

# Meteosat Third Generation

Facts and figures

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Monitoring weather and climate from space



# A highly innovative geostationary satellite system for Europe and Africa

EUMETSAT's next generation meteorological satellites are about to revolutionise weather forecasting in Europe and beyond.

The Meteosat Third Generation (MTG) system is the most complex and innovative geostationary meteorological system ever built. When fully deployed, it will include two imager satellites (MTG-I) and one sounder satellite (MTG-S). In total, the MTG programme will consist of four MTG-I and two MTG-S satellites, the first of which will be launched in 2022, providing 20 years of service. This mission marks two firsts for EUMETSAT: operating the most sophisticated and complex ground system to date, and supporting a mission that comprises two different types of satellites.

In comparison to their forerunner satellites of the Meteosat Second Generation (MSG), the MTG-I imaging satellites will provide data more frequently, in higher resolution and with a greater number of spectral bands. The fire channel will have an extended detection scale. For the first time, this will be complimented by lightning monitoring over the full disc, encompassing Europe and Africa.

In a world premiere, the Infrared Sounders aboard the MTG-S satellites will provide vertical profiles of atmospheric temperature and moisture every 30 minutes over Europe with unprecedented accuracy from the geostationary orbit. MTG-S also carries the Copernicus Sentinel-4 Ultraviolet and Near-Infrared Sounder, which measures aerosols, ozone, nitrogen dioxide and sulphur dioxide every 60 minutes.

## The MTG mission is the result of European expertise and cooperation

- The MTG satellites are developed and procured in cooperation with the European Space Agency (ESA) by a European industrial consortium led by Thales Alenia Space and OHB. They are developed according to the requirements defined by EUMETSAT after consultation with users of its data.
- The MTG-S satellite carries the European Union's Copernicus Sentinel-4 mission, the Ultraviolet, Visible and Near-Infrared Sounder, which is dedicated to measuring aerosols (fine particles in the atmosphere) as well as ozone, nitrogen dioxide and sulphur dioxide. These measurements, taken every 60 minutes, will be used to monitor and forecast air quality over Europe, to protect human health.
- The MTG ground segment is developed under EUMETSAT contracts with Thales Alenia Space, Telespazio, GMV and Thales Services.

### It's a fact

Severe convective storms are some of the most dangerous weather-related events in Europe. From 2007 to 2017, the financial losses from convective storms in Western Europe alone amounted to about €35 billion.

## Expected benefits of MTG-I

The provision of very frequent and high-resolution imagery from MTG imaging satellites will help European forecasters in their most challenging task – the “nowcasting” of fast-developing, high-impact weather. Nowcasting is critical for the protection of life and property and for important sectors of the economy, in particular, civil aviation.

To enable faster detection and earlier warning of high-impact weather events, MTG-I's Flexible Combined Imager (FCI) will collect observations over Europe every 2.5 minutes, and over Europe and Africa every ten minutes. In addition, the Lightning Imager will detect lightning flashes over a very large area, including bodies of water, such as the Atlantic and

Indian oceans and the Mediterranean Sea, that are typically poorly observed by ground systems.

The vertical profiles of temperature and moisture, available every 30 minutes, will be used as invaluable observational inputs for very high-resolution regional weather models, used for forecasting up to 36 hours ahead.

Meteosat Third Generation satellites will provide improved observations of the weather and the changing climate, continuing the essential monitoring carried out by Meteosat Second Generation satellites. This continuity is crucial for the national meteorological and hydrological services in EUMETSAT's member states.

- The FCI will provide information on fog, volcanic ash and air mass characteristics, clouds and aerosols and will support fire detection.
- FCI data will continue the more than 40-year-long data series from Meteosat satellites. Consistent measurements over a long period of time are necessary to detect climate changes.
- The Lightning Imager will provide information crucial for climate monitoring. It will provide information for assessing the impact of climate change on storm activity and for the assessment of the chemical processes in the atmosphere resulting from lightning. This will lead to the creation of new climate data records.



*Aerial photograph of the high water levels and flooded banks where the Mosel River joins the Rhine at the so-called "Deutsches Eck" in Koblenz, Germany on 3 February 2021 (credit: Reuters/Wolfgang Rattay)*

# Satellites and instruments

## How many MTG satellites are there?

A constellation made up of three satellites: two imagers and one sounder. The programme allows for the production of six satellites in total: four imagers and two sounders.

### MTG-I : two imagers



#### Full disc scanning service

16 spectral channels over Europe and Africa every 10 minutes

#### Rapid scanning service

16 spectral channels over Europe every 2.5 minutes

### MTG-S : one sounder



#### Full disc sounding service

Vertical profiles of temperature and moisture over Europe every 30 minutes

#### Payload

- 1 FCI (Flexible Combined Imager)
- 2 LI (Lightning Imager)
- 3 DCS (Data Collection and Retransmission Service)  
GEOSAR (Geostationary Search and Rescue Relay)

#### Payload

- 1 IRS (Infrared Sounder)
- 2 Copernicus Sentinel-4 UVN (Ultraviolet, Visible and Near-Infrared Sounder)

 **Dimensions**  
2.3m x 2.8m 5.2m (launch configuration)

 **Mass in orbit**  
3,800kg (including 2 tonnes of fuel)

 **Payload mass**  
800kg

 **Power**  
up to 2kW

 **Design lifetime**  
8.5 years

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# Ground segment

## How do we collect the data?

EUMETSAT controls the satellites, acquires and processes the data and delivers the extracted products to users worldwide. This is done by the ground segment which enables management of the spacecraft and which is made up of all the ground-based elements of the system used by operators and support personnel. For MTG these are:



Two mission data acquisition stations in Ka-band, in Lario, Italy and Leuk, Switzerland. Each station is comprised of three antennas of 6m diameter



Two ground stations in S-band to host the telemetry, tracking, and command facilities in Fucino, Italy, and Cheia, Romania. Fucino also functions as the back-up satellite monitoring and controlling system



Satellite monitoring and control system from Darmstadt, Germany



Data processing and archive at EUMETSAT in Darmstadt, Germany



Ground segment elements are linked to the satellites via the Ka-Band frequency which allows high-bandwidth communication





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August 2022  
Brochure: PRG.FS.01, V4

