

HYCONTROL
LEVEL MEASUREMENT SOLUTIONS



VF04 TDR
LEVEL GAUGE

WHY USE TDR FOR LEVEL MEASUREMENT?

UNAFFECTED BY CHANGES IN

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

VF04 TDR'S KEY FEATURES INCLUDE

- ◆ Measuring range of up to 24 m with a wide selection of probe types
- ◆ Versatile technology for liquids, slurries, pastes and powders
- ◆ Measures level, distance or volume
- ◆ Two-wire loop powered 24VDC
- ◆ Compact, durable design suitable for tough industrial environments
- ◆ Convenient, portable plug-in display and programming unit
- ◆ HART Protocol for ease of system compatibility
- ◆ ATEX Ex ia hazardous area options available
- ◆ Suitable for narrow tanks or side-mounted bypass chambers
- ◆ Simple to install and retrofit with a wide selection of process connections
- ◆ Coated cables suitable for corrosive and acidic atmospheres
- ◆ High-temperature options available
- ◆ Remote or local programming and configuration for maximum ease of use

APPLICATIONS IN MOST INDUSTRIES

- ◆ Petrochemical
- ◆ Food
- ◆ Water & Waste
- ◆ Cement
- ◆ Asphalt
- ◆ Power Generation
- ◆ Metals
- ◆ Chemicals
- ◆ Process
- ◆ Quarrying
- ◆ Animal Feed
- ◆ Milling

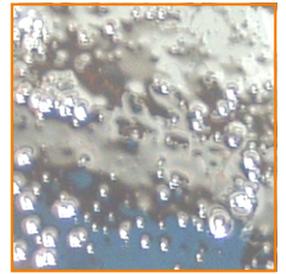
EFFECTIVE REPLACEMENT FOR

- ◆ Capacitance transmitters
- ◆ Ultrasonics
- ◆ Differential pressure transmitters
- ◆ Radar transmitters
- ◆ Displacers
- ◆ Float transmitters
- ◆ Hydrostatic transmitters
- ◆ Capacitance transmitters

MANUFACTURED TO ISO9001 Q.M.S.



The standard of all Hycontrol products is strictly monitored to conform to all ISO quality requirements. This ensures we meet the needs of customers as well as statutory and regulatory requirements.



Acids



Plastics



Grain



Powders



Flakes



Oils

REFLEX VF04 SERIES TDR

Hycontrol's VF04 guided wave radar transmitter offers users a practical solution for measuring liquids, pastes, slurries and powdered products. The robust, compact design and removable programmable display make it an ideal choice for a wide variety of industrial level control applications.

The VF04 utilises the Time Domain Reflectometry (TDR) measuring principle to accurately determine distance, level or volume. During operation, the probe transmits micro-pulses along the probe guide (usually a cable or a rod) at close to the speed of light. When these pulses hit the surface of the medium they are reflected to the electronic module. As both level and distance are directly proportional to the time of flight, this makes TDR a highly accurate measurement principle.

With ATEX options and HART connectivity, the Hycontrol VF04 offers an ideal solution for a range of level requirements.

- ◆ Aluminium or Stainless Steel housing
- ◆ Measuring range up to 24 m (80 ft)
- ◆ Accuracy of +/- 5 mm
- ◆ Rod, cable and coaxial probes
- ◆ Removable, plug-in programmable display
- ◆ ATEX options for hazardous areas
- ◆ 4~20 mA & HART output
- ◆ Maximum temp. 200°C
- ◆ Maximum pressure 40 bar
- ◆ Variety of process connections
- ◆ Simple programming
- ◆ 2-wire loop powered



PROGRAMMING THE VF04



A key feature of the VF04 TDR unit is the option to use the VGF-DISPLAY removable programming and display unit. The unit connects to the top of the TDR unit, allowing programming via touch buttons and the LCD screen. A simple menu system allows for fast programming and simple commissioning. The portable nature of the VGF-DISPLAY unit is intended to provide a cost-saving to users purchasing and installing multiple probes. Only one display unit is required to programme any number of installed VF04 units, with output information being fed back to the site PLC or a panel via the 4~20 mA or HART outputs. Alternatively, a HART programmer can be used, or HYVIEW PC software for remote computer control which can be downloaded free from hycontrol.com.

The default display shows the primary measured value (which the output current is calculated from). Besides the numerical display, there is a bar graph on the right showing the value of the current output. Programming is conducted via a text-based menu, which is navigated with the unit's four buttons.



TECHNICAL DATA

TYPE		ALUMINIUM HOUSING VF04□□-4□□-□	STAINLESS STEEL HOUSING VF04□□-6□□-□
Input data	Measured values	Between the reference point of the unit and reflection plane (material surface); distance, level and volume	
	Measuring range	Refer to TECHNICAL DATA - PROBES	
Probe types and technical data		Coaxial, twin cable, mono cable, twin rod and mono rod probes (see: Technical data of the probes table)	
Housing		Paint coated aluminium	Stainless steel
Media temperature		Standard: -30 °C ... +90 °C High-temp: -30 °C ... +200 °C SEE: PAGE 7	
Media pressure		-0.1 ... 4 MPa (-1...40 bar) SEE: PAGE 7	
Ambient temperature		-30 °C ... +60 °C, with display: -20 °C ... +60 °C	
Sealing		FPM (Viton®), optional for high temp version: FFKM Perfluoroelastomer (Kalrez® 6375), EPDM	
Ingress protection		IP67 (NEMA 4 – 4X)	
Power supply		18 ... 35 V DC, nominal 24 V DC, Ex version: 18 ... 28 V DC, protection against surge transients	
Output data	Output signals	Analogue: 4–20 mA, (3.9 ... 20.5 mA) passive output, error signal: 22 mA or 3.8 mA or HOLD	
		BUS: serial line, HART® interface, terminal resistor min. 250 Ohm	
		Display: VGF-DISPLAY plug-in LCD matrix	
	Accuracy*	For liquids: ±5mm; For probe length L =10m: ±0.05% of the range	
Resolution	For solids: ±20mm; For probe length L = 10m: ±0.2% of the range		
Electrical connection		2x M20x1,5 metal cable glands for ø 7 ... 13 mm cable, or 2x M20x1,5 plastic cable glands for ø 6 ... 12 mm cable wire cross section: 0.5 ... 1.5 mm ² (shielded cable is recommended) + internal thread for 2x ½" NPT cable protective pipe	
Electrical protection		Class III.	
Mass (housing)		2.4 kg	4.1 kg

* Under ideal reflection and stabilised temperature conditions

SPECIAL DATA FOR EX CERTIFIED MODELS

TYPE	ALUMINIUM HOUSING VF04□□-4□□-5Ex,6Ex,8Ex
Ex marking (ATEX)*	Ⓔ II 1 G Ex ia IIC T6...T3 Ga, Ⓔ II 1 G Ex ia IIB T6...T3 Ga Ⓔ II 1 D Ex ia IIIC T85°C...T180°C Da, Ⓔ II 1/2 D Ex ta/tb IIIC T85°C... T180°C Da/Db
Intrinsically safe data (Ex ia IIB and Ex ia IIIC)	Ci = 10 nF, Li = 10 µH, Ui = 30 V, li = 140 mA, Pi = 1 W
Intrinsically safe data (Ex ia IIC)	Ci = 10 nF, Li = 10 µH, Ui = 30 V, li = 100 mA, Pi = 0.75 W
Media temperature	-30 °C ... +180 °C SEE BELOW
Media pressure	-0.1 ... 4 MPa (-1...40 bar) SEE: PAGE 7

* In case of ATEX "G Ex ia" level transmitters with display the apparatus group can only be "II B".

TEMPERATURE DATA FOR EX CERTIFIED MODELS

	EXPLOSIVE GAS ATMOSPHERE				EXPLOSIVE DUST ATMOSPHERE			
	ALUMINIUM HOUSING VF04□□-4□□-8Ex				ALUMINIUM HOUSING VF04□□-4□□-5Ex,6Ex			
					HIGH TEMPERATURE VF04H□-4□□-8Ex VF04P□-4□□-8Ex			
	Ex ia IIB, Ex ia IIC				Ex ia IIIC/ Ex ta/tb IIIC			
Maximum permissible media temperature at the antenna	+80°C	+90°C	+100°C	+180°C	+80°C	+90°C	+100°C	+180°C
Maximum permissible surface temperature at the process connection	+75°C	+90°C	+100°C	+175°C	+75°C	+90°C	+100°C	+175°C
Temperature class	T6	T5	T4	T3	T85°C	T100°C	T110°C	T180°C

TECHNICAL DATA - PROBES

TYPE	VF04□K-□□□-□ VF04□L-□□□-□ VF04□V-□□□-□ VF04□W-□□□-□	VF04□R-□□□-□ VF04□P-□□□-□	VF04□S-□□□-□ VF04□Z-□□□-□	VF04□N-□□□-□ VF04□J-□□□-□	VF04□T-□□□-□ VF04□U-□□□-□	VF04□D-□□□-□ VF04□E-□□□-□	VF04□A-□□□-□ VF04□B-□□□-□ VF04□C-□□□-□ VF04□H-□□□-□
Denomination	4mm cable	Rod	Rod	8 mm cable	4mm twin cable	Twin rod	Coaxial
Max. measuring distance	24 m	3 m	6 m	24 m	24 m	3 m	6 m
Min. measuring distance $\epsilon_r = 80 / \epsilon_r = 2.4$	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m	0.15 m / 0.3 m	0.15 m / 0.3 m	0 m
Min. range	∅ 600 mm	∅ 600 mm	∅ 600 mm	∅ 600 mm	∅ 200 mm	∅ 200 mm	∅ 0 mm
Min. medium ϵ_r	2.1	2.1	2.1	2.1	1.8	1.8	1.4
Process connection	K - 1" BSP	1" BSP	1 1/2" BSP	1 1/2" BSP	T - 1 1/2" BSP	D - 1 1/2" BSP	A - 1" BSP
	L - 1" NPT						B - 1" NPT
	V - 1 1/2" BSP	1" NPT	1 1/2" NPT	1 1/2" NPT	U - 1 1/2" NPT	E - 1 1/2" NPT	C - 1 1/2" BSP
	W - 1 1/2" NPT						H - 1 1/2" NPT
Probe material	1.4401	1.4571	1.4571	1.4401	1.4401	1.4571	1.4571
Nominal diameter of probe	4 mm	8 mm	14 mm	8 mm	4 mm	8 mm	28 mm
Mass	0.12 kg/m	0.4 kg/m	1.2 kg/m	0.4 kg/m	0.24 kg/m	0.8 kg/m	1.3 kg/m
Separator material	-	-	-	-	PFA, welded on the cable	PTFE-GF25 if length > 1.5m	PTFE, if length > 1.5m
Weight dimensions	∅ 25 x 100 mm	-	-	∅ 40 x 260 mm	∅ 40 x 80 mm	-	-
Weight material	316Ti	-	-	316Ti	316Ti	-	-

DIMENSIONS

VF04TK-□□□-□ VF04TL-□□□-□ VF04TV-□□□-□ VF04TW-□□□-□	VF04TR-□□□-□ VF04TP-□□□-□	VF04TS-□□□-□ VF04TZ-□□□-□	VF04TN-□□□-□ VF04TJ-□□□-□	VF04TT-□□□-□ VF04TU-□□□-□	VF04TD-□□□-□ VF04TE-□□□-□	VF04TA-□□□-□ VF04TB-□□□-□ VF04TC-□□□-□ VF04TH-□□□-□

TECHNICAL DATA - COATED PROBES

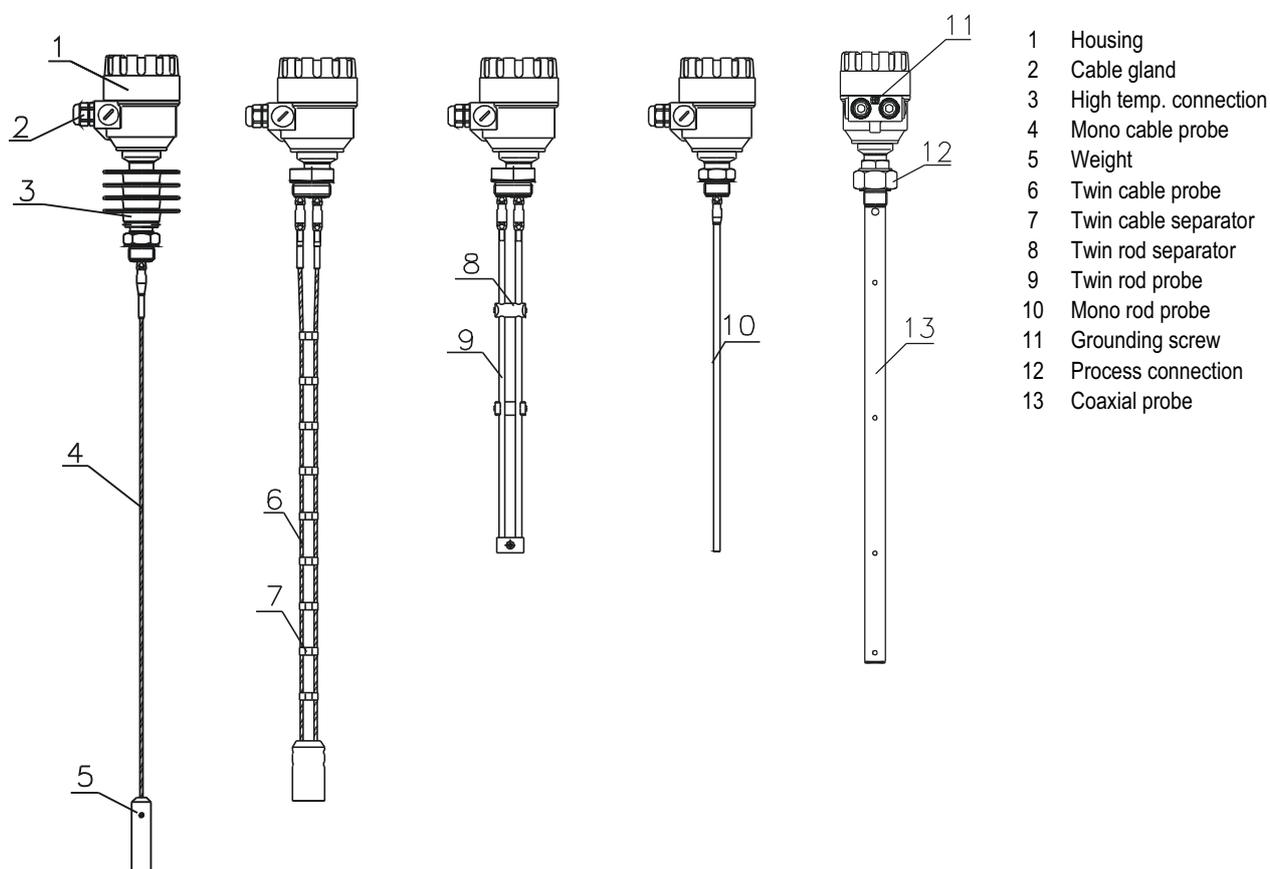
TYPE	VF04F-□□□-□ VF04G-□□□-□	VF04TX-□□□-□	VF04TY-□□□-□	VF04TM-□□□-□	VF04TQ-□□□-□	VF04TI-□□□-□
Denomination	4mm FEP coated cable	4mm FEP coated cable	4mm FEP coated cable	4mm fully FEP coated cable	Fully PFA coated rod	Fully PP coated rod
Max. measuring distance	24 m	24 m	24 m	24 m	3 m	3 m
Min. measuring distance $\epsilon_r = 80 / \epsilon_r = 2.4$	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m	0.3 m / 0.4 m
Min. distance to objects	∅ 600 mm	∅ 600 mm	∅ 600 mm	∅ 600 mm	∅ 600 mm	∅ 600 mm
Min. media ϵ_r	2.1	2.1	2.1	2.1	2.1	2.1
Process connection	F - 1" BSP G - 1" NPT	DN 40 Triclamp	DN 40	DN 50	DN 50	DN 50
Probe material	1.4401 / FEP	1.4401 / FEP	1.4401 / FEP	1.4401 / FEP	1.4571 / PFA	1.4571 / PP
Nominal diameter of the probe	6 mm	6 mm	6 mm	6 mm	12 mm	16 mm
Mass	0.16 kg/m	0.16 kg/m	0.16 kg/m	0.16 kg/m	0.5 kg/m	0.6 kg/m
Weight coating material	-	-	-	PFA	PFA	PP
Weight dimensions	∅ 25 x 100 mm	∅ 25 x 100 mm	∅ 25 x 100 mm	∅ 30 x 183 mm	-	-
Weight material	316Ti	316Ti	316Ti	316Ti	-	-
Max. media temp.	+150 °C	+150 °C	+150 °C	+150 °C	+150 °C	+60 °C

DIMENSIONS

VF04TF-□□□-□ VF04TG-□□□-□	VF04TX-□□□-□	VF04TY-□□□-□	VF04TM-□□□-□	VF04TQ-□□□-□	VF04TI-□□□-□

SELECTING THE RIGHT PROBE

PROBE TYPE	MAXIMUM MEASURING RANGE	DEAD ZONE (UNMEASURABLE AREA OF THE VESSEL)		PROCESS CONNECTION	ϵ_R MINIMUM
		UPPER (T) / LOWER (B) $\epsilon_R = 80$	UPPER (T) / LOWER (B) $\epsilon_R = 2.4$		
Mono cable \varnothing 4 mm	24 m	300 / 20 mm	400 / 100 mm	1"; 1½"	2.1
Mono cable \varnothing 8 mm				1½"	
Mono rod \varnothing 8 mm	1"				
Mono / segmented rod \varnothing 14 mm	6 m			150 / 20 mm	300 / 100 mm
Twin cable \varnothing 4 mm	24 m				
Twin rod \varnothing 8 mm	3 m	0 / 10 mm	0 / 100 mm	1"; 1½"	1.4
Coaxial pipe \varnothing 28 mm	6 m	300 / 20 mm	400 / 100 mm	1"; 1½"	2.4
Coated cable \varnothing 6 mm	24 m			TriClamp; DN40; DN50	
Coated rod \varnothing 12 / 16 mm	3 m			DN50	



ORDERING INFORMATION

VF04 - - - - * 2-wire guided microwave level transmitter

TYPE	CODE	PROBE / PROC. CONN.	CODE	HOUSING	CODE	INSERTION LENGTH	CODE	INSERTION LENGTH	CODE	OUTPUT / EX	CODE				
Transmitter	T	Coaxial / 1" BSP	A	Aluminium	4	Coaxial, Rod, Twin rod	0m	0m	0	4 - 20 mA + HART / Normal	4				
High temp. transmitter	H	Coaxial / 1" NPT	B	Stainless steel	6					1m	1	0.1m	1	4 - 20 mA + HART / Ex tD**	5
Transmitter + display	B	Coaxial / 1 1/2" BSP	C							2m	2	0.2m	2	4 - 20 mA + HART / Ex iaD**	6
High temp. transmitter + display	P	Coaxial / 1 1/2" NPT	H							3m	3	0.3m	3	4 - 20 mA + HART / Ex ia**	8
		Rod / 1" BSP	R							Coaxial, Rod (∅14mm)		0.4m	4		
		Rod / 1" NPT	P							4m	4	0.5m	5		
		Rod / 1 1/2" BSP	S			5m	5	0.6m	6						
		Rod / 1 1/2" NPT	Z			6m	6	0.7m	7						
		Twin rod / 1 1/2" BSP	D					0.8m	8						
		Twin rod / 1 1/2" NPT	E					0.9m	9						
		4mm cable / 1" BSP	K												
		4mm cable / 1" NPT	L												
		4mm cable / 1 1/2" BSP	V												
		4mm cable / 1 1/2" NPT	W												
		8mm cable / 1 1/2" BSP	N												
		8mm cable / 1 1/2" NPT	J												
		4mm twin cable / 1 1/2" BSP	T												
		4mm twin cable / 1 1/2" NPT	U												
		4mm FEP coated cable 1" BSP	F												
		4mm FEP coated cable 1" NPT	G												
		4mm FEP coat. cable / DN 40 Tricl.	X												
		4mm FEP coat. cable / DN 40 Milk	Y												
		PFA fully coated rod / DN 50	Q												
		4mm FEP fully coat. cable / DN 50	M												
		PP fully coated rod / DN 50	I												
		PFA fully coated rod / 1 1/2" Triclamp	O												

Cable version	
0m	0
10m	1
20m	2

Cable version	
0m	0
1m	1
2m	2
3m	3
4m	4
5m	5
6m	6
7m	7
8m	8
9m	9

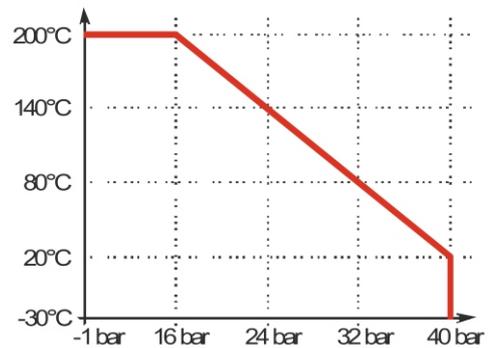
* The order code of an Ex version should end in 'Ex'

** Not available with stainless steel housing.

MEDIA TEMPERATURE TABLE & PRESSURE DIAGRAM

TYPE	FLANGE TEMPERATURE
Transmitter	-30 °C ... +90 °C
High temp. VF04H_ or VF04P_ transmitter	-30 °C ... +200 °C

Lower or higher temperature for non-Ex version on special request



DISPLAY UNIT TECHNICAL DATA

Display	64x128 Dot-matrix LCD, glyphs, units and bargraph
Ambient temperature	- 20°C...+60°C
Housing material	PBT fiberglass, plastic (DuPont®)

HYCONTROL - THE COMPLETE LEVEL SOLUTION

Hycontrol has been at the forefront of level control and measurement technology for over thirty-five years, providing effective solutions for diverse applications across a wide range of industries ranging from quarrying to food; from nuclear power to chemical; and from animal feed to waste recycling. From our manufacturing base in Redditch, Worcestershire, we have been trusted to oversee thousands of applications across the UK and around the world.

At Hycontrol, we pride ourselves on providing a 'complete solution' service to our UK customers. We provide a turnkey solution for level equipment requirements, with the experience and skill to design, manufacture, install and maintain bespoke measurement and control systems that are crafted to suit the particular needs of each individual customer.

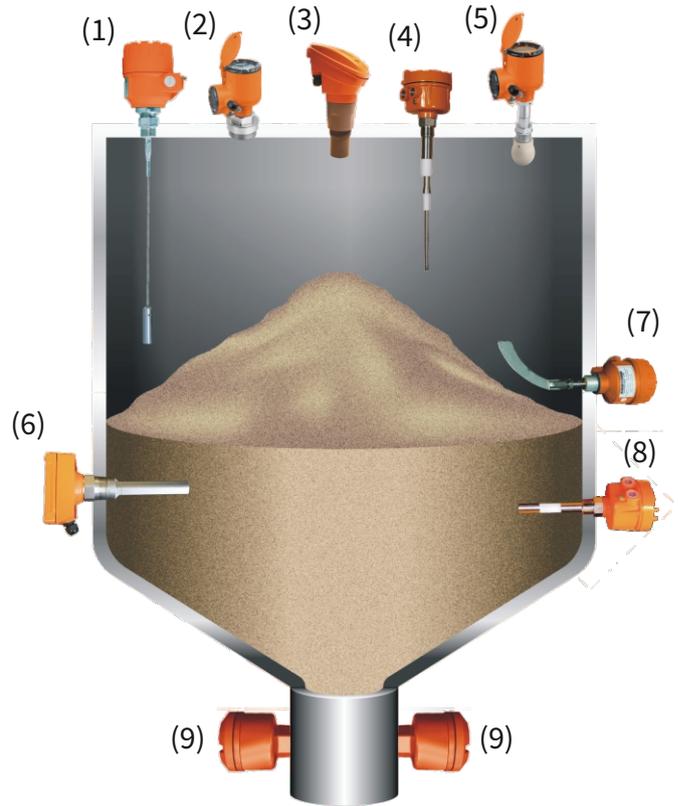
We understand the consequences of inaccurate or unreliable level systems, and therefore each Hycontrol installation is tailored precisely to match your application. Our goal is simple: to provide the best-engineered solution - *without compromise*.

With one of the widest ranges of level measurement technologies on the market including award-winning silo pressure safety systems and a patented range of foam detection and control equipment, backed up by a team of highly experienced engineers and technicians, Hycontrol is a leading force in the manufacture and supply of advanced level solutions.



Product Range for Solids:

- (1) TDR radar for solids
- (2) 80 GHz FMCW radar
- (3) 2-wire ultrasonic transmitter
- (4) RF admittance level switch
- (5) 24 GHz FMCW radar
- (6) Vibrating level probe
- (7) Rotary paddle switch
- (8) Capacitance level switch
- (9) Microwave flow & blockage switch



Product Range for Liquids:

- (1) Bypass level indicator
- (2) 80 GHz FMCW radar
- (3) Foam control system
- (4) 24 GHz FMCW radar
- (5) 2-wire ultrasonic transmitter
- (6) TDR radar for liquids
- (7) Capacitance level switch
- (8) RF admittance level switch
- (9) Tuning fork vibrating level switch

