# Gurley Series 8X60
# Angle Encoder

**Motion Type:**

Rotary

**Usage Grade:**

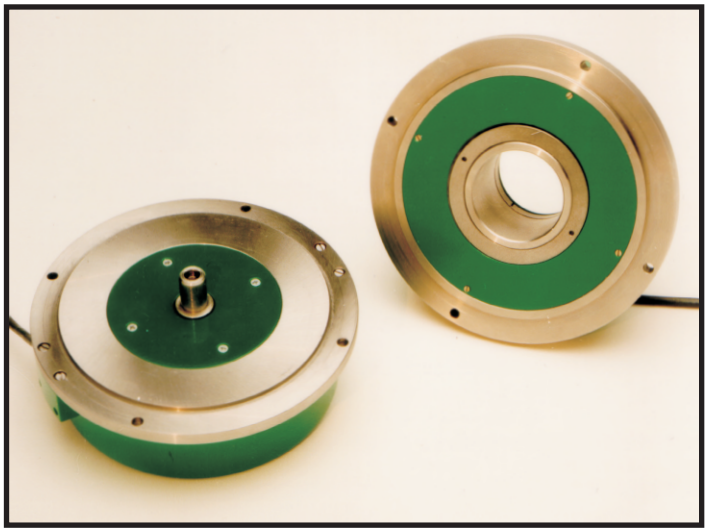
Industrial Metrology

**Output:**

Incremental

**Max Resolution:**

0.000078°
(0.28 arcsec)



## Very High Resolution - Industrial Ruggedness

The Series 8X60 is a robust metrology-grade encoder that is equally well-suited for industrial applications. It incorporates four reading heads to eliminate many common sources of encoder errors, while its stainless steel construction greatly enhances resistance to shock and vibration.

It is designed for very precise positioning of rotary tables on machine tools, coordinate measuring machines, dividing apparatus, antennas, test equipment and similar devices.

The 8X60 incorporates an internal ASIC (application-specific integrated circuit) to generate quadrature square waves up to 64 times the line count on the disc. Thus, the resolution (after 4X quadrature evaluation by the user) can be as fine as 0.28 arcsec (0.000078°, or 4,608,000 counts per revolution).

The 8X60 is available in both shafted and hollow shaft versions, and is interchangeable with common competitive products. It comes in two accuracy grades:

**8460: ± 2 arcseconds accuracy**
**8560: ± 1.25 arcseconds accuracy**

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ISO 9001 Certified

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**514 Fulton Street**
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**(800) 759-1844, (518) 272-6300, fax (518) 274-0336,**
**Online at www.gurley.com, e-mail: info@gurley.com**

GPI

# Specifications

| MODEL | 8460H | 8460S | 8560S |
|---|---|---|---|
| Input Power | +5 VDC +/- 5%, 150 mA max | | |
| Available line counts | 12960, 15000, 16384 and 18000 | | |
| Output waveforms<br>Data<br>Index<br>Fault detection signal | Quadrature square waves<br>¼-cycle wide, gated with high states of A and B<br>Active low pulse indicates out-of-tolerance encoder operation | | |

For all models:

| Interpolation | Deg. Of Res. (arcsec) | Max. Output Frequency, mHz | RPM |
|---|---|---|---|
| 64X | 0.00007° (0.28) | 2.70 | 140 |
| 50X | 0.0001° (0.36) | 2.70 | 180 |
| 32X | 0.00015° (0.56) | 2.70 | 280 |
| 25X | 0.0002° (0.72) | 1.35 | 180 |
| 16X | 0.0003° (1.125) | 1.60 | 330 |
| 10X | 0.0005° (1.80) | 1.00 | 330 |
| 8X | 0.0006° (2.25) | 0.80 | 330 |
| 5X | 0.001° (3.60) | 0.50 | 330 |
| 4X | 0.0012° (4.50) | 0.64 | 530 |
| 2X | 0.0025° (9.0) | 0.32 | 530 |
| 1X | 0.005° (18.0) | 0.16 | 530 |

| | | | |
|---|---|---|---|
| Output device | EIA/RS-422 differential line drivers (TTL compatible) on all channels | | |
| Accuracy at 20° C | +/- 2.0 arcsec | | +/- 1.25 arcsec |
| Maximum output frequency | 3 MHz (with 50X interpolation) | | |
| Maximum weight, kg [lb] | 3.8 [8.4] | 3.5 [7.7] | |
| Starting torque at 20°C Nm [in-oz] | 0.5 [75] | 0.012 [1.8] | |
| Moment of inertia g-cm$^2$ [in-oz-s$^2$] | 1700 [0.24] | 3140 [0.44] | |
| Maximum shaft load | N/A | 30 N [7 lb] (axial or radial) | |
| Protection level | IP64 | | |
| Operating temperature | 0°C to 50°C [32°F to 122°F] | | |
| Maximum mech. speed | 1000 RPM | | |

## USING THE 8X60

In order to have a system that does not miss any counts during the 4X quadrature evaluation, user's counter or input circuit must be able to detect quadrature edges as close as 50 nanoseconds, which corresponds to a 20 MHz count rate.

## WATCHDOG CIRCUIT

A fault-detection circuit constantly monitors the encoder's internal signals . If they deviate beyond prescribed limits, an active-low signal is generated.

Fault conditions detectable by this circuit include:
-LED light source failure or aging
-Defective photo-detectors
-Contamination of the code disc or other optical components
-Localized code disc defects such as chips or cracks



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# Specifications

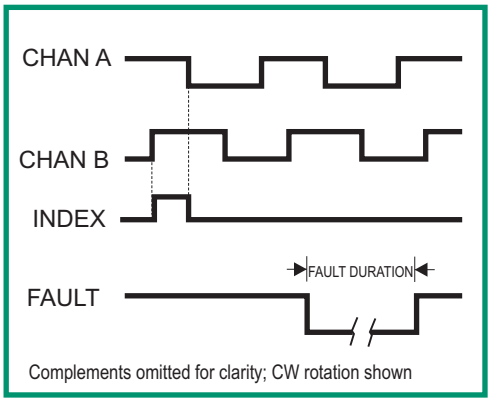
## SHAFT COUPLING

The Model 8460H incorporates an internal coupling that easily clamps to the user's shaft; it does not require threads, precise shoulders or other special machining.

To take full advantage of the inherent accuracy of the Model 8X60S, we recommend that either the SCB-14MN or SCC-14MN shaft coupling be used to connect the encoder shaft to the user's shaft or rotary table.

| COUPLING SPECIFICATIONS | SCB-14MN | SCC-14MN |
|---|---|---|
| Kinematic accuracy | ± 0.5 arcsec (1) | |
| Torsional rigidity, N-m/rad [in-oz/arcsec] | 6000 [4.1] | 4000 [2.7] |
| Maximum parallel offset, mm [in] | 0.3 [0.012] | 0.5 [0.020] |
| Max. axial extension or comp., mm [in] | 0.1 [0.004] | 0.5 [0.020] |
| Maximum angular misalignment | 0.2° | 2.0° |
| Moment of inertia (approximate) g cm$^2$ [ in-oz-s$^2$] | 2000 [0.028] | |

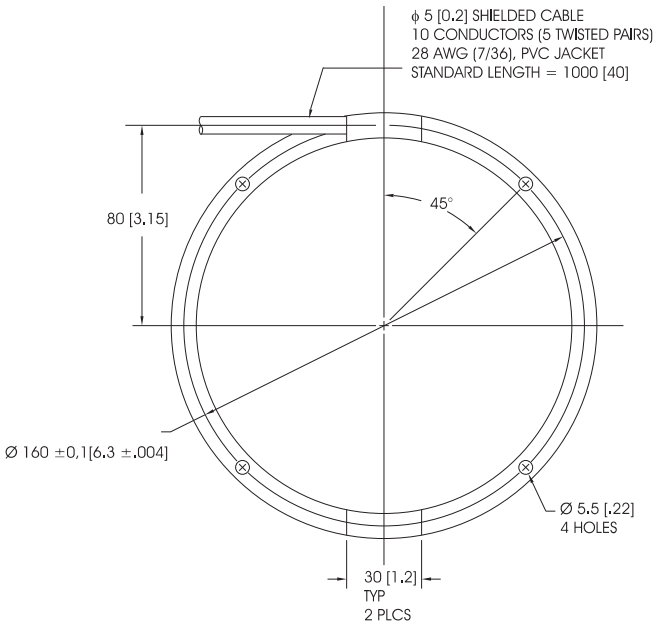
## OUTPUT SIGNALS

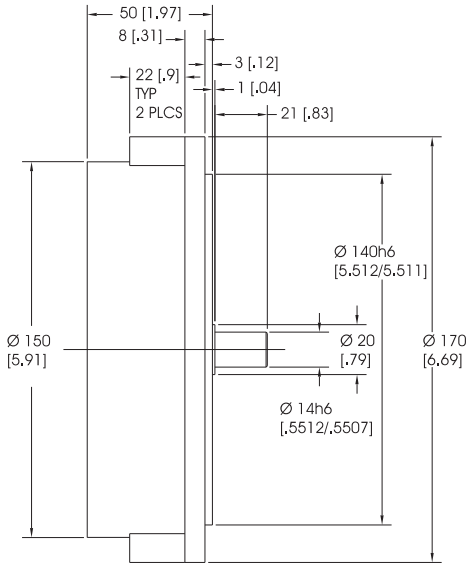



**NOTES:**

1. With parallel offset ≤ 0.05 mm and angular misalignment ≤ 0.03°
2. Weight in grams [lbs] is 190 [0.42]
3. Clamping screw torque, N-M [in-lb] is 1 [9]

# 8X60S Dimensions




*ALL DIMENSIONS IN mm [in]*

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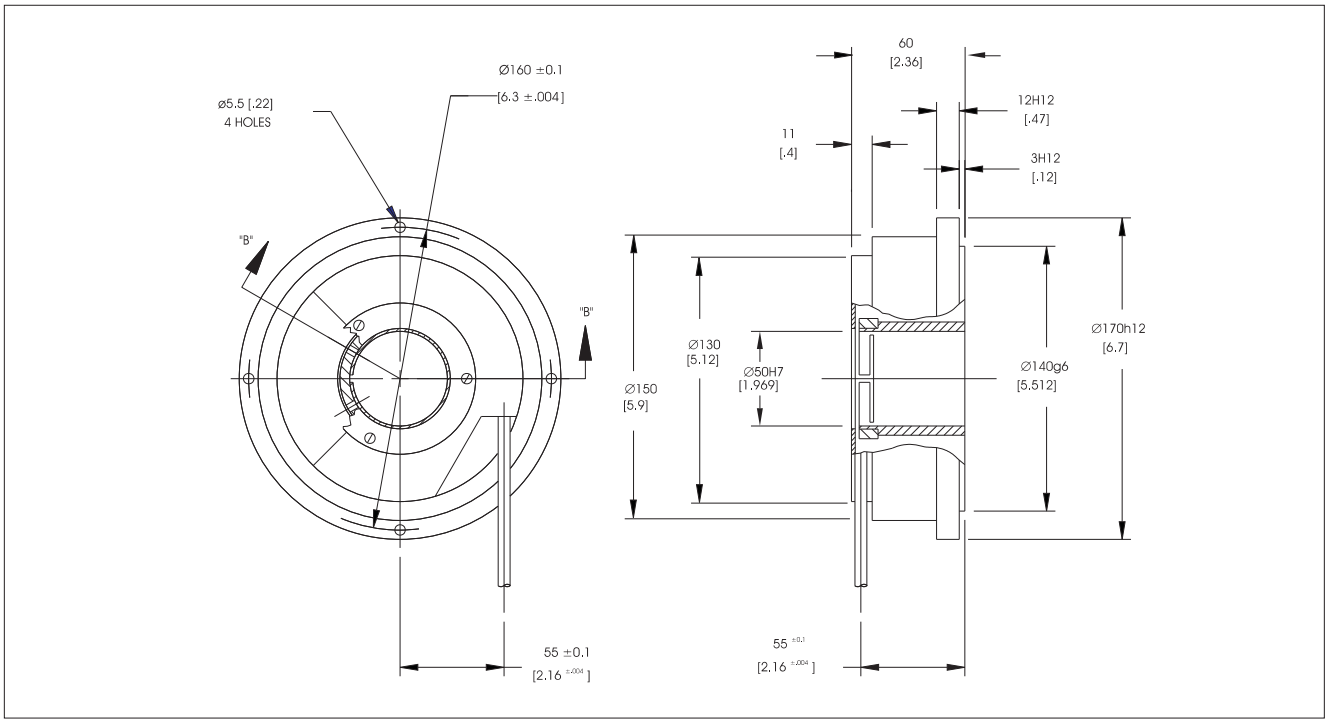
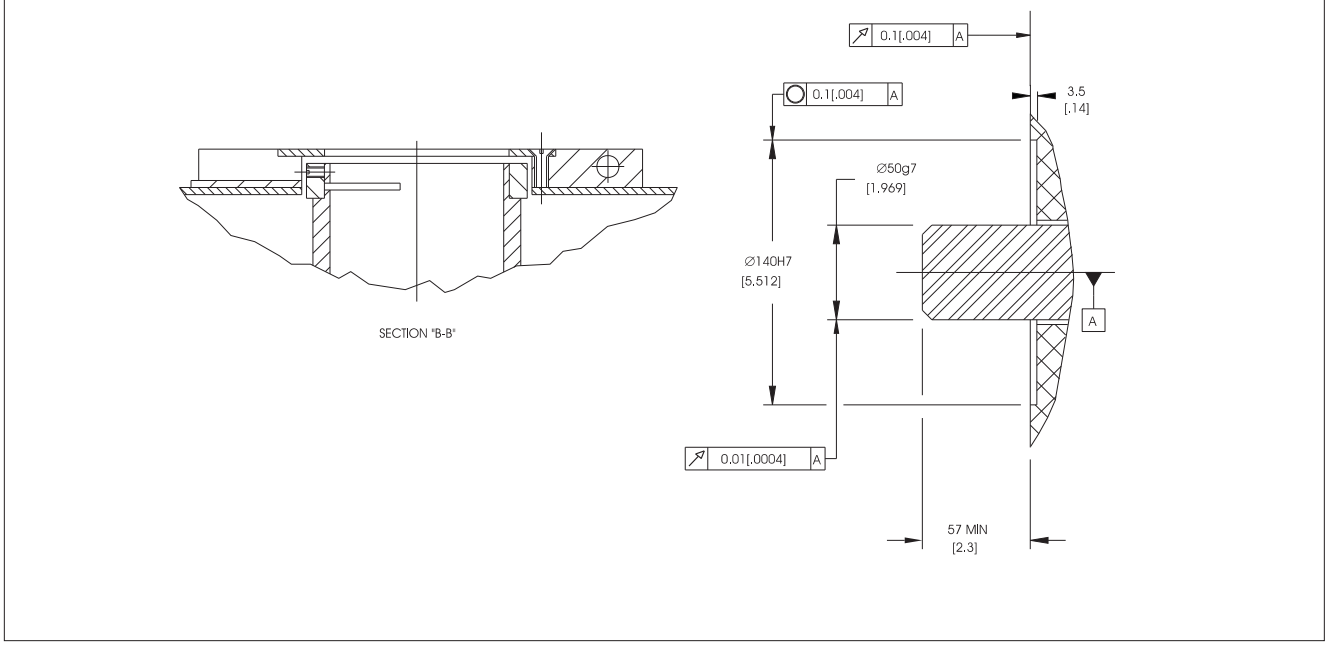
## Model 8460H




## User's Mounting Dimensions

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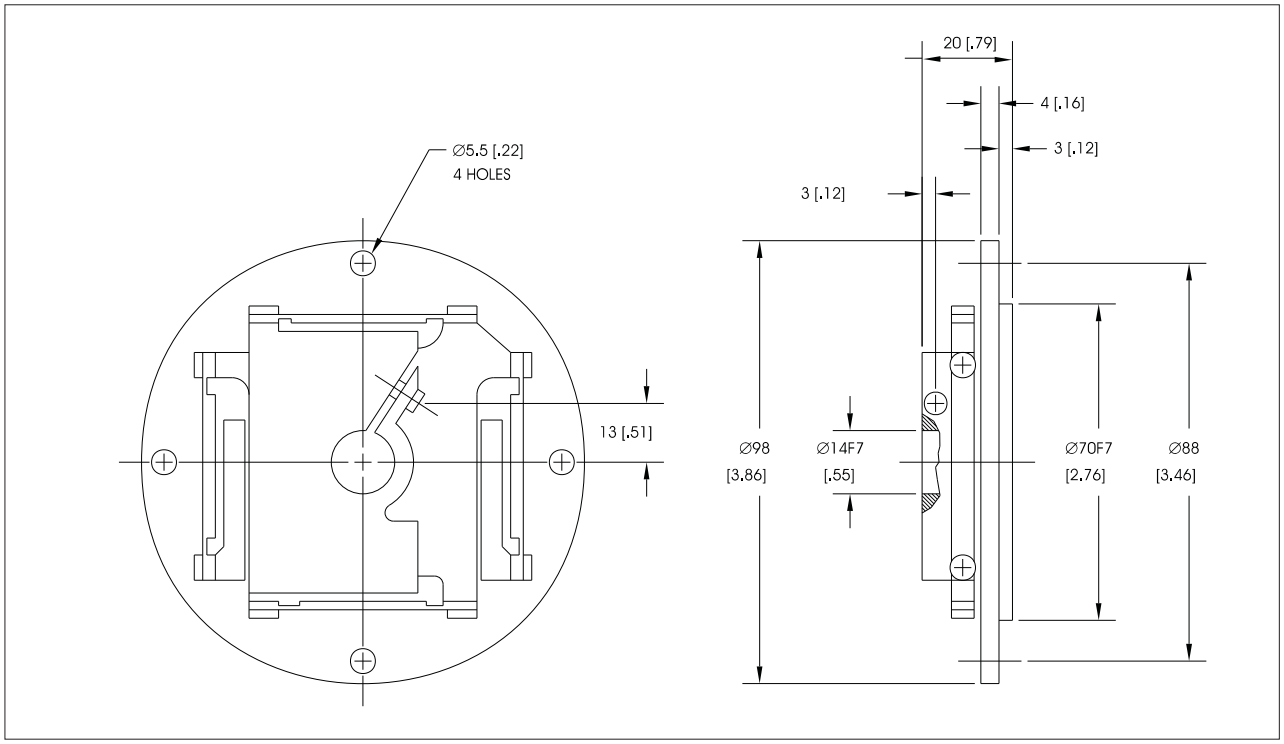
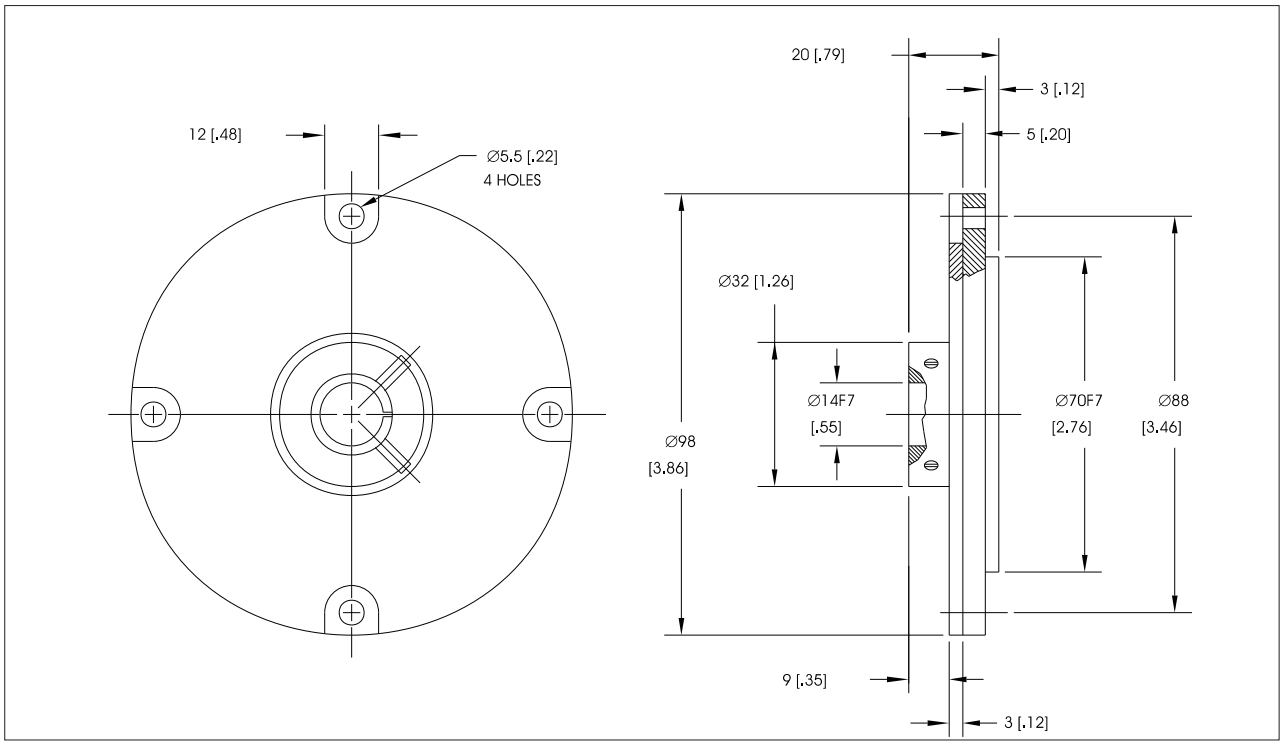
## OPTIONAL SCB-14MN SHAFT COUPLING




## OPTIONAL SCC-14MM SHAFT COUPLING

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# Ordering Information

| MODEL | SHAFT | LINES | IND | VOLT | OUT | INTERP | BASE | CABLE | EXIT | CONN | DIA | SPEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q | 5 | L | | A | | S | | | |

**MODEL**
**8460** ± 2 arcsec accuracy
**8560** ± 1.25 arcsec accuracy

**SHAFT** - shaft type
**S** Solid shaft
**H** Hollow shaft (8460 only)

**LINES** - Disc line count
**12960, 15000, 16384, 18000**

**IND** - Index format
**Q** Quarter cycle

**V** - Input voltage
**5** +5 volts dc

**OUT** - Output format
**L** RS-422 differential line driver

**INTERP** - Interpolation factor
**01, 02, 04, 08, 10, 16,**
**25, 32, 50, 64** X

**BASE** - Base
**A** Synchro/face mount

**CAB** - Cable length, inches
**40** Standard

**EXIT** - Cable exit
**S** Side

**CONN** - Connector
**P** Pigtails (no connector)
**Q** DA - 15P
**S** DE-9P (FLT and /FLT not available)

**DIA** - Shaft diameter
**14M** Solid shaft
**50M** Hollow shaft

**SPEC** - Special features
**N** No special features

**OPTIONS**
**SCB-14MN** Shaft coupling
**SCC-14MN** Shaft coupling
**M01** Mating connector for DA-15P
**M06** Mating connector for DE-9P

| ELECTRICAL CONNECTIONS | | | |
|---|---|---|---|
| CONN. CODE | **P** | **Q** | **S** |
| CONN. TYPE | NONE | DA-15P | DE-9P |
| FUNCTION | COLOR | PIN # | PIN # |
| A | Yellow | 8 | 4 |
| / A | Brown | 7 | 8 |
| B | Green | 5 | 3 |
| / B | Orange | 4 | 7 |
| IND | Blue | 2 | 2 |
| / IND | White | 1 | 6 |
| + V | Red | 10 | 5 |
| COMMON | Black | 13 | 9 |
| CASE | Drain | 9 | 1 |
| FAULT | Violet | 12 | N/A |
| / FAULT | Gray | 11 | N/A |
| MATING CONN. | - | M01 | M06 |

## SPECIAL CAPABILITIES

For special situations, we can optimize catalog encoders to provide higher frequency response, greater accuracy, wider temperature range, reduced torque, non-standard line counts, or other modified characteristics. In addition, we regularly design and manufacture custom encoders for user-specific requirements. These range from high-volume, low-cost, limited-performance commercial applications to encoders for military, aerospace and similar high-performance, high-reliability conditions. We would welcome the opportunity to help you with your encoder needs.

## WARRANTY

Gurley Precision Instruments offers a limited warranty against defects in material and workmanship for a period of one year from the date of shipment.



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