SRH501P SIN G LEoutput and SRH502P DUALOUTPRT rugged contactless rotary sensors

PERFORMANCE

## Output options

## ELECTRICAL

| Measurement range | 。 | 20 to 360 in $1^{\circ}$ increments |
| :---: | :---: | :---: |
| Supply voltage |  |  |
| unregulated | Vdc | 9 to 30 |
| regulated | Vdc | $5 \pm 0.5$ |
| Over voltage protection | Vdc | Up to $40\left(-40\right.$ to $\left.+60^{\circ} \mathrm{C}\right)$ |
| 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* | \% | $< \pm 0.4$ |
| Temperature coefficient pp | m/ ${ }^{\circ} \mathrm{C}$ | $< \pm 30$ in 5 V supply mode $< \pm 90$ in $9-30 \mathrm{~V}$ supply mode |

A2
$0-10 \mathrm{Vdc}$

A3
4-20mA

20 to 360 in $1^{\circ}$ increments

| 13.5 to 30 | 9 to 30 |
| :--- | :--- |
| No | No |

Up to $40\left(-40\right.$ to $\left.+60^{\circ} \mathrm{C}\right)$

| $<30$ | $<25+$ total output current |
| :--- | :--- |
| Yes | Yes |


| Yes | Yes |
| :--- | :--- |
| Yes | Yes |
| $<1$ | $<1$ |

0.025 of measurement range (12 bit)

$$
< \pm 0.4 \quad< \pm 0.4
$$

$< \pm 50 \quad< \pm 200$ typical
N/A $< \pm 200$ maximum $^{* *}$
*Non-linearity is measured using the Least-Squares method on a computerised calibration system
**Temperature compensation possible by using graph shown on page 30

Analog Voltage Output - (order code A1, A4) see typical 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 ( $\pm 3 \%)$ <br> 5V supply |
|  | Vdc | Ratiometric output voltage -10 to $90 \%$ (A1) or 2 to $98 \%$ (A4) of Vs over measurement <br> range $( \pm 1 \%)$ |
| Monotonic range | Vdc | $0.25(5 \%)$ and $4.75(95 \%)$ nominal (A1) |
|  | Vdc | $0.05(1 \%)$ and $4.95(99 \%)$ nominal (A4) |
| Load resistance | $\Omega$ | 10 k minimum (resistive to GND) |
| Output noise | $\mathbf{m V r m s}$ | $<1$ |
| Input/ output delay | $\mathbf{m s}$ | $<2$ |

Analog Voltage Output - (order code A2) see typical graph on page 31

| Voltage output range | Vdc | Absolute voltage, nominally 0.2 to $9.8( \pm 0.2 \mathrm{~V})$ |
| :--- | ---: | :--- |
| Load resistance | $\Omega$ | 10 k minimum (resistive to GND) |
| Output noise | $\mathbf{m V r m s}$ | $<1$ |
| Input/ output delay | $\mathbf{m S}$ | 3.5 |

Analog Current Output - (order code A3) see typical graphon page 31
Current output range mA Absolute current, nominally 4 to 20 ( $\pm 2 \%$ span)
Load resistance $\quad \Omega \quad 400$ maximum (resistive to GND)
Output noise $\quad \mu$ Arms $\quad<10$
Input/ output delay mS 3.75

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

| PWM frequency | Hz | 244 (P1); 500 (P2); or 1000 (P3) $\pm 20 \%$ over temperature range |
| :---: | :---: | :---: |
| PWM levels 9-30V supply | Vdc | 0 and 5 nominal ( $\pm 3 \%$ ) |
| 5 V supply | Vdc | 0 and Vs ( $\pm 1 \%$ ) |
| Duty cyde | \% | 10 to 90 over measurement range |
| Monotonic range | \% | 5 and 95 nominal |
| Load resistance | $\Omega$ | 10 k minimum (resistive to GND) |
| Rise/fall time | $\boldsymbol{\mu S}$ | <20 |
| MECHANICAL |  |  |
| Mechanical angle | - | 360, continuous |
| Operating torque - max | g-cm | 1000 |
| Shaft velocity maximum | $\% \mathrm{sec}$ | 3600 |
| Weight | g | 265 (without cable) |
| Mounting |  | Use $3 \times$ M6 threaded holes in front face or $3 \times$ M6 (or $1 / 4$ UNC) clearance holes through the flange - See dimensions for details |
| Phasing |  | When the shaft flat is facing towards the cable exit, sensor output is at mid electrical angle ( $\pm 5^{\circ}$ ) |

## ENVIRONMENTAL

## Protection dass

IP69K with cable codes Bxx and Sxx
IP68 or IP69K with cable code C01 when mating connectors (see page 26) are attached and fully engaged)

## Life <br> Dither life <br> Shaft side load Operational temperature ${ }^{\dagger} \quad{ }^{\circ} \mathrm{C}$ Output A1, A4, P1-3

20 million operations ( $10 \times 10^{6}$ cycles) of $\pm 75^{\circ}$ Sensing element life is essentially infinite (contactless), and the SRH501P/502P life figures refer to the operating shaft seal. Mechanical load (axial and radial) on the shaft should also be considered.
Contactless - no degradation due to shaft dither
2 Kg mounted on sensor shaft - tested 3 million cycles
-40 to +140 (5V supply)
-40 to +135.7 ( 9 V supply) Derate upper temperature limit by $1.7^{\circ} \mathrm{C}$ for every 1 V increase in
supply: e.g. -40 to $+100 @ 30 \mathrm{~V}$
Output A2
-40 to +115 ( 13.5 V supply) Derate upper temperature limit by $0.91^{\circ} \mathrm{C}$ for every 1 V increase in supply: e.g. -40 to $+100 @ 30 \mathrm{~V}$
Output A3 $\quad-40$ to $+120\left(9 \mathrm{~V}\right.$ supply) Derate upper temperature limit by $1.05^{\circ} \mathrm{C}$ for every 1 V increase in supply: e.g. -40 to +98 @ 30 V
Storage temperature ${ }^{\circ} \mathrm{C}$
Vibration
Shock
EMC Immunity level

## Salt spray

-55 to +140
BS EN 60068-2-64:1995 Sec 8.4 ( 14 gn rms ) 20 to 2000 Hz Random
3 m drop onto concrete and 2500 g - all axes
BS EN $61000-4-3: 1999$, to $100 \mathrm{~V} / \mathrm{m}, 80 \mathrm{MHz}$ to 1 GHz and 1.4 GHz to 2.7 GHz
( $35 \mathrm{~V} / \mathrm{m} 1.4 \mathrm{G} \mathrm{Hz}$ to 2.7 GHz for output A3) (2004/108/EC)
BS EN 60068-2-52: 1996, Test Kb Severity 2 (48hr)
Humidity
BS EN 60068-2-30: 2005, Severity Db ( $55^{\circ} \mathrm{C}, 93 \% \mathrm{RH}$ )
${ }^{+}$See Maximum O perating Temperature - Derating graphs on page 30.
If the maximum operating temperature is exceeded, the voltage regulator will shut down to protect the device from overheating

## O PTIONS

Measurement range (angle) Output
coming soon in 2012

## Output direction <br> Electrical connections

## Cabled sockets

Operating levers
OEM options

Select from $20^{\circ}$ to $360^{\circ}$ in $1^{\circ}$ increments (factory programmed) for each output channel
Analog voltage (A1, A2, A4)
Analog current (A3)
PWM (Pn)
CAN bus outputs: J1939 (J1); CAN open (O 1)
Both clockwise, both anticlockwise or one CW, one ACW
No cable (A00, S00), 1m, 5m, 10m unscreened (Bxx) or screened (Sxx) cable or M12 receptacle (C01)
$1.5,2,5 \& 10 \mathrm{~m}$ mating cabled sockets can be ordered separately. See details on page 26 O perating levers 155 or 230 mm long can be ordered separately. See details on page 25 O utputs can be programmed to provide: non linear laws; switch outputs; clamp voltages; different output phasing $\mathrm{CH} 1 / \mathrm{CH} 2$; faster input/output delay; extended analog range; and output mapping for potentiometer replacements.

## SRH501P AND SRH502P

## AVAILABILITY

## ORDERING CODES

NOTE: When selecting output option A3 ( $4-20 \mathrm{~mA}$ ), cable codes Sxx are the only cable codes allowable.

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

SINGLE OUTPUT SRH501P

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SRH501P/
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Measurement range \(\quad=\) angle in \({ }^{\circ}\)
\begin{tabular}{ll} 
O utput & A1 \(=\) Analog \(0.5-4.5 \mathrm{Vdc}\) \\
& A2 \(=\) Analog \(0-10 \mathrm{Vdc}\) \\
& A3 \(=\) Analog \(4-20 \mathrm{~mA}\) \\
A4 \(=\) Analog \(0.1-4.9 \mathrm{Vdc}\) \\
& P1 \(=\) PWM, 244 Hz \\
P2 \(=\) PWM, 500 Hz \\
& P3 \(=\) PWM, 1000 Hz
\end{tabular}

Direction \(\quad 1=\) Clockwise
\(2=\) Anticlockwise
Cable code \(\quad \mathrm{A} 00=\) No cable, gland fitting
SOO = No cable, screened cable gland (A3 output option - see note)
B01 \(=1 \mathrm{~m} 3\)-core unscreened cable, IP69K
B05 \(=5 \mathrm{~m} 3\)-core unscreened cable, IP69K
B10 \(=10 \mathrm{~m} 3\)-core unscreened cable, IP69K
S01= 1m 3-core screened cable, IP69K (A3 output options - see note)
S05 \(=5 \mathrm{~m} 3\)-core screened cable, IP69K
S10 \(=10 \mathrm{~m} 3\)-core screened cable, IP69K
C01 = M12 screw locking receptacle

DUAL OUTPUT SRH502P
\begin{tabular}{|c|c|}
\hline Measurement range & \(\mathrm{CH} 1=\) angle in \({ }^{\circ}\) \\
\hline \multirow[t]{8}{*}{Measurement range \({ }_{\text {O utput }}\)} & \(\mathrm{CH} 2=\) angle in \({ }^{\circ}\) \\
\hline & A1 \(=\) Analog \(0.5-4.5 \mathrm{Vdc}\) \\
\hline & \(\mathrm{A} 2=\) Analog \(0-10 \mathrm{Vdc}\) \\
\hline & A3 \(=\) Analog \(4-20 \mathrm{~mA}\) \\
\hline & A4 \(=\) Analog 0.1-4.9Vdc \\
\hline & P1 = PWM, 244 Hz \\
\hline & P2 \(=\) PWM, 500 Hz \\
\hline & P3 \(=\) PWM, 1000 Hz \\
\hline Direction & 3 = Both clockwise \\
\hline & 4 = Both anticlockwise \\
\hline & \(5=\mathrm{CH} 1 \mathrm{CW}\); CH2 ACW \\
\hline \multirow[t]{9}{*}{Cable code} & A00 \(=\) No cable, gland fitting \\
\hline & S00 \(=\) No cable, screened cable gland (A3 output option - see note) \\
\hline & B01 \(=1 \mathrm{~m} 4\)-core unscreened cable, IP69K \\
\hline & B05 \(=5 \mathrm{~m} 4\)-core unscreened cable, IP69K \\
\hline & B10 \(=10 \mathrm{~m} 4\)-core unscreened cable, IP69K \\
\hline & S01 = 1m 4-core screened cable, IP69K (A3 output options - see note) \\
\hline & S05 = 5m 4-core screened cable, IP69K \\
\hline & S10 \(=10 \mathrm{~m} 4\)-core screened cable, IP69K \\
\hline & C01 \(=\) M12 screw locking receptacle \\
\hline
\end{tabular}

Accessories (order separately)
Drive lever kit - SA202195/MK - see page 25
Mating connectors - see details on page 26


PHASING OF SHAFT TO HOUSING


LEVER OPTIONS (order separately)


\section*{SRH501P AND SRH502P}

\section*{ELECTRICAL}

\section*{CONNECTIONS}

Option A00 - No cable supplied
Option SOO - No cable supplied (Fitted gland to suit screened cable)
Option Bxx - Cable supplied ( \(1 \mathrm{~m}, 5 \mathrm{~m}\) or 10 m )
Option Sxx - Screened cable supplied ( \(1 \mathrm{~m}, 5 \mathrm{~m}\) or 10 m )
Option C01 - Series M12 screw locking receptacle to IEC 61076-2-101 (Ed.1) /IEC 60947-5-2 fitted to sensor body. Mating cabled sockets to be ordered separately.

\section*{CONNECTING CABLE OPTIONS}

Connection details for no cable option A00 S00


Connection capacity AWG 26-16 or 0.14-1.5mm \({ }^{2}\)

Connection details for cable option Bxx and Sxx


Connection details for option C01-M12 connector (not available for output A3)


M12 mating connectors for cable option C01 (order separately)

Connector IP68
2 metre X61-220-101
5 metre X61-220-102
10 metre X61-220-103


Steel connector IP69K
1.5 metre X61-222-001

5 metre X61-222-003
10 metre X61-222-005

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 to GND, but if the outputs are connected to the supply this will result in device failure.```

