



ENDEVCO MODELS  
**7310A, 7330, 7360A, 773A, 776**

## ANGULAR RATE AND 6DOF SENSORS

Measure it easily and accurately with  
Endevco Angular Rate & 6DoF sensors

### TYPICAL APPLICATIONS

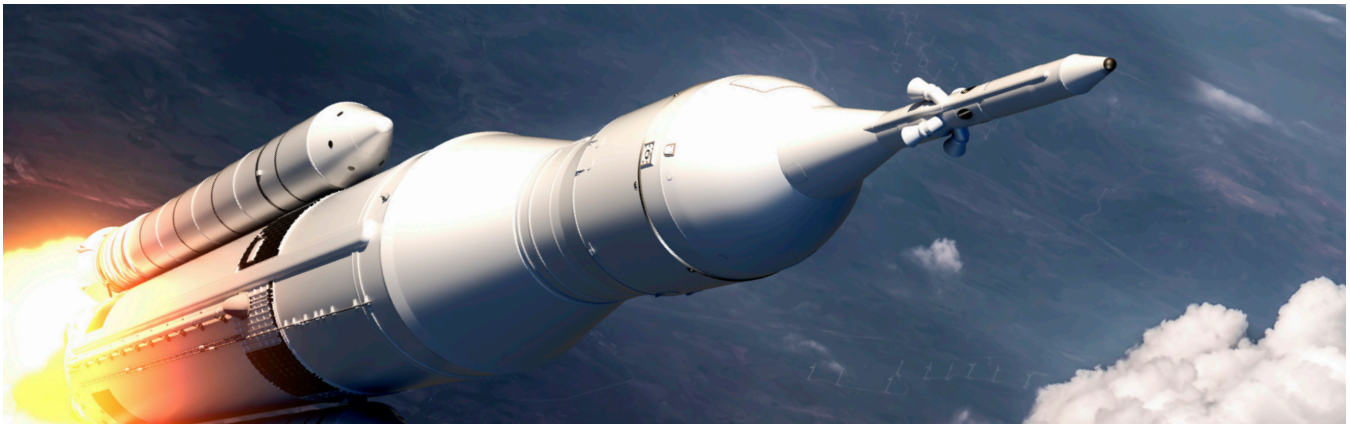
- Vehicle dynamics
- Aircraft flight testing
- Spacecraft and satellite
- Missile testing
- Automotive rollover






Endevco® models 7310A, 7330 and 7360A include angular rate sensors that utilize unique silicon MEMS gyroscope technologies with custom electronics and packaging, providing reliable sensing performance even under excessive shock and vibration environments. These angular rate sensors are designed for automotive safety testing and other system designs requiring accurate measurement of angular velocity.

We now offer two ways to obtain a six degrees of freedom (6DoF) sensor that provides analog output for three axes of linear acceleration and three axes of angular rate in a compact package. Our Modular 6DoF family includes 773A and 776 triaxial accelerometers which can be stacked with a 7330 triaxial angular rate sensor to create a custom 6DoF Sensor which offers flexibility and our smallest size package. Our legacy 7360A includes all six axes in one package if 500g range is needed or a single package is preferred.

A 6DoF sensor with analog output offers the advantage of being able to troubleshoot the data to its source and examine the output compared to its time history. As opposed to inertial measurement units (IMU's) where the information has been digested and presented in a take-it-or-leave-it fashion, which is not user-friendly in a test and measurement or R&D environment.

In typical dynamic measurements, acceleration and angular rate data are essential parameters needed to fully characterize the complex behavior of a moving object. Until recently, engineers could only conveniently gather information using linear accelerometers because the massive array of sensors required to collect rotational data was impractical due to the expense and space required. Our 6DoF sensors solve this problem by providing multiple measurements with one compact sensor. Now, rather than having to make assumptions about these dynamic interactions, our 6DoF provides reliable, empirical data to support the analytical results. What makes our solutions truly unique is the low acceleration ranges and low angular rate ranges most suitable for accurately characterizing motion.



SENSOR FAMILY					
					
<b>Model Number</b>	<b>7310A</b>	<b>7330</b>	<b>7360A</b>	<b>773A</b>	<b>776</b>
Description	Angular rate sensor	Triaxial angular rate sensor	Six degrees of freedom (6DoF) sensor	Triaxial variable capacitance accelerometer	Triaxial piezoresistive accelerometer
Linear Range	$\pm 100 / \pm 500 / \pm 1,500 / \pm 6,000 / \pm 8,000 / \pm 12,000 / \pm 18,000$ deg/sec		Accelerometers: $\pm 2 / \pm 10 / \pm 50 / \pm 200 / \pm 500$ g  Angular rate sensors: $\pm 100 / \pm 500 / \pm 1,500 / \pm 8,000 / \pm 12,000 / \pm 18,000$ deg/sec	$\pm 8 / \pm 15 / \pm 50 / \pm 100 / \pm 200$ g	$\pm 2000$ g
Sensitivity	20 / 4 / 1.333 / 0.333 / 0.25 / 0.167 / 0.111 mV/deg/sec		Accelerometers: 1000 / 200 / 40 / 10 / 4 mV/g  Angular rate sensors: 20 / 4 / 1.333 / 0.25 / 0.167 / 0.111 mV/deg/sec	250 / 133 / 40 / 20 / 10 mV/g	0.30 mV/g
Frequency Response (Hz)	0-1000 / 0-1000 / 0-1000 / 0-1000 / 0-1000 / 0-2000 / 0-2000 (+1dB/-3dB)		Accelerometers: 0-300 / 0-1500 / 0-1800 / 0-1800 0-1800 ( $\pm 1$ dB)  Angular rate sensors: 0-1000 / 0-1000 / 0-1000 / 0-1000 0-2000 / 0-2000 (+1dB/-3dB)	0-450 / 0-450 / 0-750 / 0-1200 / 0-1200 ( $\pm 5\%$ )	0-5000 ( $\pm 5\%$ )
Shock Limit (g)	5,000			10,000	10,000








Modular 6DoF Model 773A  
with Model 7330 stacked on top

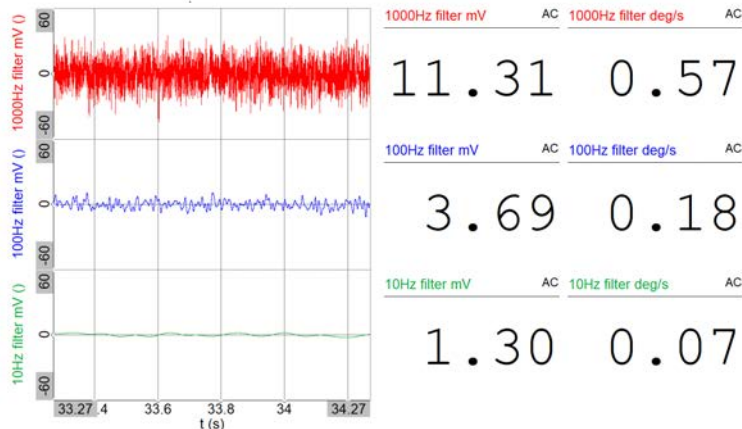


Modular 6DoF Model 776  
with Model 7330 stacked on top

# ANGULAR RATE RANGE APPLICATION GUIDE

RANGE	IDEAL FOR	APPLICATIONS	
100 deg/sec	Long events such as vehicle rollover, flight, automotive yaw/pitch/roll	Aerodynamic measurements Vehicle rolling/tipping Motorsport	
500 deg/sec	Off-road testing, RLDA/road load data, construction equipment testing	Autonomous vehicle development Road test, ride quality, chassis response HVOR testing Robotic motion	
1.5k deg/sec	Vehicle rotation during crash test (mounted between driver and passenger along transmission tunnel)	Automotive rollover Missile/rocket flight Shaker testing of small structures ATD's (Q3s Head) Rear impact testing	
6K and 8K deg/sec	Vehicle rotation during crash test (mounted between driver and passenger along transmission tunnel)	ATD's Car body motion during impact, Offset impact structure deformation Ejector seat testing Helmet Testing	
12K and 18K deg/sec	Calculating head injury criteria (HIC value)	ATD's THOR, & HIII WorldSID & Q series aPLI Pedestrian leg form impactor Free ejection head forms	

## FILTERING RECOMMENDATIONS





RMS values in both mV and scaled deg/s  
(without filtering higher peaks will be seen)

MEMS gyroscopes have modulated drive frequencies that can impose noise across the bandwidth of the gyro. Our gyroscopes have particularly high bandwidth, ideal for fast acting and impact applications. For relatively slow applications filtering can improve residual noise levels.

Here is a 100 deg/s gyro sampled at 10kHz and low pass filtered at 1kHz, 100Hz and 10Hz. Note the marked decrease in residual noise at each filter level.

# RECOMMENDED ACCESSORIES

SIGNAL CONDITIONERS		
		
<b>Model Number</b>	<b>PCB 482C27</b>	<b>PCB 483C28</b>
<b>Features</b>	Bridge/differential, ICP®, voltage sensor signal conditioner	
<b>Channels</b>	4	8
<b>Gain</b>	x0.1 to x200 (ICP®, Volt) x0.1 to x2000 (Brdg/Diff)	
<b>Frequency Range (+/-5% (gain &lt;100))</b>	0.05 Hz to 100 kHz	
<b>Digital Control Interface</b>	RS-232, Ethernet	Ethernet
<b>Electrical Connector (Inputs)</b>	BNC jack, 8-socket mini DIN	
<b>Power Requirements (VAC)</b>	AC	



## TRIAxIAL AND 6DOF MOUNTING BLOCK

ENDEVCO MODEL 7930

- Accommodates three 7310A angular rate sensors and three 7264C, 7264D, 7264H or 726CH accelerometers



## ADHESIVE MOUNTING PLATE

ENDEVCO MODEL 7973

- For Modular 6DoF (773A+7330) or (776+7330), includes two #2-56 x 7/8" socket head cap screws