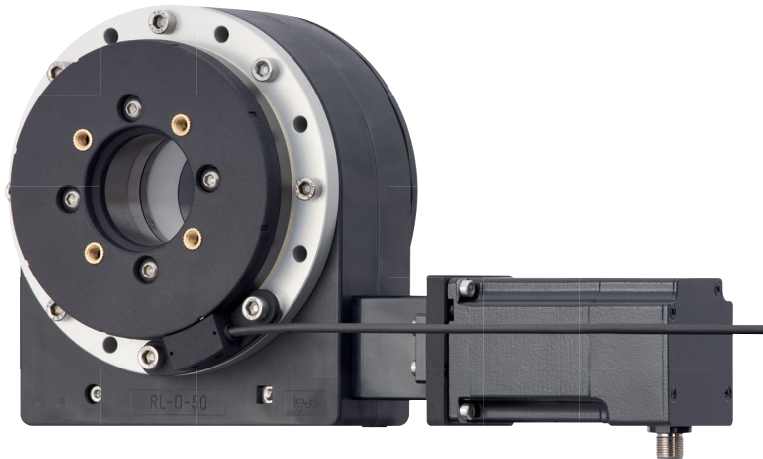


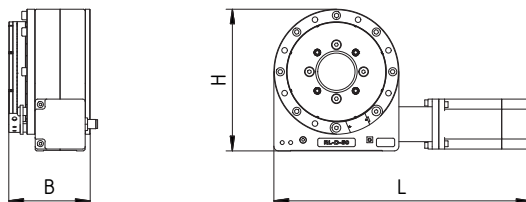
Stückliste			
OBJEKT	Anz.	Artikelnr.	Bezeichnung
1	1	RL-D-20-A0143	RL-D-20...01000 / MK-N17-01 / EK
2	1	RL-D-30-A0144	RL-D-30...01000 / MK-N23-01 / EK
3	1	RL-D-50-A0140	RL-D-50...01035 / MK-N23XL-01 / EK
4	1	RL-D-50-A0141	RL-D-50...01033 / MK-N23XL-01 / EK
5	1	RL-DC-20-S-170-AA	Connection part 170mm
6	1	RL-DC-30-20-270-AA	Connection part 270mm
7	1	RL-DC-50-30-350-AA	Connection part 350mm
8	1	RL-DC-50-50-T-01	Connection part 50-50
9	1	RL-DC-BL-50-BX-AA-02	Connection part Base-50
10	1	RL-DC-CBK-5532S-M-01	Chain/Cable Kit
11	1	RL-S-17-A0154	RL-S-17 / MK-N11-01 / EK

Freigabe	Datum:	Name:	Unterschrift:							
Für Entscheidungen über die Geeignetheit der von igus® zu liefernden Produkte für bestimmte Anwendungsfälle und Konstruktionen, in die die igus®-Produkte einbezogen sind, ist ausschließlich der Kunde verantwortlich. Die ausschließliche Verantwortung des Kunden für die Konstruktion und/oder Verwendung liegt auch dann beim Kunden, wenn igus in die Entwicklung eines vom Kunden geschaffenen Produktes einbezogen wird und dabei, etwa durch Ratschläge oder Empfehlungen, mitwirkt.			Schutzvermerk nach DIN ISO 16016 beachten							
Werkstoff:										
mit <input type="text"/> gekennzeichnete Maße sind Prüfmaße		Maßstab:	Zulässige Abweichung für Maße ohne Toleranzangabe							
Zeichnungsänderungen:		Nennmaßbereich	über bis	0,5 6	6 30	30 120	120 315	315 1000	1000 2000	2000 4000
		Bauteilvolumen:	DIN ISO 2768-m	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2
Zeichnungsstand:		Zeichnungsnummer: RL-10502								
30.03.2017		Assembly RL-D								
Datum		Name								
erstellt 30.03.2017		F. Berger								
geprüft										
igus®		Spicher Str. 1a								
Plastics for longer life ®		51147 Köln								
		www.igus.de								
Artikelnummer:		RL-D-RBT-5532S-BC-AE								
Blatt		1								
A3										
Index	Änderung	Datum	Name	Dateiname: RL-D-RBT-5532S-BC-AE - RL-10502.idw						

Component RL-D-50-A0140



Weight	4,2 kg
Max. output torque	50 Nm
Max. speed (at max. load)	6 rpm



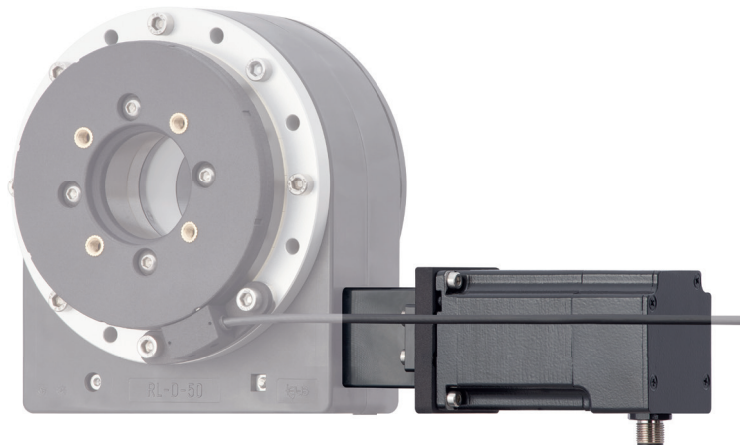
... Dimensions [mm]

B	L	H
87,5	309	170

... consisting of the following individual components

1. Motor kit **RL-D-50-MK-C-N23XL-01**
2. Robot joint **RL-D-50-102-48-01035**
3. Output encoder **RL-D-50-EK-01**

Motor kit RL-D-50-MK-C-N23XL-01



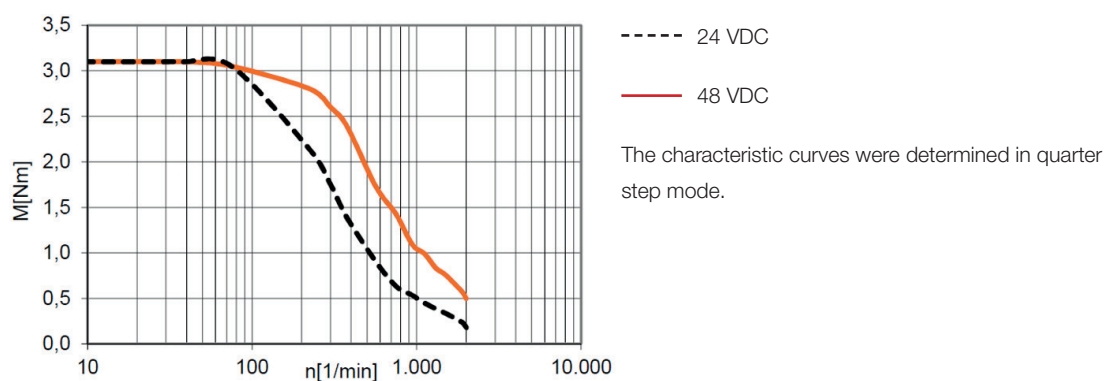
... for distance over hubs

60 (Nema23XL)

Maximum voltage	60 VDC
Nominal voltage	24-48
Nominal current	4,2 A
Holding torque	3,5 Nm
Ratchet torque	0,075 Nm
Step angle	1.8 ±5%
Resistance/phase	0.65 ±10%
Inductivity/phase	3.2 ±20%
Moment of inertia of rotor	0,84 kgcm ²
Shaft load, axial	15 N
Shaft load, radial (20 mm)	63 N

... Motor identification

MOT-AN-S-060-035-060-M-A-AAAA



... Motor weights

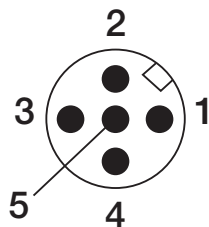
Strands	1,45 kg
Connector	1,56 kg
Encoder	1,58 kg
Encoder and brake	1,82 kg

... Operating data

CE	EMC guideline
Insulation class	B
Max. humidity	85 %
IP rating - motor housing	IP65 (shaft seal IP52), motor with stranded wires IP40
Max. allowable temperature increase	80 °C
Ambient temperature max.	+50°C
Ambient temperature min.	-10°C

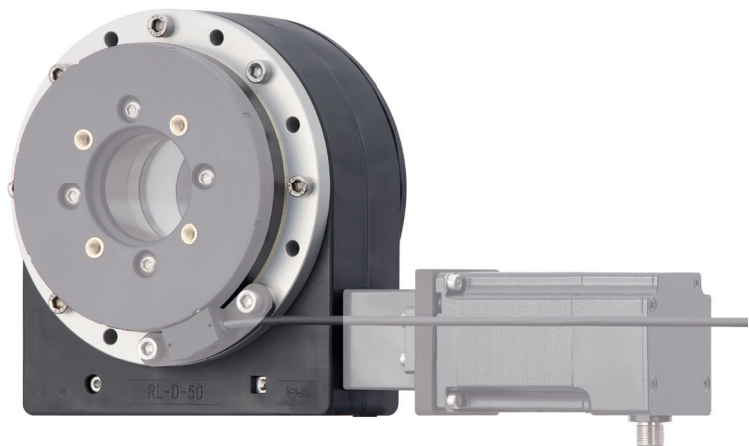
... Pin assignment of stepper motor connector

Motor size: 42, 56, 60 (Nema17, 23, 23XL)



PIN	Signal	Phase	Colour
1	A/	1	brown
2	A	1	white
3	B	2	blue
4	B/	2	black
5	PE	–	green-yellow
Housing	Shielding	–	–

robot joint
RL-D-50-102-48-01035

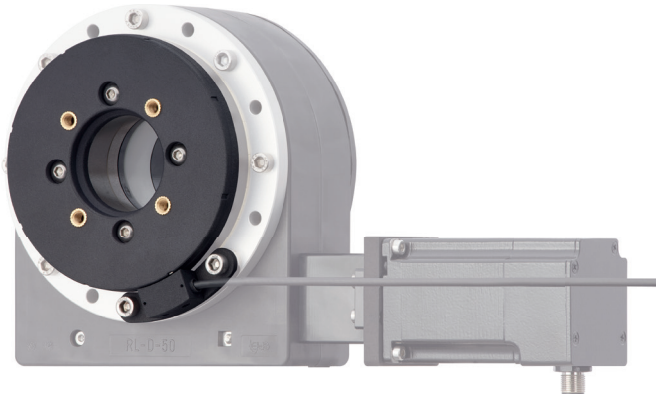


... Technical data

Max. output torque dyn., periodic use (<30% duty)	50 Nm
Max. axial stat. load in the case of horizontal mounting	< 1,200 N
Max. radial torque (permanent)	25 Nm
Efficiency	< 0.4
Transmission	48:1
Axis distance	63 mm
Backlash	< 0.5 °
Breakaway torque	< 10 cNm

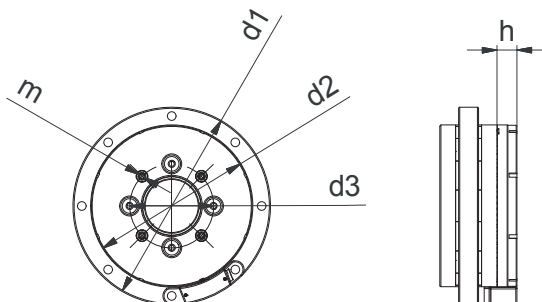
Type			Dimensions [mm]		
RL-	D-	50-	102-	48-	01035
robolink®	Type	Installation size	Design	Reduction	Variation

Output encoder RL-D-50-EK-01



... Dimensions [mm]

d1	d2	d3	m	h	Pole pairs	for
150	120	65	4 x M6	10	~92	PRT-01



... Resolution per axis

Operating voltage	5 V
Signals/rotation	7140
Zero signal/index	yes
Number of pulses per channel	~3660
Number of edges (quadrature)	~14640
Resolution	0,02 °

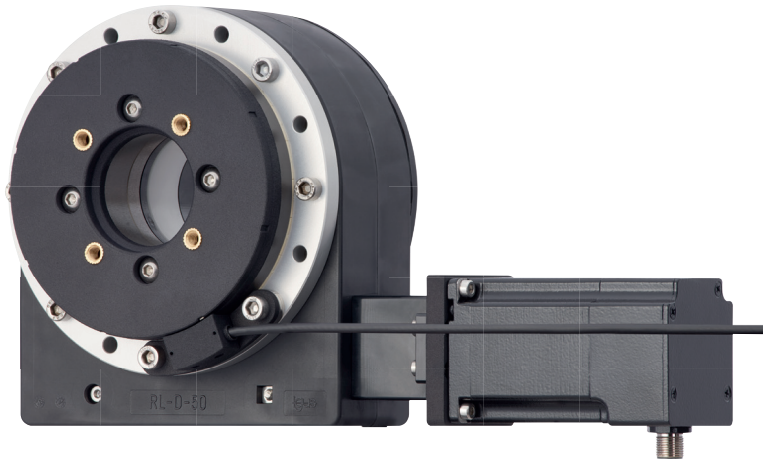


Contact:

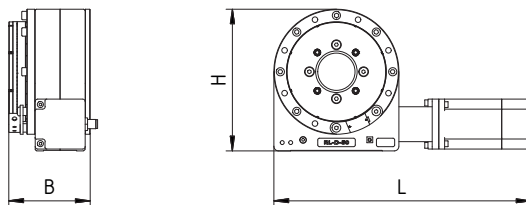
Martin Raak
Product Manager robolink®

Phone +49 2203 9649 409
Fax +49 2203 9698 409
mraak@igus.de

Component RL-D-50-A0141



Weight	4,9 kg
Max. output torque	50 Nm
Max. speed (at max. load)	6 rpm



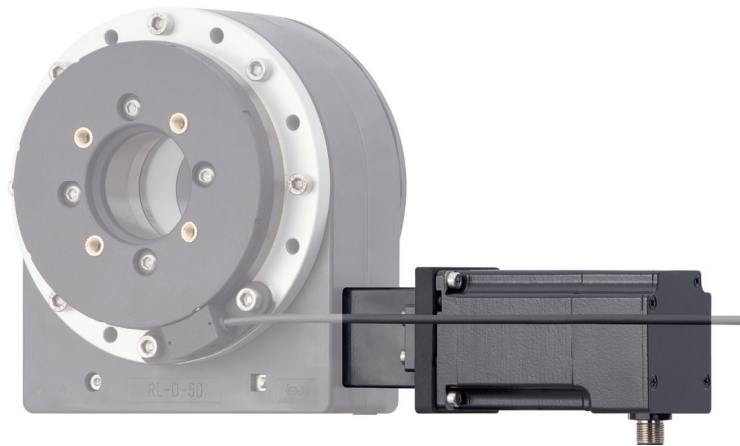
... Dimensions [mm]

B	L	H
103	309	170

... consisting of the following individual components

1. Motor kit **RL-D-50-MK-C-N23XL-01**
2. Robot joint **RL-D-50-101-48-01033**
3. Output encoder **RL-D-50-EK-01**

Motor kit RL-D-50-MK-C-N23XL-01



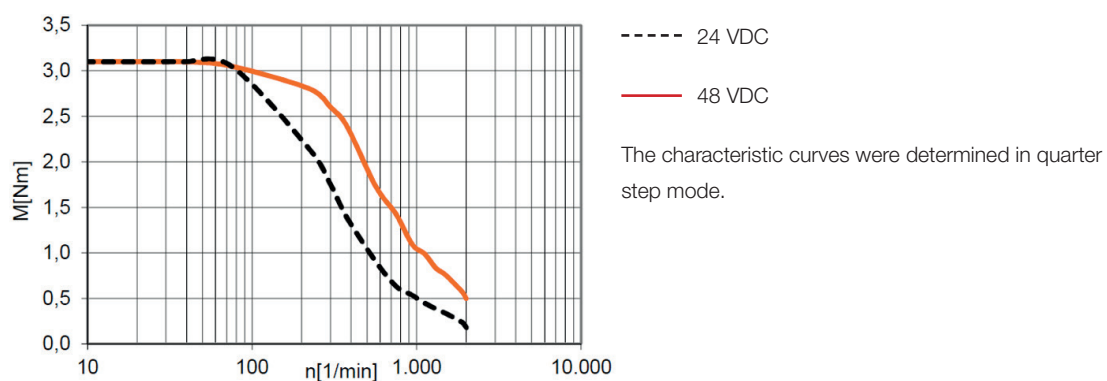
... for distance over hubs

60 (Nema23XL)

Maximum voltage	60 VDC
Nominal voltage	24-48
Nominal current	4,2 A
Holding torque	3,5 Nm
Ratchet torque	0,075 Nm
Step angle	1.8 ±5%
Resistance/phase	0.65 ±10%
Inductivity/phase	3.2 ±20%
Moment of inertia of rotor	0,84 kgcm ²
Shaft load, axial	15 N
Shaft load, radial (20 mm)	63 N

... Motor identification

MOT-AN-S-060-035-060-M-A-AAAA



... Motor weights

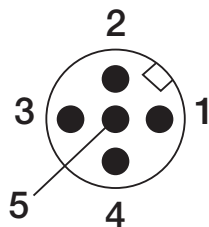
Strands	1,45 kg
Connector	1,56 kg
Encoder	1,58 kg
Encoder and brake	1,82 kg

... Operating data

CE	EMC guideline
Insulation class	B
Max. humidity	85 %
IP rating - motor housing	IP65 (shaft seal IP52), motor with stranded wires IP40
Max. allowable temperature increase	80 °C
Ambient temperature max.	+50°C
Ambient temperature min.	-10°C

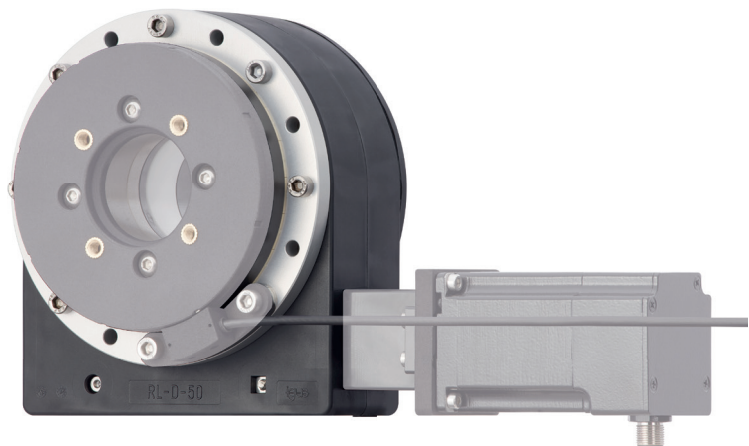
... Pin assignment of stepper motor connector

Motor size: 42, 56, 60 (Nema17, 23, 23XL)



PIN	Signal	Phase	Colour
1	A/	1	brown
2	A	1	white
3	B	2	blue
4	B/	2	black
5	PE	–	green-yellow
Housing	Shielding	–	–

Robot joint
RL-D-50-101-48-01033

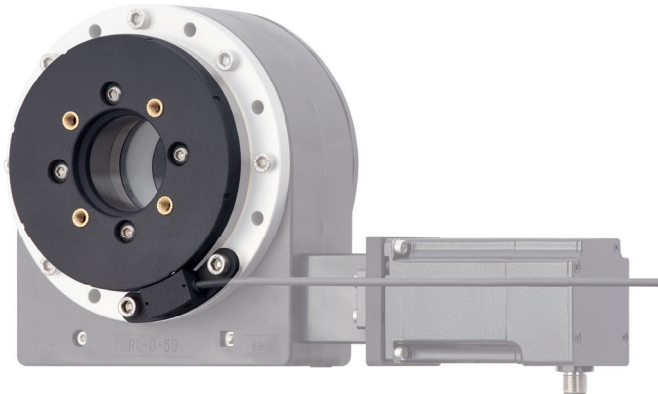


... Technical data

Max. output torque dyn., periodic use (<30% duty)	50 Nm
Max. axial stat. load in the case of horizontal mounting	< 1,200 N
Max. radial torque (permanent)	25 Nm
Efficiency	< 0.4
Transmission	48:1
Axis distance	63 mm
Backlash	< 0.5 °
Breakaway torque	< 10 cNm

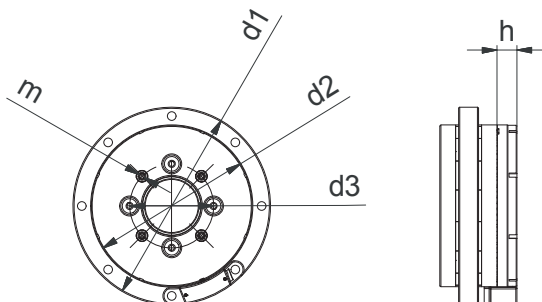
Type			Dimensions [mm]		
RL-	D-	50-	101-	48-	01033
robolink®	Type	Installation size	Design	Reduction	Variation

Output encoder RL-D-50-EK-01



... Dimensions [mm]

d1	d2	d3	m	h	Pole pairs	for
150	120	65	4 x M6	10	~92	PRT-01



... Resolution per axis

Operating voltage	5 V
Signals/rotation	7140
Zero signal/index	yes
Number of pulses per channel	~3660
Number of edges (quadrature)	~14640
Resolution	0,02 °

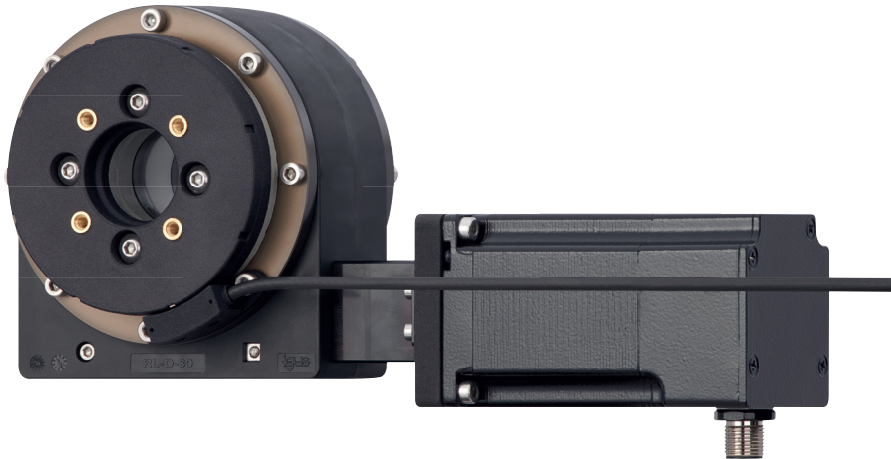


Contact:

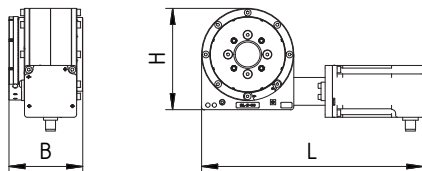
Martin Raak
Product Manager robolink®

Phone +49 2203 9649 409
Fax +49 2203 9698 409
mraak@igus.de

Component RL-D-30-A0144



Weight	2,1 kg
Max. output torque	20 Nm
Max. speed (at max. load)	9 rpm



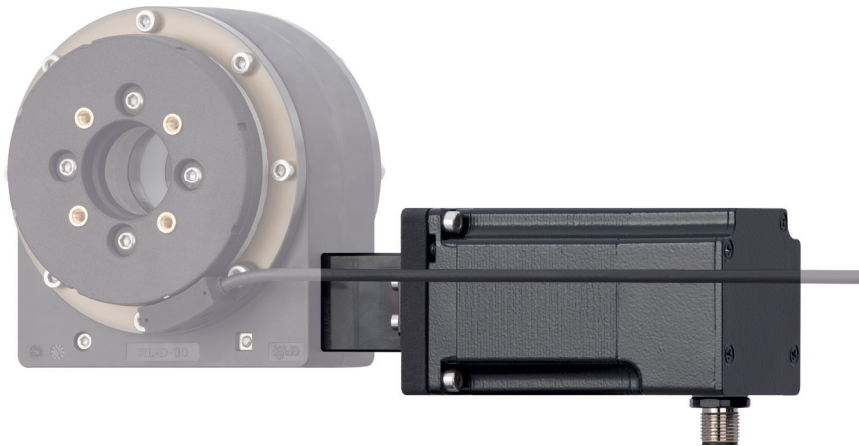
... Dimensions [mm]

B	L	H
70	240	110

... consisting of the following individual components

1. Motor kit **RL-D-30-MK-C-N23-01**
2. Robot joint **RL-D-30-101-50-01000**
3. Output encoder **RL-D-30-EK-02**

Motor kit RL-D-30-MK-C-N23-01



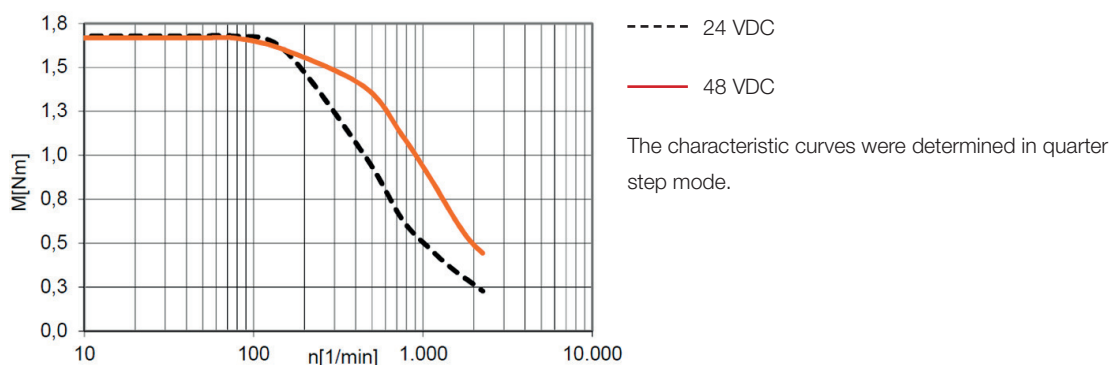
... for distance over hubs

56 (Nema23)

Maximum voltage	60 VDC
Nominal voltage	24-48 VDC
Nominal current	4,2 A
Holding torque	2 Nm
Ratchet torque	0,068 Nm
Step angle	1.8 ± 5%
Resistance/phase	0.5 ± 10%
Inductivity/phase	2.2 ± 20%
Moment of inertia of rotor	0,48 kgcm ²
Shaft load, axial	15 N
Shaft load, radial (20 mm)	52 N

... Motor identification

MOT-AN-S-060-020-056-M-A-AAAA



... Motor weights

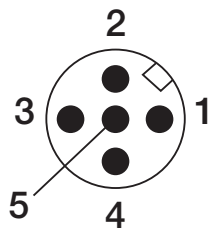
Strands	1,04 kg
Connector	1,12 kg
Encoder	1,14 kg
Encoder and brake	1,36 kg

... Operating data

CE	EMC guideline
Insulation class	B
Max. humidity	85 %
IP rating - motor housing	IP65 (shaft seal IP52), motor with stranded wires IP40
Max. allowable temperature increase	80 °C
Ambient temperature max.	+50°C
Ambient temperature min.	-10°C

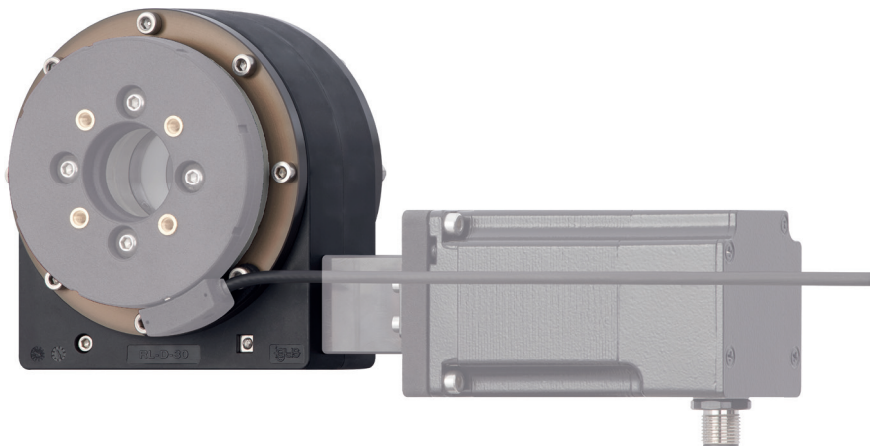
... Pin assignment of stepper motor connector

Motor size: 42, 56, 60 (Nema17, 23, 23XL)



PIN	Signal	Phase	Colour
1	A/	1	brown
2	A	1	white
3	B	2	blue
4	B/	2	black
5	PE	–	green-yellow
Housing	Shielding	–	–

Robot joint
RL-D-30-101-50-01000

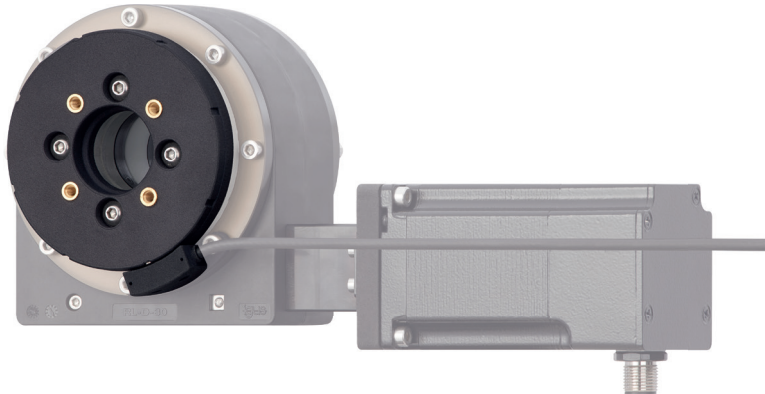


... Technical data

Max. output torque dyn., periodic use (<30% duty)	20 Nm
Max. axial stat. load in the case of horizontal mounting	< 700 N
Max. radial torque (permanent)	10 Nm
Efficiency	< 0.35
Transmission	50:1
Axis distance	40 mm
Backlash	< 0.5 °
Breakaway torque	< 7 cNm

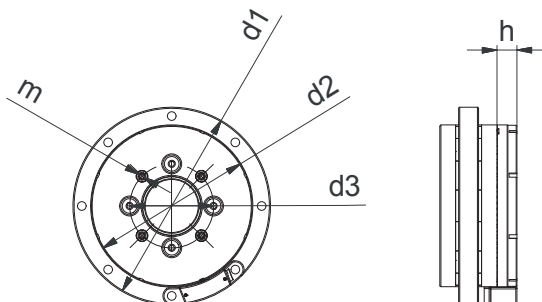
Type			Dimensions [mm]		
RL-	D-	30-	101-	50-	01000
robolink [®]	Type	Installation size	Design	Reduction	Variation

Output encoder RL-D-30-EK-02



... Dimensions [mm]

d1	d2	d3	m	h	Pole pairs	for
100	80	42,5	4 x M4	10	~62	PRT-02



... Resolution per axis

Operating voltage	5 V
Signals/rotation	7140
Zero signal/index	yes
Number of pulses per channel	~2470
Number of edges (quadrature)	~9880
Resolution	0,04 °



Contact:

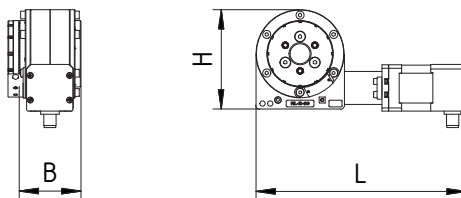
Martin Raak
Product Manager roboLink®

Phone +49 2203 9649 409
Fax +49 2203 9698 409
mraak@igus.de

Component RL-D-20-A0143



Weight	1 kg
Max. output torque	7 Nm
Max. speed (at max. load)	12 rpm



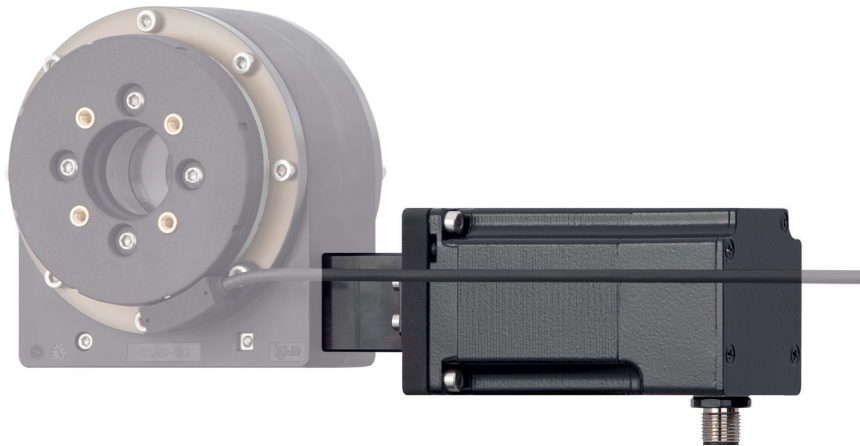
... Dimensions [mm]

B	L	H
56	191	90

... consisting of the following individual components

1. Motor kit **RL-D-20-MK-C-N17-01**
2. Robot joint **RL-D-20-101-38-01000**
3. Output encoder **RL-D-20-EK-02**

Motor kit RL-D-20-MK-C-N17-01



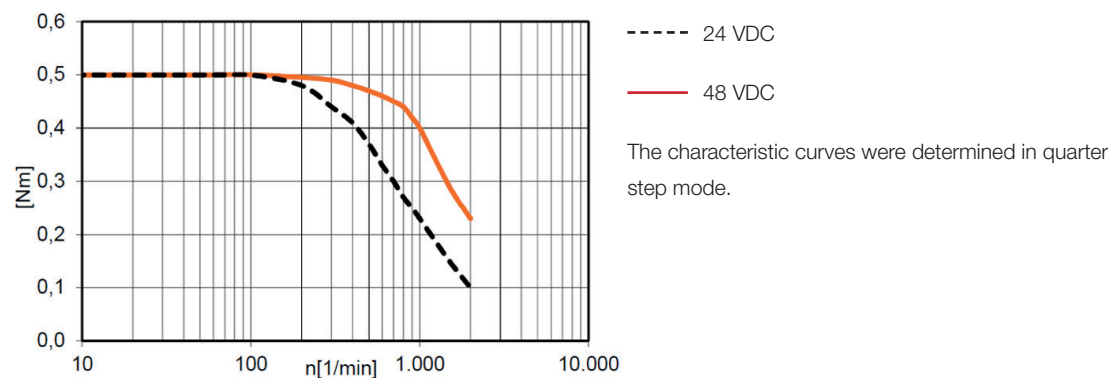
... for distance over hubs

42 (Nema17)

Maximum voltage	60 VDC
Nominal voltage	24-48
Nominal current	1,8 A
Holding torque	0,5 Nm
Ratchet torque	0,022 Nm
Step angle	1.8 ±5 %
Resistance/phase	1.75 ±10 %
Inductivity/phase	3.30 ±20 %
Moment of inertia of rotor	0,082 kgcm ²
Shaft load, axial	7 N
Shaft load, radial (20 mm)	20 N

... Motor identification

MOT-AN-S-060-005-042-M-A-AAAA



... Motor weights

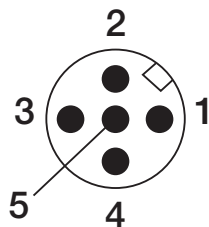
Strands	0,38 kg
Connector	0,43 kg
Encoder	0,45 kg
Encoder and brake	0,58 kg

... Operating data

CE	EMC guideline
Insulation class	B
Max. humidity	85 %
IP rating - motor housing	IP65 (shaft seal IP52), motor with stranded wires IP40
Max. allowable temperature increase	80 °C
Ambient temperature max.	+50°C
Ambient temperature min.	-10°C

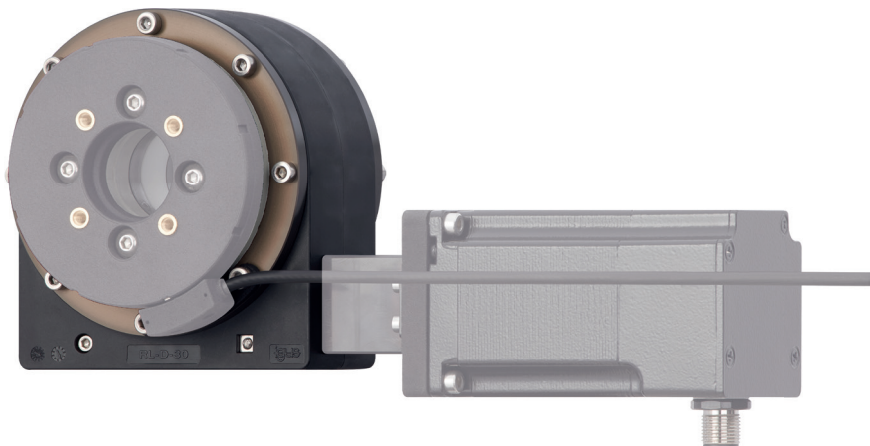
... Pin assignment of stepper motor connector

Motor size: 42, 56, 60 (Nema17, 23, 23XL)



PIN	Signal	Phase	Colour
1	A/	1	brown
2	A	1	white
3	B	2	blue
4	B/	2	black
5	PE	–	green-yellow
Housing	Shielding	–	–

Robot joint
RL-D-20-101-38-01000

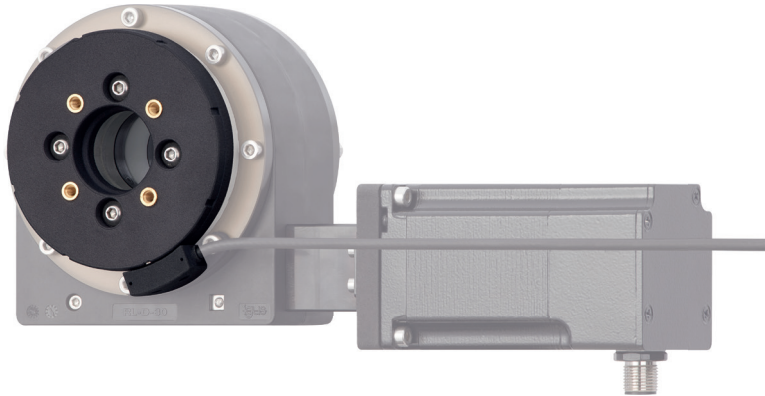


... Technical data

Max. output torque dyn., periodic use (<30% duty)	10 Nm
Max. axial stat. load in the case of horizontal mounting	< 500 N
Max. radial torque (permanent)	5 Nm
Efficiency	< 0.4
Transmission	38:1
Axis distance	31 mm
Backlash	< 0.5 °
Breakaway torque	< 5 cNm

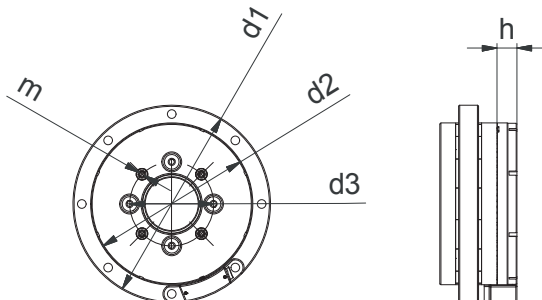
Type			Dimensions [mm]		
RL-	D-	20-	101-	38-	01000
robolink®	Type	Installation size	Design	Reduction	Variation

Output encoder RL-D-20-EK-02



... Dimensions [mm]

d1	d2	d3	m	h	Pole pairs	for
80	60	31	3 x M4	10	~45	PRT-02



... Resolution per axis

Operating voltage	5 V
Signals/rotation	7140
Zero signal/index	yes
Number of pulses per channel	~1785
Number of edges (quadrature)	~7140
Resolution	0,05 °



Contact:

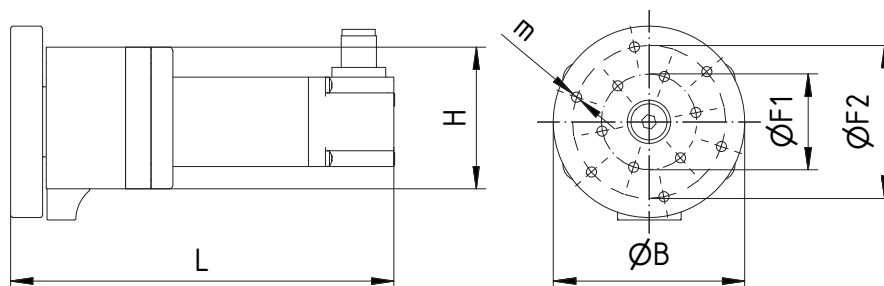
Martin Raak
Product Manager roboLink®

Phone +49 2203 9649 409
Fax +49 2203 9698 409
mraak@igus.de

Component **RL-S-17-A0154**



Weight	0,4 kg
Max. output torque	0,6 Nm
Max. speed (at max. load)	6 rpm



... Dimensions [mm]

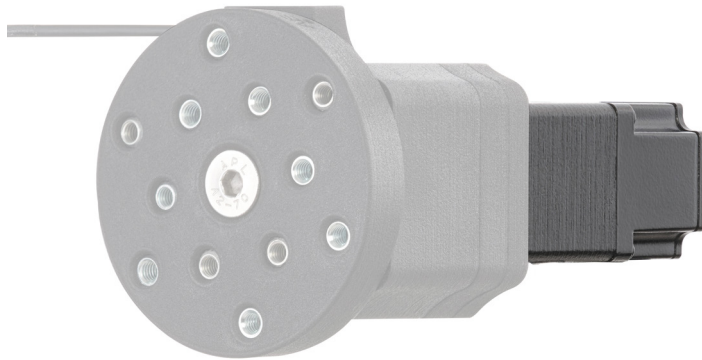
B	L	H	F1	F2	m
60	121	44,5	30	48	12x M4

... consisting of the following individual components

1. Motor **MOT-AN-S-060-001-028-M-A-AAAA**
2. Robot joint **RL-S-17-N11-00-28-020K0**
3. Output encoder **RL-S-17-EK-01**

Motor kit

MOT-AN-S-060-001-028-M-A-AAAA



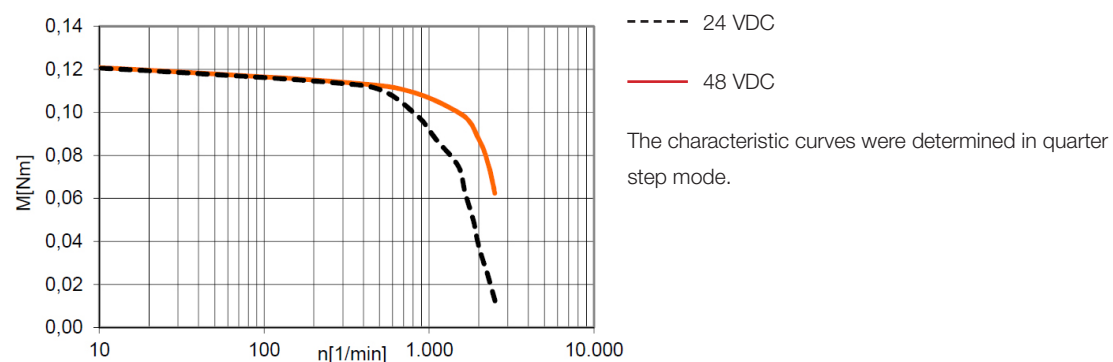
... for distance over hubs

28 (Nema11)

Maximum voltage	60 VDC
Nominal voltage	24-48
Nominal current	1 A
Holding torque	0,12 Nm
Ratchet torque	0,004 Nm
Step angle	$1.8 \pm 5\%$
Resistance/phase	$2.3 \pm 10\%$
Inductivity/phase	$1.8 \pm 20\%$
Moment of inertia of rotor	$0,018 \text{ kgcm}^2$
Shaft load, axial	7 N
Shaft load, radial (20 mm)	20 N

... Motor identification

MOT-AN-S-060-001-028-M-A-AAAA



... Motor weights

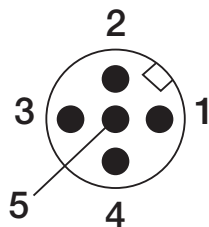
Strands	0,2 kg
Connector	0,25 kg
Encoder	0,27 kg
Encoder and brake	

... Operating data

CE	-10 ... +50
Insulation class	B
Max. humidity	85 %
IP rating - motor housing	IP65 (shaft seal IP52), motor with stranded wires IP40
Max. allowable temperature increase	80 °C
Ambient temperature max.	+50
Ambient temperature min.	-10

... Pin assignment of stepper motor connector

Motor size: 42, 56, 60 (Nema17, 23, 23XL)



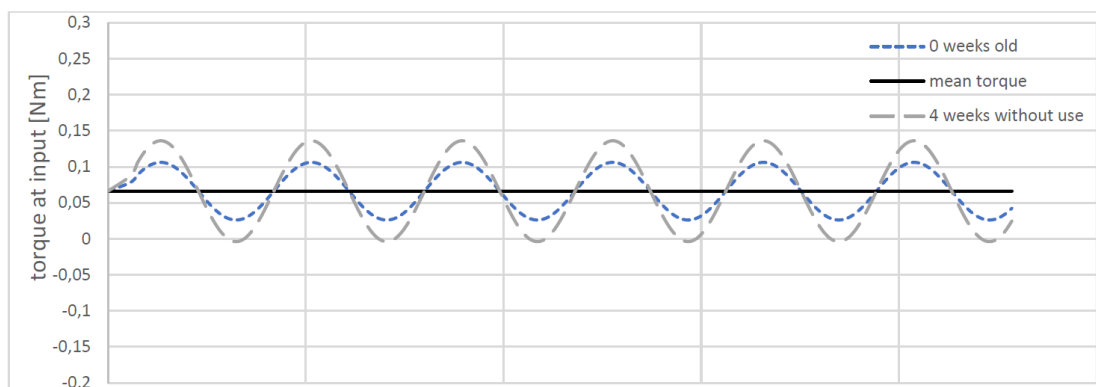
PIN	Signal	Phase	Colour
1	A/	1	brown
2	A	1	white
3	B	2	blue
4	B/	2	black
5	PE	–	green-yellow
Housing	Shielding	–	–

Robot joint RL-S-17-N11-00-28-020K0



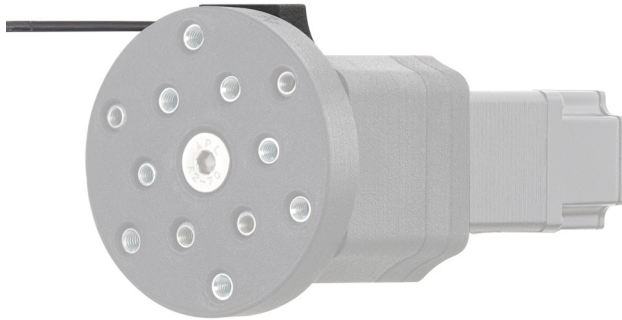
... Technical data

Max. output torque dyn., periodic use (<30% duty)	0,75 Nm
Max. axial stat. load in the case of horizontal mounting	< 20 N
Max. radial torque (permanent)	0.5 Nm
Efficiency	< 0.2
Transmission	28:1
Axis distance	0 mm
Backlash	< 1°



Torque fluctuations due to relaxation of the shaft ring when the output torque is 0.5 Nm (simplified illustration)

Output encoder RL-S-17-EK-01



... Resolution per axis

Operating voltage	Signals/rotation	Zero signal/index	Number of pulses per channel	Number of edges (quadrature)	Resolution
5	7140	yes	~3660	~14640	0,02



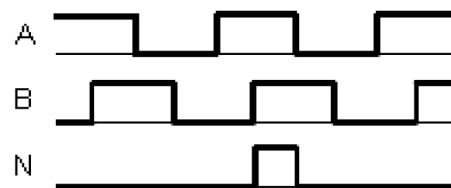
Contact:

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mraak@igus.de

+5V	GND	Hall sensor	Encoder Index	Encoder channel A	Encoder channel B
red	black	white	green	blue	yellow

**Signal shape
(clockwise)**



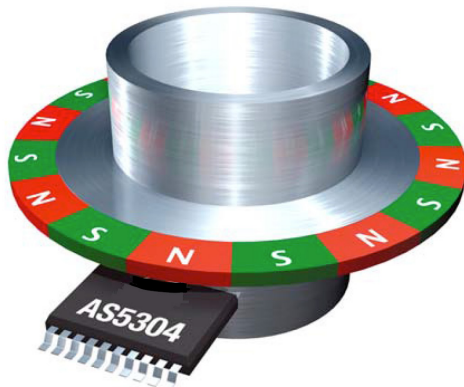
The robolink sensors are magnetic, incremental angle sensors. Each axis (DOF) has (optional) a magnetic ring and an associated encoder ship. The specifications of the magnetic rings are as follows:

RL-S-17	31 pole pairs*	1 south pole additionally (rectangular magnet)
RL-D-20	~45 pole pairs*	1 south pole additionally (rectangular magnet)
RL-D-30	~62 pole pairs*	1 south pole additionally (rectangular magnet)
RL-D-50	~92 pole pairs*	1 south pole additionally (rectangular magnet)

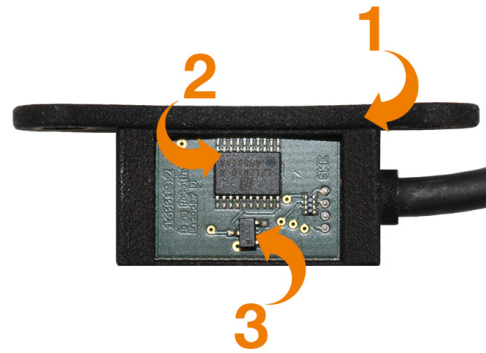
*) In case of the strain wave gear (RL-S-17, 5th axis) a magnetic ring with an exact pole number is used. In our worm gears (RL-D) a magnet band is used which is fixed in radial direction on the output ring of the joint. With these, it is not possible to measure full 360° rotations! The exact number of pole pairs (signals) can vary due to tolerances (variation <1%).

The encoder from Austriamicrosystems (data sheet for download at <http://ams.com/eng/Products/Magnetic-Position-Sensors/Linear-Position/AS5304>) determines 4x40=160 A/B edges per pole pair (quadrature signals).

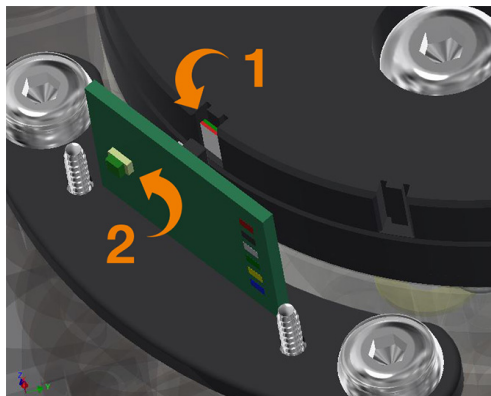
The Hall sensor Honeywell SS343RT is used to reference the system (zero position). As soon as the Hall sensor is triggered by the fitted magnets („south pole“), a green LED lights up (see Fig. 4).



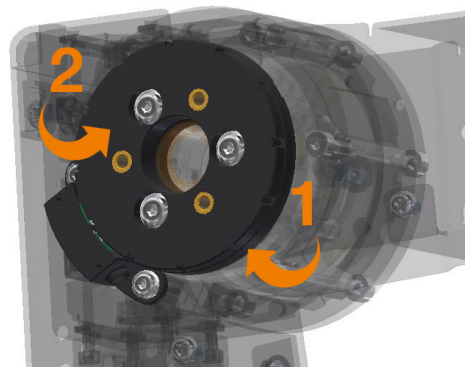
A/B and index signals of the encoder



- 1) Housing (SLS)
- 2) Sensor chip (ALS)
- 3) Hall sensor



- 1) Magnet (0 position)
- 2) LED (green) when Hall sensor active



- 1) Magnetic ring
- 2) Support (SLS)