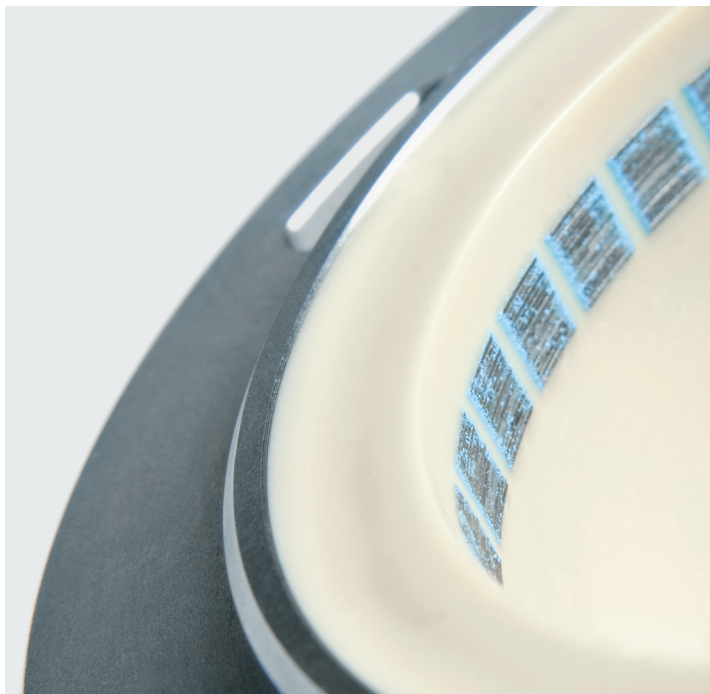


LTN SERVOTECHNIK GMBH
PRODUCT BROCHURE





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Subject to change without prior notice. Issued 12/2016

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LTN Servotechnik GmbH is a German SME specialised to provide components to the international machine builders and plant engineering industry. The worldwide network of sales and service offices is the backbone of the traditionally oriented company's global activities. Dedicated to traditional values such as partnership with customers and suppliers. LTN's 270 highly skilled employees constantly develop and produce new ideas and products. This secures the success as one of the leading supplier of components for industrial application.

Our product range covers slip rings for micro signals and high power transmission, resolvers and incremental encoders as reliable angular feedback systems for complex control and monitoring tasks as well as optical rotary joints. Thus, this range is perfectly adjusted to our customers' needs and represents tailor-made solutions for machine builders and plant manufacturers. We supply on-demand concepts with special geometries, connectors, cables and other special features. Consequently we combine our products into complex systems together with hydraulic and pneumatic rotary joints.



SLIP RINGS

Slip rings enable the transmission of electrical signals and power from a stationary to a rotary system. Even harsh environmental conditions, as those are found in offshore applications or strong vibrations do not harm our products. In line with this, they reliably secure the functionality and availability of the entire machinery.

Slip ring systems can be found in many electrical systems. Core applications are

- surveillance systems such as radar systems and CCTV applications
- medical applications in surgical lights
- the field of renewable energies such as wind turbines and solar panel tracking
- high frequency signal transmission
- digital data transfer in computer networks

The range of our products reaches from a few mV or mA to 1.500 V and 200 A



RESOLVERS

Resolvers transform the angular position of a rotating system into an electrical signal. Our brushless resolvers operate wear-free and failsafe under the hardest of conditions, such as found in mining, under high temperature, or in a vacuum.

Resolvers provide reliable and highly repeatable data for drives and controls in

- servomotors such as brushless DC motors
- mining (e.g. rock drilling)
- looms and spinning machines
- explosive areas
- cryogen applications
- radioactive applications (such as for the rebuilding of nuclear power plants)

Our optional downstream PCBs convert the analogue resolver signal into any digital signal.

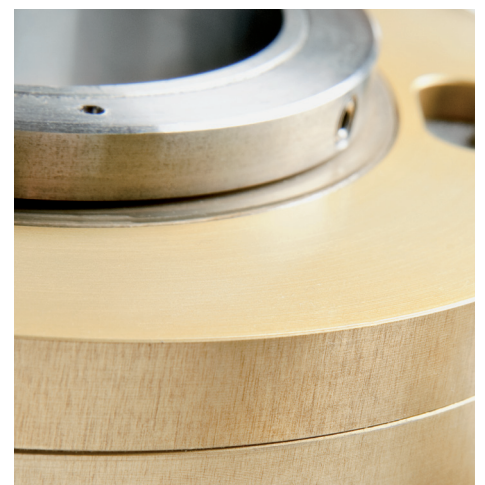


ENCODERS

Incremental encoders convert an angular position optically into an electronic signal. Those highly precise signals are a must-have for high-end position controls.

Typical applications for incremental encoders include

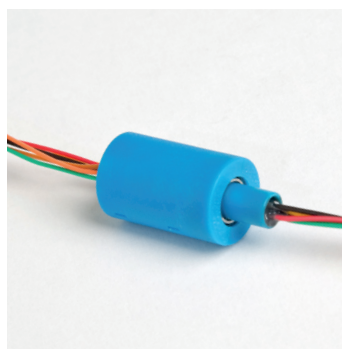
- machine tools
- elevators and escalators
- automatic doors and access systems
- fans
- packaging machines
- paper processing



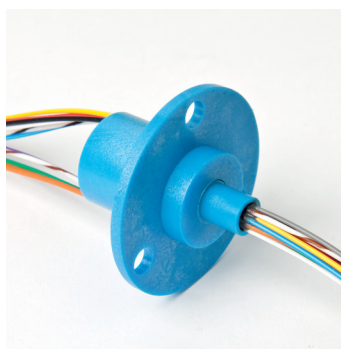


OVERVIEW SLIP RING UNITS

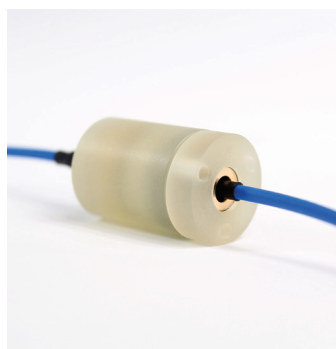
Type	Outer diameter	Max. inner diameter	Protection class	Max. speed	No. of rings <small>*more rings on request</small>	Electrical transmission per ring
SC012	12 mm	no bore	IP51	250 min ⁻¹	6, 12	2 A / 48 V
SC020	20 mm	3 mm	IP51	250 min ⁻¹	6, 12, 18, 24, 36	2 A / 48 V
SC020-COAX	20 mm	0 mm	IP51	10 min ⁻¹	2 rings for one Coax 75 Ω	2 A / 24 V
SC040	40 mm	no bore	IP50 (connector IP00)	400 min ⁻¹	max. 6	3 x 10 A / 230 V & 3 x 2 A / 48 V
SC050	50 mm	17 mm	IP54	250 min ⁻¹	max. 12*	10 A / 230 V
SC080	80 mm	30 mm	IP54	150 min ⁻¹	max. 24*	16 A / 230 V
SC100	100 mm	50 mm	IP54	120 min ⁻¹	max. 24*	16 A / 400 V
SC104-A01	104 mm	50 mm	IP54	400 min ⁻¹	max. 24*	10 A / 500 V
SC104-L01	104 mm	50 mm	IP54	up to 800 min ⁻¹	2, 4, (6, 8)*	10 A / 500 V
SC120	120 mm	70 mm	IP54	100 min ⁻¹	max. 24*	16 A / 400 V
SH085	85 mm	25 mm (excentric)	IP50	1500 min ⁻¹	max. 16*	25 A / 400 V
DISC SLIP RING SD	50 - 580 mm	0 - 560 mm	IP00	30 - 200 min ⁻¹	2 - 12*	1 A / 60 V



SC012 (Design example)



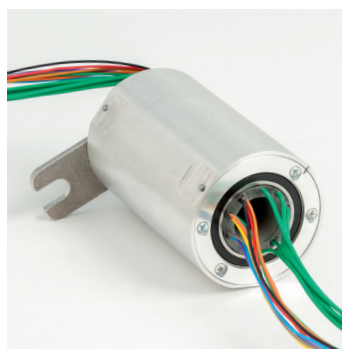
SC020 (Design example)



SC020-COAX (Design example)



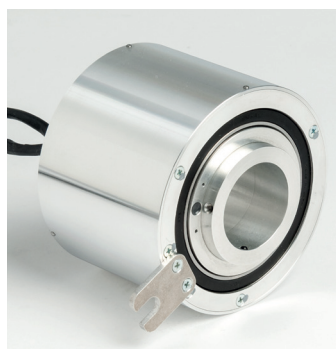
SC040 (Design example)



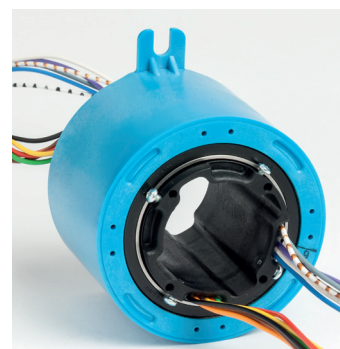
SC050 (Design example)



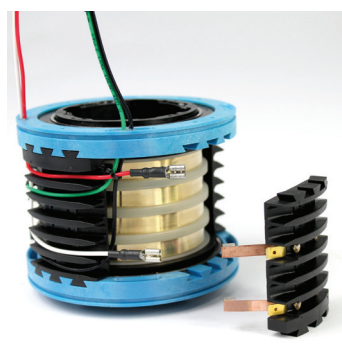
SC080 (Design example)



SC100 (Design example)



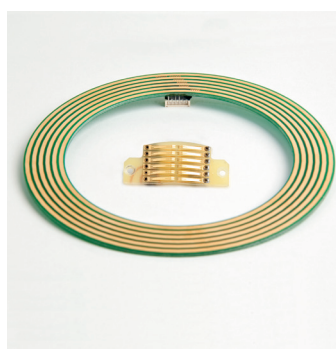
SC104-A01 (Design example)



SC104-L01 (Design example)



SH085 (Design example)



DISC SLIP RING SD (Design example)

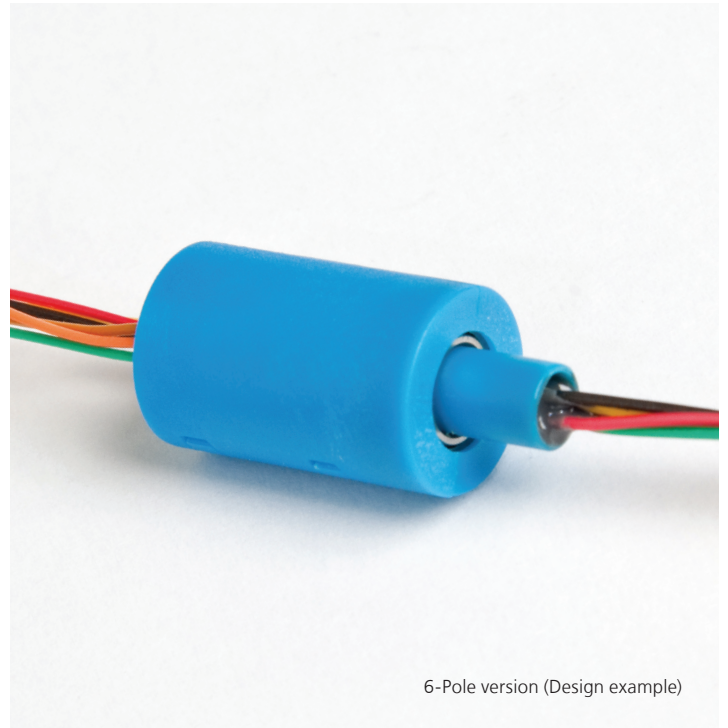
Length:	Depending on ring quantity
Protection class:	higher on request
Operating temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F); higher on request
Others:	Customized versions and slip ring combinations are available Combinations consisting of slip rings and encoders or resolver on request



SLIP RING
SC012

FACTS

- 3, 6 or 12 rings with max. 2 A per ring
- Max. 48 V_{DC}
- Outer diameter 12 mm



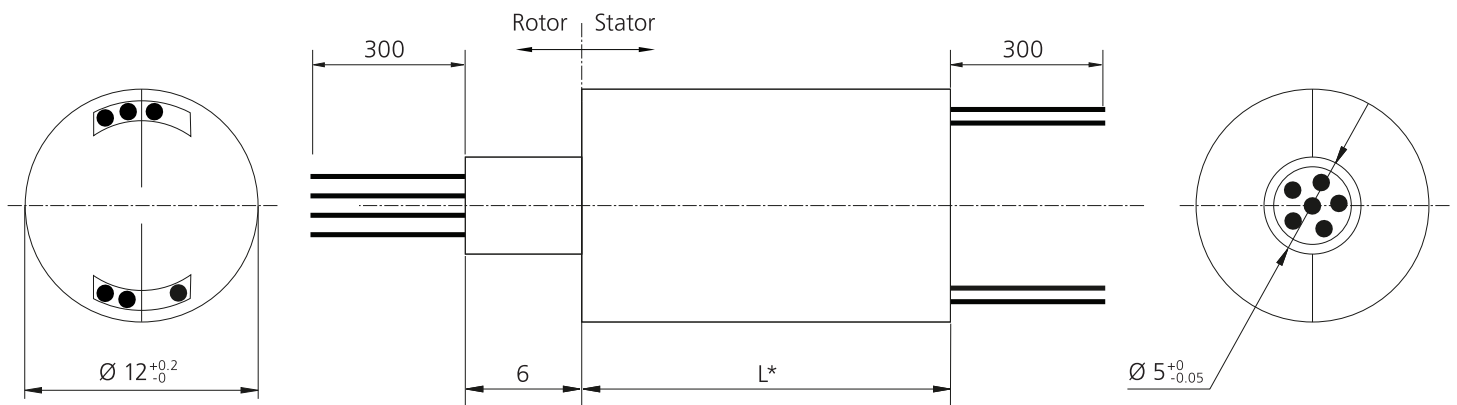
6-Pole version (Design example)

ELECTRICAL DATA

Number of rings:	3, 6 or 12
Current:	max. 2 A per ring
Voltage:	max. 48 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 5 min ⁻¹ , 6 V _{DC} and 50 mA
Contacts / Leads:	gold-gold / silver plated copper with PTFE insulation

MECHANICAL DATA

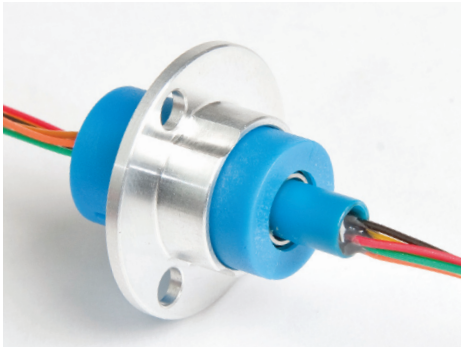
Speed:	max. 250 min ⁻¹
Protection class:	IP40
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor / Stator conn.:	300 mm leads; AWG 28/19 (0.1 mm ²)
Bearings:	sealed miniature ball bearings of steel
Housing:	made of glass fibre reinforced polycarbonate
Secure:	body to be clamped or glued; flange optional



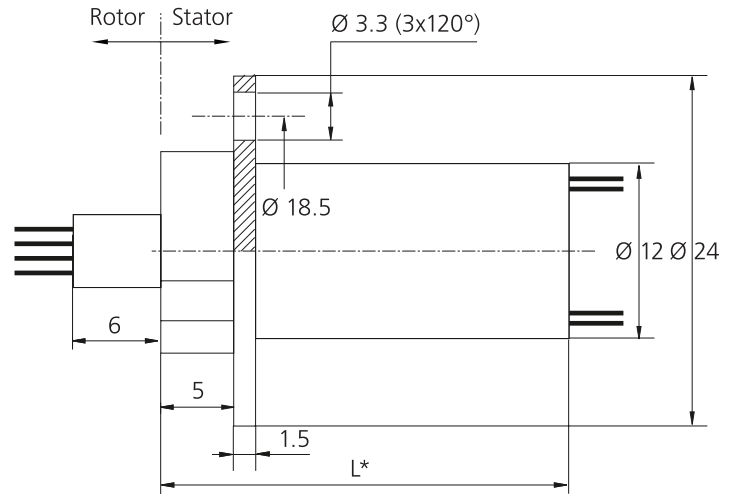
Number of rings	3	6	12
L* (mm)	14.5	19	28

OPTIONS

- Flange with 3 bores dia. 3.3 mm on b.c.d. of 18.5 mm
different axial flange position on request
- Other ring quantity on request



SC020 with flange



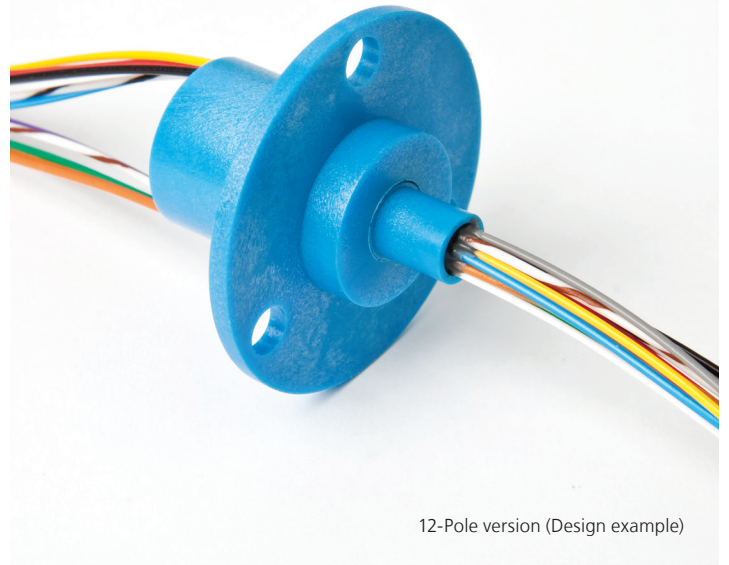
Illustrated option: SC012-XX-F01



SLIP RING
SC020

FACTS

- 6, 12, 18, 24 or 36 rings for max. 2 A each
- 4 A with 2 combined rings; up to 12 A with 6 combined rings
- Outer diameter 20 mm



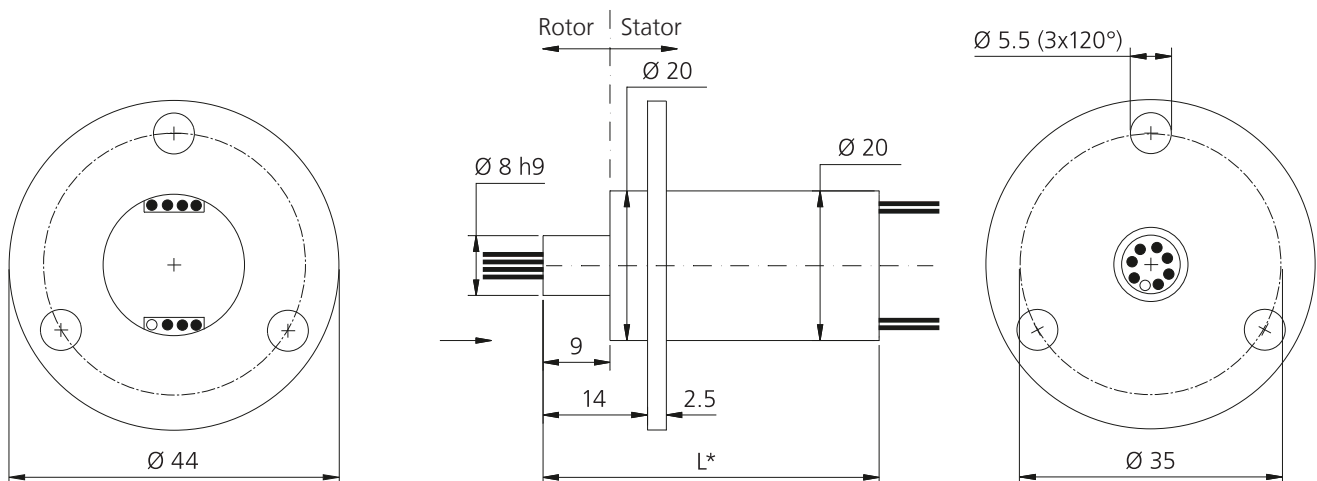
12-Pole version (Design example)

ELECTRICAL DATA

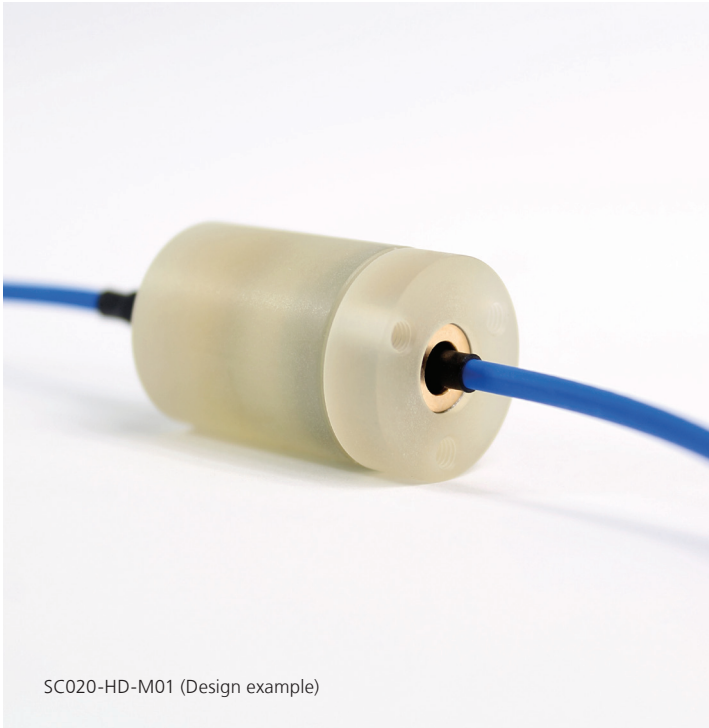
Number of rings:	6, 12, 18, 24 or 36 (2 A per ring; 4 A with 2 combined rings; up to 12 A with 6 combined rings)
Voltage:	max. 48 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 5 min ⁻¹ , 6 V _{DC} and 50 mA
Contacts / Leads:	gold-gold / silver plated copper with PTFE insulation

MECHANICAL DATA

Speed:	max. 250 min ⁻¹
Protection class:	IP51; others on request
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor/Stator conn.:	300 / 600 / 1000 mm leads; AWG 26/19 (0.15 mm ²); 36 pole version: AWG 28/19; others on request
Bearings:	miniature ball bearings of steel
Housing:	with flange of PC; others on request



Number of rings	6	12	18	24	36
L* (mm)	27	36	45	54	72



SC020-HD-M01 (Design example)

SLIP RING
SC020-COAX 

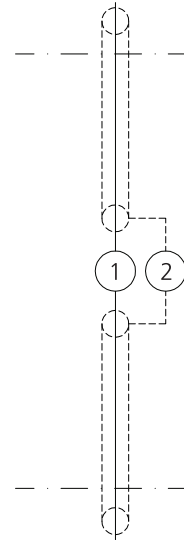
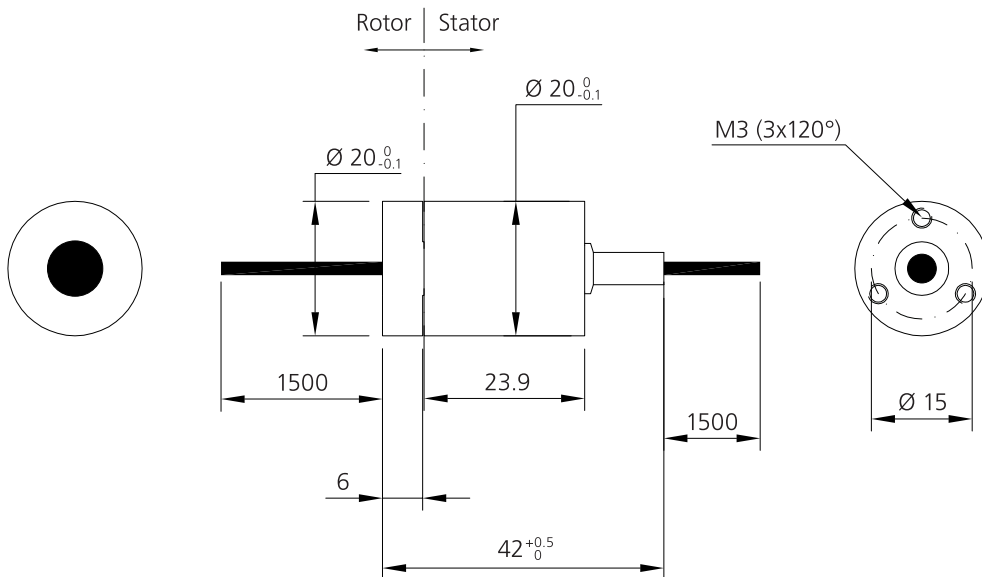
COAXIAL SLIP RING FOR HD-VIDEO SIGNALS

ELECTRICAL DATA

Number of rings:	2 rings for Coax 75 Ω
Voltage:	max. 24 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Contacts / Leads:	gold-gold

MECHANICAL DATA

Speed:	max. 10 min ⁻¹
Protection class:	IP51
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor/Stator conn.:	Enviroflex RG 179 length = 1500 mm
Bearings:	miniature ball bearings of steel
Housing:	with flange of Polycarbonate



Enviroflex RG 179 Length = 1500 mm



SLIP RING
SC040

FACTS

- 2 ... 6 rings
- 2 ... 15 A per ring
- max. 240 V_{AC}
- Flat pin connector for sockets 6.3 mm or 2.8 mm
- Outer diameter 40 mm



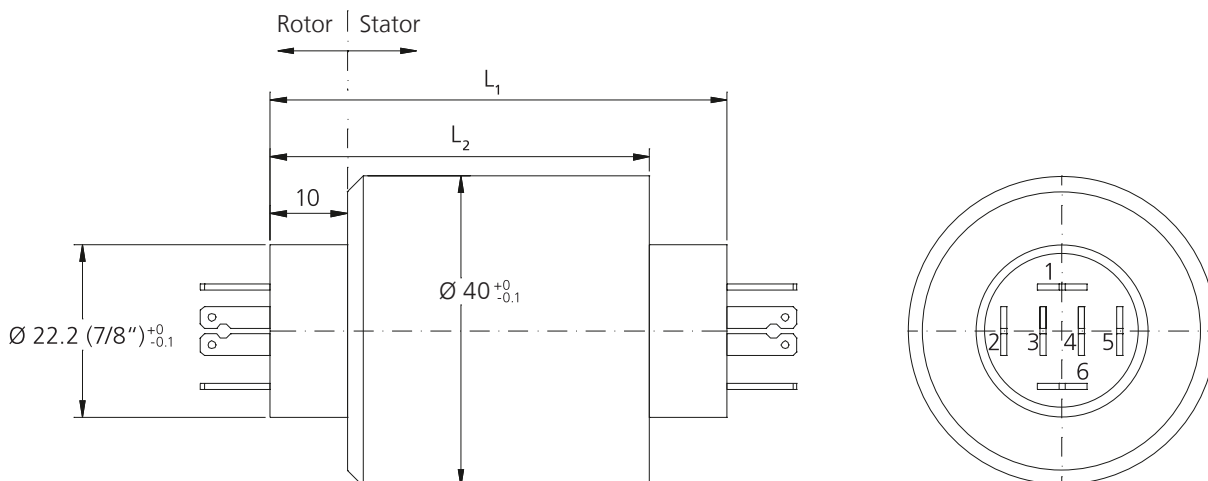
SC040-02/04-LTN (Design example)

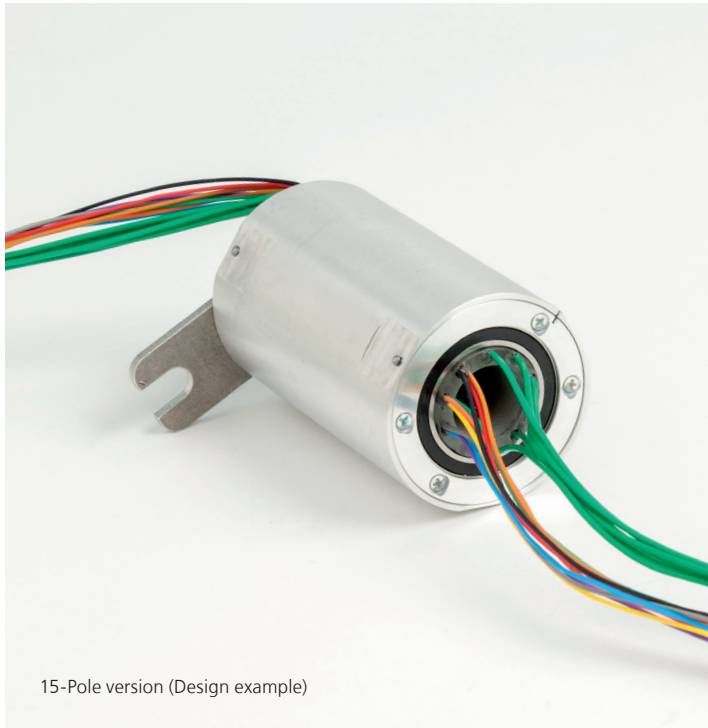
ELECTRICAL DATA

Ring group I:	up to 4 x 10 A / 230 V _{AC}
Ring group II:	up to 2 x 2 A / 48 V _{DC}
Test voltage:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	60 mΩ at 5 min ⁻¹ , 6 V _{DC} and 50 mA
Contacts / Leads:	gold-gold

MECHANICAL DATA

Speed:	max. 400 min ⁻¹
Protection class:	IP50 (connector IP00)
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor / Stator conn.:	flat pin connectors for socket (mating connectors included)
Bearings:	ball bearings of steel
Gasket:	ring gasket of FPM
Housing:	glass fibre reinforced polycarbonate, aluminium anodized on request
Length:	L ₁ /L ₂ on request





15-Pole version (Design example)

FACTS

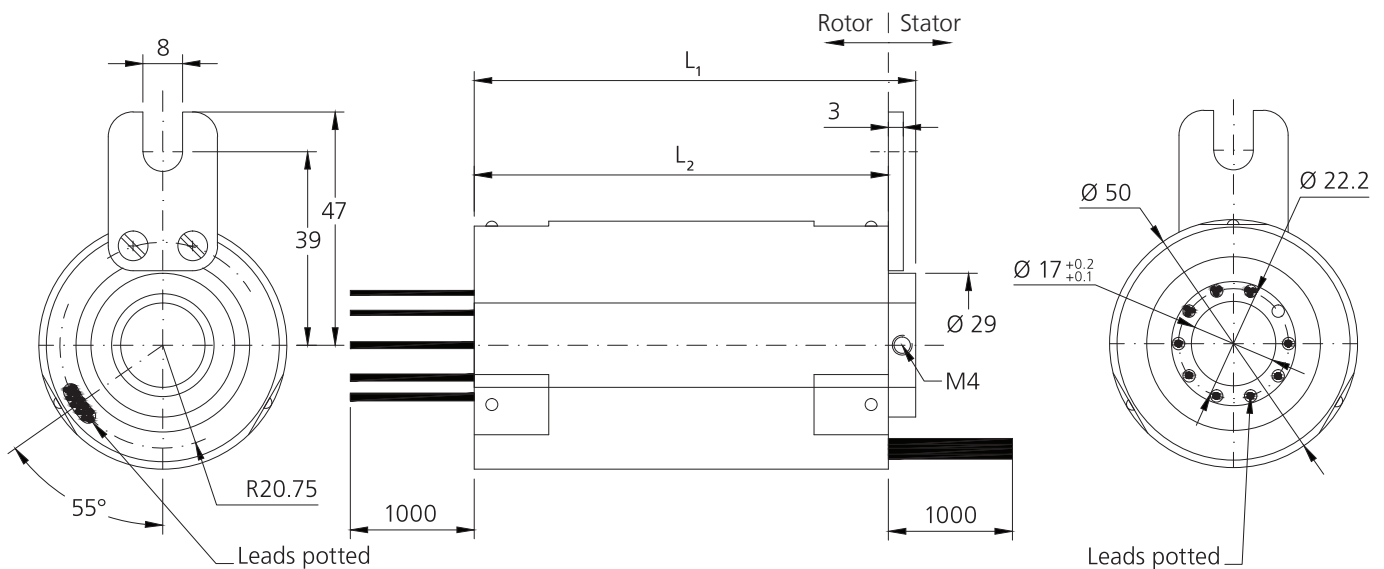
- Max. 24 rings with 2 A or max. 12 rings with 16 A
- Rings with 2 A or 16 A can be combined
- Outer diameter 50 mm
- Inner diameter max. 17 mm
- 240 V_{AC} / 240 V_{DC}

ELECTRICAL DATA

Number of rings:	max. 24 rings pairwise with 2 A; max. 12 rings with 16 A; to be combined
Voltage:	240 V _{AC} / 240 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 10 V _{DC} / 1A
Contacts / Leads:	gold / gold; PTFE

MECHANICAL DATA

Speed:	max. 250 min ⁻¹
Protection class:	IP54; IP64 on request
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor/Stator conn.:	1000 mm leads; other lengths on request
Bearings:	ball bearings of steel
Housing:	Aluminium
Length:	L ₁ /L ₂ on request





SLIP RING
SC080

FACTS

- Max. 24 rings with 3 A or max. 12 rings with 16 A
- Rings with 3 A or 16 A can be combined
- Outer diameter 80 mm
- Inner diameter max. 30 mm
- 240 V_{AC} / 240 V_{DC}



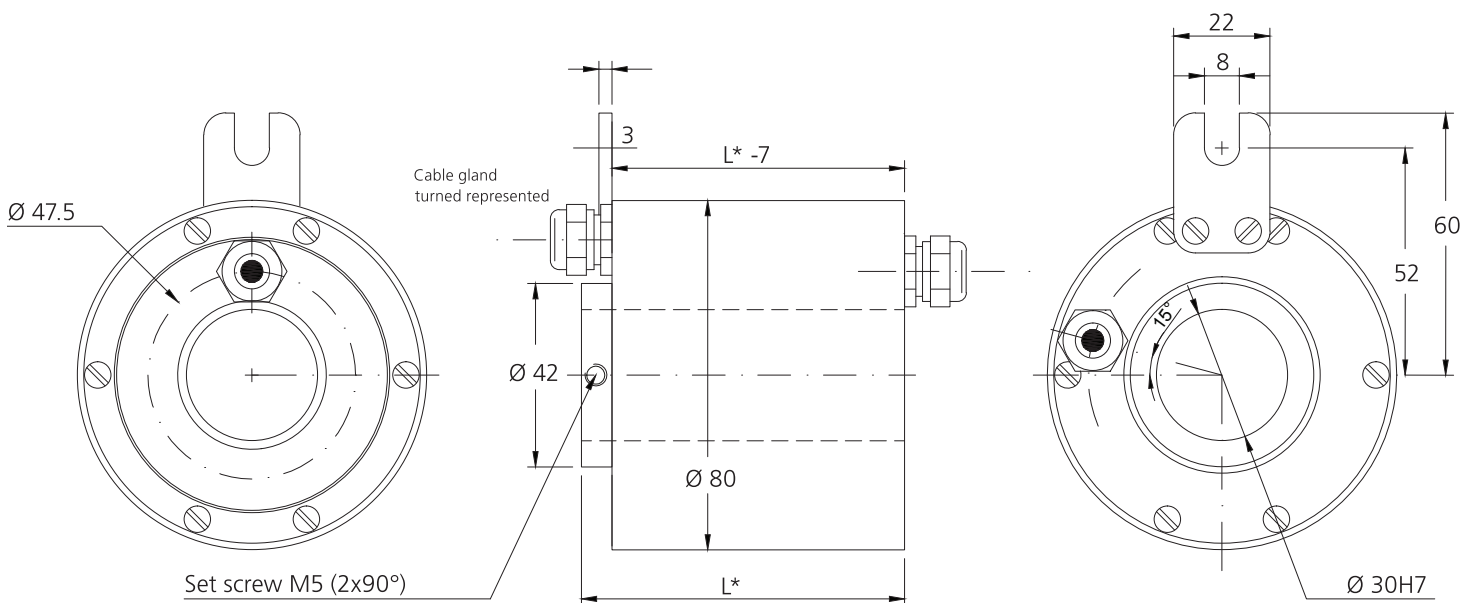
6-Pole version (Design example)

ELECTRICAL DATA

Number of rings:	max. 24 rings pairwise with 3 A; max. 12 rings with 16 A; to be combined
Voltage:	240 V _{AC} / 240 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 10 V _{DC} / 1 A

MECHANICAL DATA

Rated speed:	150 min ⁻¹ for gold contacts or 1000 min ⁻¹ for silvercarbone on brass rings
Protection class:	IP54; IP64 on request
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor / Stator conn.:	1000 mm cable or leads; other lengths on request
Bearings:	ball bearings of steel
Housing:	Aluminium



Number of rings	2	3	4	6	9	12	18	24
Power (L*)	54	64	74	94	124	144	-	-
Signal (L*)	54	-	54	64	-	84	114	154



6-Pole version (Design example)

FACTS

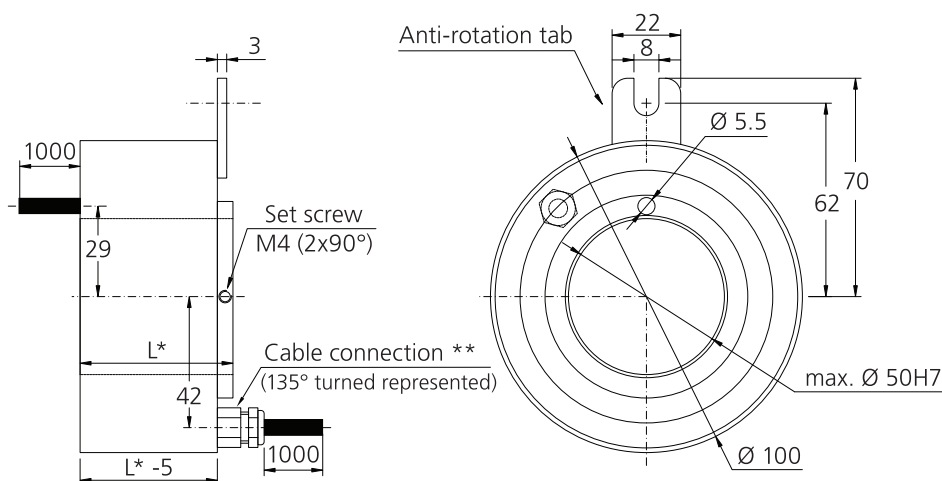
- Max. 24 rings with 3 A or max. 12 rings with 16 A
- Rings with 3 A or 16 A can be combined
- Outer diameter 100 mm
- Inner diameter max. 50 mm
- max. 400 V_{AC}

ELECTRICAL DATA

Number of rings:	max. 24 rings pairwise with 3 A; max. 12 rings with 16 A can be combined
Voltage:	240 V _{AC} / 240 V _{DC} ; 400 V _{AC} on request
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	60 mΩ at 5 min ⁻¹ , 6 V _{DC} and 50 mA

MECHANICAL DATA

Rated speed:	120 min ⁻¹ for gold contacts, 1000 min ⁻¹ for silver graphite brush on brass rings
Protection class:	IP54; IP64 on request
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor/Stator conn.:	1000 mm cable; leads and other lengths on request
Bearings:	ball bearings of steel
Housing:	Aluminium



Number of rings	4	6	12	18	24
Power (L*)	85	120	160	on request	on request
Signal (L*)	50	60	90	120	150



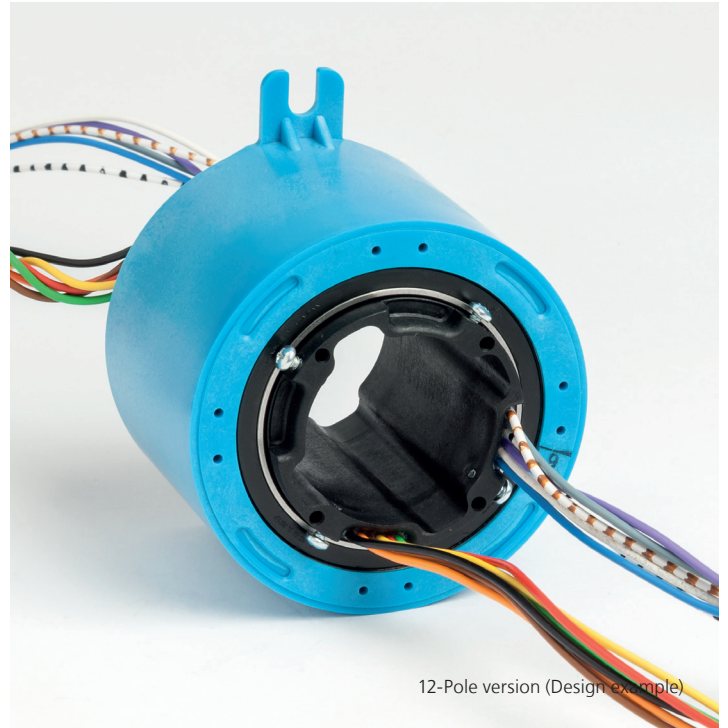
SLIP RING

SC104-A01

FACTS

- 6, 12, 18 or 24 rings for max. 10 A
- 500 V_{AC} per ring
- Outer diameter 104 mm
- Hollow shaft diameter 50 mm
- Max. 400 min⁻¹

The system is maintenance free for up to 50 million rotations (depending on rotation speed and environmental conditions).



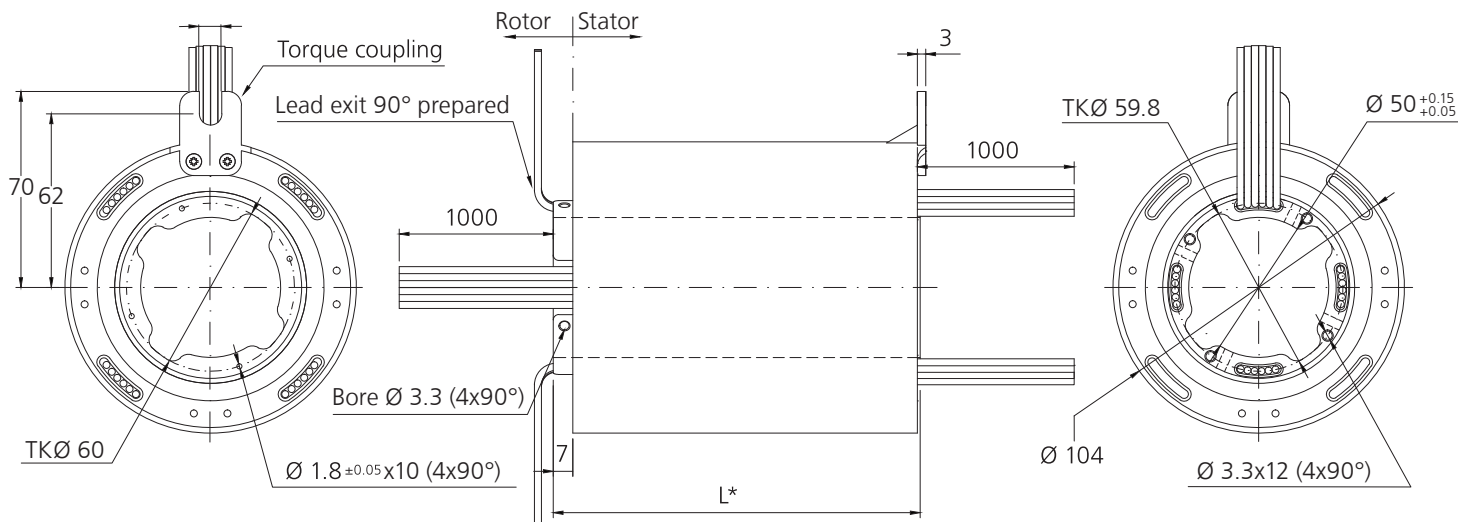
12-Pole version (Design example)

ELECTRICAL DATA

Number of rings:	6, 12, 18 or 24
Current:	max. 10 A per ring
Voltage:	500 V ~ EN60664-1 (VDE0110)
Test Voltage:	1500 V _{AC} (60 Hz) between all rings
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 5 min ⁻¹

MECHANICAL DATA

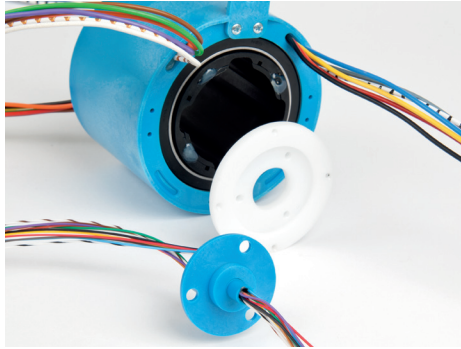
Speed:	max. 400 min ⁻¹
Protection class:	IP54
Temperature:	-40 °C ... +80 °C (-40 °F ... +176 °F)
Connection:	1000 mm leads; AWG 16 - leads (1.23 mm ²) PVC
Bearings:	precision steel ball bearings with seals
Housing:	fibre-reinforced plastics



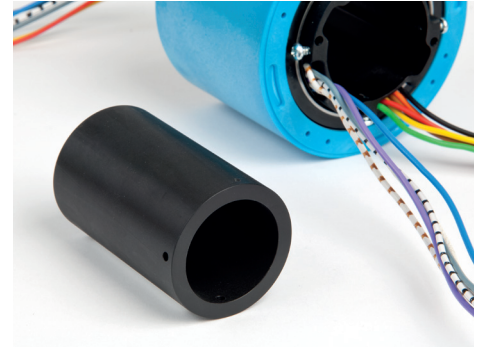
Number of rings	6	12	18	24
L* (mm)	59	83	107	131

ACCESSORIES ON REQUEST

- Adapter for slip ring SC020
 - Shaft bushing (Inner diameter: 1.5"/ 38.1 mm)
- * Extension by slip ring SC020 for additional channels, rotational speed max. 250 min⁻¹ (see data sheet SC020).

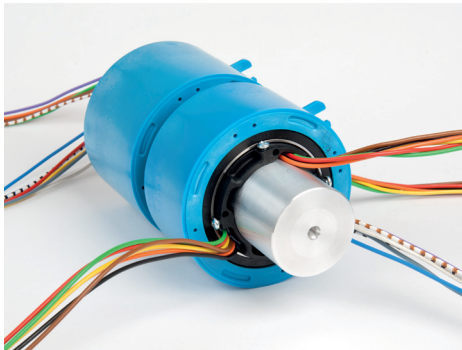


*Combination with slip ring SC020

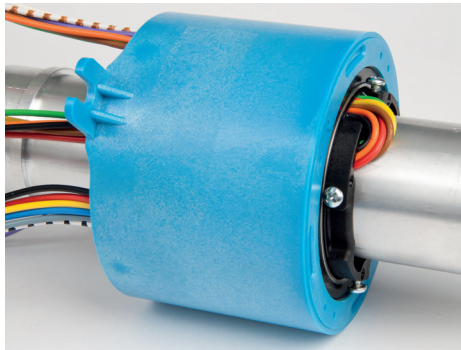


Shaft bushing (smaller inner diameter)

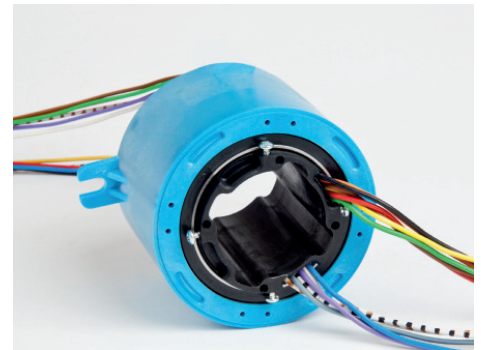
VARIANTS



Combination 2 systems SC104



Cable led out one-sided



Torque arm shifted by 90°

The SC104 is a standard slip ring with exceptionally durable industrial bearings. With additional slots for axial cable routings, it can be applied modularly as combination of up to three 12-pole-systems with 36 rings max. The torque support can be placed at the front or back side of the housing and with flexibility of 90°. All models are equipped with 1 meter lead wires, lead exit optionally on one side of the housing - to turn them on 0°, 90°, 180° and 270°.



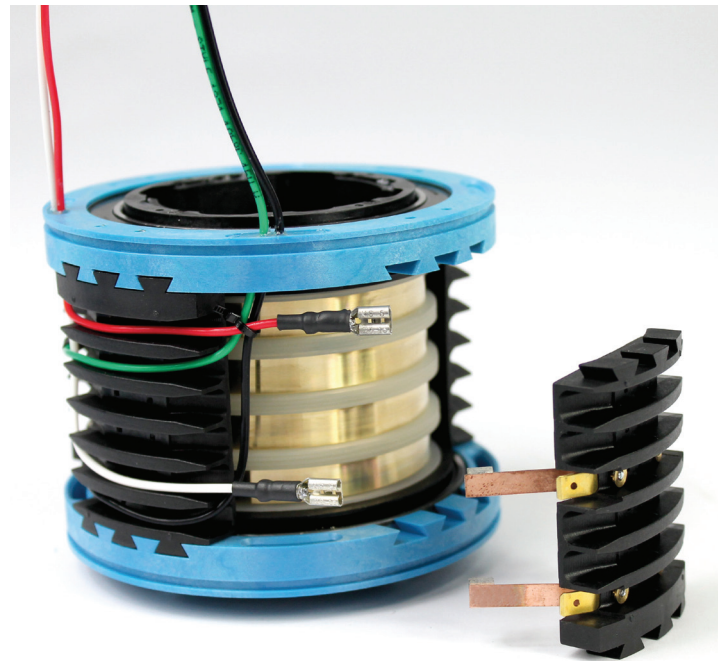
SLIP RING

SC104-L01

FACTS

- 2 or 4 rings for max. 16 A (6 or 8 on request)
- 500 V_{AC} per ring
- Outer diameter 104 mm
- Hollow shaft diameter 50 mm
- Up to 800 min⁻¹

The system is maintenance free for up to 150 million rotations (depending on rotation speed and environmental conditions).
Brush block changeable for easy maintenance and extended life time.



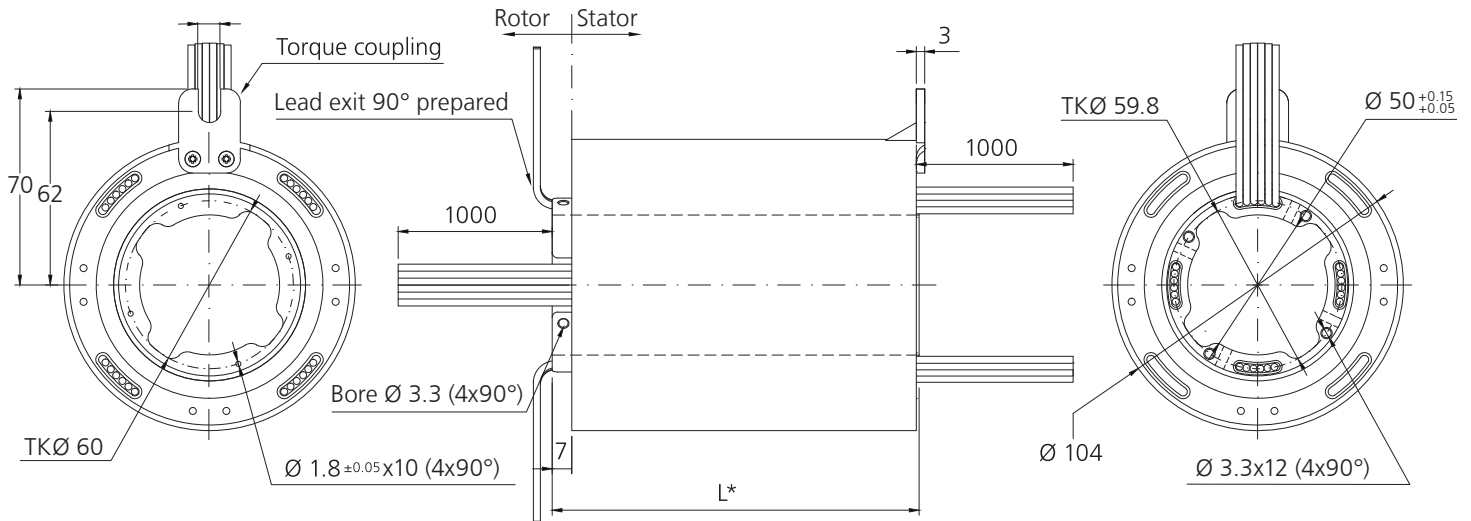
4-Pole version (Design example)

ELECTRICAL DATA

Number of rings:	2, 4 (6 or 8 on request)
Current:	max. 16 A per ring
Voltage:	500 V ~ EN60664-1 (VDE0110)
Test Voltage:	1500 V _{AC} (60 Hz) between all rings
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	20 mΩ at 5 min ⁻¹

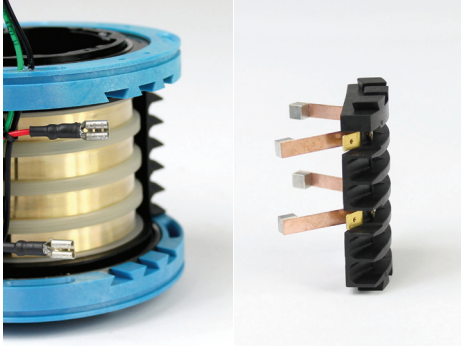
MECHANICAL DATA

Speed:	up to 800 min ⁻¹
Protection class:	IP54
Temperature:	-40 °C ... +80 °C (-40 °F ... +176 °F)
Connection:	1000 mm leads; AWG 16 - leads (1.23 mm ²) PTFE
Bearings:	precision steel ball bearings with seals
Housing:	fibre-reinforced plastics

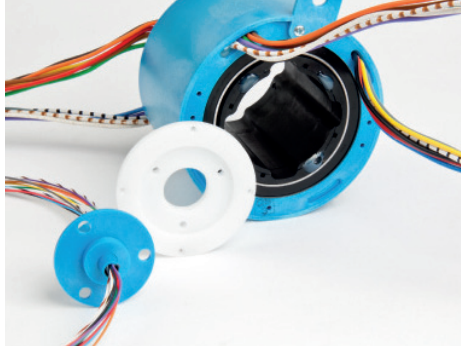


Number of rings	2	4	6	8
L* (mm)	59	83	107	131

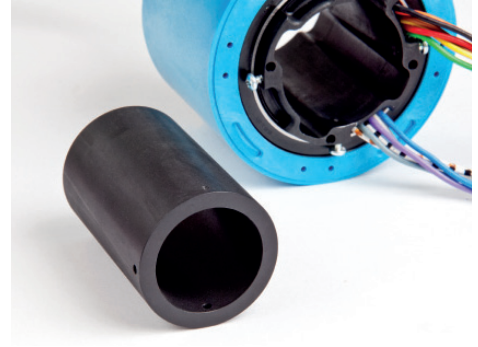
ACCESSORIES ON REQUEST



Spare brush block for extended lifetime. Easily replaceable by dove tail guide and blade terminal.

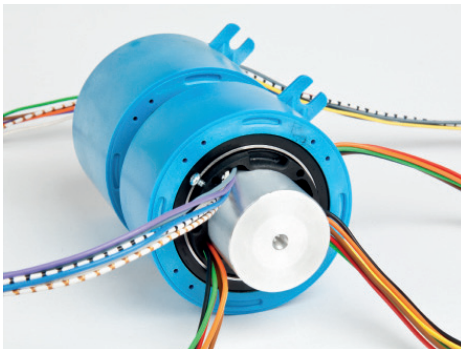


Adapter for slip ring SC020 for additional channels, rotational speed max. 250 min⁻¹ (see data sheet SC020).

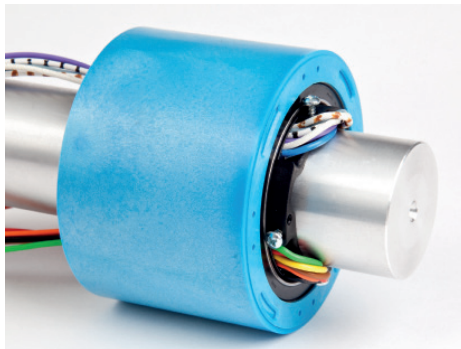


Shaft bushing. Smaller inner diameter: 1.5" / 38.1 mm.

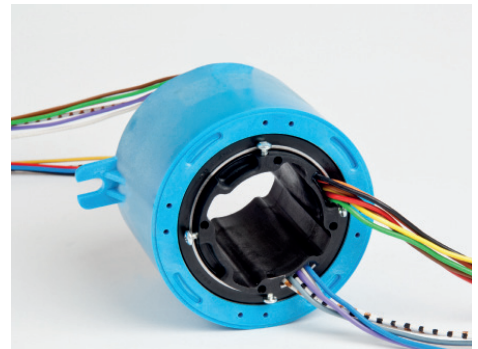
VARIANTS



Combination 2 systems SC104
SC104-06-A01 (for Signal)
SC104-04-L01 (for Power)



Cable led out one-sided



Torque arm shifted by 90°

The SC104 is a standard slip ring with exceptionally durable industrial bearings. With additional slots for axial cable routings, it can be applied modularly as combination of up to four systems with 16 rings max. The torque support can be placed at the front or back side of the housing and with flexibility of 90°. All models are equipped with 1 meter lead wires, lead exit optionally on one side of the housing - to turn them on 0°, 90°, 180° and 270°.



SLIP RING
SH085

FACTS

- 2 ... 16 rings
- Max. 25 A per ring
- Outer diameter: 85 mm
- Inner diameter: 25 mm
- Interchangeable brushblock



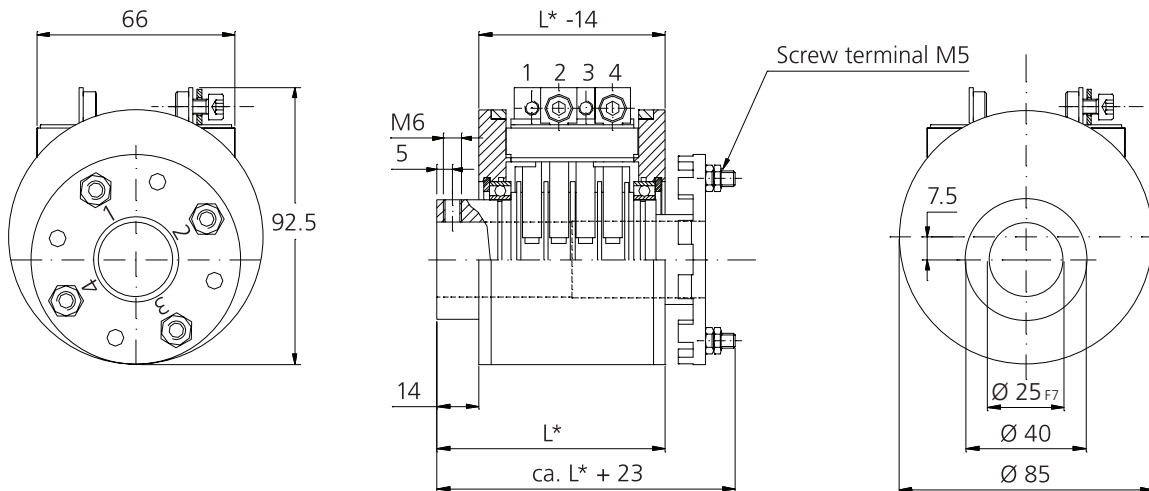
4-Pole version without protection caps (Design example)

ELECTRICAL DATA

Number of rings:	2 ... 16
Operating current:	max. 25 A; higher current on request
Operating voltage:	nom. 50 V _{AC/DC} ; higher voltage on request
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Circuit resistance:	max. 0.1 Ω (terminal / terminal)
Contacts:	silver carbon / brass

MECHANICAL DATA

Speed:	max. 1500 min ⁻¹
Protection class:	IP50 with protection caps
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor connection:	screw terminal M5
Stator connection:	screw terminal M5
Hollow shaft:	Ø 25 F7 throughbore; others on request



Number of rings	2	4	6	8	10	12	14	16
L* (mm)	76	76	94	112	130	148	166	184

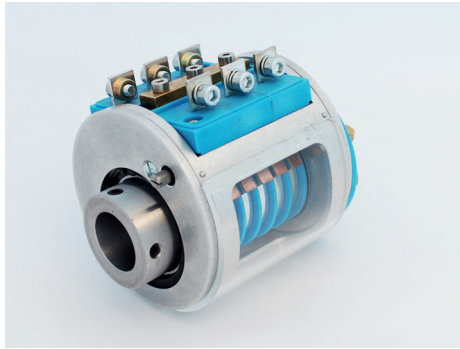


OPTIONS

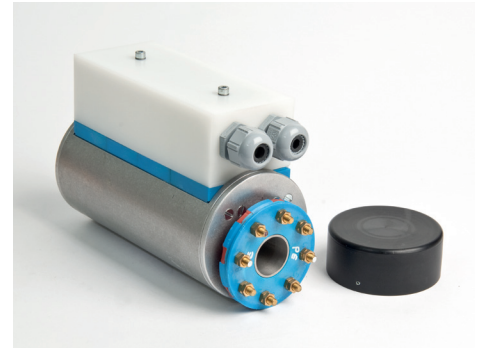
- Bracing: Customer design (Standard) / Anti-Rotation-Pin / Positioning-Disk
- Stator Protection cap with cable gland or connector



Bracing: Positioning-Disk (at shaft end)



Removable Plexiglas-Window for maintenance work
Bracing: Anti-Rotation-Pin (at shaft end)



Protection caps for screw terminals
Stator: optional with cable gland

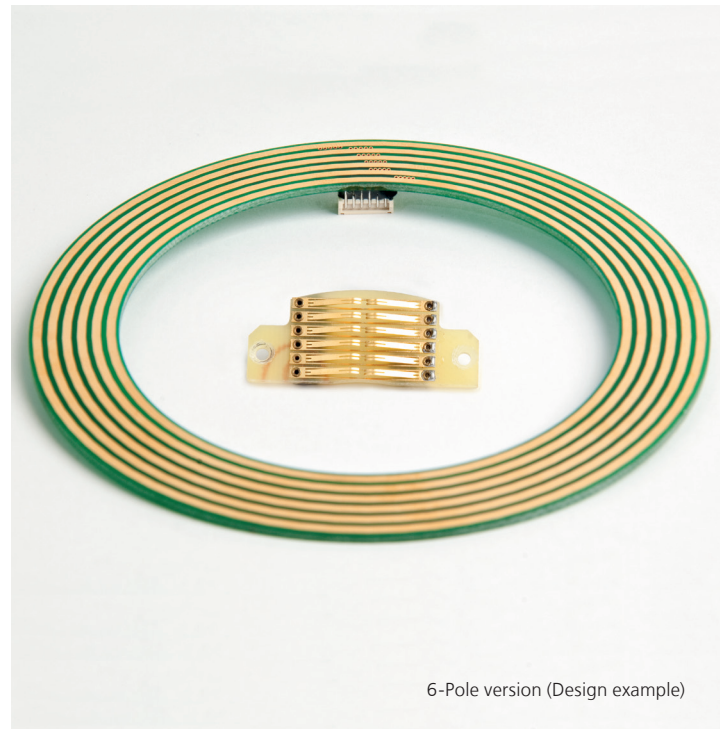


DISC SLIP RING

SD

FACTS

- 2 ... 12 rings; other on request
- Outer diameter 50 - 580 mm
- Inner diameter 0 - 560 mm
- 60 V_{DC}



6-Pole version (Design example)

ELECTRICAL DATA

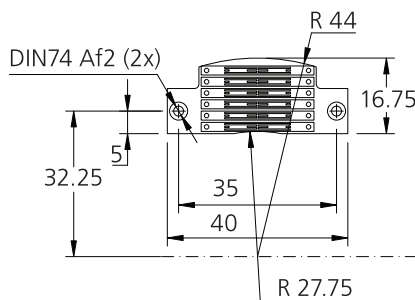
Number of rings:	2 ... 12, other on request
Current:	1 A per ring
Voltage:	60 V _{DC}
High pot:	500 V _{AC}
Insulation resistance:	1000 MΩ at 500 V _{DC}
Noise:	max. 20 mΩ at 5 min ⁻¹ and 6 V _{DC} , 50 mA
Contacts:	gold-gold

MECHANICAL DATA

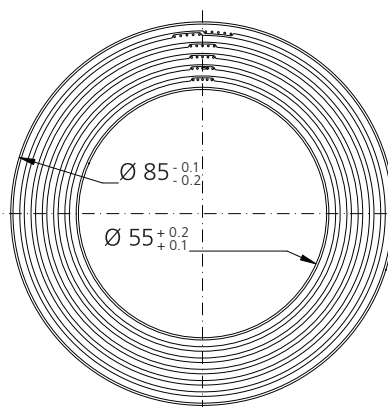
Rated speed:	30 - 200 min ⁻¹ depending on diameter
Protection class:	IP00
Temperature:	-30 °C ... +80 °C (-22 °F ... +176 °F)
Rotor / Stator conn.:	customized (leads, cable or connector)

DESIGN EXAMPLE - SD085 (6-POLE)

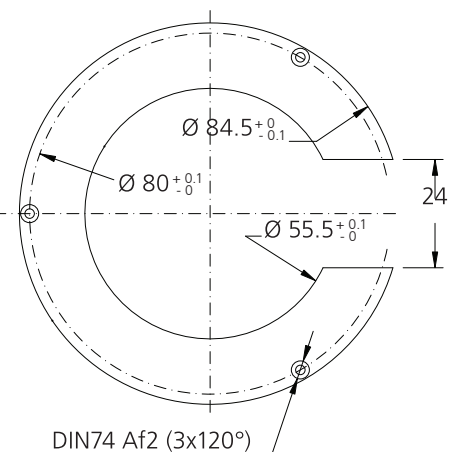
Brushblock (s = 2 mm)



Rotor (s = 1,5 mm)



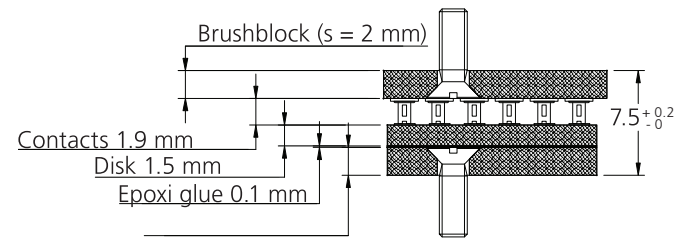
Adapter ring (s = 2 mm)



All parts made of PCB-material FR4
5 screws M2x4 DIN963 free issued



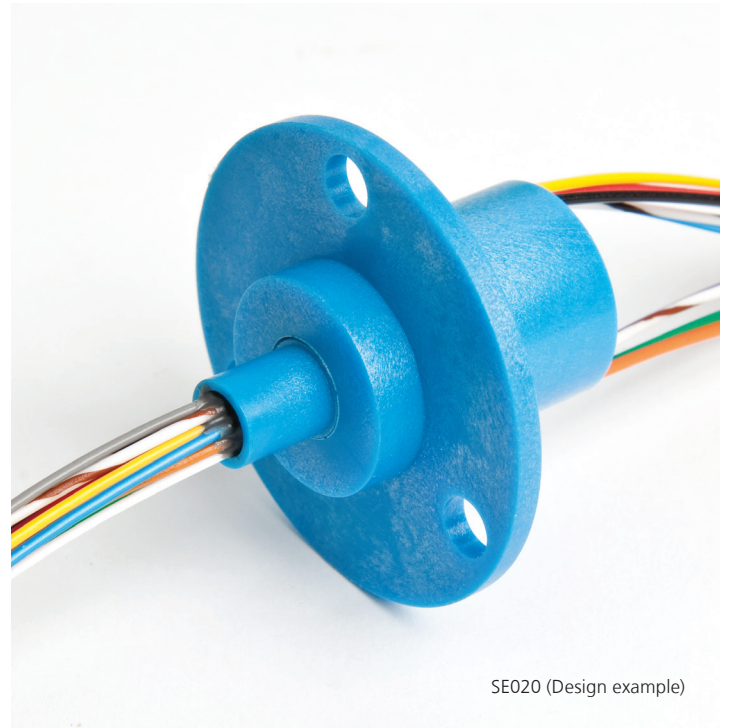
ASSEMBLY





COMBINATION
SE020

SLIP RING COMBINED WITH AN INCREMENTAL ROTARY ENCODER



SE020 (Design example)

ELECTRICAL DATA - SLIP RING

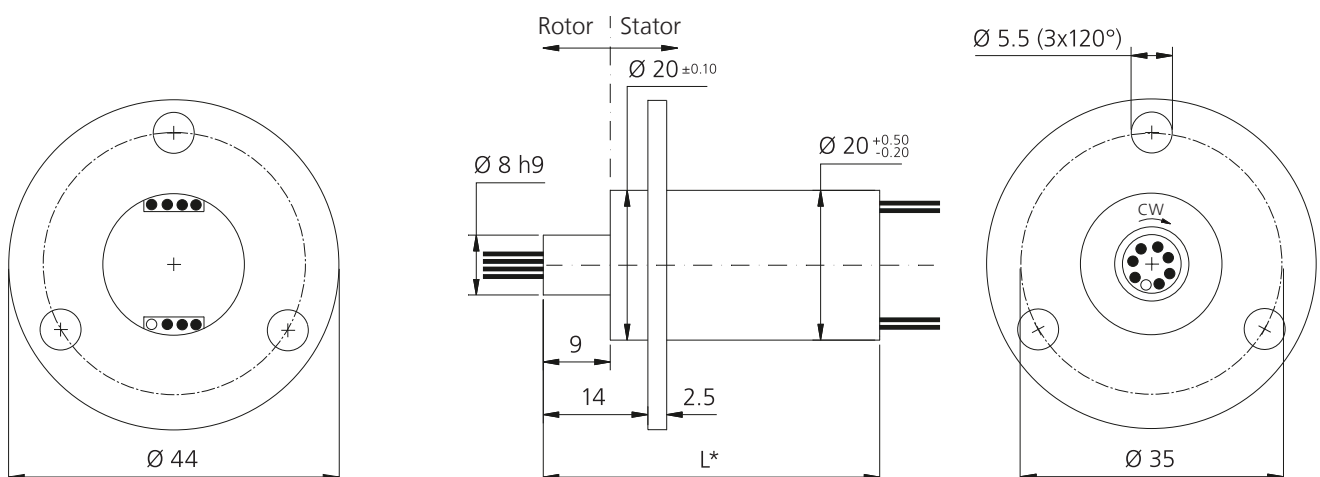
Number of rings:	6, 12, 18, 24
Current:	max. 2 A per ring
Voltage:	48 V _{DC} , higher on request
High pot:	500 V _{AC}
Insulation resistance:	1000 MOhm at 500 V _{DC}
Noise:	20 mOhm at 5 min ⁻¹ , 6 V _{DC} and 50 mA
Contacts / Leads:	Gold-gold / silver plated copper with PTFE insulation

MECHANICAL DATA

Speed:	max. 250 min ⁻¹
Protection class:	IP51
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor / Stator conn.:	300 mm leads; AWG 28/19 (0.15 mm ²)
Bearings:	miniature ball bearings of steel
Housing:	made of glass fibre reinforced polycarbonate
Assembly:	body to be clamped or glued; flange as a standard, others on request

ELECTRICAL DATA - ENCODER

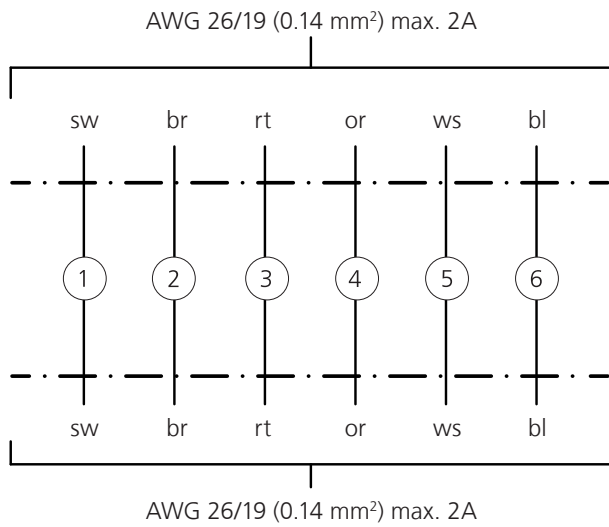
Power supply:	4.5 - 5.5 V _{DC} or 8 - 30 V _{DC} polarity reversal protected
No-load current drain:	< 30 mA without power load
Output signal:	A and B + reference signal Z short-circuit protected
Direction of rotation:	view A: cw
max. Output current:	20 mA
Line counts:	1 2 4 8 16 32 64 128 256 512 1024



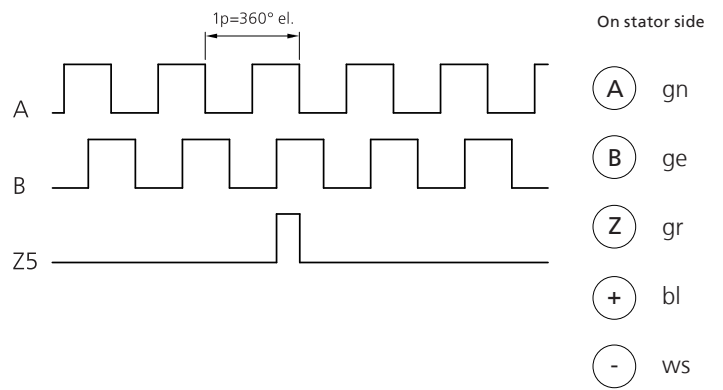


Number of rings	6	12	18	24	Others on request
L* (mm)	36	45	54	63	

SLIP RING LEADS

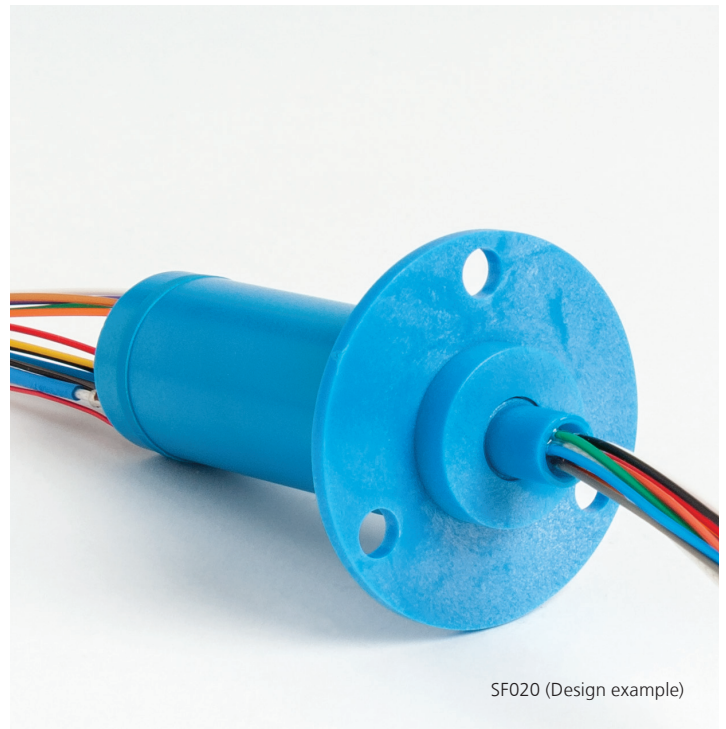


OUTPUT SIGNALS AND ENCODER LEADS





SLIP RING COMBINED WITH A CONTACTLESS ACTIVE DATA TRANSMISSION ROTARY JOINT



SF020 (Design example)

ELECTRICAL DATA - SLIP RING

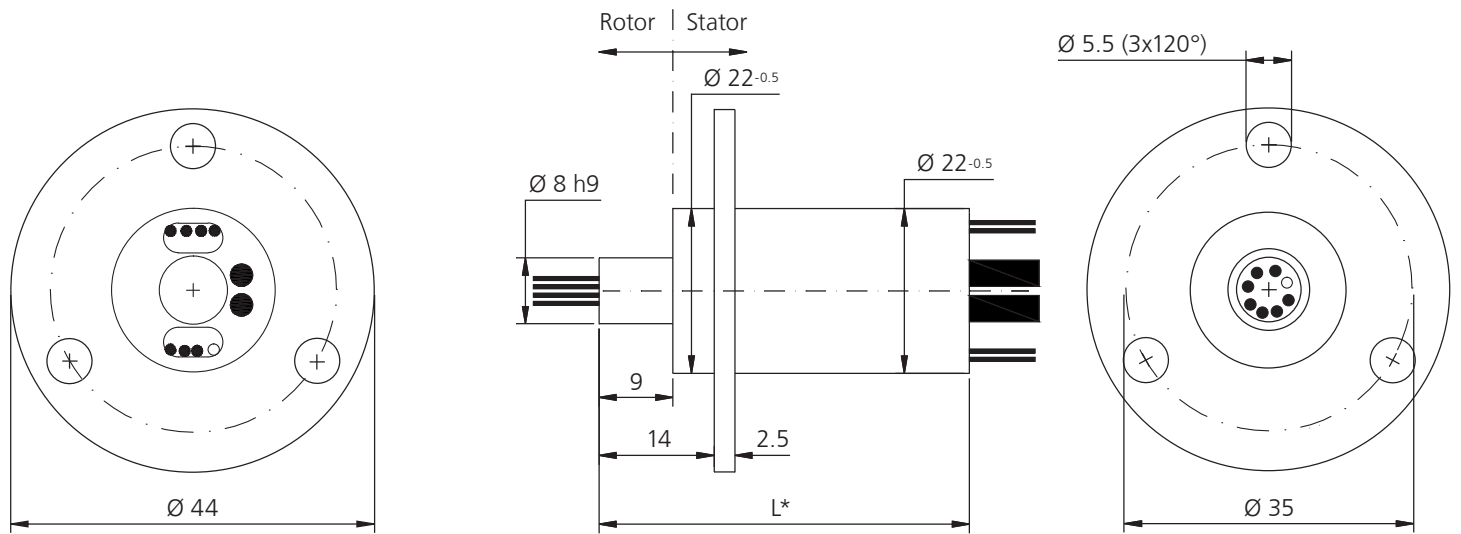
Number of slip rings:	6, 12, 18, 24
Current:	max. 2 A per ring (single groove) 2 grooves combined for 4 A 3 grooves combined for 6 A
Voltage:	48 V _{DC} , higher on request
High pot:	500 V _{AC}
Insulation resistance:	1000 MOhm at 500 V _{DC}
Noise:	20 mOhm at 5 min ⁻¹ , 6 V _{DC} and 50 mA
Contacts / Leads:	Gold-gold / silver plated copper with PTFE insulation

MECHANICAL DATA

Speed:	max. 250 min ⁻¹
Protection class:	IP40
Temperature:	-20 °C ... +80 °C (-5 °F ... +175 °F)
Rotor / Stator conn.:	300 mm leads; AWG 26/19 (0.1 mm ²) Coax 50 Ω Impedance, 75 Ω on request
Bearings:	miniature ball bearings of steel
Housing:	made of glass fibre reinforced polycarbonate
Assembly:	body to be clamped or glued; other dimensions on request

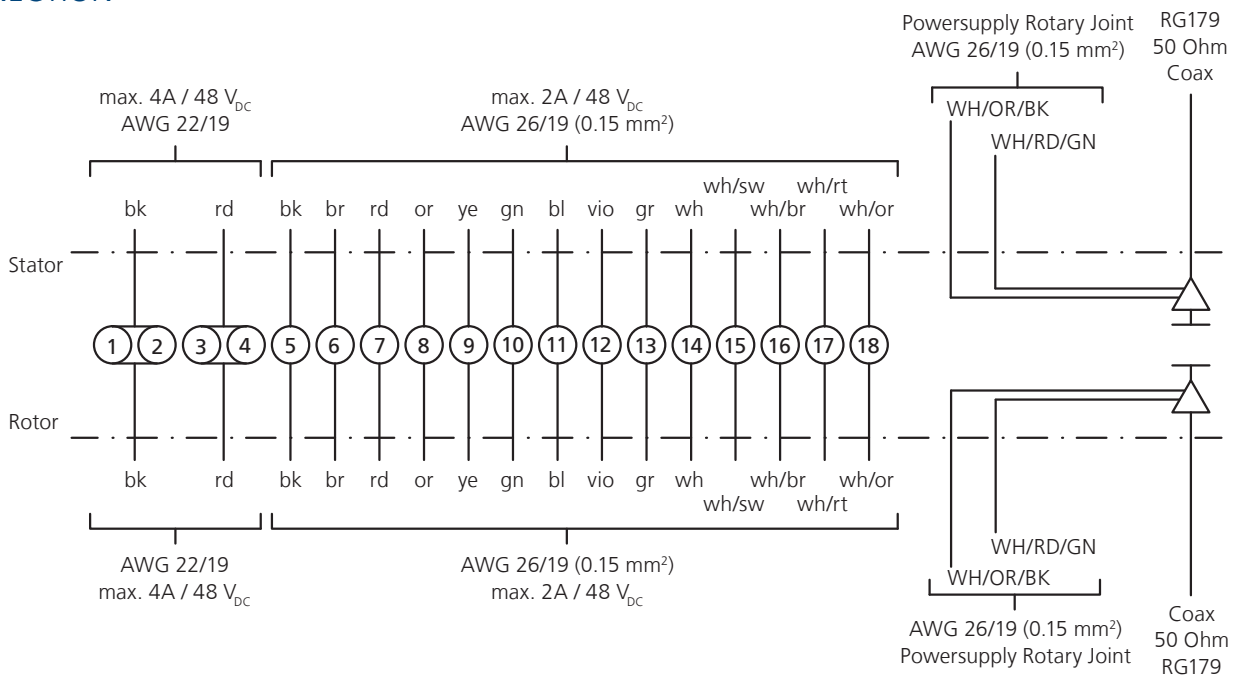
ELECTRICAL DATA - CONTACTLESS ROTARY JOINT

Number of channels:	1	Total Differential-	
Transmission bitrate:	0.155 Gbps - 1.25 Gbps	Input Signal:	200 mV - 2400 mV (R _i =100 Ω)
	0.155 Gbps - 2.95 Gbps on request	Output Amplitude:	400 mV - 600 mV (R _a =50 Ω)
Power supply:	3.3 V ± 0.2 V / 150 mA	Simplex transmission:	Data stream from rotor to stator Data stream from stator to rotor on request
	(rotor- and stator-side)		



Number of rings	6	12	18	24	Others on request
L* (mm)	68	77	86	95	

CONNECTION





CONTACTLESS TRANSMISSION

K32ST

FIBRE OPTICS ROTARY JOINT (FORJ)
FOR 1 CHANNEL (PATH) MULTI MODE



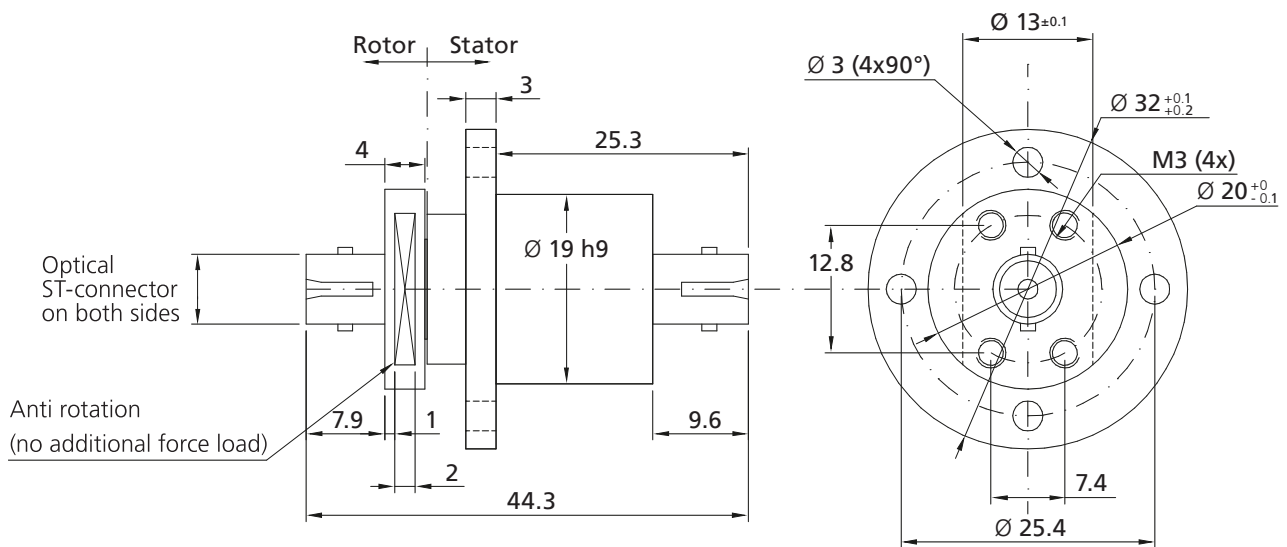
K32ST (Design example)

ELECTRICAL DATA

Core diameter:	50 - 62.5 μm
Wave length:	830 or 1300 nm
Loss:	max. 4 dB
Life time:	500 Million revolutions

MECHANICAL DATA

Speed:	max. 1200 min^{-1}
Protection class:	IP54
Temperature:	-20 $^{\circ}\text{C}$... +60 $^{\circ}\text{C}$ (-4 $^{\circ}\text{F}$... +140 $^{\circ}\text{F}$)



ADSR®



SLIP RING UNIT WITH BUILD-IN DIAGNOSTIC SYSTEM

ADSR® is an integrated diagnostic system, which offers a remote monitoring of the conditions in a slip ring unit. The aim is an improved planning of preventive maintenance measures.

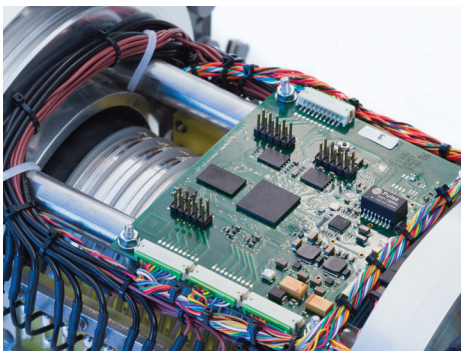
The diagnostic system ADSR® is integrated inside the housing and constantly monitors key parameters of a slip ring unit. It thereby anticipates possible malfunctions. If a failure is detected, the central control unit receives an alert signal. In addition, information on vibration, voltage level, power level, rotational counts and speed, as well as, optionally, the internal/external humidity and temperature during operations is supplied to the operator. The analysis of this operational data allows estimates of the remaining lifetime of the slip ring unit – both in terms of time and rotations.

Slip ring unit SC168 with ADSR®

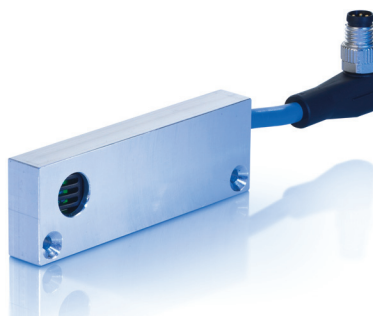
MONITORING OF CONDITIONS THROUGH CONTROL OF KEY PARAMETERS

- Temperature internal / external
- Humidity internal / external
- Vibration axial / vertically / horizontal
- Current and voltage on 4 power ways
- Absolute rotational counts
- Rotational speed
- Noise

The warning and alert information of the diagnostic system is transmitted via a signal cable and also visualized directly on the slip ring unit by an LED. The currently measured values and the alarm history are also available through browser-based network interfaces. The monitoring system of the slip ring unit can be connected to SCADA via an OPC-UA interface.



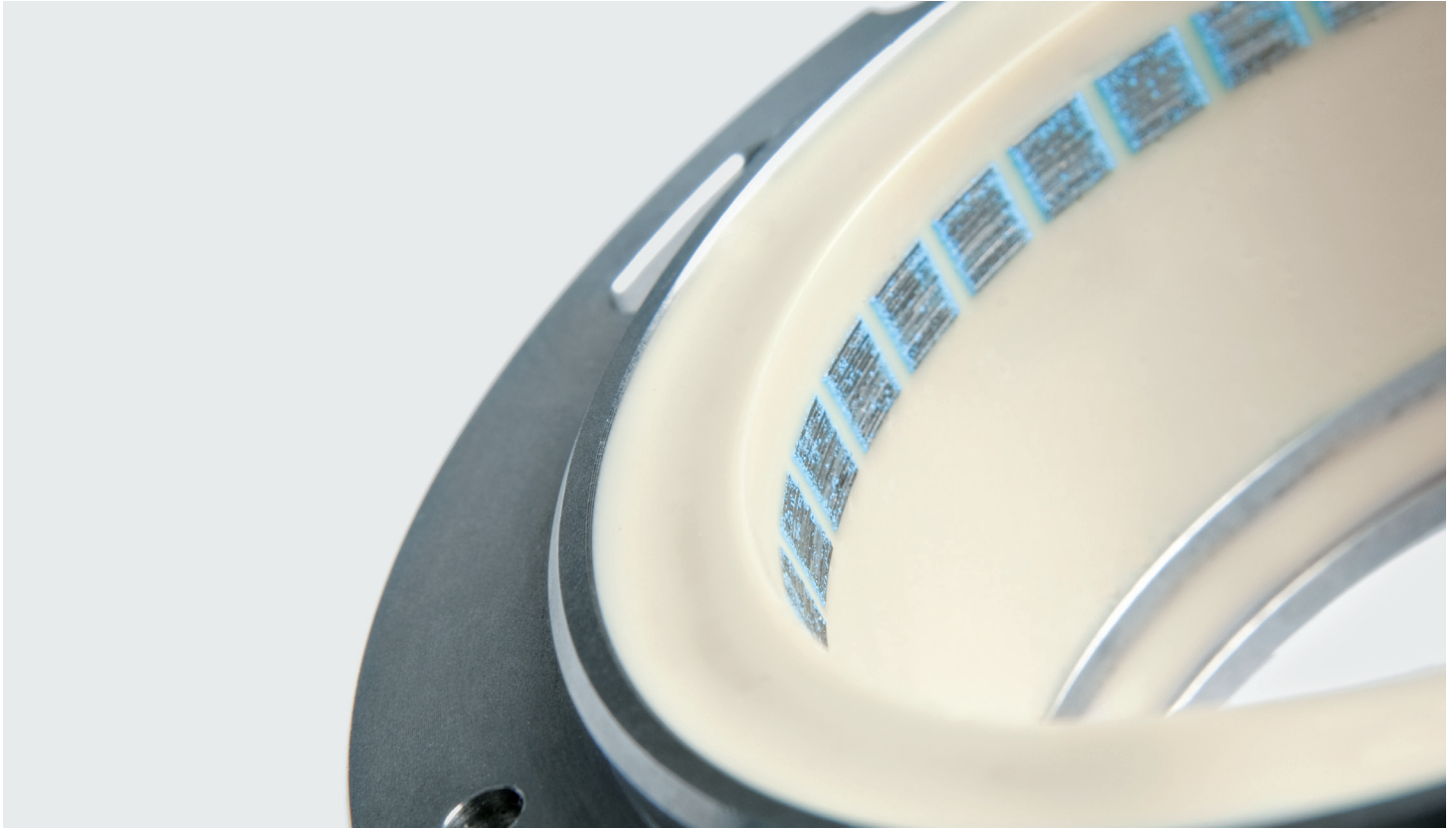
Integrated electronics



Optional external sensor



LED status indication



OVERVIEW HOUSED RESOLVERS



RE36 (Design example)



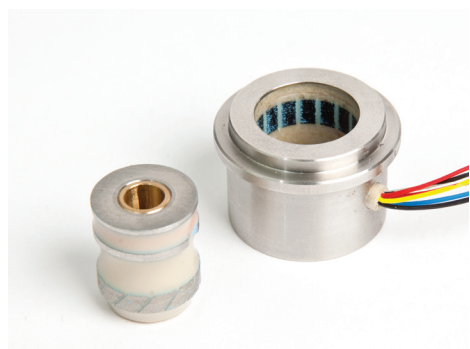
R58 (Design example)



R71 (Design example)

Type	Min. outer diameter	Max. hollow shaft diameter	Max. Shaft diameter	Pole pairs	Accuracy	Input current (can vary by types)
R36	36 mm	12 mm	16.1 mm	1...5	$\pm 6'$ / $\pm 10'$	58 mA at 7 V & 5 kHz
R58	58 mm	20 mm	12 mm	1...5	$\pm 6'$	58 mA at 7 V & 5 kHz
R71	71 mm	17 mm	12 mm	1...5	$\pm 6'$	47 mA at 7 V & 5 kHz

OVERVIEW FRAMELESS RESOLVERS



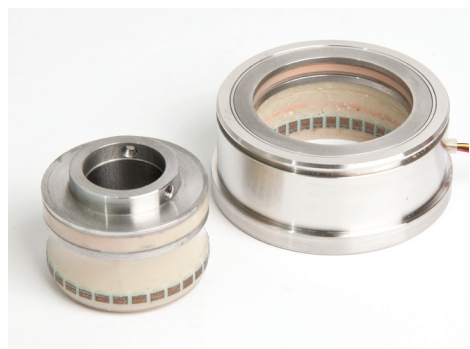
RE10 (Design example)



RE15 (Design example)



RE21 (Design example)



RE27 (Design example)



RE35 (Design example)



RE43 (Design example)

Type	Min. outer diameter	Max. hollow shaft diameter	Min. Length	Pole pairs	Accuracy	Input current (can vary by types)
RE10	26 mm	7 mm	20 mm	1	$\pm 15'$	65 mA at 7 V & 5 kHz
RE15	33.5 mm	12 mm	16.1 mm	1...5	$\pm 5' / \pm 6' / \pm 7' / \pm 10'$	58 mA at 7 V & 5 kHz
RE21	51 mm	17 mm	27.1 mm	1...5	$\pm 4' / \pm 6' / \pm 10'$	47 mA at 7 V & 5 kHz
RE27	64 mm	28 mm	25 mm	1	$\pm 10'$	30 mA at 7 V & 10 kHz
RE35	90 mm	40 mm	30 mm	1...4	$\pm 10'$	48 mA at 7 V & 5 kHz
RE43	104 mm	65 mm	30 mm	1...3	$\pm 20'$	55 mA at 7 V & 5 kHz

Transmission ratio: 0.3 / 0.5 / 1; other on request
 Operating temperature: -55 °C ... +155 °C (-67 °F ... +311 °F); lower and higher on request
 Connection: Leads; cables; clamp terminals; length on request
 Others: Customized versions and resolver combinations are available
 Combinations consisting of slip rings and encoders or resolver on request



HOUSED RESOLVER

R36

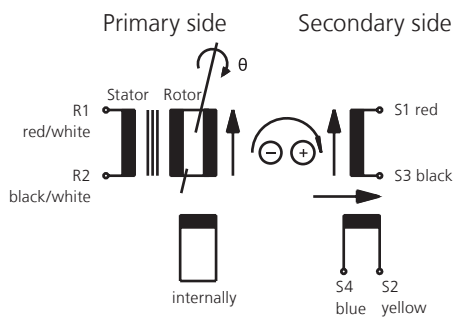
FACTS

- Outer Ø: 36.3 mm
- Hollow shaft Ø: max. 12 mm
- Length: 16 mm



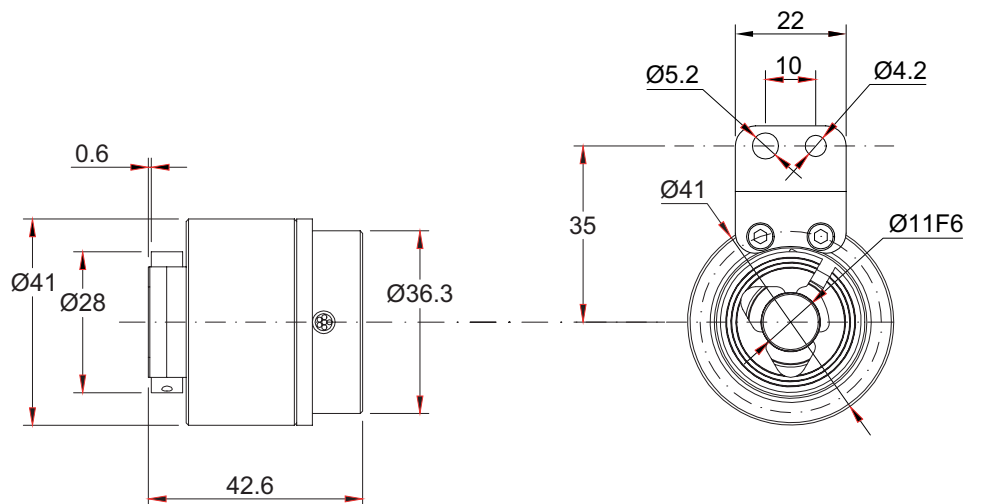
R36 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction:
 Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side	R1 - R2
Pole Pairs	1
Transformation ratio	0.5 ± 0.05
Input voltage	7 V / 7 V
Input current	58 mA / 36 mA
Input frequency	5 kHz / 10 kHz
Phase shift ($\pm 3^\circ$)	$8^\circ / -6^\circ$
Null voltage	max. 30 mV
Accuracy	$\pm 10'$, $\pm 6'$ on request
Accuracy ripple	max. $1'$
Operating temperature	$-55^\circ\text{C} \dots +155^\circ\text{C}$ ($-67^\circ\text{F} \dots +311^\circ\text{F}$)
Max. permissible speed	20.000 min^{-1}
Hi-pot housing/winding	min. $500 V_{AC}$
Hi-pot winding/winding	min. $250 V_{AC}$
Rotor / Stator	Completely impregnated



HOUSED RESOLVER

R58

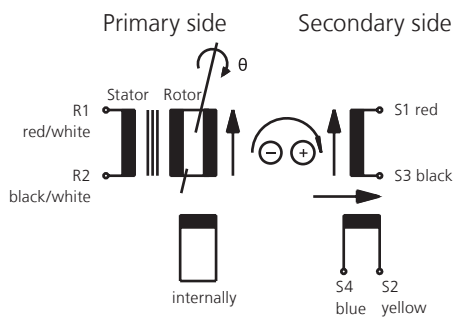
FACTS

- Shaft Ø: max. 12 mm
- Hollow shaft Ø: max. 17 mm
- Outer Ø: 58 mm



R58 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$

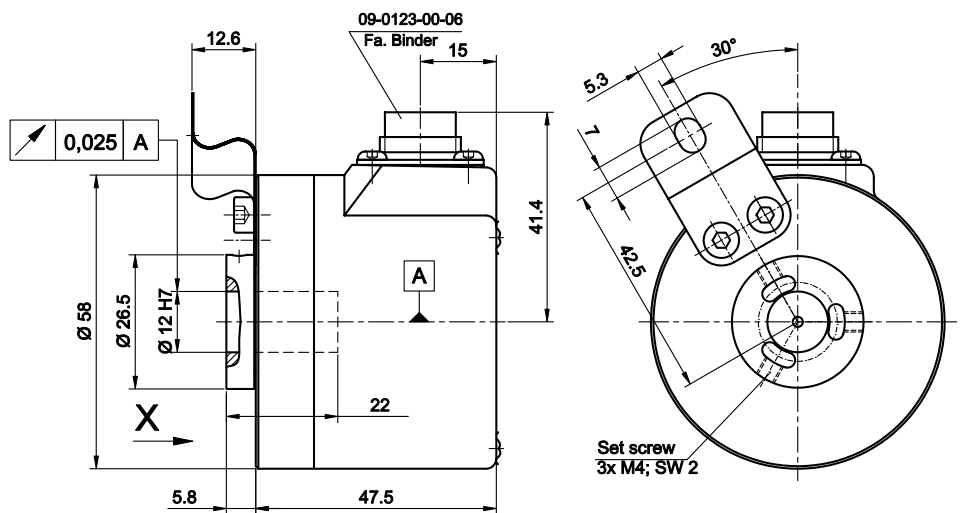
Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$

$E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$

TR = Transformation ratio

Positive counting direction:

Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side	R1 - R2	R1 - R2
Pole Pairs	1	1
Transformation ratio	0.5 ± 10%	0.5 ± 10%
Input voltage	7 V	7 V
Input current	58 mA	36 mA
Input frequency	5 kHz	10 kHz
Phase shift	8° ± 3°	-6° ± 3°
Null voltage	max. 30 mV	max. 30 mV
Impedance		
Zro	75 Ω + j · 98 Ω	110 Ω + j · 159 Ω
Zrs	70 Ω + j · 85 Ω	96 Ω + j · 150 Ω
Zso	180 Ω + j · 230 Ω	245 Ω + j · 400 Ω
Zss	170 Ω + j · 200 Ω	216 Ω + j · 370 Ω
D.C. resistance		
Rotor	40 Ω ± 10% at 20 °C	40 Ω ± 10% at 20 °C
Stator	102 Ω ± 10% at 20 °C	102 Ω ± 10% at 20 °C
Accuracy	± 6'	± 10'
Accuracy ripple	max. 1'	max. 1'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... -155 °C (-67 °F ... +311 °F)
Max. permissible speed	5.000 min ⁻¹	5.000 min ⁻¹
Weight rotor/stator	350 g	350 g
Hi-pot housing/winding	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}	min. 250 V _{AC}
Rotor / Stator	Completely impregnated	Completely impregnated



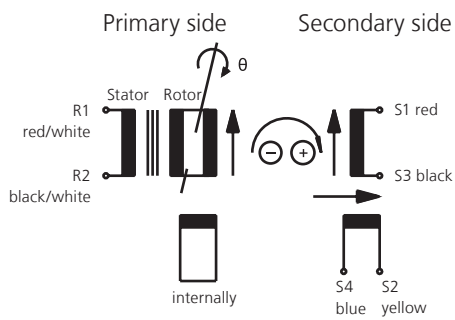
FACTS

- Shaft Ø: max. 12 mm
- Hollow shaft Ø: max. 20 mm
- Outer Ø: 71 mm



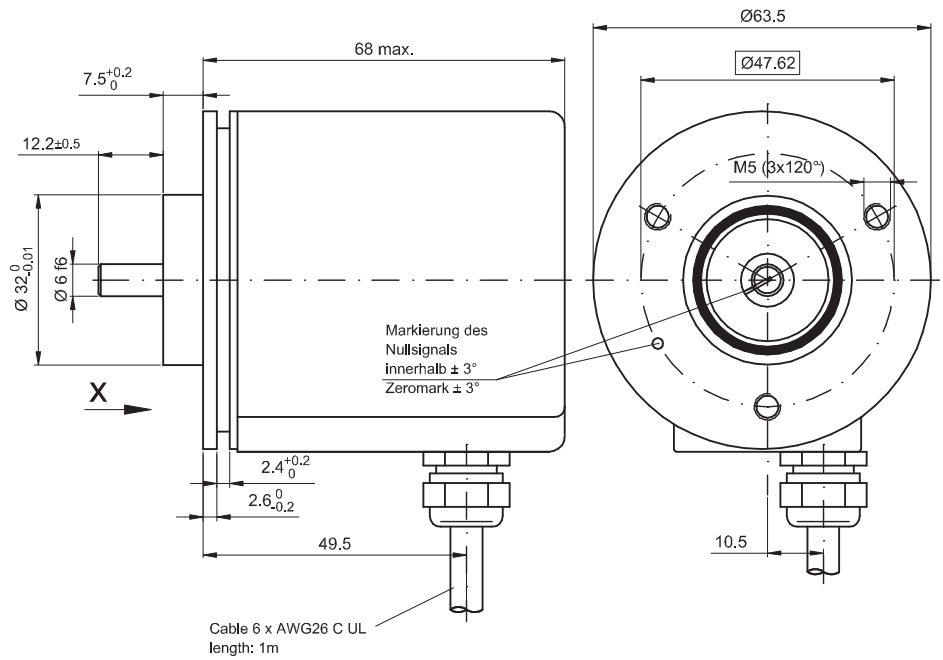
R71 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
TR = Transformation ratio

Positive counting direction:
Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side	R1 - R2	R1 - R2
Pole Pairs	1	1
Transformation ratio	0.5 ± 10%	0.5 ± 10%
Input voltage	7 V	7 V
Input current	47 mA	35 mA
Input frequency	5 kHz	8 kHz
Phase shift	8° ± 3°	-3° ± 3°
Null voltage	30 mV max.	30 mV max.
Impedance		
Zro	92 Ω + j · 120 Ω	110 Ω + j · 170 Ω
Zrs	82 Ω + j · 100 Ω	95 Ω + j · 153 Ω
Zso	154 Ω + j · 275 Ω	210 Ω + j · 387 Ω
Zss	140 Ω + j · 240 Ω	178 Ω + j · 347 Ω
D.C. resistance		
Rotor	56 Ω ± 10% at 20 °C	56 Ω ± 10% at 20 °C
Stator	53 Ω ± 10% at 20 °C	53 Ω ± 10% at 20 °C
Accuracy	± 6'	± 6'
Accuracy ripple	10'	10'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... +155 °C (-67 °F ... +311 °F)
Max. permissible speed	5.000 min ⁻¹	5.000 min ⁻¹
Weight rotor/stator	350 g	350 g
Hi-pot housing/winding	500 V _{AC}	500 V _{AC}
Hi-pot winding/winding	250 V _{AC}	250 V _{AC}
Rotor / Stator	Completely impregnated	Completely impregnated

CABLE LAYOUT

RESOLVER	LEADS
R1	brown
R2	orange
S1	red
S3	black
S2	yellow
S4	green



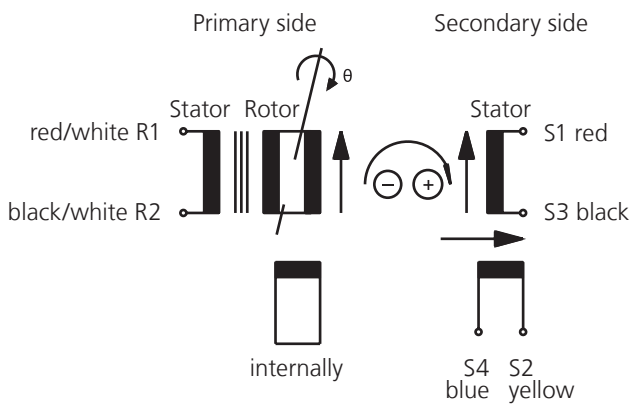
FACTS

- Hollow shaft Ø: max. 4 mm
- Outer Ø: 20 mm
- Length: 18 mm



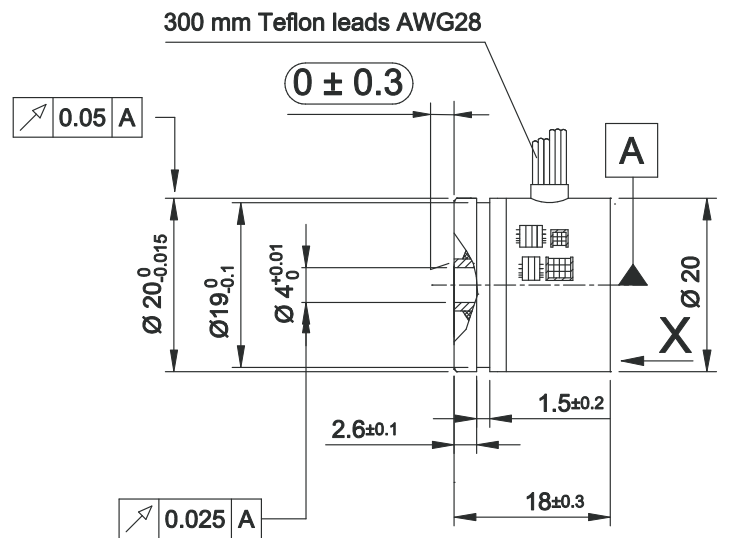
RE08 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side:	R1 - R2	R1 - R2
Pole Pairs:	1	1
Transformation ratio:	0.5 ± 10%	0.5 ± 10%
Input voltage:	7 V	7 V
Input current:	32 mA	20 mA
Input frequency:	5 kHz	10 kHz
Phase shift:	9° ± 3°	-3° ± 3°
Null voltage:	max. 30 mV	max. 30 mV
Impedance		
Zro:	130 Ω + j · 180 Ω	200 Ω + j · 304 Ω
Zrs:	125 Ω + j · 140 Ω	160 Ω + j · 235 Ω
Zso:	205 Ω + j · 190 Ω	265 Ω + j · 330 Ω
Zss:	190 Ω + j · 140 Ω	210 Ω + j · 250 Ω
D.C. resistance		
Rotor:	60 Ω ± 10% at 20 °C	60 Ω ± 10% at 20 °C
Stator:	130 Ω ± 10% at 20 °C	130 Ω ± 10% at 20 °C
Accuracy:	± 10' / 20' spread	± 10' / 20' spread
Accuracy ripple:	max. 1'	max. 1'
Operating temperature:	-55 °C ... +155 °C (-67 °F ... + 311 °F)	-55 °C ... +155 °C (-67 °F ... +311 °F)
Max. permissible speed:	40.000 min ⁻¹	40.000 min ⁻¹
Shock (11ms):	< = 1.000 m/s ²	< = 1.000 m/s ²
Vibration (10 to 500 Hz):	< = 500 m/s ²	< = 500 m/s ²
Hi-pot housing/winding:	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding:	min. 250 V _{AC}	min. 250 V _{AC}
Rotor:	Completely impregnated	Completely impregnated
Stator:	Windings impregnated	Windings impregnated



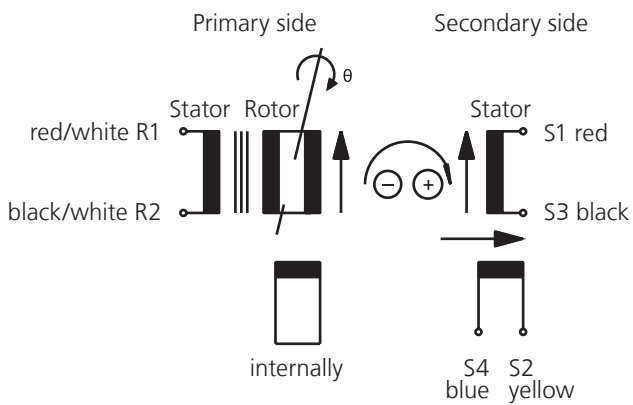
FACTS

- Hollow shaft Ø: max. 6 mm
- Outer Ø: 26 mm
- Length: 20 mm



RE10 (Design example)

OPERATING PRINCIPLE

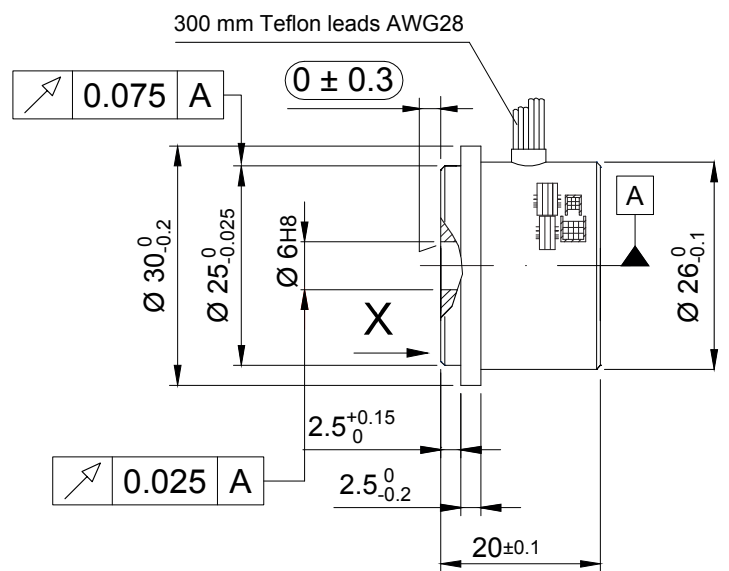


Input: $E(R1-R2) = E \cdot \sin(\cos)$

Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$

$E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$

TR = Transformation ratio



Positive counting direction: Rotor cw as viewed (X →)



ELECTRICAL DATA

Primary side	R1 - R2	R1 - R2
Pole Pairs	1	1
Transformation ratio	0.5 ± 10%	0.5 ± 10%
Input voltage	7 V	7 V
Input current	65 mA	35 mA
Input frequency	5 kHz	10 kHz
Phase shift	9° ± 3°	-2° ± 3°
Null voltage	max. 30 mV	max. 30 mV
Impedance		
Zro	53 Ω + j · 105 Ω	85 Ω + j · 175 Ω
Zrs	52 Ω + j · 85 Ω	70 Ω + j · 150 Ω
Zso	78 Ω + j · 126 Ω	115 Ω + j · 235 Ω
Zss	75 Ω + j · 100 Ω	90 Ω + j · 195 Ω
D.C. resistance		
Rotor	22 Ohm ± 10% at 20 °C	22 Ohm ± 10% at 20 °C
Stator	77 Ohm ± 10% at 20 °C	77 Ohm ± 10% at 20 °C
Accuracy		
Accuracy	± 10'	± 10'
Accuracy ripple	max. 1'	max. 1'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... -155 °C (-67 °F ... +311 °F)
Max. permissible speed		
Shock (11ms)	20.000 min ⁻¹ < = 1.000 m/s ²	20.000 min ⁻¹ < = 1.000 m/s ²
Vibration (10 to 500 Hz)	< = 500 m/s ²	< = 500 m/s ²
Hi-pot housing/winding	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}	min. 250 V _{AC}
Rotor	Completely impregnated	Completely impregnated
Stator	Windings impregnated	Windings impregnated



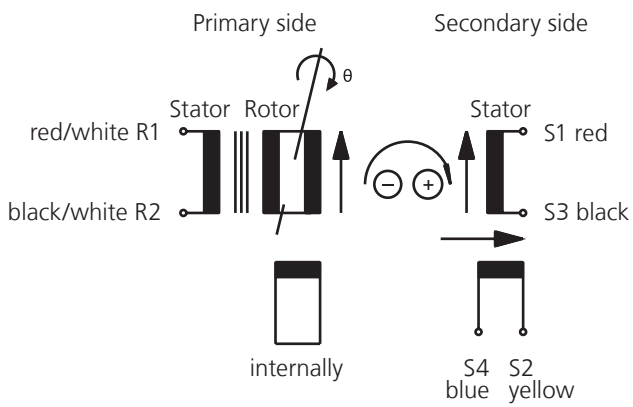
FACTS

- Hollow shaft Ø: max. 12 mm
- Outer Ø: 36.3 mm
- Length: 16 mm



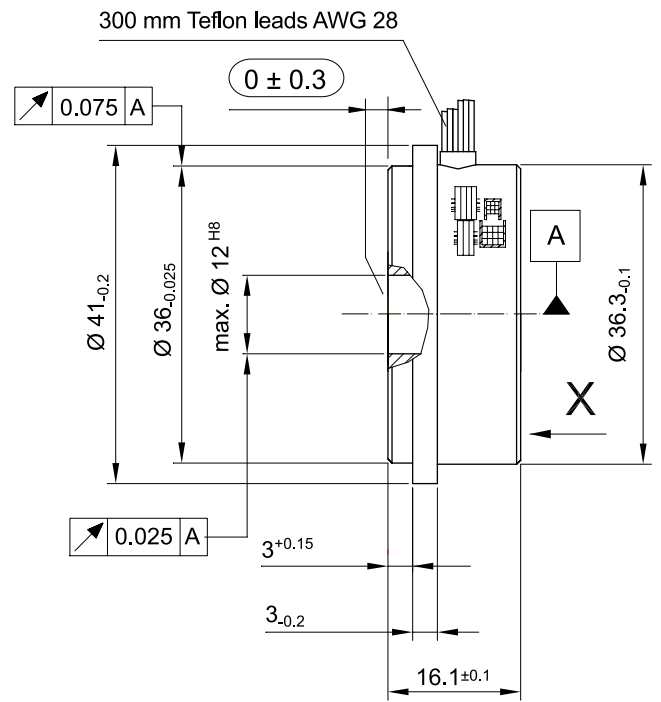
RE15 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





ELECTRICAL DATA

Basic Model	RE 15-1-A15	RE 15-1-K01	RE 15-1-V07	RE 15-3-D04	RE 15-4-D04					
Primary Side	R1 - R2									
Pole Pairs	1			3	4					
Transformation ratio	0.5 ± 0.05									
Input voltage	7 V _{rms}	7 V _{rms}	5 V _{rms}	5 V _{rms}	7 V _{rms}	7 V _{rms}	7 V _{rms}	7 V _{rms}	7 V _{rms}	7 V _{rms}
Input current	58 mA	36 mA	48 mA	17 mA	58 mA	36 mA	50 mA	24 mA	16 mA	10 mA
Input frequency	5 kHz	10 kHz	1 kHz	4.5 kHz	5 kHz	10 kHz	4 kHz	10 kHz	5 kHz	10 kHz
Phase shift (± 3°)	8°	-6°	26°	0°	8°	-6°	15°	0°	15°	1°
Null voltage	max. 30 mV									
Accuracy	± 10', ± 6' on request			± 4'	± 5'	± 6'				
Accuracy ripple	max. 1'				max. 3'					
Operating temperature	- 55 °C ... + 155 °C (-67 °F ... +311 °F)									
Max. permissible speed	20.000 min ⁻¹									
Hi-pot housing/winding	min. 500 V _{AC}									
Hi-pot winding/winding	min. 250 V _{AC}									
Rotor/Stator	Completely impregnated									



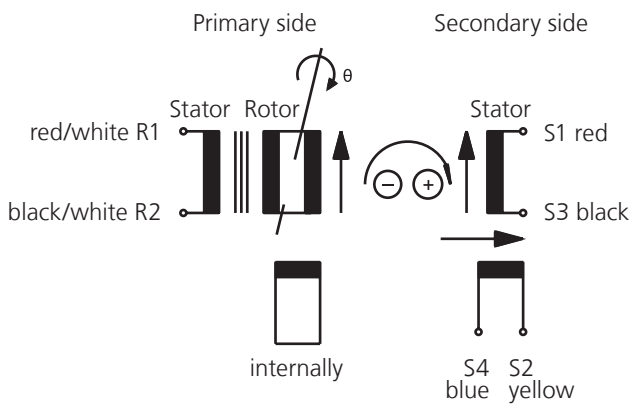
FACTS

- Hollow shaft Ø: max. 17 mm
- Outer Ø: 52.4 mm
- Length: 26 mm



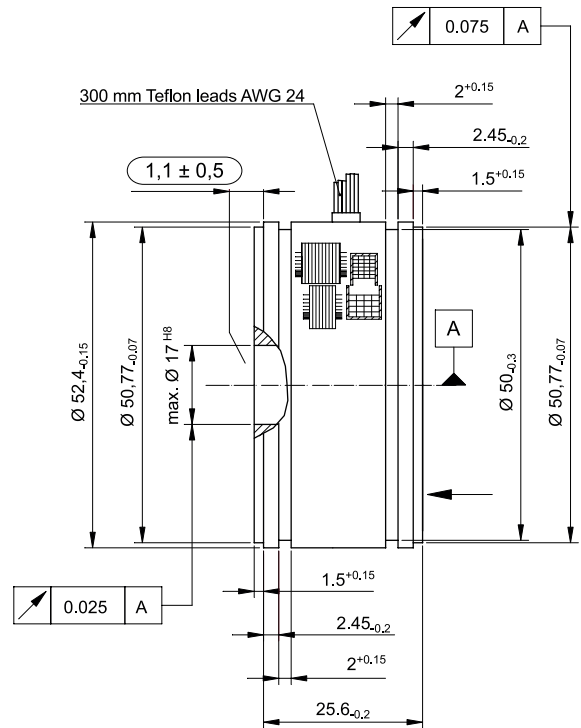
RE21 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





ELECTRICAL DATA

Basic Model	RE 21-1-A01	RE 21-1-A05	RE 21-1-K05	RE 21-3-A03
Primary Side	R1 - R2			
Pole Pairs	1			3
Transformation ratio	1.0 ± 0.1		0.5	
Input voltage	$7 V_{rms}$	$7 V_{rms}$	$7 V_{rms}$	$7 V_{rms}$
Input current	40 mA	30 mA	70 mA	56 mA
Input frequency	5 kHz	10 kHz	5 kHz	7 kHz
Phase shift (± 3°)	11°	-7.5°	8°	0°
Null voltage	max. 30 mV			
Accuracy	± 10', ± 4' on request			
Accuracy ripple	max. 1'			
Operating temperature	- 55°C ... + 155°C (-67 °F ... +311 °F)			
Max. permissible speed	20.000 min ⁻¹			
Hi-pot housing/winding	min. 500 V _{AC}			
Hi-pot winding/winding	min. 250 V _{AC}			
Rotor/Stator	Completely impregnated			



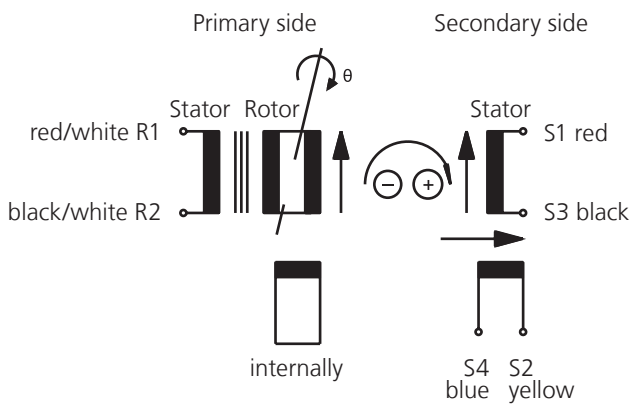
FACTS

- Hollow shaft Ø: max. 30 mm
- Outer Ø: 72 mm
- Length: 30 mm



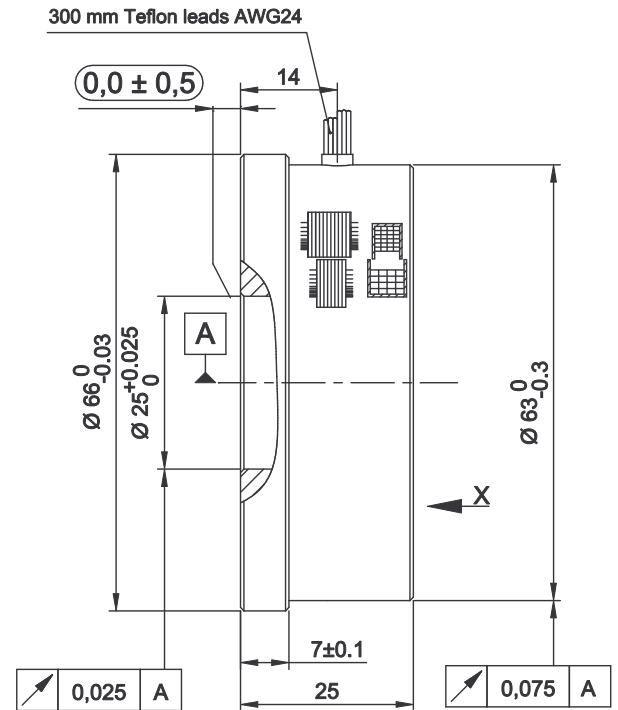
RE27 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side	R1 - R2
Pole Pairs	1
Transformation ratio	$0.5 \pm 10\%$
Input voltage	7 V
Input current	30 mA
Input frequency	10 kHz
Phase shift	$-8^\circ \pm 3^\circ$
Null voltage	max. 30 mV
Impedance	
Zro	$138 \Omega + j \cdot 210 \Omega$
Zrs	$116 \Omega + j \cdot 191 \Omega$
Zso	$271 \Omega + j \cdot 462 \Omega$
Zss	$223 \Omega + j \cdot 420 \Omega$
D.C. resistance	
Rotor	$62 \Omega \pm 10\%$ at 20 °C
Stator	$53 \Omega \pm 10\%$ at 20 °C
Accuracy	
Accuracy	$\pm 10'$
Accuracy ripple	max. 1'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)
Max. permissible speed	16.000 min^{-1}
Shock (11ms)	$< = 1.000 \text{ m/s}^2$
Vibration (10 to 500 Hz)	$< = 500 \text{ m/s}^2$
Weight rotor/stator	142 g / 188 g
Hi-pot housing/winding	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}
Rotor/Stator	Completely impregnated



FRAMELESS RESOLVER

RE35

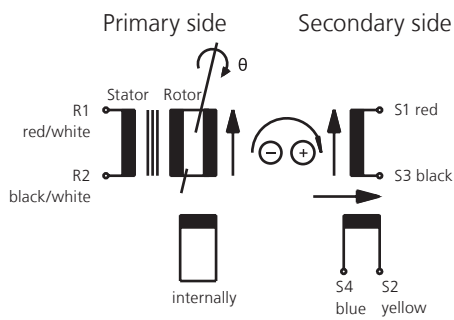
FACTS

- Hollow shaft Ø: max. 40 mm
- Outer Ø: 90 mm
- Length: 40 mm



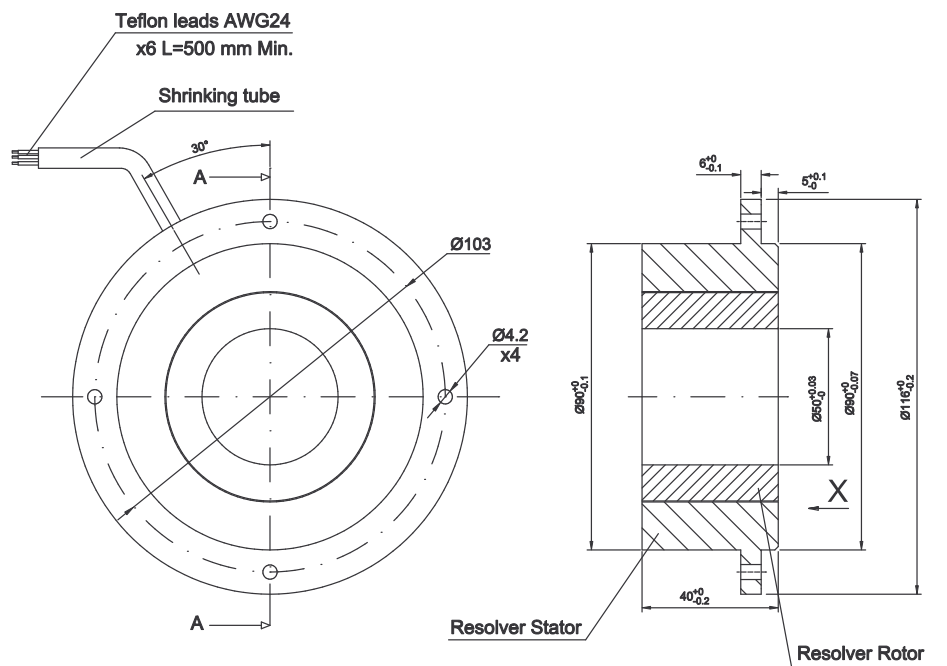
RE35 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction:
 Rotor cw as viewed (X →)





ELECTRICAL DATA

	RE-35-1-V05	RE35-3-V01
Primary side	R1 - R2	R1 - R2
Pole Pairs	1	3
Transformation ratio	$0.5 \pm 10\%$	$0.5 \pm 10\%$
Input voltage	7 V	7 V
Input frequency	5 kHz	5 kHz
Phase shift	$+4^\circ \pm 3^\circ$	$+5^\circ \pm 3^\circ$
Input current (typ.)	48 mA	30 mA
Null voltage	max. 30 mV	max. 30 mV
Accuracy spread	20'	6'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... +155 °C (-67 °F ... +311 °F)
Hi-pot housing/winding	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}	min. 250 V _{AC}
Rotor/Stator	Completely impregnated	Completely impregnated



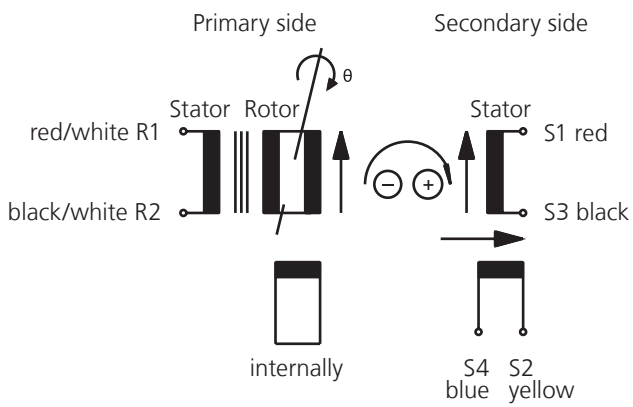
FACTS

- Hollow shaft Ø: max. 65 mm
- Outer Ø: 110 mm
- Length: 30 mm



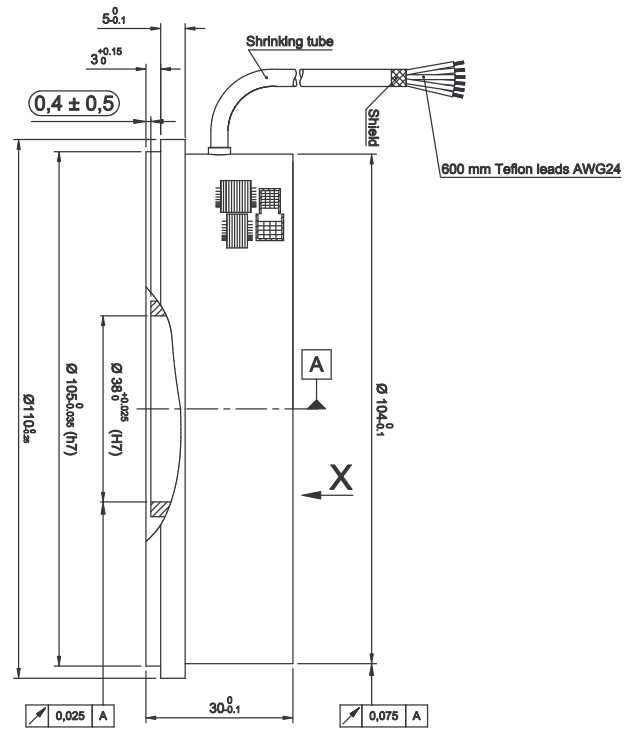
RE43 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





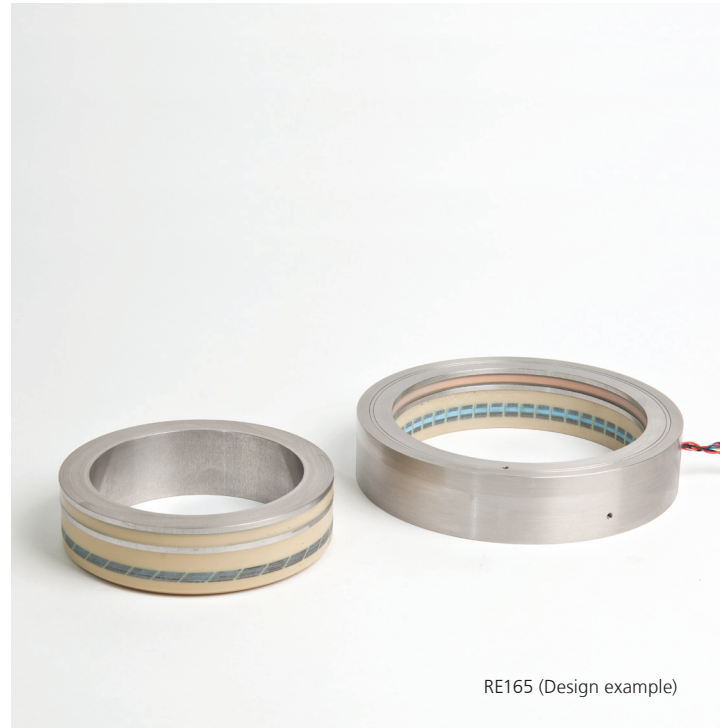
ELECTRICAL DATA

Primary side	R1 - R2	R1 - R2
Pole Pairs	1	1
Transformation ratio	$1 \pm 10\%$	$1 \pm 10\%$
Input voltage	7 V	7 V
Input current	55 mA	39 mA
Input frequency	5 kHz	10 kHz
Phase shift	$10^\circ \pm 3^\circ$	$-7^\circ \pm 3^\circ$
Null voltage	max. 30 mV	max. 30 mV
Impedance		
Zro	$109 \Omega + j \cdot 72 \Omega$	$129 \Omega + j \cdot 120 \Omega$
Zrs	$96 \Omega + j \cdot 64 \Omega$	$114 \Omega + j \cdot 115 \Omega$
Zso	$204 \Omega + j \cdot 238 \Omega$	$279 \Omega + j \cdot 380 \Omega$
Zss	$185 \Omega + j \cdot 211 \Omega$	$240 \Omega + j \cdot 355 \Omega$
D.C. resistance		
Rotor	$76 \Omega \pm 10\%$ at 20 °C	$76 \Omega \pm 10\%$ at 20 °C
Stator	$74 \Omega \pm 10\%$ at 20 °C	$74 \Omega \pm 10\%$ at 20 °C
Accuracy	$\pm 20'$	$\pm 20'$
Accuracy ripple	max. 1'	max. 1'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... -155 °C (-67 °F ... +311 °F)
Max. permissible speed	5.000 min ⁻¹	5.000 min ⁻¹
Shock (11ms)	$< = 1.000 \text{ m/s}^2$	$< = 1.000 \text{ m/s}^2$
Vibration (10 to 500 Hz)	$< = 500 \text{ m/s}^2$	$< = 500 \text{ m/s}^2$
Weight rotor/stator	400 g / 500 g	400 g / 550 g
Hi-pot housing/winding	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}	min. 250 V _{AC}
Rotor/Stator	Completely impregnated	Completely impregnated



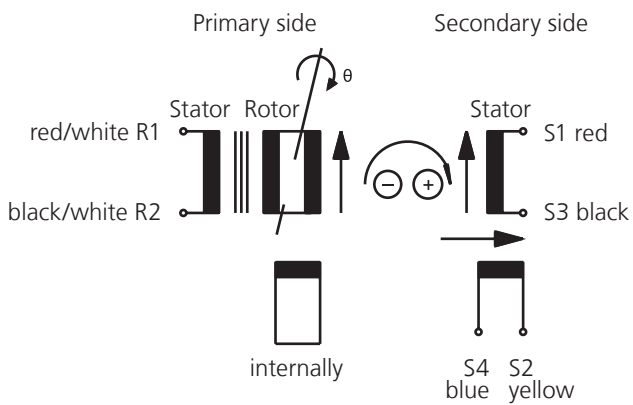
FACTS

- Hollow shaft Ø: max. 100 mm
- Outer Ø: 165 mm
- Length: 35 mm



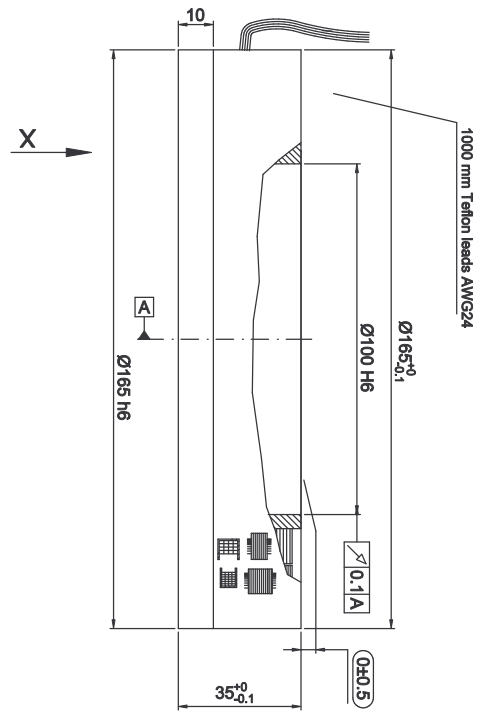
RE165 (Design example)

OPERATING PRINCIPLE



Input: $E(R1-R2) = E \cdot \sin(\cos)$
 Output: $E(S1-S3) = TR \cdot E(R1-R2) \cdot \cos \theta$
 $E(S2-S4) = TR \cdot E(R1-R2) \cdot \sin \theta$
 TR = Transformation ratio

Positive counting direction: Rotor cw as viewed (X →)





ELECTRICAL DATA

Primary side	R1 - R2	R1 - R2
Pole Pairs	1	1
Transformation ratio	0.5 ± 10%	0.5 ± 10%
Input voltage	5 V	5 V
Input current	23 mA	17 mA
Input frequency	5 kHz	10 kHz
Phase shift	8° ± 3°	-10° ± 3°
Null voltage	max. 30 mV	max. 30 mV
Impedance		
Zro	191 Ω + j · 109 Ω	228 Ω + j · 180 Ω
Zrs	183 Ω + j · 107 Ω	220 Ω + j · 182 Ω
Zso	724 Ω + j · 1383 Ω	1149 Ω + j · 2494 Ω
Zss	687 Ω + j · 1346 Ω	1079 Ω + j · 2482 Ω
D.C. resistance		
Rotor	138 Ω ± 10% at 20 °C	138 Ω ± 10% at 20 °C
Stator	200 Ω ± 10% at 20 °C	200 Ω ± 10% at 20 °C
Accuracy	± 4'	± 4'
Operating temperature	-55 °C ... +155 °C (-67 °F ... +311 °F)	-55 °C ... -155 °C (-67 °F ... +311 °F)
Max. permissible speed	5.000 min ⁻¹	5.000 min ⁻¹
Weight rotor/stator	1000 g / 1500 g	1000 g / 1500 g
Hi-pot housing/winding	min. 500 V _{AC}	min. 500 V _{AC}
Hi-pot winding/winding	min. 250 V _{AC}	min. 250 V _{AC}
Rotor/Stator	Completely impregnated	Completely impregnated

Leads pairwise twisted and shielded:

red/white - black/white

red - black

blue - yellow

shield over twisted pairs

not connected to housing

shrinking tube over shield end



RESOLVER TO ENCODER CONVERTER

The LTN-REC is a position data converter.

The LTN-REC drives autonomously a resolver sensor and converts its output signals to encoder incremental (square wave) output signals (emulates encoder signals).



G-REC (Design example)

SPECIFICATIONS - ENCODER OUTPUT

Output Signals:	incremental A+, A-, B+, B-, Z+, Z-
Resolution:	12 bit / 1024 incremental steps per revolution
Output Voltage Level:	5 V (TTL), 14-36 V (HTL) limited by the supply voltage
Output Current:	100 mA limited, short circuit proof
Dynamic Peak Current:	1500 mA max.
Accuracy:	+/- 0.184° (+/- 11 arcmin)
Repeatability:	+/- 1/4 of incremental step
Angular speed:	up to 1000 s ⁻¹

RESOLVER OUTPUT / INPUT

Output Ref. Signal:	2.8 V _{rms} 100 mA max. 10 kHz
Input SIN / COS:	1.4 V _{rms} (diff.)
Transformation Ratio:	K = 0.5 +/- 10%

POWER SUPPLY

Supply Voltage (+V _s):	+8 to +15 V _{DC} or +14 to +36 V _{DC}
Power Consumption:	~1 W (e.g. 40 mA at 24V)
Operating Temperature:	0 to +85 °C

The supply voltage can be supplied via the power connector or optionally via the encoder connector (from the encoder decoding unit). The G-REC is protected against the wrong polarity and transient overvoltage of power supply and short circuit proof on output terminals.

Housing:	Phoenix Contact „ME 22,5“ for top hat rail mounting
Dimensions:	l=114.5 mm; h = 99 mm, w = 22.5 mm



CONNECTOR TERMINALS

Encoder Out: Sub-D, 9-pole male -> mating connector: female	
Pin 1	GND
Pin 2	Z-
Pin 3	Z+
Pin 4	A
Pin 5	A+
Pin 6	-
Pin 7	+V _s (Opt.)
Pin 8	B-
Pin 9	B+
Screen	PE

Resolver IN: Sub-D, 9-pole female -> mating connector: male	
Pin 1	Ref-
Pin 2	-
Pin 3	-
Pin 4	-
Pin 5	SIN+
Pin 6	SIN
Pin 7	Ref+
Pin 8	COS+
Pin 9	COS
Screen	PE

Power connector: 4-pole plug, screw wire connection, included	
Pin 1 (left)	+V _s
Pin 2	+V _s
Pin 3	GND
Pin 4	GND
Max. loopthroughed current:	
+V _s :	Pin 1 - Pin 2: 3A
GND:	Pin 3 - Pin 4: 3A

The PE connection (protective earth) is implemented over the mounting clamp to the top hat rail.

ORDERING INFORMATION

G-RECLDBI1024-5X1-15	Supply Voltage (+V _s): +8 to +15 V _{DC}	Output Voltage Level: 5V	3933542
G-RECLDBI1024-5X1-24	Supply Voltage (+V _s): +14 to +36 V _{DC}	Output Voltage Level: 5V	3931647
G-RECKIBI1024-5X1-24	Supply Voltage (+V _s): +14 to +36 V _{DC}	Output Voltage Level: V _s	3932553

Other configurations on request.



RESOLVER TO DIGITAL CONVERTER

The LTN G-RDC is a position data converter.
The LTN G-RDC drives autonomously a resolver sensor and converts its output signals to digital position data.



G-RDC (Design example)

SPECIFICATIONS - CONVERTER OUTPUT / CONTROL

Output Signals:	10 bit: binary position data, parallel, H-active 16 bit: binary position data, parallel, H-active 1 bit: /BIT (Error), L-active
Input Signals:	1 bit: /Inhibit, L-edge-active 1 bit: /Enable, L-edge-active (Both Inputs can be put together)
Resolution:	10-bit / 1024 steps per revolution 16-bit / 65536 steps per revolution
Output Voltage Level:	TTL (5 V)
Output Current:	30 mA
Input Voltage Level:	TTL (5 V)
Accuracy:	0.072° (4 arcmin +1LSB max.)
Repeatability:	+/- 1 LSB
Angular speed:	10 bit: up to 1152 s ⁻¹ 16 bit: up to 18 s ⁻¹ (to be specified on order)

RESOLVER OUTPUT / INPUT

Output Ref. Signal:	4 V _{rms} 100 mA max. 5 kHz
Input SIN / COS:	2 V _{rms}
Transformation Ratio:	K = 0.5 +/- 10%

POWER SUPPLY

Supply Voltage (+Vs):	+10 to +36 V _{DC}
Power Consumption:	~1,5 W (e.g. 60 mA at 24 V)
Operating Temperature:	0 to +85°C

The supply voltage can be supplied via the power connector or optionally via the encoder connector (from the encoder decoding unit).
The G-RDC is protected against the wrong polarity and transient overvoltage of power supply and short circuit proof on output terminals.

Housing:	Phoenix Contact „ME 22,5“ for top hat rail mounting
Dimensions:	l = 114,5 mm; h = 99 mm, w = 22,5 mm



CONNECTOR TERMINALS

10 bit

Data Out /Controll I/O: Sub-D, 25-pole female -> mating connector: male	
Pin 1	Out DB1 (MSB)
Pin 2	Out DB2
Pin 3	Out DB3
Pin 4	Out DB4
...	...
...	...
Pin 10	Out DB10 (LSB)
Pin 11	NC
...	...
Pin 16	NC
Pin 17	Out /BIT (Error)
Pin 18	IN /Inhibit
Pin 19	IN /Enable
Pin 20	NC
Pin 21	NC
Pin 22	NC
Pin 23	V _s (Opt.)
Pin 24	GND
Pin 25	GND
Screen	PE

16 bit

Data Out /Controll I/O: Sub-D, 25-pole female -> mating connector: male	
Pin 1	Out DB1 (MSB)
Pin 2	Out DB2
Pin 3	Out DB3
Pin 4	Out DB4
...	...
...	...
Pin 13	Out DB13
Pin 14	Out DB14
Pin 15	Out DB15
Pin 16	Out DB16 (LSB)
Pin 17	Out /BIT (Error)
Pin 18	IN /Inhibit
Pin 19	IN /Enable
Pin 20	NC
Pin 21	NC
Pin 22	NC
Pin 23	V _s (Opt.)
Pin 24	GND
Pin 25	GND
Screen	PE

Resolver IN: Sub-D, 9-pole female -> mating connector: male	
Pin 1	Ref-
Pin 2	-
Pin 3	-
Pin 4	-
Pin 5	SIN+
Pin 6	SIN-
Pin 7	Ref+
Pin 8	COS+
Pin 9	COS-
Screen	PE

Power connector: 4-pole plug, screw wire connection, included	
Pin 1 (left)	+V _s
Pin 2	+V _s
Pin 3	GND
Pin 4	GND
Max. loopthroughed current:	
+V _s :	Pin 1 - Pin 2: 3A
GND:	Pin 3 - Pin 4: 3A

The PE connection (protective earth) is implemented over the mounting clamp to the top hat rail.

ORDERING INFORMATION

10 bit G-RDCTLSC01024-0XX-24
16 bit G-RDCTLSC65536-0XX-24

Supply Voltage (+V_s): +10 to +36 V_{DC}
Supply Voltage (+V_s): +10 to +36 V_{DC}

Output Voltage Level: TTL (5 V)
Output Voltage Level: TTL (5 V)

3938524
3933425

Other configurations on request.

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