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Rotary Joints for Transmitting HD-SDI Signals Through a Blocked Central Axis

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Transitioning from analog to digital video, and especially to HD-SDI 292M or 424M, is not a simple matter. Normal coaxial cables work with non-rotating applications, but if the system is turning the digital signal has to pass through the rotary joint. For transmitting slower signals, the conventional approaches include the use of gold-on-gold, silver-graphite-on-brass or silver-plated slip rings. The diameter of the overall system is the constraining factor here. They can work at frequencies up to 250 MHz with very small diameters and at up to 100 MHz with larger diameters.

However, a different transmission technology is needed for 1.5 Gbit/s and faster signals. Contactless technology is the best solution for blocked central axes but when the axis is open, the best approach is a fiber-optic link. For cases in which the central axis is blocked (because

it contains a mechanical interface, RF components, etc.), no acceptable solution was available for transmitting a test signal which contains a pathological pattern until recently. To address this, SPINNER has modified its standard capaci-

tive coupling device to meet the specification, resulting in a perfect eye diagram.

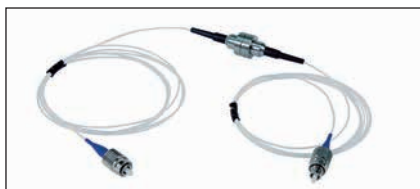
For HD-SDI (SMPTE 292M) signals, the company has adapted a number of hybrid rotary joint units involving signal multiplexers for RS422, RS232, CAN bus, I/O lines and 1000BaseT Ethernet. One example is a very complex installation with three HD-SDI cameras and around 150 RS422 lines. For this a fiber-optic rotary joint that is half the size of a conventional slip ring unit and has an MTBF of at least 300,000 hours was developed. This is a 1000 percent improvement.

The other benefits of a solution like this include less weight, smaller interfaces, lower prices, and an end to issues with terminations and end-to-end resistances.

Currently there are uses for HD-SDI contactless rotary joints in tracking radar systems, gun systems and naval optronic systems. They are available with clear internal diameters of up to 300 mm and more. If the central axis is free, fiber-optic rotary joints can be used.

FIBER OPTIC ROTARY JOINTS

SPINNER has developed a series of Fiber Optic Rotary Joints (FORJ). Single-mode and multimode FORJs are used in land-based, na-



▲ Fig. 1 The single-channel FORJ 1.14.

MILITARY MICROWAVES



▲ Fig. 2 The FORJ 1.17 is engineered for harsh environments.



▲ Fig. 3 The FORJ 1.22 is rated at IP 65.



▲ Fig. 4 The FORJ 2.28 fills the need for a basic two-channel, single-mode rotary joint.

val, and airborne applications, either by themselves or integrated in a slip ring.

The new FORJ 1.14 (see **Figure 1**) family of single-channel products is claimed to exhibit outstanding per-



▲ Fig. 5 The FORJ x.40 has an outer housing diameter of only 39.5 mm.

formance despite its very compact dimensions. Its design reduces the typical insertion losses to less than 1 dB with single-mode fibers. Its small size, combined with a light weight of only 18 g, permits it to spin at speeds of 10,000 rpm or more. Also, the company's FLEXIFLANGE makes it easy to adapt this rotary joint to specific applications.

The FORJ 1.17 (see **Figure 2**) is engineered for harsh environments, being able to withstand intense vibrations, strong jolts, high humidity and saltwater. It was originally designed to meet the needs of offshore and underwater vessels and has an IP 68 protection rating. The single-channel rotary joint FORJ 1.17pc version is supplied with integrated pressure compensa-

tion for deep-sea applications down to depths of 4500 m.

For harsh industrial environments the FORJ 1.22 (see **Figure 3**) is rated at IP 65 for protection from dust and humidity. It includes protective tubing for the fibers to prevent them from breaking or otherwise being damaged during or after installation.

The dual-channel FORJ 2.28 (see **Figure 4**) fills the need for a basic two-channel, single-mode rotary joint. Its patented mechanical system makes it very compact with a total length of just under 90 mm and an outer diameter of only 28 mm. It is offered in versions that include multimode only or a combination of single-mode and multimode fibers.

Finally, the FORJ x.40 (see **Figure 5**), with an outer housing diameter of only 39.5 mm, is claimed to deliver market-leading compactness for multi-channel solutions involving up to six channels. It is available in single-mode, multimode and mixed fiber configurations.

VENDORVIEW

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