

Inertial Measurement Unit (IMU)



ASC IMU 8.X.Y

- ▶ Tactical Grade
- ▶ 6 Degrees of Freedom (DOF)
- ▶ Analog Output
- ▶ Detachable Cable
- ▶ Aluminium Housing
- ▶ Made in Germany



Features

- ▶ Acceleration Rate:
 $\pm 2g$ to $\pm 30g$
- ▶ Rotation Rate: $\pm 100^\circ/s$
and $\pm 200^\circ/s$
- ▶ Excellent Bias and Scale
Factor Stability
- ▶ Low Noise
- ▶ FOG-like Performance
- ▶ DC Response
- ▶ Protection Class IP 65

Options

- ▶ Acceleration and Rotation
Rate Range Selection
- ▶ Customised Cable Length
and Connector

Applications

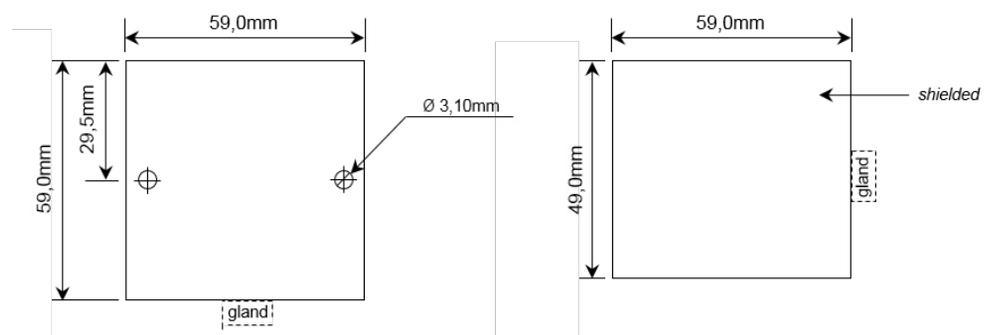
- ▶ Rail Track Monitoring
- ▶ Avionics, UAV
- ▶ Robotics
- ▶ Automated Guided Vehicles
- ▶ Platform Stabilisation
- ▶ GPS Aided Guidance
- ▶ Ship Navigation and
Control
- ▶ Mobile Mapping
- ▶ Drilling Equipment
and Guidance
- ▶ Weapon Launch Systems

Description

An Inertial Measurement Unit (IMU) is a 6-DOF system that measures linear and angular motion using a combination of accelerometers and gyroscopes. MEMS based IMUs include a range of precision inertial sensors, including a triaxial acceleration sensor and a triaxial gyroscope. The IMU thus outputs acceleration and rotation rate signals in the form of an analog raw signal. Due to the excellent long-term stability and the low noise (bias, scale factor, noise, angular random walk) of the sensors used, it is possible to reliably obtain position changes in all 6 DOFs with high accuracy and repeatability by integrating the analog sensor signals twice. This results in new fields of application in the area of autonomous transport and unmanned flying.

ASC IMU 8.X.Y

ASC IMU 8.X.Y features the performance of the tactical grade measurements. The capacitive MEMS accelerometer is obtainable with acceleration ranges from $\pm 2g$ to $\pm 30g$. The excellent long term bias and scale factor repeatability with low in-run bias and low noise allows accurate working with the angular rate sensor. The MEMS vibrating ring gyros are obtainable with rate ranges of $\pm 100^\circ/s$ and $\pm 200^\circ/s$. The gyro features also a low bias instability, excellent angular random walk with low noise. ASC IMU 8.X.Y can be powered by a DC power supply (+8V to +30V) where the output voltage is independent of the supply. The IMU is made of lightweight anodised aluminium housing and features a 15-pin comtronic connector and a detachable cable.



Power Supply:	Gyroscope:	Acceleration:
Pin 1: GND	Pin 3: Signal + X	Pin 9: Signal + X
Pin 2: Power Supply +	Pin 4: Signal - X (GND)	Pin 10: Signal - X
Shield connector	Pin 5: Signal + Y	Pin 11: Signal + Y
	Pin 6: Signal - Y (GND)	Pin 12: Signal - Y
	Pin 7: Signal + Z	Pin 13: Signal + Z
	Pin 8: Signal - Z (GND)	Pin 14: Signal - Z

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. 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 the angular rate. The balanced ring design results in excellent shock and vibration rejection.

Typical Specifications

ASC IMU 8.X.Y

DYNAMIC

Measurement Range	g °/s	Acceleration: ± 2 to ± 30 Rotation: ± 100 and ± 200
Shock Limit		95g x 6ms (operating) 1000g x 1ms (powered survival)

ELECTRICAL

Excitation Voltage	V DC	8 to 30
Current Consumption	mA	200
Isolation		Case Isolated

ENVIRONMENTAL

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

PHYSICAL

Sensing Elements		MEMS Capacitive Accelerometers & MEMS Vibrating Ring Gyros
Case Material		Anodised Aluminium
Connector		15-pin Comtronic
Mounting		M3 screws
Weight (without cable)	gram	260
Cable		18-wire PUR, Li12YD11Y 18*0.06mm ² (AWG 30), 36 gram/meter; Diameter: 4.35 ±0.15mm

ASC IMU 8.X.Y**ASC MEMS ACCELEROMETERS****DYNAMIC**

Measurement Range	g	±2	±5	±10	±30
Sensitivity	mV/g	1350	540	270	90
Frequency Response (±5%)	Hz	150	150	150	150
Resonant Frequency	kHz	1.4	2.2	3.7	>8
In-Run Bias Stability	µg	3	7.5	15	45
Amplitude Non-Linearity	% FSO	typ. 0.3, max. 1			

ELECTRICAL

Zero Acceleration Output	mV	max. ±10			
Output Impedance	MΩ	>1			
Spectral Noise (typical)	µg/√Hz	7	17	34	102

ENVIRONMENTAL

Temperature Coefficient of Sensitivity (Thermal Sensitivity Shift)	%/°C	typ. 0.01, max. 0.02			
Temperature Coefficient of Bias (Thermal Zero Shift)	mg/°C	0.075	0.187	0.375	1.125

ASC MEMS GYROSCOPES**DYNAMIC**

Measurement Range	°/s	±100			±200
Sensitivity (±1%)	mV/°/s	20			10
Bandwidth (max.)	Hz			100	
Non-Linearity	%	typ. ±0.02, max. ±0.05			
g-Sensitivity (Linear Acceleration)	°/s/g	0.02			

ELECTRICAL

Bias	V	2.4			
Bias Variation with Temperature (referred to the value at +25°C)	°/s	typ. ±0.1, max. ±0.2		typ. ±0.15, max. ±0.25	
Bias Instability	°/hr	0.12			
Angular Random Walk	°/√hr	0.017 (Allan Deviation; τ=1s)			
Vibration Induced Noise	°/s/g ²	0.01			

ENVIRONMENTAL

Sensitivity Variation Over Temperature (referred to the value at +25°C)	%	typ. ±0.3, max. ±0.5			
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ASC IMU 8.X.Y**FACTORY CALIBRATION****ASC MEMS ACCELEROMETERS**

Measurement Range	±2g, ±5g, ±10g, ±30g
Sensitivity	5m/s ² @16Hz
Frequency Response	1Hz to 100Hz

Conversion Factor: 1g corresponds to 9,80665 m/s²

ASC MEMS GYROSCOPES

Measurement Range	±100°/s, ±200°/s
Sensitivity	50°/s@16Hz
Frequency Response	1Hz to 70Hz

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

DAKKS-CALIBRATION DIN ISO 17025 (ORDER SEPARATELY)

A calibration certificate accredited by the German accreditation body (Deutsche Akkreditierungsstelle, DAkkS) is possible. The DakkS certificates are internationally accepted, e.g. by the European cooperation for Accreditation (EA) and the International Accreditation Cooperation (ILAC).

ORDERING INFORMATION

	Accelerometer	Gyroscope	Cable Length	Connector
	Measurement Range (g)	Measurement Range (°/s)	in Meters	A: No Connector L3: Cable Switch
	XXX	YYY	Z	
ASC IMU 8	002	100	3	

Ex: ASC IMU 8.002.100-3-A

Contact ASC for individual requirements, cable length and customised connectors such as Lemo, SubD, Banana or BNC.

Note: Export License required for the measurement ranges ±2g, ±5g and ± 10g due to dual use.

QUALITY

- ▶ ASC GmbH is ISO 9001:2015 certified.
- ▶ The Deutsche Akkreditierungsstelle GmbH (DAkkS) has awarded to our calibration laboratory the DIN EN ISO/IEC 17025:2005 accreditation for calibrations and has confirmed our competence to perform calibrations in the field of mechanical acceleration measurements. The pictured DAkkS-ILAC logo refers exclusively to the accredited service.

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