AMETEK®

DREXELBROOK®

PRODUCT OVERVIEW

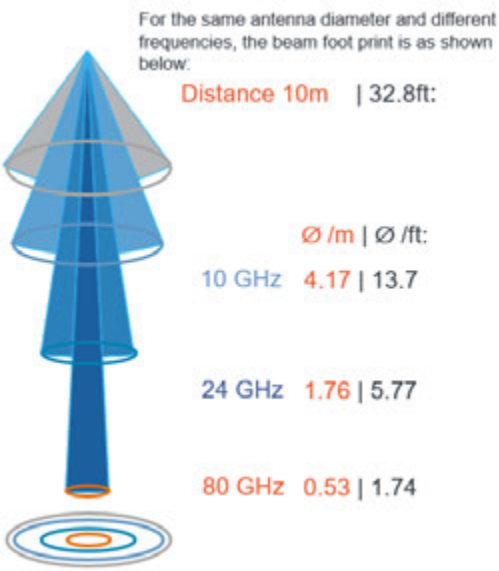
Open Air Radar Level Measurement

NON-CONTACT LEVEL MEASUREMENT

FMCW radar transmitters allow for the continuous, contactless level measurement of liquids, pastes, granulates, powders and other solids in a wide variety of industries.

With the Drexelbrook DR5200 (10 GHz) and now the new series of 24 and 80 GHz radars, Drexelbrook offers the appropriate frequency for each application. The DR5400 / 6400 / 7400 (24 GHz) and DR3500 / 6500 / 7500 (80 GHz) radars are each designed for specific industry needs. They improve our portfolio for reliable and accurate level measurement of liquids and solids, even in most difficult applications.

Drexelbrook has more than 15 years' experience in providing superior FMCW radar devices to its customers.



Industries:

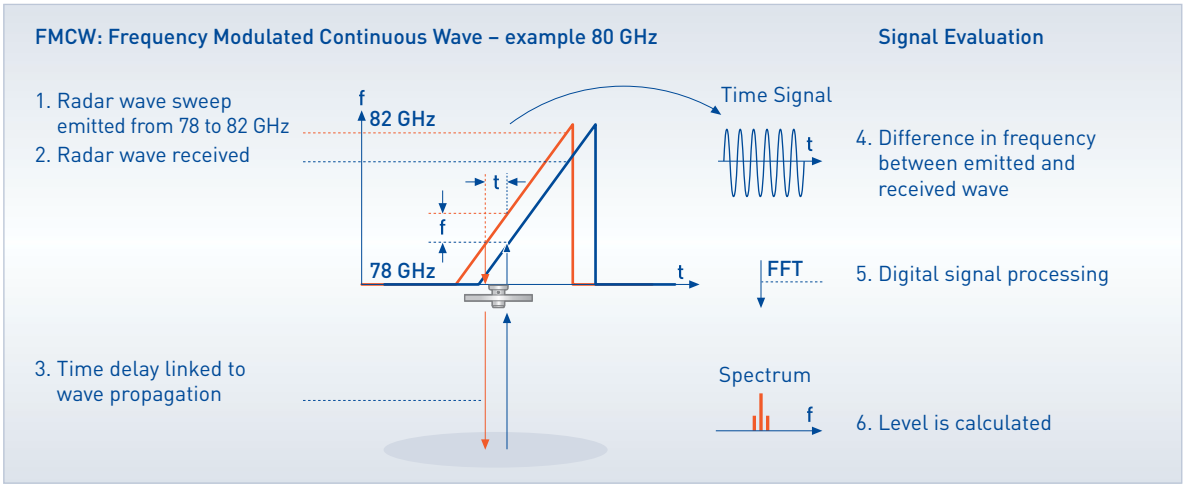
- Chemical
- Oil & Gas
- Power Generation
- Metal & Mining
- Environment
- Food & Beverage
- Pharmaceutical
- Agriculture
- Pulp & Paper
- Water & Wastewater

Radar (FMCW)

The measuring principle

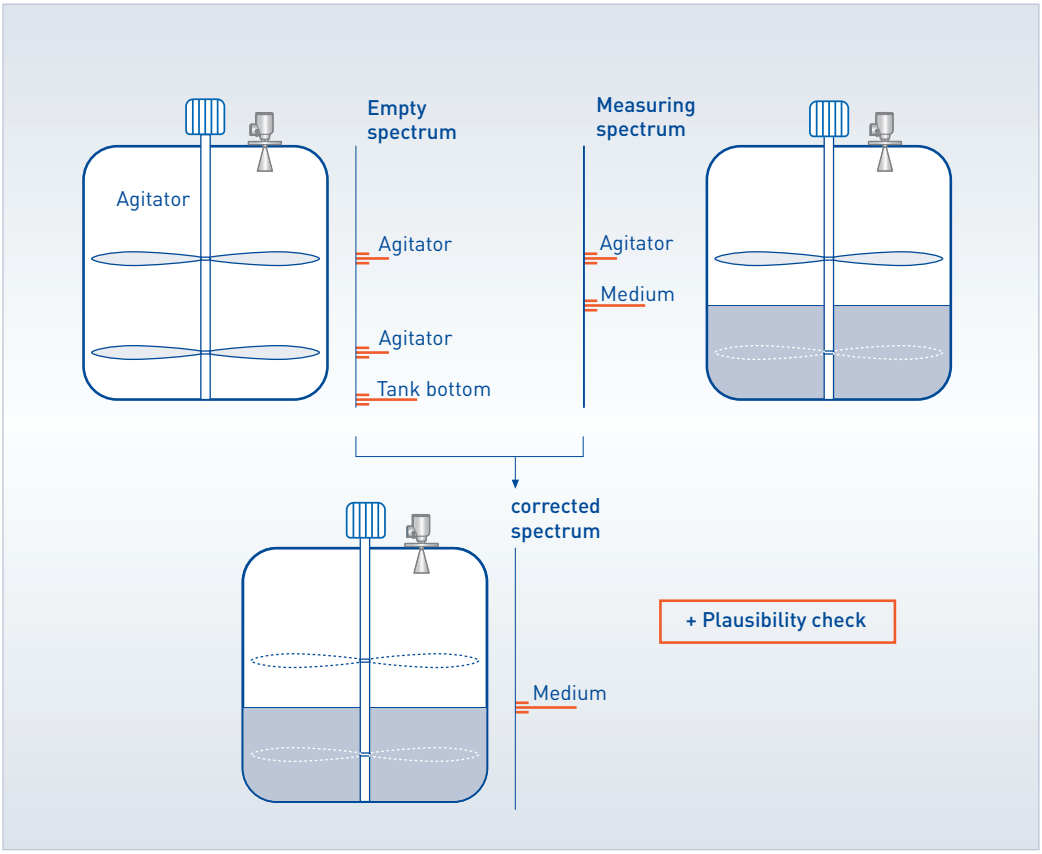
The radar principle used is FMCW (Frequency Modulated Continuous Wave). The FMCW radar emits a high frequency signal whose frequency increases linearly during the measurement phase (called the frequency sweep). The signal is emitted via an antenna, reflected off the product surface and received with a time delay, t. Time delay, t=2d/c, where d is the distance to the product surface and c is the speed of light in the gas above the product. For further signal processing the difference Δf is calculated from the actual transmitted frequency and the received frequency. The difference is directly proportional to the distance.

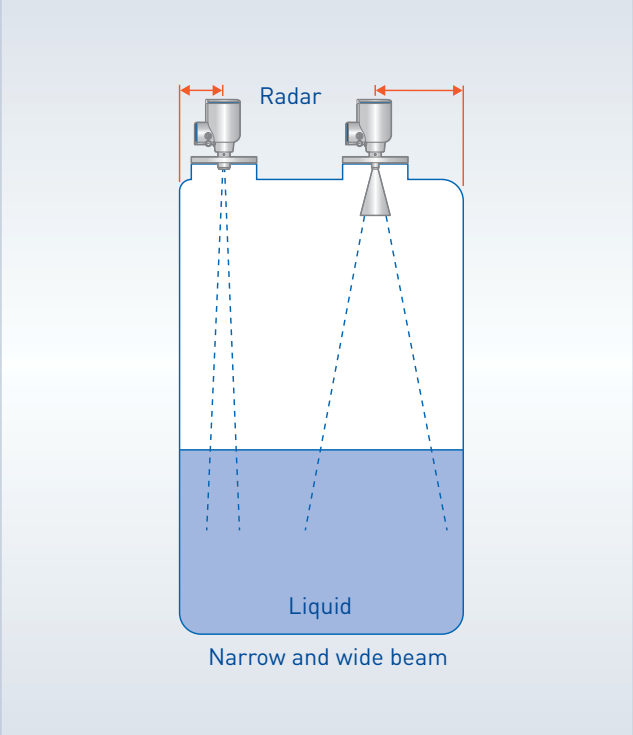
A large frequency difference corresponds to a large distance and vice versa. The frequency difference Δf is transformed via a Fast Fourier Transformation (FFT) into a frequency spectrum and then the distance is calculated from the spectrum. The level results from the difference between the tank height and the measured distance.



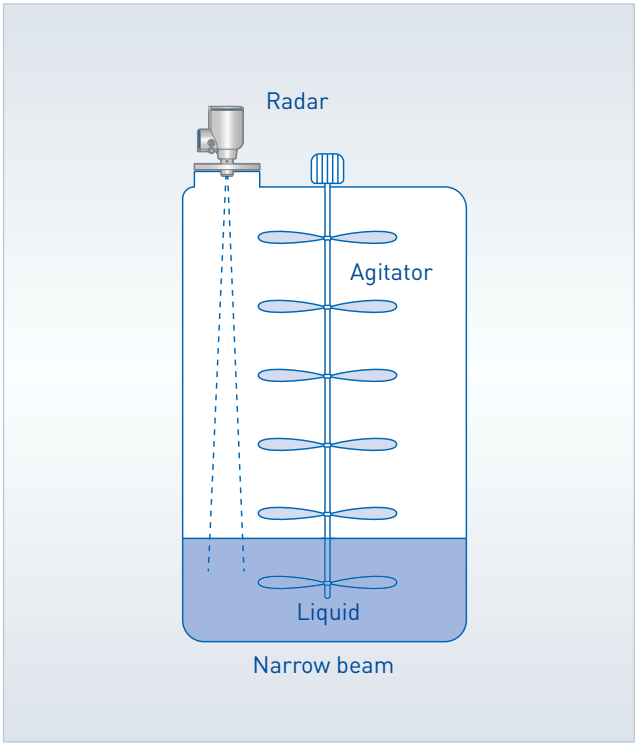
Empty tank spectrum for radar devices

All interference reflections, which are caused by fixed or moving tank internals and the tank bottom, can be detected and saved by recording an empty spectrum. The surface reflections are reliably detected, distinguished from interference reflections and analyzed by comparing the empty spectrum to the reflections in the filled state. For applications with tanks that cannot be emptied before device setup, the radar transmitter offers the capability of recording a partially empty spectrum.





Antennas with small beam width can be installed closer to the tank wall



Antennas with small beam width are ideal to avoid interference reflections from tank internals

Highlights:

- 15 years of extensive industry knowledge
- Radar devices for liquid, hygienic and solid applications
- Accuracy from ±2 mm/±0.08"
- Lens, Drop and Horn antennas for measuring up to 100 m/328 ft
- Measurement in processes with fast changing levels (≤60 m/min/≤196.85 ft/min)
- Extensive choice of process connections starting from ¾"
- Can measure products with dielectric constants as low as 1.4
- Quick setup assistant for easy commissioning
- Measurement through tank roofs made of non-conductive materials
- Empty tank spectrum function eliminates interference reflections caused by tank internals
- Large backlit LCD display with 4-button keypad
- Text displayed in 12 languages

For liquids

DR3500

80 GHz FMCW radar for liquids with hygienic requirements

DR5200

10 GHz FMCW radar for liquids in storage and process applications

DR5400

24 GHz FMCW radar for liquids in basic process applications

DR7400

24 GHz FMCW radar for agitated and corrosive liquids

DR7500

80 GHz FMCW radar for liquids in narrow tanks with internal obstructions

For solids

DR6400

24 GHz FMCW radar for solids from granulates to rocks

DR6500

80 GHz FMCW radar for powders and dusty atmospheres

	For liquids in storage and process applications	For liquids in basic process applications	For agitated and corrosive liquids
			
	DR5200	**DR5400**	**DR7400**
Frequency range	X-band/10 GHz	K-band/24 GHz	K-band/24 GHz
Dielectric constant ε_r	≥1.8 (TBF 1.1)	≥1.4 (TBF 1.1)	≥1.4 (TBF 1.1)
Measuring range	0…30 m/0…98 ft	0…100 m/0…328 ft	0…100 m/0…328 ft
Accuracy	±5 mm/±0.2"	±2 mm/±0.08"	±2 mm/±0.08“
Repeatability	±1 mm/±0.04"	1 mm/±0.04"	±1 mm/±0.04”
Converter	C (compact), F (field remote)	C (compact)	C (compact)
Housing material	Aluminum, stainless steel	Aluminum, stainless steel	Aluminum, stainless steel
Ingress protection	IP 66, 67; NEMA 4X	IP66, 68; 0.1 barg/1.45 psig	IP66, 68; 0.1 barg/1.45 psig
Antenna installation*	TLPR*	LPR and TLPR*	LPR and TLPR*
Antenna type (material), size (beam angle)	Metallic Horn (316L) DN65/2.5" (for BM 26); Metallic Horn (316L) DN80...200/3...8" (32…12°); Wave Horn (PP or PTFE) Ø43 mm/1.69" (20°); Metallic Wave Guide (316L) Ø30 mm/1.18"	Metallic Horn (316L) DN40…200/1.5…8" (17…5°); Drop (PP) DN80/3" (9°), DN100/4" (7°), DN150/6" (5°)	Metallic Horn (316L) DN40…200/1.5…8" (17…5°); Drop (PEEK) DN80/3" (9°); Drop (PTFE) DN80/3" (8°), DN100/4" (7°), DN150/6" (4°)
Process connection	Thread: G1½, G2, 1½ NPT, 2 NPT; Flange: DN50... 200/2...8", 50…200A	Thread: G1, G1½, 1 NPT, 1½ NPT; Flange: DN40…200/1½…8", 40…200A	Thread: G1, G1½, 1 NPT, 1½ NPT; Flange: DN40…200/1½…8", 40…200A
Gasket	FKM/FPM, Kalrez® 6375, EPDM, PFA	FKM/FPM, EPDM, Kalrez® 6375	FKM/FPM, EPDM, Kalrez® 6375
Ambient temperature	-40…+80°C/-40…+176°F	-40…+80°C/-40…+176°F	-40…+80°C/-40…+176°F
Process temperature	-60…+250°C/-76…+482°F (higher on request)	-50…+130°C/-58…+266°F	-50…+200°C/-58…+392°F (higher on request)
Process pressure	-1…40 barg/-14.5...580 psig (higher on request)	-1…16 barg/-14.5…232 psig	-1…100 barg/-14.5…1450 psig (higher on request)
Power supply	11.5…30 V DC (Exi), 13.5…36 V DC (Exd)	12…30 V DC (Exi), 16…36 V DC (Exd) 1	2…30 V DC (Exi), 16…36 V DC (Exd)
Output	4…20 mA (HART® 6), PROFIBUS PA,bRS 485 MODBUS RTU**	4…20 mA (HART® 7), PROFIBUS PA**	4…20 mA (HART® 7), PROFIBUS PA**
Accessories	Antenna extensions of various shapes and lengths, heating/cooling systems for metallic horn antennas, weather protection	Antenna extensions in metal or PP, purging system, flange plate protection made of PP, weather protection, wall mounted or hanging brackets, low pressure flange disc	Antenna extensions in metal or PTFE, purging/ heating/cooling systems for metallic horn antennas, flange plate protection made of PTFE or PEEK, weather protection, wall mounted or hanging brackets, low pressure flange disc
Approvals	ATEX, IECEx, cFMus, NEPSI, INMETRO, PESO, EAC, WHG, CRN, NACE	ATEX, IECEx, cQPSus, NACE, CRN - ASME B31.3**, PESO**	ATEX, IECEx, cQPSus, NACE, WHG**, DNV-GL**, CRN - ASME B31.3**, PESO**
SIL approval	SIL2	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**

* LPR (Level Probing Radar): The antenna can be installed in a closed tank as well as outside. The antenna needs to point downwards and location restrictions apply (Radio Astronomy Station). TLPR (Tank Level Probing Radar): The antenna must be installed in a closed tank.

** Approval Pending

	For liquids in narrow tanks with internal obstructions	For liquids with hygienic requirements	For solids from granulates to rocks	For powders and dusty atmosphere
				
	DR7500	**DR3500**	**DR6400**	**DR6500**
Frequency range	W-band/80 GHz	W-band/80 GHz	K-band/24 GHz	W-band/80 GHz
Dielectric constant ε_r	≥1.4 (TBF 1.1)	≥1.4 (TBF 1.1)	≥1.4 (TBF 1.1)	≥1.4 (TBF 1.1)
Measuring range	0…100 m/0…328 ft	0…100 m/0…328 ft	0…100 m/0…328 ft	0…100 m/0…328 ft
Accuracy	±2 mm/±0.08"	±2 mm/±0.08"	±2 mm/±0.08"	±2 mm/±0.08"
Repeatability	±1 mm/±0.04"	±1 mm/±0.04"	±1 mm/±0.04"	±1 mm/±0.04"
Converter version	C (compact)	C (compact)	C (compact)	C (compact)
Housing material	Aluminum, stainless steel	Aluminum, stainless steel	Aluminum, stainless steel	Aluminum, stainless steel
Ingress protection	IP66, 68; 0.1 barg/1.45 psig	IP66, 68; 0.1 barg/1.45 psig	IP66, 68; 0.1 barg/1.45 psig	IP66, 68; 0.1 barg/1.45 psig
Antenna installation*	LPR and TLPR*	LPR and TLPR*	LPR*	LPR*
Antenna type (material), size (beam angle)	Lens (PEEK) DN20; ¾" (15°), DN25; 1" (10°), DN40; 1.5" (8°), DN70; 2.75" (4°)	Lens (PEEK) DN25; 1" (10°), DN40; 1.5" (8°)	Metallic Horn (316L) DN80…200; 3…8" (9…5°); Drop (PP) DN80; 3" (9°), DN100 4" (7°), DN150; 6" (5°); Drop (PTFE) DN80; 3" (8°), DN100; 4" (7°), DN150; 6" (4°)	Lens (PEEK) DN40; 1.5" (8°), DN70; 2.75" (4°)
Process connection	Thread: G¾, G1, G1½, G3, ¾ NPT, 1 NPT, 1½ NPT, 3 NPT; Flange: DN50…200; 2…8", 50…200A	Tri-Clamp®: 1½", 2" DIN 11851 or DIN 11864-1 Form A: DN40, DN50 VARIVENT® or NEUMO BioControl®: DN50 SMS 1145: DN51	Thread: G1, G1½, 1 NPT, 1½ NPT; Flange: DN80…200; 3…8", 80…200A	Thread: G1½, G3, 1½ NPT, 3 NPT; Flange: DN50…200; 2…8", 50…200A
Gasket	FKM/FPM, EPDM, Kalrez®6375	PEEK	FKM/FPM, EPDM, Kalrez® 6375	FKM/FPM, EPDM, Kalrez® 6375
Ambient temperature	-40…+80°C/-40…+176°F	-40…+80°C/-40…+176°F	-40…+80°C/-40…+176°F	-40…+80°C/-40…+176°F
Process temperature	-50…+150°C/-58…+302°F, -50…+200°C/-58…+392°F**	-40…+150°C/-40…+302°F	-50…+130°C/-58…+266°F -50…+150°C/-58…+302°F, -50…+200°C/-58…+392°F**	-50…+200°C/-58…+392°F
Process pressure	-1…40 barg/-14.5…580 psig	-1…25 barg/-14.5…362.6 psig	-1…16 barg/-14.5…232 psig	-1…40 barg/-14.5...580 psig
Power supply	12…30 V DC (Exi), 16…36 V DC (Exd)	12…30 V DC (Exi), 16…36 V DC (Exd)	12…30 V DC (Exi), 16…36 V DC (Exd)	12…30 V DC (Exi), 16…36 V DC (Exd)
Output	4…20 mA (HART® 7), PROFIBUS PA**	4…20 mA (HART® 7), PROFIBUS PA**	4…20 mA (HART® 7), PROFIBUS PA**	4…20 mA (HART® 7), PROFIBUS PA**
Accessories	Antenna extensions in metal, purging system, flange plate protection made of PEEK, weather protection, wall mounted or hanging brackets, low pressure flange disc	Weather protection	Antenna extensions, orientation system, slanted flange, purging system, weather protection, DR 6300 process connection adaptor, wall mounted or hanging brackets, low pressure flange disc	Antenna extensions, orientation system, slanted flange, purging system, weather protection, wall mounted or hanging brackets, low pressure flange disc Antenna extensions, purging system 1/8 NPT (for metallic horn antenna only), DR 8300 process connection adaptor
Approvals	ATEX, IECEx, cQPSus, NACE, cQPSus, DNV-GL**, CRN - ASME B31.3**, PSEO**	ATEX, IECEx, cQPSus, FDA, EC 1935/2004, EC 2023/2006, EU 10/2011, EHEDG, CRN - ASME B31.3**, PESO**	ATEX, IECEx, cQPSus (IS), cQPSus (XP/NI)**, CRN - ASME B31.3**, PESO**	ATEX, IECEx, cQPSus, CRN - ASME B31.3**, PSEO**
SIL approval	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**	Developed acc. to SIL2/3, IEC 61508 – 2010. The SIL approval is in the process of validation by TÜV Süd, Germany.**

The AMETEK Sensors, Test & Calibration Business Unit is a part of the AMETEK Measurement, Communications & Testing Division.

Sensors, Test & Calibration (STC) provides calibration, temperature measurement, pressure measurement, position measurement, level measurement, material testing, force measurement, springs and reels, cable management, and weighing solutions for a wide range of industries. We operate 7 manufacturing facilities plus 9 sales and service centers in the US and 8 other countries and have approximately 400 colleagues worldwide.

AMETEK Sensors, Test & Calibration is one of the world's leading manufacturers of level, pressure and position measurement devices. In addition to the measurement instruments, we also develop and manufacture custom flat wound springs and retractable power and data reels. Drexelbrook, US Gauge, Gemco, BW Controls, and PMT Products are considered some of the world's leading brands for measurement instruments. Additionally, Hunter Spring has a long history of supplying quality OEM spring and reel products worldwide to virtually every industry. Customers across the globe have been relying on our products for over 60 years to meet the most stringent application requirements. Supplying over 3 million individual products annually worldwide, we continue to be the go to choice in quality instrumentation.

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