

MITSUBISHI PRECISION CO., LTD.

Inertial Reference Unit & Reaction Wheel

The 2000s

			IRU	RW
The 1990s	1992/02/11	JERS-I(FUYOU1)	●	
	1994/08/28	ETS-VI	●	
	1995/03/18	SFU	●	
	1996/08/17	ADEOS(MIDORI)	●	
	1997/11/28	ETS-VII	●	
The 2000s	1998/02/21	COMETS(KAKEHASHI)	●	
	2002/9/10	DRTS(KODAMA)	●	
	2002/9/10	USERS	●	
	2002/12/14	ADEOS-II(MIDORI II)	●	
	2002/12/14	μLabSat		○
	2003/10/30	SERVIS#1	●	
	2005/8/24	OICETS(KIRARI)	●	
	2005/8/24	INDEX(REIMEI)		○
	2006/1/24	ALOS(DAICHI)	●	
	2006/2/18	MTSAT-2	●	
	2006/2/22	ASTRO-F(AKARI)	●	
	2006/9/23	SOLAR-B(HINODE)	●	
	2006/12/18	ETS-VIII	●	
	2007/09/14	SELENE(KAGUYA)	●	
	2008/2/23	WINDS(KIZUNA)	●	
	2008/08/15	Superbird-C2	●	
	2009/1/23	GOSAT(IBUKI)	●	○
	2009/1/23	SDS-1		○
	The 2010s	2010/8/29	JEM-ICS	●
2010/06/02		SERVIS-2	●	○
2010/09/11		QZS(MICHIBIKI)	●	
2011/05/27		ST-2	●	
2012/5/18		GCOM-W1(SHIZUKU)	●	○
Future	2013	ASNARO	●	
	2013	ASTRO-H	●	○
	2014	GCOM-C1	●	○
		SLATS		○
		ALOS-2	●	○

Future



Key Components for Mission Achievement



TOC ARIAKE EAST TOWER 13F 3-5-7 ARIAKE KOTO-ku TOKYO 135-0063, JAPAN
TEL:+81-3-5531-8065 FAX:+81-3-5531-8143 HP: <http://www.mpcnet.co.jp>

Subject to change without prior notice.
This product cannot be exported overseas without permission from the government.
UEX告110010-C(E) Feb.2013

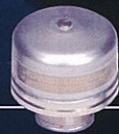
RW

Reaction Wheel



IRU

Inertial Reference Unit



Since 1964, Mitsubishi Precision Co. has provided the outstanding equipments to satellite & rocket manufacturers. Gyro technologies are our core competency, based on lubrication and ultra-precision machining technology.

■ From micro satellite to large satellite

Development of HMMW (for micro satellites) and Type S Wheel enables options of angular momentum between 0.2Nms ~80Nms.

The Wheels could be provided for all range of micro satellite to large satellite.

■ Long life motion control mechanism

Highly reliable, long life rotating mechanical system is realized by the combination of precise machinery technology and bearing lubrication technology achieved through gyro development.

■ Reliability evaluation

Durability of the wheel is proven for the enough margin by zero cross operation test, which the rotor repeats reversal at the speed of rotation is close to zero, and maximum acceleration / deceleration test, which maintains the maximum torque output status. Since 2005, continuous rotating life time test has been conducted.

All the test results are reflected to the product developments and will contribute for higher reliability.

■ Low disturbance wheel optimized for high accuracy observation mission

Optimum wheel for high accuracy observation, as the wheel restrains vibration disturbance noise originated by a rotating rotor.

Parameter		Micro Satellite (~ 100kg)		Small Satellite ~ Large Satellite (1000kg ~)			
		HMMW	Mini	Type S	Type M	Type M - A	Type L - A
							
		© JAXA		© JAXA	© JAXA	© JAXA	© JAXA
Angular momentum	[Nms]	0.2~0.4	1.5	5~10	10~30	10~30	30~80
Rotation speed	[rpm]	±6000	±6000	±5000	±6000	±6000	±6000
Reaction Torque @Max.Speed	[Nm]	> 0.012	> 0.01	> 0.06	> 0.1	> 0.2 > 0.4@2000rpm	> 0.2 > 0.4@2000rpm
Power consumption Steady state Peak Torque	[W]	4.3 TYP	< 15 < 25	10 TYP 50 TYP	21 TYP 115 TYP	23 TYP 208 TYP	23 TYP 208 TYP
Bus voltage	[VDC]	16~38.4, 5	23~35	22~52	30~52	30~52	30~52
Dimension	[mm]	72Dx72Wx70H TYP	Φ 150 x 100H TYP	Φ 222 x 98H TYP	Φ 279 x 153H TYP	Φ 279 x 145H TYP	Φ 365 x 145H TYP
Mass	[kg]	1.05TYP (@0.4Nms)	2.6 TYP	3.9 TYP (@5Nms)	9.3 TYP(@30Nms)	8.6 TYP(@30Nms)	11.0TYP (@80Nms)

□ Tuned Dry Gyro (TDG) for space

Long life, high accuracy gyro for attitude control of satellite, which detect angular speed of cross-axis at high accuracy.

□ Complete redundancy configuration

Enables to configure 3 axis complete redundancy, as IRU has 3 sets of built-in TDG, independent, two axis angular speed detectors.

□ Flight records

Our first IRU was installed to the Japanese Earth Resources Satellite "FUYOU1" launched in 1992. Since then, our IRU has installed to most of the Japanese satellites (33 units) and 17 units are operational in orbit.

□ Development of small, low cost models

Small, light weight, and low cost, Type-IIIC is available from April 2012.

Parameter	Type-III C	Type-III A
		
	© JAXA	© JAXA
Number of TDG	2 or 3 (Redundant conf.)	←
Measurement range Linear range Polarity range	> ± 4.0 deg/s Min > ± 10.0 deg/s Min	← ←
Scale factor (Nominal)	0.05 arcsec/pulse	←
Short term stability	0.002 deg/h (1σ) Max	←
NEA (Noise Equivalent Angle)	2.0 arcsec p-p Max	←
Power (@3TDG on)	36 W Max	←
Bus voltage	30~53[VDC]	←
Dimension	218 W x 208D x 175H mm TYP	364W x 257D x 120H mm TYP
Mass	< 7.0 kg (3 Gyros)	10.0 kg TYP (3 Gyros)