Forward Scatter Sensor FD70

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
- Look-down geometry to minimize measurement disturbances
- Enhanced visibility measurement in sand dust conditions

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 patented.

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
- Dust

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

Visibility (MOR) measurement

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 METAR: WMO table 4678 NWS codes Light, moderate, and heavy intensities

Precipitation measurement (optional)

Precipitation Intensity	
Sensitivity	Single droplet Ø ≧ 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 and uncertainty [1)]	0.01 mm (0.0004 in), ±2.2 %
Reporting range, snow height	0 ... 9999 mm (0 ... 32 ft 9 in)
Reporting resolution, snow height	1 mm (0.04 in)
Additional precipitation reporting	
Droplet size / fall speed distribution	41 size classes, 26 speed classes
Size / speed measuring range	Ø 0.1 ... 35 mm (0.004 ... 1.38 in) 0 ... 10+ m/s (0 ... 32.8+ ft/s)
Radar reflectivity	−9.9 ... 99.9 dBZ
Kinetic energy	0.000 ... 999.999 J/m^2 × h

1) Proven under laboratory conditions.

Compatibility

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

Measurement specifications

Operating principle	Look-down forward scatter
Scattering angle (main receiver)	42° ±0.25°
Scattering angle (side receiver)	90° ±0.25°
Light source	Near-infrared
Sampling frequency	5 MHz
Measurement cycle	5 s

Mechanical specifications

Material, measurement unit	Aluminum
Material, interface unit	Maritime-grade aluminum (EN AW-5754)
Coating	Multi-layer coating to prevent environmental corrosion
Dimensions, measurement unit	354 × 551 × 883 mm (13.94 × 21.69 × 34.76 in)
Weight, measurement unit	Max. 7.5 kg (16.5 lb)
Dimensions, 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

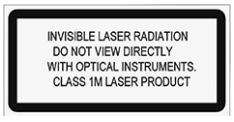
Operating voltage	Measurement unit with interface unit: 115/230 V AC ±10 %, 50 ... 60 Hz Measurement unit only: 10 ... 50 V DC
Heating voltage	24 V AC or V DC ±10 %
Power consumption, typical	Measurement unit with interface unit, all options: 245 W Measurement unit: 10.0 W / 24 V Measurement unit, heating: 180 W (at 60 W per hood)
Backup battery (optional)	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

Operating environment

IP rating	IP66
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)

Compliance

EU directives	EMC, LVD, RoHS
Environmental	IEC 60068-2-1, 2, 6, 14, 30, 31, 52, 78 IEC 60529, VDA 621-415 IEC/EN 63000
Eye safety	Class 1M IEC / EN 60825-1:2014
Electrical safety	IEC/EN/UL/CSA 61010-1
EMC compliance	EN 61326-1, industrial environment CISPR 32 / EN 55032, Class B



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