

Reflex VG Series Extended Range FMCW Radar Technical Data Sheet

1	Range of application	Distance, level, volume and reflection measurement of liquids, pastes, slurries, solids and particulate material on storage and process tanks or containers made of metal or concrete, and also in stilling wells
2	Mode of operation / system structure	FMCW-Radar in the X-Band (8.5-9.9 GHz) with digital signal processing; compact device, modular design
3	Input	
	<u>Measured variable</u>	Primary variables: distance, reflection; derived variables: level, volume
	<u>Measuring range</u>	Min. tank height: 0.5 m max. measuring range: 40 m (optionally up to 100m); Wave-Stick: 20 m, VG502 = 35m
	<u>Block distance</u>	Min. 0.2 to 1.0 m; see Sect. 3.3
	<u>Rate of change in level</u>	VG500/510 ≤ 10 m/min; VG502 ≤ 1m/min
4	Output	
	Variant 1 Ex-e current output HART®	Type active (current source); Ex -e Current range 4-20 mA (error: 2 mA or 22 mA) Accuracy/linearity 0.05 % (rel. 20 mA; 25°C) Temperature drift ≤ 100 ppm/K (typically 30 ppm/K) Load impedance ≤ 500 Ω
	with switching output: and digital input:	Max. 100 mA / 30 V DC or 30 V AC; internal resistance ≤ 20 Ω; potential-free to "freeze" the measured value; voltage: 5 to 28 V DC; input resistance: ≥ 1 kΩ; potential-free
	Variant 2 Ex-i current output HART®	Type passive (current sink); Ex -i Current range 4-20 mA (error 3.6 or 22 mA); 4 mA constant for HART®-Multidrop Temperature drift ≤ 100 ppm/K (typically 30 ppm/K) Accuracy/linearity 0.05 % (rel. 20 mA; 25°C) Supply voltage 8-30 V (terminals 31 and 32) Load impedance ≤ (U _S - 8 V) / 22 mA, (U _S = external supply voltage)
	with optional switching output:	6 ... 30 V; I _{Low} ≤ 2 V; I _{High} ≤ 900 μA (U = 30 V), I _{High} = 200 μA (U = 8 V)
	Variant 3 RS 485 interface	Transmission rate 1200 to 38400 bauds Address: 0 to 255 Protocols: Hycontrol Protocol, Modbus-RTU, HART®
	with additional current output	Type active (current source); not communicable; Ex-e Current range 4-20 mA (error 2 mA or 22 mA) Accuracy/linearity 0.3 % (rel. 20 mA; 25°C) Temperature drift ≤ 200 ppm/K (typically 70 ppm/K) Load impedance ≤ 250 Ω When operated as switching output: Low: I < 2 mA; High: I = 22 mA (R ≤ 250 Ω) and no-load voltage ≤ 18 V
	Variant 4: PROFIBUS-PA (Ex-i) Hardware	
	Physical	To IEC 61 158-2 and the FISCO model
	Bus characteristics	9 ... 30 V; 0.3 mA max.; 4.2 W max.
	Base current	10 mA
	Default current	6 mA
	Variant 5: Foundation Fieldbus (FF)	See Supplementary Instructions
	Breakdown signal	Current output: error signal 2/22 mA or 3.6 mA (Ex-i), plain text in local display Switching contact: opening or closing of the contact Digital interfaces: error flags
5	Measuring accuracy	
	<u>Error of measurement</u>	Reference conditions and error curves: see Sect. 5.1 and 5.2
	<u>Repeatability</u>	≤ 0.5 × error of measurement
	<u>Measured-value resolution</u>	VG500/510: 1 mm; VG502: 0.1 mm
	<u>Effect of ambient temperature</u>	No significant effect on measured value (- 1 ppm/°C); (see also signal outputs)
6	Operating conditions	
6.1	Installation conditions	Avoid interference reflections and multiple reflections
6.2	Ambient conditions	
	<u>Hazardous locations</u>	VG5xx Ex: Zone 0,1,2; IIC/IIB, T6...T2 -20...+55°C (-24...+131°F)
	<u>Ambient temperature at signal converter</u>	Functional range: -40...+70°C (-40...+158°F) Horn antenna, Wave-Guide (T _{amb} ≤ 50°C/122°F): -30...+130°C (-22...+266°F) Horn antenna, Wave-Guide (T _{amb} ≤ 55°C/131°F): -30...+120°C (-22...+248°F)
	<u>Flange temperature</u>	

<u>Wave-Stick:</u>	High-temperature version with: - FFKM gasket (Kalrez 4079/Parofluor V8545-75): -30...+250°C (-22...+482°F) - safety limit 280°C/536°F
<u>Environment class</u>	- Kalrez 2035 gasket: -30...+210°C (-22...+410°F) - Viton gasket: -30...+200°C (-22...+392°F) - FEP-sheathed gasket: -30...+200°C (-22...+392°F) -20...+100°C (-4...+212°F)
<u>Protection category</u>	pressure-dependent up to +150°C/302°F
<u>Shock resistance</u>	Locations exposed direct to open-air climate, D1 Severity in conformity with EN 60654-1
<u>Vibration endurance limit</u>	(signal converter) IP 66 / IP 67
<u>EMC</u>	Impact test to EN 61010, Sect. 8.2 with 0.5 J energy; drop test to prEN 50178
	IEC 68-2-6 and prEN 50178 (10-57Hz:0.075 mm/57-150 Hz:1 g)
	EN 50081-1, EN 50082-2; NAMUR Recommendation

6.3 Product conditions

<u>Physical properties</u>	No effect on measurement results; to ensure reliable measurements, the relative permittivity should have the following minimum values: $\epsilon_r \geq 1.5$; $\epsilon_r < 3$: stilling well recommended; Wave-Stick immersed: $\epsilon_r \geq 4$
<u>Relative permittivity</u>	Liquid Ammonia (NH_3); liquid Hydrogen (H_2); liquid Helium (He)
<u>Limitations</u>	Unrestricted (but be aware of ambient and flange temperatures)
<u>Temperature of product</u>	dependent on flange size and pressure rating (see Table)
<u>Operating pressure</u>	Standard: max. 64 bar (higher on request)
Horn antenna/Wave-Guide	
Wave-Stick	

7 Component parts

<u>Dimensions and weights</u>	See Sect. 7.2 of manual
<u>Materials</u>	
Housing: signal converter	Aluminium with electrostatic powder coating; sight window: glass
Flange system, antenna, extension	Stainless steel 1.4571 or 1.4435, Hastelloy C4 or B2, titanium, tantalum; (other materials on request)
Gaskets	FFKM (Kalrez 4079 or Parofluor V8545-75); Kalrez 2035; Viton (FPM); FEP-sheathed (basically, all versions include PTFE as the material in contact with the product)
Wave-Stick	only PTFE in contact with product; flange made of 1.4571 (316 Ti)
<u>Process connection</u>	
Horn antenna/Wave-Guide	DIN 2501 / DIN 2526, Form C DN 50 ... DN 200 / PN 6 ... PN 64; ANSI B 16.5 2" ... 8", Class 150/300 lb/RF;
Wave-Stick	DIN 2501 / DIN 2526, Form C DN 50 ... 150; ANSI B 16.5 2" ... 6";
Dairy screw connection	DIN 11 851 DN 50, DN 65, DN 80 SMS 1145 51 mm, 63 mm, 76 mm
Tri-Clamp connection	ISO 2852 2" ... 4"
<u>Electrical connection</u>	Cable entries: 3x M25x1,5 Terminals: 0.5-2.5 mm² (solid conductor: max. 4 mm²) PE or FE and PA: U-clamp terminal (max. 4 mm²) Shielding for RS 485 cable and for current output cable > 100 m

8 User interface

<u>Keypad</u>	3 keys
<u>Magnetic sensors</u>	operation with magnetic pin without opening the housing
<u>Local display</u>	2-line illuminated LCD + 6 status markers
<u>User language</u>	German, English, French, Italian, Spanish, Portuguese, Swedish
<u>Units of measurement</u>	Length: m, cm, mm, inch, ft, % Volume: m³, Liter, US Gal, GB Gal, ft³, bbl, % Conversion unit: any text

9 Power supply

<u>24 V DCAC</u>	18-31.2 V DC or 18-26.4 V AC (45-66 Hz)
<u>115/230 V AC</u>	Optionally: 100-120 V AC (tolerance: 85-127V), 200-240 V AC (tolerance: 170-254V); 45-66 Hz
<u>Power consumption</u>	Typically 7.5 - 10 W / 12 VA