Selex ES
A Finmeccanica Company

Space

# IRES
## INFRARED EARTH SENSOR

**IRES is a two axis infrared Earth horizon sensor for accurate measurement of pitch and roll attitude angles with respect to the Earth disk centre. It is used in three-axes stabilised spacecrafts operating in GEO (Geostationary Earth Orbit) and MEO (Medium Earth Orbit).**

Due to its extended acquisition and operational capabilities, IRES allows meeting transfer orbit operations of different launchers.

The operating principle is based on electro-mechanical modulation of the radiation coming from the Earth horizon in the 14-16.25µm band. Four IR (Infrared) beams in a single telescope swung by a mirror along a scan path of 45° Earth latitude North and South, generates Earth/Space and Space/Earth pulses. These are compared in phase with the internal encoder reference to derive Pitch and Roll measurements.

IRES consists of an optical head packaged with the processing electronics in a single housing for the two axis measurement. Pitch and Roll are computed inside the sensor by means of a dedicated ASIC.

### HERITAGE

Selex ES started developing infrared Earth sensors for the Earth horizon detection during 1960. Several IRES generations were developed (around 300 units sold), all based on the same earth horizon detection concept that provides pitch and roll direct output. Selex ES IRES has already experienced hundreds of years of successful in-flight life in the frame of many programmes.

Historic program including infrared earth sensor from Selex ES are: AGILA, AMC12, AMC13, AMOS, APSTAR, ARABSAT, ARTEMIS, ASIASAT, ASTRA, DFH/FO, DFH3, DRS, ECS, EUTELSAT24, EUTELSAT1/2/3, EURASIASAT, KOREASAT-5, GSTV-V2A and GSTB-V2B, HISPASAT, INMARSAT, ITALSAT, MARECS, NAHUELSAT, OLYMPUS, ORION, OTS, RASCOM, SICRAL, SINOSAT, SIRIUS2, SKYNET, SYRACUSE-3A, SYRACUSE-3B, THAICOM, TURKSAT.

The latest generation of IRES (IRES-N2) is based on the same concept and offers the same performance and interfaces as the previous generation. IRES-N2 is based on pyroelectric detectors, is ITAR free and lower cost with respect to the previous IRES generation.

IRES is installed on the GALILEO constellation satellites.

IRES installed onboard of OLYMPUS

## TECHNICAL CHARACTERISTICS

### Operating modes

- Earth acquisition mode (Wide Scan)
- Earth pointing mode (Narrow Scan)
- Chord mode (single beam crossing)

### Performances

| | |
|---|---|
| Operating band | 14-16.25µm wavelength |
| Earth acquisition mode | between 15,300 and 53,000Km altitude |
| Operational capability | up to 140,000Km altitude |

| **Operational range at GEO** | |
|---|---|
| Pointing mode linear range | ±5.5° pitch; ±2.5° roll |
| Acquisition mode linear range | ±11° pitch; ±2.5° roll |
| Chord mode linear range | ±23° pitch; ±14° roll |
| Acquisition mode sign range | ±22° pitch; ±13° roll |
| Output data rate | 10Hz |
| Accuracy | <0.05 deg random error (3σ)<br><0.02 deg bias error |

### Data Interfaces

| | |
|---|---|
| Type | Digital serial interface 32/48 bit<br>or MIL-STD-1553B available |

### Mechanical Interfaces

| | |
|---|---|
| Dimensions | 169.9 x 163.8 x 156mm |
| Mass | <2.5Kg |

### Electrical interfaces

| | |
|---|---|
| Type | 24 to 50V or 75 to 100V unregulated power bus |
| Power consumption | <4W |

### Environmental conditions

| | |
|---|---|
| Operating temperature | -30° - +60°C |
| Storage temperature | -40° - +70°C |

| **Ambient and space vacuum pressure** | |
|---|---|
| Vibration levels | Sine: 20g peak |
| Random | 26g rms |
| Shock | 2000g from 3 to 10kHz |
| Lifetime in GEO | > 15 years |

For more information please email **space@selex-es.com**

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