PRO GYRO®

# Rate Gyro – Bipolar Output
# Owner's Manual

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## Introduction

Watson Industries has been designing and manufacturing solid-state gyros since 1980. They have now produced a new series of rate gyros, the Pro Gyro®. This breakthrough new gyro is built to be a VSG replacement and much more. Based on proven technology, this gyro is built under ISO 9001:2015 quality standards with many new features.

## Description

The Pro Gyro® is a solid state, single-axis, angular rate sensor. A vibrating structure detects angular rotation about the sensitive axis by sensing changes in the vibration pattern produced by Coriolis forces acting upon the gyro element. A sophisticated detection circuit then produces a DC voltage output proportional to the rate of rotation.

The Pro Gyro® has enhanced performance for acceleration insensitivity; low mounting sensitivity and excellent vibration rejection. Features that are standard for the Pro Gyro® include available rate ranges up to 475 degrees per second, internal power regulation for power input between 8 volts and 45 volts, EMI and RFI protection, and a case mounted connector.

This gyro has a Built In Test (BIT) output. This connection presents 5 volts DC when the unit is on and within normal operating parameters. This BIT function will detect almost all defects in the operation of the gyro plus it indicates as a fault when the gyro temperature exceeds its normal operating range.

## Characteristics

### *Electrical*

The input range, sensitivity, and resolution for different bipolar versions of the Pro Gyro® are given in Table 1.

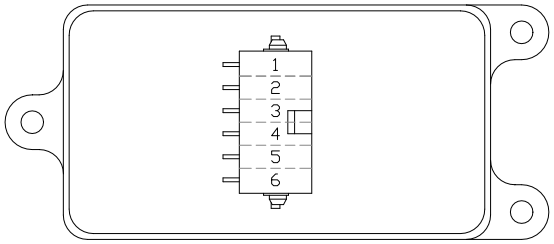
**Table 1**

| Part Number | Rate Input Range °/s | Nominal Scale Factor | | Resolution | Voltage Range for Full Scale Rate* |
|---|---|---|---|---|---|
| | | mV/°/s | °/s/V | | |
| PRO-122-3A(W) | ±50 | 100 | 10 | 0.013 | ±5 V |
| PRO-132-3A(W) | ±100 | 50 | 20 | 0.025 | ±5 V |
| PRO-142-3A(W) | ±200 | 25 | 40 | 0.05 | ±5 V |
| | Additional scale factors available on request. | | | | |

*Note: Some over range signal is available.

**Standard configuration with case mounted connector Pin-outs:**

| Pin | Description |
|---|---|
| 1 | Built In Test (BIT) Output |
| 2 | Signal Ground (Connected internally to Pin 5) |
| 3 | +2.5 Voltage Reference Output |
| 4 | Angular Rate Output |
| 5 | Power Ground |
| 6 | +8 to +45V Supply |



### *Pro Gyro® Specifications*

| | | |
|---|---|---|
| **Angular Rate** | | |
| Range: | ±100°/sec (Typical) | See table 1 above |
| Resolution: | 0.025°/sec (Typical) | See table 1 above |
| Analog Scale Factor: | 50mV/°/sec (Typical) | See table 1 above |
| Scale Factor Accuracy: | 0.2% | At constant room temperature |
| Scale Factor Temp Coefficient: | 0.5% | Over temperature range |
| Bias: | ±0.1°/sec | At room temp |
| Bias: Over Temp Range | ±0.5°/sec | |
| Warmup Drift: | ±0.1°/sec | |
| Non-Linearity: | < 0.15% | Full scale range |
| Bandwidth: | 70 Hz | |
| Noise: | < 0.1°/sec rms | 1 Hz to 100 Hz |
| **Environmental** | | |
| Temperature: Operating | -40°C to +85°C | |
| Temperature: Storage | -55°C to +85°C | |
| Vibration: Operating | 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: | 8 to 45VDC | Reverse protected |
| Input Current: | 25mA @ 12VDC | 0.3W |
| Analog Output: | ±5VDC (Typical) | See table 1 above |
| Analog Output Impedance: | 1000 Ohm | 5% |
| **Physical** | | |
| Size: Including Mounting Flanges | 1.2"W x 2.8"L x 1.2"H | 3.0 x 7.1 x 3.0 (cm) |
| Weight: | 2 oz | 56 grams |
| Connection: | Amp 1445057-6 Connector (6 pin) | Mating Connector Incl. 12" Wire bundle optional |
| Life: | > 100,000 Hrs MTBF | 20 years shelf life |

- Specifications are subject to change without notice.
- This product may be subject to export restrictions. Export Classification ECCN EAR99.

### *Mating Connector*

The Pro Gyro® mating connector is made by Amp-Tyco Electronics. One mating connector is included with each sensor. Each connector consists of two parts: the connector receptacle and the receptacle contacts (Qty 6). Additional connectors may be purchased from Amp-Tyco Electronics or electronics vendors such as Digikey and Mouser.

Connector Receptacle Housing:

| Vendor | Part Number |
|---|---|
| AMP-Tyco | 1445022-6 |
| Digikey | A30262-ND |
| Mouser | 571-14450226 |

26-30 AWG Contacts (Qty 6):

| Vendor | Part Number |
|---|---|
| AMP-Tyco | 1-794611-2 |
| Digikey | A33279-ND |
| Mouser | 571-1-794611-2 |

### *Mounting*

The physical dimensions of the unit are shown in Figure 2. A three-point mounting is provided on the case of the unit. The gyro is to be attached by three # 4 screws (or 3 mm) through the 0.120" holes in the mounting feet. To avoid distortion, the gyro must be attached to a clean, flat surface, and the fasteners must be tightened evenly.

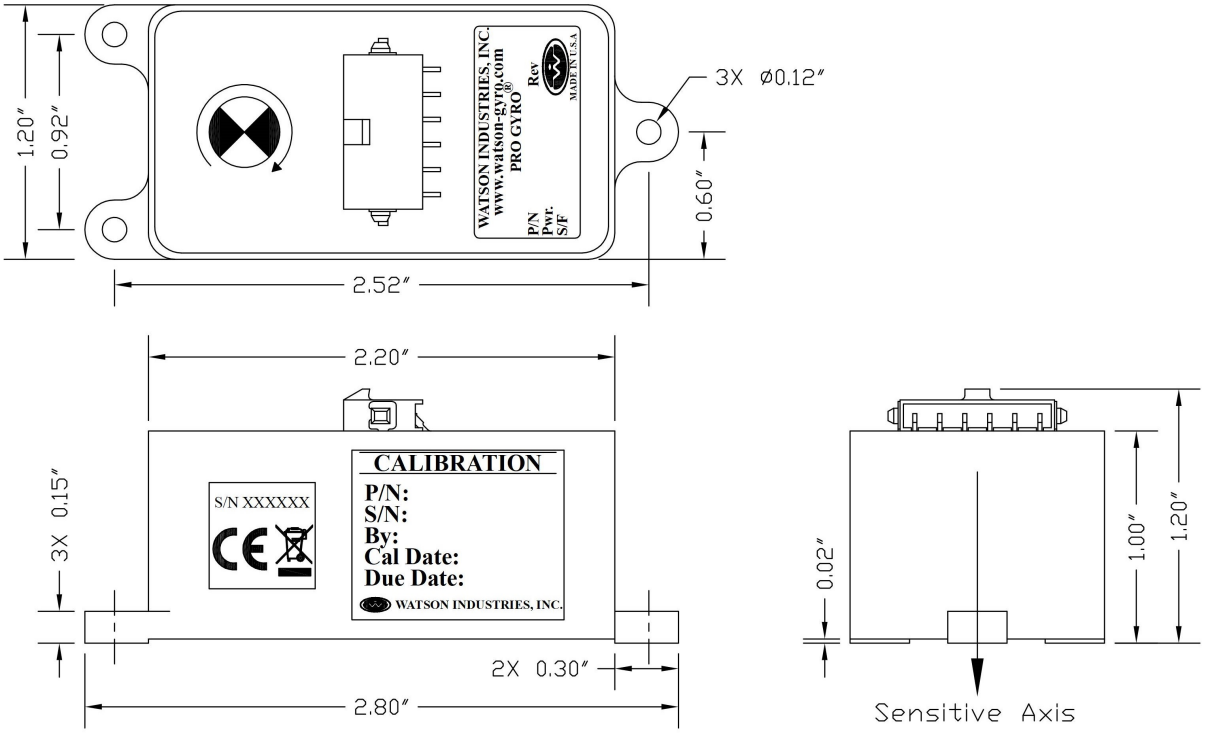



**Figure 2: Dimensions**

This gyro can serve as a replacement for the VSG – manufactured by British Aerospace. To facilitate this process, we offer an adapter plate as an option.

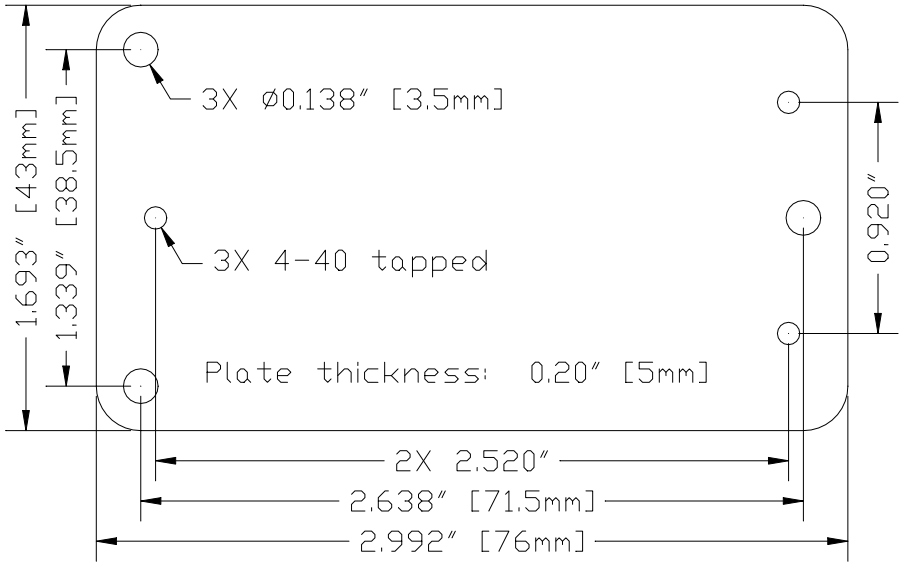



**Figure 3: Optional VSG Adapter Plate**

## Constraints

The case of the Pro Gyro® is splash resistant, but not hermetically sealed. Avoid prolonged exposure to moisture.

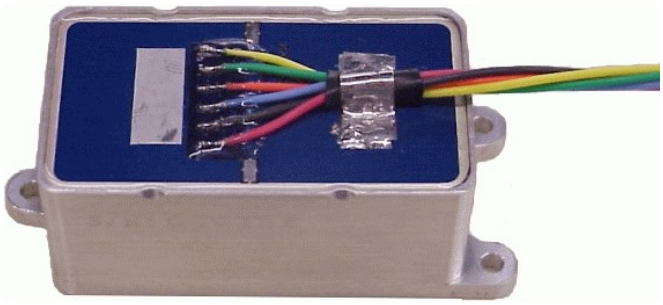
The power ground is already connected internally to the signal ground. Do not connect the ground wires externally.

***The Pro Gyro® although of rugged design, is a sensitive instrument. Take care when handling it.***

## Optional Configurations

***Wire Bundle (Flying Leads):***

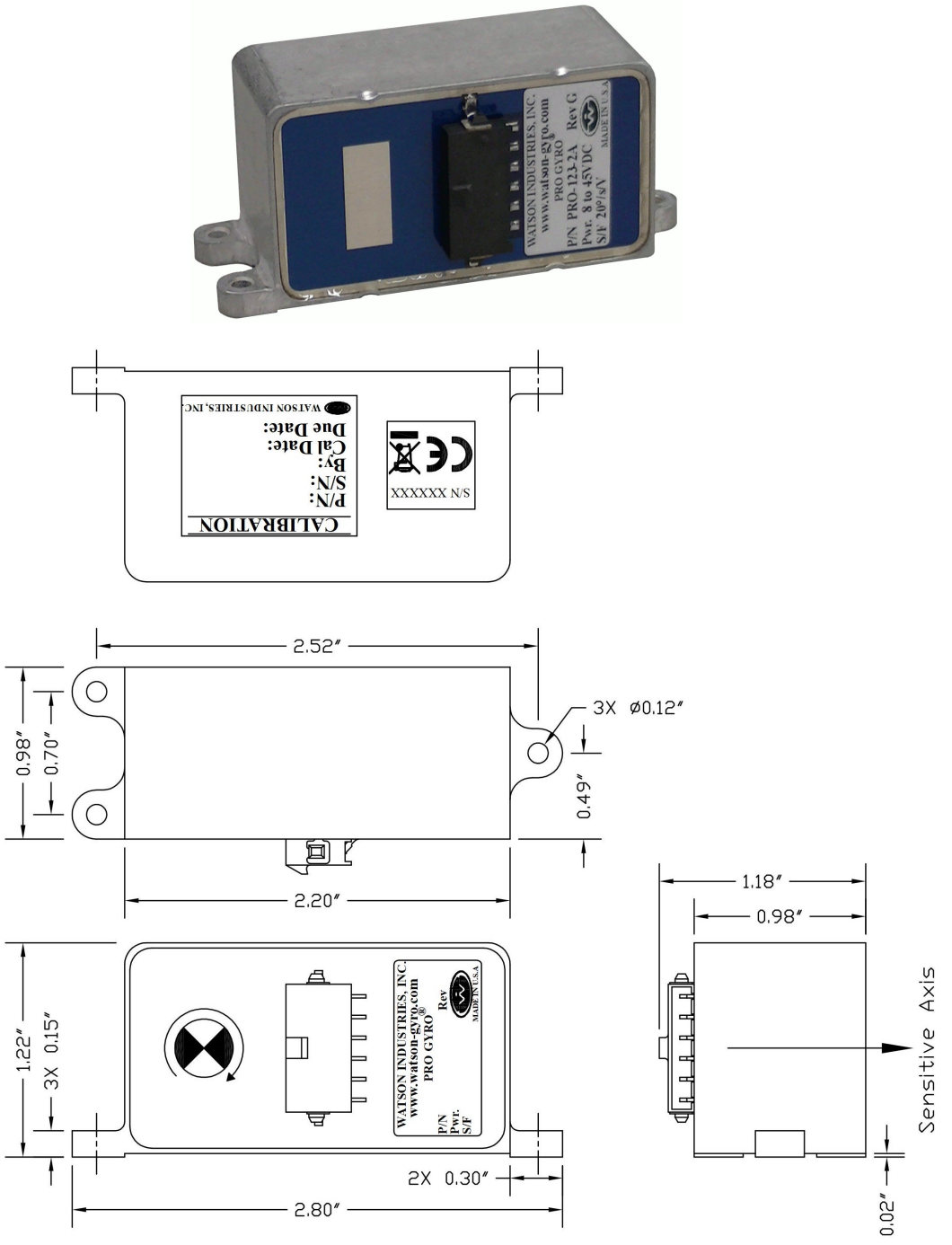
To order a Pro Gyro® with optional 12" wire bundle, add a 'W' to the part number (see Table 1 above). For example: PRO-122-3AW.



| Wire Color | Wire size | Description |
|---|---|---|
| Red | 24 awg extruded TFE | +8 to +45V Supply |
| Black | 24 awg extruded TFE | Power Ground |
| Blue | 24 awg extruded TFE | Angular Rate Output |
| Orange | 24 awg extruded TFE | +2.5 Voltage Reference Output |
| Green | 24 awg extruded TFE | Signal Ground (Connected internally to Power Ground) |
| Yellow | 24 awg extruded TFE | Built In Test (BIT) Output |

***Alternate Orientation:***

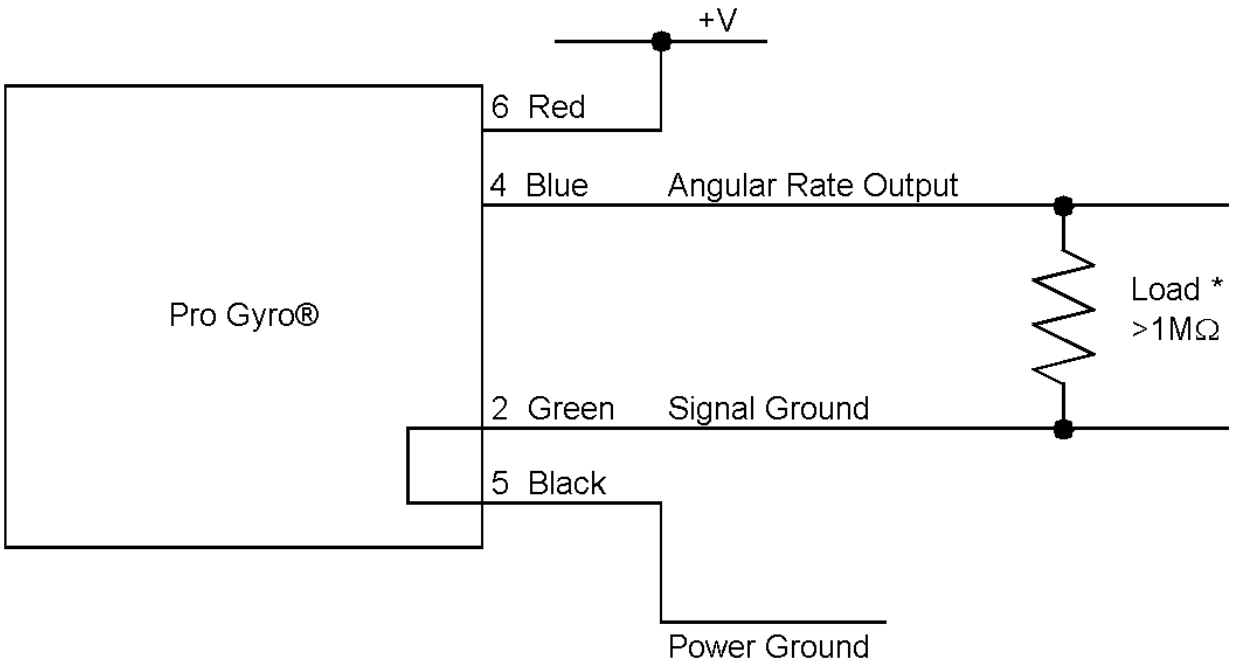
To mount a Pro Gyro® so that its sensitive axis is parallel with the mounting surface, you can order the gyro with an alternate enclosure. To order this gyro instead involves changing one number in the gyros part number. For example: The part number for a PRO-122-3A with an alternate enclosure would be a PRO-123-3A.




Pro Gyro® – Alternate Enclosure

Note: A gyro can have both a wire bundle and an alternate enclosure.

## Typical Operating Circuit




*Note: For Loads less than 1.0 M ohm, the scale of the output will be affected.

Zero rate = 0 VDC
+ Full Scale = +5.0 VDC
- Full Scale = –5.0 VDC

**Figure 4: Typical Bipolar Configuration Referenced to Signal Ground**

## Warning

Rough handling, dropping, or miswiring this unit is likely to cause damage.

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 two full years 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 two full years 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.**

## Safety Information

Watson Industries

**EC Declaration of Conformity**

Manufacturer
Watson Industries, Inc.
3035 Melby St.
Eau Claire, Wisconsin 54703 USA

Plant
Watson Industries, Inc.
3035 Melby St.
Eau Claire, Wisconsin 54703 USA

CE

Hereby declare that:

Product Description: Single Axis Angular Rate Gyro
Product Name: PRO-122-2A, PRO-122-3A
PRO-132-2A, PRO-132-3A
PRO-142-2A, PRO-142-3A
PRO-152-2A, PRO-152-3A
Model Number: PRO

are in conformity with the provisions of the directives applied: Electromagnetic Compatibility Directive 2004/108/EC

Harmonized Standards applied:
EMC: EN 55011:2009/A1:2010 Group 1 Class B
EN 61326-1:2006

Issued By: Watson Industries, Inc.

Signature: _____

William S. Watson
President

## Waste Electrical and Electronic Equipment Directive

This symbol on the product or its packaging indicates that the product must not be disposed of with normal household waste. Instead, it is your responsibility to dispose of your waste equipment by arranging to return it to a designated collection point for the recycling of waste electrical and electronic equipment. By separating and recycling your waste equipment at the time of disposal you will help conserve natural resources and ensure that the equipment is recycled in a manner that protects human health and the environment. For more information, contact Watson Industries, Inc. or visit www.watson-gyro.com