Triaxial Angular Rate Sensor

OWNER'S MANUAL

PART NUMBER: ARS-C332-3A

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Watson Industries prides itself on solving customer problems and serving their needs in a timely fashion. This manual is intended to facilitate this goal and to provide written information about your product. We ask that you carefully read this manual. Becoming familiar with the manual will help you understand the product's capabilities and limitations, as well as provide you with a basic understanding of its operation. If, after reading the manual, you require further assistance, do not hesitate to call Watson Industries with your questions and comments.

CAUTION!

Watson Sensors are rugged devices that have been used successfully in a number of harsh environments. The components have been qualified to withstand a mechanical shock of 500g's or greater, and most enclosures provide an added level of protection. However, dropping a sensor from waist height onto a hard floor can cause a shock level of 600g's. At this level, damage is likely to occur.

Product Description

The ARS-C332-3A is a solid-state, triaxial rate sensor consisting of three (3) single axis, solid-state sensors. The sensor provides analog signals for X, Y & Z angular Rate. The sensors are installed nominally orthogonal.

Principles of Operation

Gyroscopes (Gyros) are used to measure angular motion. Watson ARS Gyros are solid-state devices that provide an output voltage proportional to the rate of turn applied to the sensitive axis.

The solid-state gyros described here work on the basic principle of detecting coriolis forces. These forces are generated when a moving particle is rotated.

To use the coriolis effect to detect angular rotation, a solid structure is forced to vibrate normally at its resonant frequency. The vibration provides the structure with a linear velocity component. When the structure is rotated, the coriolis forces cause the vibration motion of the structure to be coupled to another vibration mode or plane of the structure. The magnitude of this secondary vibration is proportional to the angular rate of turn.

Installation

Orientation/Mounting

The unit has 4 holes for mounting using a 6-32 screw. A mounting plate is provided for a flat surface mount. To avoid distortion, the unit must be attached to a clean, flat surface. The axis orientation is available in Figure 1. If high shock loads are expected (greater than 20G or repeated shocks greater than 10G), appropriate shock mounting should be used to prevent damage. Vibration isolation should be used if operation in 2G or greater vibration environments is expected.

Environment

Avoid mounting sites that are subject to significant temperature variation over the duration of the test. Temperature variation will induce noticeable rate sensor bias drift.

Power

Best operation is obtained at 12 or 24 VDC level, although operation is fully satisfactory down to 10 VDC and up to 35 VDC. Power draw of the unit is approximately 0.36Watts. Internal capacitors are provided to remove a reasonable level of power line noise, however, capacitors should be added for long power line wiring or if noise is induced from other loads on the circuit.

Calibration

The ARS is calibrated at the factory before it is shipped to the user. It is recommended that the unit be examined, preferably at the factory annually for evaluation and recalibration.

Output:

The signal output is protected by 1K series resistor and will not be damaged by intermittent short circuits. These resistors protect the circuit from ringing caused by capacitive loading of long wires. The output is 0.0 VDC at zero angular rate. Approximately 20% over-range is available.

Specifications

Angular Rate

Range: X, Y, Z	±100°/sec	
Resolution:	0.1°/sec	
Analog Scale Factor:	20°/sec/V	±5V Output
Scale Factor Accuracy:	1%	Constant temperature
Scale Factor Temp Coefficient:	3%	Over temperature range
Bias: X, Y, Z	< 1.5°/sec	
Bias: Over Temp Range	±10°/sec	
Warmup Drift:	±1°/sec	
Non-Linearity:	< 0.05%	Full scale range
Bandwidth:	50 Hz	
Noise:	< 0.1°/sec rms	

Environmental

Temperature: Operating	-20°C to +50°C	-40°C to +85°C w/ reduced spec
Temperature: Storage	-55°C to +85°C	
Vibration: Operating	2.5g rms	20 Hz to 2 KHz
Vibration: Survival	10g rms	20 Hz to 2 KHz
Shock: Survival	500g	10mS ½ sine wave

Electrical

Input Power:	10 to 35VDC	0.36W
Input Current:	28mA @ 12VDC	
Analog Output:	±5VDC	
Analog Output Impedance:	1000 Ohm	

Physical

Axis Alignment:	< 2°	
Size: Including Mounting Flanges	3.13"W x 4.50"L x 3.12"H	8.0 x 11.4 x 7.9 (cm)
Weight:	14 oz (0.9lb)	397 grams (0.4Kg)
Connection:	9 pin male "D" subminiature	

- Specifications are subject to change without notice.
- This product may be subject to export restrictions. Export Classification ECCN 7A994.

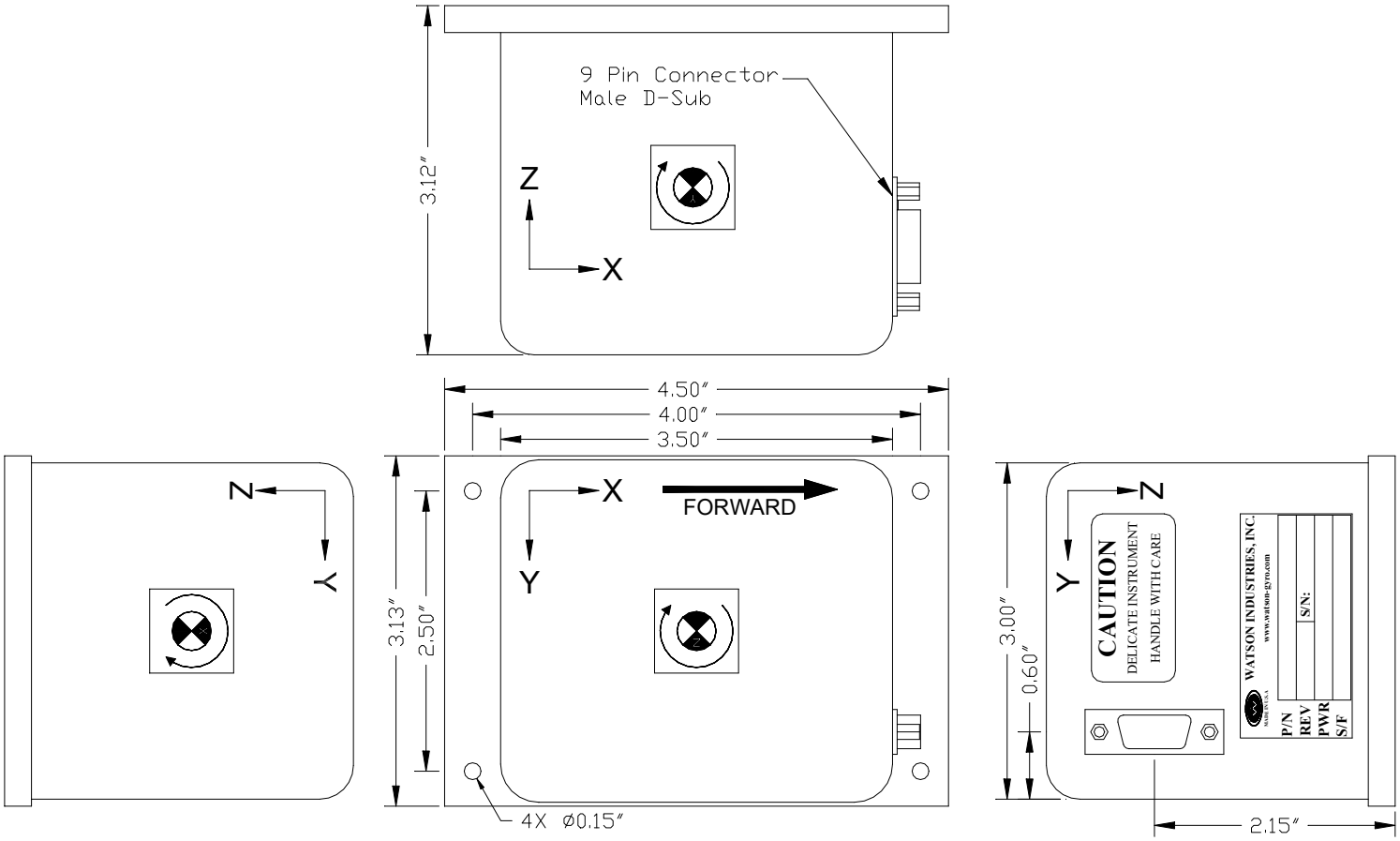
Connections / Dimensions

ARS-C332-3A Pin out (Male D-sub 9 pin)

Pin 1	Ground
Pin 2	+12 VDC @ 28 mA
Pin 3 – 5	No connection
Pin 6	X Rate Output *
Pin 7	Y Rate Output *
Pin 8	Z Rate Output *
Pin 9	No Connection

* Rate output: 0.00 VDC @ 0 °/second
-5.00 VDC @ -100 °/second
5.00 VDC @ +100 °/second
Scale Factor: 20°/second/Volt

Other scale factors / ranges available



ARS-C332-3A
Figure 1

Warning

Rough handling or dropping of this unit is likely to cause damage.
Over-voltage and/or miswiring of this unit will cause damage.
This unit should be protected against prolonged exposure to high humidity and/or salt air environments.

DISCLAIMER

The information contained in this manual is believed to be accurate and reliable; however, it is the user's responsibility to test and to determine whether a Watson Industries' product is suitable for a particular use.

Suggestion of uses should not be taken as inducements to infringe upon any patents.

WARRANTY

Watson Industries, Inc. warrants, to the original purchaser, this product to be free from defective material or workmanship for a period of one full year from the date of purchase. Watson Industries' liability under this warranty is limited to repairing or replacing, at Watson Industries' sole discretion, the defective product when returned to the factory, shipping charges prepaid, within one full year from the date of purchase. The warranty described in this paragraph shall be in lieu of any other warranty, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.

Excluded from any warranty given by Watson Industries are products that have been subject to abuse, misuse, damage or accident; that have been connected, installed or adjusted contrary to the instructions furnished by seller; or that have been repaired by persons not authorized by Watson Industries.

Watson Industries reserves the right to discontinue models, to change specifications, price or design of this product at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury that may result from the use, or misuse, of this product by the purchaser, his employees or agents. The purchaser further agrees that seller shall not be liable in any way for consequential damages resulting from the use of this product.

No agent or representative of Watson Industries is authorized to assume, and Watson Industries will not be bound by any other obligation or representation made in connection with the sale and/or purchase of this product.

PRODUCT LIFE

The maximum expected life of this product is 20 years from the date of purchase. Watson Industries, Inc. recommends the replacement of any product that has exceeded the product life expectation.

Customer Service

All repairs, calibrations and upgrades are performed at the factory. Before returning any product, please contact Watson Industries to obtain a Returned Material Authorization number (RMA).

Return Address & Contact Information

Watson Industries, Inc.
3035 Melby Street
Eau Claire, WI 54703
ATTN: Service Department
Telephone: (715) 839-0628 Fax: (715) 839-8248 email: support@watson-gyro.com

Returning the Product

Product shall be packaged making sure there is adequate packing around all sides. Correspondence shall include:

- Customer's Name and Address
- Contact Information
- Equipment Model Number
- Equipment Serial Number
- Description of Fault

It is the customer's responsibility to pay all shipping charges from customer to Watson Industries, including import and transportation charges.