Sensor Guide
WS100 Radar Precipitation Sensor

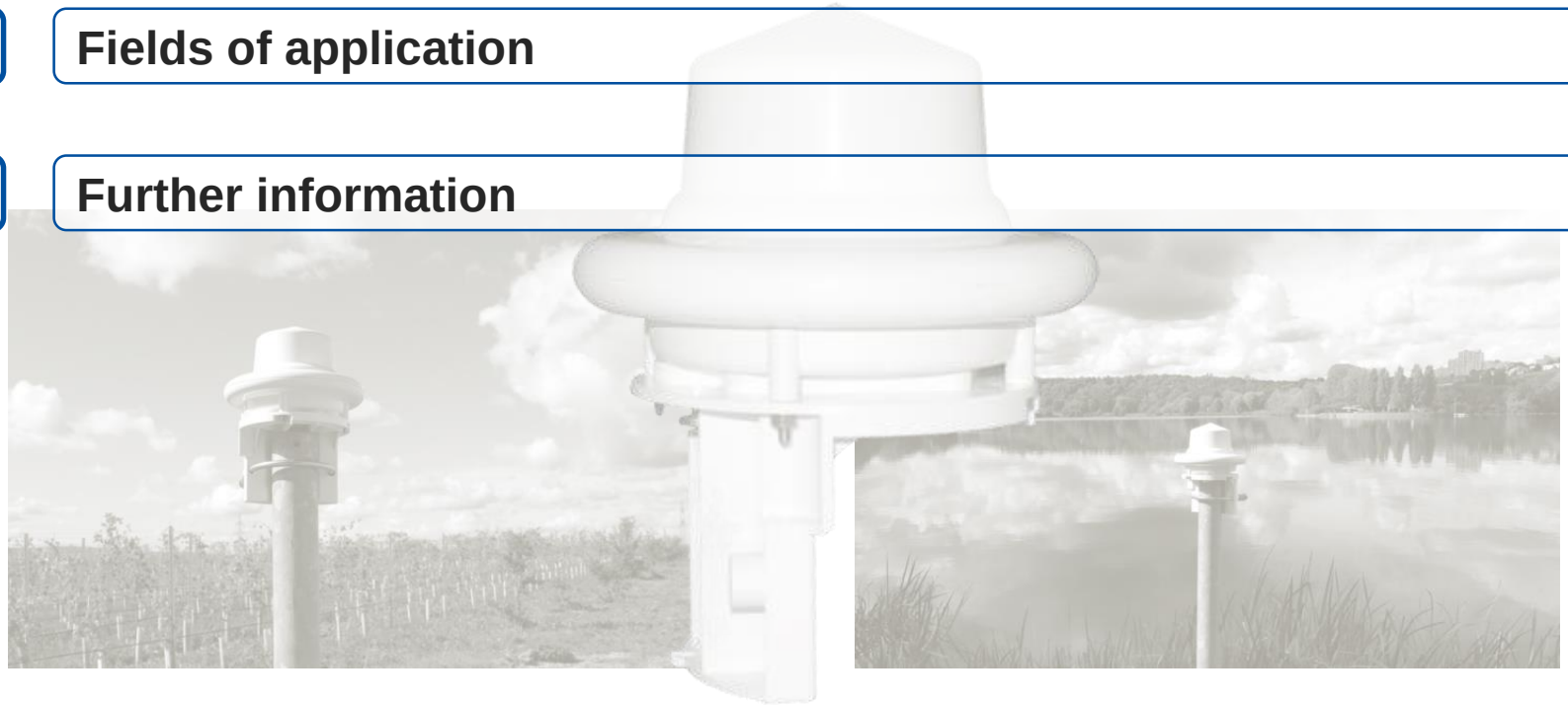


October 2017

Lufft

Sensor Guide: WS100 Precipitation Sensor

1. Product description
2. Overview of precipitaiton measurement principles
3. Fields of application
4. Further information



1. Overview – Precipitation Sensor WS100

WS100 in a nutshell:

- 24GHz Doppler Radar precipitation sensor
- Measures precipitation intensity and precipitation type (Rain, snow, sleet, freezing rain, hail)

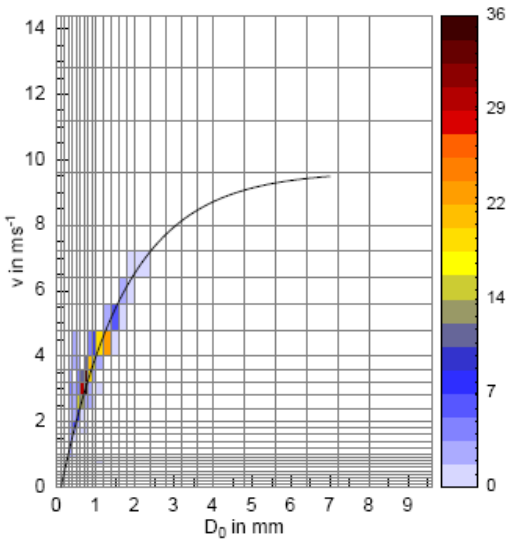


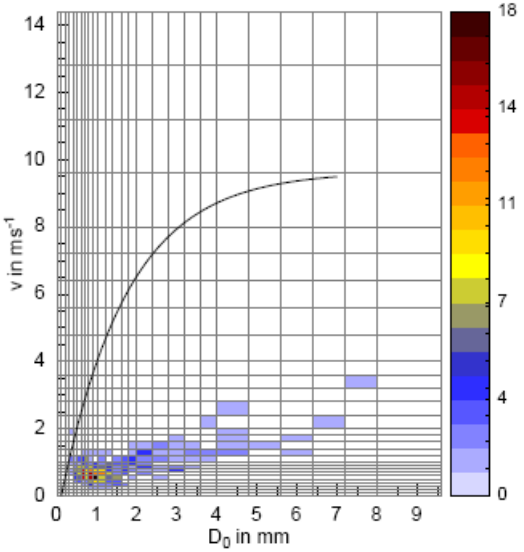
Overview - WS100-UMB Measuring Principle



24 GHz Microwave Doppler Radar works with the radar reflection method and measures the precipitation quantity or precipitation intensity by means of the correlation of drop size and velocity.

Drop Size distribution matrix to calculate intensity of precipitation and to determine type of precipitation according fundamental meteorological relationships *(Gunn-Kinzer and Hobbs and Locatelli).*





1. WS100 - Product Benefits

Freedom of maintenance…

…thanks to the smart measurement principle, no moving parts and no open housing design!





In comparison to tipping buckets, weighing gauges and optical measurement principles the WS100 is the only sensor, that can offer maintenance-free operation!

1. WS100 - Product Benefits

When the first drop counts…



…is the WS100 radar reflection method the right choice. The first drop can be detected and reported!

The Radar measurement principle offers extremely fast response time.
Precipitation intensity can be detected up to 200 mm/h and drop of up to 5.0 mm can be recognized.



1. WS100 - Product Benefits

Differentiation of precipitation types...

… like rain, snow sleet, freezing rain and hail is available with the WS100.

This feature makes the sensor to a Present Weather Detector!





With the drop size distribution matrix and the detection of the speed of the precipitation event, the sensor can recognize the precipitation type!

1. WS100 - Product Benefits

Low power mode…



…can be adjusted! With the low power mode, the sensor has a power consumption of only 0,4 VA (~40mA, 12V), which makes solar-powered operation possible.

The switchable heater offers maintenance-free operation in summer and winter time. With the heater on, the sensor has a power consumption of 9 VA.



1. WS100 - Technical Data

Electrical parameters	
Power supply	10...28 VDC
Power consumption without heating	1 VA / 0.4 VA (low power mode)
Heating power	9 VA
Operating parameters	
Operat. temp. range	-40...60 °C
Operat. humidity range	0...100 %
Protection class	IP66
Survival wind speed	75 m/s
Data transfer	
Interfaces/ protocols	RS-485 semi-duplex two-wire, SDI-12, pulse interface / UMB protocol, Modbus
(Pluggable) cable length	10 m
Transmission frequency	24 GHz

Precipitation	
Measurement surface	9 cm²
Precipitation types	Rain, snow, sleet, freezing rain, hail; No precipitation (SYNOP 4677)
Principle	Doppler radar
Accuracy	+-10%
Resolution liquid preciptiation	0.01 / 0 .1 / 0.2 / 0.5 / 1.0 mm (pulse interface)
Measurement ranges	
Droplet size	0.3...5.0 mm
DSD	11 drop size classes with bandwidth of 0.5 mm
Precipitation intensity	0.01...200 mm/h / 0...7.874 inch/h
Particle velocity	0.9...15.5 m/s
Solid precipitation	5.1...~30 mm

2. Overview of Precipitation Measurement Principles



2. Overview of Precipitation Measurement Principles



Tipping Bucket



Weighing Gauge



Radar



Hybrid



Disdrometer

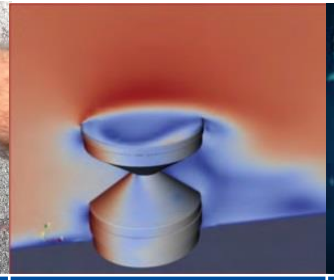
What are the differences?

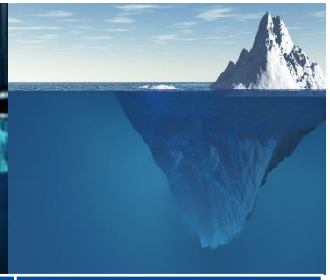
When to use which device?

2. Differences of Measurement Principles

Comparison of the different product types by…



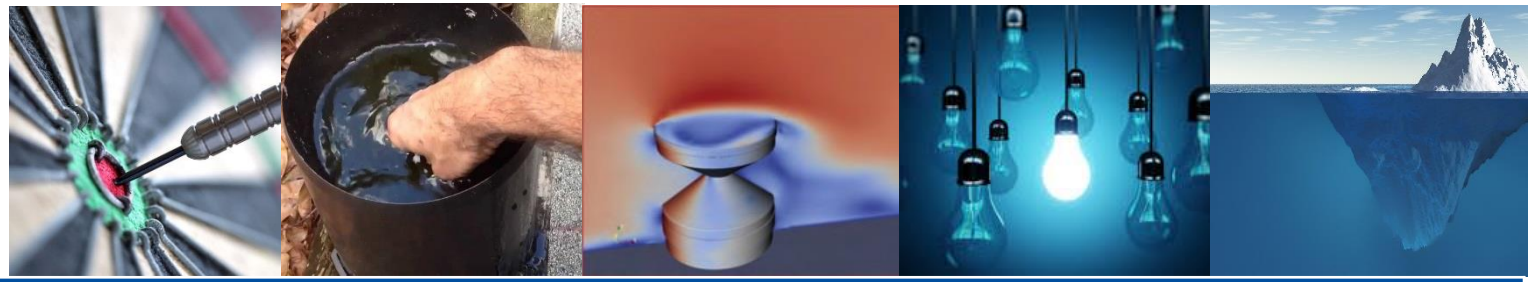




	Accuracy	Maintenance	Wind influence	Response Time / Speed	Total Cost of ownership
Tipping Bucket	☂☂	☂	☂☂	☂☂	☂
Weighing Gauge	☂☂	☂☂☂	☂☂	☂☂☂	☂☂
Hybrid	☂☂☂	☂	☂☂	☂☂☂	☂☂
Radar	☂	☂☂☂☂	☂☂	☂☂☂☂	☂☂☂☂
Disdrometer	☂☂☂	☂☂	☂☂	☂☂☂	☂

2. Differences of Measurement Principles

Application fields…



Tipping Bucket	Reference networks in Hydrology, Meteorology
Weighing Gauge	Reference networks in Hydrology, Meteorology
Hybrid	Reference networks in Hydrology, Meteorology
Radar	Traffic weather, Hydrology (Storm/flood warning especially in urban areas), Meteorology, Building Automation, Agricultural Meteorology, …
Disdrometer	Reference networks in Hydrology, Meteorology

2. Result of General Comparison on Measurement Principles



Tipping Bucket

Weighing Gauge



Radar



Hybrid



Disdrometer

Freedom from maintenance, a very fast response time and excellent total cost of ownership can only offer the radar precipitation sensor compared to other measuring principles.

Trade-offs have to be accepted with regard to accuracy,
which can be explained by the measuring principle!

3. Further Information



More WS100 Details

Click here to visit the WS100 product site for more info

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WS100 Radar Precipitation Sensor / Smart Disdrometer

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Absolutely maintenance-free and extremely fast measurement of precipitation type (Rain, snow, sleet, freezing rain, hail) and intensity, thanks to radar measurement technology. The smart radar rain sensor & present weather detector!



Radar reflection method to measure velocity on hydrometeors by 24-GHz-Doppler radar.
Correlation and determination of drop size classes to provide DSD matrix in 11 classes.
Drop Size distribution matrix to calculate intensity of precipitation and to determine type of precipitation according fundamental meteorological relationships (Gunn-Kinzer and Hobbs and Locatelli).
Multiple and simultaneous interfaces for data output and communication.

Parameters measured:	Rain/precipitation quantity, rain/precipitation type (Rain, snow, sleet, freezing rain, hail)
Measurement technology:	24GHz Doppler radar

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