

Absolute Stand Alone Inclinometer

Dual Axis Analog Output



0751 DUAL AXIS INCLINOMETER MODULES

The 0751 Series contain 3D-MEMS-based dual axis inclinometer modules that provide instrumentation grade performance for leveling applications in harsh environment. The measuring axis of the sensing elements are parallel to the mounting plane and orthogonal to each other. Low temperature dependency, high resolution and low noise, together with robust sensing element design, make the 0751 the ideal choice for leveling instruments. The inclinometers are insensitive to vibration, due to their over damped sensing elements, and can withstand mechanical shocks of up to 20000 g.

Features

- Dual axis inclination measurement (X and Y)
- Measuring ranges $\pm 30^\circ$ and $\pm 90^\circ$
- 0.1° Accuracy
- 0.0035° resolution (10 Hz BW, analog output)
- Sensing element controlled over damped frequency response (-3dB 18Hz)
- Robust design, high shock durability (20000g)
- High stability over temperature and time
- Unregulated 7...35V supply
- RoHS compliant

Applications

- Platform leveling and stabilization
- 360° vertical orientation measurement
- Leveling instruments
- Cabin leveling
- Solar panel control systems

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1 Electrical Specifications

The 0751 product family comprises two versions, the 0751-9002 and the 0751-3002 that differs in measurement range and supply voltage. The product version specific performance specifications are listed in the table 0751 performance characteristics below.

1.1 Absolute Maximum Ratings

Supply voltage Voltage at input / output pins Storage temperature Operating temperature Mechanical shock	Unregulated +7V to +35V -0.3V to 5.3 -55°C to +85°C -40°C to +85°C Drop from 1 meter onto a concrete surface (20000g). Powered or non-powered
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1.2 Performance Characteristics

Parameter	Condition	0751-9002	0751-3002	Units
Measuring range	Nominal	+/-90	+/-30	°
		_/ -1	+/-0.5	g
Supply Voltage		7...35	7...35	V
Offset (Output at 0g)		2.5	2.5	V
Offset calibration error	Max deviation	+/-1	+/-1	°
Sensitivity	between 0...1° ⁽¹⁾	2	4	V/g
		35	70	mV/°
Sensitivity calibration error		+/-1.5	+/-1.5	%
Offset temperature error	-25...85°C	+/-0.6	+/-0.6	°
	0...70°C	+/-0.2	+/-0.2	°
Sensitivity temperature dependency	-25...85°C	-1.5...+0.5	-1.5...+0.5	%
	0...70°C	-0.8...+0.3	-0.8...+0.3	%
Typical non-linearity	Sinus output	N/A	+/-0.1	°
Frequency response	-3dB LP ⁽²⁾	18	18	Hz
Cross-axis sensitivity	Max.	3	3	%

1.3 Electrical Characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Current consumption	No load		5	8	mA
Operating temperature		-40		+85	°C
Analog resistive outout load	Vout to Vdd or GND	10			kOhm
Analog capacitive output load	Vout to Vdd or GND			20	nF
Start-up delay	Reset and parity check			10	ms

1.4 Electrical Connection

Wire Color	Name	Function
Blue	GND	Ground
Red	Vdd	Power supply
Yellow	Out X	X-axis output
White	Out Y	Y-axis output
Green	NC	Not Connected

2 Functional Description

2.1 Measuring Directions

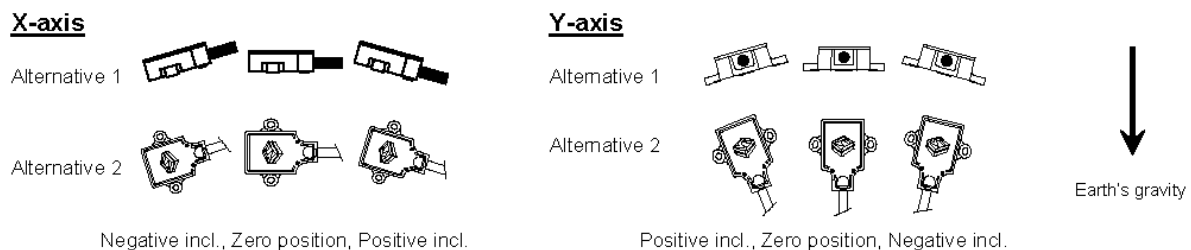


Figure 1. The measuring directions of the 0751

2.2 Voltage to Angle Conversion

Analog output can be transferred to angle using the following equation for conversion

$$\alpha = \arcsin \left\{ \frac{V_{out} - Offset}{Sensitivity} \right\}$$

Where: Offset = output of the device at 0° inclination position, Sensitivity is the sensitivity of the device and V_{Dout} is the output of the 0751. The nominal offset is 2.5 V and the sensitivity is 4 V/g for the 0751-3002 and 2 V/g for the 0751-9002.

Angles close to 0° inclination can be estimated quite accurately with straight line conversion but for the best possible accuracy, arcsine conversion is recommended to be used. The following table shows the angle measurement error if straight line conversion is used.

Straight line conversion equation:

$$\alpha = \left\{ \frac{V_{out} - \text{Offset}}{\text{Sensitivity}} \right\}$$

Where: Sensitivity = 70mV/° with 0751-3002 or Sensitivity = 35mV/° with 0751-9002

Tilt angle [°]	Straight line conversion error [°]
0	0
1	0.0027
2	0.0058
3	0.0094
4	0.0140
5	0.0198
10	0.0787
15	0.2185
30	1.668

3 Mechanical Specifications

Cable length:	0751	30cm 0c
Cable type:	UL/CSA listed,	
PUR black Cable diam.:	6±0.2mm	
Leads:	5 x 0.14mm ²	
Total weight:	Approx. 60 grams	
Protection class:	IP66	
Housing:	Zinc casting with passivation	
Mounting:	The sensor module is to be mounted on a flat and smooth surface with 2 screws, dimension M4. Mounting torque 5 ±1Nm	

3.1 Sensor dimensions

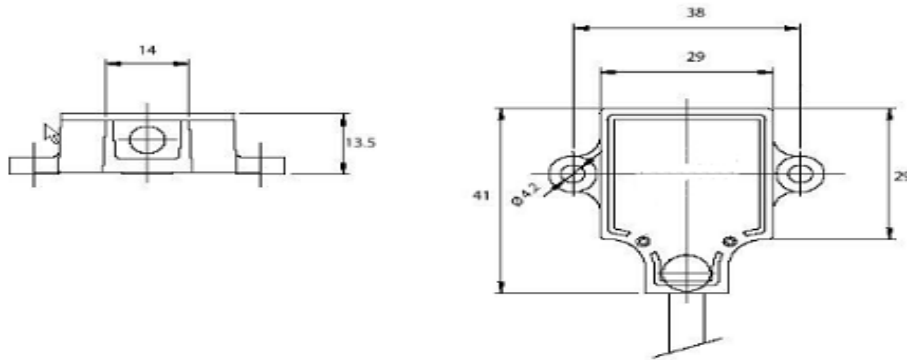


Figure 2. Mechanical dimensions of the 0751 (dimensions in mm)