Penny & Giles

No-Contact, Rotary Position Sensor

NRH271 & NRH272

- **No-Contact – Hall-effect technology**
- **Wear-Free – unlimited mechanical life**
- **Simple mounting, low-profile design**
- **Measurement angle 20-360°**
- **5V or 9-30V supply options**
- **Single or dual redundant outputs**
- **Analog output – 0.5-4.5V or 0.2-4.8V**
- **PWM output – 244Hz, 500Hz or 1,000Hz**
- **Fail-safe outputs**
- **Encapsulated electronics**
- **Sealing to IP67**
- **AMP or Deutsch connector options**
- **Flying-lead option**
- **Protective cable conduit option**

The NRH271 and NRH272 is a family of no-contact, Rotary Position Sensors that offers the optimal combination of performance, safety and cost. All variants utilise proven Hall-effect, sensing technology and are accommodated in a low-profile (9.5mm) housing with a compact footprint of just 36 x 35mm.

The electrical output span can be set to correspond to rotations of 20° to 360°, and the positional information is determined by the angle of the supplied magnet relative to the sensor body. The maximum air gap between magnet and sensor is 7mm, while concentric offsets of up to 2mm can be tolerated with minimal impact on output linearity. The magnet can be supplied in a convenient carrier, housed in a bolt, as a plug or loose.

A choice of power supply options are available – one for connection to a regulated 5V supply and the other to a varying voltage in the range of 9-30V, such as a vehicle's battery. The NRH271 range has a single output, while the NRH272 has a second, redundant output. In addition, the NRH272 contains two completely independent measuring circuits, each with its own power supply, meaning high-performing, safety-critical applications can easily be addressed. Furthermore, both models contain on-board diagnostic functions that mean the outputs can be put into safe, pre-defined states should an internal sensor error be detected. The versatile, factory-programmable electronics can be easily set to one of two analog voltage output ranges or one of three PWM frequencies. In addition, the polarities of each of the analog outputs can be independently set.

A fully encapsulated design offers exceptional levels of performance with respect to water and dust, shock, vibration and temperature, meaning the sensor is ideal for use in hostile, on- and off-highway vehicle environments.

Connection options are industry-standard AMP Superseal (IP68 rated) or Deutsch DT04 series (IP67 rated) connectors, or simple flying leads for customer termination. The sensor can also be supplied with a protective conduit for the cabling.

SPECIFICATIONS

ELECTRICAL	
MEASUREMENT RANGE	20-360° in 1° increments
SUPPLY VOLTAGE	5Vdc ± 0.5Vdc or 5Vdc ± 0.5Vdc and 9-30Vdc – auto-selects
SUPPLY CURRENT	NRH271: <12.5mA NRH272: <25mA
SUPPLY REVERSE POLARITY PROTECTION	Yes
SHORT-CIRCUIT PROTECTION TO GND	Yes
SHORT-CIRCUIT PROTECTION TO SUPPLY	When used with 5Vdc supply only
OVER-VOLTAGE PROTECTION	Up to 12Vdc with 5Vdc supply only, up to 40Vdc with 9-30Vdc option
POWER-ON SETTLEMENT	<1s
RESOLUTION	12-bit (0.025% of measurement range)
LINEARITY (ABSOLUTE)	±0.4% with 5Vdc supply only, ±0.6% with 9-30Vdc option
TEMPERATURE COEFFICIENT	<30ppm/°C (<110ppm/°C in 9-30Vdc mode)
VOLTAGE OUTPUTS	
0.5-4.5V OUTPUT OPTION (5V SUPPLY)	10-90% ±1% of Vsupply over measurement range
0.5-4.5V OUTPUT OPTION (9-30V SUPPLY)	0.5-4.5V ±3% absolute
MONOTONIC RANGE (0.5-4.5V OUTPUT OPTION)	5%/0.25V to 95%/4.75V nominal
0.2-4.8V OUTPUT OPTION (5V SUPPLY)	4-96% ±1% of Vsupply over measurement range
0.2-4.8V OUTPUT OPTION (9-30V SUPPLY)	0.2-4.8V ±3% absolute
MONOTONIC RANGE (0.2-4.8V OUTPUT OPTION)	1%/0.05V to 99%/4.95V nominal
LOAD RESISTANCE	10kΩ min. (resistive to GND)
OUTPUT NOISE	<1mV rms
INPUT/OUTPUT DELAY	<2ms
PWM OUTPUTS	
PWM FREQUENCY	244Hz, 500Hz or 1kHz ±20%
PWM LEVELS (5V SUPPLY)	0V and Vsupply ±1%
PWM LEVELS (9-30V SUPPLY)	0V and 5V ±3% nominal
DUTY CYCLE	10-90% over measurement range
MONOTONIC RANGE	5-95% nominal
LOAD RESISTANCE	10kΩ min. (resistive to GND)
RISE/FALL TIME	<15µs typical
MECHANICAL	
MECHANICAL ANGLE	360° continuous
MAXIMUM OPERATING SPEED	3600°/s
WEIGHT	<100g
MOUNTING	2x M3 screws
CABLE	Spec 44A wires 18AWG 1.65mm OD
ENVIRONMENTAL	
OPERATING TEMPERATURE (5V SUPPLY)	-40°C to 140°C (limited to 120°C if conduit fitted)
OPERATING TEMPERATURE (9-30V SUPPLY)	-40°C to 135.2°C at 9Vdc (de-rate upper temperature by 1.7°C per volt increase)
SEALING	AMP connector: IP68, Deutsch connector: IP67
VIBRATION	EN 60068-2-64: 1995 section 8.4 (31.4gn rms) 20-2000Hz random
SHOCK	3m drop onto concrete and 2500g
LIFE	Virtually infinite
MTTFd	> 600 years
ELECTROMAGNETIC INTERFERENCE	EN 61000-4-3: 1999 to 100V/m 80-1000MHz & 1.4-2.7GHz
SALT SPRAY	BS EN 60068-2-52 test Kb severity 2

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