Sensor Guide
WS100 Radar Precipitation Sensor

October 2017

Lufft

Sensor Guide: WS100 Precipitation Sensor

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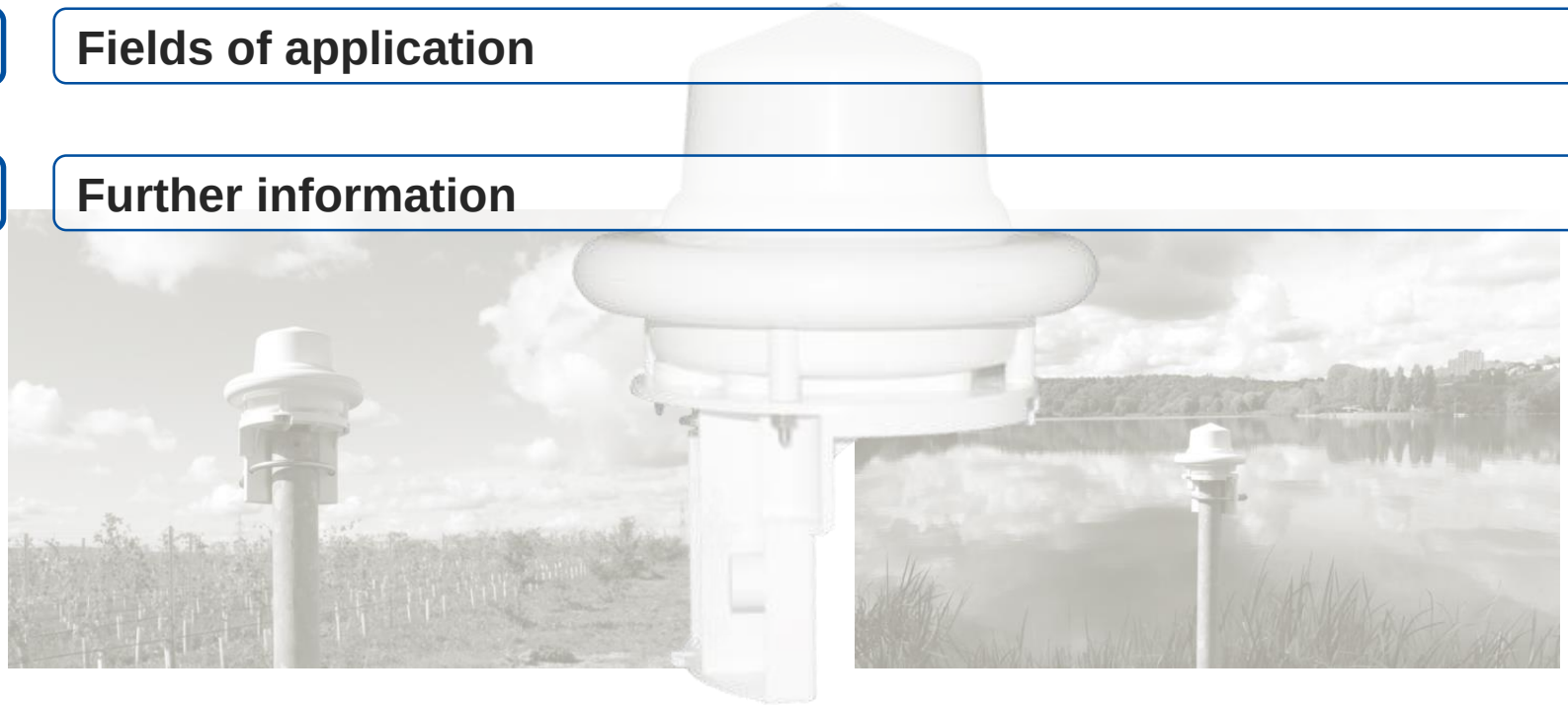
3. Fields of application
4. Further information



1. Overview – Precipitation Sensor WS100

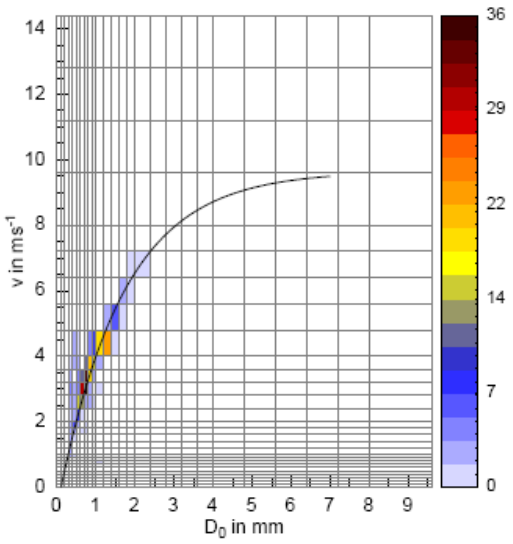
WS100 in a nutshell:

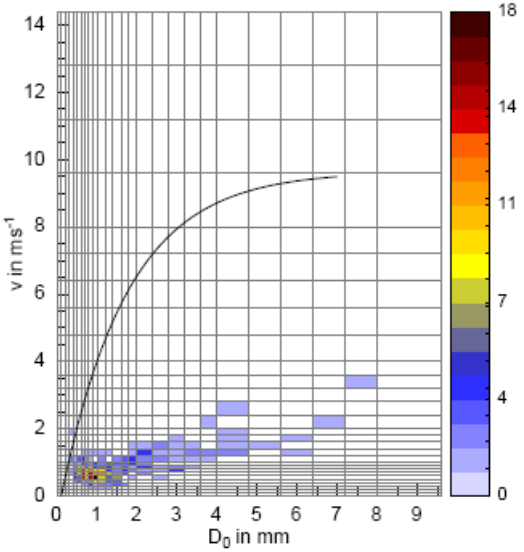
- 24GHz Doppler Radar precipitation sensor
- Measures precipitation intensity and precipitation type (Rain, snow, sleet, freezing rain, hail)

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

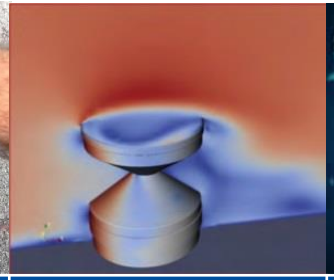
What are the differences?

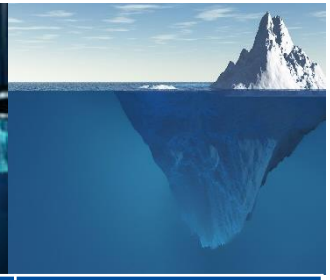
When to use which device?

2. Differences of Measurement Principles

Comparison of the different product types by…



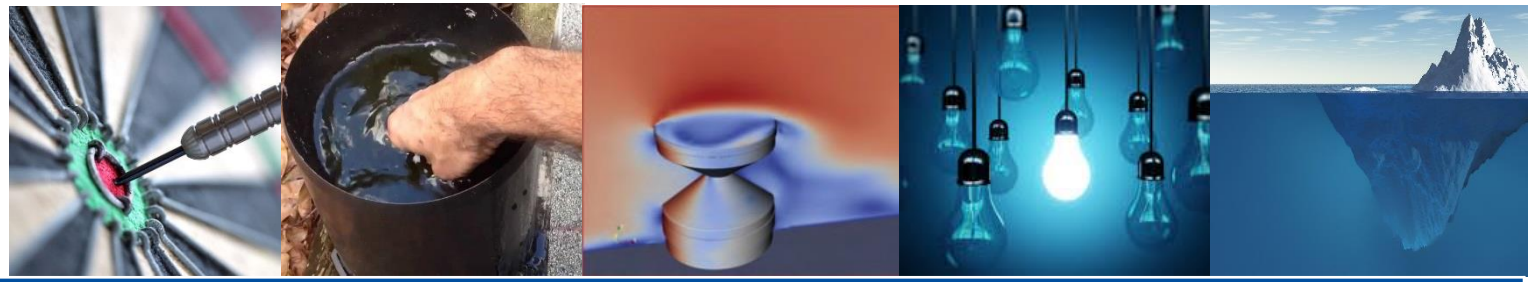




	Accuracy	Maintenance	Wind influence	Response Time / Speed	Total Cost of ownership
Tipping Bucket	☂☂	☂	☂☂	☂☂	☂
Weighing Gauge	☂☂	☂☂☂	☂☂	☂☂☂	☂☂
Hybrid	☂☂☂	☂	☂☂	☂☂☂	☂☂
Radar	☂	☂☂☂☂	☂☂	☂☂☂☂	☂☂☂☂
Disdrometer	☂☂☂	☂☂	☂☂	☂☂☂	☂

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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EU-Konformitätserklärung
EU-Declaration of Conformity

Nr. / No.: 1510-2017-02

Wir *We*

G. Lufft Mess- und Regeltechnik GmbH
Gutenbergstraße 20
70736 Fellbach, Germany

erklären, in alleiniger Verantwortung für die Ausstellung dieser Konformitätserklärung in Bezug auf die Erfüllung der grundlegenden Anforderungen und die Anfertigung der technischen Unterlagen
declare in sole responsibility for issuing this declaration of conformity regarding compliance with essential requirements and preparation of technical documentation

für das nachfolgend bezeichnete Produkt
for the product specified as follows

WS100-UMB **Art.-Nr.** **8967.U03**
order no. **8967.U04**

dass es bei bestimmungsgemäßer Verwendung, den grundlegenden Anforderungen der nachfolgend bezeichneten Richtlinien entspricht:
that it complies with the essential requirements of the directives mentioned below if used as intended:

Richtlinie ***Directive***	
2014/53/EU	RICHTLINIE 2014/53/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 16. April 2014 über die Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung von Funkanlagen auf dem Markt und zur Aufhebung der Richtlinie 1999/5/EG – kurz: **Funkanlagen-Richtlinie** *DIRECTIVE 2014/53/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC – short:* ***Radio Equipment-Directive***
2011/65/EU	RICHTLINIE 2011/65/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten – kurz: **RoHS-Richtlinie** *DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011on the restriction of the use of certain hazardous substances in electrical and electronic equipment – short:* ***RoHS-Directive***

EU-Konformitätserklärung
EU-Declaration of Conformity

Die nachfolgend bezeichneten harmonisierten Normen wurden angewandt:
The following designated harmonized standards have been applied:

Fundstelle *Reference*	**Ausgabedatum** *Publication Date*	**Titel** *Title*
Harmonisierte Normen für die Funkanlagen-Richtlinie: *Harmonized standards for Radio Equipment-Directive*		
EN 60950-1:2006	2006-11	Einrichtungen der Informationstechnik - Sicherheit - Teil 1: Allgemeine Anforderungen
EN 60950-1 / A11:2009		
EN 60950-1 / A1:2010		
EN 60950-1 / A12:2011		
EN 60950-1 / AC:2011		
EN 60950-1 / A2:2013		
DIN EN 61326-1	2013-07	Elektrische Mess-, Steuer- Regel- und Laborgeräte – EMV-Anforderungen – Teil 1: Allgemeine Anforderungen *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*
EN 300 440 V2.1.1		Funkanlagen mit geringer Reichweite (SRD) - Funkgeräte zum Betrieb im Frequenzbereich von 1 GHz bis 40 GHz - Harmonisierte EN, die die wesentlichen Anforderungen nach Artikel 3.2 der EU-Richtlinie 2014/53/EU enthält *Short Range Devices (SRD) - Radio equipment to be used in the 1 GHz to 40 GHz frequency range - Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU*
EN 301 489-1 V2.2.0		*ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirements - Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU*
EN 301 489-3 V2.1.1		
Harmonisierte Normen für die RoHS-Richtlinie: *Harmonized standards for RoHS-Directive*		
DIN EN 50581	2013-02	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

Diese Erklärung wird abgegeben durch
This declaration is given by

Name	Axel Schmitz-Hübsch
Position	Geschäftsführer *Managing Director*

Fellbach, 20.10.2017

Ort, Datum
Place and date of issue

Rechtsgültige Unterschrift
Authorized signature