Accu-Wave

Non-Contacting Radar Continuous Level Transmitter

Introduction

The Thermo MeasureTech Accu-Wave Radar Level Transmitter is our fourth generation radar product and marks a breakthrough in radar level measurement technology. As the first instrumentation company to use radar technology for process level measurement, our design and application engineers have years of practical experience in radar technology. In developing the Accu-Wave, we set out to redefine your expectations for performance and reliability. After all, as the company that brought you products from Texas Nuclear, Kay-Ray and Sensall, we know what we're talking about.



D^2F^3 Measurement Technology

The Thermo MeasureTech Accu-Wave Radar Transmitter is based on proven Frequency Modulated Continuous Wave (FMCW) operating principle. Combined with our Dual Dynamic Feed-Forward Filtering (D^2F^3) signal processing, Patented Marker Sweep and Dynamic Process Tracking software the Accu-Wave transmitter establishes new standards in performance not found in competitive radar transmitters. The Accu-Wave continuously sweeps a frequency from ~9.5 GHz to ~10.5 GHz emitting a signal from the antenna to the surface of the process. Unlike competitive systems going “offline” to linearize the return signal, our Patented Marker Sweep software continually monitors and adjusts the sweep to maintain linearity. The reflected signal is compared to the transmitted signal, resulting in a differential signal whose frequency is directly proportional to the distance (level) of the process material. This differential signal is digitized by dual dynamic-range A-D converters resulting in an extremely broad dynamic signal range. This technique allows the Accu-Wave to operate in a broad range of conditions including, level range, material types, turbulence, and foam without the need for gain control schemes operating in the "catch-up"

Features and Benefits

- Integrated transmitter/antenna reduces installation and wiring costs
- Advanced D^2F^3 technology (Dual Dynamic Feed Forward Filtering) provides enhanced signal management with an extremely broad dynamic range independent of measured distance, turbulence, foam, etc.
- Frequency Modulated Continuous Wave (FMCW) technology, operating to ~10.5GHz, allows the Accu-Wave to operate in a wide range of applications
- Patented Marker Sweep software for continuous linearization of microwave output for reported accuracy in real time.
- Wide range of antenna options to fit every application in pressure ranges from full vacuum to 600 psi.
  - Uniquely designed 3" and 4" process isolation antenna isolates the antenna from the process material
  - 2", 3", 4", 6" and 8" antenna designs for measurement of turbulent liquids in agitated process vessels, storage vessels or calming (stilling) wells.
  - TEFLON dielectric rod antenna ideal for small diameter process connections.
- Communicate via HART protocol, Model 9734 handheld or Windows based EZ-Cal software

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Accu-Wave Radar Transmitter

mode. Unlike this feedback mode where the transmitters next reading is optimized based on old data, the D^2F^3 technology reports all results, up to 100 times a second, in real time. Using a Fast Fourier Transformation (FFT) within the Digital Signal Processor (DSP) this real time data is analyzed in the host processor based on parameters established at start-up to insure accurate level indication in difficult applications.

Dynamic Process Tracking™

For fast response and accurate readings in upset process conditions while maintaining a stable output during normal process conditions look no further than the patented Dynamic Process Tracking™ (DPT) found in the Accu-Wave. Unlike lump sum or rolling average techniques, DPT insures that actual process changes are immediately reflected in the output without affecting the stability in normal process conditions. This patented exponential filtering technique monitors the measured signal to determine process stability. If process conditions are changing rapidly, a fast response time is applied to the reported output. If the process is in a more stable mode, a longer time constant is applied to smooth the reported output.

Echo Management

Powerful onboard software tools compensate for vessel conditions and enhance return signal (echo) for accurate/reliable readings.

Specifications

System Performance

- **Range:** 0 to 115 ft. (0 to 35 Meters)
- **Reference Accuracy:** ± 3 mm (1/8 in.)
- **Repeatability:** ± 3 mm (1/8 in.)
- **Material Dielectrics:** Dielectric constants ≥ 1.4

Integrated Transmitter/Antenna

System Architecture:

- Multiprocessor based electronics means uninterrupted output during data entry and system interrogation.
- Surface mount technology provides high degree of reliability.
- All user data doubly stored in non-volatile memory with no battery backup required.

Antenna Configurations/Specification:

- TEFLON dielectric rod antenna ideal for small diameter process connections.
  - Mounting available as 1" NPT, 1" BSPP, 2", 3", 4", 6" and 8" 150#/300# ANSI flanges or DN50, DN80 and DN100 PN16/PN40 DIN flanges. (316L SS)
  - Flange/bushing temperature range is: -40° F to +302° F -40° C to +150° C
  - Pressure range: Full vacuum to 600 psi from -40° C to +100° C.
  - Max. pressure at 150° C is 475 psi. Derate pressure by 2.5 psi/°C from 100° C to 150° C.
- Uniquely designed 3" and 4" process isolation antennas (316L SS) coupled with a wide range of process seals isolates the antenna from the process material.
  - Process seals available in TEFLON, Polyproplylene, Kynar and Ultem for compatibility to process chemical, pressure and temperature.
  - Mounting available as 3" and 4" 150#/300# ANSI flanges or DN80 and DN100 PN16/PN40 DIN flanges.
  - Isolation antenna mounting flange is polyurethane painted carbon steel
- Horn antennas (316L SS) ranging from 2", 3", 4", 6" and 8" designs for measurement of turbulent liquids in agitated process vessels, storage vessels or calming (stilling) wells.
  - Insertion antenna flange temp. range is -40° F to +392° F (-40° C to +200° C)
  - Insertion antennas have a pressure range from full vacuum to 600 psi
  - Mounting available as 2", 3", 4", 6" and 8" 150#/300# ANSI flanges or DN50, DN80 and DN100 PN16/PN40 DIN flanges.
  - Limited Hastelloy C antennas available.
- High-Temperature horn antennas (316L SS) ranging from 2", 3", 4", 6" and 8" designs for measurement of turbulent liquids in agitated process vessels, storage vessels or calming (stilling) wells where high-temperature conditions exist up to 400° C .
  - Hi-Temp Insertion antenna flange temp. range is -40° F to +751° F (-40° C to +400° C)
  - High-Temperature insertion antennas have a pressure range from full vacuum to 600 psi

Electronics Enclosure:

- Construction: Cast aluminum with polyester powder coat
- Input power:
  - +24 VDC ± 25%, 1.5 watts
  - Model 9735 AC power supply providing 85 VAC to 264 VAC, 50/60 Hz. capability.
- Operating temperature:
  - -40° C to +70° C (-40° F to 158° F) ambient.
- Output:
  - 0 to 20 mA isolated loop-powered into 800 ohms, field scalable
  - RS485 (std) with RS232 (optional)

Approvals:

- FMRC rated Class I, II, III, Div. 1, Grps. B, C, D, E, F, G; (NI) Class I, II, III, Div. 2, Grps. B, C, D, F, G Nema 4X.
- CSA rated Class I, II, III, Div. 1, Grps. B, C, D, E, F, G; (NI) Class I, II, III, Div. 2, Grps. B, C, D, E, F, G Type 4X.
- ATEX (Cenelec) rated EEx d IIB + H2 (Zone 1), EEx n IIB + H2 (Zone 2), IP66
- CE Mark
- FCC Part 15, Part 90

Local/Remote Display:

Model 9723

- Backlit LCD with two lines: 16 alphanumeric characters.
- Hazardous enclosure is FMRC and CSA approved: Class I, II, III, Div. 1, Grps. B,C, D, E, F and G; hazardous locations. FMRC approved NEMA 4 and CSA TYPE 4.
- Display powered from electronics.
- Maximum separation from electronics 300 ft. (91.4m).

Programming:

- HART Smart compatible with Model 275 communicator. BEL202FSK standard.
- Hand Held Terminal Model 9734. Used to set up and calibrate gauge, and to enter data. Communicates with any Accu-Wave via the RS 485 connector.
- Windows based "EZ-Cal" software allows set-up and calibration of the Accu-Wave through the use of a PC. Configurations can be saved to disk for system restoration and a trend view is available to track process conditions.
- TN Comm PC Interface Software. Interface with up to 32 Accu-Wave units over RS 485 Loop. RS 485-RS 232 converter provided.

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Thermo MeasureTech ◆ Austin
2555 North IH 35
Round Rock, Texas 78664
512-388-9100 • 800-736-0801 (v)
512-388-9200 (f)

Thermo MeasureTech ◆ Canada
14 Gormley Industrial Avenue, Unit 4
Gormley, Ontario LOH 160
905-888-8808 (v)
905-888-8828 (f)

Thermo MeasureTech ◆ Chicago
1400 Business Center Drive, Suite 100
Mt. Prospect, IL 60056
847-803-5100 • 800-323-7594 (v)
847-803-5466 (f)

www.ThermoMeasureTech.com
sales@ThermoMT.com

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