IMU 7-LN

Inertial Measurement Unit

- *6-axis MEMS mini-IMU*
- *Acceleration & Angular Rotation analog output*
- *12-pin connector with detachable cable*
- *Aluminium housing*
- *Made in Germany*

Features

- *Acceleration rate: ±2g to ±50g Rotation rate: ±75°/s to ±900°/s*
- *DC response*
- *Excellent Bias and Scale factor stability*
- *Protection class IP65*
- *Low power consumption*
- *Compact design and lightweight (26 gram)*

Options

- *Acceleration and rotation rate range selection*
- *Customised cable length and connector*
- *Stainless steel housing*

Applications

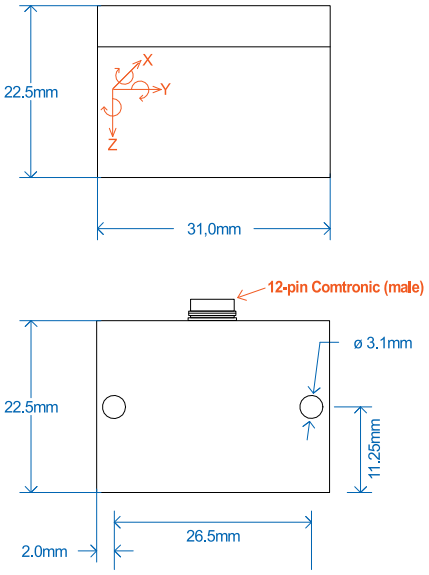
- *Indoor Navigation and Pointing*
- *Precision Agriculture*
- *Camera/Antenna/Platform Stabilisation*
- *Industrial and Robotics*
- *Biomechanics (Motion tracking; Gesture Sensing)*
- *Marine (yacht stabilisation; tests on ship models)*
- *Automotive in-car Navigation*
- *Precision GPS Vehicle and Personal Navigation Aiding (Dead Reckoning Navigation)*

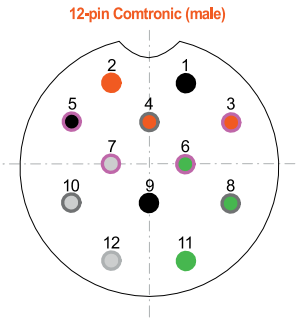
Description

An Inertial Measurement Unit (IMUs) is a 6-axis system that measures linear and angular motion using a combination of gyroscopes and accelerometers. MEMS based IMUs incorporate an assortment of precision inertial sensors, including a 3-axis accelerometer and a 3-axis gyroscope. The IMU thus outputs raw acceleration and rotation rate signals, which could be further integrated to obtain the actual position and orientation.

ASC IMU 7.X.Y

ASC IMU 7.X.Y incorporates either the LN series (Low-Noise) accelerometers or the MF series (Medium-Frequency) accelerometers, featuring an acceleration range from ±2g to ±50g. The IMU features MEMS vibrating ring gyros with a rate range from ±75°/s to ±900°/s. ASC IMU 7.X.Y can be powered by a DC power supply (+5V to +40V) where the output voltage is independent of the supply. The miniature IMU is made of lightweight anodised aluminium housing and features the industry standard 12-pin comtronic connector and a detachable cable.





Pin assignment:

Power Supply:

Pin 1: Power Supply - (black)
Pin 2: Power Supply + (red)

Gyroscope:

Pin 3: Signal X (red / violet)
Pin 4: Signal Y (red / grey)
Pin 5: Signal Z (black / violet)

Acceleration:

Pin 6: Signal + X (green / violet)
Pin 7: Signal - X (white / violet)
Pin 8: Signal + Y (green / grey)
Pin 9: not connected
Pin 10: Signal - Y (white / grey)
Pin 11: Signal + Z (green)
Pin 12: Signal - Z (white)

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MEMS Accelerometers

ASC's capacitive accelerometers are based on MEMS sensing technology and produce an analog voltage proportional to the input acceleration. The accelerometers can measure both static (gravity) and dynamic accelerations. ASC's MEMS capacitive accelerometers can be used for very low to medium frequency vibration measurements, ranging from 0Hz to 4kHz. The sensors feature a MEMS sensor element where the seismic mass is connected between two conductive capacitor plates. When subjected to an input acceleration, the seismic mass oscillates between the two capacitor plates and there is a change in the capacitance. This change in capacitance is converted via an ASIC (Application Specific Integrated Circuit) into a low impedance analog voltage output signal.

MEMS Gyroscopes

ASC's precision navigation and pointing gyroscopes are made of robust silicon MEMS vibrating ring elements. The gyro detects the magnitude and direction of angular velocity by using the coriolis force effect. As the gyro is rotated, coriolis forces acting on the silicon ring cause radial movement at the ring perimeter, the magnitude of which is proportional to the angular velocity of rotation. The gyro thus produces an analog voltage signal, which is linearly proportional to angular rate. The balanced ring design results in excellent shock and vibration rejection.

Typical Specifications

ASC IMU 7.X.Y

DYNAMIC

Range		Acceleration: ±2g to ±50g Rotation: ±75°/s to ±900°/s
Shock limit	±g peak	500 (operating) 2000g (unpowered)

ELECTRICAL

Excitation voltage	V DC	MF: 5 to 40	LN: 6 to 40
Current Consumption	mA	MF: 21	LN:30
Isolation		Case Isolated	

ENVIRONMENTAL

Operating Temperature	°C	-40 to +85
Storage Temperature	°C	-40 to +100
Sealing		IP65

PHYSICAL

Sensing elements		MEMS Capacitive Accelerometers & MEMS Vibrating Ring Gyros
Case material		Anodised Aluminium
Connector		12-pin Comtronic
Mounting		M3 screws
Weight (without cable)	gram	26
Cable		12-wire PUR 30 gram/meter; AWG 30; Diameter: 4.4m

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Typical Specifications

ASC MEDIUM-FREQUENCY ACCELEROMETERS

DYNAMIC

		Range (±g)				
		2	5	10	30	50
Sensitivity	mV/g	1350	540	270	90	54
Frequency response: ±5%	Hz	700	700	1400	1600	1800
Amplitude non-linearity	% FSO			<0.5		
Transverse sensitivity	%			<5		

ELECTRICAL

Zero acceleration output	±mV			50		
Spectral noise	µg/√Hz	20	40	70	200	340
Residual / Broadband noise (±5% frequency range)	µV	720	580	720	720	780

ENVIRONMENTAL

Temperature coefficient of sensitivity (Thermal sensitivity shift)	%/°C			0.01		
Temperature coefficient of bias (Thermal zero shift)	mg/°C	0.2	0.5	1	3	5

ASC LOW NOISE ACCELEROMETERS

DYNAMIC

		Range (±g)				
		2	5	10	25	50
Sensitivity	mV/g	2000	800	400	160	80
Frequency response: ±5%	Hz	100	100	300	500	650
Amplitude non-linearity	% FSO			<1		
Transverse sensitivity	%			3		

ELECTRICAL

Zero acceleration output	±mV	150	150	80	80	80
Spectral noise	µg/√Hz	7	12	18	50	100
Residual / Broadband noise (±5% frequency range)	µV	200	120	140	180	200

ENVIRONMENTAL

Thermal sensitivity shift	%/°C			0.015		
Thermal zero shift	mg/°C	0.15	0.4	0.75	2	4

Typical Specifications

ASC MEMS GYROSCOPES

DYNAMIC

		Rate Range (±°/s)			
		75	150	300	900
Sensitivity (±1%)	mV/°/s	13.2	6.6	3.3	1.1
Bandwidth (max.)	Hz		150		
Non-linearity	%		0.05		
g-sensitivity (linear acceleration)	°/s/g		0.1		

ELECTRICAL

Bias (for cables up to 10 m)	V	1.70 ± 0.06
Bias variation with temperature (referred to the value at +25°C)	°/s	±3
Bias Instability	°/hr	9
Rate Noise Density	°/s/√Hz	0.02
Angular Random Walk	°/√hr	0.2 (Allan Deviation; τ=1s)
Vibration induced Noise	°/s/g²	0.08

ENVIRONMENTAL

Sensitivity variation over temperature (referred to the value at +25°C)	%	±1.5

CALIBRATION

ACCELEROMETERS (LN)

Range	2g and 5g	10g	25g and 30g	50g
Sensitivity	at 160Hz and 0.5g	at 80Hz and 5g	at 80Hz and 15g	at 80Hz and 20g
Frequency Response	1 to 100Hz	10 to 300Hz	10 to 500Hz	10 to 650Hz

ACCELEROMETERS (MF)

Range	2g and 5g	10g	30g	50g
Sensitivity	at 16Hz and 0.5g	at 80Hz and 5g	at 80Hz and 15g	at 80Hz and 20g
Frequency Response	1 to 200Hz	10 to 1400Hz	10 to 1600Hz	10 to 1800Hz

GYROSCOPES

A factory calibration certificate is provided with each axis. Sensitivity over the measurement range and non-linearity data are provided in the calibration certificate.

Note: For the IMU, a DAkkS certified (Deutsche Akkreditierungsstelle, DAkkS, to DIN EN ISO / IEC 17025) calibration can be provided upon request.

ORDERING INFORMATION

	Accelerometer		Gyroscope	Cable Length	Connector
	Measurement Range (±g)	Low-noise (LN) or Medium-Frequency (MF)	Measurement Range (±°/s)	in meters	A: No connector
	XXX	LN or MF	YYY	Z	
ASC IMU 7	002	LN		3 (supplied with	Contact ASC for
	005	MF	075	the IMU)	customised
	010		150		connectors such
	025		300	6 (6m cable)	as Lemo or Sub D
	030		900	9 (9m cable)	
	050			12 (12m cable)	

Ex: ASC IMU 7.002LN.150-3A