LevelWave Radar

Sales Brochure

Field Devices for Measurement & Instrumentation

Foxboro®
by Schneider Electric

Universal radar measurement for liquids and solids

One solution for all liquids and solids including corrosive, sticky or difficult media

Foxboro Field Devices has more than 50 years expertise in level measurement. With our LevelWave Radar Series we offer a state-of-the-art measurement technology with the highest flexibility in the field. The modular design guarantees easy and fast field installation. Our radar devices will consistently provide you with accurate and stable measurement performance across a wide range of installations and applications.

Why choose radar for level measurement?

Radar measurement can do the really difficult applications.

Free-Space Radar* (LR01) provides a non-contact antenna that is virtually unaffected by changes in temperature, pressure or gas and vapour composition, which means it is excellent for all kind of liquids including corrosive and other difficult media.

The measurement of our Guided Wave Radar* (LG01) device is unaffected by changes in density, conductivity, pressure, temperature or by gas movement above the product.

Our chosen technologies with Quick Noise Scanning* and Empty Tank Spectrum* for vessel level measurement provide greater accuracy and improved reliability & stability.

Unique advantages designed to save you cost, time and resource

Easy for You and Easy for your Operators

Easy Installation

Do you want easy installation for your operators so interruptions in your plant and headaches in the field are kept to a minimum?

With our unique modular design, installation really couldn't be easier which means your operators can move onto the next job more quickly.

Effortless Operation

When considering a new or replacement device another concern is how will it fit with your existing installation?

Each device in our range has unique adaptable mounting which makes it much simpler to fit into an existing space. Not only that, we added an optional display with an externally-accessible keyboard, and a remote version, which means day to day effortless operation for your engineers.

Exceptional Quality

You can also rest easy that every time you order from Foxboro each device has been rigorously factory tested which guarantees the build quality of every instrument we ship to you.

* See back page for Glossary of Terms

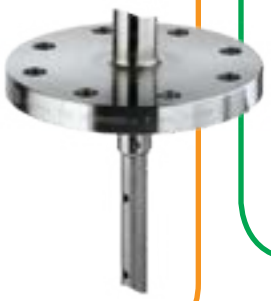
Typical Problems and Our Solution

"Often our measurement devices don´t work properly when used with sulfuric acid because the antenna rusts - this means maintenance, in fact total cost of ownership becomes very high and we have to replace the devices very often."

Foxboro Field Devices offers our LR01 Free-Space Radar device with PP/PTFE* wave horn antenna for applications with corrosive media. Our wave horn antenna is made of synthetic material (PP/PTFE) which is not affected by corrosion.

"We are looking for a measurement system which is usable for media with very low dielectric constants such as hexane and other solvents."

Our LG01 Guided Wave Radar device, with a coax probe that goes down to dielectric constant 1.1 is a perfect solution because the TDR* technology is designed to measure media with very low dielectric constants.



"Our current measurement system is not able to handle sticky media which causes delays in the process and high costs for laboratory tests."

Our LR01 Free-Space Radar device has a metallic horn antenna and an optional integrated purging unit. A metallic horn antenna handles sticky media very well and the integrated purging unit gives a perfect cleaning solution without any shut down of the system.

"We have over 20 tanks in our tank farm which require a complete level overview of all the different tanks at a glance."

With the LevelWave Series (LG01/ LR01) different tanks can be managed through a remote electronics option for a distance up to 100 m / 328 ft.

"I run an offshore oil platform which needs device protection against weather influences such as sun and heavy rain to avoid a shutdown of the system."

Our LevelWave Series has a broad accessory portfolio such as stainless steel weather protection to ensure we can cover all extremes of temperature and weather conditions.

* See back page for Glossary of Terms

Real-world applications

Industry	Application	Solution
Petrochemical / Oil & Gas 	**Fuel storage** • Media: Petrol • Temperature: 20 to 45 °C (68 to 113 °F) • ε_r: 2 • Pressure: 3 bar (44 psi) • Distance: 18 m (59 ft.) • Connection: DN50 PN10 • Approval: FM XP • Remarks: Remote version	• Device: LevelWave LG01 (GWR) • Probe: Double cable with turnbuckle • Remark: Remote version with 25 m signal cable (up to 100 m possible) • Optional weather protection
Chemical 	**Fiberglass tank for acid storage** • Media: Sulfuric acid 97% • Temperature: 5 to 50 °C (41 to 122 °F) • ε_r: 8 • Pressure: 2 bar (29 psi) • Distance: 8 m (26 ft.) • Connection: DN50 PN16 • Approval: None • Remarks: Remote version	• Device: LevelWave LR01 (FSR) • Antenna: PTFE Wave Horn • Remark: Remote version with 75 m signal cable (up to 100 m possible) • Optional weather protection
Chemical  	**Intermediate production** • Media: Hydrocarbon dilution • Temperature: 50 to 70°C (122 to 158 °F) • ε_r: 20 • Pressure: 2 bar • Distance: 4 m (13 ft.) • Connection: DN150 PN16 • Approval: ATEX Ex ia • Remarks: Difficult installation situations, there is an in-flow directly below the flange	• Device: LevelWave LR01 (FSR) Stainless Steel Housing • Antenna: S-bend & metallic Horn Antenna DN150 • With the S- and L- bend there are two special solutions for our customer
Food and Beverage 	**Whiskey (new make)** • Media: Whiskey 70% Alcohol • Temperature: 20 to 70°C (68 to 158 °F) • ε_r: 16 • Pressure: 4 bar (58 psi) • Distance: 28 m (92 ft.) • Connection: DN200 PN16 • Approval: ATEX Ex ia • Remarks: Metallic antenna, non-contact	• Device: LevelWave LR01 (FSR) • Antenna: Metallic Horn 316L • Remark: No EHEDG or 3-A sanitary certificate needed
Chemical 	**Backfitting level measurement** • Media: Several dissolvents • Temperature: Ambient • ε_r: 2 to 10 • Pressure: Ambient • Distance: 5 m (16 ft.) • Connection: DN40 PN10 B1 • Approval: ATEX Ex d • Ceiling height above the vessel 1.5 m (5 ft.)	• Device: LevelWave LG01 (GWR) • Probe: Segmented coax probe • Segmented probes available as coax or single rod

Real-world applications

Industry	Application	Solution
Water & Wastewater	**Sewage treatment plant** • Media: Waste water • Temperature: 0 to +45 °C (32 to 113 °F) • ε_r: 50 to 90 • Pressure: Ambient • Distance: 2 to 4 m (6 to 13 ft.) • Connection: G 1½" Thread • Approval: R&TTE 1999/5/EC • Remarks: Moving & sticky media	• Device: LevelWave LR01 (FSR) • Antenna: PP Wave Horn • Optional weather protection
Environment	**Stream gauge** • Media: Water • Ambient Temperature: -20 to +45 °C (-4 to 113 °F) • ε_r: 80 • Pressure: Ambient • Distance: 2 to 8 m (7 to 26 ft.) • Connection: NPT 1½" Thread • Approval: FCC Part 15 • Remarks: Stainless Steel Housing	• Device: LevelWave LR01 (FSR) • Antenna: PP Wave Horn • Optional weather protection
Chemical	**Vertical intermediate storage tank** • Tank: Vertical cylinder 8 m / 26.2 ft • Product: Water based intermediate • Temperature: Ambient • Previous meter: Submerged pressure gauge • Connection: DN40 PN16 • Approval: Without	• Device: LevelWave LG01 (GWR) • Sensor: Single cable 2 mm / 0.08" • Gasket: Kalrez®
Water	**Fire fighting water tank** • Media: Water • Temperature: 5 to 25 °C (41 to 77°F) • ε_r: 50 to 80 • Pressure: 2 bar • Distance: 4 m (13 ft.) • Connection: DN200 PN16 • Approval: None • Remarks: Remote version	• Device: LevelWave LG01 (GWR) • Probe: Coax Probe • Remote version with 10 m signal cable (up to 100 m possible) • Optional weather protection
Power	**Difficult to measure liquids** • Tank: 3.5 m / 11.5" • Media: H_2O_2 • Temperature: Ambient • Connection: Special flange • Approval: SIL 2	• Device: LevelWave LR01 (FSR) • Sensor: Wave Guide Antenna • Gasket: FKM/FPM

Product Selection Guide

Foxboro Field Devices offers more than radar level meters

Foxboro Field Devices offers different product solutions for level, density and interface measurement. For each application requirement there are dedicated solutions available from Foxboro. Use this table to assist you with selecting the best product for your needs.

Key: ✓ Suitable
(✓) Suitable under certain conditions

Selection guide

Foxboro RADAR vs. LEVELSTAR DISPLACER

Parameters	Model Free-Space Radar LR01	Guided Wave Radar LG01	Displacer 244LD
Density / Temperature Fluctuation	✓	✓	(✓)
Density & Interface Measurement	–	–	✓
Very Low Dielectric Constant	–	(✓)	✓
Multipurpose Tanks	✓	✓	(✓)
Tank With Build-In Components	(✓)	(✓)	(✓)
Dished Vessel / Tank End	(✓)	✓	✓
Strong Moving Media	✓	(✓)	(✓)
Steam Generation	–	–	✓
Media With Foam / Boiling Surface	–	(✓)	✓
Pressure > 40 Bar	–	–	✓
Direct Measurement Inside The Tank	✓	✓	✓
Non-Contact Measurement	✓	–	–
Temperature > 250°C	–	(✓)	✓
Temperature < –50°C	✓	–	✓

Process Parameter Selection Guide

To assist with your selection here is a quick breakdown of the most commonly used process parameters to quickly decide which product suits your application best.

Key: ✓ Suitable
(✓) Suitable under certain conditions

Selection guide

Foxboro LevelWave Radar Series

Process Parameters	Model Free-Space Radar LR01	Guided Wave Radar LG01
Measuring range ≤ 30 m; ≤ 98.43ft	✓	✓
Measuring range ≤ 40 m; ≤ 131.23 ft	–	✓
Storage tanks	✓	✓
Still well/reference chambers	(✓)	✓
Complex process tanks (e.g. with agitators)	(✓)	✓
Pressure ≤ 40 barg; ≤ 580 psig	✓	✓
Process connection temperature ≤ +250°C; ≤ +482°F	✓	✓
Process connection temperature ≤ +300°C; ≤ +572°F	–	✓
2-wire technology	✓	✓
Profibus PA / Foundation Fieldbus	✓	✓
ATEX, FM, IECEX and other approvals	✓	✓
SIL 2	✓	✓

Product Comparison Quick guide

Foxboro LevelWave Radar Series

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Model	FREE-SPACE RADAR LR01	GUIDED WAVE RADAR LG01
Frequency	X-band (10 GHz)	L-band (1 GHz)
Technology	Frequency Modulated Continuous Wave (FMCW*)	Time-Domain Reflectometry (TDR*)
Media	Liquids, pastes and slurries	Liquids, pastes and solids
Measuring Range m / ft	30 / 100	40 / 130
Pressure bar / psi	40 / 580	40 / 580
Temp. Min °C / °F	–60 / –76	–50 / –58
Temp. Max °C / °F	250 / 482	300 / 572
Calibrated Accuracy	± 5 mm (± 0.2”)	± 3 mm (± 0.12”)
MATERIALS (other on request)		
Stainless Steel	+	+
PP	+	-
PTFE	+	-
Hastelloy® C	-	+
COMMUNICATION		
HART®	+	+
Foundation Fieldbus	+	+
Profibus PA	+	+
Display	Standard	Standard
Direct Keys	+	+
Direct-Configuration	+	+
Remote Version m / ft	Up to 100 / 328	Up to 100 / 328
HOUSING		
Aluminium	+	+
Stainless Steel	+	+
2-wire	+	+
CERTIFICATES		
FM	+	+
ATEX	+	+
CSA	+	+
IECEx	+	+
NEPSI	+	+
NACE	+	+
SIL	2	2
CONNECTIONS		
ANSI	+	+
EN/DIN	+	+
JIS	+	+
NPT-Thread	+	+
BSP / G-Thread	+	+
ACCESSORIES for		
Heating / Cooling	+	-
Weather protection	+	+
Purging (liquid or gas)	+	-

* See back page for Glossary of Terms

Your Foxboro Field Devices Representative:

Glossary of Terms.

FSR: Free-Space Radar
Electromagnetic pulses emitted through an antenna, pulses are reflected back at the product surface, the distance is calculated by measuring the frequency shift. Perfect for storage tanks, easy & fast installation (no probe), suitable for applications corrosive, high viscous, sensitive or sticky media.

GWR: Guided Wave Radar
Electromagnetic pulses are emitted and guided along a probe, pulses are reflected back at the product surface, the distance is calculated by measuring transit time. Perfect for high end applications, suitable for applications with foam, dust, vapour and agitated or boiling surfaces.

TDR: Time Domain Reflectometry
A level measurement device generates an impulse that propagates down a wave guide (probe) typically a metal rod or a steel cable. When this impulse hits the surface of the medium to be measured, part of the impulse reflects back up the wave guide.

FMCW: Frequency Modulated Continuous Wave Radar
Uses a high frequency signal (~ 10 GHz) which transmits frequency increasing linearly 1 GHz within approx. 7 ms during the measurement (frequency sweep). With FMCW fast level-changes, as well as moving surfaces can be better measured with the reduction of interfering signals/ spurious echoes.

FDT/DTM: Field Device Technology/Device Type Manager
Complementary technology to the Fieldbus communications protocols (HART, Profibus, Foundation Fieldbus).

QNS: Quick Noise Scanning
Eliminates false reflections and improves level measurement.

ETS: Empty Tank Spectrum
Software used to remove interferences in the level readings (such as tank stirrers, braces, inlet pipes etc) which can cause false signal tracking. It enables accurate and reliable level readings even on complex internal tank structures.

DD: Device Description
Provides an extended description of each object in the virtual field device (VFD). It includes information that a control system or host needs to understand the meaning of data in the VFD.

PP: Polypropylene
Also known as polypropene, a thermoplastic polymer used in a wide variety of applications.

PTFE: Polytetrafluoroethylene
A synthetic fluoropolymer that has numerous applications. The best known brand name of PTFE is Teflon® by DuPont™ Co.

SIL2: Safety Integrity Level
(SIL) is defined as a relative level of risk-reduction provided by a safety function, or to specify a target level of risk reduction. In simple terms, SIL is a measurement of performance required for a Safety Instrumented Function (SIF).

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