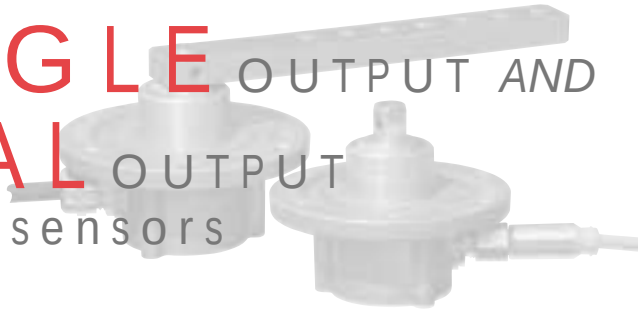
SRH501P SINGLE OUTPUT *AND* SRH502P DUAL OUTPUT

rugged contactless rotary sensors



PERFORMANCE

Output options		A1 | A4 | P1 | P2 | P3 0.5-4.5 or 0.1-4.9Vdc | PWM	A2 0-10Vdc	A3 4-20mA

ELECTRICAL

Measurement range	°	20 to 360 in 1° increments	20 to 360 in 1° increments	
Supply voltage				
unregulated	**Vdc**	9 to 30	13.5 to 30	9 to 30
regulated	**Vdc**	5 ±0.5	No	No
Over voltage protection	**Vdc**	Up to 40 (-40 to +60°C)	Up to 40 (-40 to +60°C)	
Maximum supply current	**mA**	<25	<30	<25+total output current
Reverse polarity protection		Yes	Yes	Yes
Short circuit protection				
Output to GND		Yes	Yes	Yes
Output to supply		In 5V regulated mode only	Yes	Yes
Power-on settlement time	**S**	< 1	< 1	<1
Resolution	**%**	0.025 of measurement range (12 bit)	0.025 of measurement range (12 bit)	
Non-linearity*	**%**	<±0.4	<±0.4	<±0.4
Temperature coefficient	**ppm/°C**	<±30 in 5V supply mode <±90 in 9-30V supply mode	<±50 N/A	<±200 typical <±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 (±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

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

Voltage output range	**Vdc**	Absolute voltage, nominally 0.2 to 9.8 (±0.2V)
Load resistance	Ω	10k minimum (resistive to GND)
Output noise	**mVrms**	<1
Input/output delay	**mS**	3.5

Analog Current Output - (order code A3) see typical graph on page 31

Current output range	**mA**	Absolute current, nominally 4 to 20 (±2% span)
Load resistance	Ω	400 maximum (resistive to GND)
Output noise	**µArms**	<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) ±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**	<20

MECHANICAL

Mechanical angle	**°**	360, continuous
Operating torque - max	**g-cm**	1000
Shaft velocity maximum	**°/sec**	3600
Weight	**g**	265 (without cable)
Mounting		Use 3 x M6 threaded holes in front face or 3 x 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 (±5°)

ENVIRONMENTAL

Protection class		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		20 million operations (10 x 10^6 cycles) of ±75° 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.
Dither life		Contactless - no degradation due to shaft dither
Shaft side load		2Kg mounted on sensor shaft - tested 3 million cycles
Operational temperature†	**°C**	
Output A1, A4, P1-3		-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
Output A2		-40 to +115 (13.5V supply) Derate upper temperature limit by 0.91°C for every 1V increase in supply: e.g. -40 to +100 @30V
Output A3		-40 to +120 (9V supply) Derate upper temperature limit by 1.05°C for every 1V increase in supply: e.g. -40 to +98 @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 and 2500g – all axes
EMC Immunity level		BS EN 61000-4-3:1999, to 100V/m, 80MHz to1GHz and 1.4GHz to 2.7GHz (35V/m 1.4GHz to 2.7GHz for output A3) (2004/108/EC)
Salt spray		BS EN 60068-2-52: 1996, Test Kb Severity 2 (48hr)
Humidity		BS EN 60068-2-30: 2005, Severity Db (55°C, 93%RH)

† See Maximum Operating 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

OPTIONS

Measurement range (angle)	Select from 20° to 360° in 1° increments (factory programmed) for each output channel
Output	Analog voltage (A1, A2, A4) Analog current (A3) PWM (Pn) CANbus outputs: J1939 (J1); CANopen (O1)
Output direction Electrical connections	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)
Cabled sockets	1.5, 2, 5 & 10m mating cabled sockets can be ordered separately. See details on page 26
Operating levers	Operating levers 155 or 230mm long can be ordered separately. See details on page 25
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.

SRH501P AND SRH502P

AVAILABILITY

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

ORDERING CODES

NOTE: When selecting output option A3 (4-20mA), cable codes Sxx are the only cable codes allowable.

SINGLE OUTPUT SRH501P

SRH501P/ ..... / ..... / ..... / .....

Measurement range = angle in °

Output
A1 = Analog 0.5-4.5Vdc
A2 = Analog 0-10Vdc
A3 = Analog 4-20mA
A4 = Analog 0.1-4.9Vdc
P1 = PWM, 244 Hz
P2 = PWM, 500 Hz
P3 = PWM, 1000 Hz

Direction
1 = Clockwise
2 = Anticlockwise

Cable code
A00 = No cable, gland fitting
S00 = No cable, screened cable gland (A3 output option – see note)

B01 = 1m 3-core unscreened cable, IP69K
B05 = 5m 3-core unscreened cable, IP69K
B10 = 10m 3-core unscreened cable, IP69K

S01 = 1m 3-core screened cable, IP69K (A3 output options – see note)
S05 = 5m 3-core screened cable, IP69K
S10 = 10m 3-core screened cable, IP69K

C01 = M12 screw locking receptacle

DUAL OUTPUT SRH502P

SRH502P/ ..... / ..... / ..... / ..... / .....

Measurement range CH1 = angle in °

Measurement range CH2 = angle in °

Output
A1 = Analog 0.5-4.5Vdc
A2 = Analog 0-10Vdc
A3 = Analog 4-20mA
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

Cable code
A00 = No cable, gland fitting
S00 = No cable, screened cable gland (A3 output option – see note)

B01 = 1m 4-core unscreened cable, IP69K
B05 = 5m 4-core unscreened cable, IP69K
B10 = 10m 4-core unscreened cable, IP69K

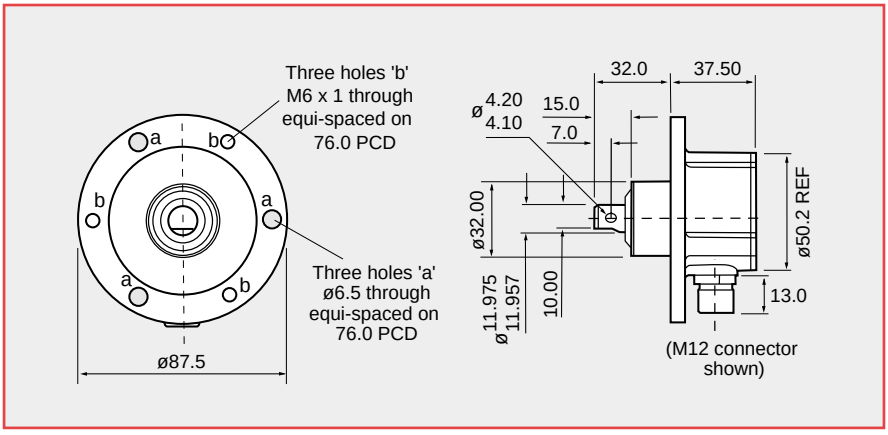
S01 = 1m 4-core screened cable, IP69K (A3 output options – see note)
S05 = 5m 4-core screened cable, IP69K
S10 = 10m 4-core screened cable, IP69K

C01 = M12 screw locking receptacle

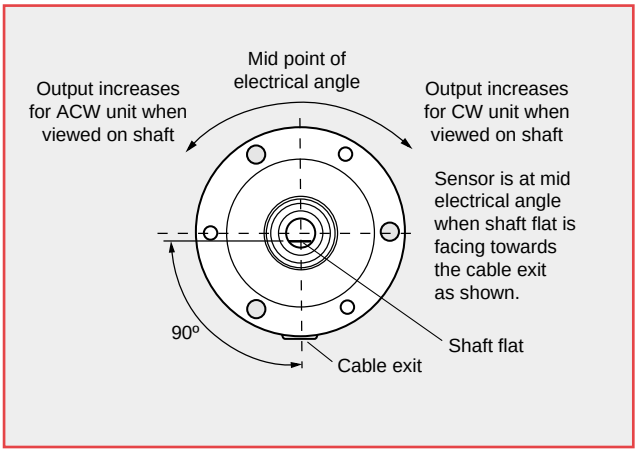
Accessories (order separately)
Drive lever kit – SA202195/MK - see page 25
Mating connectors - see details on page 26

DIMENSIONS

Note: drawings not to scale

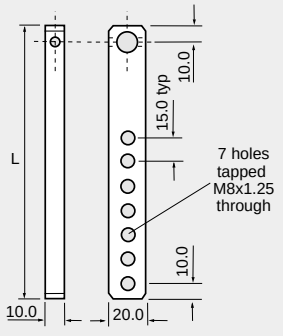


PHASING OF SHAFT TO HOUSING



LEVER OPTIONS (order separately)

Lever SA202195/MK1 L = 155
Lever SA202195/MK2 L = 230



ELECTRICAL CONNECTIONS

Option A00 – No cable supplied

Option S00 – No cable supplied (Fitted gland to suit screened cable)

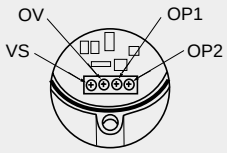
Option Bxx – Cable supplied (1m, 5m or 10m)

Option Sxx – Screened cable supplied (1m, 5m or 10m)

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.

CONNECTING CABLE OPTIONS

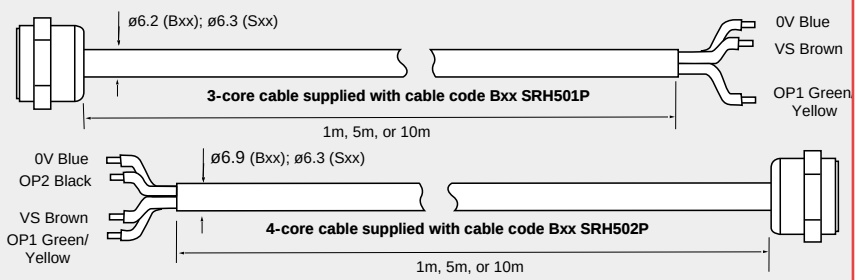
Connection details for no cable option A00 S00



Cable gland for cable between ø4-8mm

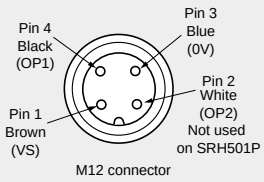
Connection capacity - AWG 26-16 or 0.14-1.5mm^2

Connection details for cable option Bxx and Sxx



Note: Sxx option includes a cable screen required for output option A3

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



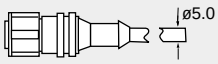
Pin No.	Cable colour	Description
1	Brown	+V Supply
2	White	Output 2 (not used on SRH501P)
3	Blue	0V Supply (GND)
4	Black	Output 1

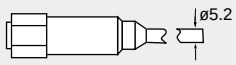
Output increases with CW or ACW rotation viewed on shaft - depending on selected order code

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

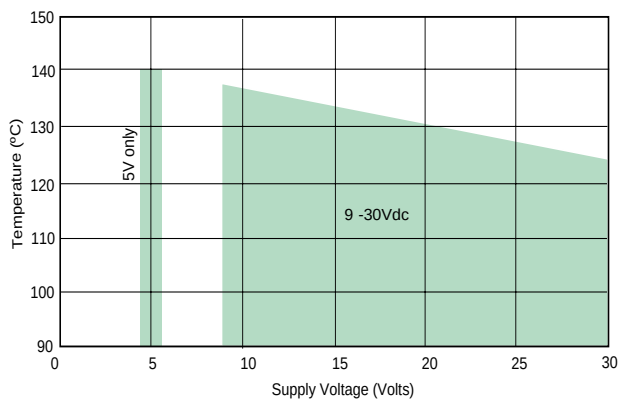
1.5 metre	X61-222-001
5 metre	X61-222-003
10 metre	X61-222-005

連接傳感器時，請注意正確的連接。
傳感器的輸出和GND之間具有極性保護和短路保護，但是如果將輸出端連接到電源端，則將導致傳感器故障。

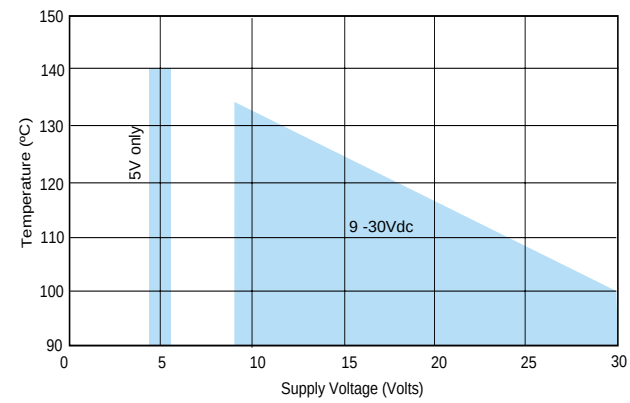
TEMPERATURE AND OUTPUT GRAPHS

MAXIMUM OPERATING TEMPERATURE - DERATING GRAPHS

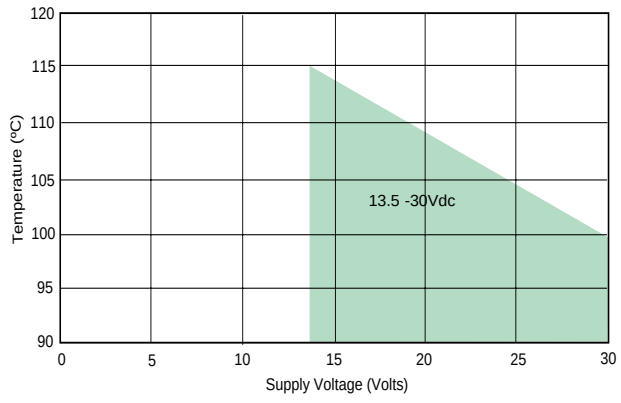
SRH280P



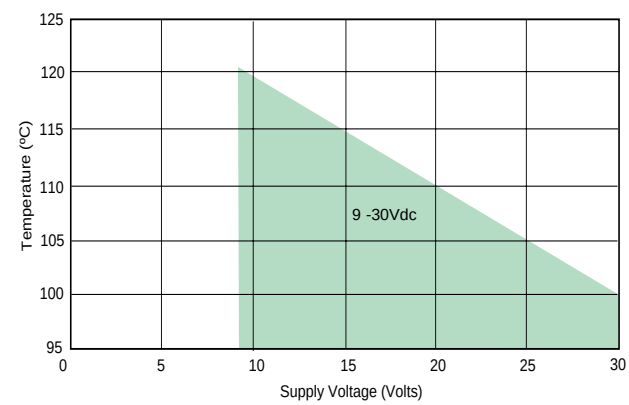
SRH280DP, NRH280DP, TPS280DP, SRH220DR SRH501P/502P (not A2 & A3 options)



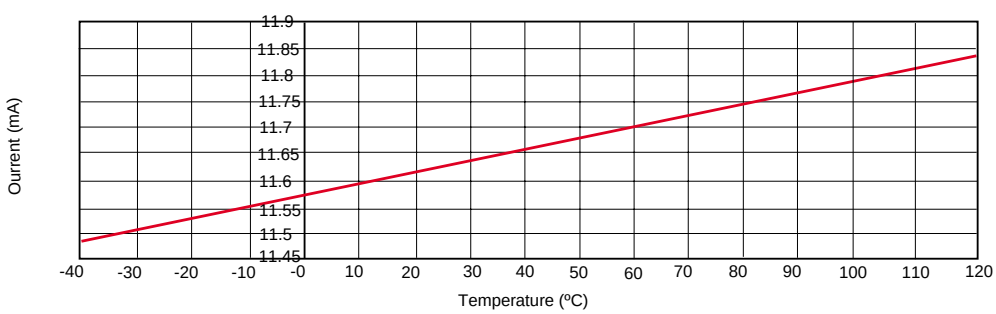
SRH220DR, SRH501P/502P - OUTPUT A2



SRH501P/502P - OUTPUT A3

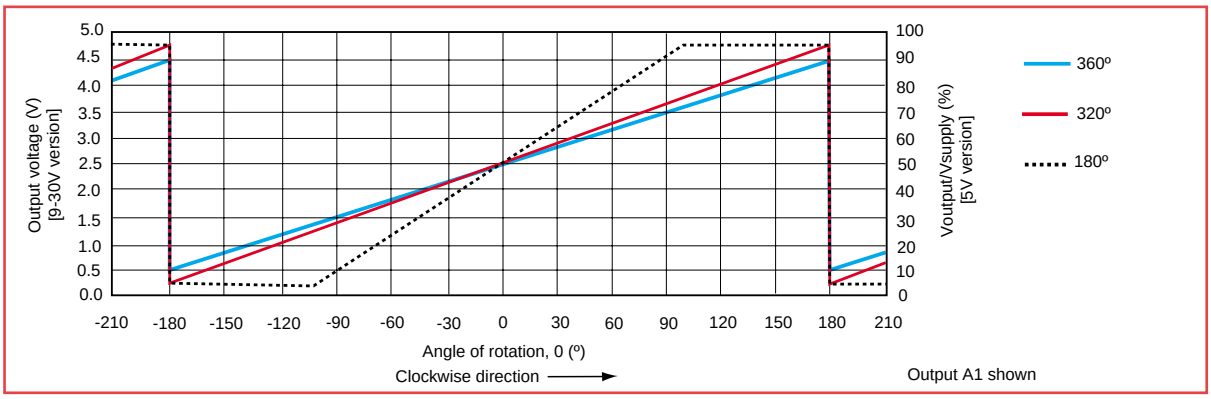


A3 Typical temperature slope characteristic (can be used for compensation)

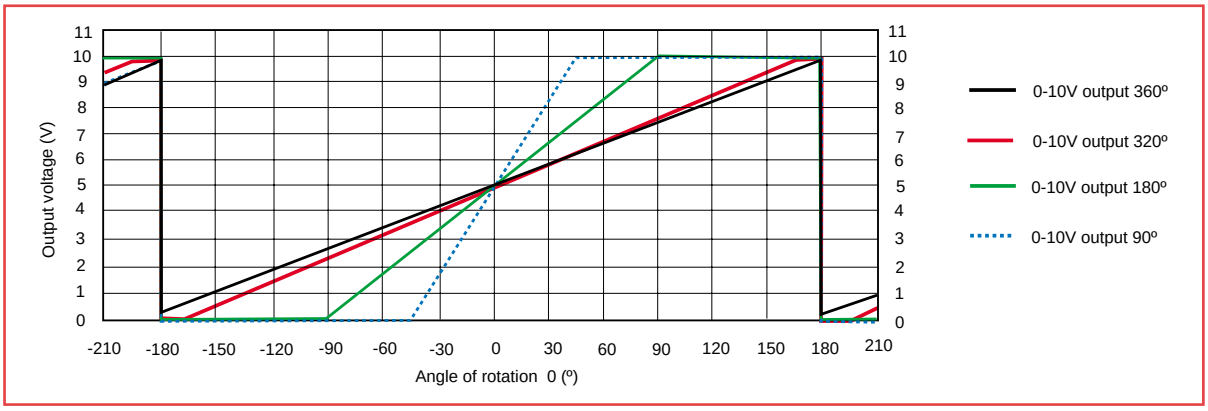


SENSOR OUTPUT GRAPH- examples for three different angles

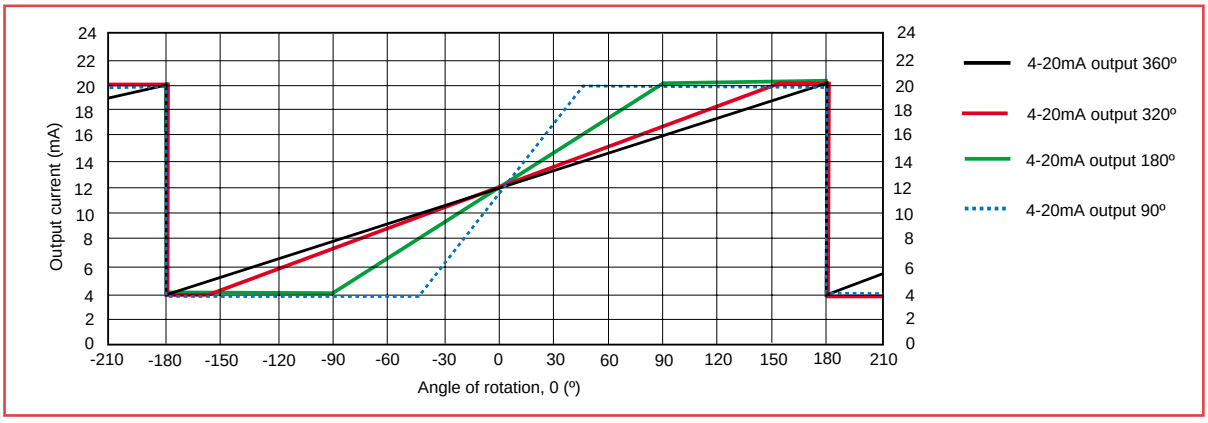
SRH280P, SRH280DP, NRH280DP, NRH285DR, TPS280DP, SRH220DR - OUTPUT A1
SRH501P/502P - OUTPUT A1
SRH880P - OUTPUT A



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

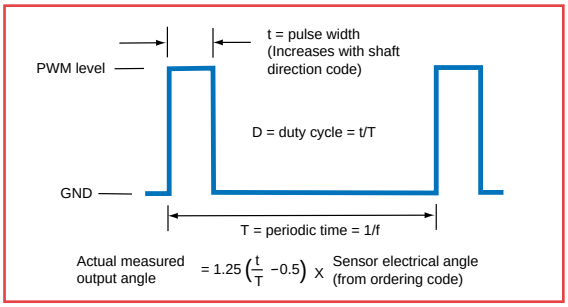


SRH501P/502P - OUTPUT A3 (4-20mA)



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