

Description
 N° 11.0015 -2 / 12.07.00
 PULS 4*

VEGAPULS 4*

Company VEGA Grieshaber KG
 Am Hohenstein 113
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 Germany

Types VEGAPULS 4* with
 RADAR Module 3B

FCC ID XXXPULS 40

Task

The Radar Modules will be deployed in compact level transmitters for continuous non-contact measurement of liquids in vessels and tanks. Short microwave pulses were sent from the antenna, reflected at the surface of the material and received from the antenna. The time between transmitting and receiving will be evaluated and calculated to an adequate level signal. Because the velocity of light waves is nearly independent of temperature, pressure and humidity, these new radar technologies offer new applications for level measurement under the rough conditions in the industry.

Instrument assembly

The modules are deployed in different product families (e.g. VEGAPULS42, VEGAPULS44) of radar level transmitters of VEGA Grieshaber KG in combination with different types of antennas like horn or rod antennas.

All product families comprise different variants, which can be different from housing, evaluation electronic with signal processing or communication protocol. The microwave performance, however, is fixed by the module itself so that the transmitted microwave power depends only on the gain of the antenna.

System description of the emitting / receipt part:

The RADAR Module consists of two parts:

- 1) The scanning frequency processing
- 2) The pulse generator

The output signal of part 1) triggers the generation and emission of the emitting microwave pulse in part 2). The scanning frequency processing also triggers an internal microwave pulse within the module. The trigger signal for the internal pulse is delayed in dependence on time compared to the emitted pulse, so that the receiving pulse reflected by the level will be scanned by this internal pulse. Both signals are fed to an mixer and result in an IF signal. This technique causes a time conversion from the nanosecond range of the HF signal to the millisecond range of the IF signal, enabling the possibility that the signal processing can be performed by low cost standard semiconductor electronic.

The pulse generator emits extreme short pulses of approx. 1 ns, which therefore correspond with a bandwidth of approx. ± 1 GHz. This short pulses are required to get an appropriate accuracy and resolution for the level measurement. The pulses comprises a few oscillations and result together with all possible tolerances in the listed values for the spread spectrum.

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This scanning principle is comparable with the correlation principle and therefore results in a powerful filter effect. In this way even extreme low power emitted pulses are sufficient for the level measurement with high accuracy.

Summary of the electrical characteristics values of the S / E part:

Emitting frequency	26	GHz
Emission pulse clock frequency	3.579545	MHz
Scanning pulse clock frequency	3.57952315	MHz
Frame frequency of the PN-generator	27.96	kHz
Emitting pulse with 6 dB app.	0.8	ns
Emitting pulse peak envelope power	< -9	dBm
Antenna gain	< 26	dBi

Calculation of pulse spectrum:

$$f_{\text{centre}} = 26.0\text{GHz} \quad \text{centre frequency}$$

$$T_{\text{pulse}} = 0.8\text{nsec} \quad \text{pulse length}$$

$$B = 2/T_{\text{pulse}} \quad \text{band width}$$

$$f_{\text{min}} = f_{\text{centre}} - 1/T_{\text{pulse}} = 26\text{GHz} - 1.25\text{GHz} = 24.75\text{GHz} = >24.0\text{GHz}$$

Assembly:

A Radar Module 3B consists of a multilayer printed circuit board built in a plastic housing. The surface of the housing is electrically conductive. One face of the printed circuit board of the Radar Module 3B is the HF Front end according to the schematic SB1148 page1 called "HF- Modul 3B"; the other face of the printed circuit board contains the frequency treatment stage according to the schematic SB1148 page2 called "Frequenzerzeugung Radar Modul 3B".

Inputs / Outputs:

The electrical connection from the Radar Module 3B to the evaluation stage of the VEGAPULS4* is made via connector. The Radar Module has following input / output ports (see drawing n° SB1148):

- Supply
- Standby input
- Intermediate frequency output
- Trigger output signal
- GND

The microwave signals are led to the antenna systems of the VEGAPULS series 40 by a coaxial cable.

Operating data:

Supply voltage. 3,5V