



## Vaisala PWD sensor series

**A cost effective  
and compact  
Present Weather  
and  
Visibility sensors  
for automatic  
weather stations**



## Vaisala PWD sensor series

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### Measurements

- Accurately measures prevailing visibility (MOR) from 10 m up to 20 km
- Indicates the cause of reduced visibility
- Detects precipitation type
- Measures the intensity and accumulation of precipitation
- Estimates snow accumulation





## Vaisala PWD sensor series

•4 different models, Product matrix :

	<b>Only Visibility</b>	<b>Visibility and PW reports</b>
<b>Vis. range 2 km</b>	<b>PWD10</b>	<b>PWD12</b>
<b>Vis. range 20 km</b>	<b>PWD20</b>	<b>PWD22</b>

## Visibility sensor models

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### Visibility sensor PWD10

- visibility 2km, no PW
- no RAINCAP<sup>®</sup> plate
- for road visibility applications

### Visibility sensor PWD20

- visibility 20km, no PW
- no RAINCAP<sup>®</sup> plate
- for marine and general vis. applications

## Present Weather Detector models

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### Present Weather Sensor PWD12

- visibility 2km, 4 different precipitation types
- 1 RAINCAP® plate
- for road weather applications
- replaces current PWD11 model



### Present Weather Sensor PWD22

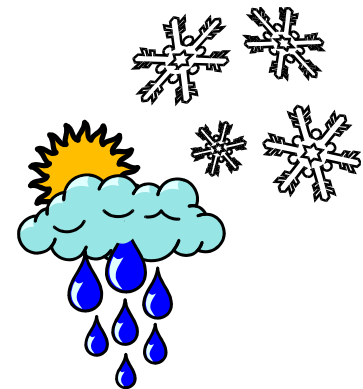
- visibility 20km, 7 diff. precipitation types,  
PW reports also in Metar format
- 2 RAINCAP® plate for better Drizzle sensitivity
- for small airports and general AWS applications
- replaces current PWD21 model

## Present weather identification

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- 7 different types of precipitation: rain, **freezing rain\***, drizzle, **freezing drizzle\***, mixed rain/snow, snow, **ice pellets\***
- the cause of reduced visibility: fog, mist, haze (smoke, sand)
- reports: WMO 4680 (Synop), **4678 (Metar)\*** and NWS code tables

\* **Supported only in PWD22 model**





## WMO code table 4680 used by PWD12

00	Clear	42	Precipitation, heavy
04	Haze or smoke, or dust in suspension in the air, visibility equal to, or greater than, 1 km	50	DRIZZLE
05	Haze or smoke, or dust in suspension in the air, visibility less than 1 km	51	Drizzle, not freezing, slight
10	Mist	52	Drizzle, not freezing, moderate
	Code figures 20 to 25 are used, if precipitation or fog was observed during the preceding hour but not at the time of observation	53	Drizzle, not freezing, heavy
20	Fog	60	RAIN
21	PRECIPITATION	61	Rain, light
22	Drizzle (not freezing) or snow grains	62	Rain, moderate
23	Rain (not freezing)	63	Rain, heavy
24	Snow	67	Rain (or drizzle) and snow, light
30	FOG	68	Rain (or drizzle) and snow, moderate or heavy
31	Fog or ice fog, in patches	70	SNOW
32	Fog or ice fog, has become thinner during the past hour	71	Snow, light
33	Fog or ice fog, no appreciable change during the past hour	72	Snow, moderate
34	Fog or ice fog, has begun or become thicker during the past hour	73	Snow, heavy
40	PRECIPITATION	80	SHOWERS OR INTERMITTENT PRECIPITATION
41	Precipitation, slight or moderate	81	Rain showers, light
		82	Rain showers, moderate
		83	Rain showers, heavy
		84	Rain showers, violent ( >32 mm/h )
		85	Snow showers, light
		86	Snow showers, moderate
		87	Snow showers, heavy

# WMO code table 4680 used by PWD22

00	Clear	54	Drizzle, freezing, slight
04	Haze or smoke, or dust in suspension in the air, visibility equal to, or greater than, 1 km	55	Drizzle, freezing, moderate
05	Haze or smoke, or dust in suspension in the air, visibility less than 1 km	56	Drizzle, freezing, heavy
10	Mist	60	RAIN
Code figures 20 to 25 are used, if precipitation or fog was observed during the preceding hour but not at the time of observation			
20	Fog	61	Rain, light
21	PRECIPITATION	62	Rain, moderate
22	Drizzle (not freezing) or snow grains	63	Rain, heavy
23	Rain (not freezing)	64	Rain, freezing, light
24	Snow	65	Rain, freezing, moderate
25	Freezing rain or freezing drizzle	66	Rain, freezing, heavy
30	FOG	67	Rain (or drizzle) and snow, light
31	Fog or ice fog, in patches	68	Rain (or drizzle) and snow, moderate or heavy
32	Fog or ice fog, has become thinner during the past hour	70	SNOW
33	Fog or ice fog, no appreciable change during the past hour	71	Snow, light
34	Fog or ice fog, become thicker during the past hour	72	Snow, moderate
40	PRECIPITATION	73	Snow, heavy
41	Precipitation, slight or moderate	74	Ice pellets, light
42	Precipitation, heavy	75	Ice pellets, moderate
50	DRIZZLE	76	Ice pellets, heavy
51	Drizzle, not freezing, slight	80	SHOWERS OR INTERMITTENT PRECIPITATION
52	Drizzle, not freezing, moderate	81	Rain showers, light
53	Drizzle, not freezing, heavy	82	Rain showers, moderate
		83	Rain showers, heavy
		84	Rain showers, violent ( >32 mm/h )
		85	Snow showers, light
		86	Snow showers, moderate



## WMO Codes (Table 4678) Used by PWD22

### WMO Code Table 4678 for reports from Aerodromes (METAR)

Qualifier			Weather Phenomena				
INTENSITY 1	DESCRIPTOR 2		PRECIPITATION 3		OBSCURATION 4		OTHER 5
- Light	BC	Patches	DZ	Drizzle	BR	Mist	
Moderate (No qualifier)	SH	Shower(s)	RA	Rain	FG	Fog	
+ Heavy	FZ	Freezing	SN	Snow	DU	Widespread dust	
			PL	Ice pellets	HZ	Haze	

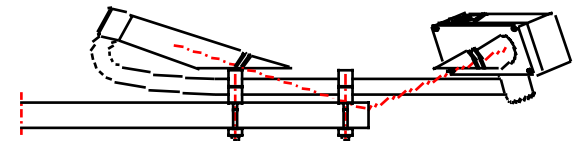
**Example report from light freezing rain:**

**-FZRA**

## Visibility measurement accuracy

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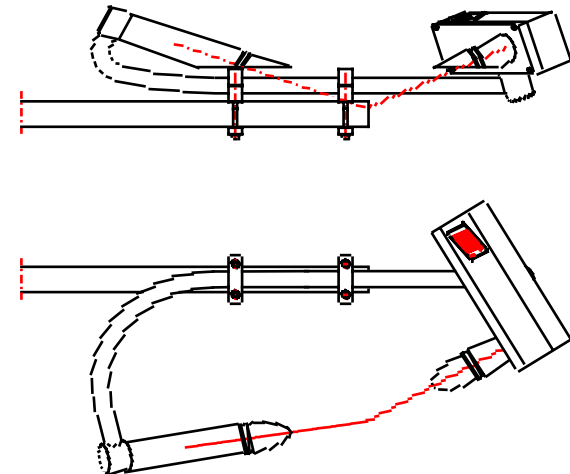
- **Visibility sensor based on proven forward scatter principle**
- **Scientifically valid chain of calibration**
- **calibrated with reference to a highly accurate transmissometer**
- **extensive set of self diagnostic and automatic detection of contamination ensures that false values are not reported**



### How does it work?

Combination of an **OPTICAL** visibility sensor and a **CAPACITIVE** precipitation sensor

- Optical measurement, relative to droplet size
- Capacitive measurement (RAINCAP plate), relative to water content of droplets



Liquid precipitation (e.g. rain):

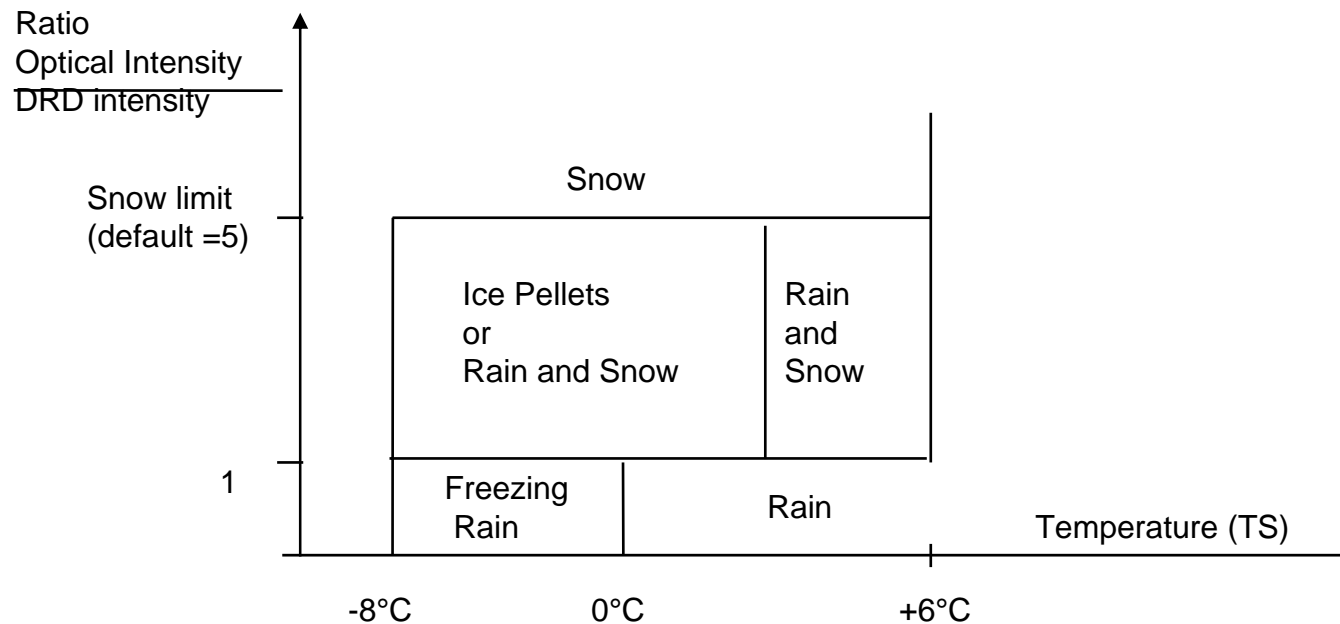
- water content and droplet volume are equal

Solid precipitation (e.g. snow):

- water content is much lower than droplet (snowflake) size

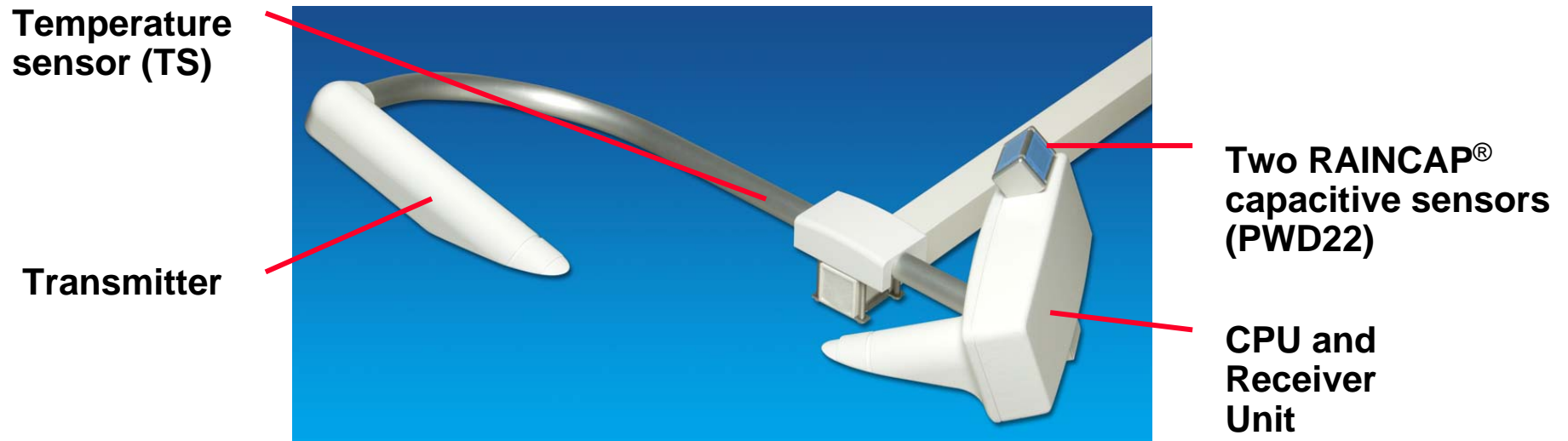
## PWD22 Precipitation type algorithm

- Temperature information is also used to limit some decisions and to detect freezing precipitation



- Maximum droplet size information and capacitive sensor signal are used to distinguish:
  - Drizzle and Ice Pellets

## Main parts (PWD22)

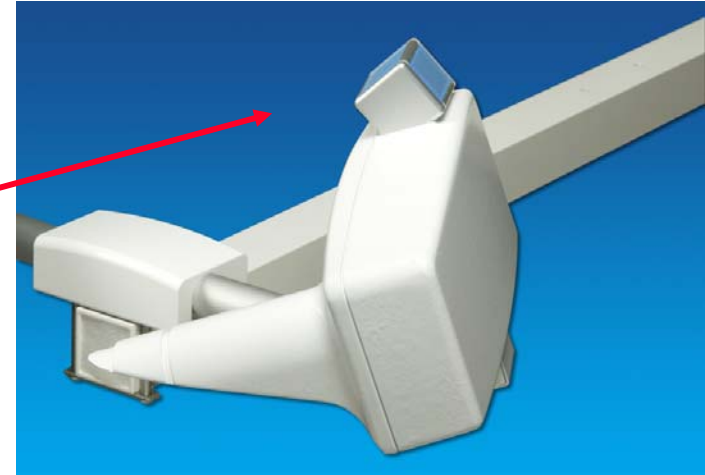
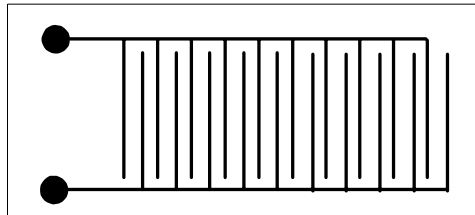


- Transmitter unit PWT11
- RAINCAP® Capacitive sensor
- Processor board PWC22

- PWC22 Processor board includes:
- processor board
  - light receiver
  - power supply
  - interfaces

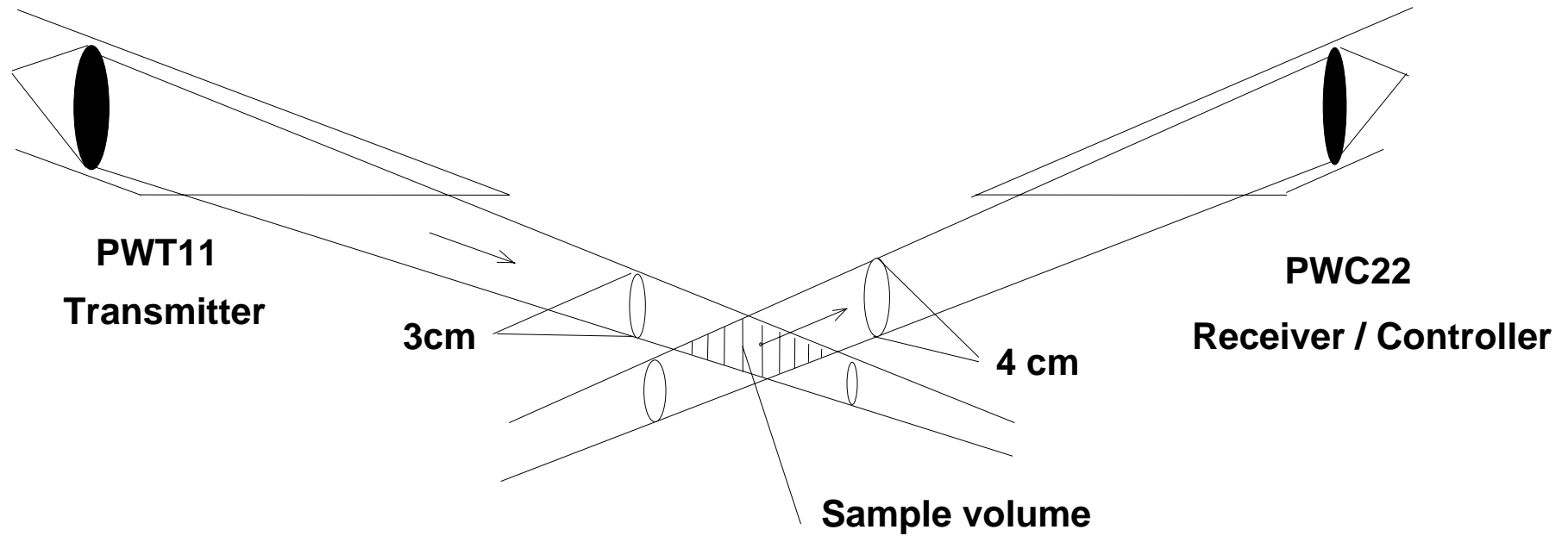
## Capacitive precipitation measurement

- RainCap<sup>®</sup> sensing element



- PWD22 contains two RAINCAP<sup>®</sup> plates for better particle catch during light precipitation events.
- Thin wires under glass coating form a capacitor
- The capacitance changes when there is water on the surface and the change is proportional to the water amount
- RainCap<sup>®</sup> is heated to prevent water condensation on the surface

# PWD Optical system

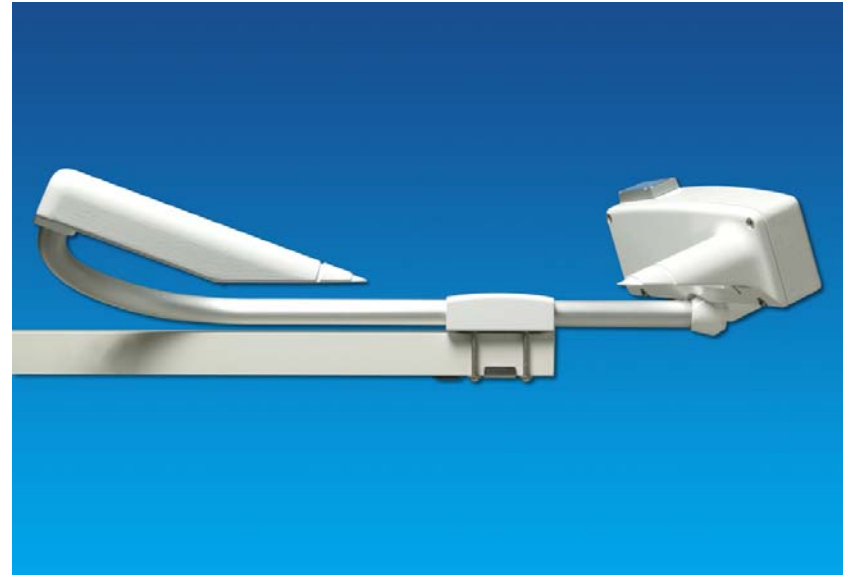


**Wave length: 875 nm**

**Scatter angle: 45°**

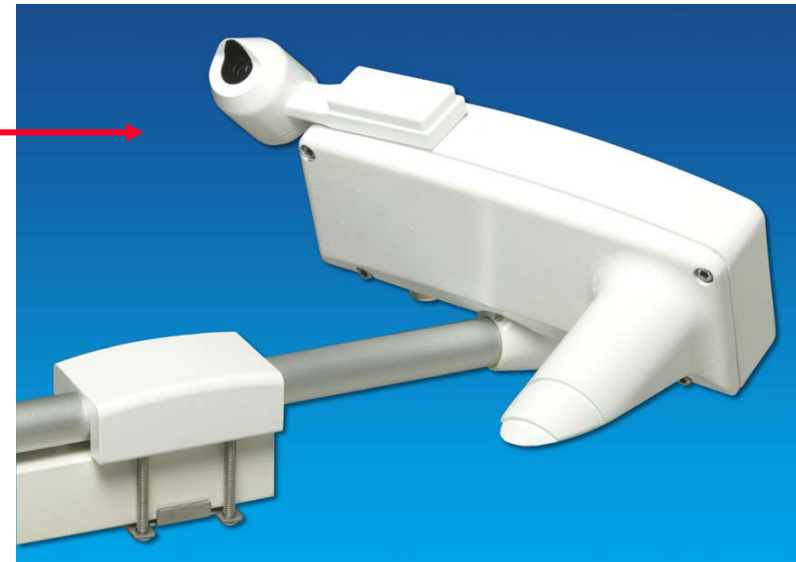
## Present Weather Detector features

- **low power consumption**
  - 3W, visibility sensors
  - 6W, PW models
- **compact size (weight 3 kg, width 0.7 m)**
- **easy installation and calibration**
- **weather-proof mechanical design**
  - **optical components point downwards and hood covers protect the lenses against precipitation, spray and dust.**



# Options

- **Luminance Sensor PWL111 for AWOS use.**
- **Can be used as Day/Night switch or in continuous luminance measurement mode**



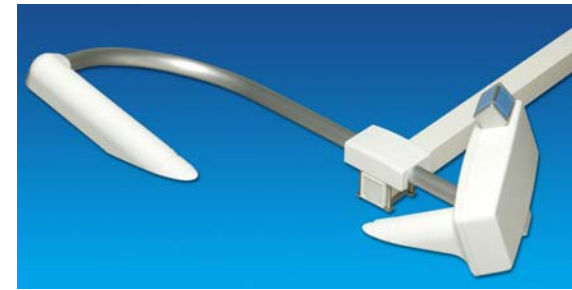
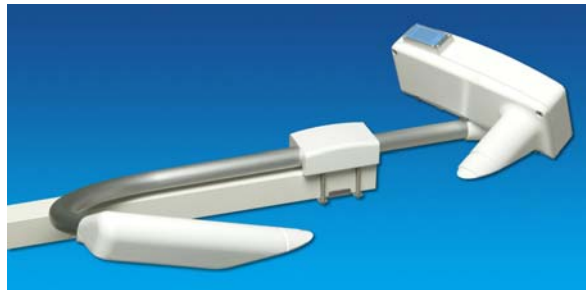
- **Hood Heaters for wintry conditions**

## Use of PWD sensor

- Together with Automatic Weather Stations with RS-232 or RS-485 serial line connection
- As a stand alone unit (requires external power supply unit)
- Installation possibilities:



**Installation directly to the top of the mast or with a sensor boom**





## Compared to PWD11/21 models the new PWD family provides

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- **New visibility sensor models PWD10 and PWD20**
- **Optional heaters for wintry conditions**
- **Luminance sensor option for AWOS use**
- **Lower power consumption**
- **More flexible installation possibilities**
- **Professional outlook of the sensor**
- **The PWD22 model is equipped with additional second RAINCAP® sensor element to improve Drizzle detection.**
- **Analog output (4-20mA or 0-1mA) for visibility data providing easy integration with all kind of data collection systems.**
- **Compatible message formats and interfaces with old Impulsphysik visibility sensors Videograph and Fumosens E**

## Spare parts and upgrades

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### Spare part availability

- new CPUs PWC12 and PWC22 work as a spare part also for existing PWD11 and PWD21 installations

### Upgrade requirements

- PWD10, PWD20, models can be upgraded to PWD12 and PWD22 models.
- Upgrade requires factory service



## Vaisala's Present Weather Sensors

<b>Product</b>	<b>applications</b>	<b>Visibility</b>	<b>PW</b>
PWD12 Present Weather Detector	for road applications with Road weather station.	10-2000m	4 different precipitation types, 39 WMO codes
PWD22 Present Weather Detector	for general Meteorological and aviation applications with AWS.	10-20000m	7 different precipitation types, 49 WMO codes, Metar codes
FD12P Present Weather sensor	for demanding MET customers and CAT airports for PW (and RVR) measurements. FAA approved for US AWOS use.	10-50000m	11 different precipitation types, 52 WMO codes, Metar codes



## Vaisala's Visibility Sensors

<b>Product</b>	<b>applications</b>	<b>Visibility</b>
PWD10 Visibility Sensor	for road applications with Road weather station.	10-2000m
PWD20 Visibility Sensor	for diverse applications covering harbors, coastal areas, heliports, windmill parks.	10-20000m
FD12 Visibility sensor	for RVR and for SYNOP visibility measurements. Fulfills ICAO guidelines for RVR use. FAA approved for US AWOS use.	10-50000m
FS11 Visibility sensor	New Forward scatter sensor for RVR application. FS11 replaces FD12 in RVR application. Fulfills ICAO and FAA specifications for RVR.	5-75000m
Mitras Transmissometer	Transmissometer for RVR use.	7-2000m