

Accu-Wave Level Gauge

Installation Instructions - Draft

Introduction

The Accu-Wave Model 1440 Radar Level Gauge uses a microwave signal to continuously measure the level of the process material. The transmitted microwave signal is reflected off of the surface of the process material. The Digital Signal Processing (DSP) software detects this reflection or echo and computes the distance to the liquid or solid material in the tank. The Accu-Wave firmware then uses the distance measurement to calculate level, volume, and other user-selected measurements.

The Accu-Wave Radar Level Gauge consists of an integrated *sensor* and *transmitter*. The microwave and transmitter circuitry are combined on a single board. Initially, the Accu-Wave will be available with dielectric rod antennas (probes). Horn antennas will be provided as a future option.

Antennas

The standard antenna configuration for the Accu-Wave gauge consists of a dielectric-filled, 1 inch O.D. stainless steel waveguide with a dielectric rod antenna. Polypropylene or Teflon (PTFE) antennas are available. The stainless steel (SS 316) waveguide material is swaged (crimped) over the dielectric-fill material. The swage serves both as a process seal as well as a pressure seal.

Future options for the dielectric rod antennas will include Hastelloy waveguides and a fully-jacketed configuration where the only material exposed to the process will be Teflon (PFA).

In addition, horn antennas will be available in the future, with horn diameters ranging from 2 to 8 inches. For the horn antenna configuration, all materials exposed to the process are constructed of stainless steel (SS 316) and Teflon.

Mounting Configurations

The dielectric rod antennas are fitted with a 1-inch NPT threaded bushing, welded to the waveguide. Flanges are also available – 150 lb. or 300 lb., with diameters ranging from 2 to 8 inches. The waveguides are available in 6, 9, 12, or 15 inch lengths, where the length refers to the portion of the waveguide that extends below the bushing or the flange. For optimum performance the end of the waveguide should reach to the bottom of the nozzle. Level measurements can be made with the process material above the antenna to within ~3.5 inches of the antenna waveguide; however, measurement accuracy will be degraded.

Horn antennas are provided with welded flanges.

Communications

RS-485 and RS-232 (optional) serial ports are provided to support communications with the gauge via a remote terminal, a PC with terminal emulation software, or a TN Technologies' Hand Held Terminal.

Current Output

The gauge provides a 4-20 mA, loop-powered (24 Vdc) current output.

Setting Up and Using the Gauge

The companion manual “Accu-Wave Operation Manual” (717791) provides detailed information on how to set up the Accu-Wave software and operate the Accu-Wave gauge.

Hardware Installation

Licensing

All microwave frequency tuning is completed at the factory (TN Technologies Inc., Round Rock, Texas). The Accu-Wave gauge has a Part 15 FCC license (approval pending) for metal tank installations, so no special license is required. For other installations, a Part 90 FCC license must be obtained and displayed at the installation site. TN Technologies can assist you with licensing. For assistance, call or fax one of the following numbers:

- Phone: (800) 736-0801 (US only)
- Main Office: (512) 388-9100
- FAX: (512) 388-9200

Selecting a Location for the Gauge

Selecting a good location and properly mounting the gauge will help ensure the accuracy and ease of operation of the gauge.

Follow these guidelines when selecting a location:

1. The operating temperature range for the electronics is -40°C to 70°C (-40°F to 158°F).
2. The antenna (probe) should be mounted above the smoothest portion of the process material surface. The antenna should be mounted with 3 degrees of vertical.
3. For best performance, there should be a clear path between the antenna and the process material to avoid false reflections. Verify that the path is clear of pipes, beams, or any intermittent liquid sprays that could block the microwave beam. Try to locate the sensor to keep the beam path (approximately 18° wide) clear of the following conditions:

- Turbulence, splashing, or waves such as those caused by filling, recirculation, or sparging of light material entrances near the bottom of the tank.
 - Pipe entrances near the top or side of the tank.
 - Agitator blade passing directly through the beam path.
 - Vortices caused by baffles, drains, or any other obstructions.
4. The mounting location should also avoid horizontal structural surfaces such as baffle support brackets or side wall joints as these surfaces reflect a strong false signal.
 5. If the vessel has a dome top, a good guideline is to mount the sensor away from the vessel's center point by at least 10% of the vessel diameter.

Note: If the sensor is mounted in the center of the vessel, the dome top will act as a parabolic antenna, potentially enhancing "false" echoes due to multiple reflections of the transmitted energy.

The tank's nozzle must meet the following requirements.

1. For dielectric rod antennas, the antenna waveguide should extend to or below the bottom of the nozzle.
2. Nozzle must meet or exceed tank pressure requirements.
3. Align nozzle within 3° of vertical (verify this with a carpenter's combination level). Flange surface must be aligned within 3° of horizontal (verify this with a carpenter's combination level).

Note: Refer to the equipment tag for the approvals applicable to the configuration of your Accu-Wave gauge.

Dimensional Drawings

Refer to the proper dimensional drawings for the mounting dimensions.

Note: Reduced-size copies of the drawings are provided for your convenience.

Mounting Hardware

For flange configurations, the following customer-supplied hardware is required:

1. 1 gasket suitable for the process material
2. 16 steel washers
3. 8 nuts and bolts
 - 150 lb flange (5/8 inch) hardware
 - 300 lb flange (3/4 inch) hardware

Caution: Use proper lifting procedures to avoid injury.

Install the bolts and washers, and attach the nuts. Tighten the bolts in a star-patterned sequence to equalize compression. Unless otherwise specified, use a torque specification of 50 foot pounds.

For 1 inch, NPT bushing configurations, simply thread the bushing into the corresponding opening on the tank. To adapt to a flange mounting, simply use a tapped flange that will accept the 1 inch NPT bushing.

Installation Wiring

Basic wiring consists of

- connecting power to the gauge (24 Vdc standard, 100-240 Vac future option), and
- setting up serial communications with the gauge.

Additional wiring can include

- relay contacts,
- contact switch inputs, and
- 4-20 mA current outputs.

Caution: Remove all power from the unit before making any connections.

Warning: All wiring must be done by qualified individuals in accordance with NEC (National Electric Code) ANSI/NFPA 70 specifications, or the Canadian Electrical Code, Part I.

If metal conduit is used, it must be grounded.

Instructions

You will need a 1/8 inch bladed screwdriver to connect the wires to the plug-in connector. Refer to Wiring Diagram 868641 for wiring details.