Lufft
an OTT HydroMet brand

Lufft Ceilometer Series
CHM 15k and CHM 8k

OTT HydroMet

Lufft Ceilometers
CHM Series

A ceilometer is a device which uses a laser or other light source to determine the height of a cloud ceiling or cloud base. Ceilometers can also be used to measure the aerosol concentration within the atmosphere. A variant of atmospheric lidars (light detection and ranging), ceilometers send short laser pulses into the atmosphere and measure the backscattering of molecules and aerosols. From the backscatter signal, a ceilometer determines cloud bases and aerosol layer heights.

Using the single-wavelength, backscatter Lidar technology, Lufft ceilometers accurately deliver cloud base heights, cloud penetration depths, and aerosol layer heights via boundary layers, vertical visibility, and sky condition indexes.

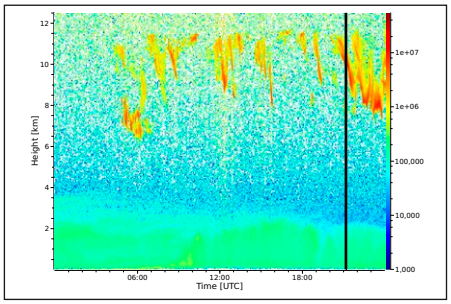
The Lufft CHM Ceilometers have a double-walled housing and combined with an integrated fan and automatic heating system provide reliable protection against misting, precipitation, freezing, and overheating. Reliable and accurate results 24 hours a day are ensured by the use of long-life laser sources, filters with narrow bandwidth, and highly sensitive photo-detectors.

The CHM 8k and the CHM 15k are equipped with an integrated controller offering a fully embedded real-time calculation of all target parameters. Additionally, Lufft offers intuitive user web interfaces for data monitoring. The CHM 8k is the new ceilometer from Lufft and has a measuring range from 0 m to 10 km (0 to 32,808 ft) and a cloud detection range from 5 m to 8 km (16 to 26,246 ft). The tried-and-tested Lufft CHM 15k has a measuring range of 15 km (49,212 ft).

The new Lufft CHM 8k ceilometer empowers meteorologists at weather services and airports to make the right decisions with highest confidence and minimal maintenance. Especially in the critical height below 1 km, the Lufft CHM 8k detects cloud bases in any place and season with outstanding precision and reliability. Internal data storage and a battery backup enable unmatched sensor uptime and data availability even at the harshest conditions.

Measurement Examples

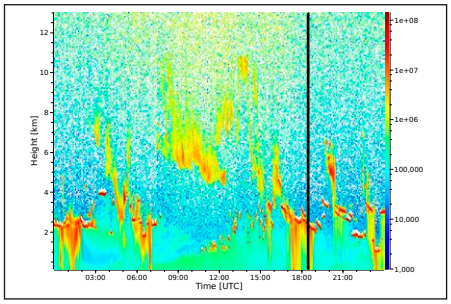
Cirrus Clouds



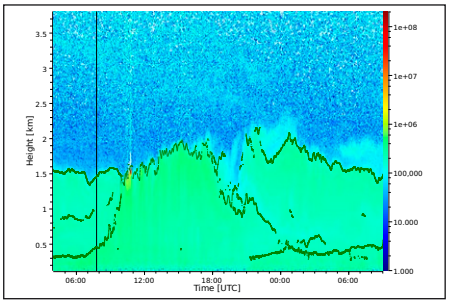
The graphical view of backscatter activity shows a cirrus cloud structure over the course of the day between 6 and 12 km and an aerosol layer structure up to 2 km altitude. The related height profile (black line at 21:00 UTC) is shown at the right side of the diagram.

Rain

This graphic shows a rain situation. A certain drop in cloud height and an increase in cloud mass and volume can easily be perceived in the graphical view by evaluation of the height profile (black line at 18:30 UTC) shown in the right sub-area of the graphical view. One can identify precipitation and estimate the intensity of a likely precipitation event.



Planetary Boundary Layer

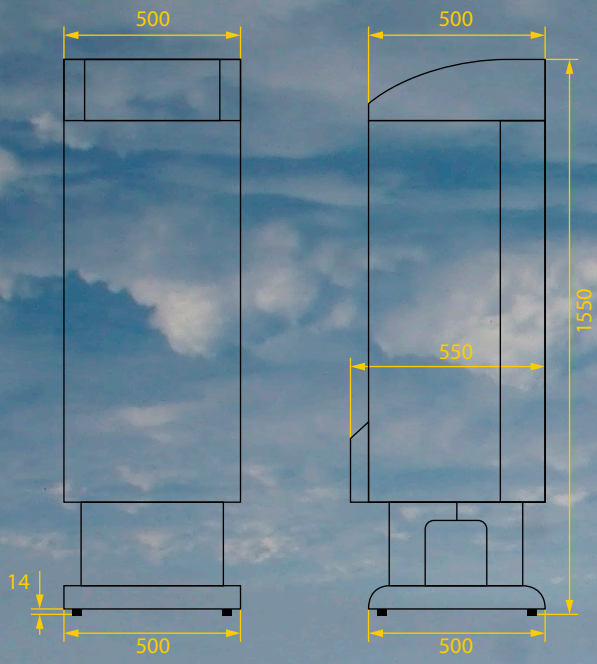


The planetary boundary layer (PBL) or atmospheric boundary layer (ABL) is the lowest part of the atmosphere. It is affected by heat, wind, moisture or momentum transfer from the ground. Within the PBL, the mixed layer (MXL) height is of interest, because all particles and gases arising from the Earth surface are first concentrated and mixed within it. Therefore, the ceilometer's measurement of the aerosol layer height gives valuable information about the particle concentration, e.g. PM2.5 fine dust. The diagram to the left shows an aerosol profile for a typical mixing layer as it develops over the course of the day.

Product Description & Technical Data

The main difference between the two Lufft ceilometers is the laser source, the detection method (analog versus photon counting method) and the sensivity at ground level. The field of view of the receiver is larger on the Lufft CHM 8k cloud height sensor.

Dimensions



CHM 8k

- Confident detection of low clouds with minimum False Alarm Rate (FAR) and an outstanding Probability of Detection (POD) even at extreme conditions
- Application focus on aviation and environmental services
- Maximum sensor uptime and data availability thanks to integrated data storage and a robust battery backup (-40 °C to 60 °C)
- Low-maintenance through self-monitoring function
- Data output in NetCDF format available
- Various interfaces (LAN, serial)
- Safe and certified operation in compliance with UL50e (North America), TÜV (Europe), ICAO GRF

CHM 15k

- Cloud Height Detection up to 15 km / 50,000 ft
- Application focus on meteorological and environmental services
- Sophisticated housing, ventilation and heating withstands even extreme conditions
- Based on micro chip laser
- Data output in NetCDF format available
- Multiple interfaces (LAN, serial)

Fields of Application

- Weather services
- ASOS systems, aviation market
- EPA/ Universities: Environmental studies of fine dust, mixing layer
- Renewable energy market
  - solar energy (cloud cover)
  - wind energy (cloud base)

Benefits

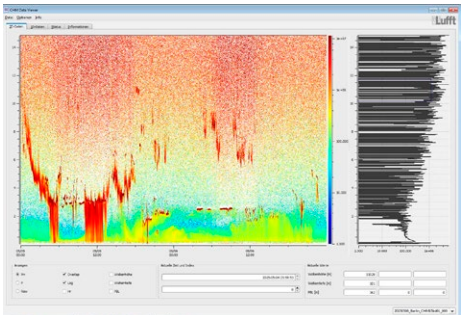
- Reliable cloud monitoring under all weather conditions through low false alarm rate and high probability of detection
- Rugged housing
- Service-friendly operation
- Easy installation
- Self-diagnostics
- High accuracy and simultaneous measurement of several parameters
- In-field performance test with dedicated Cloud Height Simulator device
- Data transparancy thanks to open and comprehensive netCDF data format

Technical Specifications

	Lufft CHM 8k	Lufft CHM 15k
Measuring principle	Lidar (optical, time of flight)	Lidar (optical, time of flight)
Measuring parameter	Aerosol backscatter profile $ß_{att}(r)$	Aerosol backscatter profile $ß_{att}(r)$
Measuring range	0 m ... 10,000 m (0 ft ... 32,808 ft)	0 m ... 15,000 m (0 ft ... 49,212 ft)
Cloud detection range	5 m ... 8,000 m (16 ft ... 26,246 ft)	10 m ... 15,000 m (33 ft ... 49,212 ft)
Time resolution	2 ... 600 s	2 ... 600 s
Range resolution	5 m (16 ft)	5 m (16 ft)
Quality and auxiliary values	External and internal temperature, internal voltages, internal relative humidity, improved status values for window, laser and receiver	External and internal temperature, status values for window, laser and receiver
Quantities given in layers	Cloud base height, cloud penetration depth, aerosol layer height and measured uncertainties	
Accuracy (measured on hard target in 10 km distance)	±5 m (±16 ft)	±5 m (±16 ft)
Additional quantities	Cloud cover, vertical visibility, Sky Condition Index	Cloud cover, vertical visibility, Sky Condition Index
Standard interfaces	RS485 (ASCII communication); LAN (web interface, (S-)FTP, NetTools)	RS485 (ASCII communication); LAN (web interface, (S-)FTP, NetTools)
Optional interfaces	DSL modem	DSL modem
Power supply	230 VAC or 115 VAC, ±10 %	230 VAC or 115 VAC, ±10 %
Power consumption	150 W @115/230 VAC (without housing heater) 450 W (with case heater)	450 W @115 / 230 VAC (without housing heater) 800 W (with case heater)
UPS functionality (opt.)	Internal backup battery for electronics >1 h across full ambient temperature range	
Light source	Laser diode	Nd:YAG solid-state laser
Wavelength	905 nm	1064 nm
Laser protection class	1M, IEC 60825-1	1M, IEC 60825-1
Protection level housing	IEC 60529:IP66	IEC 60529:IP66
General safety	EC 61010-1 (TÜV Rheinland certified), UL 61010-1 (TÜV SÜD certified), AS 61010.1 (Australia and New Zealand), CAN/CSA-C22.2 No. 61010-1 (TÜV SÜD certified)	
EMC	CE (EU), FCC Part 15 Class B (US), IC (CN)	CE (EU), FCC Part 15 Class B (US), IC (CN)
Temperature range	-40 ... +60 °C	-40 ... +50 °C
Operational altitude	up to 5000 m	up to 5000 m
Relative humidity	0 ... 100 %	0 ... 100 %
Wind	60 m/s	60 m/s
Dimensions	500 x 500 x 1550 mm	500 x 500 x 1550 mm
Weight	70 kg (130 kg incl. packaging)	70 kg (130 kg incl. packaging)
Accessories	CHM Cloud Height Simulator CHM Data Viewer - Software Adapter Bracket	CHM Cloud Height Simulator CHM Data Viewer - Software Adapter Bracket

Accessories

CHM Cloud Height Simulator
Simulates different cloud heights to check the proper functioning of the device. Generates light pulses that correspond to well-defined clouds. Enables independent in-field quality check within 15 minutes.



CHM Data Viewer – Software
Special software developed by Lufft is available to visualize the data that is measured by the CHM.

Adapter Bracket
Tilts the device at an angle (5° or 15° available). Strongly recommended for installations below 35° latitude.

Application
AVIATION

In Ukraine, thanks to Lufft partner Dataspektr, the state aviation administration certified that the Lufft ceilometers comply with the ICAO standards.

One important use of the ceilometer is to determine cloud ceilings at airports. CHM 8k can identify up to 9 cloud layers and is very sensitive even at ground level.

The CHM series is part of the Lufft sensor range for Airport Weather Observation Systems (AWOS) and Runway Ice Detection Systems (IDS).

Further sensors in this range:

Mobile Runway Sensor MARWIS

MARWIS is the first road and runway weather sensor detecting road conditions, temperatures, friction, and other parameters – mobile and in real-time from driving vehicles.

Lufft ARS31 Embedded Runway Sensors

The embedded active road weather sensor ARS31 detects freezing temperatures independently from de-icing materials and is easy to maintain due to its two parted housing.

Mobile Runway Condition Assessment

Powerful combination of Lufft runway sensors and ViewMondo software to comply with ICAO's Global Reporting Format.

Application
RESEARCH

Dutch Weather Service KNMI
A network of more than 40 Lufft ceilometers supports the Dutch Weather Service for precise and real-time monitoring of all aerosol and clouds activities over the Netherlands itself as well as on various offshore locations in the North Sea.

MeteoSwiss Payerne
CHM 15k mounted with a tilt of 45° to measure aerosols in the air. It masters the challenge to measure in the Alps over the valley. Thanks to the special installation, the application has delivered stunning results.

German Weather Service DWD
Measurement site of the DWD in Lindenberg, Germany, 2022: Evaluation of Lufft CHM 8k against CHM 15k and various meteorological observation systems located at the same site. In total, OTT HydroMet provided the DWD with more than 200 CHM 15k and nearly 100 CHM 8k.

Insights for Experts

For more information, please contact:

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