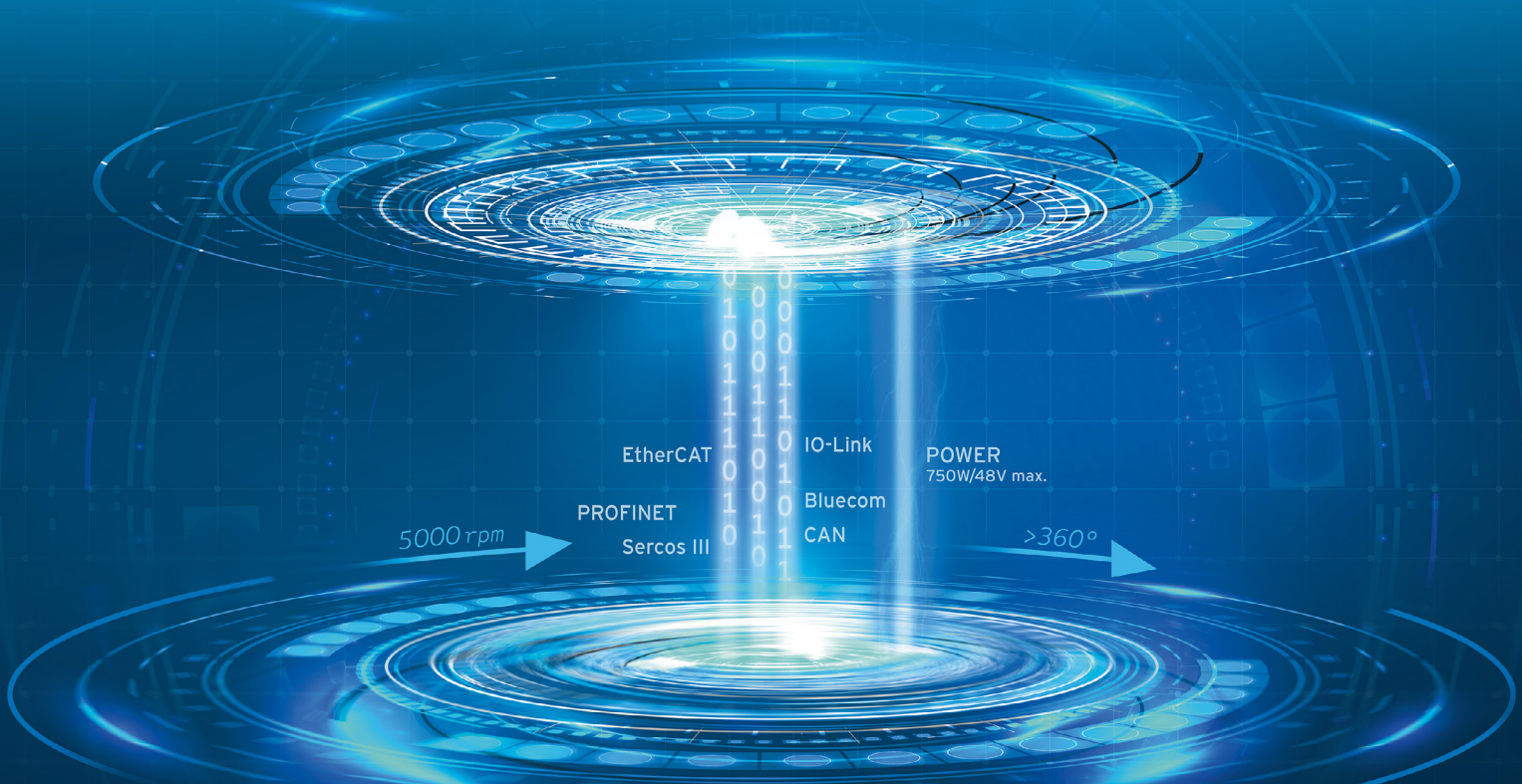


SPINNER

Contactless Data & Power Transmission for Rotating Applications



The diagram illustrates a contactless transmission system between two rotating shafts. A central vertical column of binary code (0s and 1s) represents the data being transmitted. To the left, a shaft rotates at 5000 rpm. To the right, a shaft rotates through more than 360 degrees. The transmission capabilities are listed in the center: EtherCAT, PROFINET, Sercos III, IO-Link, Bluecom, and CAN. Power transmission is also indicated as 750W/48V max.

5000rpm

EtherCAT
PROFINET
Sercos III

IO-Link
Bluecom
CAN

POWER
750W/48V max.

>360°



Data (Real Time) & Power Transmission

HIGH FREQUENCY PERFORMANCE WORLDWIDE
www.spinner-group.com



The SPINNER Group

For more than 75 years, the SPINNER Group has been setting new standards worldwide in high-frequency technology. Based in Munich with production facilities in Germany, Hungary and China, SPINNER currently has over 900 employees. Our international network of subsidiaries and distributors supports customers in over 40 countries.

SPINNER Rotating Solutions

SPINNER has become one of the leading manufacturers in **rotary joints** thanks to its innovative approach, technical expertise, and high standards of quality. Our products are used in **maritime applications (both above and below water), on land, in the air, and in space.**

Across all applications, the trend toward digitization and increasing data transmission rates is continuing. Our contactless modules for rotating systems deliver benefits whenever slip rings are inadequate due to large outer diameters and/or high data transmission rates.



WIND ENERGY



INDUSTRY



SATCOM



SUBSEA/OFFSHORE



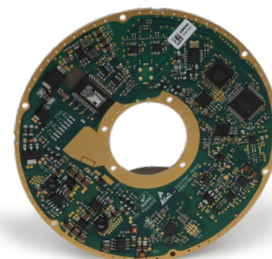
SPACE



RADAR

Key Features of Our Data Couplers

- ✓ Real time data transmission at 100 Mbit/s and 99% bus traffic; multiplexing of two independent channels
- ✓ Multi-channel designs on request, as well as simultaneous transmission of other bus protocols parallel to real time protocols
- ✓ Maximum immunity to interference due to enclosed design, no Wi-Fi used
- ✓ Works at any direction of rotation and rotational speed from 0 to 5000 r/min with constant transmission quality; ready for use immediately after system power-up
- ✓ All-in-one PCB design: No adjustments, no additional gateways or data converter necessary
- ✓ Maximum reliability and long service life thanks to frictionless, maintenance-free operation
- ✓ Modules with free inner diameters of up to 320 mm available on request
- ✓ Combinations available with contactless power transmission of up to 750 W at 48 V DC



Universal 100 Mbit/s Ethernet rotary joint for real time industrial applications

- POWERLINK
- EtherCAT
- PROFINET CC-A, CC-B, CC -C (IRT-Isochronous real time)
- Bluecom
- Sercos III
- VARAN
- EtherNet/IP
- DRIVE-CLiQ
- IEEE 1588 v2 (PTP)

Ethernet rotary joint for up to 1Gbit/s, IEE 802.3

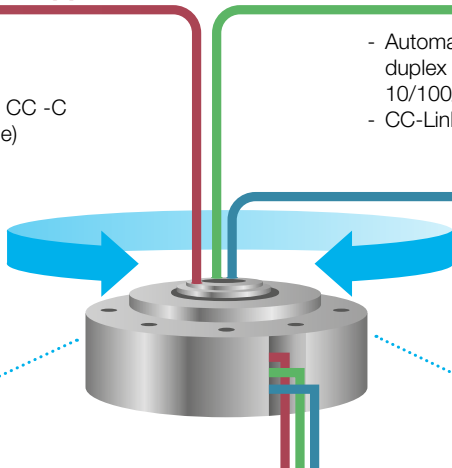
- Automatic setting of speed and duplex mode
- 10/100/1000 Mbit/s (auto-negotiation)
- CC-Link

Others

- CAN 500 kbit/s (repeater mode)
- PROFIBUS 500 kbit/s (12 Mbit/s)
- IO-Link

360°

5,000 rpm



Contactless Data Transmission (Real Time Capable)

Like in many other areas of technology, Ethernet is used as a standard interface for data transmission. SPINNER has developed a contactless coupler (module) that is available with clear inner diameters between 20 mm and 100 mm.

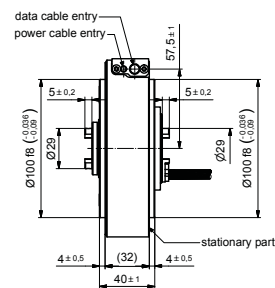
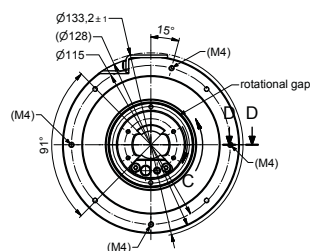
In contrast to conventional slip rings, all sizes of Ethernet module also support Gigabit Ethernet. The correct standard of this version is automatically detected and transmitted: 10BASE-T (10 Mbit/s), Fast Ethernet (100 Mbit/s), Gigabit Ethernet (1 Gbit/s). The 1 Gbit/s module supports CC-Link.

All Ethernet data transmitters are fully compatible with Profinet (class A and B) without the need for any adjustments. The Profinet Class C (IRT) real time version with 100 Mbit/s also supports other real time protocols.

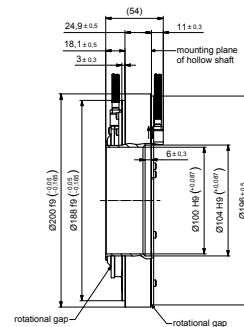
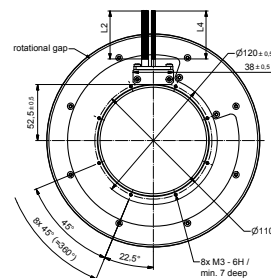
Data Transmission Modules



BN 637421C000X (20 mm clear inner diameter)



BN 637426C000X (100 mm clear inner diameter)



Available Configurations:

Type X	
1	1000BASE-T Ethernet according to IEE 802.3
3*	CAN channel (500 kbit/s repeater)
4**	1 channel 100BASE-TX, for real time Ethernet applications*
7**	2 channels 100BASE-TX, multiplexed, for real time Ethernet applications*
9*	Profibus DP according to IEC 61158, 500 kbit/s (12 Mbit/s on request)

*BN 637421 only

**half-duplex on request

Contactless Data Transmission (Real Time Capable)

Example: Type 1 - BN 637421C0001 (1 Gbit/s Ethernet)

1000BASE-T Ethernet-Channel	One contactless coupler for one channel
Supported Ethernet standards	10BASE-T (IEEE 802.3 clause 14) 100BASE-TX (IEEE 802.3 clause 25) 1000BASE-T (IEEE 802.3 clause 40) Includes autonegotiation for automatically selecting the Ethernet standard and full/half duplex mode
OSI layer operation	Layer 1 and 2
Supported protocols	Profinet CC-A, CC-B, CC-Link
Ethernet frame loss ratio according to RFC2544	$\leq 1 \times 10^{-9}$ Measured at 99% channel utilization, corresponding to BER $\leq 1 \times 10^{-12}$
Data interface connection	Cat. 6A S/FTP 4x2xAWG26/7 (PiMF) on stator and rotor side

Example: Type 7 - BN 637426C0007 (2 Channel Multiplexed Profinet Class C)

100BASE-TX Ethernet Channel	Two signal channels over one contactless transmission channel, signals are multiplexed, no redundancy
Supported Ethernet standards	100BASE-TX (IEEE 802.3 clause 25), autonegotiation (full duplex only)
Supported protocols	Profinet CC-A, CC-B, CC-C (IRT), POWERLINK, EtherCAT and others
OSI layer operation	Layer 1 (physical)
Multiplexer	Time domain multiplexing
Ethernet frame loss ratio according to RFC2544	$\leq 1 \times 10^{-9}$ Measured at 99% channel utilization, corresponds to BER $\leq 1 \times 10^{-12}$
Data interface connection	Cat. 6A S/FTP 4x2xAWG26/7 (PiMF) on stator and rotor side

Example: Type 9 - BN 637421C0009 (1 Channel Profibus)

Supported PROFIBUS standards:	PROFIBUS DP according to IEC 61158
Signal channel characteristics:	PROFIBUS DP, RS-485, half-duplex
Data format/rate	UART (11 Bit, NRZ)/500 kbit/s (12 Mbit/s on request)
Termination	Internal, permanently terminated

Power Transmission Modules

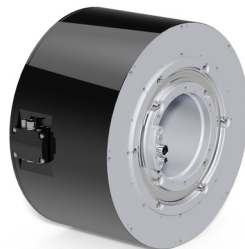
SPINNER's contactless power transmission system is a rotationally symmetrical system for contactless transmission of electric energy. This transmission system is used to supply DC voltage to control systems, sensors, or other consumers on rotating shafts.

The transmission system works like a galvanically isolated DC voltage transmitter. It keeps the output voltage nearly constant over a wide input range, regardless of the load. The output has a short-circuit-proof and open-circuit-proof design. A major advantage is the presence of a hollow shaft, thus permitting combinations with optical single-channel or

multi-channel rotary joints for data transmission. These DC/DC converters conform to all common industry standards with respect to safety, interference immunity, and emitted interference. DC/DC converters for 24 V are available for up to 300 W, other output voltages such as 48 V for output power up to 750 W on request.



BN 636695 - 300 W



BN 637452 - 500 W

Standalone Module DC/DC Converter

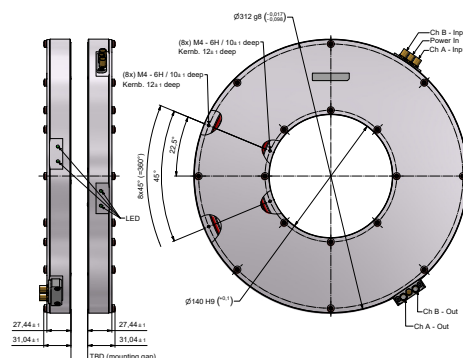
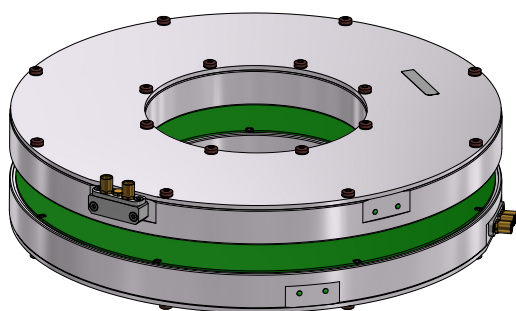
SPINNER BN	BN 636695	BN 637452
Input voltage	21.6 V - 28.0 V DC	48 V DC $\pm$ 4V
Output voltage	24 V DC $\pm$ 3%	48 V DC $\pm$ 2V**
Nominal output current	12.5 A	10.7 A
Efficiency, typ.	85% at full load	93% at full load
Max. rotational speed / optionally up to	600 rpm / 1500 rpm	300 rpm*
Free inner diameter available	30 mm	100 mm
Min. service life	200 x 10 ⁶ revolutions	
MTBF	300,000 hours	
Standards	DIN EN 55022, DIN EN 61000-4-2, DIN EN 61000-4-3, DIN EN 61000-4-4, DIN EN 61000-4-6	
EU Directive	EMC Directive 2004/108/EC	

*High speed version on request

**Additionally 24 V DC / 8 W for contactless data transmission modules

Combined Contactless Data & Power Transmission Modules for IO-Link

- **Big free inner bore > 140 mm**
- **Bearingless system**
- Adaptable to other diameters
- Suitable for high rotational speed
- High gap tolerance 1 - 3 mm
- Insensitive to slight misalignment
- Easy integration
- Power transfer up to 50 W @ 24 VDC
- 2 channel I/O-Link data transfer at 230 kbit/s each



BN 637446 (> 140 mm clear inner diameter)

Data Channel Characteristics

No of channels	2
Signal Channel Characteristics	IO-Link (SIO-Mode not supported)
Data rate	COM 2 / COM 3 38.4 kbit/s / 230.4 kbit/s

Contactless DC-Power Transmission Characteristics

Input voltage range	24 V DC $\pm 10\%$; 0 V is potential free against case ground
Output voltage	24 V DC $\pm 5\%$, potential free against case ground

Mechanical Characteristics

Rotating speed, max.	300 rpm (up to 3000 rpm on request)
Case material	Aluminum alloy
IP protection level	IP64

Environmental Conditions

Ambient temperature range	-20 to +50°C
Relative humidity, max.	95% (non-condensing)

Combined Contactless Data & Power Transmission Modules for Ethernet and Other Bus Systems

SPINNER uniquely combines contactless data modules for rotary applications.

The modules are designed for 24/7 use. No maintenance due to contactless transmission.

Combined contactless data and power transmission modules are available for the 24 V and 48 V industrial voltages in 300 W and 750 W versions with different clear inner diameters.

The data channels are realized by rotating capacitive couplers and the power channel is based on an inductive technology.



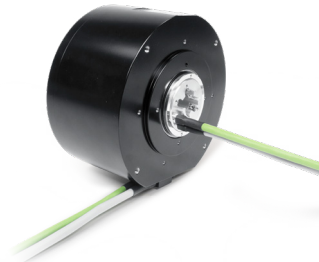
BN 637440



BN 637490



BN 637491



BN 637493

Combined Contactless Data & Power Transmission Modules for Ethernet and Other Bus Systems

Combined contactless data and power transmission modules are available for the 24V and 48V industrial voltages in 300 W and 750 W versions with different clear inner diameters.

Available Configurations (Data Transmission)

Type	
4	1 Channel ethernet for real-time applications 100BASE-TX, full duplex*
7	2 Channel ethernet (multiplexed) for real-time applications 100BASE-TX, full duplex*

*half-duplex on request

100BASE-TX Ethernet-Channel	One or two signal channels provided
OSI layer operation	Layer 1 (physical)
Supported protocols	All real-time Ethernet protocols
Ethernet frame loss ratio according to RFC2544	$\leq 1 \times 10^{-9}$ Measured for 800s with 64-byte frames at 99% channel utilization, corr. to BER $\leq 1 \times 10^{-12}$
Data interface connection	Cat.6A S/FTP 4x2xAWG26/7 (PiMF) on body and hollow core sides

Available Models BN 637440

Version	BN 637440
Nominal output power	50 W
External power supply	Power Supply has to be a ES1 type acc. to DIN EN 62368-1
Input voltage range	24 V DC $\pm$ 10%
Output voltage	24 V DC $\pm$ 3% Potential-free with case ground
Output current, continuous	2.1 A
Efficiency	85% @ full load
Type of external load	Resistive
Protection	Output with overcurrent protection and short-circuit-protected

Standards and Directives

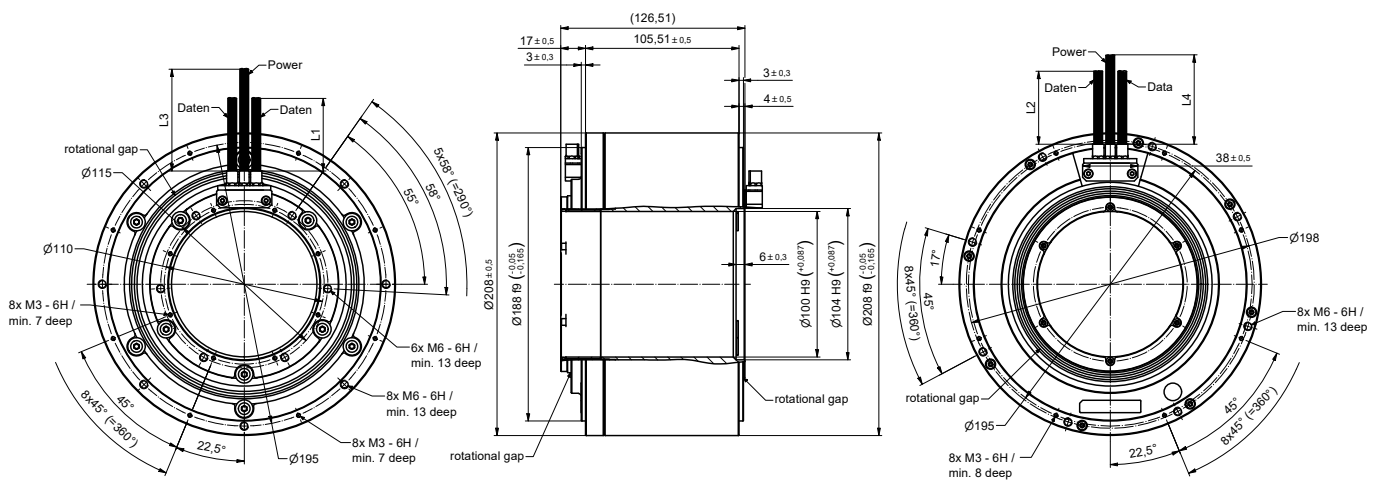
Applicable EU Directive	EMC Directive 2014/30/EU
Applied standards	DIN EN 55032 (Class B) Radio disturbance characteristics DIN EN 55024 Immunity characteristics

Combined Contactless Data & Power Transmission Modules for Ethernet and Other Bus Systems

Mechanical Characteristics and Environmental Conditions

Clear inner diameter	BN 637440 100 mm
Max. rotational speed	300 rpm*
Min. service life	200 x 10 ⁶ revolutions
Duty cycle	100%
MTBF	300,000 h
Case material	Aluminum alloy
IP protection level	IP60
Operating ambient temperature range (near housing)	BN 637440 -25°C to +60°C
Storage ambient temperature range	-40°C to +85°C

*Up to 3,000 rpm on request



BN 637440 (Standard outline, all dimensions in mm)

Combined Contactless Data & Power Transmission Modules for Ethernet and Other Bus Systems

Available Models BN 637490/93 and BN 637491

Version	BN 637490 / 637493	BN 637491
Nominal output power	300 W	750 W
External power supply	Power Supply has to be a ES1 type acc. to DIN EN 62368-1	
Input voltage range	48 V DC $\pm$ 10% / 24 V DC $\pm$ 10%	48 V DC $\pm$ 10%
Output voltage	48 V DC $\pm$ 5% / 24 V DC $\pm$ 5%	48 V DC $\pm$ 5%
	Potential-free with case ground	
Output current, continuous	6.6 A	15.8 A
Efficiency	85% @ full load	90% @ full load
Type of external load	Resistive	
Protection	Output with overcurrent protection and short-circuit-proofed	

Standards and Directives

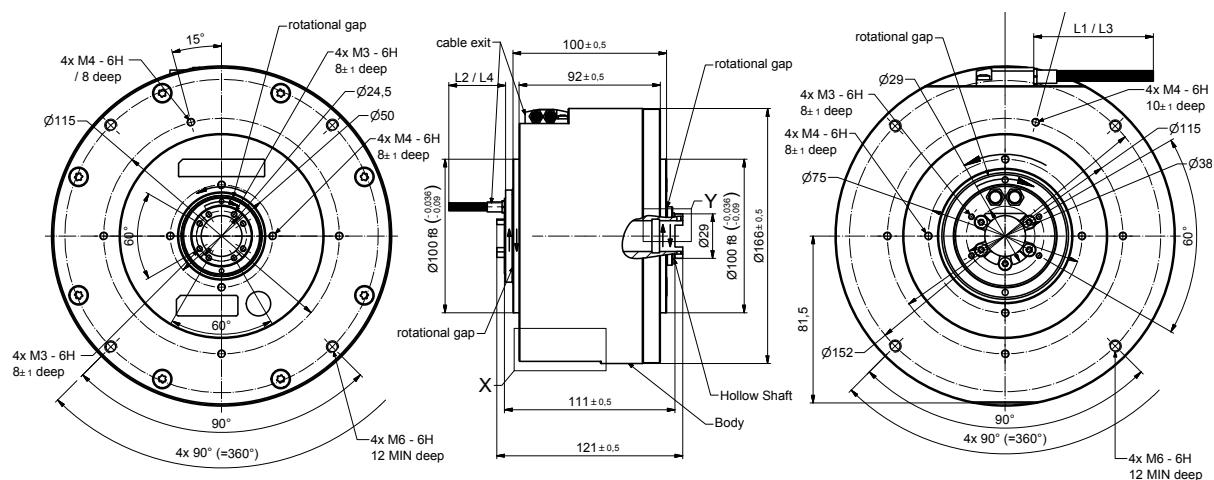
Applicable EU Directive	EMC Directive 2014/30/EU
Applied standards	DIN EN 55032 (Class B) Radio disturbance characteristics
	DIN EN 55024 Immunity characteristics

Mechanical Characteristics and Environmental Conditions

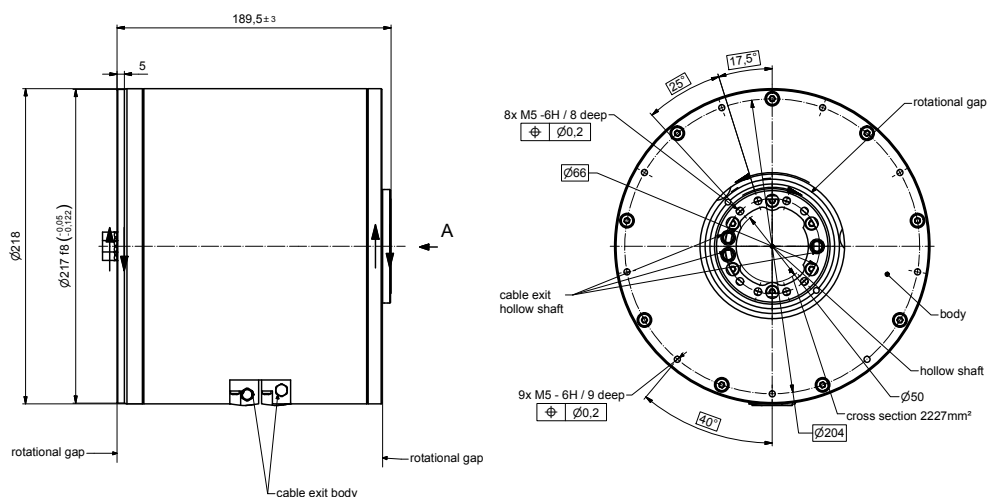
	BN 637490 / BN 637493 20 mm	BN 637491 50 mm
Clear inner diameter		
Max. rotational speed	300 rpm*	
Min. service life	200 x 10 ⁶ revolutions	
Duty cycle	100%	
MTBF	300,000 h	
Case material	Aluminum alloy	
IP protection level	IP60	
Operating ambient temperature range (near housing)	BN 637490 / BN 637493 -25°C to +60°C	BN 637491 -25 °C to + 45 °C
Storage ambient temperature range	-40°C to +85°C	

*BN 637490 / 637493: up to 3,000 rpm on request

Combined Contactless Data & Power Transmission Modules for Ethernet and Other Bus Systems

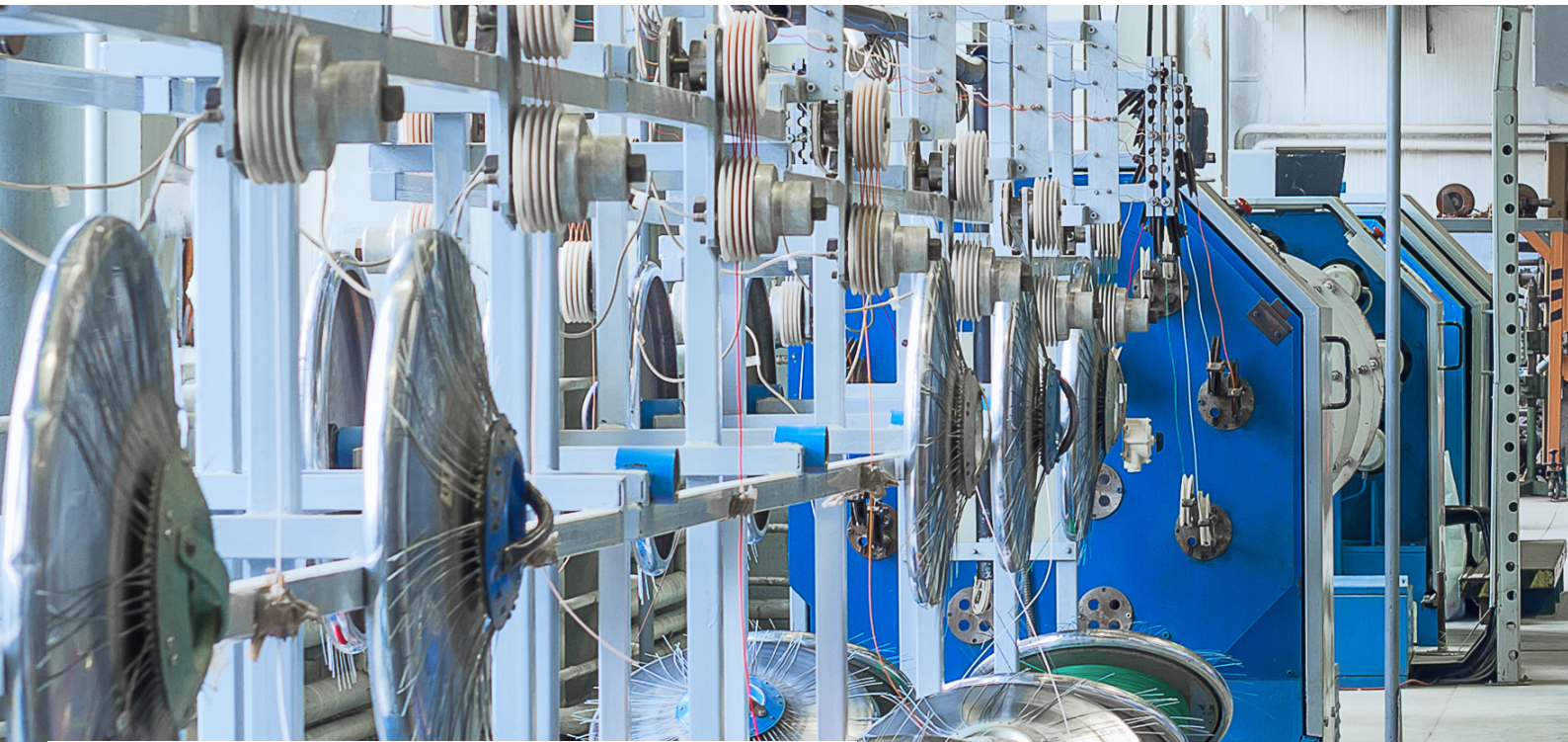


BN 637490 (Standard outline, all dimensions in mm)



BN 637491 (Standard outline, all dimensions in mm)

Special Modules for Industrial Applications



SPINNER contactless capacitive rotary joint for GigE (1000Base-T) or 100 Mbit/s real time transmission with 300 mm inner clear diameter (BN 637418C000X)

This new contactless rotary transmission solution now makes it possible for SPINNER to supply products with an especially large inner diameter for dependably transmitting Ethernet protocols across a rotating interface. The joints feature a clear inner diameter of 300 mm and enable reliable Gigabit-Ethernet-LAN or 100 Mbit/s real time transmission. This isn't possible with conventional sliprings or other technologies.

In applications in which lines, shafts, or drives occupy the central axis, this large clear inner diameter now also enables fault-free transmission of data. The possible uses include smaller CT scanners like those used for animals or e.g. data transmission from drums or drives in the steel industry. Power for the data transmitter can be supplied (for example) via a pre-existing slip ring, which can now also be smaller since there is no longer any need for data rings.

The contactless data channels are implemented with rotating capacitive couplers and require no maintenance. This innovative solution also has the major advantage that the user no longer needs to deal with technical issues like impedance matching or crosstalk, a problem that can affect slip rings. These SPINNER rotary joints boast a bit error rate of $BER \leq 1 \times 10^{-12}$.

Special Modules for Industrial Applications

Transmission Type BN 637418C0001

1000BASE-T Ethernet-Channel	One signal channel provided
Supported ethernet standards	1000BASE-T (IEEE802.3 Clause 40)
OSI layer operation	Layer 1 (2)
Supported protocols	Not for real-time ethernet applications

Transmission Type BN 637418C0004

100BASE-TX Ethernet-Channel	One signal channel provided
Supported ethernet standards	100BASE-TX (IEEE802.3 Clause 25), autonegotiation (full duplex only)
Supported protocols	Real-time ethernet protocols

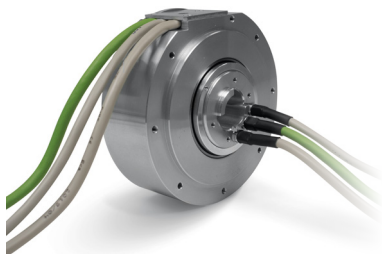
Operating Condition

External power supply	Power supply has to be a ES1 type acc. to DIN EN 62368-1 The current must be externally limited to 4 A
Input voltage range	21.6 V to 28.8 V DC; 0 V DC is isolated to case ground (potential-free)
Current consumption typ. / max.	0.33 A / 0.5 A @ 24 v supply voltage

Mechanical Data

	Sealed version	Unsealed version (optional)
IP protection level	IP60	IP40
Rotating speed, max.	100 rpm	
Life, min.	20 x 10 ⁶ revolutions	200 x 10 ⁶ revolutions
Free inner diameter	300 mm	

Special Modules for Industrial Applications



20 mm contactless data transmission with internal 6-way slip ring (BN 637424C000X)



100 mm contactless data transmission with internal 6-way slip ring (BN 637427C000X)

POWERLINK
PROFINET
EtherCAT
SERCOS III
EtherNet/IP
VARAN
IEEE/1588 v2 (PTP)

Contactless data transmitter with up to 100 mm clear internal diameter for rotating applications with all popular ethernet-based protocols with integrated 6-way slip ring (self-supply).

Contactless data transmitters for rotating systems have a wide range of uses. They are especially beneficial for ensuring reliable transmission whenever slip rings are inadequate due to large system diameters and/or data volumes.

While developing the latest generation of SPINNER rotary transmitters, we paid special attention to ensuring that they support as many bus protocols as possible and include plug&play capabilities. SPINNER has consistently pursued (and achieved) this goal for 100 Mbit/s real-time systems. A single version enables reliable transmission of many of the most common bus protocols in full duplex mode without packet losses and without requiring any additional external configuration or programming work.

The 6-way slip ring 24 V - up to 6 A enables the power supply on the rotating side for sensors or switches etc.

Special Modules for Industrial Applications

Available Configurations

Type X	Description
1	1000BASE-T Ethernet
4	1 channel ethernet for real-time applications 100Base-TX, full duplex
5	1 channel ethernet for real-time applications 100Base-TX, half duplex
7	2 channel ethernet (multiplexed) for real-time applications 100Base-TX, full duplex
8	2 channel ethernet (multiplexed) for real-time applications 100Base-TX, half duplex

Transmission Type 1

1000BASE-T Ethernet-Channel	One signal channel provided
Supported ethernet standards	10BASE-T (IEEE802.3 Clause 14) 100BASE-TX (IEEE802.3 Clause 25) 1000BASE-T (IEEE802.3 Clause 40) Auto negotiation provided to select ethernet-standard and full / half duplex mode automatically
OSI layer operation	Layer 1 - 2
Supported protocols	Not for real-time ethernet applications

Transmission Type 4, 5, 7 and 8

1000BASE-T Ethernet-channel	One or two signal channels provided (no redundancy)	
	Type 4 / 7	Type 5 / 8
Supported ethernet standards	100BASE-TX (IEEE802.3 Clause 25), autonegotiation (full duplex only)	100BASE-TX (IEEE802.3 Clause 25), autonegotiation (half duplex only)
Supported protocols	Real-time ethernet protocols	

Slip Ring Characteristics

Number of channels	4 (+2) + case ground	
Type of circuit	SELV	
Current nom. (DC)	BN 637424: 4 A	BN 637427: 6 A
Voltage	4 channels 50 V DC, 2 channels 28.8 V DC	

Operating Conditions

External power supply	Power supply has to be a ES1 type acc. to DIN EN 62368-1 The current must be externally limited to 10 A	
Input voltage range	21.6 V to 28.8 V DC; 0 V DC is isolated to case ground (potential-free)	
Current consumption, typ. / max.	0.33 A / 0.5 A @ 24 VDC supply voltage	
Rotating speed, max.	BN 637424: 200 rpm	BN 637427: 120 rpm
Life, min.	BN 637424: 20 x 10 ⁶ rev.	BN 637427: 10 x 10 ⁶ rev.

Contactless Data Transmission in Wind Turbines



Real time data transmission module



SPINNER FORJ 1.17 for wind turbines (IP 68)

Contactless digital transmission in pitch slip rings can increase the reliability of wind power stations for pitch controls. BUS systems including EtherCAT, Profinet, Profibus and CAN are currently used, with the signals being transmitted by slip rings. Due to natural wear of the slip rings, downtimes for maintenance are inevitable.

SPINNER's contactless data transmitters for popular BUS systems experience no wear and therefore minimize downtimes and operating and maintenance costs. The data transmitters can also be combined with a fiber-optic rotary joint for redundancy.

Contactless Data and Power Transmission Modules can be used 24/7 in Various Applications, e.g.:



Wind turbines



Battery production machines



Robotic systems



Packaging machines



Amusement park rides



Turntables



Injection molding machines



Blow molding machines



Wallpaper production machines



Cable reels



Machine tools



Bottle filling machines



Labeling machines



Others

Notes

Notes



HIGH FREQUENCY PERFORMANCE WORLDWIDE

SPINNER designs and builds cutting-edge radio frequency systems, setting performance and longevity standards for others to follow. The company's track record of innovation dates back to 1946, and many of today's mainstream products are rooted in SPINNER inventions.

Industry leaders continue to count on SPINNER's engineering excellence to drive down their costs of service and ownership with premium-quality, off-the-shelf products and custom solutions. Headquartered in Munich, Germany, the global frontrunner in RF components remains the first choice in simple-yet-smart RF solutions.

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