Safe
- ◆ Multiple probe options
- ◆ 316 Stainless Steel Probe
- ◆ FEP Coating option
- ◆ Liquids and Solids



### REFLEX VF7 TWO WIRE TDR

- ◆ 35m Measuring Range
- ◆ 24 VDC Two Wire
- ◆ HART / PACTWARE / FIELDBUS
- ◆ Pressure up to 300 Bar
- ◆ Flange Temperature up to 300°C
- ◆ ATEX EExia / EExd Flameproof
- ◆ Capable of measuring low dielectric
- ◆ Integral display and programmer
- ◆ High Accuracy 3mm std(2mm option)
- ◆ Liquids and Solids



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

Pulses of low power microwaves are sent along conductors. At the point where they 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 :

### 1. Products with a dielectric constant $\epsilon_r \geq 1.6$

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).

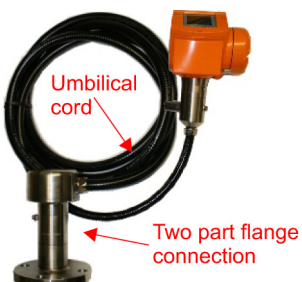
#### b) Interface measurement

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 their 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( $\epsilon_r$ ) of this first layer to determine the interface level.

### 2. Product with a dielectric constant $\epsilon_r > 1.4$

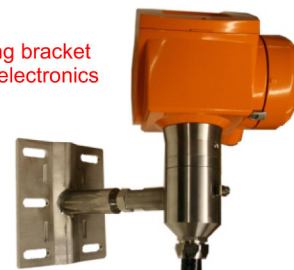
To monitor products with low dielectrics we utilise tank bottom following principle (TBF)

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



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.

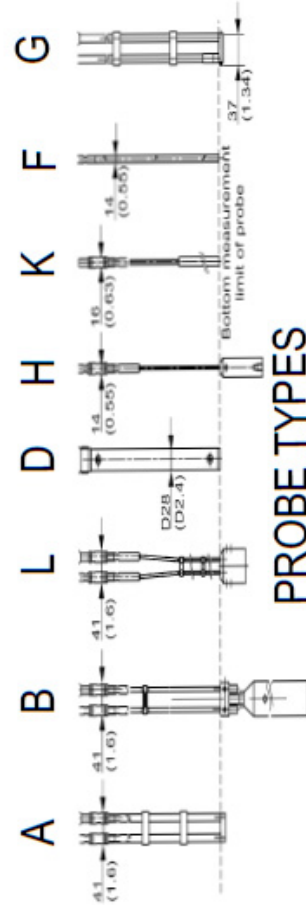
Mounting bracket to hold electronics in place



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MODEL	VF0301	VF0302	VF0303	VF0304	VF0306	VF7000	VF7001	VF7002	VF7003	VF7004	VF7005	VF7006
Probe Type	F	H	D	L	K	F	A	D	H	K	G	H2mm
Process Connection (min)	1"	1"	1"	1 1/2"	1 1/2"	3/4"	1 1/2"	3/4"	3/4"	1 1/2"	1 1/2"	1/2"
Maximum Range (m)	3	12	6	24	24	4	4	6	35	35	8	35
Product	Liquids Solids	Liquids Solids*	Liquids Solids	Liquids Solids	Liquids Solids	Liquids Solids	Liquids	Liquids	Liquids Solids	Liquids solids	Liquids	Liquids
Measurement	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance	Distance
	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume	Volume
Operating Mode	Direct	Direct	Direct	Direct	Direct	Interface	Interface	Interface	Interface	Interface	Interface	Interface
Accuracy +/- mm(Liquids)	5mm	5mm	5mm	5mm	5mm	Direct/TBF	Direct/TBF	Direct	Direct/TBF	Direct/TBF	Direct/TBF	Direct/TBF
Accuracy +/- mm(Solids)	20mm	20mm	20mm	20mm	20mm	20mm	20mm	3mm	20mm	20mm	20mm	3mm
Minimum Dielectric	2.1	2.1	1.6	1.8	2.1	1.6/1.1	1.6/1.1	1.4/1.1	1.6/1.1	1.6/1.1	1.6/1.1	1.6/1.1
Repeatability	2mm	2mm	2mm	2mm	2mm	1mm	1mm	1mm	1mm	1mm	1mm	1mm
Max Pressure (bar)	40	40	40	40	40	100	100	100	100	100	100	300
Maximum temperature (°C)	200	200	200	200	200	200	200	200	200	200	200	300
Power supply 24V DC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Wire device	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Output (4-20mA)	Yes	Yes	Yes	Yes	Yes	Yes*2	Yes*2	Yes*2	Yes*2	Yes*2	Yes*2	Yes*2
HART	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PACTWARE	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RS485	No	No	No	No	No	No	No	No	No	No	No	No
Profibus PA	No	No	No	No	No	Option	Option	Option	Option	Option	Option	Option
Fieldbus	No	No	No	No	No	Option	Option	Option	Option	Option	Option	Option
ATEX EExia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ATEX EExd	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HMI	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes



\*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. The 2mm option is only for liquids.

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## Ordering Code

PRODUCT CODE	
<b>VF7</b>	Two wire extended range TDR
APPROVAL	
0	Without
2	ATEX II G/D 1 1/2 2 EEx ia IIC T6
3	ATEX II G/D 1/2 2 EExd ia IIC T6
6	FM IS CI 1, II, III Div.1,2 Gr A-G Dual Seal
7	FM XP CI 1, II, III Div.1,2 Gr A-G Dual Seal
H	CSA IS CI 1, II, III Div.1,2 Gr A-G Dual Seal
K	CSA XP CI 1, II, III Div.1,2 Gr A-G Dual Seal
PROCESS CONNECTION & PROBE MATERIAL	
0	316L / 1.4404 Stainless Steel 40 bar
1	Hastelloy C-22 / 2.4602. 40 bar (Not for probes 4-5-D-E) Triple price for 316L parts +
2	316L / 1.4404 Stainless Steel 100 bar
3	Hastelloy C-22 / 2.4602. 100bar (Not for probes 4-5-D-E) Triple price for 316L parts +
PROBE	
0	Single rod Ø 8mm / 0.31" Max 4m / 13.12ft
1	Double rod Ø 8mm / 0.31". Max 4m / 13.12ft
2	Coax Ø 22mm / 0.87". Max 6m / 19.96ft
3	Single cable Ø 4mm / 0.16" Max 35m / 114.83ft
4	Single cable Ø 8mm / 0.31" Max 35m / 114.83ft
5	Double cable Ø 4mm / 0.16" Max 35m / 114.83ft
7	Single cable Ø 4mm / 0.16" FEP Coated Max 35m / 114.83ft
A	NO probe - (Single rod Ø 8mm / 0.31" Max 4m / 13.12 ft)
B	NO probe - (Double rod Ø 8mm / 0.31" Max 4m / 13.12 ft)
C	NO probe - (Single cable Ø 4mm / 0.16" Max 35m / 114.83 ft)
D	NO probe - (Single cable Ø 8mm / 0.31" Max 35m / 114.83 ft)
E	NO probe - (Double cable Ø 4mm / 0.16" Max 35m / 114.83 ft)
M	Segmental Single 8mm rod
S	Segmental coaxial 22mm Probe
COUNTERWEIGHT & PROBE END TYPE	
0	Without
1	Counterweight Ø12mm / 0.47" x 100mm / 3.94" (Single cable Ø 8 mm / 0.31 inch)
2	Counterweight Ø38mm / 1.5" x 245mm / 9.65" (Single cable Ø 8 mm / 0.31 inch)
3	Counterweight Ø20mm / 0.79" x 100mm / 3.94" (Single cable Ø 4 mm / 0.16 inch)
4	Counterweight Ø38mm / 1.5" x 60mm / 2.36" (Doble cable Ø 4 mm / 0.16 inch)
A	Turnbuckle
B	Chuck
C	M8 Threaded end
D	Crimped end
E	Open end with no counterweight
TEMPERATURE & SEALING	
0	Standard / -40°C...+200°C / 40 bar Viton GLT
1	Standard / -20°C...+200°C / 40 bar Kalrez 6375
4	Standard/ -50C...+150C / EPDM
EN PROCESS CONNECTION	
0	Without
1	G 3/4" A ISO229
2	G 1" A ISO229
3	G 1 1/2" A ISO229
4	DN 25 PN 40 Form B1 EN1093
5	DN 40 PN 40 Form B1 EN1092
6	DN 50 PN 40 Form B1 EN1092
7	DN 80 PN 40 Form B1 EN1092
8	DN 100 PN 16 Form B1 EN1092
A	DN 100 PN 40 Form B1 EN1092
B	DN 150 PN 16 Form B1 EN1092
C	DN 150 PN 40 Form B1 EN1092
D	DN50 PN63 Form B1 EN1092
E	DN80 PN63 Form B1 EN1092
F	DN100 PN63 Form B1 EN1092
K	DN25 PN63/PN100 Form B1 EN1092
L	DN40 PN63/PN100 Form B1 EN1092
M	DN50 PN100 Form B1 EN1092
N	DN80 PN100 Form B1 EN1092
P	DN100 PN100 Form B1 EN1092

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## Ordering Code

	R	DN150 PN63 Form B1 EN1092
	S	DN150 PN100 Form B1 EN1092
		<b>ANSI PROCESS CONNECTION</b>
	0	Without
	1	3/4" NPT
	2	1" NPT
	3	1 1/2" NPT
	4	1" 150 lb RF ANSI B16.6
	5	1" 1/2 150 lb RF ANSI B16.5
	6	1" 1/2 300 lb RF ANSI B16.5
	7	2" 150 lb RF ANSI B16.5
	8	2" 300 lb RF ANSI B16.5
	A	3" 150 lb RF ANSI B16.5
	B	3" 300 lb RF ANSI B16.5
	C	4" 150 lb RF ANSI B16.5
	D	4" 300 lb RF ANSI B16.5
	E	6" 150 lb RF ANSI B16.5
	F	8" 150 lb RF ANSI B16.5
	G	6" 300 lb RF ASME B16.5
	M	1" 600 lb RF ASME B16.5
	N	1"1/2 600 lb RF ASME B16.5
	P	2" 600 lb RF ASME B16.5
	R	3" 600 lb RF ASME B16.5
	S	4" 600 lb RF ASME B16.5
	T	1" 900 lb RF ASME B16.5
	U	1"1/2 900 lb RF ASME B16.5
	V	2" 900/1500 lb RF ASME B16.5
	W	3" 900 lb RF ASME B16.5
	X	4" 900 lb RF ASME B16.5
		<b>OTHER PROCESS CONNECTION</b>
	0	Without
	5	10K 40A RF JIS B2238
	6	10K 50A RF JIS B2238
	7	10K 80A RF JIS B2238
	8	10K 100A RF JIS B2238
		<b>OUTPUT</b>
	0	1 x Output: 4...20mA (HART)
	1	1 x Output: 4...20mA (HART) - INTERFACE
	2	2 x Outputs: 4...20mA (HART) + 4...20mA
	3	2 x Outputs: 4...20mA (HART) + 4...20mA - INTERFACE
	A	Fieldbus Foundation(4 Wire + Local Hart)
	B	Fieldbus Foundation(4 Wire + Local Hart) + Interface
	D	Profibus PA (4 Wire + Local Hart)
	E	Profibus PA (4 Wire + Local Hart) + Interface
		<b>HOUSING - CABLE ENTRY - CABLE GLAND</b>
	0	Aluminium / M20x1,5 / without
	1	Aluminium / 1/2 NPT / without
	2	Aluminium / G 1/2 / without
	3	Aluminium / M20x1,5 / Plastic (non-EEEx: black, EEx i: blue)
	4	Aluminium / M20x1,5 / Metall (only for EEx d devices)
	A	Stainless Steel / M20x1,5 / without
	B	Stainless Steel / 1/2 NPT / without
	D	Stainless Steel / M20x1,5 / Plastic (non-EEEx: black, EEx i: blue)
	E	Stainless Steel / M20x1,5 / Metall (only for EEx d devices)
		<b>HOUSING OPTION</b>
	0	Without
	2	Weather protection
	3	Remote housing with Max range 30m
	4	Remote housing with Max range 25m
	5	Remote housing with Max range 15m
	6	Remote housing with Max range 5m
	A	Remote housing with 2m interco Max range 30m
	B	Remote housing with 4.5m interco Max range 25m

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