Slip Ring & Rotation Sensor Assembly

SR/ERT Series

- 10, 20, or 36 slip ring connections
- Encoder or resolver rotation sensor
- Additional encoder electronics (built in)
- Available with or without weatherproof seals
- Different rotor styles
- Circular connectors or color coded solder terminals
- Instrumentation quality rings & brushs
- Sealed, corrosion resistant metal housing
- Lightweight and compact
- Quick deliver

Description

The SR/ERT Series is used when slip rings and/or a rotation sensor need to be mounted at the end of a rotating shaft. The gold alloy slip rings are used to make high quality electrical connection to strain gages, thermocouples, or other sensors that have been installed on rotating machinery. Current capacity is 0.5A per connection and the maximum peak resistance variation is 0.1W. The rotation sensor is used to measure rotational velocity, angular position, and direction of rotation. The rotation sensors do not use any of the slip ring connections.

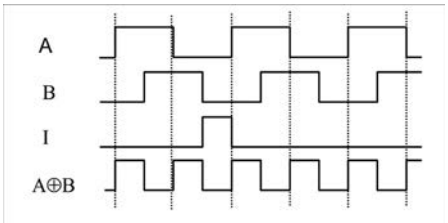
The housings are 3 to 5 inches long, depending on the number of slip rings. They weigh about 15 ounces. The rotors are made from high strength stainless steel. The stators are lightweight, nickel-plated, aluminum. Threaded holes are provided for attaching a rotation restraint. Connection information is permanently engraved on the housing. Circular connectors or solder terminals are offered as wiring terminations. A circular connector is usually specified on the stator. On the rotor, test applications needing a quick disconnect specify circular connectors. If small size is needed, solder terminals are specified on the rotor. In both cases there is also a choice of orientation. For outline drawings, contact Michigan Scientific or visit our web site at www.michsci.com.

All the housings in this series have been designed to accept contacting rotary seals. Units ordered with these seals (choice W) are completely weatherproof and can survive days of total submersion. The seals limit operation to 2000 rpm maximum. Most wet weather applications, like automotive wheels, are within this range. For higher speeds in dry conditions, order units without the contacting rotary seals. Units without seals are capable of the following speeds: 10 rings: 10,000 rpm, 20 rings: 4000 rpm, and 36 rings: 2400 rpm. Unit torque with seals is 21 inch-ounces. Unit torque without seals is 3 inch-ounces. If the application requires a high speed, weatherproof slip ring & encoder, consider units with noncontacting labyrinth seals in the SR/E512 series.

Rotation sensor choices E256, E360, E500, & E512: Four optical encoder resolutions are offered, see the table below. Each of these encoder choices has 4 outputs, shown graphically below. Outputs A and B are in quadrature (exactly 90° out of phase). Output I is an index pulse. Output A⊕B is the exclusive OR of A and B, which doubles the basic resolution of the encoder. The outputs, 0 to 5 volt pulses, can drive TTL loads. The encoders will operate from a +5 to +20 Vdc, 100 mA power supply. Temperature range is -40F to +212F. The encoders have metal code wheels and rugged electronics so they tolerate shock and vibration. They are also protected from incorrect wiring up to 20 volts. Accuracy of encoder systems is 0.25° (maximum cumulative error).

Encoder choices	Outputs:Pulses per revolution A	B	I	A⊕B
E256	256	256	1	512
E360	360	360	1	720
E500	500	500	1	1000
E512	512	512	1	1024

ENCODER OUTPUTS



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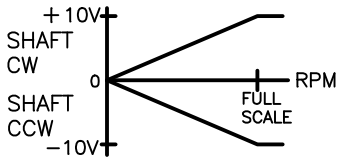
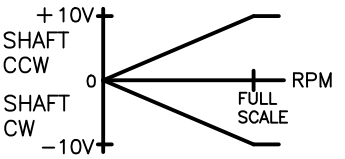
Rotation sensor choices T256, T360, T500 & T512: Additional encoder electronics can be built into the encoder units. The electronics adds two analog outputs, a voltage proportional to shaft velocity (similar to a tachometer) and a voltage proportional to the angular position of the shaft. The analog outputs are easier to record than the digital encoder outputs, which require high sampling rates. Both analog outputs are updated at each pulse of encoder output A, so they are instantaneous, not average values. The encoder electronics will operate from a +6 to 16 Vdc, 400 mA power supply. Temperature range is -40F to +185F.

Full scale for the angular position output is +10V for rotation in either direction.

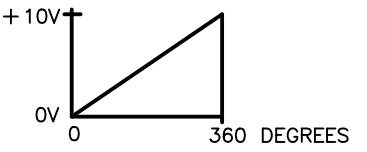
Full scale for the velocity output is +10V for rotation in one direction and -10V for rotation in the opposite direction. Two velocity sensitivities and direction of rotation are usually programmed into each unit. Two pins in the stator connector are designated as option pins, through which the user selects 1 of 4 combinations. For example, units used on our torque wheels are normally programmed to output 10V at 1000 rpm with option pin #1 open. With option pin #1 grounded, full scale is 1800 rpm. Option pin #2 sets the polarity, or direction of rotation, viewing the end of the shaft. With pin #2 open, CW rotation results in a positive velocity output. When pin #2 is grounded, CCW rotation results in a positive velocity output.



VELOCITY OUTPUT WITH OPTION PIN #2 OPEN



VELOCITY OUTPUT WITH OPTION PIN #2 GROUNDED



POSITION OUTPUT (0 IS AT INDEX PULSE)

Because the velocity output is like a dc tachometer, we sometimes refer to it as the tachometer circuit. However, unlike a tachometer, there is no commutation ripple, it works down to 0 rpm, linearity and accuracy are better, it is small and lightweight, and the performance does not degrade with use.

Rotation sensor choice R360: A resolver can be specified instead of an encoder. The resolver is an analog rotation sensor with two outputs labeled sine and cosine. The outputs can be passed through the same type of filters as strain gage or other analog sensor signals coming through the slip rings. Then the rotation signal will remain in phase with the sensor signals. The resolver requires additional external electronics for excitation and for processing the outputs. (Michigan Scientific makes resolver electronics, see model RESSC-2-12V in the electronics section of the catalog.) A resolver is an absolute position sensor. Its' angular position is known as soon as the excitation and electronics is turned on, an index pulse does not have to be located before the shaft position can be determined. Temperature range is -40F to +250F. Accuracy of the resolver is 0.25°. System accuracy, which includes the electronics, is within 1°. The resolver option is most often used with 6 axis wheel load transducers.