

2291 Guided Wave Radar Level Transmitter



Product description / Function

The 2291 Guided Wave Radar level transmitter is designed for continuous level measuring of conductive or non-conductive liquids, pulps and solids. The 2291 level gauge operates based on the well-known TDR (Time Domain Reflectometry) principle. Micropulses are sent along a probe guide at the speed of light. As soon as the impulse reaches the surface of the medium, it is reflected back to the electronic module. Level distance is directly proportional to the flight time of the impulse.

The reflected signal is dependent on the dielectric constant of the material; the feasibility of the measurement is $\epsilon_r \geq 1.9$. The TDR technology is unaffected by the properties of the medium as well as that of the space above it. Measurement is also unaffected by the change in the physical properties of the materials such as temperature, pressure, dielectric constant.

Approvals



Features/Benefits

- Measuring range up to 6m (19.6 ft)
- Accuracy: ± 5 mm (0.2 in)
- PP / PFA coated probes available on request
- Rod & cable versions available
- Minimum ϵ_r 1.9
- 2-wire version
- Graphic LCD display
- 4-20 mA + HART output
- Medium temperature range: -30 °C... +90°C (-22 °F... +194 °F)
- Maximum process pressure: 40 bar (580 psi)
- IP67 protection

Applications

- Inventory tanks
- Day tanks
- Process vessels for mixing & batching
- Bypass applications (requires calibration)
- Stilling-wells
- Powders
- Slightly conductive foams
- Low dielectric constant liquids

Technical Data

Specifications

Measured values	Distance, level; calculated values: volume, mass
Measuring range	Depends on the probe type and dielectric constant (ϵ_r) of the measured medium
Probe types	Mono cable, mono rod
Accuracy: Linearity error ¹	For liquids: ± 5 mm (0.2 inch), if probe length ≥ 10 m (32 feet): ± 0.05 % of the probe length
Accuracy: Resolution	± 3 μ A
Minimum ϵ_r of the medium	1.9
Power supply	18 V... 35 V DC
Output: Digital communication	4-20 mA + HART
Output: Display	Graphical LCD display unit
Medium temperature	-30 °C... +90 °C (-22 °F... +194 °F),
Maximum medium pressure	4 MPa (40 bar g/ 580 psi g); with plastic lined flange: max. 2.5 MPa (25 bar g/ 363 psi g)
Ambient temperature	-20 °C... +60 °C (-4 °F... +140 °F)
Process connection	1" BSP, 1" NPT Thread
Ingress Protection	IP 67
Electrical connection	2x M20x1.5 cable glands + internal thread for 2x 1/2" NPT cable protective pipe, cable outer diameter: $\varnothing 7$... $\varnothing 13$ mm (0.3 ... 0.5 inch), wire cross section: max. 1.5 mm ² (AWG 15)
Electrical protection	Class III
Housing material	Plastic (PBT)
Sealing	FPM (Viton®), On request: FFKM (Kalrez®), EPDM
Mass (head unit)	1.5 kg (3.3 lb)
EX-Approvals	ATEX (ia): II 1/2 G Ex ia IIB T6...T5 Ga/Gb ICEX (ia): EX ia IIB T6...T5 Ga/Gb

¹ Under reference conditions and stabilized temperature

Probe specifications*

Probe type	Max. measuring range	Dead-zone ²		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 (0.15 inch)	6 m (19.6 feet)	300 /20 mm (12 / 0.75 inch)	400 / 100 mm (16 / 4 inch)	1"	1.9
Mono rod \varnothing 8 mm (0.3 inch)	2 m (6.56 feet)	300 /20 mm (12 / 0.75 inch)	400 / 100 mm (16 / 4 inch)	1"	1.9

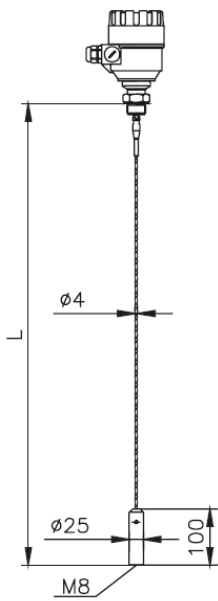
* The unmeasurable upper and lower part of the tank. The lower dead zone is extended by the length of the counterweight (cable versions only).

Technical data of the probes

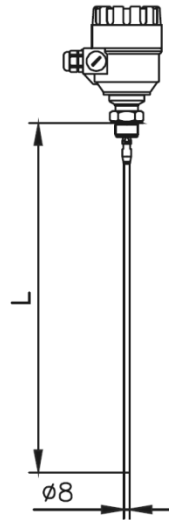
	Cable	Rod
Max. meas. dist.	24 m (80 feet)	3 m (10 feet)
Min. meas. Dist. ($\epsilon_r = 80$ / $\epsilon_r = 2.4$)	0.3 m / 0.4 m (1 feet / 1.3 feet)	
Minimal medium ϵ_r	1.9	
Sensing space around the probe	\varnothing 600 mm (2 feet)	
Process connection	1" BSP, 1" NPT	
Probe material	1.4401 (316)	1.4571 (316 Ti)
Probe nominal \varnothing	4 mm (0.15 inch)	8 mm (0.3 inch)
Mass	0.12 kg/m (0.08 lb/ft)	0.4 kg/m (0.25 lb/ft)
Counterweight dimensions	\varnothing 25x100 mm (1x4 inch)	
Counterweight material	1.4571 (316 Ti)	

² The unmeasurable upper and lower part of the tank, the lower dead-zone is extended with the length of the counterweight (cable version)

Dimensions



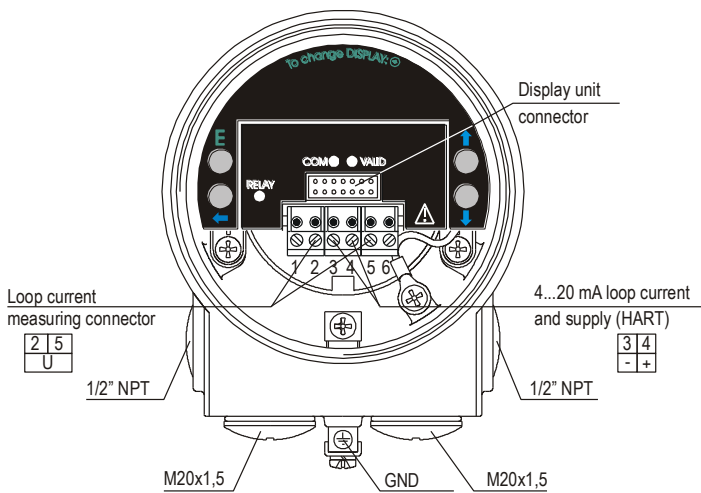
Type 2291 Cable version
L = 6m (236 inch)



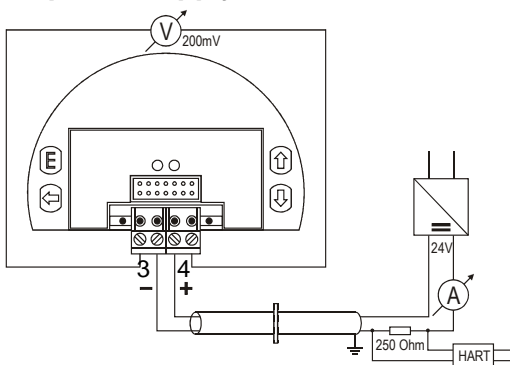
Type 2291 Rod version
L = 2m (78 inch)

Wiring

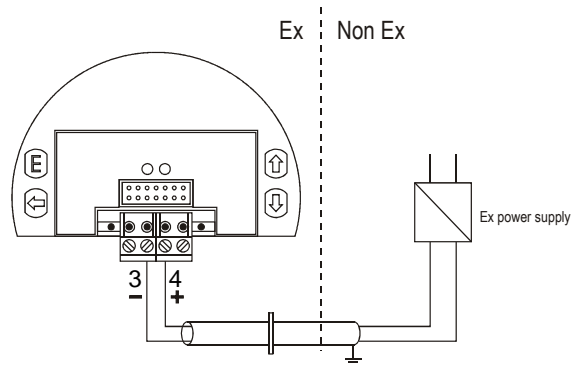
Connections



To power supply / HART modem

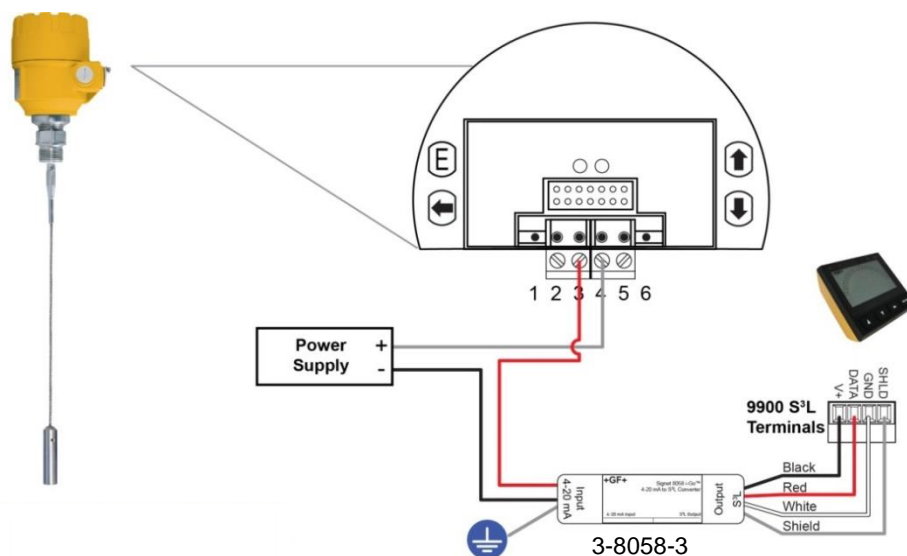


Standard wiring & connection of HART-Modem



Wiring in an EX-environment

To iGo Converter – S³L/4-20mA



Pin No.	Assignment
1	Not Assigned
2	(+) Voltage measuring connector (200 mV)
3	(-) 4-20mA loop current + supply (HART)
4	(+) 4-20mA loop current + supply (HART)
5	(-) Voltage measuring connector (200 mV)
6	Not Assigned

Article overview

Order Code No.	Type Key	Article description
159300190	2291-S-1DB1-6-R	LCD,PBT housing, 1" BSP, 6m cable Ø 4mm, SS316 Ti
159300191	2291-S-1DN1-6-R	LCD,PBT housing, 1" NPT, 6m cable Ø 4mm, SS316 Ti
159300192	2291-S-1DB1-2-D	LCD, PBT housing, 1" BSP, 2m rod Ø 8mm, SS316 Ti
159300193	2291-S-1DN1-2-D	LCD, PBT housing, 1" NPT, 2m rod Ø 8mm, SS316 Ti

Additional accessories

Order Code No.	Type Key	Article description
159300181	HART - USB Modem	HART - USB Modem
159000966	3-8058-3	Wire-mount Signet i-Go signal (4-20mA /S ³ L) converter to connect 2290 to 9900 Smart Pro, 8900 transmitter. Single input.
159300967	3-8058-2	DIN rail mount Signet i-Go (4-20mA/S ³ L) converter to connect 2290 to 9900 SmartPro, 8900 transmitter. Two inputs.
159001695	3-9900-1P	9900 Panel Mount Transmitter
159001696	3-9900-1	9900 Field Mount Transmitter