Layer Thickness Radar V0.2 (Prototype) – Datasheet (Preliminary)

System Description

The layer thickness radar consists of two main components:

- Layer thickness sensor module
  - Designed for operation in the machine room of a road roller
  - Ultra-wideband radar sensor with directional coupler
  - Transmitting and receiving of an ultra-wideband-pseudo-noise signal
  - 2 Ultra-wideband Vivaldi antennas in a robust housing connected via coaxial cables to the sensor module
  - Temperature-controlled robust housing
- Control panel
  - Designed for operation in the driver's cab of a roller
  - Control computer for controlling the measurements and data recording
  - GPS-module for position determination
  - Mass storage (Micro-SD) for data recording
  - UPS for safe operation of the measuring system

Both are connected via an interconnect cable.

Figure 1:Layer thickness measurement system consisting of (from left to right) a control panel connected to the layer thickness sensor module via an interconnection cable and two antennas connected to the sensor via two coaxial-cables.

Measurement Properties

Transmitter	1
Receiver	2 coherent (working in parallel) ➔ 1 monostatic ➔ 1 bistatic
UWB pseudo-noise signal	MLBS12
	no high voltage peaks (0.8 V_{pp} max.)
	low field strength operation (when connected to antennas)
	low crest factor (CF ≈ 2.6) / PAPR (PAPR ≈ 8.3 dB)
Instantaneous 10 dB bandwidth	1.15 - 6 GHz
Ambiguity time	T_{amb} ≈ 307.6 ns (1-way range in air)
Antenna	Housed Vivaldi
Measurement rate	129.576 measurements / s (status for prototype!)
	Optional increased measurement speed upon request
Accuracy	±1 mm (averaging on 3x3 m²)
Penetration depth	Ca. 0.5 m

- extremely stable generation driven by phase locked RF system clock: 13.312 GHz
- output power-down feature (software controlled)
- EMV:
  - Ground Penetrating UWB Radar: ETSI EN 302 066
  - Emitted interference: EN 55011:2016 class b, (*EN 61326-1*)
  - Conducted interference emission: (*CISPR-25*)
  - Overvoltage protection: DIN EN ISO 13766-1, (*ISO 16750-2:2012 §4.3*)
  - Electrical, conducted and coupled disturbances: DIN EN ISO 13766-1, (*ISO 7637-2*)

General Information

Dimensions (WxDxH), Sensor	17.5x18.5x30 cm
Dimensions (WxDxH), Antenna	15x13x11.5 cm
Dimensions (WxDxH), Control Panel	25x7x18.5 cm
Weight, Sensor	8.3 kg
Weight, Antenna	1.7 kg
Weight, Control Panel	1.5 kg
RF-cable length	30 cm (adjustable)
Interconnect cable length	2 .. 3 m
IP protection class, Sensor	IP67K (according to ISO 20653) *(pending measurements)*
IP protection class, Antenna	IP66 (according to ISO 20653)

IP protection class, Control Panel	IP54 (according to ISO 20653)
Power supply rating	DC +24 V (20...28.5V) 2 A (heating), 4 A (cooling)
Operating temp. range, Sensor	0 .. +70 °C
	convection/active cooling by integrated fan
	heating
Operating temp. range, Antenna	0 .. +120 °C
Operating temp. range, Control Panel	0 ..+36°C
Data rate on SD card	4.092 MB/s

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