

**REVISED  
SPECIFICATION  
NOW WITH 12 BIT RESOLUTION**



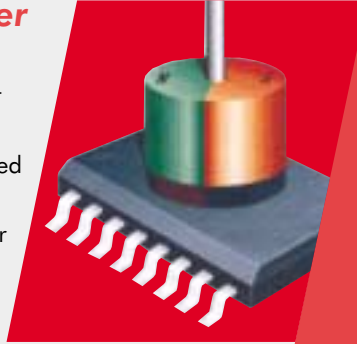
# SRH CONTACTLESS ROTARY SENSORS

# INNOVATION IN MOTION

Penny+Giles SRH280 and SRH880 contactless rotary sensors have been specially developed to provide maximum performance under extremes of temperature, humidity, vibration, shock and immersion

## Contactless magnetic rotary encoder

The SRH series rotary position sensor uses a high performance 12 bit magnetic rotary encoder ASIC that includes integrated Hall elements and digital signal processing. The angular position information is provided by a two pole magnet integrated with the sensor shaft. The sensor provides a Pulse Width Modulated signal or an absolute analogue voltage signal by using a low-pass filter circuit. Able to operate from an 8 to 30 Vdc unregulated supply, with a high stability circuit and EMC immunity to 100V/m, this new sensor is ideally suited to operation in extremely hostile applications such as off-road vehicles.



### Features

- Contactless technology
- Absolute analogue or digital (PWM) output
  - Measuring range from 90° to 360°
- Temperature error less than 50ppm/°C
- Rugged housing and shaft design
  - Protection up to IP68M
- Choice of shaft attachments and mountings
  - Duplex shaft bearing support
- Rapid despatch of any option
  - CE approved



### Benefits

- Long life and impervious to dither vibration
- No loss of position on power down
- Maximum sensitivity in all applications
- Maximises system accuracy over temperature range
- Suitable for extreme environments
- Operation in hostile environments including submersion
- Interchangeable with existing installations
- Optimum performance under vibration and shock
- Eliminates customer inventory
- Confidence in EMC performance



#### EMC Directive 89/336/EEC

The products detailed in this document have been tested to the requirements of EN 61000-6-2 (Immunity).



#### Quality Assurance

Penny+Giles are accredited to BS EN ISO9001:2000. Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

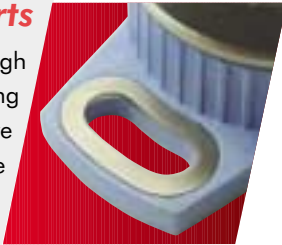
Certificate No. LRQ 0924881

# SRH280 contactless rotary sensor

The SRH280 sealed rotary sensor has been specially developed to meet the harsh requirements of today's automotive, motorsport and industrial position sensing applications. Interchangeable with the popular 38mm fixing centres format, several innovative features are included to increase the reliability and performance over similar devices already in service. The contactless operating principle makes this sensor particularly suitable for applications where a high level of dither vibration is present.

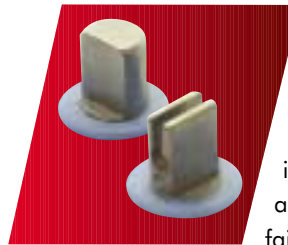
## Crush proof inserts

The sensor housing is a high strength glass-filled engineering polymer that has the added feature of stainless steel inserts around the mounting screw area so preventing damage to the flange by over-tightening. This permits the sensor to be re-used after installation and allows minute adjustments to be made.



## Shaft attachment

The sensor shaft has the option of two attachment formats that are interchangeable with existing installations. The sprung shaft style is a one-piece design that eliminates failures caused by more common two-piece designs. The shaft can be sealed to meet IP50 or IP68 protection.



## Cable outlet

The sensor rear housing has an integrally moulded cable fully sealed to IP68, effectively eliminating the need to over-fit a moulded boot to improve sealing, thus saving the user time and cost. To facilitate the addition of supplementary heatshrink sleeving over the cable, a small lip on the moulding assists attachment at the sensor housing. The standard cable length supplied is 0.5m.



# SRH880 submersible contactless rotary sensor

The SRH880 submersible contactless rotary sensor has been specifically developed to meet the harsh operating environments in heavy duty industrial position sensing applications, including construction, agricultural and military vehicles, steelworks and power generation plants. The contactless operating principle makes this sensor particularly suitable for applications where a high level of dither vibration is present. The sensor is sealed to meet IP68M protection.

## Choice of mounting

The sensor can be mounted by three M6 clearance holes through the body, or alternatively by three M6 threaded attachment holes in the front face. The sensor shaft has a flat on the diameter that would allow it to be secured by a locking screw, or an optional lever kit can be used to attach to the moving surface via a selection of M8 threaded holes.



## Rugged design - superior protection

The rugged, 88mm diameter housing in a choice of aluminium or stainless steel, includes a stainless steel operating shaft supported by a heavy duty, twin ball-race bearing system for maximum strength. Environmental protection is achieved by a unique double sealing system that allows the sensor to operate fully submerged to 2m.

# SRH280 CONTACTLESS ROTARY SENSOR

## PERFORMANCE

### ELECTRICAL

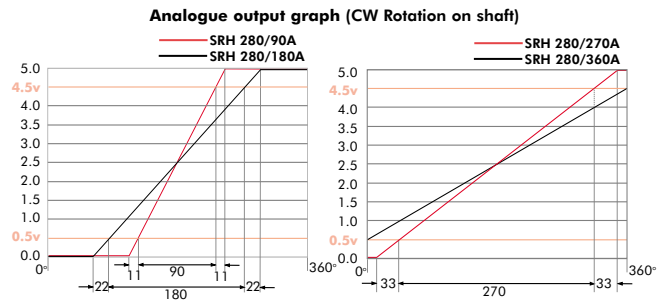
<b>Supply voltage</b>	<b>Vdc</b>	8 to 30 (unregulated)
<b>Over voltage protection</b>	<b>Vdc</b>	Up to 40 (-40 to +60°C)
<b>Maximum supply current</b>	<b>mA</b>	25
<b>Reverse polarity protection</b>		Yes - indefinitely
<b>Resolution</b>	<b>°</b>	0.088 (12bit)
<b>Non-linearity</b>	<b>%</b>	±0.2
<b>Temperature coefficient</b>	<b>ppm/°C</b>	<±50

#### Analogue Output option (A)

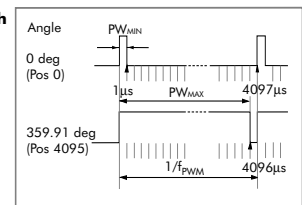
<b>Measuring range</b>	<b>°</b>	90, 180, 270 or 360
<b>Voltage output range</b>	<b>Vdc</b>	0.5 to 4.5 (over selected angle)
<b>Range accuracy</b>	<b>%</b>	1.0
<b>Load resistance</b>	<b>kΩ</b>	>5
<b>Output noise</b>	<b>mVAC</b>	<5 rms
<b>Output lag @ 3600°/S</b>	<b>mS</b>	200

#### PWM Output option (P)

<b>Measuring range</b>	<b>°</b>	360
<b>Digital output</b>		See diagram
<b>MIN pulse width</b>		1μS = 0°
<b>MAX pulse width</b>		4096μS = 359.91°
<b>PWM frequency</b>	<b>Hz</b>	244 ±5% (signal period = 4097μS ±5%)
<b>Output current maximum</b>	<b>mA</b>	4
<b>Output lag</b>	<b>mS</b>	0.1



**PWM output graph**



### MECHANICAL

<b>Mechanical angle</b>	<b>°</b>	360, continuous
<b>Mounting</b>		Use 2 x M4 socket head cap screws and M4 washer - maximum tightening torque 2Nm
<b>Operating torque maximum</b>		
unsealed shaft <b>IP50 gm cm</b>		100
sealed shaft <b>IP68 gm cm</b>		120
<b>Shaft velocity maximum</b>	<b>°/sec</b>	3600
<b>Weight</b>	<b>g</b>	35
<b>Phasing</b>		When shaft flat or shaft ident mark is in line with cable exit, output is at mid travel (±10°) The sensor housing allows for 20° adjustment via the mounting flange slots.

### ENVIRONMENTAL

<b>Protection class</b>		IP68 or IP50
<b>Life</b>		
unsealed shaft <b>IP50</b>		Exceeds 20 million operations (10 x 10 <sup>6</sup> cycles) of ±75°
sealed shaft <b>IP68</b>		20 million operations (10 x 10 <sup>6</sup> cycles) of ±75°
<b>Dither life</b>		Contactless - no degradation due to shaft dither
<b>Operational temperature†</b>	<b>°C</b>	-40 to +120 @ 8Vdc input (tested to +127 for 1 hour duration) -40 to +90 @ 30Vdc input (tested to +122 for 1 hour duration)
<b>Storage temperature</b>	<b>°C</b>	-55 to +125
<b>Vibration</b>		RTCA-DO160D, 10Hz to 2000Hz (random), 12.61g rms - all axes
<b>Shock</b>		Survival to 2500g - all axes
<b>EMC Immunity level</b>		
<b>EN 61000-6-2: 200MHz to 1GHz</b>		Threat 100V/m : derangement <±0.25% FS

† If the maximum operating temperature is exceeded, the voltage regulator will shut down to protect the device from overheating

## OPTIONS

### Measuring range/output

90°, 180°, 270° or 360° with Analogue voltage output  
 360° only with Digital PWM output

### Shaft style

D or sprung shaft (S)

### Shaft sealing

IP50 or IP68

### Custom housing

Synchro mount style with ball race bearings - ask our technical sales team for details

### Alternative output

Synchronous Serial Interface (SSI) output can be offered to high volume OEMs

## AVAILABILITY

All standard configurations can be supplied within five days from the factory

## ORDERING CODES

SRH280/...../...../...../.....

Measuring range/output  
 360P = 360° PWM  
 360A = 360° Analogue  
 270A = 270° Analogue  
 180A = 180° Analogue  
 090A = 90° Analogue

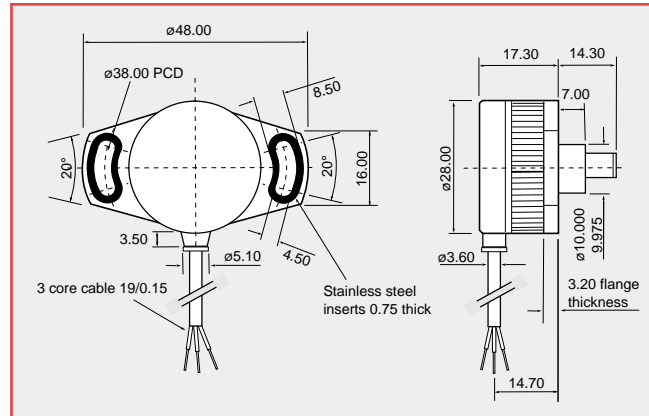
Shaft style D = D shaft  
 S = Sprung shaft

Cable A = 0.5m

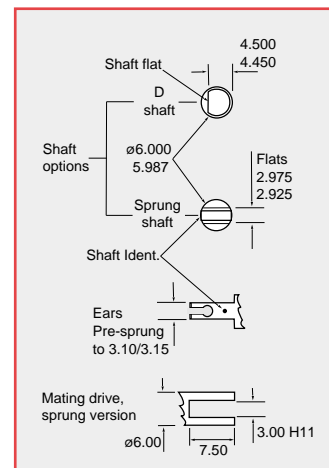
Shaft sealing 50 = IP50  
 68 = IP68

## DIMENSIONS

Note: drawings not to scale



## SHAFT OPTIONS



## ELECTRICAL CONNECTIONS

500mm of 3 core cable: PUR sheathed, with PTFE insulated 19/0.15 cores

### Cable colour Description

Red	+V Supply
Yellow	Output
Black	0V Supply (GND)

Output increases with CW rotation viewed on shaft

When connecting the sensor, care should be taken with the correct connections. The sensor is provided with indefinite reverse polarity protection and short circuit protection between output (Yellow) to GND (Black), but if the output (Yellow) is connected to the supply it will result in device failure.

# SRH 880 SUBMERSIBLE CONTACTLESS ROTARY SENSOR

## PERFORMANCE

### ELECTRICAL

<b>Supply voltage</b>	<b>Vdc</b>	8 to 30 (unregulated)
<b>Over voltage protection</b>	<b>Vdc</b>	Up to 40 (-40 to +60°C)
<b>Maximum supply current</b>	<b>mA</b>	25
<b>Reverse polarity protection</b>		Yes - indefinitely
<b>Resolution</b>	<b>°</b>	0.088 (12bit)
<b>Non-linearity</b>	<b>%</b>	±0.2
<b>Temperature coefficient</b>	<b>ppm/°C</b>	<±50

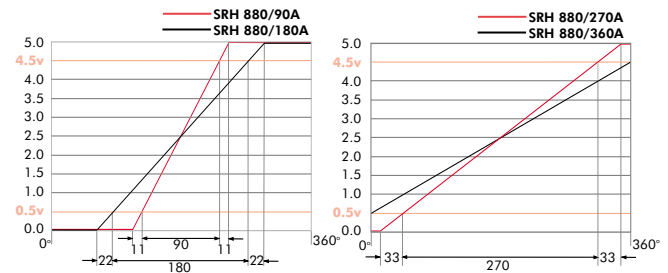
### Analogue Output option (A)

<b>Measuring range</b>	<b>°</b>	90, 180, 270 or 360
<b>Voltage output range</b>	<b>Vdc</b>	0.5 to 4.5 (over selected angle)
<b>Range accuracy</b>	<b>%</b>	1.0
<b>Load resistance</b>	<b>kΩ</b>	>5
<b>Output noise</b>	<b>mVAC</b>	<5 rms
<b>Output lag @ 3600°/S</b>	<b>mS</b>	200

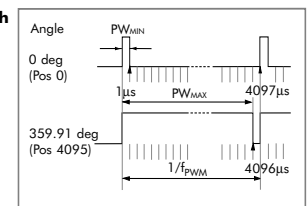
### PWM Output option (P)

<b>Measuring range</b>	<b>°</b>	360
<b>Digital output</b>		See diagram
<b>MIN pulse width</b>		1μS = 0°
<b>MAX pulse width</b>		4096μS = 359.91°
<b>PWM frequency</b>	<b>Hz</b>	244 ±5% (signal period = 4097μS ±5%)
<b>Output current maximum</b>	<b>mA</b>	4
<b>Output lag</b>	<b>mS</b>	0.1

Analogue output graph (CW Rotation on shaft)



PWM output graph



### MECHANICAL

<b>Mechanical angle</b>	<b>°</b>	360, continuous
<b>Mounting</b>		Use 3 x M6 threaded holes in front face or 3 x M6 clearance holes through the body See dimensions for details
<b>Operating torque max</b>	<b>gmcm</b>	1000
<b>Shaft velocity max</b>	<b>°/sec</b>	3600
<b>Weight</b>	<b>g</b>	500
<b>Phasing</b>		When through hole in shaft (and shaft flat) are 90° from scribed mark on front face, output is at mid travel (±5°)

### ENVIRONMENTAL

<b>Protection class</b>		IP68M
<b>Shaft seal life</b>		>20 million operations (10 x 10 <sup>6</sup> cycles) of ±75° Sensing element life is essentially infinite (contactless), but the SRH880 life figures refer to the shaft seal. Mechanical load (axial and radial) on the shaft should also be a considered.
<b>Dither life</b>		Contactless - no degradation due to shaft dither
<b>Operational temperature†</b>	<b>°C</b>	-40 to +120 @ 8Vdc input (tested to +127 for 1 hour duration) -40 to +90 @ 30Vdc input (tested to +122 for 1 hour duration)
<b>Storage temperature</b>	<b>°C</b>	-55 to +125
<b>Vibration</b>		RTCA-DO160D, 10Hz to 2000Hz (random), 12.61g rms - all axes
<b>Shock</b>		Survival to 2500g - all axes
<b>EMC Immunity level</b>		
<b>EN 61000-6-2: 200MHz to 1GHz</b>		Threat 100V/m : derangement <±0.25% FS

† If the maximum operating temperature is exceeded, the voltage regulator will shut down to protect the device from overheating

## OPTIONS

### Measuring range/output

90°, 180°, 270° or 360° with Analogue voltage output  
360° only with Digital PWM output

### Cabled socket

2m or 5m cabled socket assemblies available (rated -25 to +90°C only)

### Body material

Optional anodised aluminium or corrosion resistant stainless steel housing

### Operating levers

155 or 230mm long. See details on page 7

### Alternative output

Synchronous Serial Interface (SSI) output can be offered to high volume OEMs

### Flameproof enclosure

Please ask our technical sales team for details on our capability

## AVAILABILITY

All standard configurations can be supplied within ten days from the factory

## ORDERING CODES

SRH880/...../...../.....

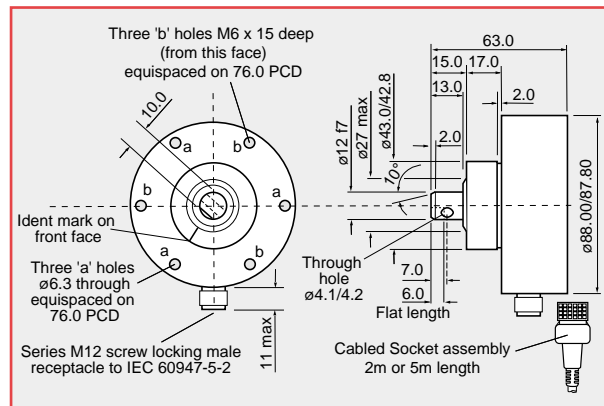
Measuring range/output  
360P = 360° PWM  
360A = 360° Analogue  
270A = 270° Analogue  
180A = 180° Analogue  
090A = 90° Analogue

Cabled socket  
00 = None  
02 = 2m  
05 = 5m

Body material  
AL = Aluminium  
SS = Stainless steel

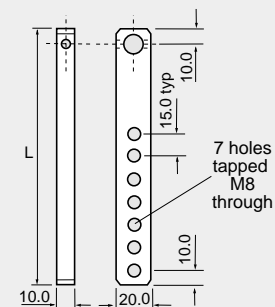
## DIMENSIONS

Note: drawings not to scale



## LEVER OPTIONS

Accessories (order separately)  
Lever SA202195/MK1 L = 155  
Lever SA202195/MK2 L = 230



## ELECTRICAL CONNECTIONS

### Straight cabled socket

E series M12 to IEC 60947-5-2, PUR jacket

Conforms to VDE 0472 part 804

Cable temperature range -25 to +90°C

Pin No.	Cable colour	Description	Cabled socket
1	Brown	0V Supply (GND)	2 metre long No. X61-169-102
3	Blue	+V Supply	(Hirschmann No. 934 401-203 2m)
4	Black	Output	5 metre long No. X61-169-105
2	-	Not connected	(Hirschmann No. 934 401-202 5m)

Output increases with CW rotation viewed on shaft

M12 connector

When connecting the sensor, care should be taken with the correct connections. The sensor is provided with indefinite reverse polarity protection and short circuit protection between output (Pin 4 - Black) to GND (Pin 1 - Brown), but if the output (Pin 4 - Black) is connected to the supply it will result in device failure.

# Penny+Giles

A Curtiss-Wright Company

[www.pennyandgiles.com](http://www.pennyandgiles.com)

## Penny & Giles

Position sensors and joysticks for commercial and industrial applications.

15 Airfield Road  
Christchurch  
Dorset BH23 3TG  
United Kingdom  
+44 (0) 1202 409409  
+44 (0) 1202 409475 Fax  
[sales@pennyandgiles.com](mailto:sales@pennyandgiles.com)

36 Nine Mile Point Industrial Estate  
Cwmfelinfach  
Gwent NP11 7HZ  
United Kingdom  
+44 (0) 1495 202000  
+44 (0) 1495 202006 Fax  
[sales@pennyandgiles.com](mailto:sales@pennyandgiles.com)

5875 Obispo Avenue  
Long Beach CA 90805  
USA  
+1 562 531 6500  
+1 562 531 4020 Fax  
[us.sales@pennyandgiles.com](mailto:us.sales@pennyandgiles.com)

Straussenlettenstr. 7b  
85053 Ingolstadt,  
Germany  
+49 (0) 841 61000  
+49 (0) 841 61300 Fax  
[info@penny-giles.de](mailto:info@penny-giles.de)

The information contained in this brochure on product applications should be used by customers for guidance only. Penny+Giles Controls Ltd makes no warranty or representation in respect of product fitness or suitability for any particular design application, environment, or otherwise, except as may subsequently be agreed in a contract for the sale and purchase of products. Customer's should therefore satisfy themselves of the actual performance requirements and subsequently the products suitability for any particular design application and the environment in which the product is to be used.

Continual research and development may require change to products and specification without prior notification. All trademarks acknowledged.

© Penny+Giles Controls Ltd 2006

Innovation In Motion

**CURTISS  
WRIGHT** Controls  
Integrated Sensing

[www.cwcontrols.com](http://www.cwcontrols.com)