



Features

- Visibility up to 100 km (62 mi)
- Precipitation type identification, intensity, and accumulation
- Droplet size distribution and reflectivity
- Exceptional precipitation detection sensitivity
- Superior liquid/frozen differentiation
- Optimal forward scatter angle 42°
- Look-down geometry to minimize measurement disturbances

Vaisala Forward Scatter Sensor FD70 combines forward scatter and optical disdrometer technologies. FD70 sets the standard in precipitation identification and quantification, providing best-in-class visibility determination.

Innovative technology

Novel use of a single thin light sheet instead of the conventional light cone results in high detection sensitivity, enabling scatter-property analysis of each single particle and allowing detection of even the smallest drizzle droplets. Particle size and fall speed distributions provide additional information, enhancing precipitation type identification.

The receiver measures forward scattered light at an angle of 42° with a very high sampling rate and powerful signal processing. Measurement arrangement and method is patent pending.

Visibility measurement

FD70 forward scatter technology provides the most representative extinction coefficient (EXCO) determination possible. Scatter-property analysis reliably calculates the visibility-reducing effect of precipitation, allowing meteorological optical range (MOR) reporting in the most challenging conditions. FD70 covers all application needs, including measurement performance and capability requirements for runway visual range (RVR).

Precipitation measurement

Due to its innovative technology, FD70 reliably detects and identifies precipitation types that have been challenging for conventional technologies.

Present weather identification ^{1) 2)}

- Drizzle
- Rain
- Snow
- Snow grains
- Ice crystals
- Ice pellets
- Freezing drizzle
- Freezing rain
- Snow pellets
- Hail
- Fog
- Freezing fog
- Mist
- Haze

1) *Optional*

2) *In addition to listed types, reports a variety of mixed precipitation types*

Reliable in all weather

FD70 has multiple features to ensure reliable operation even in extreme weather conditions. Effective hood heating and proven look-down geometry protect the sensor windows against external disturbances. These are complemented with independent optical path monitoring and window contamination compensation.

Self-diagnostics and modular design enable short service times. Redundancy of data communication is available for critical cases such as airport use.

FD70 complies with ICAO, FAA, and WMO requirements and uses WMO and NWS weather codes in reporting.

Calibration traceability

To ensure specific visibility and rain performance, Vaisala continuously compares calibrated FD70 units against reference sensors in the Vaisala outdoor test field. Every delivered unit can be traced back to this set of calibrated reference sensors.

Technical data

Measurement specifications

Operating principle	Look-down forward scatter
Scattering angle	42° ±0.25°
Light source	Near-infrared
Sampling frequency	5 MHz
Measurement cycle	5 s

Visibility (MOR) measurement performance

Reporting range	1 m ... 100 km (3 ft ... 62 mi)
Reporting resolution	1 m (3 ft)
Reporting uncertainty in operational conditions	±10 % or ±1 m at 1 m ... 10 km (±3 ft at 3 ft ... 6.2 mi) ¹⁾ ±20 % at 10 ... 100 km (6.2 ... 62 mi)
Measurement error	±0.7 %

¹⁾ Fulfills ICAO Annex 3: ±50 m (164 ft) up to 600 m (1968 ft)

Present weather reporting (optional)

Present weather identification	Drizzle, rain, snow, snow grains, ice crystals, ice pellets, freezing rain / drizzle, snow pellets, hail, fog / freezing fog, mist, haze
Weather codes	SYNOP: WMO table 4680 • Number of SYNOP codes: 56 METAR: WMO table 4678 • Number of METAR codes: 51 NWS codes • Number of NWS codes: 36 Light, moderate, and heavy intensities

Precipitation measurement performance (optional)

Precipitation Intensity

Sensitivity	Single droplet $\varnothing \geq 0.1$ mm (0.004 in)
Reporting range	0.01 ... 999.99 mm/h (0.0004 ... 40 in/h) liquid water equivalent (LWE)
Reporting resolution	0.01 mm/h (0.0004 in/h)
Minimum intensity	0.01 mm/h (0.0004 in/h)

Precipitation accumulation

Reporting range	0 ... 999.99 mm (0 ... 40 in) liquid water accumulation (LWA)
Reporting resolution	0.01 mm (0.0004 in)
Reporting uncertainty ¹⁾	±2.2 %
Reporting range, snow height	0 ... 9999 mm (0 ... 32 ft 9 in)
Reporting resolution, snow height	1 mm (0.04 in)

Droplet size distribution

Size classes	41 size classes
Measuring range	\varnothing 0.1 ... 35 mm (0.004 ... 1.38 in)

Radar reflectivity

Dynamic range	-9.9 ... 99.9 dBZ
---------------	-------------------

¹⁾ Proven under laboratory conditions

Compatibility

System compatibility	Vaisala AviMet®
Backwards compatibility	Vaisala FD12(P), FS11(P), PWD Series

Operating environment

Operating temperature	-40 ... +65 °C (-40 ... +149 °F)
Operating temperature, extended (optional)	-55 ... +65 °C (-67 ... +149 °F)
Storage temperature	-55 ... +65 °C (-67 ... +149 °F), non-condensing environment
Operating humidity	0 ... 100 %RH
Wind speed	Up to 60 m/s (134 mph)

Mechanical specifications

Material, measurement unit	Aluminum
Material, interface unit	Maritime-grade aluminum (EN AW-5754)
Coating	Multi-layer coating to prevent environmental corrosion
Dimensions (H × W × L), measurement unit	354 × 551 × 883 mm (13.94 × 21.69 × 34.76 in)
Weight, measurement unit	6 kg (13.23 lb)
Dimensions (H × W × L), interface unit with radiation shield	885 × 380 × 320 mm (34.84 × 14.96 × 12.60 in)
Weight, interface unit with electronics	Max. 25 kg (55.1 lb)

Inputs and outputs

Operating voltage	Measurement unit with interface unit: 115/230 VAC ±10 %, 50 ... 60 Hz Measurement unit only: 10 ... 50 VDC
Heating voltage	24 VAC or VDC ±10 %
Power consumption, typical	Measurement unit with interface unit, all options: 182 W Measurement unit, operating: 7.5 W / 24 V Measurement unit, heating: 120 W
Backup battery	12 V 2.6 Ah
External inputs	Vaisala HUMICAP® Humidity and Temperature Probe HMP155 Vaisala Background Luminance Sensor LM21
Data communication options	10/100 Mbps Ethernet RS-232, RS-485 Leased-line modem DXL421 UHF/VHF radio modem

Compliance

IP rating	IP66
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 52, 78 IEC 60529 VDA 621-415
Eye safety	Class 1M IEC/EN 60825-1
Electrical safety	IEC/EN/UL/CSA 61010-1
EMC compliance (measurement unit with interface unit)	IEC 61326-1 Industrial environment EN 55032 Class B
EMC compliance (measurement unit only)	IEC 61326-1 Industrial environment EN 55032 Class A



VAISALA

www.vaisala.com

Published by Vaisala | B211744EN-E © Vaisala Oyj 2021

All rights reserved. Any logos and/or product names are trademarks of Vaisala or its individual partners. Any reproduction, transfer, distribution or storage of information contained in this document is strictly prohibited. All specifications – technical included – are subject to change without notice.