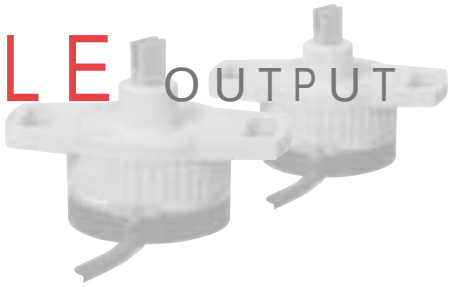
SRH280P SINGLE OUTPUT

contactless rotary sensor



PERFORMANCE

ELECTRICAL

Measurement range	**°**	20 to 360 in 1° increments
Supply voltage	**Vdc**	9 to 30 (unregulated) and 5 ±0.5 (regulated)
Over voltage protection	**Vdc**	Up to 40 (-40 to +60°C)
Maximum supply current	**mA**	<12.5
Reverse polarity protection		Yes
Short circuit protection		
Output to GND		Yes
Output to supply		In 5V regulated mode only
Power-on settlement time	**S**	<1
Resolution	**%**	0.025 of measurement range (12 bit)
Non-linearity*	**%**	<±0.4
Temperature coefficient	**ppm/°C**	<±50

*Non-linearity is measured using the least-squares method on a computerised calibration system

Analog Output (order code A1, A4) – see graph on page 31

Voltage output range		
9-30V supply	**Vdc**	Absolute voltage, 0.5 to 4.5 (A1) or 0.1 to 4.9 (A4) over measurement range (±3%)
5V supply	**Vdc**	Ratiometric output voltage - 10 to 90% (A1) or 2 to 98% (A4) of Vs over measurement range (±1%)
Monotonic range	**Vdc**	0.25 (5%) and 4.75 (95%) nominal (A1)
	Vdc	0.5 (1%) and 4.95 (99%) nominal (A4)
Load resistance	**Ω**	10k minimum (resistive to GND)
Output noise	**mVrms**	<1
Input/output delay	**mS**	<2

PWM Output (order code P) – See output characteristics on page 31

PWM frequency		**Hz**	244 (P1); 500 (P2); or 1000 (P3) ±20% over temperature range
PWM levels	**9-30V supply**	**Vdc**	0 and 5 nominal (±3%)
	5V supply	**Vdc**	0 and Vs (±1%)
Duty cycle		**%**	10 to 90 over measurement range
Monotonic range		**%**	5 and 95 nominal
Load resistance		**Ω**	10k minimum (resistive to GND)
Rise/fall time		**µS**	<15

MECHANICAL

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

GS Global Resources • 1-800-261-8735 • gsglobalresources.com
926 Perkins Drive, Mukwonago, WI 53149

SRH280P

ENVIRONMENTAL

Protection class		IP68 (to 2m depth for 1 hour) or IP50
Life		20 million operations ($10x10^6$ cycles) of ±75º Sensing element life is essentially infinite (contactless); the SRH280P life figure refers to the operating shaft seal. Mechanical load (axial and radial) on the shaft should also be considered.
Dither life		Contactless - no degradation due to shaft dither
Operational temperature†	**°C**	-40 to +140 (5V supply) -40 to +137 (9V supply) Derate upper temperature limit by 0.57°C for every 1V increase in supply: e.g. -40 to +125 @30V
Storage temperature	**°C**	-55 to +140
Vibration		BS EN 60068-2-64:1995 Sec 8.4 (14gn rms) 20 to 2000Hz Random
Shock		3m drop onto concrete
EMC Immunity level		BS EN 61000-4-3:1999, to 100V/m, 80MHz to 1GHz and 1.4GHz to 2.7GHz (2004/108/EC)

† See Maximum Operating Temperature – Derating graph on page 30
If the maximum operating temperature is exceeded, the voltage regulator will shut down to protect the device from overheating

OPTIONS

Measurement range (angle)		Select from 20° to 360° in 1° increments (factory programmed)
Output		Analog voltage (An) or PWM (Pn)
Output direction		Clockwise or Anticlockwise shaft rotation with increasing output
Shaft style		D section, sprung shaft (S) or 2.4mm blade shaft (H)
Shaft sealing		IP50 or IP68
Cable length	**m**	0.2, 0.5 or 2.0
Custom housing		Synchro mount style with ball race bearings - ask our technical sales team for details
OEM options		Output can be programmed to provide: non linear law; switch output; clamp voltages; faster input/output delay; extended analog range; and output mapping for potentiometer replacements

AVAILABILITY

All standard configurations can be supplied rapidly from the factory - check with your local supplier for more details

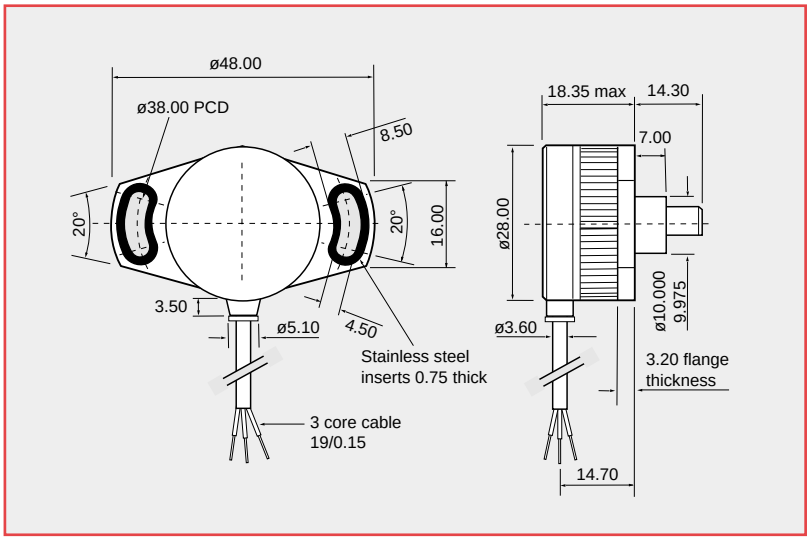
ORDERING CODES

SRH280P/ ..... / ..... / ..... / ..... / ..... / .....

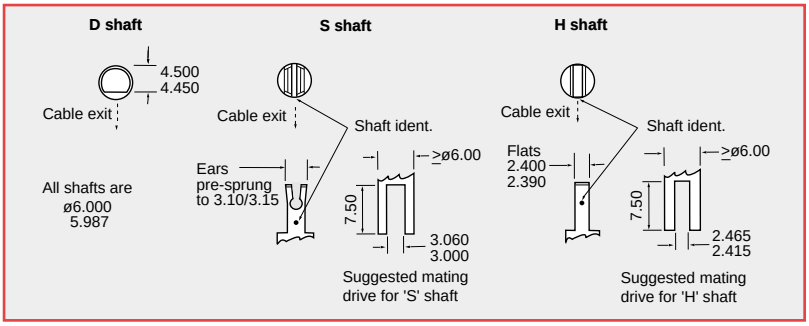
Measurement range	= angle in °
Output	A1 = Analog 0.5-4.5Vdc A4 = Analog 0.1-4.9Vdc P1 = PWM, 244 Hz P2 = PWM, 500 Hz P3 = PWM, 1000 Hz
Direction	1 = Clockwise 2 = Anticlockwise
Shaft style	D = D shaft S = Sprung shaft H = 2.4mm blade shaft
Shaft sealing	50 = IP50 68 = IP68
Cable length	P2 = 0.2m P5 = 0.5m 02 = 2.0m

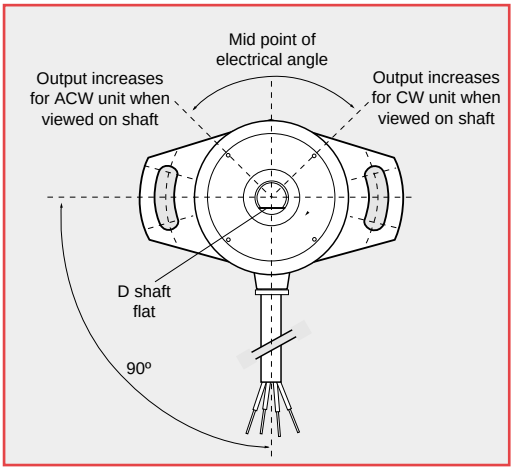
DIMENSIONS

Note: drawings not to scale



SHAFT OPTIONS





ELECTRICAL CONNECTIONS

200, 500 or 2000mm of 3-core cable: PUR sheathed, with PTFE insulated 19/0.15 cores

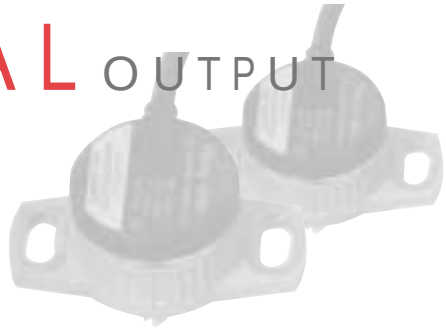
Cable colour	Description
Red	+V Supply
Yellow	Output
Black	0V Supply (GND)

Output increases with CW or ACW rotation viewed on shaft - depending on selected order code

When connecting the sensor, care should be taken with the correct connections. The sensor is provided with 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.**

SRH280DP DUAL OUTPUT

contactless rotary sensor



PERFORMANCE

ELECTRICAL

Measurement range	°	20 to 360 in 1° increments
Supply voltage	Vdc	9 to 30 (unregulated) and 5 ±0.5 (regulated)
Over voltage protection	Vdc	Up to 40 (-40 to +60°C)
Maximum supply current	mA	<25
Reverse polarity protection		Yes
Short circuit protection		
Output to GND		Yes
Output to supply		In 5V regulated mode only
Power-on settlement time	S	<1
Resolution	%	0.025 of measurement range (12 bit)
Non-linearity*	%	<±0.4
Temperature coefficient	ppm/°C	<±30 in 5V supply mode; <±90 in 9-30V supply mode

* Non-linearity is measured using the least-squares method on a computerised calibration system

Analog Output (order code A1, A4) – see graph on page 31

Voltage output range		
9-30V supply	Vdc	Absolute voltage, 0.5 to 4.5 (A1) or 0.1 to 4.9 (A4) over measurement range (±3%)
5V supply	Vdc	Ratiometric output voltage - 10 to 90% (A1) or 2 to 98% (A4) of Vs over measurement range (±1%)
Monotonic range	Vdc	0.25 (5%) and 4.75 (95%) nominal (A1)
	Vdc	0.05 (1%) and 4.95 (99%) nominal (A4)
Load resistance	Ω	10k minimum (resistive to GND)
Output noise	mVrms	<1
Input/output delay	mS	<2

PWM Output (order code Pn) – see output characteristics on page 31

PWM frequency	Hz	244 (P1); 500 (P2); or 1000 (P3) ±20% over temperature range
PWM levels 9-30V supply	Vdc	0 and 5 nominal (±3%)
5V supply	Vdc	0 and Vs (±1%)
Duty cycle	%	10 to 90 over measurement range
Monotonic range	%	5 and 95 nominal
Load resistance	Ω	10k minimum (resistive to GND)
Rise/fall time	µS	<15

MECHANICAL

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

ENVIRONMENTAL

Protection class		IP68 (to 2m depth for 1 hour) or IP50
Life		20 million operations (10 x 10^6 cycles) of ±75° Sensing element life is essentially infinite (contactless); the SRH280DP life figure refers to the operating shaft seal. Mechanical load (axial and radial) on the shaft should also be considered.
Dither life		Contactless - no degradation due to shaft dither
Operational temperature†	°C	-40 to +140 (5V supply) -40 to +135.7 (9V supply) Derate upper temperature limit by 1.7°C for every 1V increase in supply: e.g. -40 to +100 @30V
Storage temperature	°C	-55 to +140
Vibration		BS EN 60068-2-64:1995 Sec 8.4 (31.4gn rms) 20 to 2000Hz Random
Shock		3m drop onto concrete
EMC Immunity level		BS EN 61000-4-3:1999, to 100V/m, 80MHz to 1GHz and 1.4GHz to 2.7GHz (2004/108/EC)

† See Maximum Operating Temperature – derating graph on page 30.
If the maximum operating temperature is exceeded, the voltage regulator will shut down to protect the device from overheating

OPTIONS

Measurement range (angle)		Select from 20° to 360° in 1° increments (factory programmed) for each output channel
Output		Analog voltage (An) or PWM (Pn)
Output direction		Both clockwise, both anticlockwise or one CW, one ACW
Shaft style		D section, sprung shaft (S) or 2.4mm blade shaft (H)
Shaft sealing		IP50 or IP68
Cable length	m	0.2 or 0.5
Custom housing		Synchro mount style with ball race bearings - ask our technical sales team for details
OEM options		Outputs can be programmed to provide: non linear laws; switch outputs; clamp voltages; different output phasing CH1/CH2; faster input/output delay; extended analog range; and output mapping for potentiometer replacements

AVAILABILITY

All standard configurations can be supplied rapidly from the factory - check with your local supplier for more details

ORDERING CODES

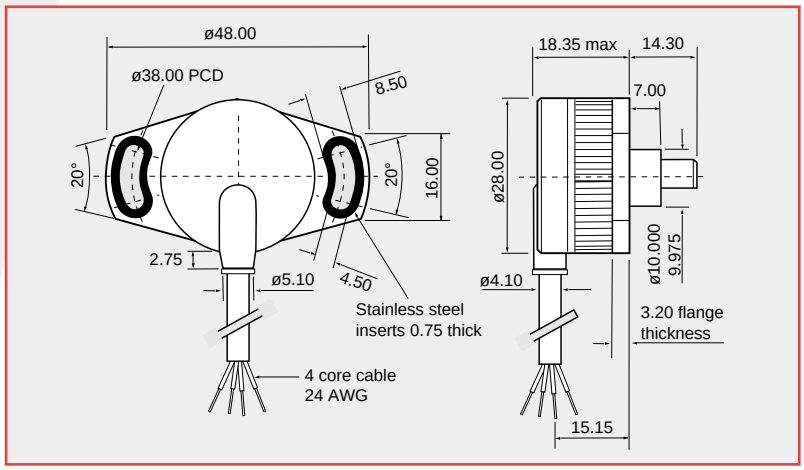
SRH280DP/..... / ..... / ..... / ..... / ..... / ..... / .....

Measurement range	CH1 = angle in °
Measurement range	CH2 = angle in °
Output	A1 = Analog 0.5-4.5Vdc A4 = Analog 0.1-4.9Vdc P1 = PWM, 244 Hz P2 = PWM, 500 Hz P3 = PWM, 1000 Hz
Direction	3 = Both clockwise 4 = Both anticlockwise 5 = CH1 CW; CH2 ACW
Shaft style	D = D shaft S = Sprung shaft H = 2.4mm blade shaft
Shaft sealing	50 = IP50 68 = IP68
Cable length	P2 = 0.2m P5 = 0.5m

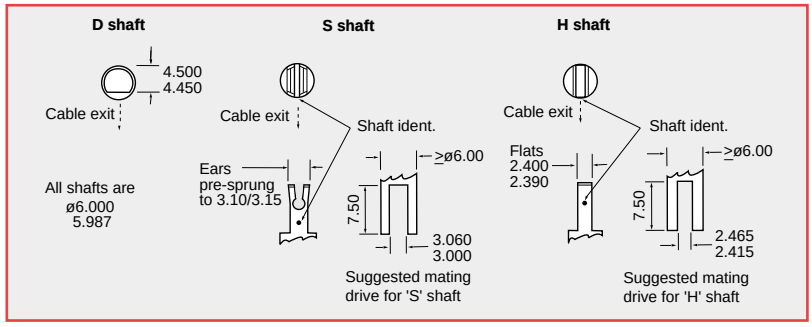
SRH280DP

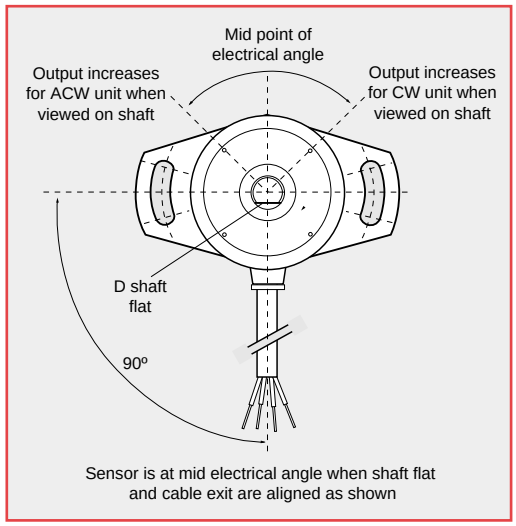
DIMENSIONS

Note: drawings not to scale



SHAFT OPTIONS





ELECTRICAL CONNECTIONS

200 or 500mm of 4-core cable: FDR-25 sheathed, with 55A spec (24AWG) cores

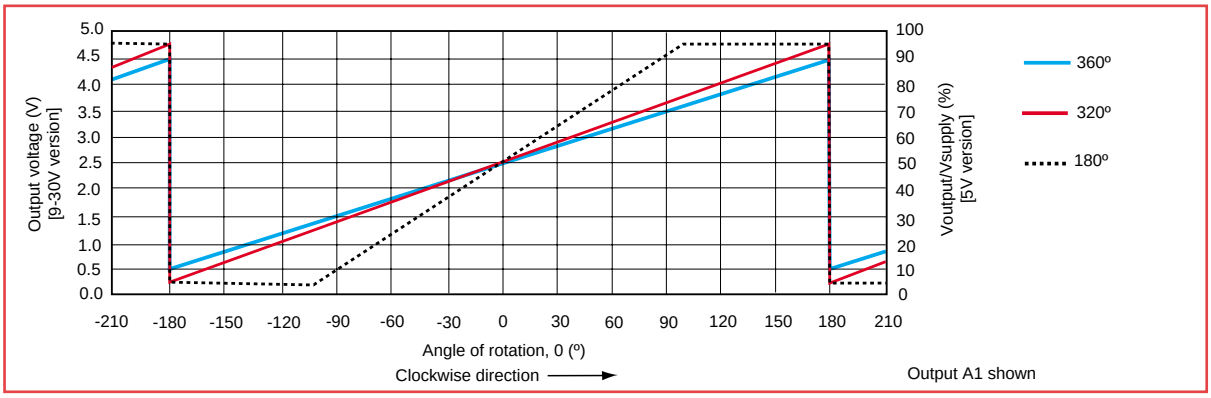
Cable colour	Description
Red	+V Supply
Yellow	Output 1
White	Output 2
Black	0V Supply (GND)

Output increases with CW or ACW rotation viewed on shaft - depending on selected order code.

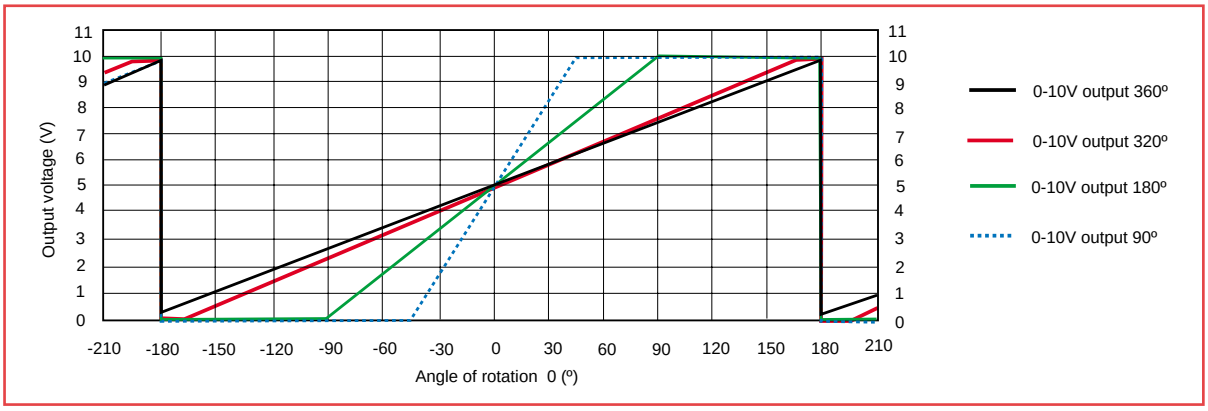
When connecting the sensor, care should be taken with the correct connections. The sensor is provided with reverse polarity protection and short circuit protection between outputs (Yellow & White) to GND (Black), **but if the outputs (Yellow & White) are connected to the supply this will result in device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

SENSOR OUTPUT GRAPH- examples for three different angles

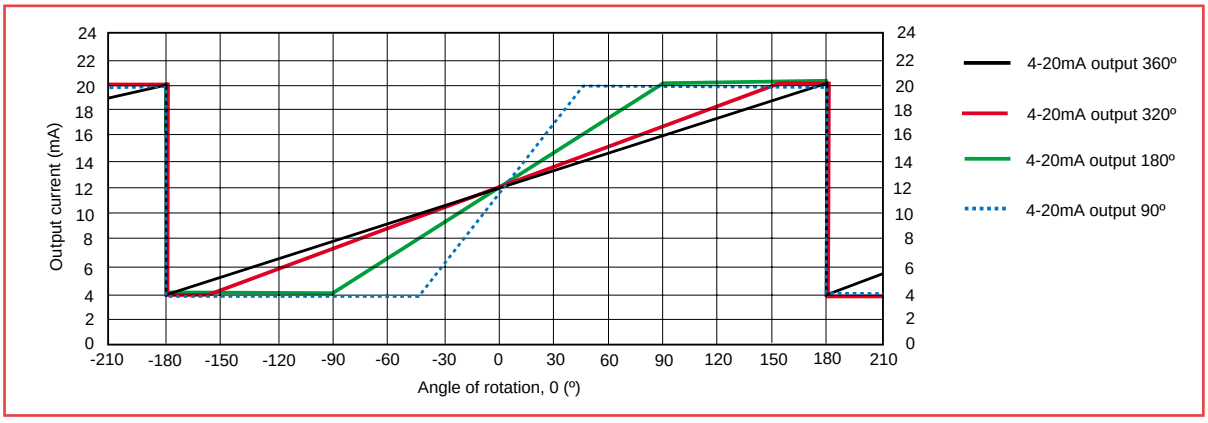
SRH280P, SRH280DP, NRH280DP, NRH285DR, TPS280DP, SRH220DR - OUTPUT A1
SRH501P/502P - OUTPUT A1
SRH880P - OUTPUT A



SRH220DR,SRH501P/502P - OUTPUT A2 (0-10Vdc)

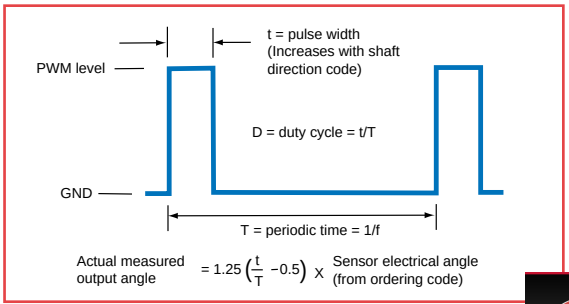


SRH501P/502P - OUTPUT A3 (4-20mA)



PWM OUTPUT CHARACTERISTICS

SRH280P, SRH280DP, NRH280DP, NRH285DR, TPS280DP, SRH220DR - OUTPUT P1, P2, P3
SRH501P/502P - OUTPUT P1, P2, P3
SRH880P- OUTPUT P



PWM levels = zero volt and 5V (±3%) for 9-30V supply
= zero volt and V_S (±1%) for 5V supply

Innovative, rugged designs - superior protection

All models in our range have been designed to offer the best combination of materials and mounting styles that ensure survivability in the most rugged applications. We use sealing systems and cable connections that offer superior protection against the most hostile of operating conditions.

Impressive environmental capability

Designed with 21st century applications in mind most of our models can withstand operating temperatures from -40°C to +140°C (+170°C for 72 hours with our NRH and TPS models) and have been tested to withstand severe shock and vibration. All sensors have protection to at least IP68 rating, with some models offering protection to IP69K. With an EMC immunity of 100V/m, these position sensors are ready for the harshest applications.

Superior performance

This range of sensors has an impressive performance specification and most can operate from a 5Vdc regulated or 9 – 30Vdc supply.

Outputs can be PWM or analog voltage (nominal 0.5 - 4.5Vdc) over the measurement range, with clockwise or anticlockwise shaft rotation. A choice of 341 different electrical angles from 20° to 360° are possible. 12 bit resolution (0.025%) is available over the selected measuring range, with a non-linearity better than ±0.4% and temperature stability better than ±50ppm/°C. The sensor's analog output option has a very low output noise level of less than 1mV rms.

World leading availability

All models have been 'designed for manufacture' which enables assembly in state-of-the-art manufacturing cells. This means that we can supply any of the configurations possible from the options offered, in a matter of days from ordering. This allows OEMs to reduce or eliminate their inventory, and call on Penny+Giles to supply 'on demand'.

*Performance assured**

Penny+Giles product development process includes exhaustive qualification testing to ensure that performance specifications published in our product brochures and technical data sheets are backed by real-life test evidence. This is our assurance to you that our designs have been tested at these parameters.

* The qualification and suitability of these products in any customer specific application is the responsibility of the customer, unless otherwise agreed with Penny+Giles.

Selection Guide

Penny+Giles offers the widest choice of options to suit your unique application. We can also offer a custom design service if one of our standard models does not suit your requirements.

NRH280DP

- **Dual output**
- **6.5mm deep with metal flange**
- **Separate magnet assembly**
- **Sealed to IP69K**
- **Raychem™ DR25 cable**

NRH285DR

- **Dual input/dual output version of NRH280DP**
- **5Vdc operation only**

SRH220DR

- **Dual input/dual output**
- **28 x 38mm body with crush proof flange**
- **Sealed to IP68**
- **Integrated connector**

SRH280P

- **Single output**
- **28mm body with crush proof flange**
- **Three shaft styles**
- **Sealed to IP68**

SRH280DP

- **Dual output**
- **Raychem™ DR25 cable**
- **28mm body with crush proof flange**
- **Three shaft styles**
- **Sealed to IP68**

TPS280DP

- **Dual output**
- **D drive**
- **Sealed to IP68**
- **25mm body with crush proof flange**
- **Raychem™ DR25 cable+connector**

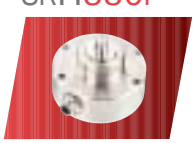
SRH501P

- **Single output**
- **87.5mm mounting flange**
- **Marine grade alloy housing**
- **Sealed to IP69K**

SRH502P

- **Dual output**
- **87.5mm mounting flange**
- **Marine grade alloy housing**
- **Sealed to IP69K**

SRH880P



- **Single output**
- **88 mm body**
- **Aluminum or stainless steel housing**
- **Sealed to IP68M**

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Penny+Giles

A Curtiss-Wright Company

CONTACTLESS ROTARY POSITION SENSORS

INNOVATION IN MOTION

The Penny+Giles contactless rotary position sensors have been specially developed to provide maximum performance under extremes of temperature, humidity, vibration, shock and immersion. Using the latest advances in 12bit Hall effect sensing technology, this expanded range of new generation sensors are factory programmed to provide the user with a wide range of previously unavailable options, including single or dual redundant outputs, clockwise or anticlockwise rotation and measurement angles from 0-20° to 0-360° in 1° increments.

This sensor range is ideally suited to operate in extremely hostile applications that are typical in motorsport, off-road specialist vehicles, military vehicles and heavy industrial machinery.

Contactless magnetic rotary sensor IC

The NRH/TPS/SRH series use a high performance, factory programmable 12 bit magnetic rotary sensor IC that includes integrated Hall elements and digital signal processing. The angular position information is provided by a magnet integrated with the sensor's shaft, or supplied separately. The sensor provides a pulse width modulated signal or an absolute analog voltage signal. Most models are designed to operate from either a 5Vdc regulated or 9-30Vdc unregulated supply, with a high stability circuit and EMC immunity to 100V/m.

Features

- **Contactless technology**
- **Absolute analog or digital (PWM) output**
- **Measuring range from 20° to 360° in 1° increments**
- **Single or Dual outputs**
- **Temperature error less than 50ppm/°C**
- **Rugged housing and shaft designs**
- **Protection up to IP69K**
- **Choice of shaft attachments and mountings**
- **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**
- **Optional redundant output for safety critical applications**
- **Maximises system accuracy over temperature range**
- **Suitable for extreme environments**
- **Operation in hostile environments including pressure washing**
- **Interchangeable with existing installations**
- **Eliminates customer inventory**
- **Confidence in EMC performance**

EMC Directive 2004/108/EEC
The products detailed in this document have been tested to the requirements of EN 61000-4-3 (Immunity).

Quality Assurance
Penny+Giles are accredited to BS EN ISO9001:2008
Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

Design Statement

The design of models SRH501P and SRH502P are subject to Community Registered Design No 000961610-0001.

The majority of our designs include an input protector circuit (Patent

Penny+Giles
A Curtiss-Wright Company

Doc Ref: SRH/TPS/NRH 10/11

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CURTISS WRIGHT Controls

Innovation in Motion