

METEOSAT THIRD GENERATION

FACTS AND
FIGURES



A HIGHLY INNOVATIVE GEOSTATIONARY SATELLITE SYSTEM FOR EUROPE AND AFRICA

The Meteosat Third Generation (MTG) system is the most complex and innovative meteorological geostationary system ever built

The MTG system comprises two types of three-axis stabilised satellites: MTG-I and MTG-S. When fully deployed in 2025, the system will include two MTG-I satellites operating in tandem – one scanning Europe and Africa every 10 minutes and the other only Europe but every 2.5 minutes – and one MTG-S satellite. These satellites will be exploited simultaneously through a comprehensive ground segment.

The MTG-I imaging satellites will substantially increase the frequency, ground resolution and number of spectral bands of the current Meteosat imagery and map lightning. The Flexible Combined Imager (FCI), with its 16 channels, will bring multispectral imagery to the highest standard. The Lightning Imager (LI) will monitor lightning activity over the entire disc.

Equipped with an Infrared Sounder (IRS), the MTG-S sounding satellites will establish a fast hyperspectral infrared sounding capability providing vertical profiles of temperature and moisture every 30 minutes over Europe, as a world premiere. MTG-S also carries the Copernicus Sentinel-4 Ultraviolet, Visible and Near-infrared Sounder dedicated to measurements of aerosols, O₃, N₂O and SO₂ every 60 minutes.

MTG in orbit configuration

The MTG programme foresees four MTG-I and two MTG-S satellites providing 20 years of service, starting in 2022.

The other main component of the MTG system is a comprehensive ground segment used to control the satellites, acquire and process the data and deliver the extracted products to users worldwide.

The MTG system is developed in cooperation with the European Space Agency (ESA) following the model which has made Europe a world leader in satellite meteorology. ESA develops MTG satellites fulfilling the requirements of EUMETSAT and procures recurring satellites on its behalf. EUMETSAT procures all launch services, develops the full ground infrastructure and integrates and validates the full system. EUMETSAT then exploits the system and develops additional products using new algorithms.

The MTG satellites are developed under ESA contract by a European industrial consortium led by Thales Alenia Space and OHB.

The MTG ground segment is developed under EUMETSAT contracts with consortia led by Thales Alenia Space, Telespazio, GMV and Thales Services.



MTG-I
FULL DISC IMAGE SERVICE
16 spectral channels over Europe and Africa every 10 minutes



MTG-I
RAPID SCANNING SERVICE
16 spectral channels over Europe every 2.5 minutes



MTG-S
FULL DISC SOUNDING SERVICE
Hyperspectral Infrared Sounder
Copernicus Sentinel-4 UVN



PRODUCTS, APPLICATIONS AND BENEFITS

A unique combination of novel products for “nowcasting” high impact weather and air quality to protect European citizens

A WEALTH OF IMPROVED AND NOVEL ATMOSPHERE, OCEAN AND LAND PRODUCTS

The great variety of products extracted from MTG will provide information on:

- Optical and physical properties of clouds
- Fog areas
- Atmospheric instability
- Lightning flashes and electrically active areas
- Convective precipitation
- Vertical profiles of temperature and moisture
- Atmospheric wind vectors estimated from the tracking of clouds and water vapour patterns
- Optical and physical properties and transport of aerosols, including volcanic ash, smoke and dust
- Concentrations of O₃, NO₂, SO₂, CO and other trace gases
- Snow and ice cover
- Land surface temperature, albedo and vegetation parameters
- Detection of fire and fire radiative power
- Sea surface temperature, radiative fluxes at the air-sea interface
- Turbidity of coastal waters.

REVOLUTIONISING NOWCASTING OF HIGH IMPACT WEATHER OVER EUROPE AND AFRICA

The combination of the frequent, high resolution and high quality imagery and sounding products from MTG will be a breakthrough for European forecasters in their most challenging task called “nowcasting”. This is about detecting, in real time, rapidly developing high-impact weather phenomena like thunderstorms, predicting their evolution a

few hours ahead and issuing timely warnings and advice to public and private decision makers.

Nowcasting is critical for the protection of life and property and vital sectors of the economy, in particular civil aviation.

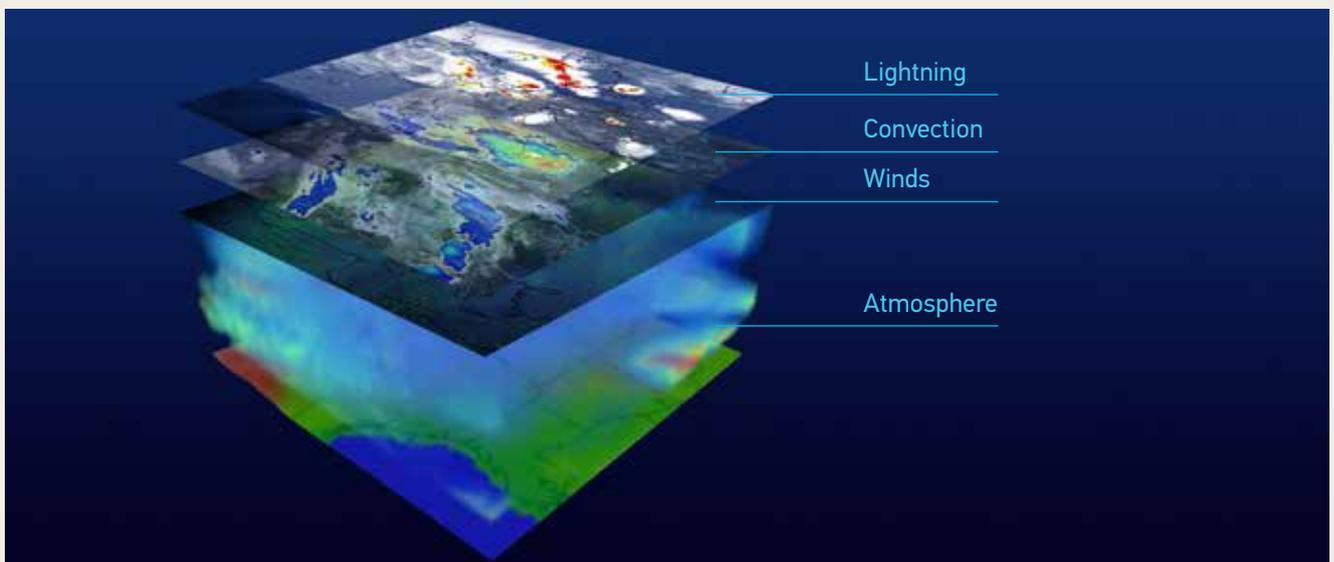
The 4D weather cube will be an essential tool for detecting the initiation of convection before it turns into devastating thunderstorms, and for real-time meteorological information services to air traffic management, including provision of information on electrically active thunderstorms to be avoided by pilots in the dangerous Atlantic intertropical convergence zone.

The vertical profiles of temperature and moisture - available for the first time every 30 minutes - will also be invaluable observational inputs for very high resolution regional weather models used for forecasting up to 36 hours ahead and a driver for the expansion of their use in nowcasting applications.

AN INTEGRATED CAPABILITY FOR MONITORING AIR QUALITY OVER EUROPE

MTG imagery and soundings from the IRS and the Sentinel-4 UVN instruments will be used in synergy to monitor the fast evolution of concentrations of aerosols, ozone, nitrogen dioxide, carbon monoxide, sulphur dioxide and other gases over Europe. These observations will be ingested by the air quality forecast models of the Copernicus Atmosphere Monitoring Service. Air quality forecasts protect the health of citizens.

A 4D Weather Cube: very frequent, co-registered MTG observations capture the fast evolutions of clouds, lightning and 3D fields of moisture and temperature



SATELLITES AND INSTRUMENTS

MTG-I

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

 **Mass in orbit**
3,600kg (including 2 tonnes of fuel)

 **Payload mass**
600kg

 **Power**
up to 2kw

 **Design lifetime**
8.5 years



 **Payload**

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

FLEXIBLE COMBINED IMAGER

CHANNEL	RESOLUTION (NADIR)	RADIOMETRIC ACCURACY
VIS 0.4	1.0km	} < 5%
VIS 0.5	1.0km	
VIS 0.6	1.0km; 0.5km*	
VIS 0.8	1.0km	
VIS 0.9	1.0km	
NIR 1.3	1.0km	
NIR 1.6	1.0km	
NIR 2.2	1.0km; 0.5km*	
IR 3.8 (TIR)	2.0km; 1.0km*	<0.1K at 300K
WV 6.3	2.0km	<0.3K at 250K
WV 7.3	2.0km	<0.3K at 250K
IR 8.7 (TIR)	2.0km	<0.1K at 300K
IR 9.7 (O3)	2.0km	<0.3K at 250K
IR 10.5 (TIR)	2.0km; 1.0km*	<0.1K at 300K
IR 12.3 (TIR)	2.0km	<0.2K at 300K
IR 13.3 (CO2)	2.0km	<0.2K at 270K
REPEAT CYCLE		
Full Earth Disc	10 minutes	
Europe RSS	2.5 minutes	

* In RSS mode

LIGHTNING IMAGER

BAND	RESOLUTION (NADIR)
777.4nm	4.5km
REPEAT CYCLE	
Continuous observations	

EUMETSAT NETWORK OF SATELLITE APPLICATION FACILITIES (SAFS)
Product Processing

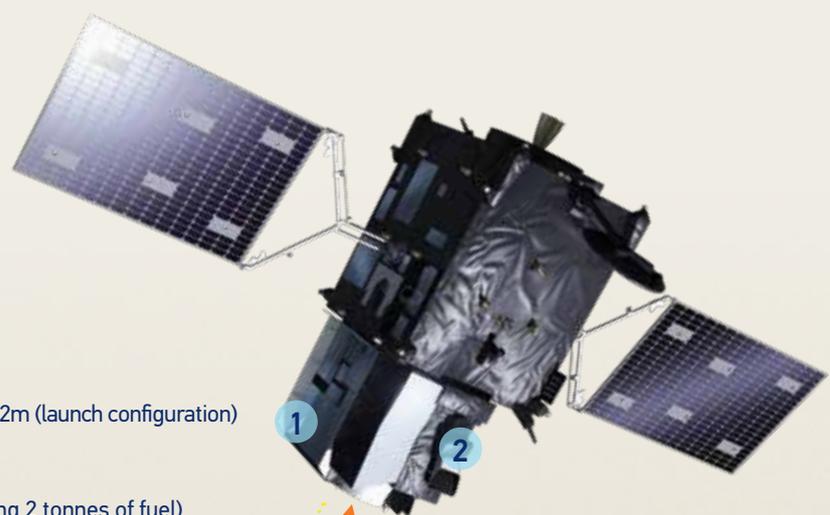
DARMSTADT, GERMANY

EUMETSAT CENTRAL FACILITIES
Mission Control Centre
Data Processing
Product Processing
Data Centre Archive
Near-Real-Time Data Dissemination
Online Data Access
User Help Desk and Support

LEUK, SWITZERLAND

Mission Data Acquisition Station

MTG-S



Dimensions
2.3m x 2.8m x 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

Payload

- 1 IRS (*Hyperspectral Infrared Sounder*)
- 2 COPERNICUS SENTINEL-4 UVN (*Ultra-violet, Visible and Near-Infrared Sounder*)



SENTINEL-4 UVN		
BAND ID	SPECTRAL RANGE (nm)	SPECTRAL RESOLUTION (nm)
UV	305-400	0.5
VIS	400-500	0.5
NIR	755-775	0.5 (Threshold) 0.2 (Breakthrough) 0.12 (Goal)
REPEAT CYCLE		
Europe and North Africa		<60 minutes

INFRARED SOUNDER (IRS)		
LWIR WAVENUMBER (CM ⁻¹)	RESOLUTION (NADIR)	RADIOMETRIC ACCURACY
700	4km	<0.5K at 280K
714	4km	<0.5K at 280K
715	4km	<0.4K at 280K
729	4km	<0.4K at 280K
730	4km	<0.3K at 280K
769	4km	<0.3K at 280K
770	4km	<0.2K at 280K
1040	4km	<0.1K at 280K
1118	4km	<0.224K at 280K
1210	4km	<0.35K at 280K
MWIR WAVENUMBER (CM ⁻¹)	RESOLUTION (NADIR)	RADIOMETRIC ACCURACY
1600	4km	<0.224K at 280K
1630	4km	<0.2K at 280K
1750	4km	<0.2K at 280K
1871	4km	<0.269K at 280K
1980	4km	<0.4K at 280K
2134	4km	<0.757K at 280K
2175	4km	<0.906 at 280K



FUCINO, ITALY
Telemetry, Tracking and Control Station
Backup Control Centre

CHEIA, ROMANIA
Telemetry, Tracking and Control Station

LARIO, ITALY
Mission Data Acquisition Station

MEMBER STATES



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EUMETSAT also has established cooperation agreements with organisations involved in meteorological satellite activities, including the National Meteorological Services of Canada, China, India, Japan, Russia, South Korea and USA