**What are slip rings?**
A: A slip ring is an electrical connection designed to pass the flow of current from a stationary device to a rotating one. This electromechanical device is also known as a rotary electrical connector or rotary electrical joint. Electrical slip rings are free to rotate without limitations, unlike cables which twist and eventually break.

**Where are they used?**
A: Typical applications include revolving automation or control systems such as turntables, index tables, and robots. Wind turbines, semiconductor processing, printing plastic molding, CT and MRI medical scanners, satellite communications, beverage processing, and industrial washers are also common slip ring applications.

**How do they work?**
A: Electrical slip rings work by holding a sliding contact (brush) against a ring (conductor ring). One part, typically the brush, is stationary while the other, typically the conductor ring, rotates. Leads to the brush and conductor ring terminate internally and provide electrical connections to devices on either side of the slip ring.

In general, conductor rings are mounted on the rotor and terminated with leadswires that run axially through the rotor to one end. Brushes are secured on the rotor and terminated with leadswires that run axially through the slip ring. Dissipated power consumption is an important consideration as well. It is generally not so much the actual voltage available at the load as the total power being dissipated across the slip ring along with the actual current flow. Voltage drop affects the voltage being used at the load that a slip ring design must be able to meet the requirement, but rather the voltage drop across the slip ring along with the actual current flow. Voltage drop affects the actual voltage available at the load as well as the total power being dissipated in the slip ring. Dissipated power converts to heat and will affect the unit’s operating temperature. If, under worst-case conditions, components in the slip ring don’t overheat and the case temperature does not pose a burn risk, the slip ring design can be acceptable.

For data, all sliding contacts will generate some electrical resistance variation as they rotate. The degree of variation depends on many variables such as the sliding contact selected, speed, temperature, and contact force. Effects of this resistance variation will depend on the overall circuit of which the slip ring is a part of. The design of the slip ring’s sliding contact should consider the data bandwidth required as well as the circuit’s tolerance to variations. For critical applications, experts recommend using many contacts for each channel to minimize the resistance variations.

**What are typical sizes?**
A: Slip rings can typically range in size from under one inch to several feet in diameter. In general, the goal is to minimize the size of the conductor rings. This reduces the equivalent linear distance traveled for each revolution and minimizes wear of the sliding contacts. This extends the life compared to designs with a larger conductor ring. However, larger sizes often permit media like fluids to pass through the center via hose or tubing. Slip rings can mount with a flange, threaded rotor, or slip fit over a shaft or into a shaft cavity. Electrical connection options include leads, wires, electrical connectors, and terminal blocks.

**FREQUENTLY ASKED QUESTIONS**

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**Are there other design concerns?**
A: EMI should always be a concern when designs include a slip ring. Even dc signals have transient voltages when they are switched on and off. Thus, good RF design techniques are recommended. Shielding sensitive signals as much as possible throughout the physical electrical path is always best. Connecting the shields through a sliding contact from the rotor to the stator is a must to get good EMI shielding from the physical braiding. Separation between channels is an important design consideration as well.

Environmental characteristics are also important. For example, ingress protection levels will dictate the sealing requirements of all components. Shock and vibration will affect the sliding contact technology that is used and the position of the contacts to assure electrical continuity is maintained under those conditions.

**Are slip rings available in standard or custom versions?**
A: Off-the-shelf slip rings are good for basic installations, but there are many unique and critical applications that demand a tailored slip ring designed to meet performance requirements and exceed the expected life from the user. For instance, Dublins develops many slip rings to satisfy customer’s demanding applications. Features include extreme temperature resistance, small packaging, integrated slip rings and rotary unions, and unique electrical connection methods, as just a few examples.

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