Model B4-2W

User Manual

Michigan Scientific Corporation

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Contents

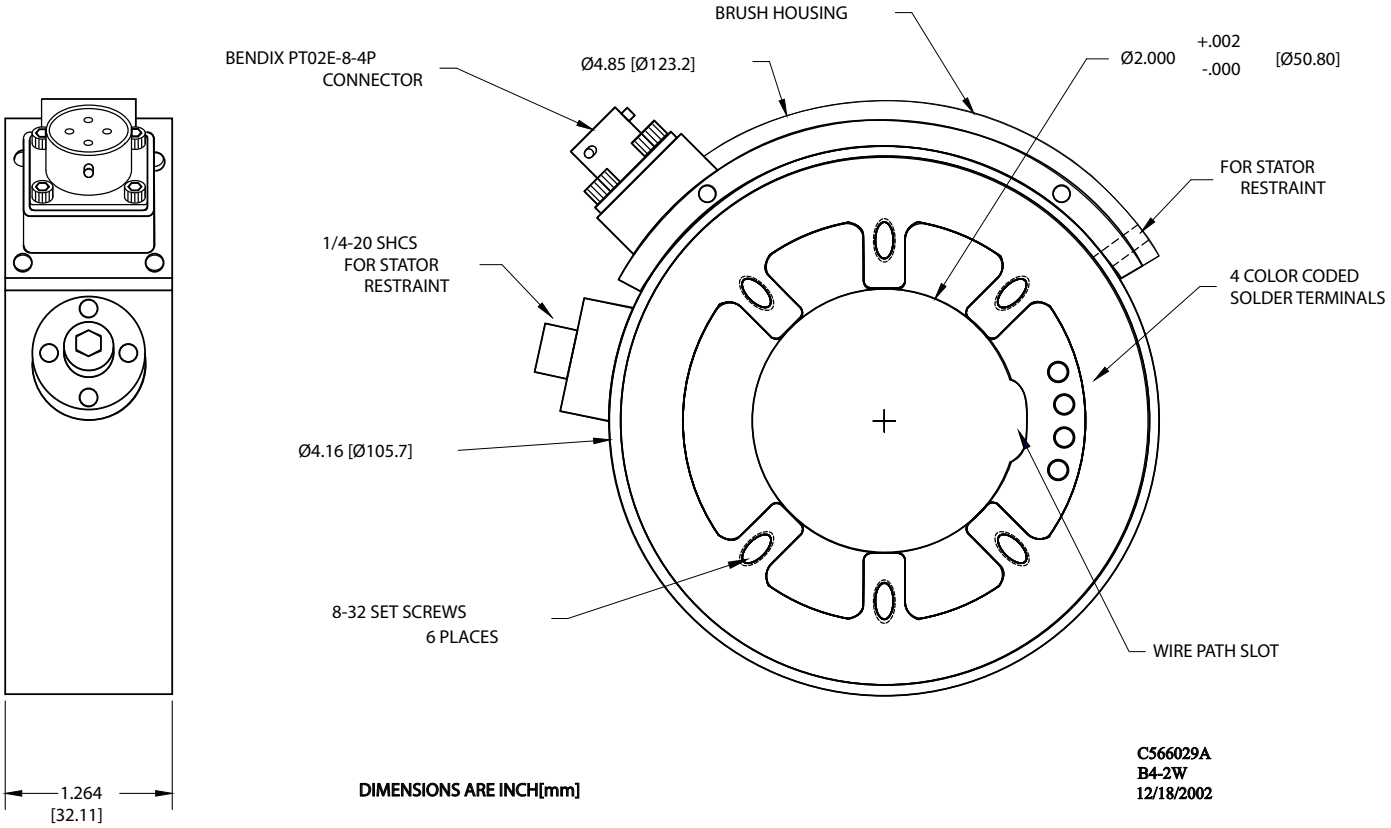
The Model B4-2W Weatherproof Slip Ring Assembly...

- Four-circuit weatherproof slip ring assembly
- Mounts on shafts up to 2 inches (50.8 mm) in diameter
- Connects to strain gauges, thermocouples, or other sensors
- Rugged construction, utilizing stainless steel and anodized aluminum on all external parts
- Instrumentation quality rings and brushes
- Specially designed, non-contacting labyrinth seals
- Compact design

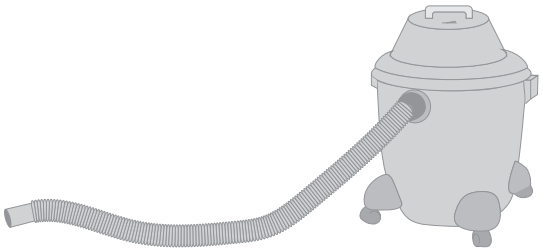
Specifications

Channels	4
Current Capacity per Channel	1 A
Temperature Range	-40 °F to 250 °F (-40 °C to 121 °C)
RPM Rating	7000 RPM
Maximum Peak Noise[1]	0.1 Ω
Width	1.264 in (32.11 mm)
Weight	2.75 lb (1.25 kg)
Output Connector	Bendix PT02E-8-4P
Mating Connector	Bendix PT06E-8-4S(SR)

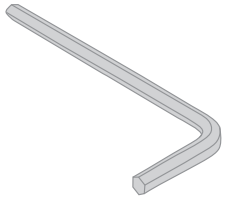
[1]Resistance variation across slip ring contact



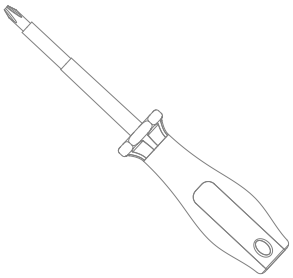
Required Tools



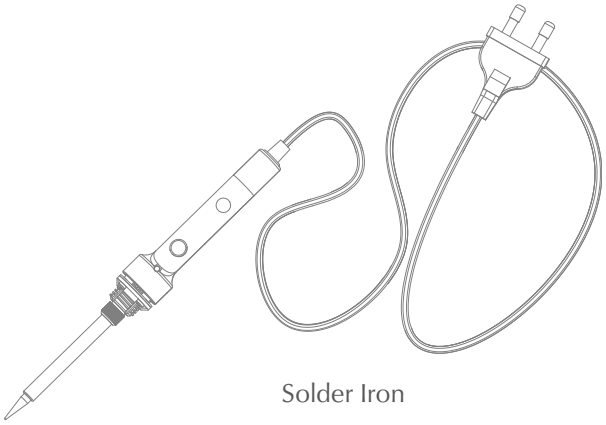
Vacuum



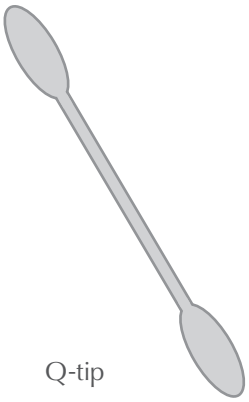
5/64" Allen Wrench



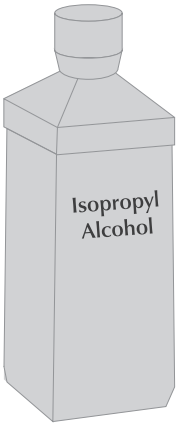
Screw Driver



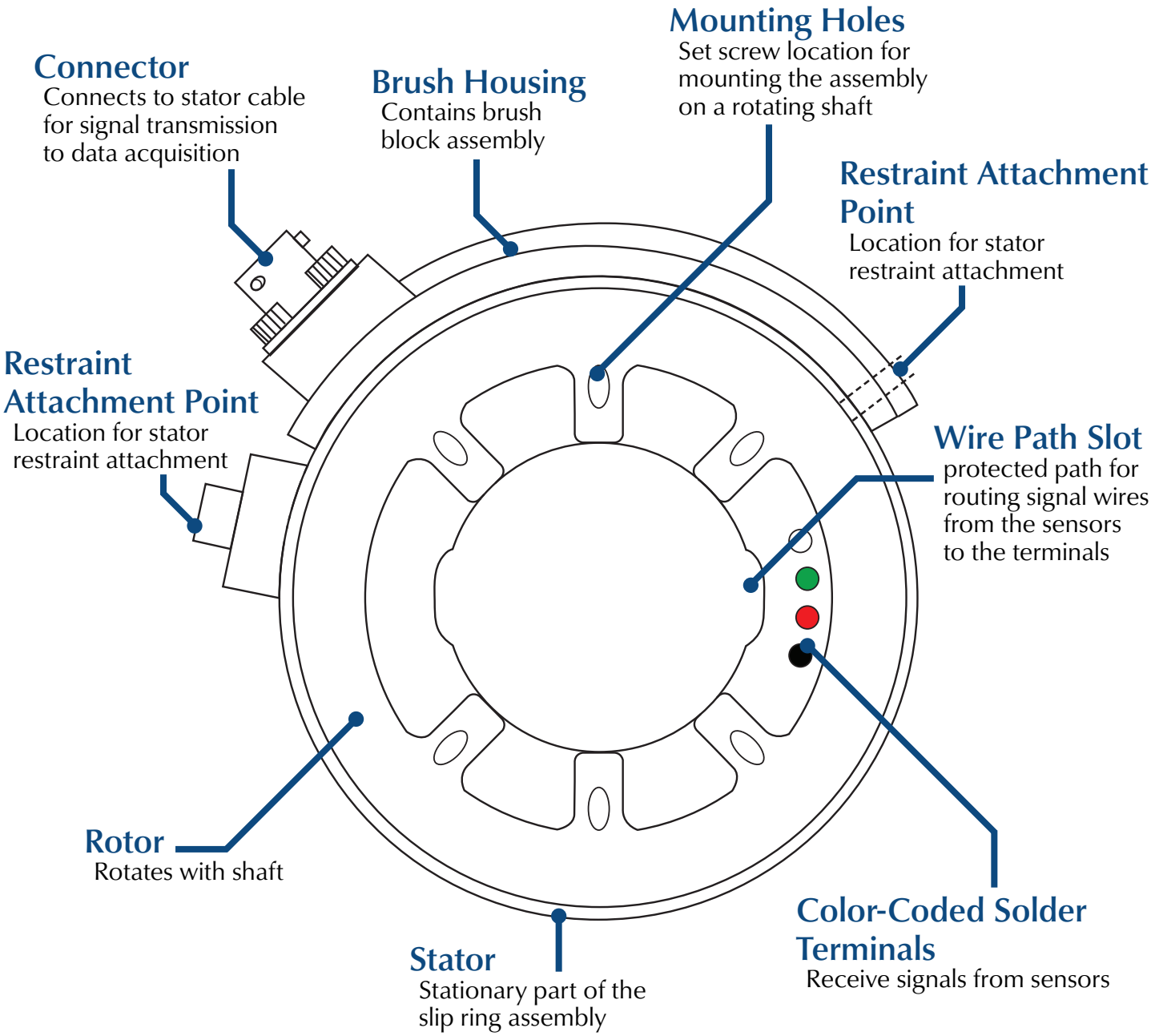
Solder Iron



Q-tip



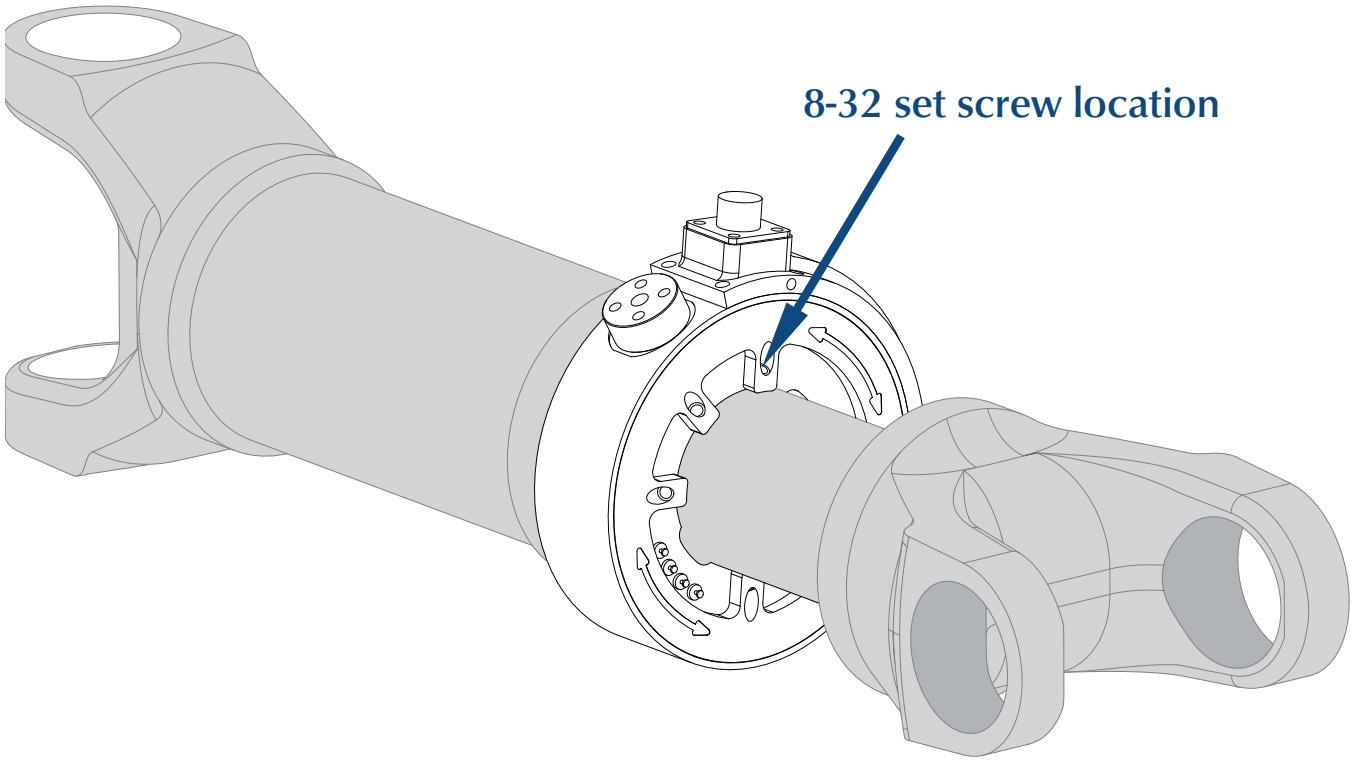
Assembly Overview



Mounting to the Shaft

Mount the slip ring assembly to the shaft as square and concentric as possible. Secure the slip ring assembly to the shaft with six 8-32 set screws.

If the assembly is installed on a vehicle prop-shaft, position the assembly so the terminals face the rear of the vehicle.



WARNING

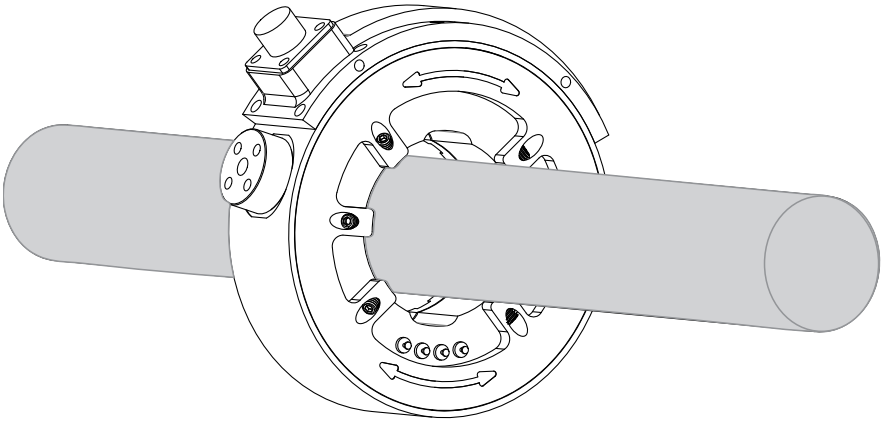
The weatherproof seals designed for this slip ring do not work on vertical shafts. If a weatherproof tubular slip ring on a vertical shaft is needed for a specific application, contact Michigan Scientific.

Mounting the Adapter

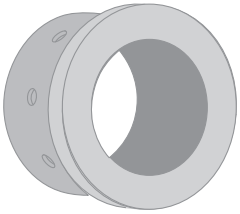
If the slip ring assembly is mounted to a shaft with a diameter smaller than 2.00 in (50.8 mm), an adapter bushing will be needed.

Machine recessed spot faces or flats in the surface of the adapter or shaft that align with the set screws to help secure the rotor to the shaft. An adapter made from aluminum or soft steel is recommended because these materials will allow the set screws to penetrate the adapter to better hold the slip ring to the shaft.

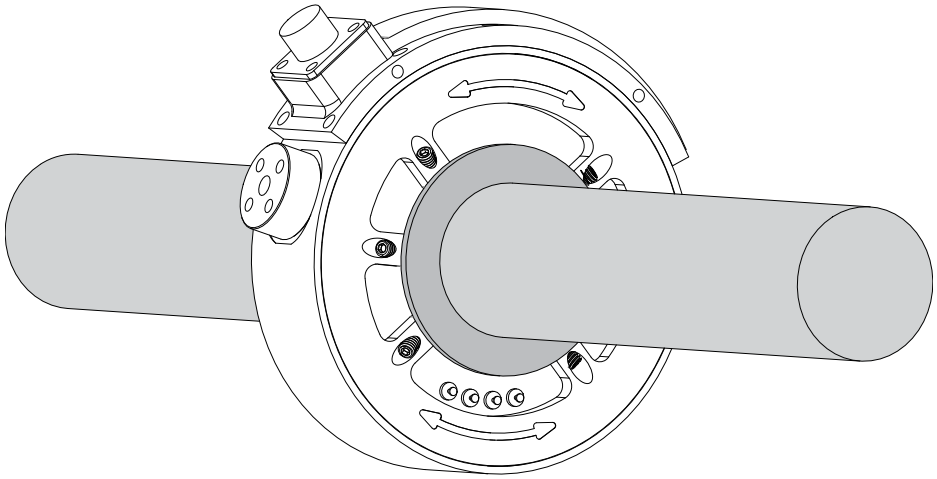
To purchase a custom adapter, contact Michigan Scientific.



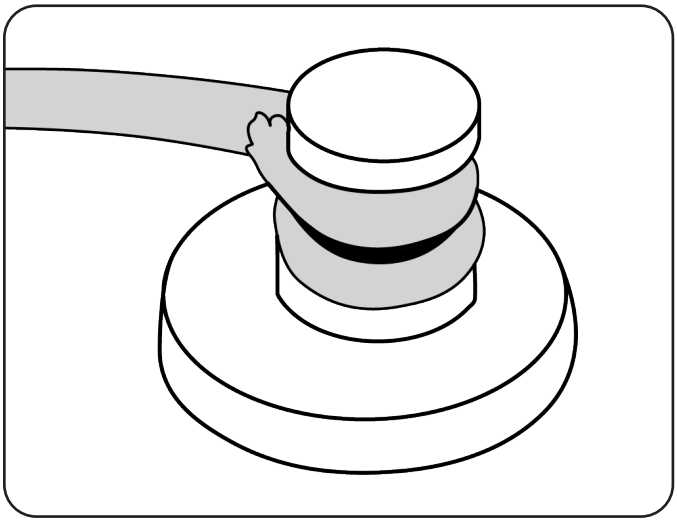
Shaft ≤ 2 in (50.8 mm)



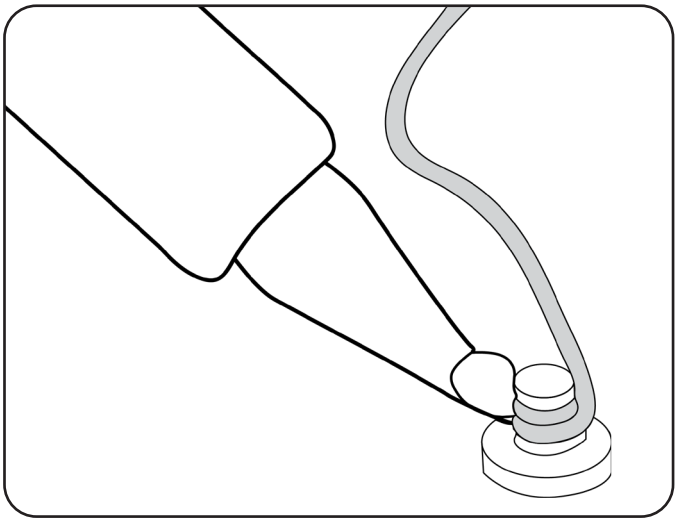
2 in (50.8 mm) outer diameter adapter



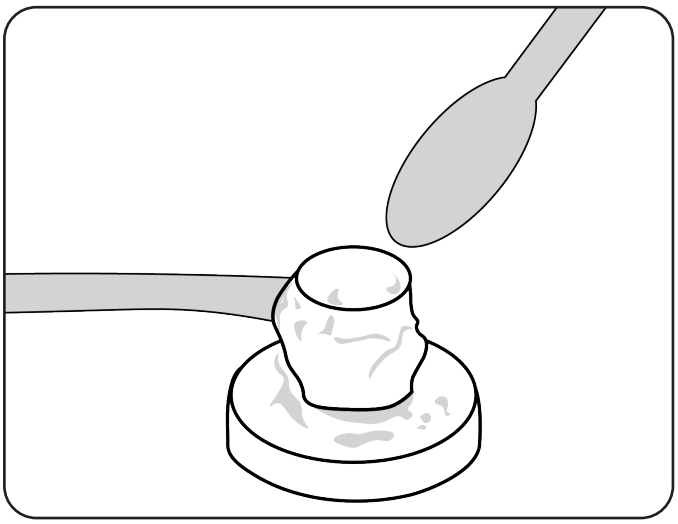
Soldering the Terminals



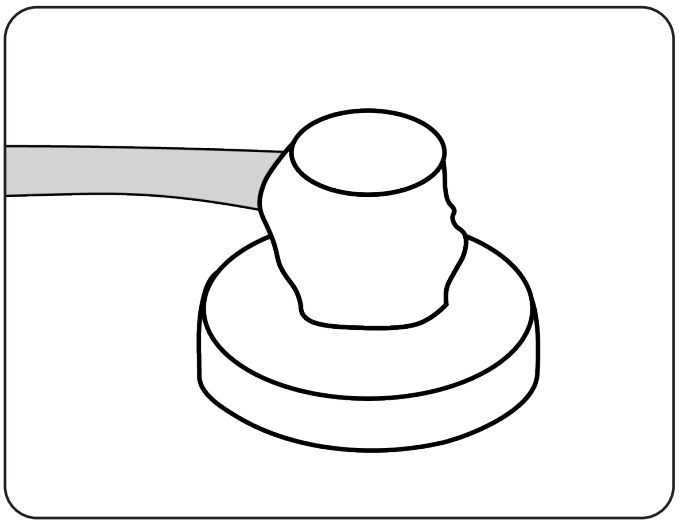
Wrap small-stranded, 24 AWG (maximum) lead wire around each terminal.



Solder the coiled wire to the terminal. Use an 80 watt solder iron (660 °F or 350 °C if temperature-controlled). Hold the iron on the terminal for 2-3 seconds only.



Remove all flux from the solder terminal with a proper solvent.



Apply a weatherproof coating to the exposed wires and terminals. Electronics grade RTV silicone sealant can be used as an effective weatherproof coating.

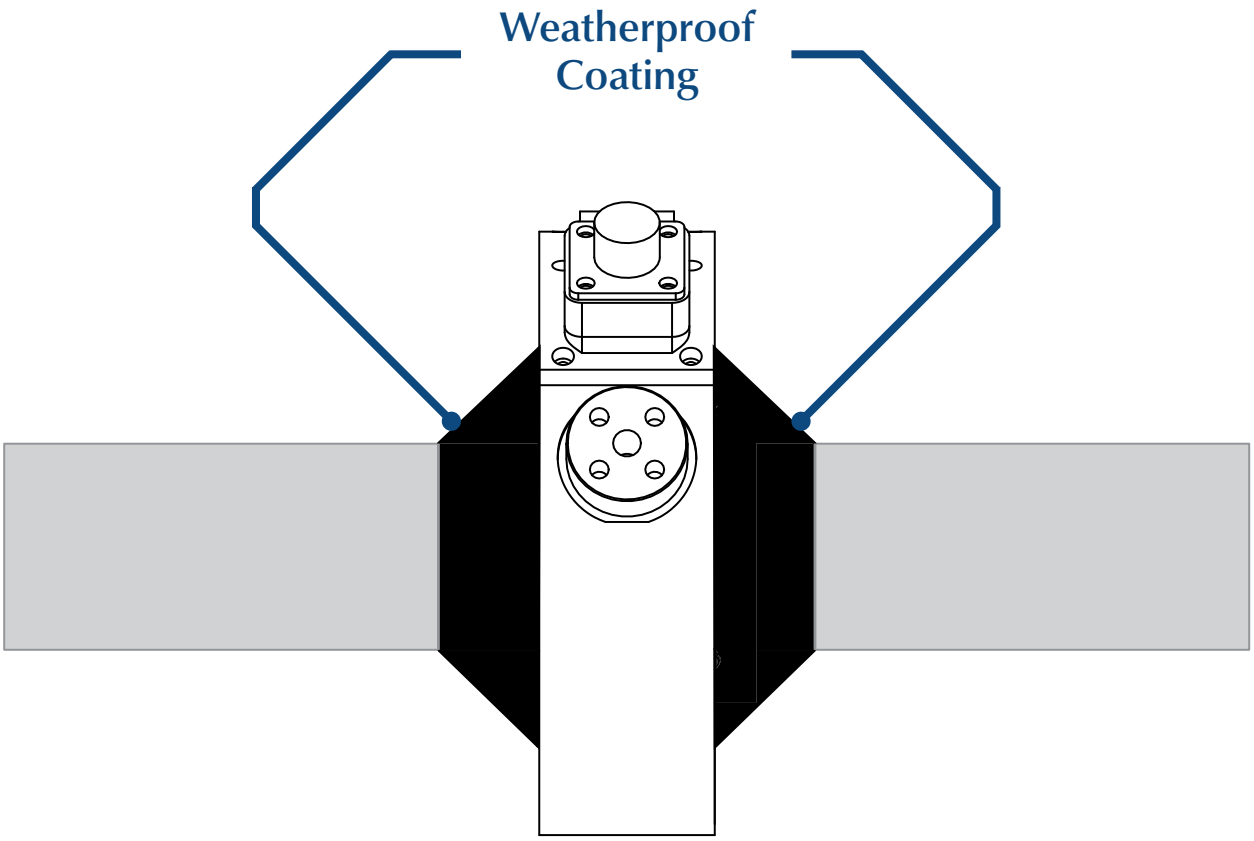
Notes

Thermocpuple leads require a specific flux, and 28 or 30 AWG wire is recommended. Contact Michigan Scientific for flux and instructions.

Once the leads are soldered to the terminals, secure them to the rotating shaft to prevent the leads from fatiguing off or damaging the terminals.

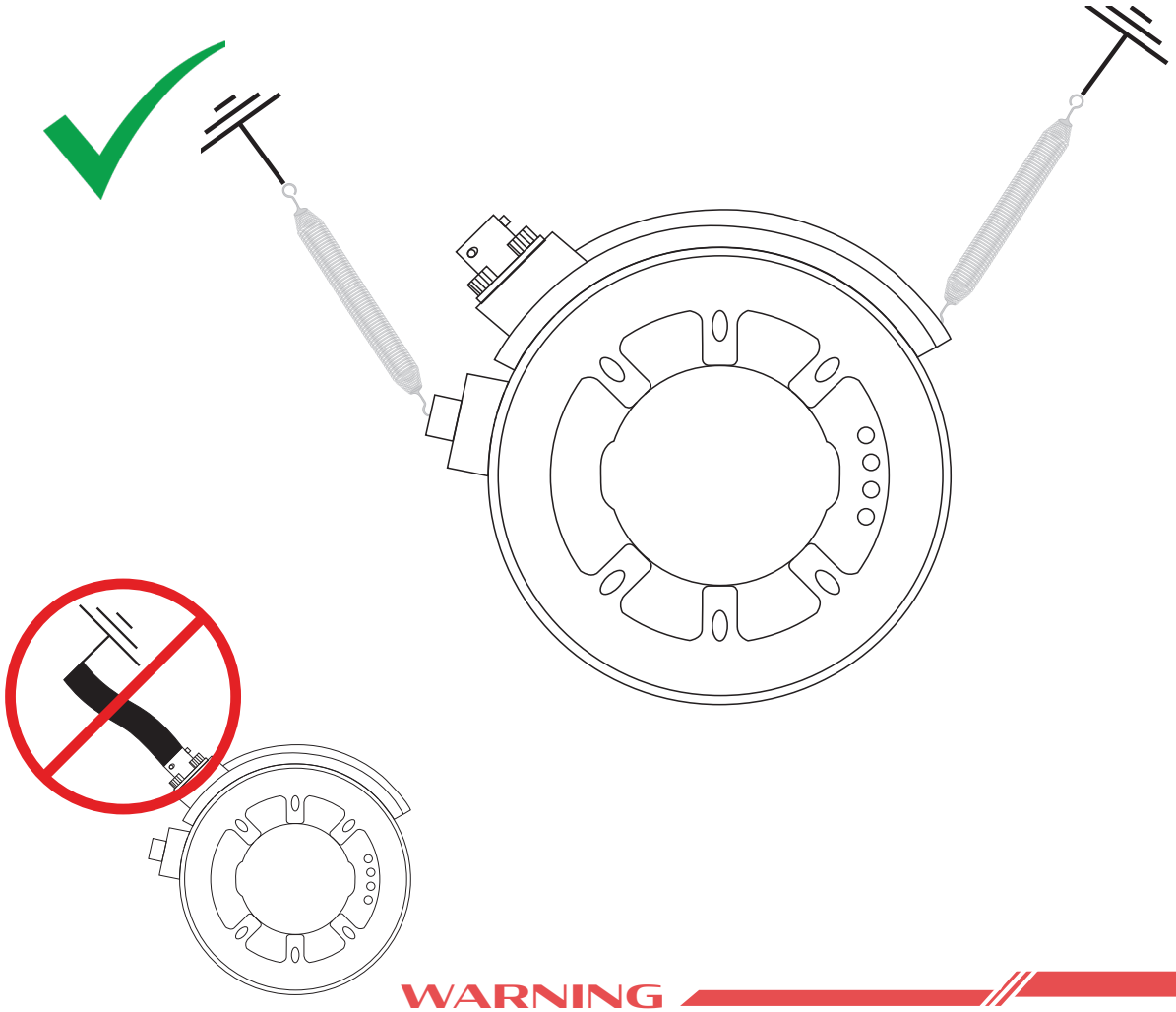
Applying Weatherproof Coating

When applying the weatherproof coating, press the coating around the soldered terminals and into every indent all the way around the slip ring assembly on both sides.



Restraining the Stator

Springs work well as rotational stator restraints because of their flexibility. When choosing restraints, keep in mind the typical operational torque for these assemblies is approximately 30 oz·in (0.2 N·m). Depending on the application, it may be best to use both restraint locations on the slip ring to limit movement.



WARNING

Do not use the stator cable as a restraint.

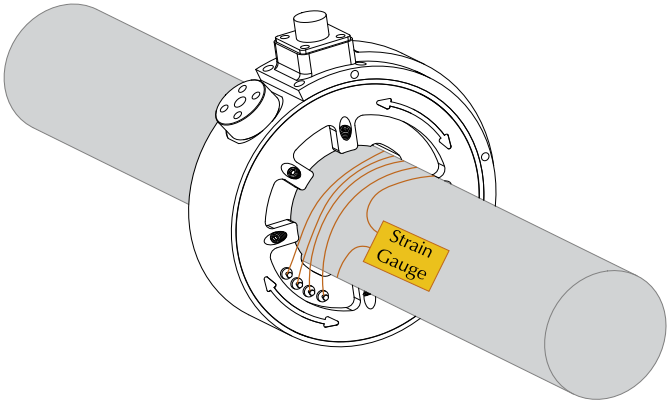
Only use flexible stator restraint systems. A rigid restraint system will damage the slip ring bearings.

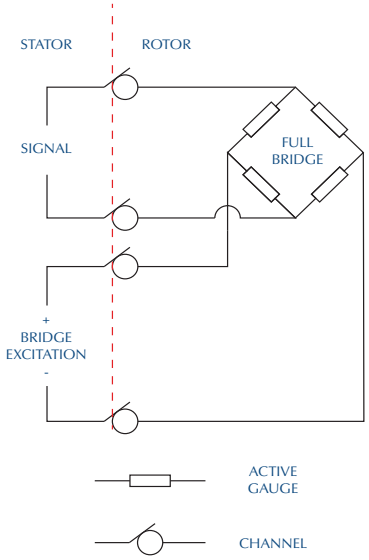
Connection Options

The most common sensors used with slip rings are strain gauges. These sensors have outputs in the microvolt to millivolt range. By using the correct circuits and installation techniques, these low-level signals are accurately transferred through the slip ring to a recording device. Accelerometers and sensors used for temperature measurements are also used with slip rings.

Strain Gauges

Most customers using the B4-2W slip ring measure torque on a shaft. A full Wheatstone bridge configuration on the rotating shaft is recommended. For information on using strain gauges with slip rings, please refer to Tech Note 101 or contact Michigan Scientific.





Accelerometers

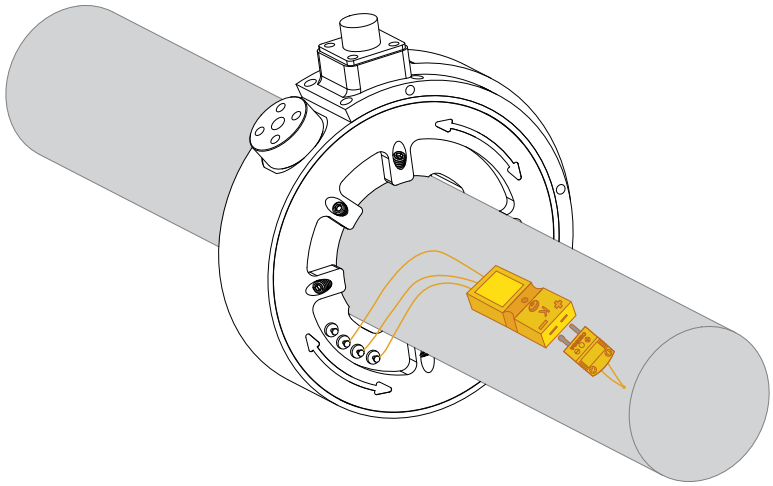
An integrated circuit Piezoelectric ICP or IEPE type accelerometer is the only type of accelerometer that can be used with this slip ring. These have a built-in microelectric voltage amplifier that converts the high impedance electrostatic charge into a low impedance voltage.

RTD

RTDs are a good temperature sensors to use with a tubular slip ring. The platinum RTDs are highly sensitive (typically 0.385 Ω/°C), linear, and accurate. A RTD can be connected with two, three, or four wires, depending on the accuracy required.

Thermocouples

When using thermocouples with a B4-2W slip ring, Michigan Scientific rotating thermocouple amplifiers are recommended. Thermocouple amplifiers ensure accurate temperature measurements with thermocouple wire. If it is necessary to use a thermocouple wire without an amplifier, contact Michigan Scientific for information on making quality measurements.

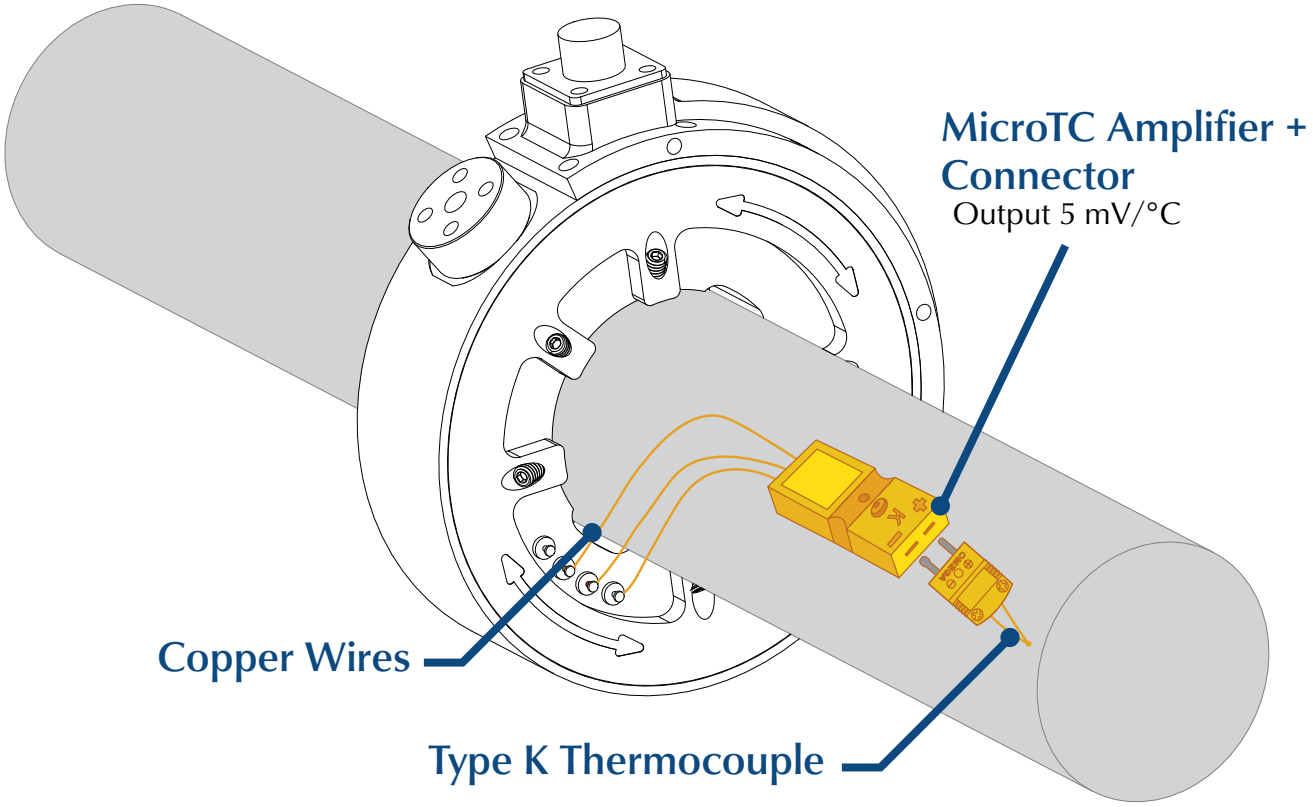


Amplifiers

Michigan Scientific manufactures precision Thermocouple and Strain Gage Amplifiers that have been designed to mount on the rotating side of the instrumentation system. The amplifiers provide precise measurements under difficult conditions such as electrically noisy environments, low strain levels, high speeds, or high vibration.

Michigan Scientific Strain Gage Amplifiers improve data accuracy because the signal conditioning electronics are mounted on the rotating shaft near the measurement sensor.

Thermocouple Amplifiers output 5 mV/°C. Refer to Tech Note 102B or contact Michigan Scientific for more information on thermocouple amplifiers.



Wiring Diagram

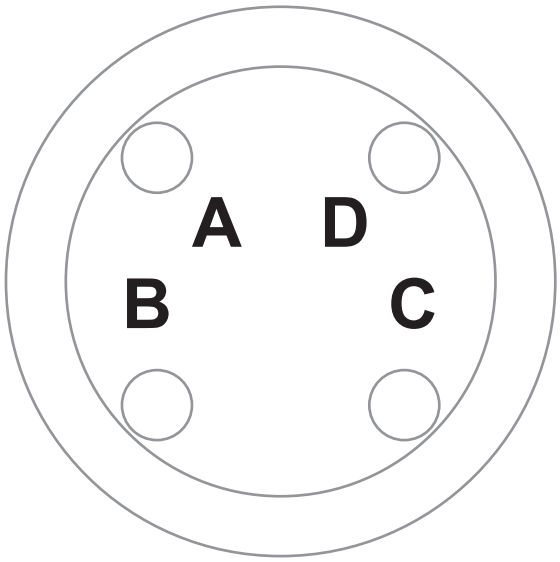
The standard connector for the Model B4-2W is the Amphenol PT02E-8-4P. The mating connector is the PT06E-8-4S(SR). Versions with the standard wiring pattern or the Western Regional Standard are available, but the preferred type must be specified when ordering.

Standard Wiring Pattern

A - White
B - Green
C - Red
D - Black

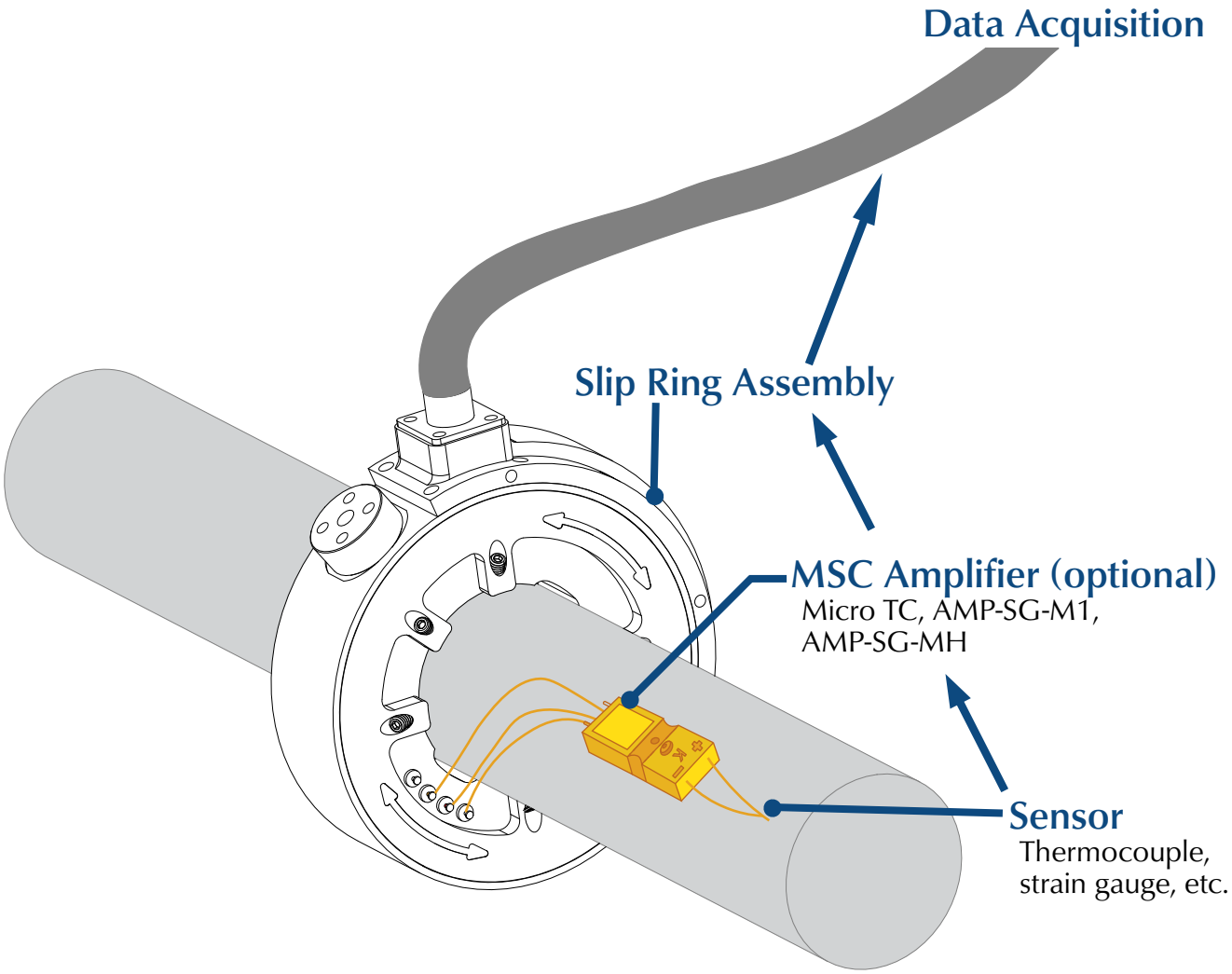
Western Regional Standard (WRS)

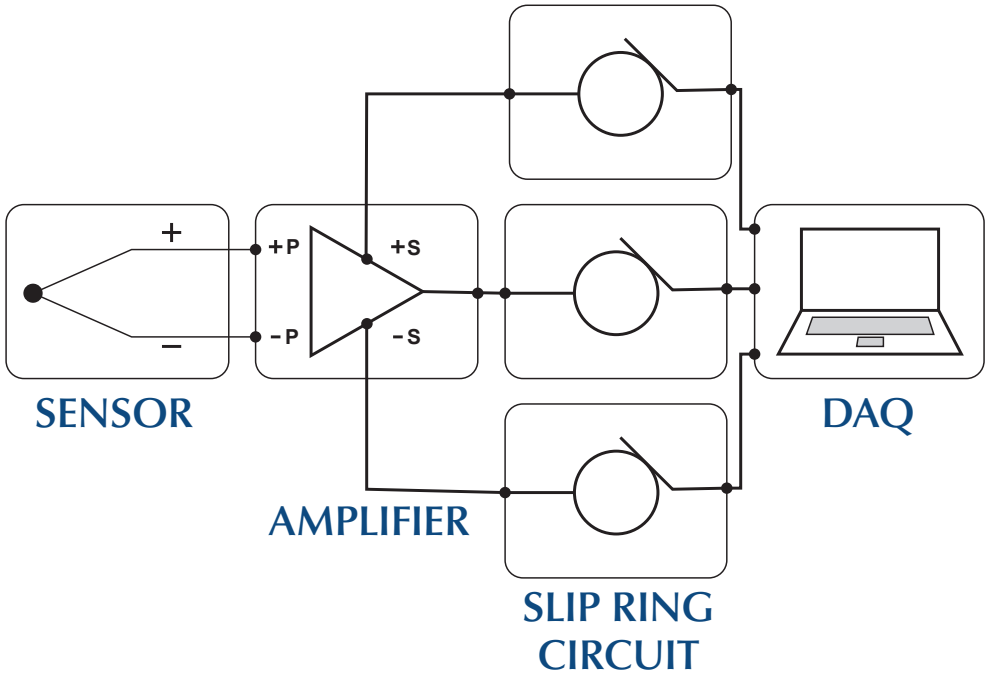
A - Red
B - Green
C - White
D - Black



Exterior view of
stator connector

Block Diagram



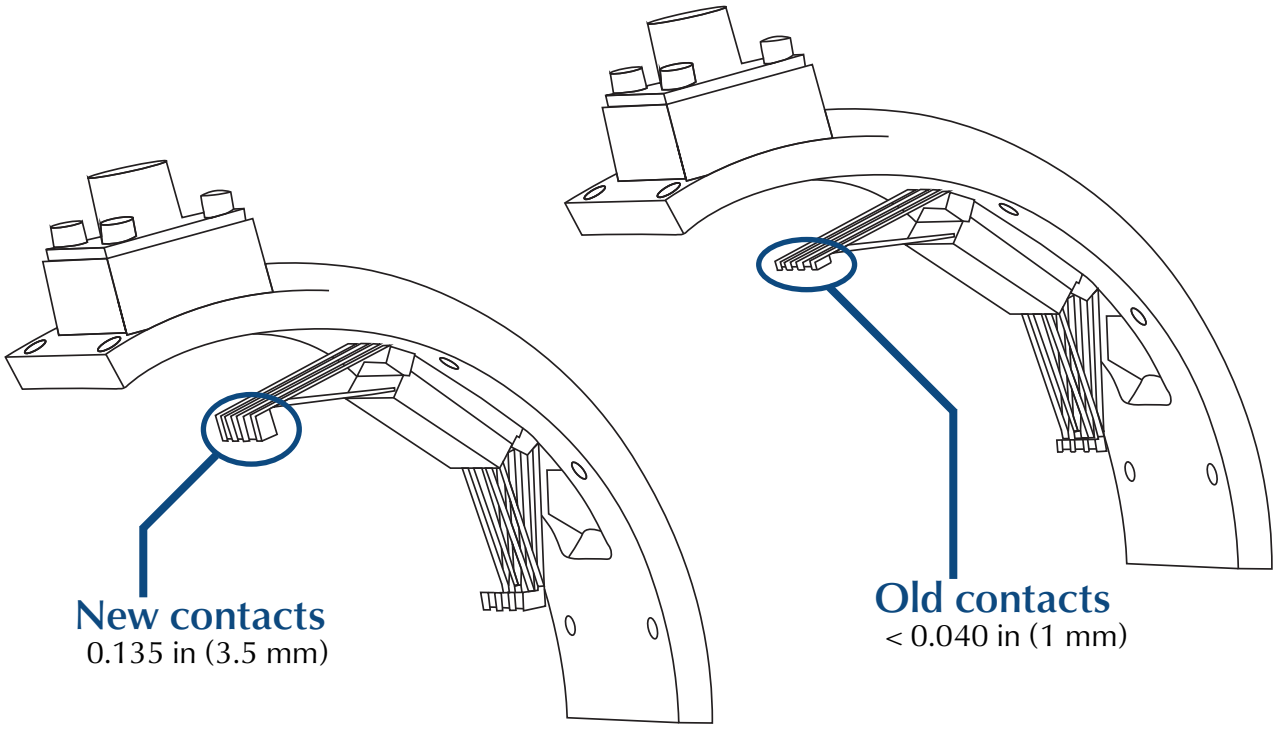


When to Replace Brush Assembly Contacts

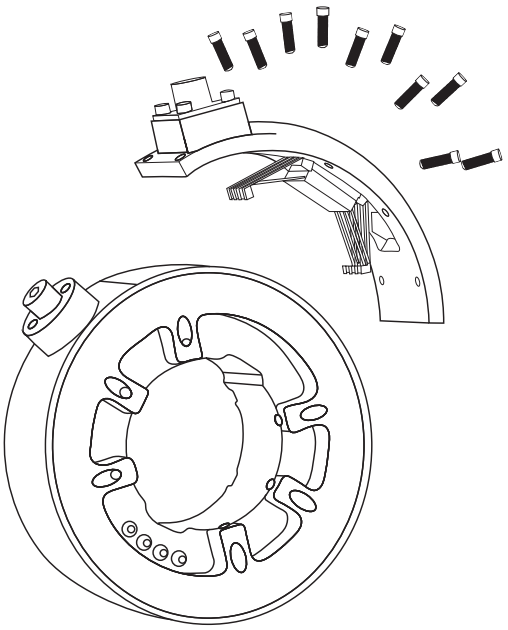
The electrical contacts of the Model B4-2W Slip Ring Assembly wear at a much higher rate than the rest of the assembly. Many factors can affect the life of the contacts, including temperature, humidity, rotational speed, amperage, and vibration. As the contacts wear, conductive debris from the contacts builds up within the slip ring housing which can eventually lead to electrical shorting between rings (slip ring connections) or between slip ring connections and ground (slip ring housing).

New contacts are 0.135 in (3.5 mm) in length. If any contact has less than 0.040 in (1 mm) of material left on the leaf, it is time to have the contacts replaced. If the leaves or contacts need to be replaced, return the assembly to Michigan Scientific Corporation for service.

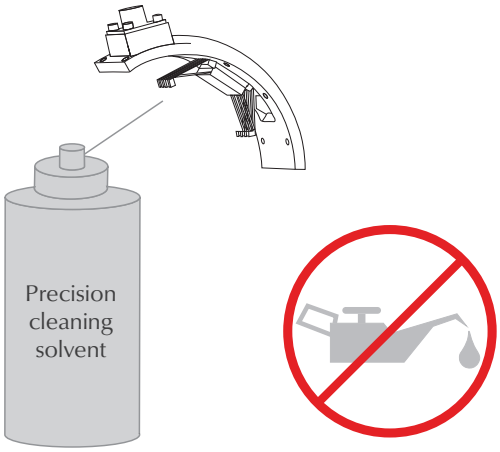
The rings and brushes in the slip ring assembly can become severely damaged if the contacts are left to wear away completely. Assuming the contacts are serviced as needed, the rest of the assembly should last through several sets of contacts.



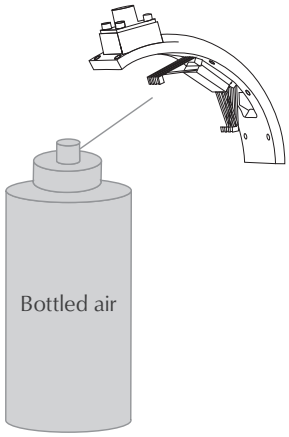
Servicing the Contacts



Hold the brush housing in place with one hand and remove the ten 2-56 x 3/16" socket head cap screws that attach it to the stator of the slip ring assembly.



Remove wear debris from the brush assembly by spraying a precision cleaning solvent or contact cleaning solution that does not contain oil on the contacts and leaves. The debris can also be removed using a soft brush and clean isopropyl alcohol.



Remove the solvents by spraying the assembly with filtered or bottled air. Do not use air from shop compressors since it often contains oil or water, either of which will contaminate the slip ring assembly.

Notes

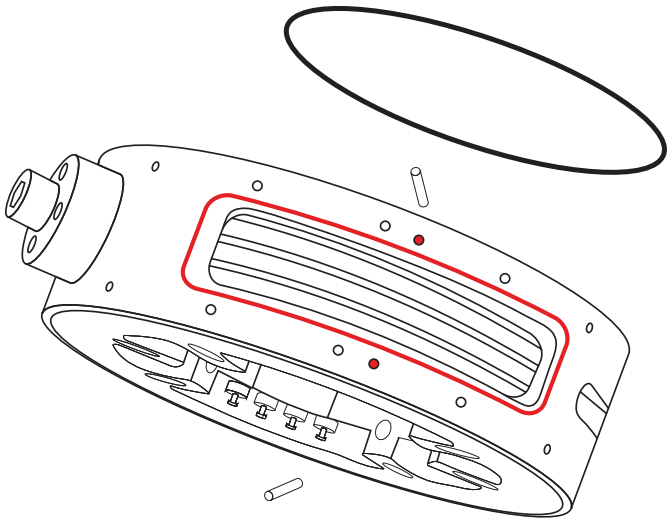
Use a cleaning solvent that is nonflammable, evaporates quickly, does not contain oil, and leaves no residue.

Spray so that the wires are facing upwards to prevent debris or solvent from running onto the wires.

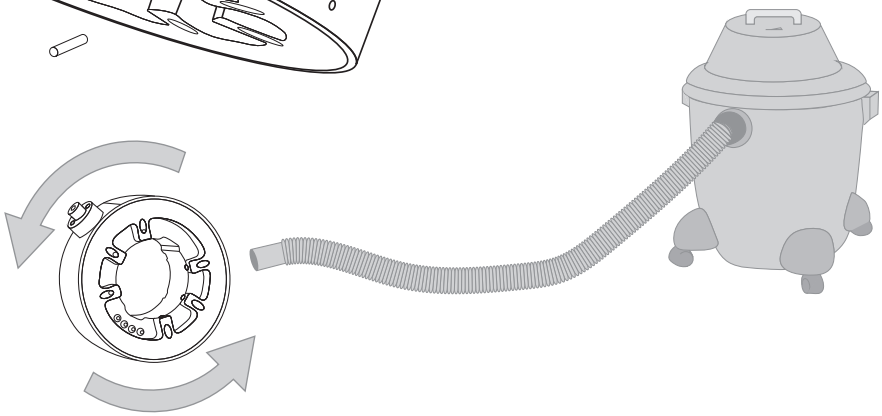
Cleaning the Assembly

Remove any excess wear debris from the slip ring assembly housing when the brush assembly is serviced.

The exterior of the slip ring assembly can be cleaned by wetting a cloth with isopropyl alcohol or other appropriate solvent and wiping the surfaces. Do not spray solvents on the housing; they can penetrate the labyrinth seal and contaminate the assembly.



Remove the O-ring from around the brush assembly installation area and the two dowel pins on either side of the opening.



Wear debris can be removed from the interior of the slip ring assembly simply by placing the nozzle of a vacuum near the opening in the housing where the brush assembly was installed. Vacuum away the debris as the assembly is slowly rotated.

Notes

Do not wipe or clean the rings with solvent; a fine dusting of debris on the rings acts as a lubricant and wear debris between rings can cause shorting.

It is normal for the contacts to wear shallow grooves in the rings. If the grooving is severe, return the assembly to Michigan Scientific Corporation for service.

Reinstalling the Brush Housing

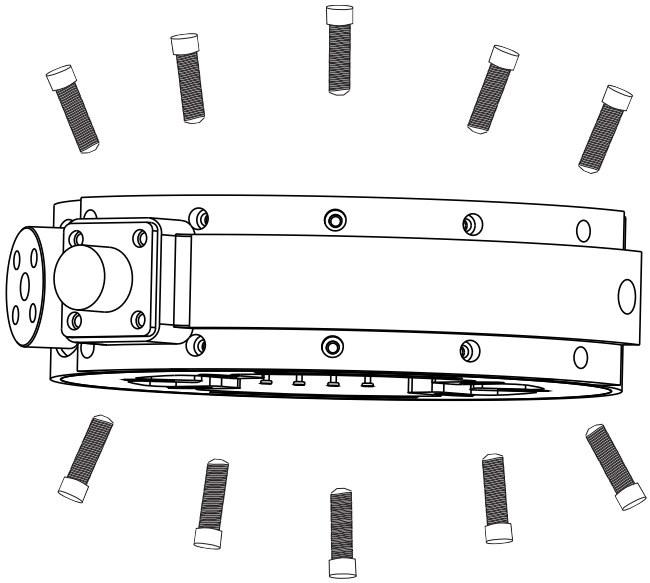
Make sure the O-ring is seated in its groove.

Lay the brush housing and rest of the slip ring assembly on a flat tabletop and carefully slide them together.

Carefully move the housing into position until the alignment pins on the slip ring assembly enter the holes in the brush housing. If the alignment pins do not allow the screw holes to line up, the housing is being installed backwards. Rotate the housing 180 degrees.

Reinstall screws in the two center holes of the brush housing and tighten until snug. Before installing the rest of the screws, make sure the O-ring is seated. Then verify that the brush housing is aligned with the slip ring assembly. If it is out of alignment, loosen the screws and adjust.

Install the remaining screws.

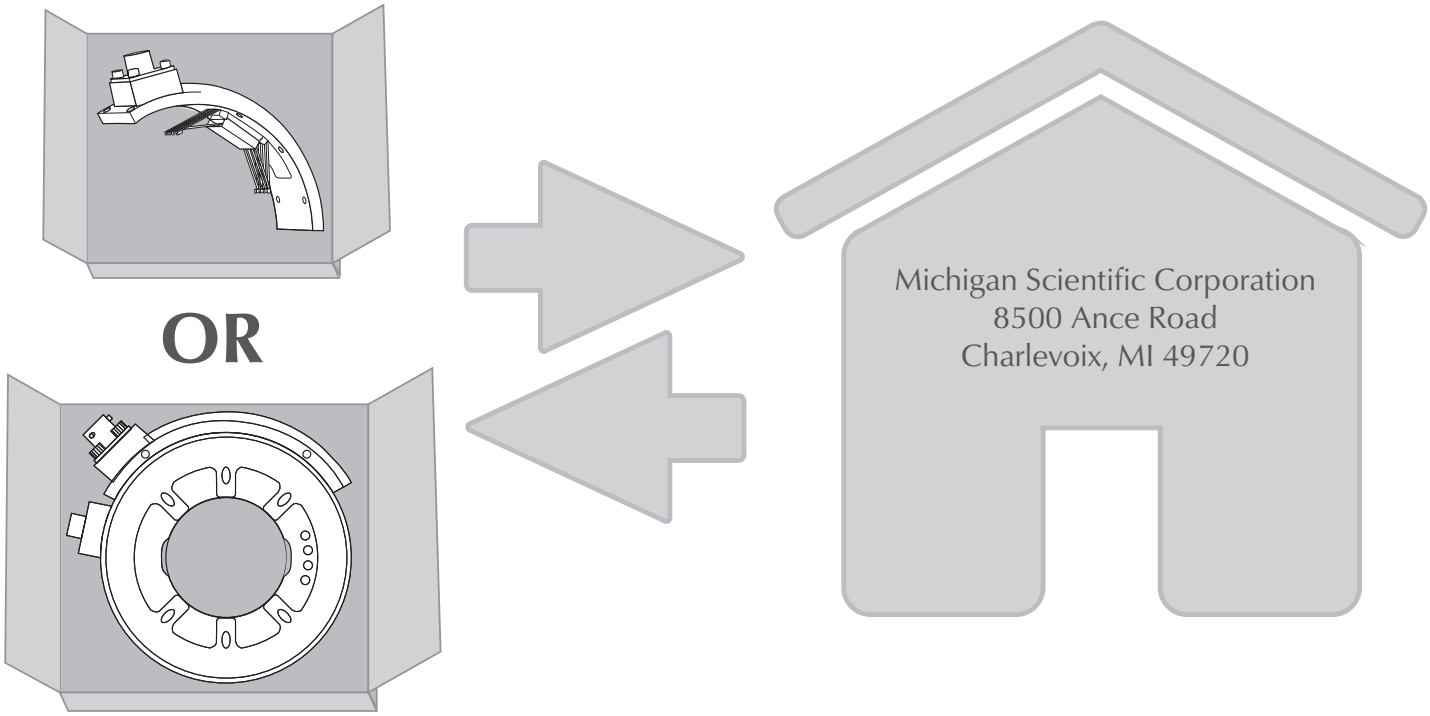


Notes

The brush housing can be replaced while the assembly is on a shaft as long as proper alignment of the two pieces is maintained.

Returning an Assembly to Michigan Scientific

If the slip ring assembly needs further inspection or maintenance, contact Michigan Scientific to initiate a return for repairs. It is advisable to return the entire assembly, but if that is not possible, just the brush assembly can be returned. Use care when packaging to protect the brush assembly during shipping. To avoid potential delays in testing, customers occasionally purchase spare brush assemblies to install on the slip ring while the original is being serviced.



Troubleshooting Guide

Problem	Potential Cause	Solution
Accelerometer Difficulties	The wrong type of accelerometer will not work with a slip ring assembly.	Only use ICP or IEPE accelerometer types with built-in electronics.
Difficulties Using Slip Ring Assemblies with Strain Gauge Circuits		Refer to Technical Note 101.
Difficulties Using Slip Ring Assemblies with Thermocouple Circuits		Refer to Technical Note 102.

Appendix