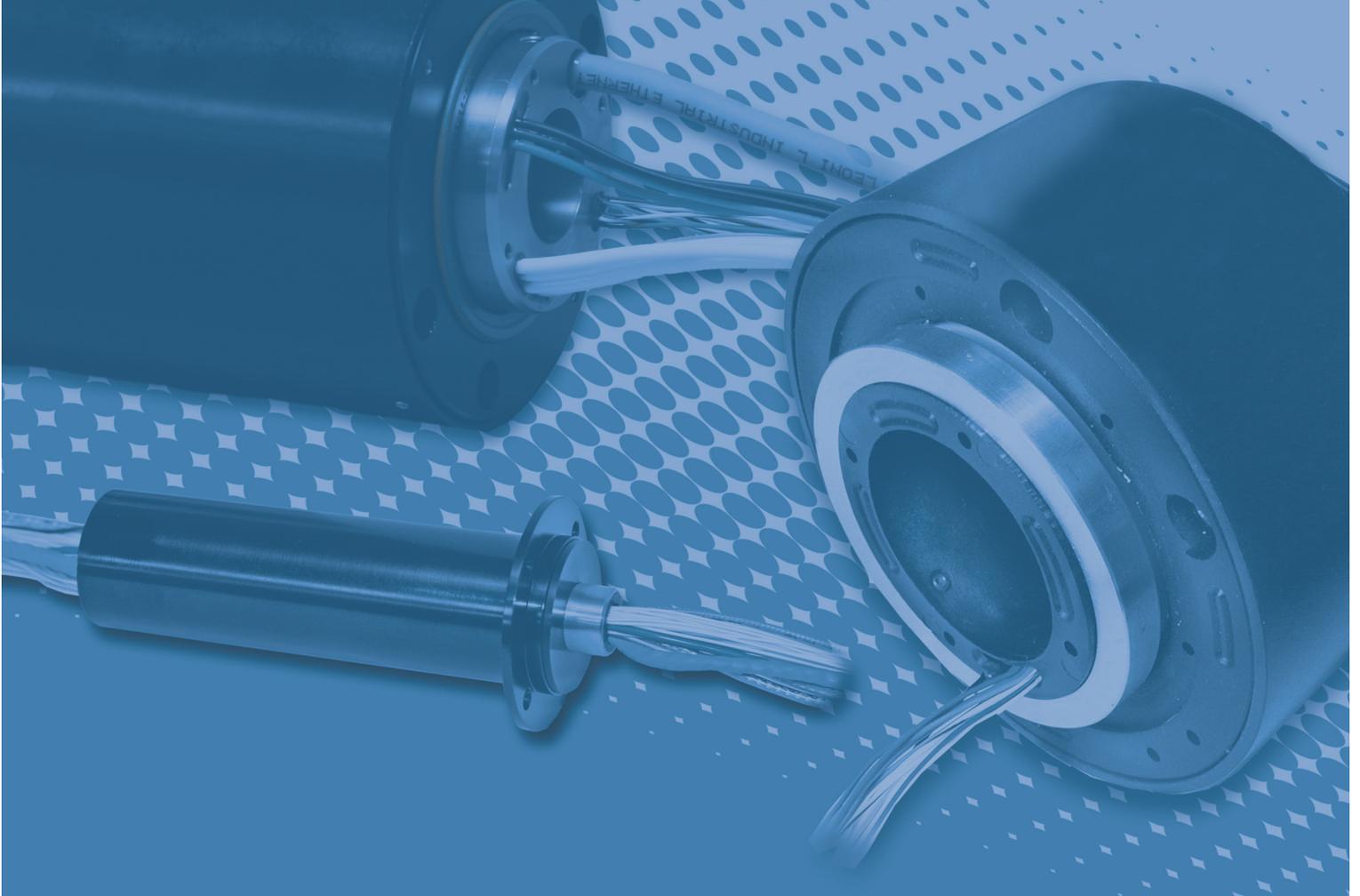


MOTION TECHNOLOGY SLIP RINGS



HIGH PERFORMANCE SLIP RINGS, FIBER OPTIC
ROTARY JOINTS, ROTARY UNIONS AND COMBINED
SYSTEMS FOR INDUSTRIAL APPLICATIONS

PROVEN SLIP RINGS

A slip ring is an electromechanical device that allows the transmission of power and data signals from a stationary to a rotating structure. Also called a rotary electrical joint, collector or electric swivel, a slip ring can be used in any electromechanical system that requires unrestrained, intermittent or continuous rotation while transmitting power and / or data. It can improve mechanical performance, simplify system operation and eliminate damage-prone wires dangling from movable joints.

For high speed data transfer or for data transfer in EMI sensitive environments, we manufacture a line of Fiber Optic Rotary Joints (FORJs). The contactless capacitive transmission technology of the Rotocap series provides the most reliable data transmission for real time Ethernet.

Capability

With over 10,000 designs, if you do not see a slip ring to match your requirements, please contact us for assistance. Our slip rings are aggressively priced, available for fast delivery and are designed for tough commercial, industrial, aerospace and military environments.

Product Range

As the world's leading slip ring manufacturer, Moog offers more than 10,000 slip ring designs that are used in medical equipment -- ranging from large CT scanners to smaller camera systems -- and rugged space and aircraft vehicles. Specific applications include:

- Commercial Camera / Security Systems
- Medical / Baggage Scanning
- Downhole / Oil Exploration
- Factory Automation
- Automotive Turntables
- Mobile Equipment Machines
- Medical
- Packaging Equipment
- EO / IR Sensors
- Radar Systems
- Unmanned Vehicles / Remotely Operated Vehicles
- Wind Energy
- Marine Winches / Handling Systems



Camera Systems



Mobile Equipment



Downhole / Oil Exploration



Factory Automation



Packaging Equipment



Remotely Operated Vehicles



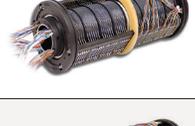
Medical



Wind Energy

SLIP RINGS WITH THROUGH-BORES *Continued on the next page*

The unobstructed bore through the center provides routing space for hydraulics, pneumatics or for a concentric shaft mount. Our through-bore slip rings use primarily fiber brush technology which offers several advantages over conventional slip ring technology, including multiple points of contact per brush bundle, low contact force per fiber and low contact wear rates. In addition, fiber brushes do not require lubrication and produce virtually no wear debris.

Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage VAC	Speed
 SRA-73683*	1/2 inch	1.38 x 1.07 - 1.97 (35.05 x 27.17 - 50.03)	6, 12, 18, 24	2 amps	210	250 rpm
 SRA-73830*	1/2 inch	1.38 x 1.07 - 1.97 (35.05 x 27.17 - 50.03)	2 to 22	2, 8 amps	210 / 240	250 rpm
 AC6438	1/2 inch	2.1 x 1.75 - 3.4 (53.60 x 44.45 - 86.36)	6, 12, 18, 24	5 amps	240	250 rpm
 AC6349	1 inch	3.07 x 2.9 - 6.5 (78.0 x 73.7 - 165.1)	6, 12, 18, 24	15 amps	440	250 rpm
 AC4598	1 1/2 inch	3.9 x 2.13 - 4.94 (100 x 54.10 - 125.48)	6, 12, 18, 24	10 amps	600	250 rpm
 AC6200	1 1/2 inch	3.9 x 2.13 - 4.94 (100 x 54.10 - 125.5)	12, 24, 36, 48	2 amps	220	250 rpm
 AC6815	1 1/2 inch	4.32 x 3.01 - 5.94 (109.7 x 76.45 - 150.8)	Up to 128	2, 3.5, 10 amps	60, 110, 220	250 rpm
 AC6428	1 3/8 inch	3.9 x 6.60 - 9.34 (99.06 x 167.6 - 237.2)	60, 72, 84, 96	2 amps	220	250 rpm
 AC6429	1 3/8 inch	3.9 x 7.5 (99.06 x 190.5)	48 @ 2 amp Plus 6 or 12 @ 10 amp	2, 10 amps	220, 2 amp, 600, 10 amp	250 rpm
 AC6275	2 3/4 inch	6.63 x 6.6 - 20.5 (168.40 x 167.64 - 520.7)	Various Configurations	5, 10, 30, 50 amps	250 for 5 amps, 600 for 10, 30, 50 amps	1,000 rpm
 AC6098	4 inch	8.0 x 4.6 - 14.4 (203.2 x 116.84 - 365.76)	Various Configurations	10, 30, 50 amps	600	250 rpm

*Gold wire contacts

SLIP RINGS WITH THROUGH-BORES

Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage	Speed
 Endura-Trac™ Standard W Series	1 1/2 inch to 3 inch	5 - 6.5 OD (127 - 165.1) Determined by number of rings	To 12 power circuits	30 amps	600 VAC	60 rpm
			To 24 signal circuits	5 amps	250 VAC	
 Endura-Trac™ Fiber W Series	Up to 9 inch	5 - 12.5 OD (127 - 317.5) Determined by number of rings	To 24 power circuits	30 amps	600 VAC	250 rpm
			To 48 signal circuits	5 amps	250 VAC	

SLIP RING CAPSULES (COMPACT) *Continued on the next page*

Our economical, compact slip ring capsule family allows tremendous flexibility in dealing with systems size requirements when larger versions are not an option. Capsules with up to 56 contacts are available.

Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage	Speed
 SRA-73540	No	0.44 x 0.64 (11.17 x 16.25)	6, 12	2 amps	120 VAC	250 rpm
 SRA-73625	No	0.44 x 1.16 (11.17 x 29.46)	18	2 amps	120 VAC	250 rpm
 AC6373	No	0.5 x 0.8 - 1.07 (12.7 x 20.32 - 27.17)	6, 12	2 amps	120 VAC	100 rpm
 SRA-73526 SRA-73528 SRA-73599	No	0.87 x 0.57 - 1.24 (22.0 x 14.47 - 31.49)	6, 12, 18, 24	2 amps	240 VAC	250 rpm
 AC6023	No	0.87 x 1.14 - 1.95 (22.0 x 28.95 - 49.53)	6, 12, 18, 24	2 amps	240 VAC	250 rpm
 SRA-73762	No	0.61 x 1.79 (15.49 x 45.46)	12, 18, 24	2 amps	240 VAC	250 rpm
 SRA-73574 SRA-73587	No	0.87 x 2.4 (22.0 x 60.96)	36	2, 10, amps	240 VAC	250 rpm

SLIP RING CAPSULES (COMPACT)

Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage	Speed
 AC6355	No	1.0 x 2.6 - 3.5 (25.4 x 66.04 - 88.9)	36 and 56	2 amps	240 VAC	250 rpm
 AC6305	No	0.87 x 1.95 (22.0 x 49.53)	3 @ 5 amps 6, 9, and 12 @ 2 amps	5, 2 amps	120 VAC	250 rpm
 AC6310	No	0.87 x 1.95 (22.0 x 49.53)	3 @ 10 amps and 3, or 6 @ 2 amps	10, 2 amps	120 VAC	250 rpm
 AC7094	No	2.17 x 6.0 - 7.67 (55.1 x 152.4 - 194.81)	30, 36, 42, 48	5 amps	240 VAC	250 rpm
 AC7036	No	3.1 x 3.1 - 6.7 (78.74 x 78.74 - 170.18)	Outer options: AC6349 Inner options: AC6355, AC7217 AC7195	2, 5, 10, 15 amps	440 VAC outer 240 VAC inner	250 rpm
 AC7212	No	3.9 x 3.11 - 5.92 (99.06 x 78.99 - 150.36)	Outer options: AC4598 or AC6200 Inner options: AC6023, AC6355, AC7188, AC7195, AC7203, AC7217	2, 5, 10 amps	Refer to individual product data sheets	250 rpm
 P Series	No	1.248 x 2.54 - 3.07 (31.69 x 64.51 - 77.97)	2, 4 and 8	2, 7, 14 amps	240 VAC	400 to 600 rpm

COMMERCIAL AND INDUSTRIAL SLIP RING PRODUCTS

The slip rings in the Rotoflux series is based on gold/gold technology and offers a reliable transmission of power, signals and data. The pairing of gold spring wire and gold-plated slip tracks ensure consistently highest contact quality and extremely low electrical noise. Rugged stainless-steel or aluminum housings allow operation even under extreme conditions. Due to the modular design, our standard slip rings of the Rotoflux ESR series can be easily adapted to customer-specific requirements.

Model	Circuits	Voltage	Current	Data	Connection	Size in (mm)	Other
 Rotoflux ESR 70 [24400]	Max. 24	Max. 480 volt	Max. 20 amps	PROFIBUS®, CAN Bus, Ethernet, DeviceNet™, PROFINET®	Cable (standard), max. 10 m	6.28 - 7.54 x Ø2.76 (159.5 - 191.5 x Ø70)	IP 64, max. 200 rpm
 Rotoflux ESR 70 [24400] + air channel G 1/4" (at max. 10 bar)	Max. 24	Max. 480 volt	Max. 20 amps	PROFIBUS®, CAN Bus, Ethernet, DeviceNet™, PROFINET®	Cable (standard), max. 10 m	6.91 - 8.17 x Ø2.76 (175.5 - 207.5 x Ø70)	IP 64, max. 200 rpm
 Rotoflux ESR 110 [22200]	Max. 32	Max. 480 volt	Max. 30 amps	PROFIBUS®, CAN Bus, Ethernet, DeviceNet™, PROFINET®	Cable (standard), max. 10 m	6.38 - 10.32 x Ø4.33 (162 - 262 x Ø110)	IP 64, max. 150 rpm
 Rotoflux ESR 110 [22200] + air channel G 1/2" (at max. 10 bar)	Max. 32	Max. 480 volt	Max. 30 amps	PROFIBUS®, CAN Bus, Ethernet, DeviceNet™, PROFINET®	Cable (standard), max. 10 m	9.02 - 12.95 x Ø4.33 (229 - 329 x Ø110)	IP 64, max. 150 rpm

More circuits, hollow shaft design, connectors also available on request. UL/CSA certification possible.

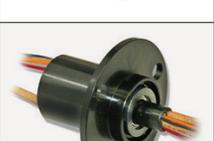
HIGH SPEED SLIP RING CAPSULES

High speed slip rings are used in applications up to 10,000 rpm. Fiber brush contacts provide long-life and operation up to 10,000 rpm without the need for cooling equipment.

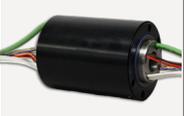
Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage	Speed
 PH Series	No	1.52 x 2.29 - 2.79 (38.60 x 58.16 - 70.86)	8 or 12	2 amps	50 volts	20,000 rpm
 AC6231 AC6266	1 1/2 inch	4.25 x 2.75 (107.9 x 69.8) 4.25 x 1.97 (107.9 x 50.3)	4 / 8	15 amps	240 VAC	2,500 rpm
 EC3848	No	1.2 x 0.98 - 1.2 (30.4 x 24.8 - 30.4)	Up to 10 (2, 6, 8 and 10)	1.0 amps max. per ring	Low millivolt range to 120 VDC	10,000 rpm
 PM Series	No	3.56 x 5.28 - 8.64 (90.42 x 134.11 - 219.45)	8, 12, 14	2.5 amps	50 VAC	12,000 rpm

ETHERNET AND HIGH DEFINITION VIDEO SLIP RING CAPSULES *Continued on the next page*

Moog's Ethernet slip ring solutions have been developed to provide reliable products to allow transfer of the Ethernet protocol through a rotating interface. The innovative designs meet the challenge of matching impedance, controlling crosstalk and managing losses. A wide range of product solutions are offered with combinations of data and power in multiple mechanical configurations to meet your application needs.

Model	Ethernet	Size in (mm)	Circuits	Current	Voltage	Speed
 SRA-73799 SRA-73806	1000BaseT (or 2 100BaseT) 100BaseT	0.44 x 1.16 (11.17 x 29.46)	Ethernet plus, 2 amp contacts	2 amps	240 VAC	250 rpm
 SRA-73798 SRA-73805	1000BaseT (or 2 100BaseT) 100BaseT	0.61 x 1.79 (15.49 x 45.46)	Ethernet plus, 2 amp contacts	2 amps	210 VAC	250 rpm
 AC7203	10 / 100BaseT and 1000BaseT	0.87 x 1.14 - 1.95 (22.0 x 28.95 - 49.53)	Ethernet plus, 2 amp, 5 amp and 10 amp	2, 5, 10 amps	240 VAC	250 rpm
 AC7188	HD-SDI	0.87 x 1.68 - 1.95 (22.0 x 42.6 - 49.5)	Video, 2 amp and 5 amp	2 amps (28 AWG) 5 amps (20 AWG)	210 VDC / 240 VAC on standard circuits	250 rpm
 SRA-73810	HD-SDI / SD-SDI	0.61 x 1.79 (15.4 x 45.4)	Video, 12, 2 amp connections	2 amps (26 AWG)	210 VDC / 240 VAC on standard circuits	250 rpm
 SRA-73811	HD-SDI / SD-SDI	0.87 x 1.79 (22.0 x 45.4)	2 video, 4, 2 amp	2 amps (26 AWG)	210 VDC / 240 VAC on standard circuits	250 rpm
 AC7195	10 / 100BaseT and 1000BaseT	1.0 x 3.5 (25.4 x 88.9)	Ethernet plus coax, 2 amp, 5 amp, 10 amp	2 to 10 amps	240 VAC on power circuits	250 rpm
 AC7217	10 / 100BaseT and 1000BaseT	1.0 x 2.6 (25.4 x 66.0)	Ethernet plus coax, 2 amp, 5 amp, 10 amp	2 to 10 amps	240 VAC on power circuits	250 rpm
 AC7183	10 / 100 / 1000BaseT and HD-SDI	1.34 x 5.02 (34 x 127.5)	Ethernet lines, 2 / 5 / 10 amp and coax options. HD video capability plus 2 / 5 / 10 amp	2, 5 and 10 amps	240 VAC on power circuits	250 rpm

ETHERNET AND HIGH DEFINITION VIDEO SLIP RING CAPSULES

Model		Ethernet	Size in (mm)	Circuits	Current	Voltage	Speed
	SRA-73801 SRA-73808	10 / 100BaseT and 1000BaseT	1.375 x 1.97 (34.92 x 50.03)	Ethernet plus, 2 amp contacts	2 amps	210 VDC on power circuits	250 rpm
	SRA-73830	100BaseT and 1000BaseT	1.375 x 1.32 - 2.22 (34.93 x 33.53 - 56.39)	Ethernet plus, 2 and 8 amp contacts	2 amp and 8 amp	120 VAC on power circuits	250 rpm
	AC7296	Ethernet, 10 / 100BaseT and 1000BaseT (shielded or unshielded)	3.9 x 2.96 - 7.64 (99.06 x 75.19 - 194.06)	Ethernet plus 2 amp through 25 amp power, other signals	2 to 25 amp	240 VDC signal / 600 VDC power	250 rpm

ETHERNET THROUGH-BORE SLIP RING CAPSULE OPTIONS

Moog also offers Ethernet capability in the following through-bore slip ring capsules:

AC6438 1/2 inch through-bore
 AC6349 1 inch through-bore
 AC4598 (AC6419) 1 1/2 inch through-bore
 AC6098 4 inch through-bore

AC6200 1 1/2 inch through-bore
 AC6428 1 3/8 inch through-bore
 AC6429 1 3/8 inch through-bore
 AC6275 (AC6793) 2 3/4 inch through-bore

SLIP RINGS FOR REAL TIME DATA TRANSMISSION

Slip rings with contactless, capacitive data transmission (Rotocap) for Fast Ethernet (real time) and continuous operation. The Rotocap technology enables a through bore with simultaneous high data transmission that would be usually only possible with a FORJ - even in environments with strong electromagnetic interference. Uninterrupted plant availability is further ensured by the system's maintenance-free technology

Model		Through-bore	Outer Diameter	Protocols	Data	Connection	Media	Other
	CAP 160	0 - 45 mm	160 mm	PROFINET*, Sercos III, Powerlink, EtherCAT*, Mechatrolink III	100 Mbit/s up to 2.5 Gbit/s	Cable (standard), max. 10 m	Combination with all Moog rotary unions possible	IP 64, max. 150 rpm
	CAP 200	0 - 40 mm	200 mm	PROFINET*, Sercos III, Powerlink, EtherCAT*, Mechatrolink III	100 Mbit/s up to 2.5 Gbit/s	Cable (standard), max. 10 m	Combination with all Moog rotary unions possible	IP 64, max. 150 rpm

Other sizes, connectors available on request. UL / CSA certification possible.

LARGE DIAMETER SLIP RINGS

Large bore slip rings represent the union of manufacturing processes and technologies that enable us to offer large, high volume slip rings with advanced features that are cost effective.

Model	Type	ID*	OD*	High Power Qty	Mid Power Qty	Signal Qty	High Power Voltage	High Power Current	Speed	Integr. Encoder	Integr. FORJ	FORJ Options
KW6455-1	Drum	31.952	33.044	4	2	8	480 VAC	100 amps	120 rpm	No	No	—
KW6764-2	Drum	37.400	39.984	4	2	0	480 VAC	100 amps	120 rpm	No	No	—
UY7013	Platter	38.590	56.194	4	2	4	400 VAC	100 amps	180 rpm	No	No	—
BN7093	Platter	42.520	54.100	3	2	4	500 VAC	100 amps	180 rpm	No	Yes	Single Ch 2.5 Gbps* R->S
UA7138	Platter	42.047	54.094	5	0	4	400 VAC	100 amps	120 rpm	No	Yes	4 Ch 2.5 Gbps* R->S
MR6970-1	Platter	44.291	59.916	3	2	6	600 VAC	100 amps	180 rpm	Yes	Yes	Single Ch 2.5 Gbps* R->S
												4 Ch R->S with 1.25 Gbps* S->R path
F06536	FORJ Only	36.624	43.040	—	—	—	—	—	300 rpm	No	—	Bidirectional Gigabit Ethernet (1000Base-SX)

*OD, ID dimensions do not include brush block or fiber optic hardware mounting dimension.

- All designs are RoHs compliant
- Design to customer specifications

AUTOMOTIVE MANUFACTURING HYBRID SLIP RINGS

For automotive production we have multiple slip rings for different applications. Moog is listed at more than 50 OEMs and delivers slip rings for turntables, trunnions and robotics. Basic versions and high end solutions with diagnostic functions and Fiber Optic Rotary Joints (FORJs) are available. Custom specification and UL / CSA certification possible. Automotive slip rings are protected to at least IP54.

Model	Circuits	Voltage	Current	Data	Connection	Media	Other / Application
 F 5812 JXY DC	2+PE	650 VDC	20 amps	—	Han Q2 / 0	1x air G1 inches	A = Active (diagnostible) P = Passive EMC + PROFINET® approved For turntables and trunnions
	24	24 volt	10 amps	—	Han 25D		
	6	5 volt	mA	PROFINET®	RJ45		
	1	FE	—	—	Bolt M8		
 F 5812 QX	4+FE	24 volt	16 amps	—	PP Power L	1x air G1 inches (also water possible)	Internal Ethernet-FORJ with RJ45 Diagnostible Repeater EMC + PROFINET® approved For welding turntables
	12+PE	24 volt	16 amps	—	Han25D		
	1	5 volt	mA	PROFINET®	RJ45		
	1	FE	—	—	Bolt M8		
 F 5051 F	3+PE	600 VDC	13 amps	—	CrouseHinds	1x air G1 inches	A GM standard EMC approved For turntables (index drives)
	4	5 volt	mA	Ethernet	M12D		
	4	5 volt	mA	Ethernet	M12D		
 F 6300 MU2 ff	3+PE	400 volt	10 amps	—	Free cable	2x air G1 / 2 inches (also 1x air G1 / 2 inches possible)	UL / CSA approved For turntables
	10+PE	24 VDC	20 amps	—	Free cable		
	1	5 volt	mA	DeviceNet™	M12D		
 F 5827 CB	2	24 volt	500 amps	—	Bolt M12	1x air G3 / 8 inches (also primer / cleaner possible)	6th axel of welding-robots
	4	24 volt	4 amps	ASI Bus	M12A		
 F 4509 G	4+PE	400 volt	270 amps	—	90 mm² cable	2x air G1 / 2 inches 2x water G1 / 2 inches	For foaming or casting turntable
	16	220 volt	16 amps	—	Sensorcable		
	1	5 volt	mA	PROFIBUS®	UL-Bus-cable		
 F 2336 ff / F 2065	—	—	200 - 1.000 amps	—	—	—	Earth brush holders with different loadings Welding and lightning protection

MOBILE EQUIPMENT / CONSTRUCTION SLIP RINGS

Moog slip rings are designed for many different mobile equipment machines which must work reliably in rough environments. All slip rings are designed and customized based on the standard parts developed by Moog.

Model	Circuits	Voltage	Current	Data	Connection	Media	Other / Application
 F 5769 MR	1 up to 50	1000 volt	50 amps	CAN Bus Ethernet	Customized	Customized 1 - 20 channels up to 500 bar (7250 psi)	Protection class: IP 67 / 69K combination with encoder For excavators, CAN safety application, truck mounted cranes / utilities, mini cranes attachments
 F 7052	1 up to 80	1000 volt	500 amps	CAN Bus Ethernet	Customized terminal box	—	Maintain housing combination with encoder For tower cranes, harbor cranes
 F 5892	1 up to 80	1000 volt	200 amps	CAN Safety Ethernet	Customized	Customized 1 - 20 channels up to 500 bar (7250 psi)	Protection class: IP67 / 69K combination with encoder trough bore for firefighting For aerial ladder, rescue platform
 F 5947	1 up to 50	1000 volt	50 amps	CAN Bus Ethernet	Customized	—	IP 67 / 69K combination with encoder For rough terrain crane, truck mounted cranes, mobile cranes

PACKAGING SLIP RINGS

Our slip ring transmitters for packaging machines are very flexible and can be used in a wide variety of applications. As with all products from Moog, the design team uses various standards and can adapt them to customer specifications.

Model	Circuits	Voltage	Current	Data	Connection	Media	Other / Application
 F 7019	1 to 250	800 volt	500 amps	DRIVE CLiQ Ethernet 100 PROFINET*	Customized	Water, hydraulic, air	For winder application, customized
 F 7170	2+PE	600 volt	30 amps	Analog signals PT100 PT1000	Self connecting via cable lug	Water, hydraulic, air	For flow pack application, small housing dimensions, up to 1000 rpm
	2	24 volt	mA				
 F 8000 ff	1 to 48	600 volt	30 amps	DRIVE CLiQ Ethernet 100 PROFINET*	Customized	Water, hydraulic, air	For stretch wrapping, maintenance free

MEDICAL SLIP RINGS

Our highly reliable slip rings are also used in surgical lamps and diagnostic centrifuges. Here they transmit not only the power for the lamps but also video data signals, for example. Standard solutions are also quickly available here - but we are also happy to adapt our products to customer specifications.

Model	Through-Bore	Size in (mm)	Circuits	Current	Voltage	Speed
 F 7154 B	50 mm	74 mm (outer diameter), 55 mm (length)	5	12 amps	50 VDC	20 rpm
 EC3848	No	1.2 x 0.98 - 1.2 (30.4 x 24.8 - 30.4)	Up to 10 (2, 6, 8 and 10)	1.0 amps max. per ring	Low millivolt range to 120 VDC	10,000 rpm
 AC6355	No	1.0 x 2.6 - 3.5 (25.4 x 66.04 - 88.9)	36 and 56	2 amps	240 VAC	250 rpm

FIBER OPTIC ROTARY JOINTS *Continued on the next page*

Fiber Optic Rotary Joints (FORJs) are to optical signals what electrical slip rings are to electrical signals - a means to pass signals across rotating interfaces, particularly when transmitting large amounts of data. FORJs maintain the intrinsic advantages of fiber end to end. The values shown are typical, please consult the factory if you have specific requirements.



Model	Fiber Type	Chan.	Insertion Loss	Maximum Rotational Speed	Operating Temp.	Size: Minimum Length	Size: Flange Diameter	Size: Drum Diameter
Single Channel								
FO228	Multimode	1	4.0 dB	100 rpm	-40° to +75° C	1.75 in (44.45 mm)	1.50 in (38.10 mm)	0.73 in (18.54 mm)
FO197	Multimode	1	3.0 dB	1000 rpm	-40° to +60° C	2.38 in (60.45 mm)	1.50 in (38.10 mm)	0.62 in (15.74 mm)
FO197S	Multimode	1	3.0 dB	100 rpm	-40° to +85° C	2.38 in (60.6 mm)	1.50 in (38.10 mm)	0.62 in (15.9 mm)
FO206	Singlemode	1	3.5 dB	1000 rpm	-40° to +60° C	2.36 in (59.94 mm)	1.50 in (38.10 mm)	0.77 in (19.55 mm)
FO285*	Singlemode	1	3.5 dB	1000 rpm	-55° to +75° C	1.02 in (25.90 mm)	0.75 in (19.05 mm)	0.37 in (9.4 mm)
FO286*	Multimode	1	2.5 dB	1000 rpm	-55° to +75° C	0.75 in (19.05 mm)	0.75 in (19.05 mm)	0.37 in (9.4 mm)
FO310	Singlemode and Multimode	1	1.5 dB	100 rpm	-40° to +85° C	3.41 in (86.6 mm)	1.50 in (38.10 mm)	0.63 in (15.9 mm)
Multi-Channel								
FO292*	Multimode	2	1.5 to 4.5 dB	500+ rpm	-40° to +60° C	2.25 in (57.15 mm)	1.25 in (31.75 mm)	0.50 in (12.70 mm)
FO292RA	Multimode	2	1.5 to 4.5 dB	500+ rpm	-40° to +60° C	1.73 in (43.87 mm)	1.05 in (26.7 mm)	0.67 in (17.1 mm)
FO291***	Singlemode	2 to 9	2 to 6.5 dB	100+ rpm	-40° to +60° C	See Data Sheet	See Data Sheet	See Data Sheet
FO190*	Multimode	2 to 21**	5.5	100+ rpm	-40° to +60° C	See Data Sheet	5.02 in (127.5 mm)	5.00 in (127.0 mm)
FO300A**	Singlemode and Multimode	Up to 17	See data sheet	100+ rpm	-40° to +60° C	4.22 in (107.2 mm)	2.35 in (60.0 mm)	2.35 in (60.0 mm)
FO300B**	Singlemode and Multimode	Up to 32	See data sheet	100+ rpm	-40° to +60° C	5.76 in (146.2 mm)	2.72 in (69.1 mm)	2.72 in (69.1 mm)
FO300C**	Singlemode	Up to 52	See data sheet	100+ rpm	-40° to +60° C	6.79 in (172.5 mm)	3.72 in (94.5 mm)	3.72 in (94.5 mm)
FO319	Singlemode	2	< 3.5 dB	100+ rpm	-46° to +71° C	4.13 in (104.6 mm)	2.60 in (66 mm)	1.90 in (48.3 mm)

FIBER OPTIC ROTARY JOINTS

Model	Fiber Type	Channels
Hybrid Units		
H18	Singlemode and Multimode	Optic: 1x singlemode or multimode Elec: 18x signal
H24	Singlemode and Multimode	Optic: 1x singlemode or multimode Elec: 24x signal
SRA-73830-[]-JXX	Singlemode and Multimode	Wide range of electrical options Multiple circuit configurations
173	Singlemode and Multimode	Optic: $\leq 52x$ singlemode or multimode Elec: ≤ 7.4 kV, ≤ 720 A total
176	Singlemode and Multimode	Optic: $\leq 52x$ singlemode or multimode Elec: ≤ 7.4 kV, ≤ 720 A total
180	Singlemode and Multimode	Optic: $\leq 12x$ singlemode and / or $\leq 12x$ multimode Elec: ≤ 1 kV, ≤ 100 A total



* The FO291 and FO190 can be combined to offer a hybrid multimode and singlemode solution

** More passes are available with a custom design

*** 1 MM pass can be accommodated on the FO291

* Right angle options available

** Consult factory for number of passes available for SM and MM

Note: Optical values for all listed multimode FORJs are based on use with LED sources.

ELECTRICAL SLIP RINGS FOR MARINE APPLICATIONS

Moog has delivered trusted technology products and services to the offshore petroleum, oceanographic, seismic and maritime industries for more than 30 years. Marine slip rings are designed to function in extreme marine environments.

Model	Current	Voltage	Size in (mm)	Rotation Speed	Through- Bore
 129	175 amp per pass	5,000 VAC max.	15.5 dia. 1.025 per ring (394, 26.03)	Max. 50 rpm continuous	No
 159	60 amp per pass max. 1,000 amp total current	7,200 VAC max.	8.5 dia. 1.025 per ring (215.9, 26.03)	Max. 50 rpm continuous	No
 176	20 amp per pass max. 720 amp total current	7,200 VAC max.	7.5 dia. (190.6) variable length	Max. 50 rpm continuous	No
 180	7 amp per pass max. 100 amp total current	1,000 VAC max.	4.00 dia. (101.6) variable length	Max. 100 rpm continuous	No

FLOATING PRODUCTION SYSTEMS (FPS) SWIVELS

The search for new oil and gas reserves has continually forced offshore exploration companies to drill in deeper water. Under these conditions, water depth and harsh weather heavily influence which type of installation to use. We design, manufacture and deliver unique FPS swivels to meet the demanding requirements of offshore operators worldwide.

Model	Description	Signal	Power	Fiber	Hazardous Area Protection	Max. Bore Ø	Max. Height	Max. Ø	Weight
430	Low voltage Electrical optical swivel	Up to 600 passes at 6 A, 600 V	Up to 20 passes at 200 A, 1 kV	UP to 52 SM or MM passes	Ex de	NA	9.2 ft [2.8 m]	4.2 ft [1.3 m]	2500 lb [1150 kg]
432	Low voltage Electrical optical swivel	Up to 600 passes at 6 A, 600 V	Up to 20 passes at 200 A, 1 kV	NA	Ex de	NA	9.2 ft [2.8 m]	5 ft [1.5 m]	6000 lb [2700 kg]
440	Low voltage Electrical power swivel	Up to 400 passes at 10 A, 1 kV	Up to 50 passes at 1 kV	NA	Ex d or Ex de	4.3 ft [1.3 m]	14 ft [4.3 m]	6.6 ft [2 m]	Depends on configuration
450	Low voltage Electrical power swivel	NA	Up to 50 passes at 1 kV	NA	Ex p	8.2 ft [2.5 m]	26 ft [8 m]	16 ft [4.9 m]	
460	Medium voltage Electrical swivel	NA	Up to 50 passes, max 36 kV*	NA	Ex p	8.2 ft [2.5 m]	26 ft [8 m]	16 ft [4.9 m]	
461	Medium voltage Electrical swivel	NA	Up to 50 passes, max 36 kV*	NA	Ex d or Ex de	4.3 ft [1.3 m]	14 ft [4.3 m]	6.6 ft [2 m]	
480	High voltage Electrical swivel	NA	Up to 6 passes, max 145 kV*	NA	Ex d or Ex de	Depends on configuration			

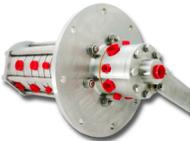
DOWNHOLE SLIP RINGS

The model 303 is a family of electrical slip ring products designed specifically for the extremely harsh high temperature and high pressure (HTHP) downhole environment. These products are designed and tested to operate at temperatures of up to 230 °C and pressures of 25,000 psi (1700 Bar) and are generally configured for an oil-filled environment.

Model	Rotational Speeds	Temperature	Pressure	Channels	Voltage	Current	Key Dimensions
 303 Miniature Bore	Up to 600 rpm standard Contact factory for other requirements	Up to 230° C (200 °C standard)	25 kpsi (1,700 bar)	Up to 8	250 - 500 VAC standard	Up to 2 A per channel	0.375 in. (9.525 mm) hollow bore ID, -1.7 in. (43.2 mm) minimum OD
 303 Large Bore	Up to 300 rpm standard Contact factory for other requirements	Up to 230° C (200 °C standard)	25 kpsi (1,700 bar)	8	Up to 100 VAC standard	10 A per channel	3.5 in. (88.9 mm) hollow bore ID, 3.83 in. (97.28 mm) minimum OD
 303 High Voltage 20 Channel	20 rpm standard	200° C standard	25 kpsi	Up to 20	Up to 1 kVAC	Up to 5 A per channel	OD 1.85 in. (47 mm)

ROTARY UNIONS (FRUs)

Moog's rotary unions are currently used around the world to ensure reliable transmission of life support, process, power and control fluids. Currently, rotary unions rated for pressures up to 15,000 PSI (1,000 bar) are available. Seals are selected based on chemical compatibility, design pressure, design temperature, required service life and acceptable leakage rate. Leak collection can be supplied when required for environmental or personnel safety. Rotary unions can be combined with our electrical slip rings and fiber optic rotary joints.

Model		Rotational Speeds	Temperature	Pressure	Channels
	Rotopack	Up to 200 rpm	Up to 120° C	415 bar	Up to 10
	Model 70	Up to 30 rpm	Up to 100° C gasses 60° C liquids	1,000 psi	Up to 13

COMBINATION WITH ROTARY UNIONS

All MOOG slip ring types can be combined with Moog rotary unions as well as fiber optic rotary joints for all applications. All components are selected and combined to meet customer-specific demands.

Model	Through-bore	Outer Diameter	Circuits	Data	Application	Media	Other
	No	118 mm	3x power (10 amps / 24 VDC) + 1x Ethernet	100 Mbit/s	Machine tools (vertical grinding machine)	2x hydraulic oil at 80 bar	Max. 200 rpm
	No	100 mm	18x 2 amps / 240 VAC	Various	Surface cleaning machine	4x air at 10 bar	Max. 20 rpm
	Ø38 mm; very compact (< 2 kg)	115 mm	1x Fast Ethernet (realtime)	100 Mbit/s	Collaborative robot (COBOT)	2x air at 10 bar	Max. 640 rpm cycling

CUSTOM SLIP RINGS FOR SEISMIC INDUSTRY

Model	Circuits	Voltage	Current	Data	Application	Media	Other
	23	1000 VDC	120 amps	Ethernet 100 Mbit/s	Gun winch	1x Air G1 at 210 bar	Max. 20 rpm

Also available with FORJs.

WIND POWER SLIP RINGS

We are the original supplier for many wind turbine models. We offer slip rings and rotary unions for hydraulic and electric pitch control (onshore / offshore).

Model	Circuits	Voltage	Current	Data	Connection	Media	Other
 M80 EX2 + ESR 110 / 23 [11122]	23	Max. 500 volt	Max. 20 amps	—	Connectors	2x hydraulic oil at max. 250 bar	For 2.3 MW turbine (also as cold climate version available)
 M60 EPX2-1 [14696]	—	—	—	—	—	2x hydraulic oil at max. 245 bar	For 2.3 MW turbine
 ESR 70 / 16 / 11 [22163]	11	Max. 230 volt	Max. 5 amps	CAN Bus	Cable glands	—	For 2.3 MW turbine
 M100 EPX2-1 + ESR 110 / 27 [22220]	27	Max. 24 volt	Max. 11 amps	2x CAN Bus	Connectors	2x hydraulic oil at max. 315 bar	For 3.0 MW turbine
 M100 EPX2-1 + ESR 110 / 18-QC [13741]	18	Max. 230 volt	Max. 10 amps	1x Ethernet	Connectors	2x hydraulic oil at max. 300 bar	For 3.0 MW turbine
 ESR 200 / 80 / 48-QC [27974]	48	Max. 575 volt	Max. 90 amps	2x Ethernet	Connectors	—	For 2.05 MW turbine, de-icing, UL certificate
 M100 EPX1-1 + ESR 200 / 51 / 29-1-QC [25123]	29	Max. 400 volt	Max. 130 amps	4x PROFIBUS®	Connectors	1x hydraulic oil at 20 bar	For 5.5 MW turbine
 M140 EX3-1 + ESR 110 / 32-1+LWL-QC [20079]	32	Max. 230 volt	Max. 20 amps	3 x Ethernet; 1 x optical channel	Connectors	2x hydraulic oil at max. 280 bar; 1x gear oil at max. 16 bar	For 6.0 MW turbine

Replacement slip rings and rotary unions of all wind turbine models are available on request. UL / CSA certification possible.

TAKE A CLOSER LOOK

Learn more about Moog's rotary transmission solutions for your specific application.
Visit our web site for more information.

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Motion Technology Slip Ring Product Guide
MS3342, rev. 4 07/23

For product information, visit
www.moog.com

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