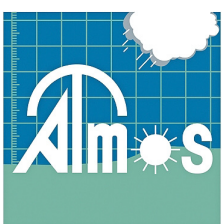# CIR-4

Day and Night !
Cloud cover monitoring

Fully automated solution for cloud fraction measurement and ceiling evaluation.

CIR-4 provides :

- The measurement during day and night of nebulosity and associated parameters with a frequency up to once per minute.

- Transmission at the same rate to any type of remote systems with serial outputs (RS 485) and optionally with voltage outputs.

- Each of the four detectors points to one of the ordinal geographic directions.

Fields of use for CIR-4 Instrument

Airport activity

For take off and landing clearance ICAO regulation requires cloud cover data in terms of cloud fraction and ceiling. CIR-4V can provide real time data to dispatchers and allow the automatic implementation of cloud data in METAR and SYNOP meteorological messages.

Climatological studies

Up to now cloud data for meteorological forecast are mostly supplied by human observers every 3 hours. This method show a lack of sampling frequency and a lack of repeatability compared to CIR technology.

Solar radiation research

Due to atmospheric pollution and ozone depletion, the energy balance between earth and atmosphere is a growing field of concern and research around the world. This phenomenon has impact with skin cancers and green house effect and is directly linked to the cloud spatial distribution which could be retrieved through CIR-4V data.

Display and storage of data

In the field of the meteorology, most of instruments and data recorders use Terminal emulation software, such as Windows Hyper Terminal. Because of its own embedded CPU, the CIR-4V can integrate data during a predefined period, under master mode or polled mode. The CIR-4V instrument includes several accessories, among which the IHM CIR-4V software, for data retrieval and storage on PC, or still the 26800 data logger, with the aim of displaying cloud fraction state in real-time.

Data produced

The CIR-4 has been designed to be a monitoring instrument which means to have a numerous deployment and with an extremely compact design to ease the integration and avoid costly infrastrutures in any automatic weather station. The CIR-4 is based on a passive thermal infrared technology creating no interferences with the environment. Each detector is shielded in a white PVC tube for a natural ventilation and avoid warmings as shown on picture here after.

Each of the four IR sensors provides a brightness temperature following the main geographic direction. This data is computed using a special algorithm designed by ATMOS to determine if the sensor watch a cloud or blue sky and determine an evaluation of the cloud height. The association of theses two data allows a view of the cloud spatial distribution.

A time series concept allows determination of the global cloud cover and per cloud attitude class fraction also. As shown by several experimental and numerical studies, the fact to mix data from four detectors provides a much better accuracy in the retrieval of the cloud fraction than the ASOS algorithm applied on data released by a single ceilometer. Several studies around the world showed that satellites provide an interesting macro and meso scale description of the cloud cover but that there is a significant need to optimize them with micro scale observation through instruments like CIR-4. The CIR-4 due to its static technology haslow power consumption and could be used in remote or regular locations.

# Ease of deployment and service

For deployment the instrument has just to be fitted on a tube 34 mm diameter and aligned to the north. The connection has to be ensured tightening gently the band clamp. We recommend that the pod be properly linked to the earth.
The instrument has been designed to ease service and maintenance. It is divided into two parts: the pyramidal sensor head and the watertight housing (IP66/NEMA 4X) integrating power regulation and embedded CPU. The two sub systems are easily exchangeable.

In order to avoid a solar warming of infrared detectors and to create a natural ventilation, Pyrometers are set into white PVC tubes.

Technical data
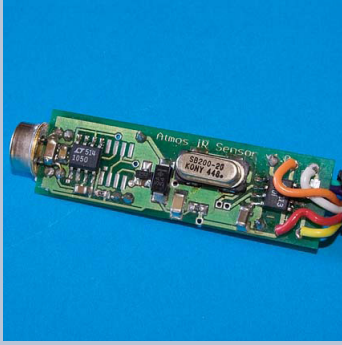
Pyrometric measurement technique has been widely developped for high temperature measurements.
ATMOS developped a rugged technique allowing measurement of low temperature from room temperature up to -50°C.
The ruggedness of the system is also ensured with the use of a mineral optical inlet more environmentally stable than polymeric devices.

Specifications

Nebulosity (cloud fraction)	Range: 0 à 100% Accuracy: +/-6%
Data output	RS 485
Ceiling Range	0 – 8000m Accuracy: +/-6%
Power supply	18-30 VDC (450mA)
Mounting	34 mm (1.34 in) diameter (standard 1 inch pipe)
Baud Rate	38400 bauds, 8 data bits, 1 stop bit, no parity
Dimensions	150*150*300mm (including mounting post)
Data archive	Delimited text files for numeric data

CIR-4 on site :

SGP, OK USA (ARM program)

IASB/BIRA, Brussels Belgium