

iVRU-FCAI-E

Inertial Measurement Unit

with Closed-loop Fiber Optic Gyros and Servo Accelerometers

The iVRU-FCAI is a small size IMU consisting of 3 very low-noise fiber optical gyros (FOG) in closed-loop technology of class 1 deg/hr and 3 servo-accelerometers of class 2 mg.

- 1 °/hr, 2 mg, 200 Hz
- low ARW, $< 0.02 \text{ }^\circ/\sqrt{\text{hr}}$
- exceptional short time bias stability of $< 0.02 \text{ deg/hr}$ and $10 \text{ } \mu\text{g}$
- odometer interface
- internal or external GPS receiver
- higher MTBF than tactical RLG based systems
- Stabilisation tasks
- INS/GPS navigation
- Surveying applications
- Guidance and Control



can be operated on a unregulated wide range input supply voltage and is protected against wrong polarity, EMC and moderate over-voltage. An SYNC input signal can be used to time stamp the output data which are sent via UART RS422 or RS232. As an option the system can be delivered with an integrated odometer interface and with an integrated L1 GPS receiver. All signals are provided via an robust connector of type MIL-C-38999-III.

The iVRU-FCAI is manufactured in Germany. Version with angular rate $< 500 \text{ deg/s}$ and acceleration $< 10 \text{ deg/s}$ does not require an export license ("-E" version).

The iVRU is designed for ruggedized applications in surveying and control. The iVRU-FCAI-E

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Technical Data of iVRU-FCAI-E:

	Angular Rate	Acceleration
Sensor Range:	$\pm 450 \text{ }^\circ/\text{s}$ (option: $\pm 1'000 \text{ deg/s}$ or more)	$\pm 5 \text{ g}$ (option: $\pm 10\text{g}, 20 \text{ g}$)
Bias:	1 deg/hr (1 sigma, OTR)	2 mg
Bias stability:	$< 0.02 \text{ }^\circ/\text{hr}$ (short time, const. temp.)	$< 50 \text{ } \mu\text{g}$
Resolution (increments):	4.8E-06 deg / LSB (internal: 32/24 Bit)	1.2E-04 m/s / LSB
Resolution (rates, accel.):	float (32 Bit)	float (32 Bit)
Linearity / Scale factor error:	$< 0.03 \text{ } \% / 0.03 \text{ } \%$ (1 sigma)	$< 0.03 \text{ } \% / 0.15 \text{ } \%$
Angular random walk:	$< 0.02 \text{ }^\circ/\sqrt{\text{h}}$	$< 50 \text{ } \mu\text{g}/\sqrt{\text{Hz}}$
Magnetic Sensitivity:	$< 0.3 \text{ }^\circ/\text{h} / \text{Gauss}$	
Output:	Roll, pitch, relative heading; angular rates and accelerations; GPS velocity / position	
Attitude Accuracy:	0.1 deg roll / pitch (depends on aiding information)	
Heading Accuracy:	1 deg/hr rel. heading drift (without aiding, known latitude)	
Axis Misalignment:	$< 0.1 \text{ mrad}$ between all sensor axes	
Digital Interface:	CAN (up to 1 MBd), RS232 (UART, up to 115.2 kbd); option: RS422 instead of RS232	
Trigger (SYNC input):	externally triggered time stamping of free running output; resolution of time stamp: 1 μs	
Odometer input:	RS422 level, A/B	
GPS Interface:	integrated L1 GPS engine or externally connected GPS engine (RS232, NMEA)	
Connector:	Standard: MIL-C-38999-III, 37 pin (male), type D38999/24WC35PA; Option: MicroDSub25	
Data rate:	0...200 Hz (free running; option: 400 Hz); gyro bandwidth 500 Hz, accelerometer bandwidth 200 Hz	
Temperature:	$-40 \dots +71 \text{ }^\circ\text{C}$ (operating, case temperature)	
Shock, Vibration:	$-45 \dots +85 \text{ }^\circ\text{C}$ (storage); Temperature gradient up to 3 K / min	
Magnetic Insensitivity:	60g / 11ms; 3 g rms (operation), 6.3 g rms (storage) @ 20...2'000 Hz	
Environment / MTBF/ MTTR:	$< 0.3 \text{ deg/hr} / \text{Gauss}$ ($< 20 \text{ Gauss}$)	
Size, Weight:	IP67 / 25.000 hrs (estimated, surveying environment) / 10 minutes	
Power, Start-up-Time:	approx. 145 x 115 x 140 mm (plus connector), approx. 2'300 grams	
	11...34 V DC ; approx. 15 W ; $< 3 \text{ sec}$; reverse-voltage protection	

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Measurements of Allan variance and Linearity of iVRU-FCAI-E:

At constant temperature the gyro bias is stable over > 1'000 s with < 0.02 deg/hr, which provides exceptional advantages for INS/GPS coupled systems.

