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2020

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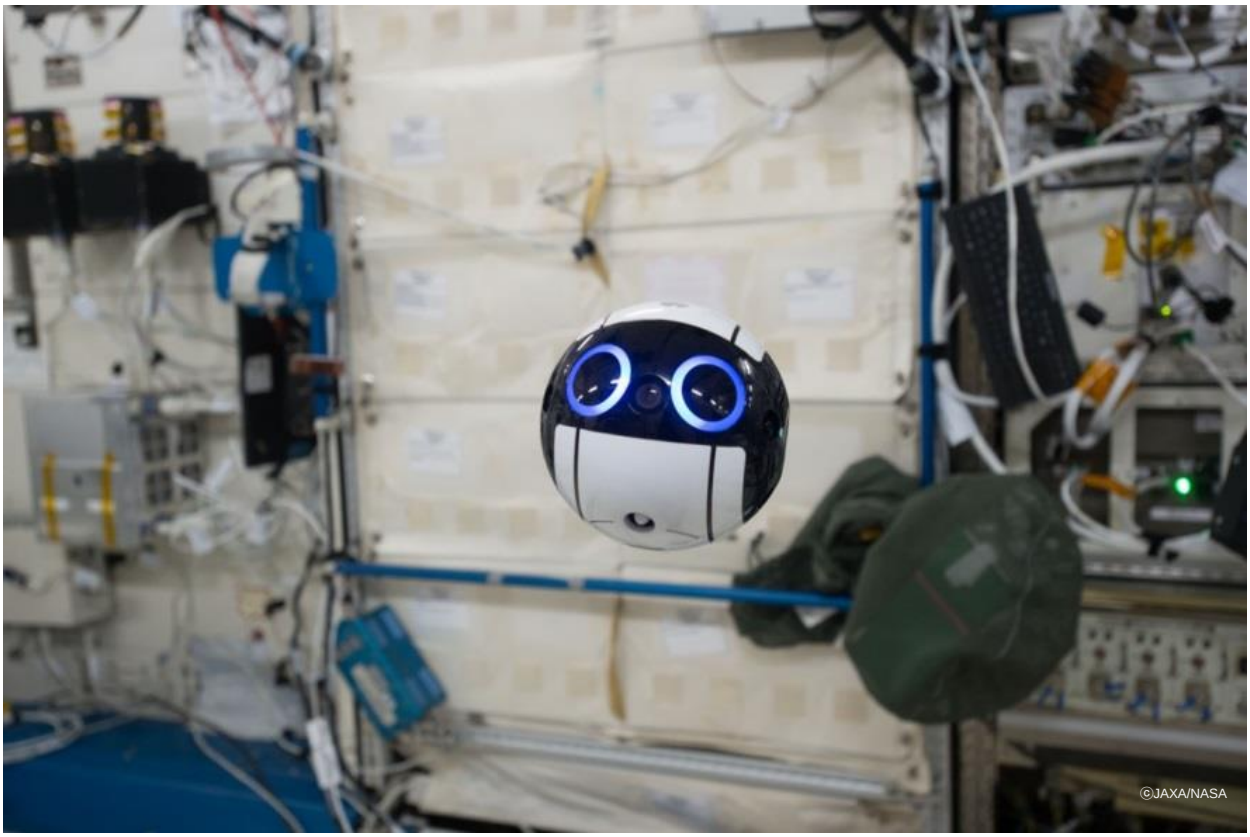
Products Guide Book







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2020

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MEISEI

MEISEI's Aerospace Products

Starting with the development of "Telemeter transmitting device" - Japan's first electronic equipment installed in a rocket launched in 1955.
Meisei Electric has developed and manufactured more than 3,000 space-related instruments since 1950's.
Meisei Electric can provide all kinds of satellite components, such as "Mission Equipment" and "Bus Components".
We are developing CubeSat, Nano Satellites, and Micro Satellites as well.

■ **Outline**
Capital Paid 3.0 billion Yen
Established in YR1938 (80-year history)
Listed in Tokyo Stock Exchange

■ **Number of Employees**
351 employees
(as at March 2020)

■ **Sales**
8.10 billion Yen
(consolidated for the year at March 2019)

■ **Location**
HQ & Factory: 2223 Naganuma-machi, Isesaki City, GUNMA 372-8585
Sales Office1-1, Toyosu 3-chome, Koto-ku, Tokyo 135-8115, Japan

HQ and Factory at Isesaki City

Tokyo Branch

ISO 9001

ISO 14001

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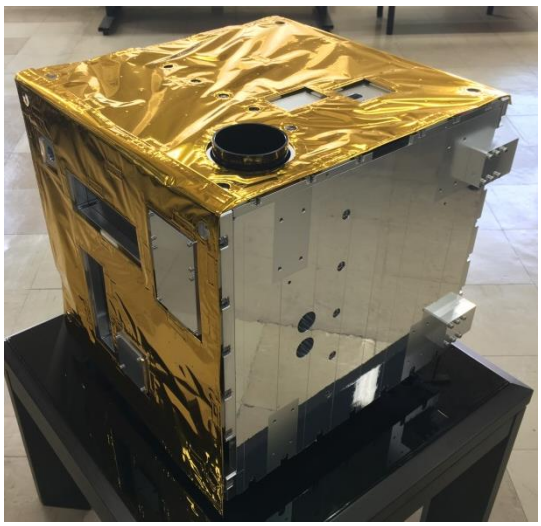
MEISEI's Nano & Micro Satellite

MEISEI's Standard Nano &
Micro Satellite Bus Systems

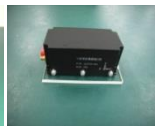
- Meet the requirement for earth observation missions
- Wide lineup (1U ~ 150kg class)
- COTS based engineering



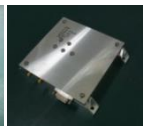
50kg piggy back structure

< Micro Satellite Bus Components >

Magnetic Torque



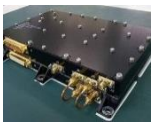
3 axis Magnetometer



GPS Receiver

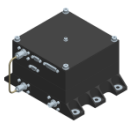
Star Tracker

OBC (Out of production)

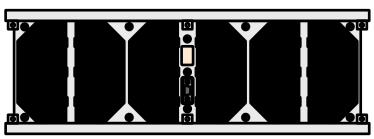


S band Transceiver

Earth Sensor

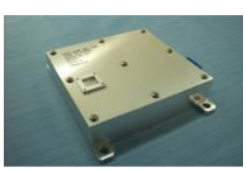


XTX



3U Nano satellite

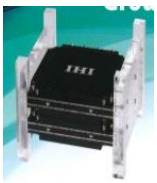
< Micro Satellite Mission Components>



Space Particle Monitor

Contamination Monitor

< Nano Satellite Components>



AIS Receiver

OBC Board for CubeSat

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M-SAT System Components

M-ICU

Meisei Electric Corp provides a new MEISEI Micro Satellite Bus System (M-SAT) for Nano Satellite / Micro Satellite. M-ICU is the Compact-PCI based OBC and S-band transceiver unit.

- CompactPCI(cPCI) based Integrated Central Unit
- High general versatility & scalability using various card module
- Various card module available (M-OBC, TC/TM, Power Control, RF(S-band) module, I/F module etc.)
- Various I/F available (Digital I/F: MIL-STD-1553B, CAN, RS422, LVDS, SpW Analog I/F: AA, PA, AB, Current Out put)
- Compact size (WDH：222×205.6×145mm)

M-ICU (Prototype)

M-OBC Board

- General purpose OBC board for Nano and Micro Satellite.
- 3U CompactPCI(cPCI) Single Board Computer
- High Performance SH2A Processor
- 2GB RAM ECC check on Data
- 2.5MB ROM
- 1GB User Flash Memory
- Dual-Redundant Boot
- Real Time Operating System available

OBC Board
(Prototype)

OBC Board Specifications

Dimension & weight	160 ×130 ×1.6 mm ,<170g
Power	3.3V, < 3W
Interface	Compact PCI (32bit) RS232C, SD card (for debug)
Option Board(cPCI)	I/F Board (UART:12ch,GPIO:In 8ch Out 8ch) STRX Board (S band wireless communication)

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Environmental Test Facilities

Contracted Test Service

- Own facilities for the Nano & micro satellite systems test
- Total support for the environmental tests for Nano & micro satellite

10tons Vibration testing equipment
shock testing equipment

Thermal vacuum chamber

Diameter: 1.2m
Temp. control range: -180 to 200℃
*Temp. control accuracy(≦-100℃):N/A

EMC shield room

3-Dimensional
X-ray inspection equipment

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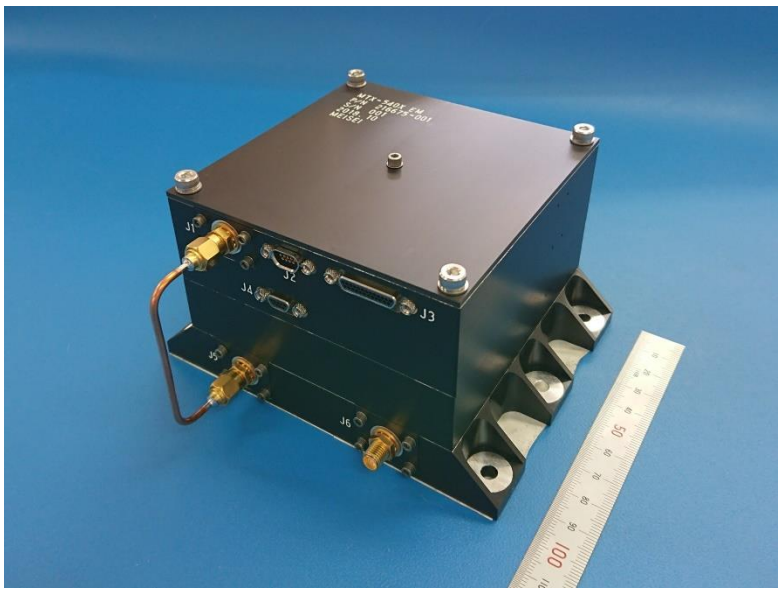
MEISEI

High-Speed X Band Transmitter MTX-540X



Outline

MTX-540X is a high-speed X band transmitter for the micro satellites. 64APSK technology achieves the world's highest class frequency efficiency for the earth observation downlink. MTX-540X enables your satellites to maximum 522 Mbps downlink.

Features

- 64APSK: the highest frequency efficiency for earth observation downlink
- High-speed 522 Mbps downlink in less than 150 MHz frequency bandwidth
- Adaptive coding and modulation (69 Mbps to 522 Mbps)
- Low power consumption (22 watts) & Low mass (about 1.3 kg)
- Compatible with generic ground receiver (Zodiac Cortex HDR 4G)
- ITAR free
- Made in JAPAN

MEISEI ELECTRIC is provider of components and small satellite systems. Since 1955, MEISEI developed more than 3,000 instruments for rockets, satellites, space probes, and space station in collaboration with JAXA, ESA, and NASA.

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SPECIFICATIONS

Electrical characteristics

Frequency	8,025 MHz to 8,400 MHz
Symbol rate	100 Msymbol/s (typ.)
Standards	CCSDS 131.2 or DVB-S2*1/S2X*2
Modulation	QPSK, 8PSK, 16APSK, 32APSK, and 64APSK
Error correction	Turbo coding (SCCC) or LDPC*1,2
Data rate	69 Mbps to 522 Mbps
RF power	+33 dBm (QPSK to 32APSK) +30 dBm (64APSK)
Bandwidth	< 150 MHz
Filter	Compliant with ITU regulations
TTC interface	RS-422 level, UART
DC power supply	+18 V to +34 V, 22 W (typ.)

Physical characteristics

Dimensions	100 x 100 x 73 mm
Mass	< 1,300 g

Data input interface

Standard	Parallel LVDS (CCSDS 130.12-G-1)
Clock input	Up to 100 MHz
Data input	8 bits + Data_valid
Data rate	Up to 800 Mbps
Flow control	Data_request from transmitter

Environment

Operational temperature	-40°C to +50°C
Vibration	GSFC-STD-7000A, Table 2.4-3
Shock	GSFC-STD-7000A, Figure 2.4-1
Radiation tolerance	> 10 krad
Design lifetime	5 years in LEO

*1 MTX-OPT-DVBS2
*2 MTX-OPT-DVBS2X

Ordering Information

MTX-540X-FM	Flight model
MTX-540X-EM	Engineering model
MTX-OPT-DATASOURCE	Option: Test data source unit and software (USB 3.0 to Parallel LVDS)
MTX-OPT-SR50M	Option: 50 Msymbol/s mode, (BW < 75 MHz, up to 269 Mbps)
MTX-OPT-DVBS2	Option: DVB-S2 mode, up to 32APSK
MTX-OPT-DVBS2X	Option: DVB-S2X mode, up to 64APSK
MTX-OPT-BPF	Option: External band pass filter for SFCG recommendation (deep space)
MTX-OPT-PANT4	Option: Patch antenna (Gain = 13.5 dBi, Size = 70 x 70 x 10 mm, Mass = 80 g)

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1Mbps S-band Transceiver for Satellite

Upper section : USB transceiver unit
Lower section : QPSK transmission unit

Outline

It will be installed on the small satellite and perform the command reception from the ground, and the telemetry transmission to the ground using 2GHz wave band.

Features

- **Flight proven**
- Lower cost using COTS parts
- The 2-way Doppler measurement function controls the transmission frequency depending on the reception frequency of the command signal from the ground.
- 1Mbps high speed communication (QPSK)
- Control for switch of USB/QPSK transmission and switch of coherent（2-Way Doppler）/incoherent mode is available
- Monitoring the status of the transceiver (transmission and reception status, internal temperature and the setting status of each mode)
- In case only USB is required, it will be realized by the sole operation of the upper unit.
- Tolerant of the severe environment of small satellite
- ITAR free
- RoHS nonconformity
- Made in Japan

＊ This product was developed in the support of JAXA.
＊ Note that, with due to the rights of other relevant parties and/or depending on usage application and/or delivery place the products may not be sold commercially distributed, leased or included in a part of product or system which intends to receive benefits through the inclusion of the product.

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SPECIFICATIONS

	Items	Performance
Receiving performance	Reception frequency	2 GHz band
	Modulation	PCM(NRZ-L)-PSK-PM
	Receiving sensitivity	＜ -100 dBm
	Sub carrier frequency	16 kHz
	Command bit rate	4 kbps
USB transmission performance	Transmission frequency	2 GHz band
	Modulation	PCM(Biφ-L)-PM
	Transmission output	+10 dBm(Typ.)
	Telemetry bit rate	16 kbps
QPSK transmission performance	Transmission frequency	2 GHz band
	Modulation	QPSK
	Transmission output	+27 dBm(Typ.)
	Telemetry bit rate	1 Mbps
Other performance	Power supply voltage	+17 to 35 VDC
	Power consumption	＜ 2.8 W (standby)
		＜ 3.8 W (USB transmission)
		＜ 15 W (QPSK transmission)
	Operating temperature range	-10 to +50℃
	Dimensions	198 x 120 x 38.8 mm (flange and screw not included)
	Mass	＜ 1.65 kg
	Lead time	About 12 months after receiving orders.
	Flight heritage	SDS-4 SOCRATES

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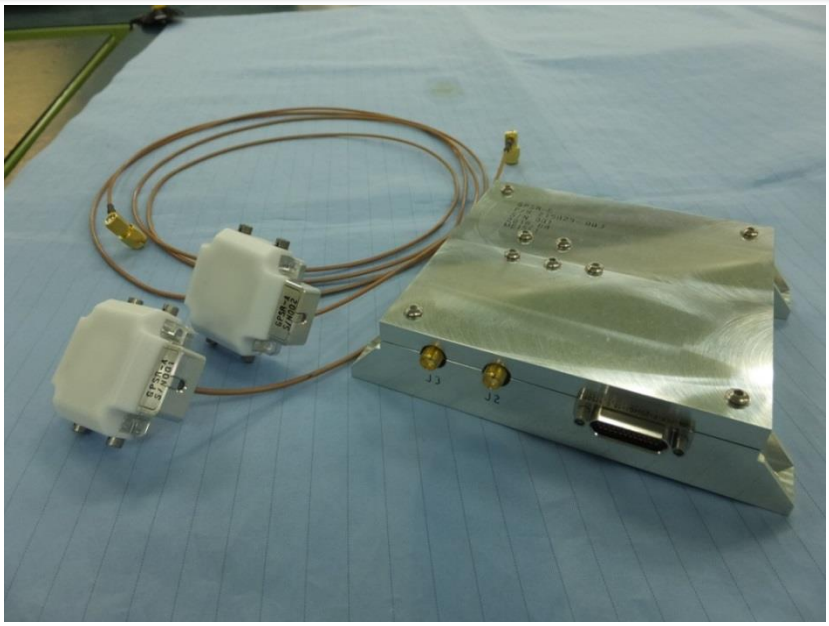
Dual Antenna GPS Receiver for Satellite



Outline

- GPS and QZSS receiver for micro and small satellites
- Dual GPS antenna enables positioning at any attitude
- Inner combination of signals from two antennas

Features

- **Flight proven**
- Lower cost using COTS parts
- QZSS and GPS receivable
- Digital synthesis of dual channel antenna input signal
- Positioning of the spacecraft regardless of the attitude by dual channel antenna
- The maximum length of cable is1.5m.
- GPS-R(1PC)/GPS-A(2PC)
- ITAR free
- RoHS nonconformity
- Made in Japan

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

	Items	Performance
GPS-R	Number of channels	16
	Number of antennas	2
	GPS signal	L1 C/A 1575.42 ± 1.023 MHz
	Positioning accuracy	< 3 m (static state)
	Time to fix	Cold start: < 15 min Warm start: < 1 min
	Sensitivity	< -130 dBm at antenna terminal
	Telemetry/command interface	Serial I/F (TIA/EIA-422 ITU-T V.11)
	Telemetry	Latitude, Longitude, Altitude, Position (3D), Velocity (3D), Status, etc.
	Supply voltage	5 V
	Power consumption	< 2.5 W (except antenna)
	Dimensions	Receiver : 107 x 131 x 31 mm Antenna : 44 x 51 x 15 mm (flange and screw not included)
	Mass	< 500 g
	Temperature range	Operation : -20 to +60℃ Non-operation : -50 to +70℃
	Vibration	Random : 25.72 Grms (20 to 2000 Hz)
	Radiation	Tolerant to radiation environment of LEO altitude
	Rigidity (first natural frequency)	300 Hz
GPS-A	Reception frequency	1575.42 ± 1.023 MHz
	Gain	26 dBi ± 6 dB (-30 to + 85 ℃)
	Output impedance	50Ω
	Output VSWR	> 2.0
	Power supply voltage	DC 4.5 ±0.5 V
	Consumption current	12 to 30mA
	Operating temperature range	-30 to +85℃
	Storing temperature range	-40 to +100℃
Other	Lead time	About 6 months after receiving orders.
	Flight heritage	ISS

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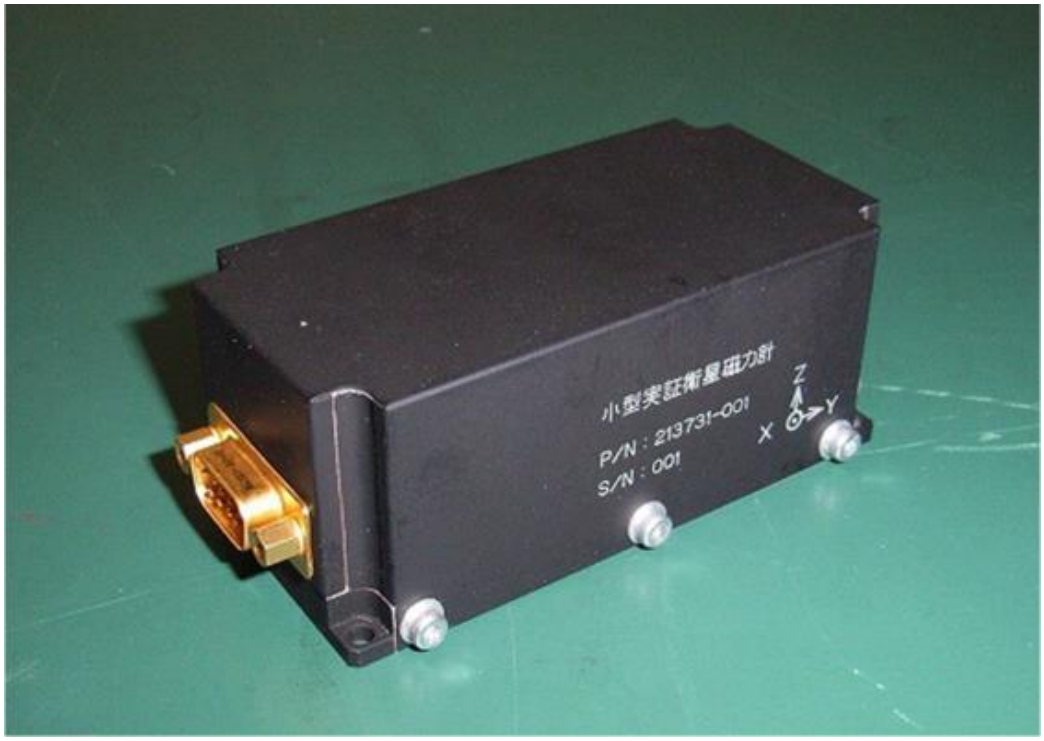
3-Axis Magnetometer for Small Satellite



Outline

3-axis fluxgate magnetometer for attitude measurement

Features

- **Flight proven**
- Lower cost using COTS parts
- High stability, good linearity
- Analog voltage output
- Wide power supply range
- Compact, light weight and low power consumption
- ITAR free
- RoHS nonconformity
- Made in Japan

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

Items	Performance
Measurement range	±64000 nT
Alignment accuracy	±1°
Analog output voltage	0 to 5 V
Power supply voltage	15 V
Power consumption	＜ 1.1 W (15 V / normal temperature)
Dimensions	100 x 50 x 40 mm (flange and screw not included)
Mass	＜ 220 g
Operating temperature range	-30 to +60℃
Lead time	About 6 months after receiving orders.
Heritages	SDS-4

∗ Above-mentioned specification is an example. The specifications will be customized to suit your request.
∗ This product was developed with the support of JAXA (Japan Aerospace Exploration Agency)
∗ Please take note that there is the possibility not to be able to sell the products mentioned herein depending on application and delivery place, concerning the rights related to technical information.

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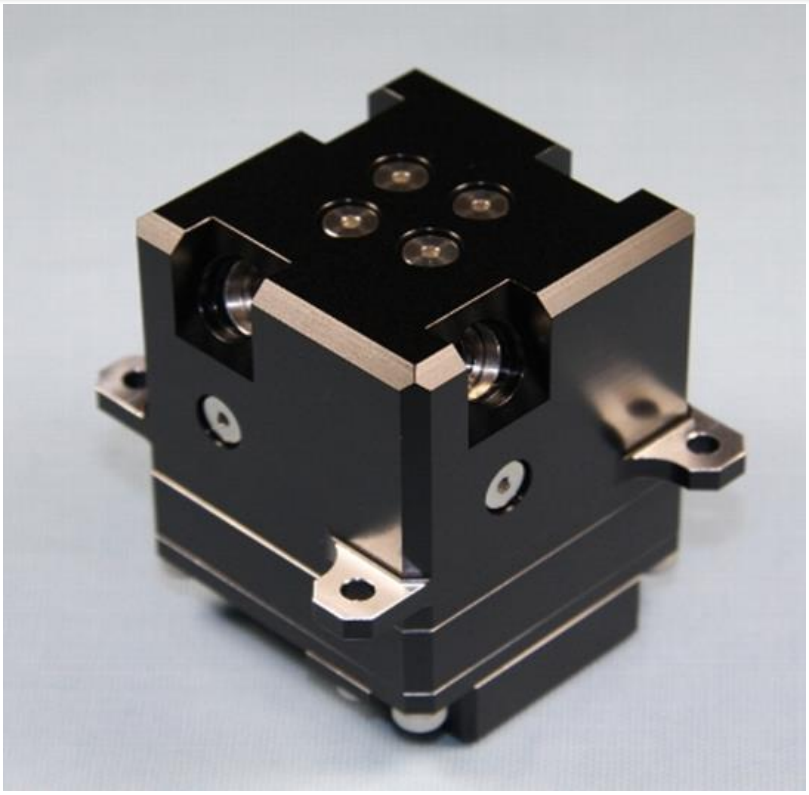
Earth Sensor for Satellite



Outline

The Earth sensor is a device for determining the attitude of a micro satellite at an altitude of about 500 km.
4 pieces of multi-pixel array of thermopile sensors detect Earth edge to calculate the roll angle and the pitch angle. Its compact design is suitable for Micro-Satellites.

Features

- **Flight proven**
- Lower cost using COTS parts.
- Can be used for both of sunlight and eclipse.
- No cooling system required
- Suitable for Earth oriented micro-satellites
- ITAR free
- RoHS nonconformity
- Made in Japan

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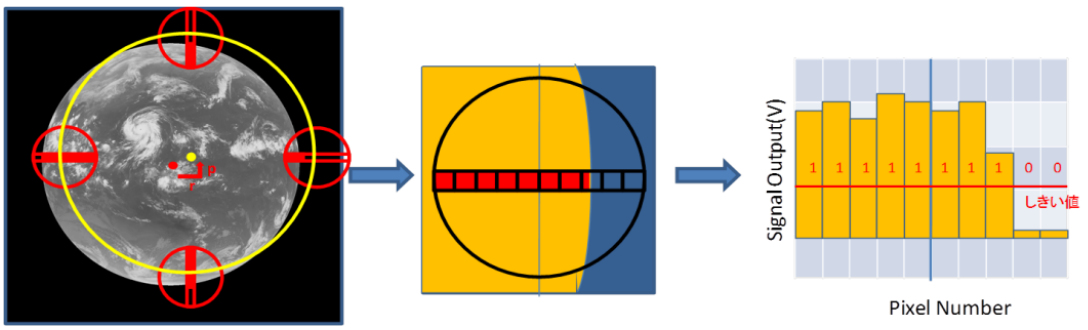
SPECIFICATIONS

Items	Performance
Detector	COTS based Thermopile Sensor
FOV	33 degrees x 4 arrays
Accuracy	4.125° Weighting calculation around Earth edge: ~1.5° (reference)
Power voltage	+5 V
Power consumption	＜ 1 W
Operating temperature range	-25 to +60 ℃
Weight	＜ 250 g
Dimensions	40 x 40 x 55 mm （flange and screw not included）
Telemetry / command interface	RS485
Lead time	About 9 months after receiving orders.
Flight heritage	SOCRATES



Position of Horizon　　Horizon of Thermo-pile array　　Output of Thermo-pile array

Theory of measurement

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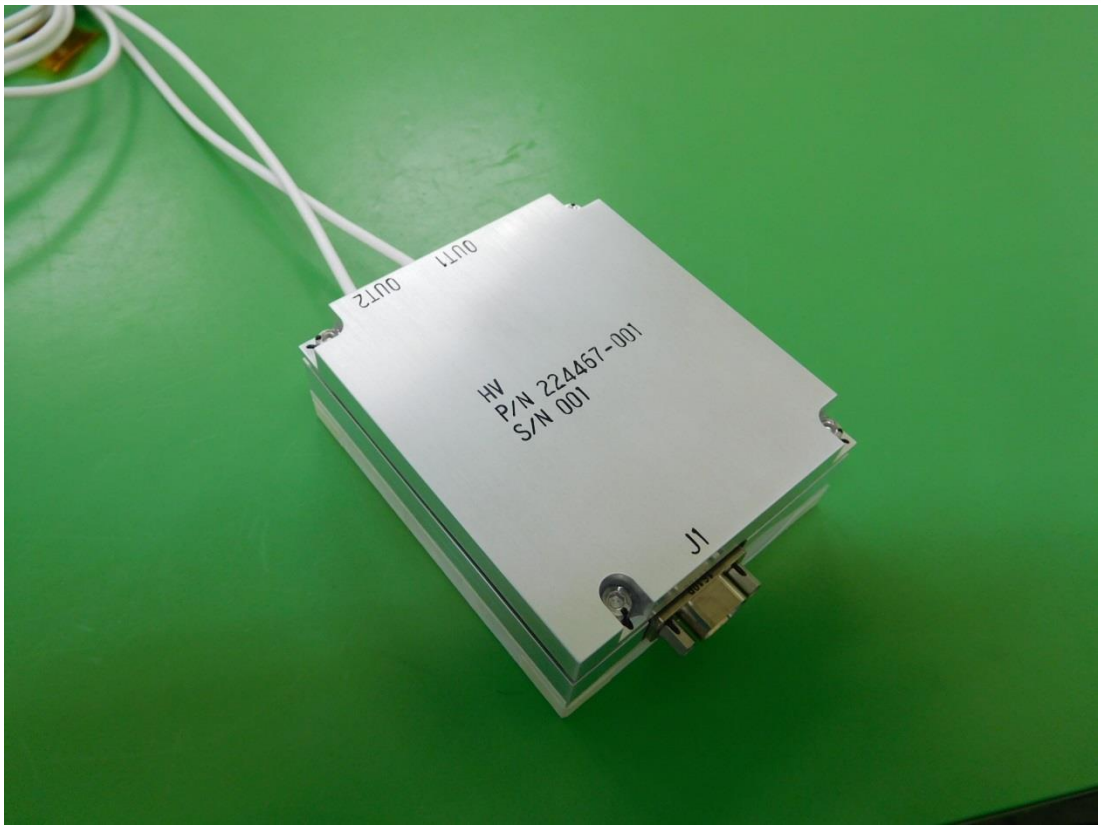
High Voltage Power Supply for Satellite



Outline

This instrument is a HVPS (high voltage power supply) to be installed on scientific satellite for supplying voltage to detectors in the space environment. It can be output up to 0 to +5000 V / -5000 to 0 V with reference voltage(analog or digital).

Features

- **Flight proven**
- Lower cost using COTS parts
- Vibration and shock resistant for space
- Up to 5kV with a fixed HVPS and sweeping HVPS
- ITAR free
- RoHS nonconformity
- Made in Japan

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

Items	Performance
Output voltage range	0 to +5000 V / -5000 to 0 V
Max output current	＜ 100 μA
Output ripple voltage	＜ 100 mVp-p
Input voltage range	+11.5 to +13.0 V (DC)/-11.5 to -13.0 V (DC)
Reference voltage range	0 to 5 V
Monitor output voltage range	0 to 5 V
Output current	＜ 0.5 W(I x V),(V: output voltage)
Dimensions	116 x 61 x 17 mm (flange and screw not included)
Lead time	About 9 months after receiving orders.
Flight heritage	ISS, Exposed Facility (MAXI) Lunar explorer, SELENE/KAGUYA

Sweeping HVPS (+5000V)
We can also make sweeping type.

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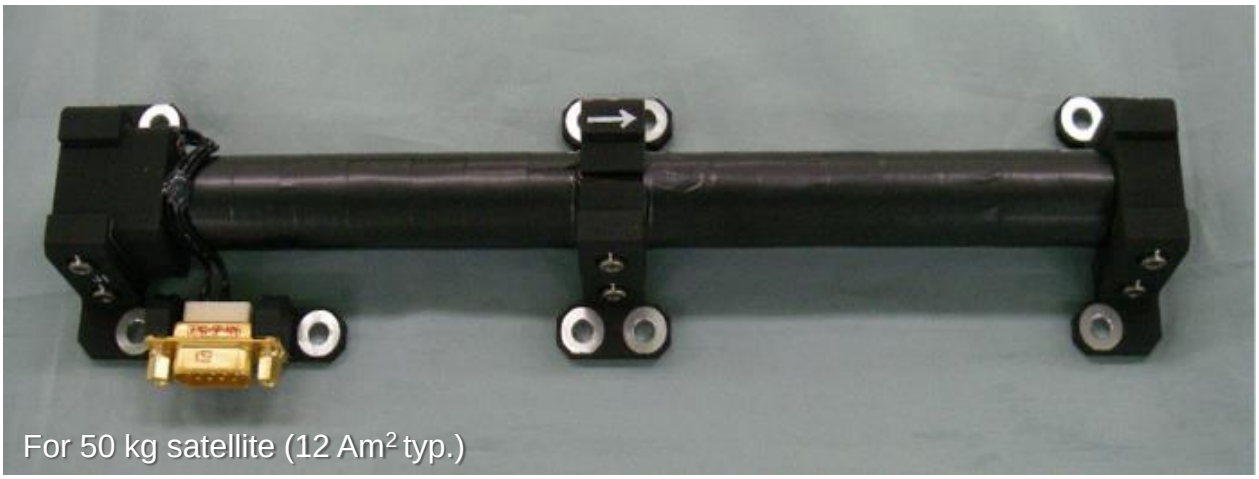
Magnetic Torquer for Small Satellite


For 50 kg satellite (12 Am^2 typ.)


For CubeSat (0.1 Am^2 typ.)

Outline

Meisei Electric provides every size of magnetic torquers: for pico, nano, micro, small satellites and CubeSat. Meisei's magnetic torquers are designed in our original technique and have a good balance of power consumption and mass. This model is for 50 to 100 Kg satellite.

Features

- **Flight proven**
- Lower cost using COTS parts
- 1 set of 3 torquers
- Optimal balance of power consumption and mass is realized
- Fully customizable: magnetic moment, dimensions, mechanical and electrical interface
- ITAR free
- RoHS nonconformity
- Made in Japan

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

Items	Performance
Output magnetic moment	12 Am^2 typ.
Power supply voltage	15 V
Power consumption	1W typ. (Nominal, 217Ω) / 12 Am^2 typ.
Dimensions	250 x 56 x 29 mm (flange and screw not included)
Mass	＜ 500 g
Operating temperature range	-30 to +60℃
Lead time	About 6 months after receiving orders.
Flight heritage	SDS-1 SDS-4 SOCRATES

∗ The specifications will be tailored to suit your needs. If you use more than for 100 Kg satellite, we would kindly ask you to pay for the option fee. Because of torque value change.
∗ This product was developed with the support of JAXA (Japan Aerospace Exploration Agency)
∗ Note that, with due to the rights of other relevant parties and/or depending on usage, application and/or delivery place, the product may not be sold, commercially distributed, leased or included in a part of product or system which intends to receive benefits through the inclusion of the product.

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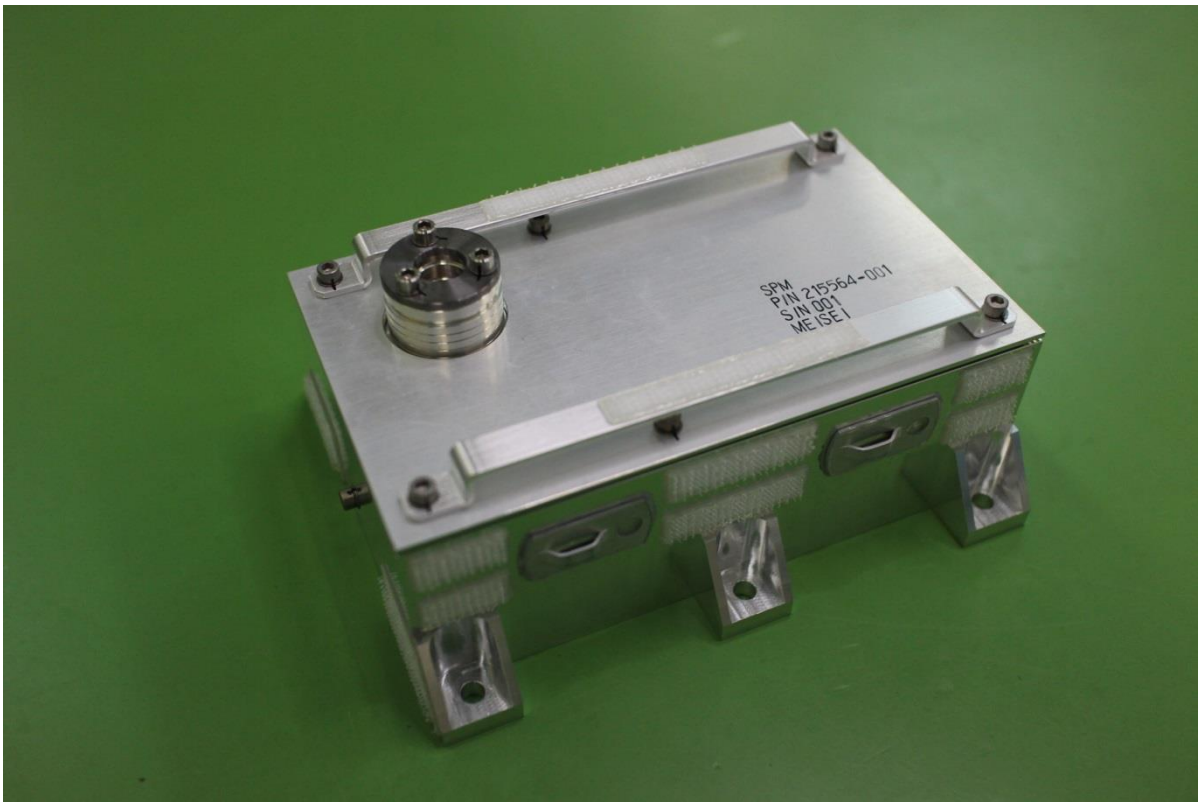
Space Particle Monitor (SPM) for Satellite

~ Monitoring for the space radiation environment in the satellite orbit ~



Outline

SPM can count space radiation, and it is used for a small satellite with an altitude of 400 to 500 km.* SPM identify the effect of the space radiation environment(TID,SEE etc.**) in the satellite orbit.

*Customization is available

**Estimate only. SPM count the number of the energy particle(Electron, Proton, Heavy ion)

Features

- Simultaneous classification and energy measurement of electrons, protons, and heavy particles.
- ITAR free
- RoHS nonconformity
- Made in JAPAN

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

Items	Performance
Power supply voltage	+12 V_{DC} (45$mA_{typ.}$), -12 V_{DC} (20$mA_{typ.}$), +5V_{DC} (60$mA_{typ.}$)
Telemetry / command interface	RS-422
Line type / Energy range	Electron：＞0.21 MeV (2CH)
	Proton：5.5 to 300 MeV (6CH)
	Heavy Ion：＞7.12 MeV/n (2CH)
FOV	±41.2 deg
Dimensions	102 x 132 x 46 mm (flange and screw not included)
Mass	＜ 900 g (MLI included)
Operating temperature range	-10 to +50 ℃
Power consumption	＜ 1.1 W
Data rate	370 bps (in the case of 1 sec integration time)
Lead time	About 9 to 12 months after receiving orders. Delivery time depends on availability of calibration test equipment.
Flight heritage	RAPIS-1 (JAXA)

＊ Above-mentioned specification is an example.
＊ FOV is determined by satellite orbit.
The specifications will be customized to suit your request.
In the case we would kindly ask you to pay for the option fee.

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Small and High Resolution Optical Sensor for Satellite

SHIROP-S (SHIROP sensor unit)

SHIROP-E (SHIROP control unit)

Outline

- The high-resolution Imaging system for Microsatellites
- Meisei Electric developed the SHIROP-E (SHIROP control unit) and took part of the thermal control design for SHIROP-S (SHIROP sensor unit) and SHIRP-E.

Features

- **Flight proven**
- SHIROP was loaded by “TSUBAME" (SLATS). TSUBAME is the optical telescope that takes the pictures of the land from the super low earth orbit (200～300km).
- Mission of the SHIROP is the technical demonstration that taking high-resolution picture by the small size telescope.
- Covered with MLI Beta Cross
- RoHS nonconformity
- Made in Japan

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SPECIFICATIONS

	Items	Performance
SHIROP-S	**Size**	Φ 200 x 500 mm
	Telescope	Cassegrain
	Mass (nominal)	11.5 Kg
	GSD	1.8 m / altitude 600 km
	Imaging range	10653 x 7000 m / altitude 600 km
	Imaging system	TDI (Time Delay Integration)
	Band	User selectable
	Flight heritage	H-IIA F37: Super Low Altitude Test Satellite "TSUBAME" (SLATS)
SHIROP-E	**Dimensions**	227.5 x 127.5 x 96.2 mm (flange and screw not included)

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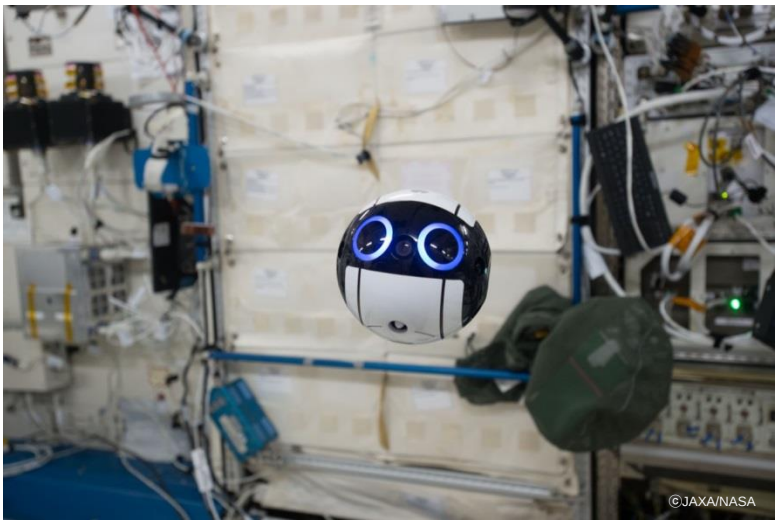
JEM Internal Ball Camera (Int-Ball)

Contact



Outline

The first camera drone that can record video while moving in space
Meisei Electric Co., Ltd. cooperated with JAXA (Japan Aerospace Exploration Agency) in the field of

- Body design
- Electric design
- Assembly
- Verification test

Features

- **Flight proven**
- Remote controlled from the ground and move autonomously
- The camera adopts existing drone technology.
- Exterior and inner structures were all manufactured by 3D-printing.
- Made in Japan

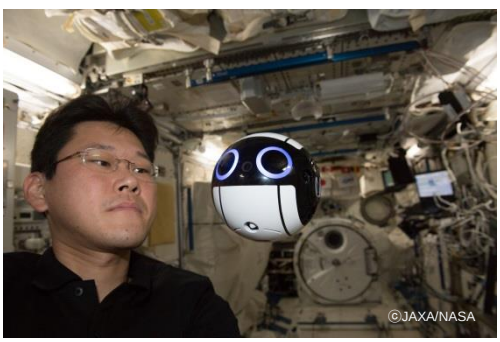
Objectives of Development

- Acquiring the capability to move anywhere at any time via autonomous flight and record images from any angle
- Realizing "zero" photographing time by the onboard crew
- Enabling flight controllers and researchers on the ground to check the crew's work from the same viewpoint as the crew

MEISEI ELECTRIC CO., LTD.

SPECIFICATIONS

Items		Performance
Dimensions		< 150 mm in diameter (not including 3D marker)
Mass		< 1 kg (not including cables and 3D marker)
Localization and control	Translational control	Micro axial fans
	Rotational control	Triaxial reaction wheels and / or Micro axial fans
	Localization	Image recognition with 3D Marker
Main Camera	Resolution	720 p (1280 × 720 pixels) 1080 p (1920 × 1080 pixels)
	Frame rate	10 to 30 fps
	Bit rate	16 kbps to 40 Mbps
	Data format	Photo / Movie (no audio)
Image stability	Bandwidth	Pan: 1 Hz or less Tilt and Roll: 0.3 Hz or less
	Attitude stability	±1 degree/s or less
Data transmission	Transmission method	IEEE802.11a
	Transmission rate	16 kbps to 40 Mbps
Power supply		Lithium battery
Battery life		Approx. 2 hours (Rechargeable via USB connector)



＊ To develop this camera drone, Meisei Electric Co., Ltd. cooperated with JAXA in the field of body design, electric design, assembly, and verification test.

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MEMO

MEMO

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