



# Radar Level System

## Non-contact level gauging using electromagnetic waves

### Data Sheet DS21-600-2



#### Introduction

The radar level wave-stick is a level gauge designed for the continuous and non-contact level measurement of liquids, pastes, slurries, and liquefied gases in glass-lined or alloy process and storage tanks in even the most difficult conditions. The measuring system consists of the flange mounted unit and the signal converter. The flange mounted unit contains the microwave window and the antenna system. The compact signal converter contains the microwave generator and the entire signal processing system, including provision of a standardized output signal (4-20 mA or digital interface). Mounted on the unit is a 3-row illuminated LCD. Display functions are level, distance (between mounting flange and product surface) and volume. The signal converter can be detached from the flange system under process conditions, without loss of pressure or escape of product.

#### Advantages

- Non-contact measurement
- Independent of the gas composition and temperature of the reactor atmosphere
- Able to work in reactor atmospheres containing vapor and dust

- Independent of electrical properties of the product (conductivity, permittivity)
- No radiation hazard
- Quality of measurement – interference signals caused by agitator blades, side streams of the main filling flow . . . are suppressed out.

#### Theory of Operation

FMCW radar principle and FFT signal analysis

(FMCW = frequency-modulated continuous wave)

(FFT = fast fourier transform)

The radar unit emits a microwave signal by way of the antenna. The signal reflects off the surface of the product and is received back through the antenna. The FMCW radar system uses a linear frequency-modulated high-frequency signal; transmission frequency increases linearly within a time interval (frequency sweep). Due to the time delay during signal propagation, the frequency of the received signal differs from the momentary transmitted frequency. From the difference in frequency, the liquid level is determined. The minimum dielectric constant, for good measurement in direct mode, is 2; however, with patented tank bottom finding, signal processing techniques may be applied to lower dielectric materials.

#### Level-Radar Choices

The radar level wave-stick is available in a 2 inch or 4 inch ANSI 150 connection. Also provided is the software package PC-CAT for convenient remote control of all functions of the signal converter and on-site calibration. With PC-CAT, the vessel can be shown in schematic form together with the associated measured values and the measured spectrum.

#### Communication

The radar level wave-stick can be operated with various communication interfaces.

#### HART Protocol

The handheld HART HHC can be used to transmit communication signals to the radar level wave-stick, remotely anywhere along the 4-20 mA loop.

#### PC-CAT

This program allows convenient remote:

- Configuration of all functions of the signal converter
- Analysis of signal quality
- Trending during process conditions

#### Handheld Bar Magnet

Communication with the radar-level wave-stick can also be accomplished locally through the display glass with a handheld bar magnet without exposing the electronics to hazardous atmospheres.

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