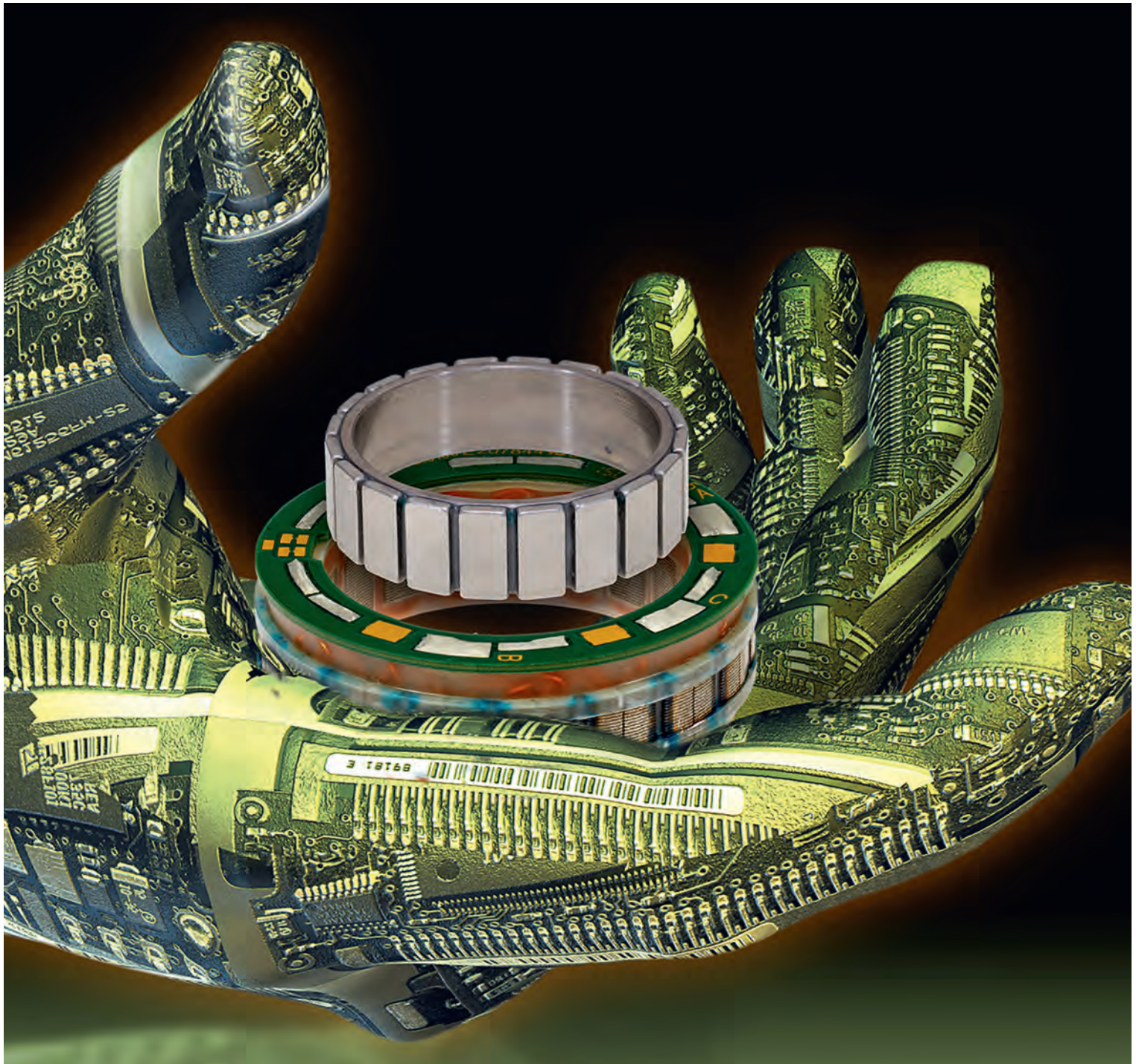


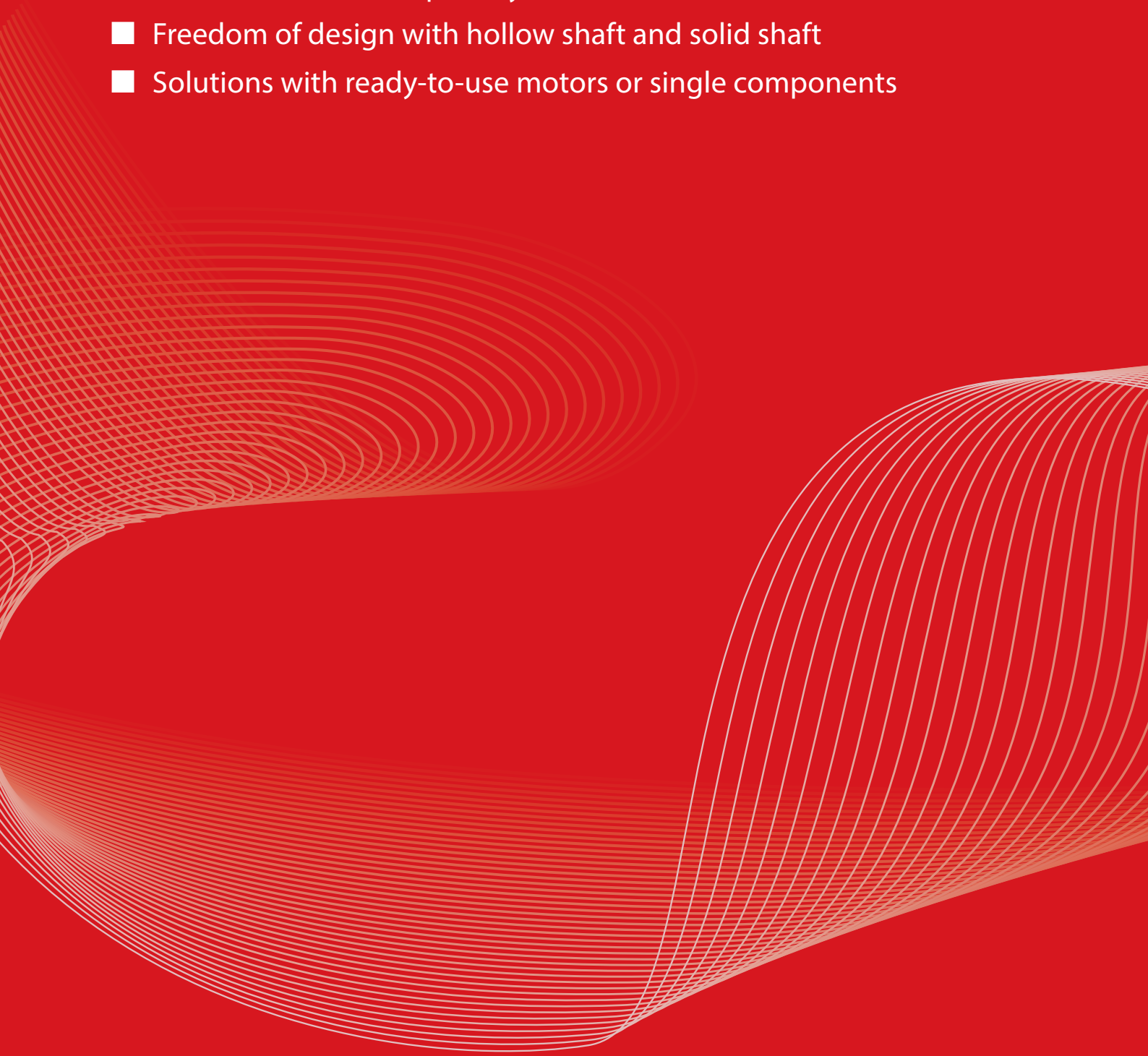


RoboDrive Product Catalogue

Flexible drive solutions



RoboDrive high-torque density and precision drives for next-generation robotic applications

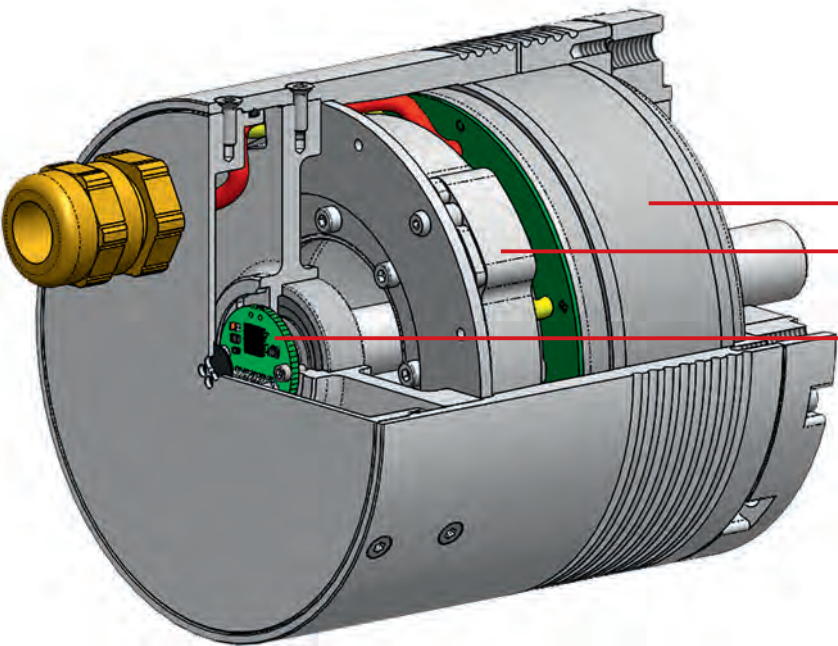
- Excellent torque density: ½ the size of comparable motors
 - Lightweight design: ½ the weight of comparable motors
 - Industry-leading power density
 - Extraordinary dynamics
 - Best positioning accuracy and precise controllability
 - Excellent overload capability
 - Freedom of design with hollow shaft and solid shaft
 - Solutions with ready-to-use motors or single components
- 

Content

TQ-Drives: One Stop Industrial Drive Solutions – Available Components	2
Servo kits ILM	4
Absolute position sensors RD50/70/85-AKSIM.	6
Safety brakes RD50/70/85/115-RSV	8
Servo motors RD25/38-VW	10
Servo motors RD50/70/85-VW	12
Hollow-shaft servo motors RD50/70/85-HW	14
Gear motors RD50/70/85-HD	16
Gear motors RD50/70/85-PG	18
RD115x50-IMD	20
SDB-40-100	22
RoboDrive, a Brand of the TQ-Group	26

TQ-Drives: One Stop Industrial Drive Solutions – Available Components

Solid Shaft Servo Motor
with integrated Safety Brake



Servo

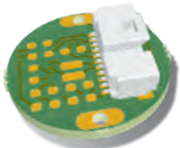


Safety



Absolute

Universal Servo Inverter
with cutting-edge dynamics



(On Axis)

Hollow Shaft Servo Motor with integrated Safety Brake

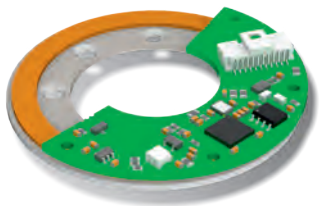
Kit



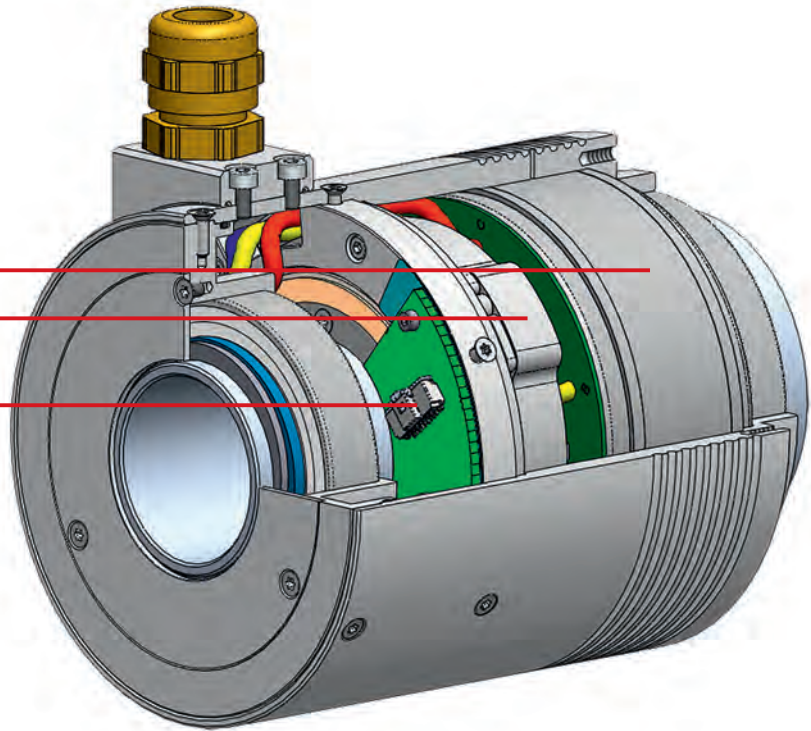
Brake

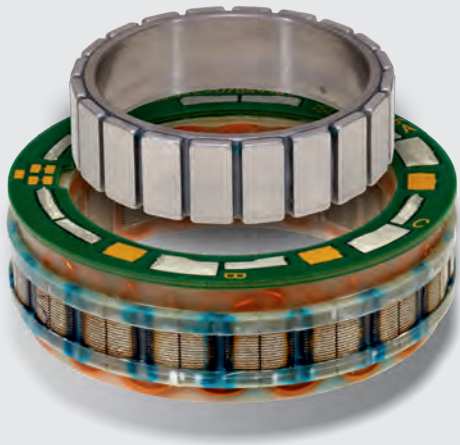


Encoder



(Hollow Shaft)





Servo kits ILM

Structural integrated drive engineering leading to highest power density by maximum degree of freedom in design



With the stator-rotor installation kits of the ILM series RoboDrive offers solutions for structurally integrated drive engineering.

The RoboDrive technology provides the highest power density at maximum torque range and overload capability in a compact design. The flexible concept offers solutions for a variety of demanding drive applications. On request alternative voltage levels and customized torque-speed characteristics can be realized.

The implementation of customer-specific solutions to achieve a compact and thermally optimized design is supported by detailed documentation, engineering services based on the RoboDrive-development expertise.

Key features:

- Frameless motors for highest design flexibility
- Hollow-shaft capability
- Low voltage 12 V - 48 V
- Highest torque density and dynamics due to excellent copper fill factor
- Redundant windings available
- Low thermal losses by concentrated coils
- Thermally optimized actuator design by structural integration and thermally conductive epoxy casting
- Weight and installation space optimized drive system design based on load-profile analysis
- High control quality by high bandwidth and lowest harmonics

Basic data

	ILM 25x 04	ILM 25x 08	ILM 38x 06	ILM 38x 12	ILM 50x 08	ILM 50x 14	ILM 70x 10	ILM 70x 18	ILM 85x 04	ILM 85x 13	ILM 85x 23	ILM 85x 26	ILM 115x 25	ILM 115x 50
Power P [W]	60	60	95	165	155	180	270	275	405	430	410	410	735	760
Rated torque T_r^* [Nm]	0.024	0.048	0.1	0.2	0.27	0.5	0.74	1.25	0.43	1.43	2.3	2.6	5.4	11.2
Peak torque T_{max} at 20% deviation from linearity [Nm]	0.1	0.2	0.4	0.7	0.9	1.4	2.3	4	1.2	4.5	7.3	8.3	12.2	40
Rotation speed n_{max}^{**} at U_r [rpm]	24,000	12,000	9,000	8,000	5,500	3,500	3,500	2,100	9,000	2,900	1,700	1,500	1,300	650
Diameter D [mm]	25	25	38	38	50	50	69	69	85	85	85	85	115	115
Length L [mm]	10.8	15.2	15.3	22.3	16.4	22.8	22.6	30.5	17.6	27.2	37.2	40.7	39	68.4
Weight m [g]	16	29	52	86	86	135	230	340	200	370	550	590	1,200	2,170
Rotor inertia J [kgcm ²]	0.0023	0.004	0.01	0.02	0.049	0.086	0.21	0.34	0.28	0.61	0.98	1.15	3.65	7.90

* When installed in aluminum, highly dependent on installation situation. Nominal operational temperature of the stator: -40°C to 125°C.

** Theoretical no-load rotation speeds at U_r . Variations can arise from operation with different inverters. Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

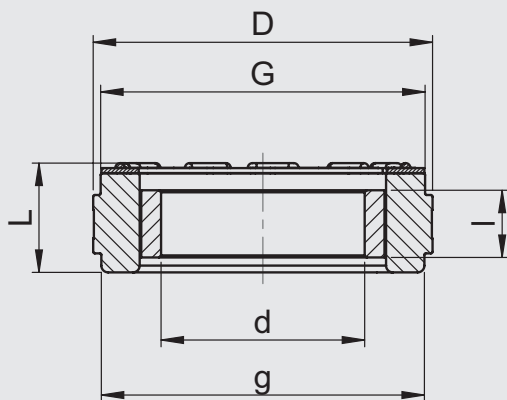
Performance characteristics (interconnection star-serial)

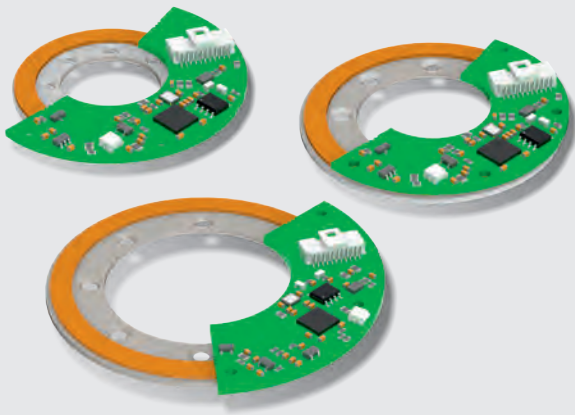
	ILM 25x 04	ILM 25x 08	ILM 38x 06	ILM 38x 12	ILM 50x 08	ILM 50x 14	ILM 70x 10	ILM 70x 18	ILM 85x 04	ILM 85x 13	ILM 85x 23	ILM 85x 26	ILM 115x 25	ILM 115x 50
Rated voltage U_r^* [V]	24	24	24	48	48	48	48	48	48	48	48	48	48	48
Rated current I_r^* [A]	2.8	2.8	5	5	4.8	5	7	7	11	11	11	11	20	20
Copper losses P_{Cu} at T_r and 20°C [W]	4	4	7	9	10	17	18	24	13	20	30	30	38	65
Torque constant k_T^* at 20°C [Nm/A]	0.008	0.016	0.021	0.042	0.057	0.098	0.106	0.180	0.040	0.130	0.210	0.244	0.270	0.560
Motor constant k_M at 20°C [Nm/√W]	0.012	0.023	0.039	0.067	0.084	0.121	0.177	0.255	0.121	0.328	0.426	0.495	0.88	1.41
Terminal resistance R_{TT}^* at 20°C [mΩ]	500	748	363	530	552	800	470	655	138	210	320	323	125	240
Terminal inductance L_{TT}^* [μH]	170	285	250	375	720	820	800	1,350	120	470	890	920	525	1,170
Number of pole pairs	7	7	7	7	10	10	10	10	10	10	10	10	15	15
Max. efficiency η [%]	87	86	88	87	88	87	90	90	92	92	92	91	93	92

* All marked quantities can be adjusted by adapting the interconnection scheme.

Mounting dimensions

	ILM 25x 04	ILM 25x 08	ILM 38x 06	ILM 38x 12	ILM 50x 08	ILM 50x 14	ILM 70x 10	ILM 70x 18	ILM 85x 04	ILM 85x 13	ILM 85x 23	ILM 85x 26	ILM 115x 25	ILM 115x 50
Stator diameter D_{js8} [mm]	25	25	38	38	50	50	69	69	85	85	85	85	115	115
PCB diameter G [mm]	23.8	23.8	36.2	36.2	47.6	47.6	66.8	66.8	82.8	82.8	82.8	82.8	111.8	111.8
Winding head diameter g [mm]	23.8	23.8	36	36	47.6	47.6	66	66	81	81	81	81	110	110
Stator length L [mm]	10.8	15.2	15.3	22.3	16.4	22.8	22.6	30.5	17.6	27.2	37.2	40.7	39.0	68.4
Hollow-shaft diame- ter rotor d H7 [mm]	11.6	11.6	18	18	30	30	42	42	52	52	52	52	74	74
Rotor length l [mm]	6.3	9.7	8.1	16.2	9.9	16.1	12.7	20.7	7.1	15.7	25.1	27.2	27.1	54.2





Absolute position sensors RD50/70/85-AKSIM

Absolute magnetic multiturn encoders with hollow-shaft designed for servo kits ILM

RoboDrive encoders RD-AKSIM provide accurate absolute position data with high resolution to control RD servo motors very precisely and efficiently. Unlike optical position sensors the magnetic sensor ASIC of the RD-AKSIM encoders is robust against dust and dirt. The multiturn cycle information is stored electronically, but will not be updated during motion without power supply to the sensor. The hollow-shaft magnet ring allows to guide signals, media and fluids, rays and cable through the sensor. With less than 10 mm axial length the sensor system with its off-axis reading head was designed for integration into space-constrained applications.

RD-AKSIM encoders are available in three sizes and have been designed to fit geometrically to the corresponding RoboDrive servo kits and safety brakes to allow the design of entire actuators and joints.



Key features:

- Hollow-shaft capability
- Flat off-axis system for space-constrained applications
- Singleturn resolution up to 262,144 incs/rev (18 bit)
- Multiturn resolution 65,536 revs (16 bit)
- Absolute accuracy $\pm 0.1^\circ$, repeatability 0.002° , no hysteresis
- High speed operation up to 10,000 rpm
- Differential BiSS-C interface (update rate 28 kHz)
- Sampling rate 18 kHz
- Dimensions adapted to corresponding RoboDrive servo kits

Basic data

	RD50-AKSIM	RD70-AKSIM	RD85-AKSIM
Singleturn resolution [incs/rev]	131,072 (17 bit)	262,144 (18 bit)	262,144 (18 bit)
Multiturn resolution [revs]	65,536 (16 bit)	65,536 (16 bit)	65,536 (16 bit)
Accuracy [deg]	± 0.1	± 0.1	± 0.1
Repeatability [deg]	0.0027	0.0014	0.0014
Sampling rate f_s [kHz]	18	18	18
Maximum rotation speed n_{max} [rpm]	10,000	7,000	6,000
Maximum acceleration a_{max} [rad/s ²]	80,000	60,000	40,000
Sensor PCB diameter D [mm]	54	74	89
Sensor length L [mm]	9.2	9.2	9.2
Weight m [g]	13.2	19.8	26.0
Inertia J [kgcm ²]	0.022	0.070	0.141

Operational temperature range -30°C to +105°C.

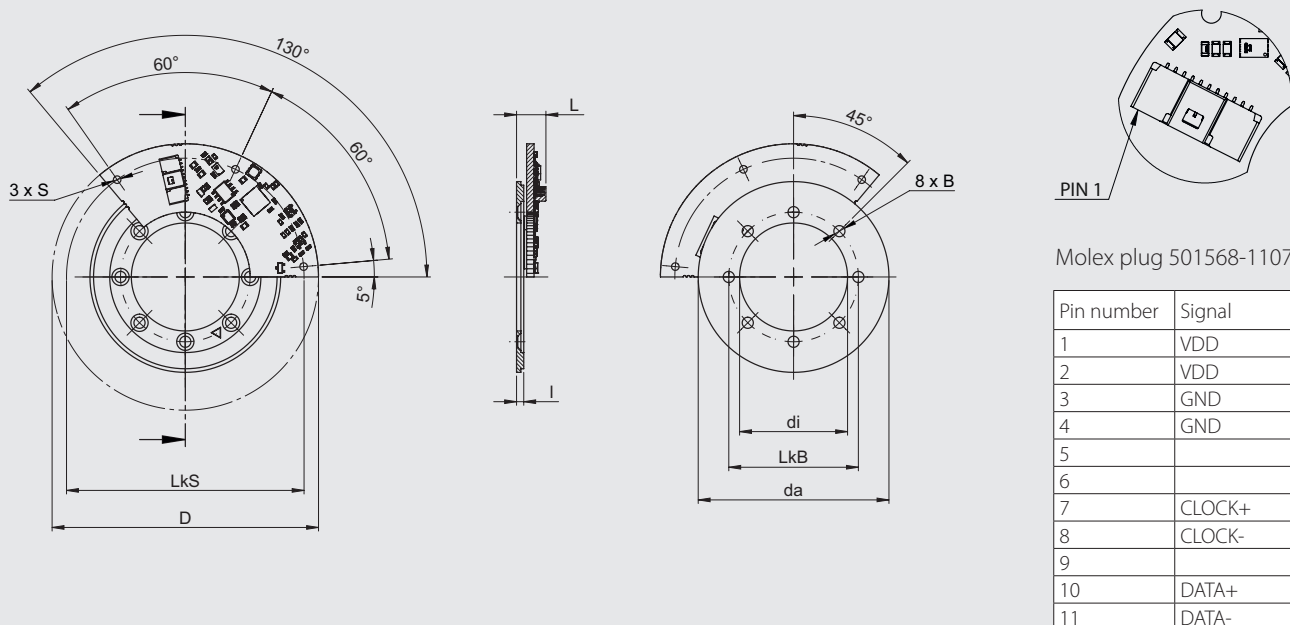
Electrical data and digital interface

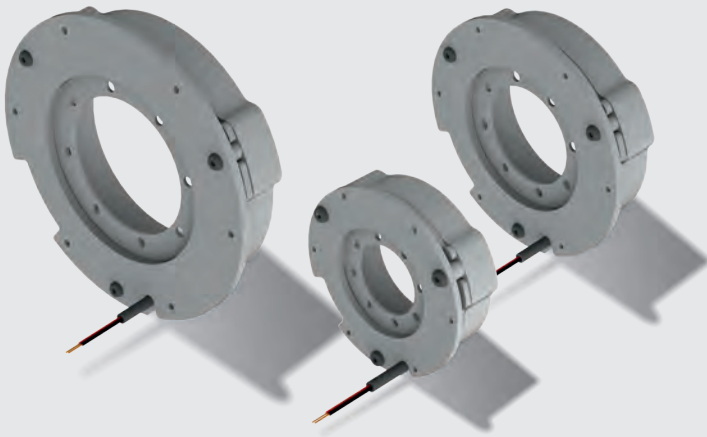
	RD50-AKSIM	RD70-AKSIM	RD85-AKSIM
Supply voltage U_{dd} [V]	5	5	5
Supply current I_{dd} [mA]	150	150	150
Communication interface*	BISS-C differential	BISS-C differential	BISS-C differential
Max. master clock frequency f_{cl} [MHz]	3	3	3
CRC bits number	0 ... 5	0 ... 5	0 ... 5
Warning bit number	6	6	6
Error bit number	7	7	7
Logic of warning and error bit	Active low	Active low	Active low
Position LSB number	8	8	8
Singleturn position data number	8 ... 24	8 ... 25	8 ... 25
Multiturn position data number	25 ... 40	26 ... 41	26 ... 41
Protocol total bits	41	42	42

* SSI, SPI, PWM, I2C, asynchronous serial communication interfaces can be realized on request.

Dimensions

	RD50-AKSIM	RD70-AKSIM	RD85-AKSIM
Sensor PCB diameter D [mm]	54	74	89
Sensor length L [mm]	9.2	9.2	9.2
Sensor ring diameter d_a [mm]	39	53	64
Hollow-shaft diameter d_i [mm]	20	30	40
Sensor ring length l [mm]	2	2	2
Pitch circle diameter LkS/LkB [mm]	49/25	66/36	80/46
Mounting hole S/B [mm]	2.1/2.5	2.1/3.1	2.1/3.1





Safety brakes RD50/70/85/115-RSV

Light-weight safety brakes with hollow-shaft
designed for servo kits ILM



RoboDrive safety brakes RD-RSV allow the design of compact and light-weight actuators and robotic joints. The brakes stop motion and keep position reliable and safe in case of power switch-off or emergency stop events. The hollow-shaft design of the brakes allows to guide signals, media and fluids, rays and cable through the brake.

The spring applied, electromagnetic safety brakes are available in four sizes and two braking torques for each size matching the nominal torque of the corresponding RoboDrive servo kit.

In applications combined with gearheads assured maximal braking torque levels protect gears from overload. The low power consumption and heat dissipation fit perfectly to the motor performance.

Key features:

- Hollow-shaft capability
- Light-weight design
- Low power consumption and heat dissipation
- Fail-safe in case of power loss
- Narrow braking torque tolerances
- Dimensions and braking torques match corresponding RoboDrive servo kits

Basic data

	RD50-RSV50		RD70-RSV60		RD85-RSV80		RD115-RSV100	
Nominal braking torque T_{Br}^* [Nm]	0.30	0.60	0.84	1.44	1.68	3.12	6.8	13.4
Maximum braking torque $T_{B,max}^*$ [Nm]	0.75	1.50	2.10	3.60	4.20	7.80	17.0	33.5
Maximum rotation speed n_{max} [rpm]	10,000	7,000	7,000	4,400	6,000	3,800	1,500	1,000
Brake diameter D [mm]	53.4		72.4		88.4		118.4	
Brake length L [mm]	15.9		17.9		17.9		26	
Weight m [g]	110		210		300		820	
Inertia J [kgmm ²]	2.10		6.95		18.6		98.6	

* Braking torque can be adapted on request. Given values for the two standard configurations are valid for a operational temperature range of +5°C to +80°C. Maximum temperature: 130°C.

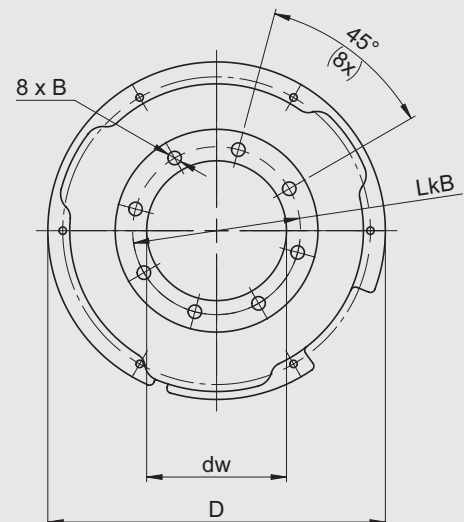
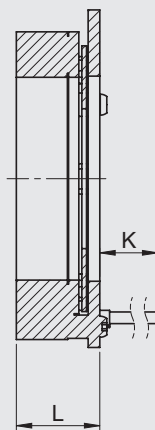
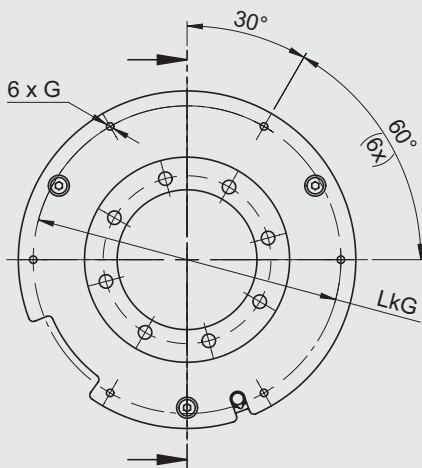
Electrical data

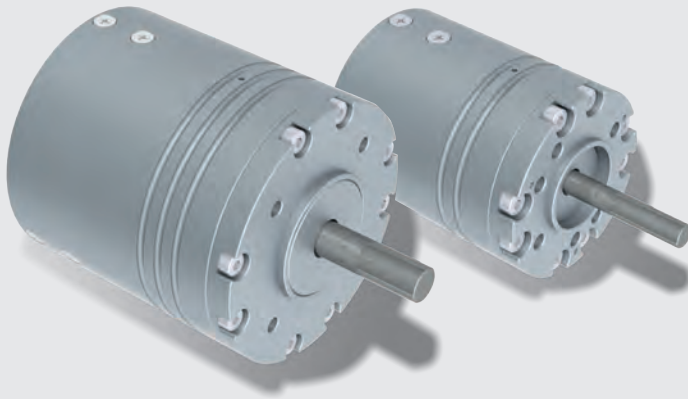
	RD50-RSV50	RD70-RSV60	RD85-RSV80	RD115-RSV100
Rated voltage U_{Br}^* [V]	8	8	8	8
Rated current I_{Br}^* [A]	0.31	0.46	0.63	1.20
Thermal losses $P_{B,L}$ at U_{Br} [W]	2.6	3.7	5.0	9.8
Overexcitation voltage U_{Bo}^* [V]	24	24	24	24
Overexcitation current I_{Bo}^* [A]	0.94	1.37	1.90	3.70
Thermal losses P_{Bo} at U_{Bo} [W]	23.4	33.4	45.0	88.2
Overexcitation time t_{Bo} [ms]	40	40	40	100
Coil resistance R_B [Ω]	25.48	17.52	12.70	6.50

* Adaption of voltage level can be realized on request.

Dimensions

	RD50-RSV50	RD70-RSV60	RD85-RSV80	RD115-RSV100
Brake diameter D [mm]	53.4	72.4	88.4	118.4
Brake length L [mm]	15.9	17.9	17.9	26.0
Hollow-shaft diameter dw [mm]	20	30	40	60
Pitch circle diameter LkG/LkB [mm]	49/25	66/36	80/46	108/67
Mounting thread G/ Hole B [mm]	M2/2.4	M2.5/2.9	M2.5/2.9	M3/3.4
Cable length K [mm]	250	250	250	250





Servo motors RD25/38-VW

Compact drive units with industry-leading power density and a wide range of applications



With the servo motors RD25 and RD38 RoboDrive presents high-performance motors based on the well-established stator-rotor kits. The RoboDrive technology provides the highest power density at maximum torque range and overload capability in a compact design. The integrated absolute encoder enables high positioning accuracy and excellent speed stability. The design of the mounting flange allows the motors to be combined with the gearheads of the leading precision gear manufacturers.

On request, the motors are delivered with gearheads from Gysin, Maxon and Neugart.

Key features:

- Industry-leading power density
- Excellent overload capability
- Compact design
- Absolute Sin-Cos encoder, accuracy $\pm 0.5^\circ$
- Prepared for gearheads of Maxon, Gysin and Neugart

Basic data

	RD25x04-VW	RD25x08-VW	RD38x06-VW	RD38x12-VW
Power P [W]	60	60	95	165
Rated torque T_r [Nm]	0.024	0.048	0.10	0.20
Peak torque T_{max} [Nm]	0.1	0.2	0.4	0.7
Rotation speed n_{max}^* at U_r [rpm]	24,000	12,000	9,000	8,000
Motor diameter D [mm]	32	32	45	45
Motor length L [mm]	35.7	40.1	41	48
Weight m [g]	75	90	170	215
Inertia J [kgcm ²]	0.0028	0.0041	0.0135	0.0235

* Theoretical no-load rotation speeds at $U_r = 24$ V (RD38x12-VW $U_r = 48$ V). Variations can arise from operation with different inverters. Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

Electrical data

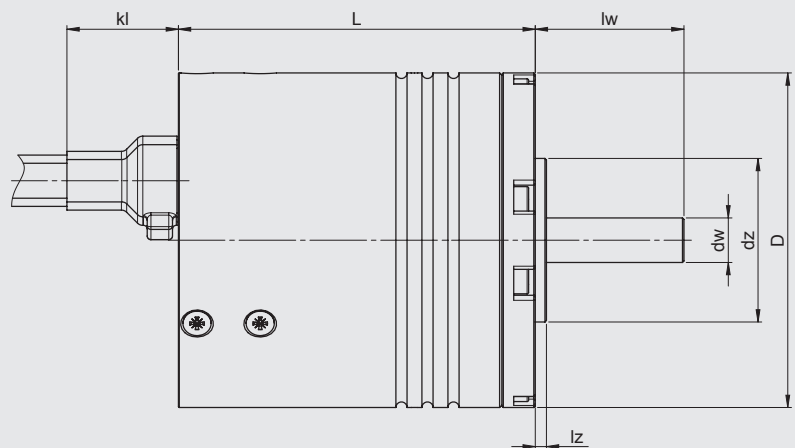
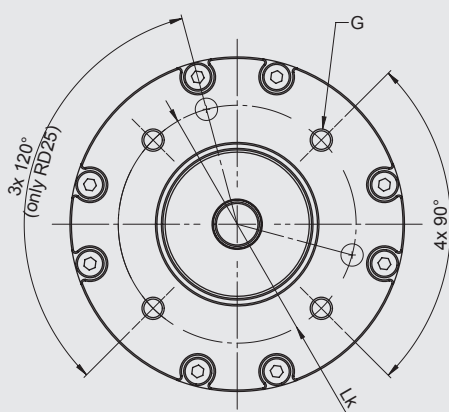
	RD25x04-VW	RD25x08-VW	RD38x06-VW	RD38x12-VW
Rated voltage U_r [V]	24	24	24	48
Rated current I_r [A]	2.8	2.8	5.0	5.0
Torque constant k_T [Nm/A]	0.008	0.016	0.021	0,042
Terminal resistance R_{TT} [mΩ]	500	748	363	530
Terminal inductance L_{TT} [μH]	170	285	250	375
Number of pole pairs	7	7	7	7
Sensor type*	Magnetic encoder, differential Sin-Cos-signal, signal amplitude $1 V_{pp}$, signal offset $U_{dd}/2$, accuracy $\pm 0.5^\circ$, supply voltage $U_{dd} = 5 V$			

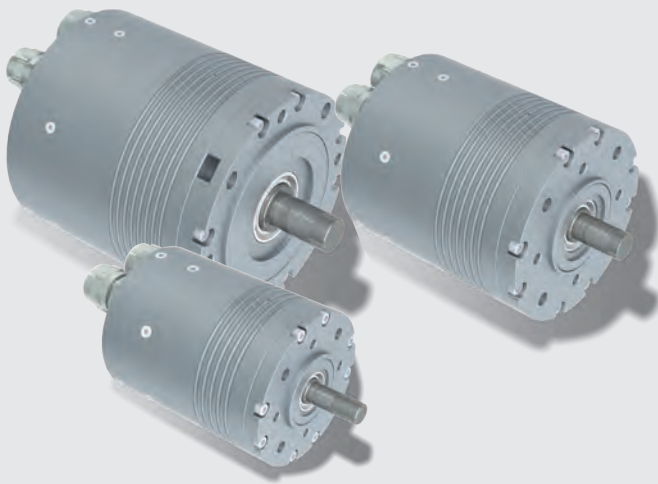
All data relate to star-serial interconnection at U_r . The voltage level can be changed on request.

* SSI, linear voltage, absolute parallel or incremental RS422 communication interface with resolution up to 8,192 inc/rev are available on request.

Dimensions

	RD25x04-VW	RD25x08-VW	RD38x06-VW	RD38x12-VW
Motor diameter D [mm]	32	32	45	45
Motor length L [mm]	35.7	40.1	41	48
Shaft diameter d_w [mm]	4 h6	4 h6	6 h6	6 h6
Shaft length l_w [mm]	20	20	20	20
Centering diameter d_z [mm]	16 j6	16 j6	22 j6	22 j6
Centering length l_z [mm]	1.2	1.2	1.5	1.5
Pitch circle L_k [mm]	22	22	32	32
Mounting thread G [metric]	M3 4x90° + 3x120°	M3 4x90° + 3x120°	M3 4x90°	M3 4x90°
Shrink hose length kl [mm]	12.2	12.2	15	15





Servo motors RD50/70/85-VW

Compact drive units with industry-leading power density and a wide range of applications



With the servo motors of the RD series RoboDrive presents high-performance motors based on the well-established stator-rotor kits. The RoboDrive technology provides the highest power density at maximum torque range and overload capability in a compact design. The variable concept offers solutions for a variety of demanding drive applications. On request alternative voltage levels, increased speeds and integrated safety brakes are available.

The integrated absolute encoder enables high positioning accuracy and excellent speed stability.

The design of the mounting flange allows the motors to be combined with the gear units of the leading gear manufacturers.

On request the motors are delivered with gear units of Neugart, Wittenstein, Spinea and Harmonic Drive.

Key features:

- Industry-leading power density
- Excellent overload capability
- Compact design
- Absolute Sin-Cos encoder, accuracy $\pm 0.5^\circ$
- Integrated safety brake
- Mounting flange based on B5/B14 standard
- Customized flange available
- Installation space savings by optional gearhead direct mounting

Basic data

	RD50x08-VW	RD50x14-VW	RD70x10-VW	RD70x18-VW	RD85x13-VW	RD85x26-VW
Power P [W]	155	180	270	275	430	410
Rated torque T_r [Nm]	0.27	0.50	0.74	1.25	1.43	2.60
Peak torque T_{max} [Nm]	0.9	1.4	2.3	4.0	4.5	8.3
Rotation speed n_{max}^* at U_r [rpm]	5,500	3,500	3,500	2,100	2,900	1,500
Motor diameter D [mm]	61	61	80	80	96	96
Motor length L [mm] w/o brake with brake	54.3 70.1	60.7 76.5	63.5 81.4	71.4 89.3	70.3 88.2	83.7 101.6
Weight m [g] w/o brake with brake	430 595	495 660	870 1,150	995 1,280	1,300 1,700	1,630 2,040
Inertia J [kgcm ²] w/o brake with brake	0.07 0.11	0.11 0.15	0.29 0.43	0.42 0.56	0.82 1.15	1.36 1.69

* Theoretical no-load rotation speeds at $U_r = 48$ V. Variations can arise from operation with different inverters.
Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

Electrical data

	RD50x08-VW	RD50x14-VW	RD70x10-VW	RD70x18-VW	RD85x13-VW	RD85x26-VW
Rated voltage U_r [V]	48	48	48	48	48	48
Rated current I_r [A]	4.8	5.0	7.0	7.0	11.0	11.0
Torque constant k_T [Nm/A]	0.057	0.098	0.106	0.180	0.130	0.244
Terminal resistance R_{TT} [mΩ]	552	800	470	655	210	323
Terminal inductance L_{TT} [μH]	720	820	800	1,350	470	920
Number of pole pairs	10	10	10	10	10	10
Sensor type*	Magnetic encoder, differential Sin-Cos-signal, signal amplitude $1 V_{pp}$, signal offset $U_{dd}/2$, accuracy $\pm 0.5^\circ$, supply voltage $U_{dd} = 5 V$					

All data relate to star-serial interconnection at $U_r = 48 V$. The voltage level can be adapted on request.

* SSI, linear voltage, absolute parallel or incremental RS422 communication interface with resolution up to 8,192 inc/rev are available on request.

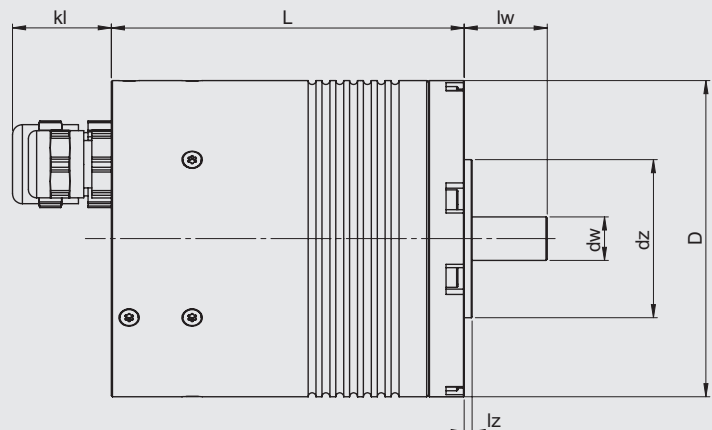
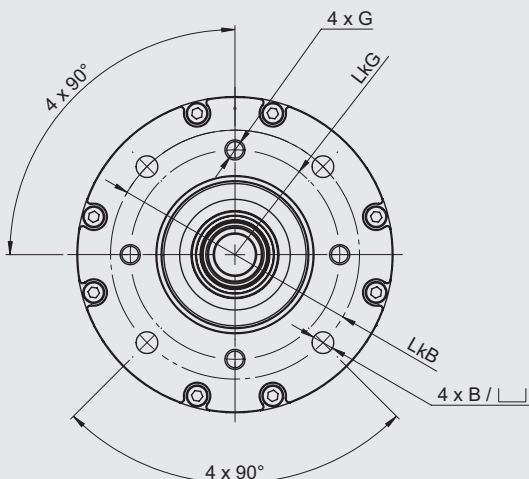
Safety brake data

	RD50x08-VW	RD50x14-VW	RD70x10-VW	RD70x18-VW	RD85x13-VW	RD85x26-VW
Braking torque $T_{Br}/T_{Br,max}$ [Nm]	0.30/0.75	0.60/1.50	0.84/2.10	1.44/3.60	1.68/4.20	3.12/7.80
Thermal losses $P_{B,L}$ at U_{Br} [W]	2.6	2.6	3.7	3.7	5.0	5.0

All brakes are operated with a rated voltage of $U_{Br} = 8 V$, to open the brake an over-excitation voltage of 24 V is required. Adaption of voltage level can be realized on request.

Dimensions

	RD50x08-VW	RD50x14-VW	RD70x10-VW	RD70x18-VW	RD85x13-VW	RD85x26-VW
Motor diameter D [mm]	61	61	80	80	96	96
Motor length L [mm] w/o brake with brake	54.3 70.1	60.7 76.5	63.5 81.4	71.4 89.3	70.3 88.2	83.7 101.6
Shaft diameter d_w [mm]	8 j6	8 j6	11 j6	11 j6	14 j6	14 j6
Shaft length l_w [mm]	22	22	21	21	27	27
Centering diameter d_z [mm]	30 j6	30 j6	40 j6	40 j6	70 j6	70 j6
Centering length l_z [mm]	2	2	2	2	2	2
Pitch circle LkG/LkB [mm]	40/46	40/46	53/63	53/63	85/85	85/85
Mounting thread G/Hole B [mm]	M4/4.5	M4/4.5	M5/5.5	M5/5.5	M6/6.6	M6/6.6
Cable gland length kl [mm]	21	21	25	25	25	25





Hollow-shaft servo motors RD50/70/85-HW



Compact hollow-shaft drives with industry-leading power density and a wide range of applications

With the hollow shaft servo motors of the RD series RoboDrive presents high-performance motors based on the well-established stator-rotor kits. The RoboDrive technology provides the highest power density at maximum torque range and overload capability with a maximized hollow-shaft diameter in a compact design. The hollow shaft design allows to guide signals, media and fluids, rays, and cables through the motor. The integration of gear elements, spindle nuts or optics and serial actuators expands the field of applications. The integrated absolute encoder enables high positioning accuracy and excellent speed stability. The variable concept offers solutions for a variety of demanding drive applications. On request alternative voltage levels, increased speeds, customized torque adaptations and integrated hollow-shaft safety brakes can be realized.

Key features:

- Hollow-shaft
- Industry-leading power density
- Excellent overload capability
- Compact design
- Absolute multiturn encoder with high resolution
- Integration of hollow-shaft safety brake possible

Basic data

	RD50x08-HW	RD50x14-HW	RD70x10-HW	RD70x18-HW	RD85x13-HW	RD85x26-HW
Power P [W]	155	180	270	275	430	410
Rated torque T_r [Nm]	0.27	0.50	0.74	1.25	1.43	2.60
Peak torque T_{max} [Nm]	0.9	1.4	2.3	4.0	4.5	8.3
Rotation speed n_{max} * at U_r [rpm]	5,500	3,500	3,500	2,100	2,900	1,500
Motor diameter D [mm]	61	61	80	80	96	96
Motor length L [mm] w/o brake with brake	57.8 73.6	64.2 80	71.2 89.1	79.1 97	75.5 93.4	88.9 106.8
Weight m [g] w/o brake with brake	465 620	530 685	820 1,100	960 1,250	1,300 1,690	1,650 2,050
Inertia J [kgcm ²] w/o brake with brake	0.22 0.25	0.26 0.30	0.78 0.90	0.94 1.06	2.15 2.45	2.76 3.06

* Theoretical no-load rotation speeds at $U_r = 48$ V. Variations can arise from operation with different inverters. Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

Electrical data

	RD50x08-HW	RD50x14-HW	RD70x10-HW	RD70x18-HW	RD85x13-HW	RD85x26-HW
Rated voltage U_r [V]	48	48	48	48	48	48
Rated current I_r [A]	4.8	5.0	7.0	7.0	11.0	11.0
Torque constant k_T [Nm/A]	0.057	0.098	0.106	0.180	0.130	0.244
Terminal resistance R_{TT} [mΩ]	552	800	470	655	210	323
Terminal inductance L_{TT} [μH]	720	820	800	1,350	470	920
Number of pole pairs	10	10	10	10	10	10
Sensor type*	Magnetic encoder, BiSS-C differential, accuracy $\pm 0.1^\circ$, supply voltage $U_{dd} = 5V$					
Resolution singleturn [incs/rev]/multiturn [revs]	131,072 (17 bit)/65,536 (16 bit)		262,144 (18 bit)/65,536 (16 bit)		262,144 (18 bit)/65,536 (16 bit)	

All data relate to star-serial interconnection at $U_r = 48V$. The voltage level can be adapted on request.

* SSI, SPI, PWM, I2C, asynchronous serial communication interfaces can be realized on request.

Safety brake data

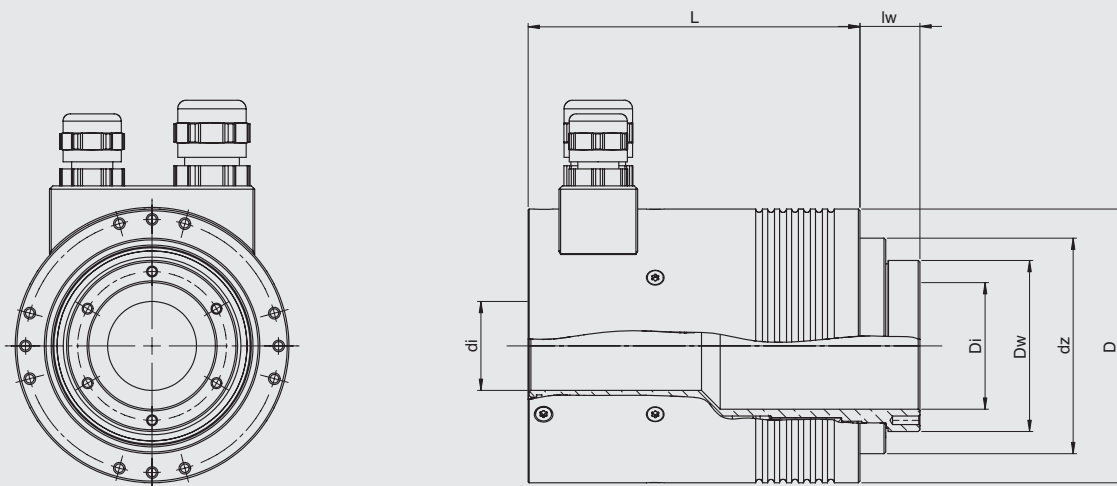
	RD50x08-HW	RD50x14-HW	RD70x10-HW	RD70x18-HW	RD85x13-HW	RD85x26-HW
Braking torque $T_{Br}/T_{B,max}$ [Nm]	0.30/0.75	0.60/1.50	0.84/2.10	1.44/3.60	1.68/4.20	3.12/7.80
Thermal losses P_{BL} at U_{Br} [W]	2.6	2.6	3.7	3.7	5.0	5.0

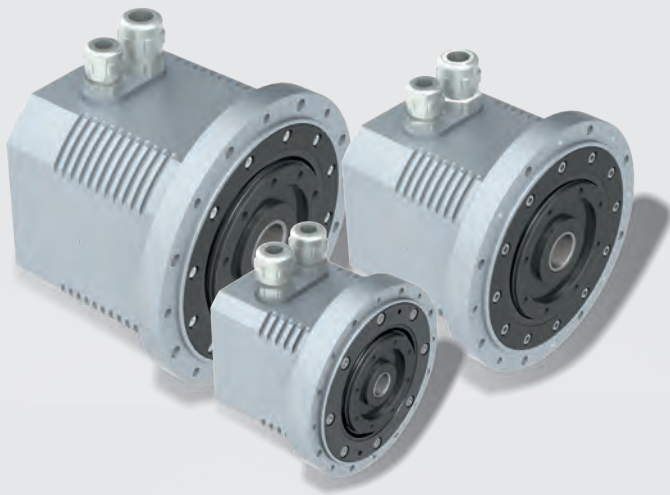
All brakes are operated with a rated voltage of $U_{Br} = 8V$, to open the brake an over-excitation voltage of 24V is required.

Adaption of voltage level can be realized on request.

Dimensions

	RD50x08-HW	RD50x14-HW	RD70x10-HW	RD70x18-HW	RD85x13-HW	RD85x26-HW
Motor diameter D [mm]	61	61	80	80	96	96
Motor length L [mm] w/o brake with brake	57.8 73.6	64.2 80	71.2 89.1	79.1 97	75.5 93.4	88.9 106.8
Shaft diameter D_w [mm]	38 g6	38 g6	50 g6	50 g6	62 g6	62 g6
Hollow-shaft diameter D_i [mm]	26.5 H6	26.5 H6	37 H6	37 H6	47.5 H6	47.5 H6
Hollow-shaft diameter d_i [mm]	17	17	26	26	35	35
Shaft length l_w [mm]	16.7	16.7	17.5	17.5	19.7	19.7
Centering diameter d_z [mm]	51 g6	51 g6	63 g6	63 g6	79 g6	79 g6





Gear motors RD50/70/85-HD

Compact actuators for high precision and backlash-free drives in industry and robotics



The geared motors of the RD-HD series are high-torque and high-precision servo solutions with hollow-shaft for low-voltage applications. The technology from Harmonic Drive uniquely combines highest precision and zero backlash in a compact lightweight design. RoboDrive technology allows Harmonic Drive gears to be operated at their peak performance.

Due to the outstanding dynamics of the RoboDrive motors and the very low gear elasticity and inertia it is possible to precisely control the powertrain. This allows the geared motors RD-HD to be used successfully in robotics, handling and automation, medical and optical applications.

On request other sizes and types of Harmonic Drive gears are delivered with matching motors.

Key features:

- Hollow-shaft
- Industry-leading power density
- Excellent torque density and positioning accuracy
- Absolute multiturn encoder with high resolution
- Very compact and lightweight design
- Integration of hollow-shaft safety brake possible

Basic data

	RD50x08-HD	RD70x10-HD	RD85x13-HD
Power P [W]	155	270	430
Rated output torque T_r [Nm]	7.8	40.0	67.0
Peak output torque T_{max} [Nm]	28	92	176
Collision torque T_{col} [Nm]	54	147	304
Output speed n_{max}^* at U_r [rpm]	55	22	18
Gear ratio **	1:100	1:160	1:160
Diameter D [mm]	61	80	96
Length L [mm]	54.3	63.5	70.3
Weight m [g]	890	2,600	3,650

* Theoretical no-load rotation speeds at $U_r = 48$ V. Variations can arise from operation with different inverters.

Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

** Other gear ratios are available on request.

Electrical data

	RD50x08-HD	RD70x10-HD	RD85x13-HD
Rated voltage U_r [V]	48	48	48
Rated current I_r [A]	1.95	3.37	4.60
Torque constant k_T [Nm/A]	0.057	0.106	0.130
Terminal resistance R_{TT} [mΩ]	552	470	210
Terminal inductance L_{TT} [μH]	720	800	470
Number of pole pairs	10	10	10
Sensor type*	Magnetic encoder, BiSS-C differential, accuracy $\pm 0.1^\circ$, supply voltage $U_{dd} = 5\text{ V}$		
Resolution singleturn [incs/rev]/ multiturn [revs]	131,072 (17 bit)/ 65,536 (16 bit)	262,144 (18 bit)/ 65,536 (16 bit)	262,144 (18 bit)/ 65,536 (16 bit)

All data relate to star-serial interconnection at $U_r = 48\text{ V}$. The voltage can be adapted on request.

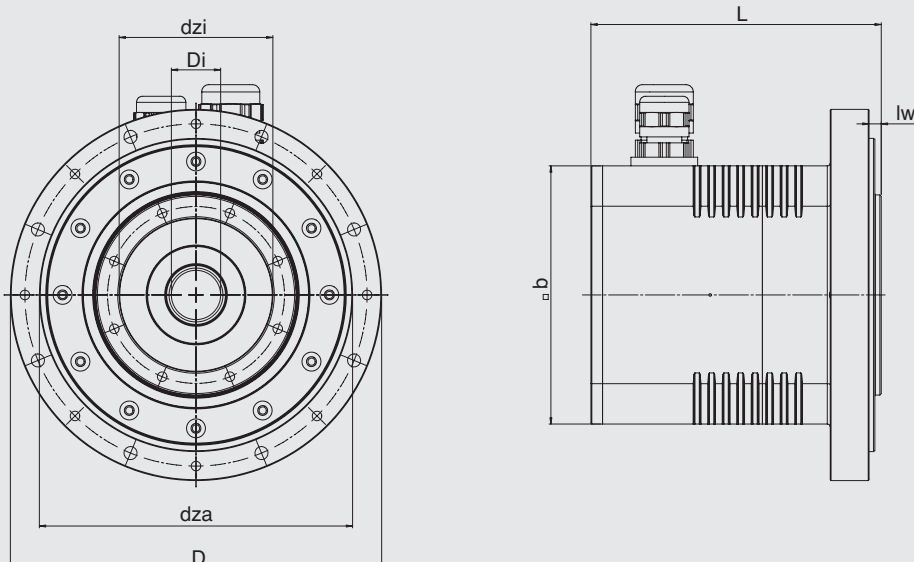
* SSI, SPI, PWM, I2C, asynchronous serial communication interfaces can be realized on request.

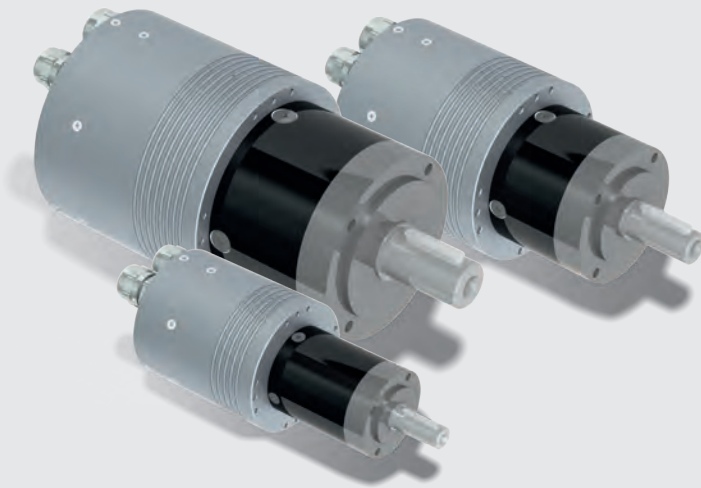
Gear data

	RD50x08-HD	RD70x10-HD	RD85x13-HD
Type	CPL-14A-100-2A	CPL-20A-160-2A	CPL-25A-160-2A
Torsional stiffness [Nm/arcmin]	1.0	8.4	16.6
Lost motion [arcmin]	< 1	< 1	< 1
Max. tilting torque [Nm]	205	230	277

Dimensions

	RD50x08-HD	RD70x10-HD	RD85x13-HD
Diameter D [mm]	97	128	141
Motor length L [mm]	77.6	99.8	111.3
Edge length b [mm]	66	89	103.5
Centering shaft diameter dzi [mm]	35 H6	53 H6	58 H7
Hollow-shaft diameter Di [mm]	10.5	17	21
Shaft length lw [mm]	4.2	4.2	5
Centering diameter dza [mm]	83 h6	108 h6	118 h6





Gear motors RD50/70/85-PG

Compact drive units with industry-leading power density and a wide range of applications



The planetary motor gear units RD-PG provide a standardized drive solution with the powerful gearheads from Neugart. Depending on the number of stages the transmission ratio ranges from 1:3 to 1:512.

The gear units have a minimal, inherent backlash. RoboDrive technology allows the performance features of the gearheads to be exploited to their full extent in both: speed and torque.

On request alternative voltage levels, increased speeds and optional integrated safety brakes can be realized.

Planetary gearheads from other well-known manufacturers like Gysin or Maxon can be integrated.

Key features:

- Industry-leading power density
- Compact design
- Absolute Sin-Cos encoder, accuracy $\pm 0,5^\circ$
- Integrated safety brake optional
- Wide range of transmission ratios: $i=1:3, \dots, 512$
- Minimum backlash
- High output torque
- Flexible mounting on gear or housing flange

Basic data

Gear motor with single stage PLE-gear $i = 1:8$

	RD50x08-PG	RD50x14-PG	RD70x10-PG	RD70x18-PG	RD85x13-PG	RD85x26-PG
Power P [W]	155	180	270	275	430	410
Rated output torque T_r [Nm]	2.1	3.9	5.7	9.7	11.1	20.2
Peak output torque T_{max} [Nm]	7.0	10.0	17.8	29.0	34.9	64.0
Output speed n_{max}^* at U_r [rpm]	690	440	440	260	360	190
Gear ratio **	1:8	1:8	1:8	1:8	1:8	1:8
Motor diameter D [mm]	61	61	80	80	96	96
Total length w/o brake [mm]	87.3	93.7	101.5	109.4	118.8	132.2
with brake [mm]	103.1	109.5	119.4	127.3	136.7	150.1
Weight m w/o brake [g]	645	710	1,385	1,510	2,495	2,825
with brake [g]	810	875	1,665	1,895	2,895	3,235

* Theoretical no-load rotation speeds at $U_r = 48$ V. Variations can arise from operation with different inverters.

Higher rotation speeds or change of the voltage level can be achieved by adapting the interconnection scheme.

** Other gear ratios are available on request. For gearbox selection. see: <http://www.neugart.de/index.php/us/Produkte/Standardgetriebe>

Electrical data

	RD50x08-PG	RD50x14-PG	RD70x10-PG	RD70x18-PG	RD85x13-PG	RD85x26-PG
Rated voltage U_r [V]	48	48	48	48	48	48
Rated current I_r [A]	4.8	5.0	7.0	7.0	11.0	11.0
Torque constant k_T [Nm/A]	0.057	0.098	0.106	0.180	0.130	0.244
Terminal resistance R_{TT} [mΩ]	552	800	470	655	210	323
Terminal inductance L_{TT} [μH]	720	820	800	1,350	470	920
Number of pole pairs	10	10	10	10	10	10
Sensor type*	Magnetic encoder, differential Sin-Cos-signal, signal amplitude $1 V_{pp}$, signal offset $U_{dd}/2$, accuracy $\pm 0.5^\circ$, supply voltage $U_{dd} = 5 V$					

All data relate to star-serial interconnection at $U_r = 48 V$. The voltage level can be adapted on request.

* SSI, linear voltage, absolute parallel or incremental RS422 communication interface with resolution up to 8,192 inc/rev are available on request.

Safety brake data

	RD50x08-PG	RD50x14-PG	RD70x10-PG	RD70x18-PG	RD85x13-PG	RD85x26-PG
Braking torque $M_{Br}/M_{Br,max}$ [Nm]	0.30/0.75	0.60/1.50	0.84/2.10	1.44/3.60	1.68/4.20	3.12/7.80
Thermal losses P_{Bl} at U_{Br} [W]	2.6	2.6	3.7	3.7	5.0	5.0

All brakes are operated with a rated voltage of $U_{Br} = 8 V$, to open the brake an over-excitation voltage of 24 V is required.

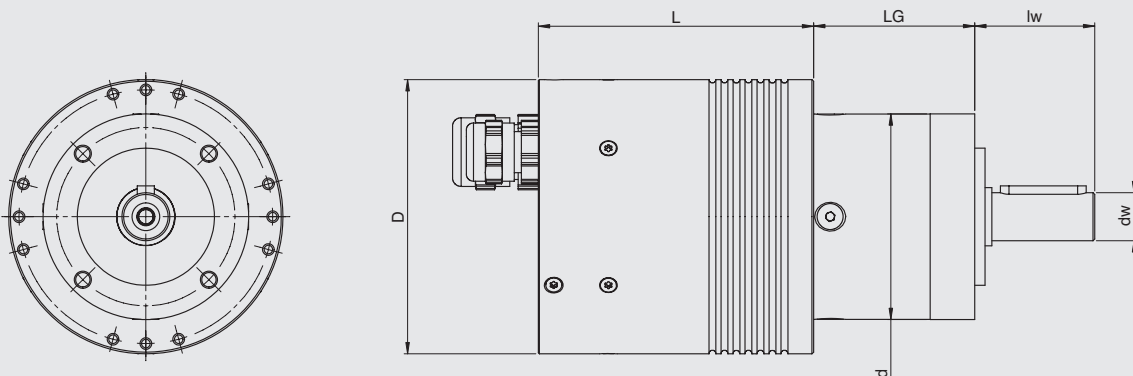
Adaption of voltage level can be realized on request.

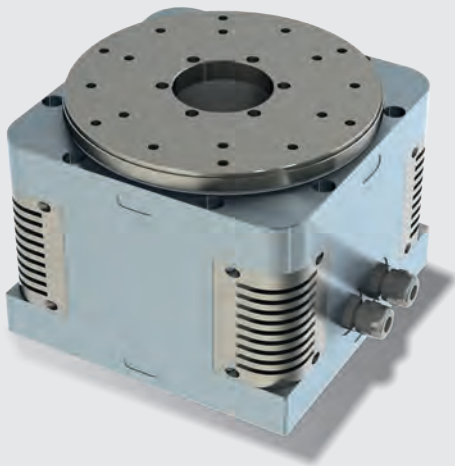
Gear data

	RD50x08-PG/RD50x14-PG	RD70x10-PG/RD70x18-PG	RD85x13-PG/RD85x26-PG
Type	PLE040	PLE060	PLE080
Torsional stiffness [Nm/arcmin]	1.0	2.3	5.8
Backlash [arcmin] 1/2/3 stages	< 15/< 19/< 22	< 10/ < 12/< 15	< 7/< 9/< 11

Dimensions

	RD50x08-PG	RD50x14-PG	RD70x10-PG	RD70x18-PG	RD85x13-PG	RD85x26-PG
Motor diameter D [mm]	61	61	80	80	96	96
Motor length L [mm] w/o brake with brake	48.3 64.1	54.7 70.5	54.5 72.4	62.4 80.3	58.8 76.7	72.2 90.1
Gearbox diameter d [mm]	40	40	60	60	80	80
Gearbox length LG [mm] 1/2/3 stages	39/52/64.5	39/52/64.5	47/59.5/72	47/59.5/72	60/77.5/95	60/77.5/95
Shaft diameter dw [mm]	10 h7	10 h7	14 h7	14 h7	20 h7	20 h7
Shaft length lw [mm]	26	26	35	35	40	40





RD1 15x50-IMD

New dimensions in the field of compact drive motors

With the integrated motor device RD115x50-IMD new levels in the field of compact direct-drive motors are achieved. Three independent windings allow synchronous operation of three integrated compact inverter units. Each winding is powered with up to 50 A.

This motor, with a continuous power of 2.200 W, a peak power of up to 5.200 W and a compact installation space combined with a hollow-shaft of 50 mm, shows power density and compact design at its best. The high-performance drive is based on the well-established RoboDrive technology. This direct-drive is a first choice, when maximum torque for maximum dynamics, positioning accuracy and minimal weight, compact installation space and low power dissipation is required. It delivers a rated torque of 11 Nm and peak torque up to 27 Nm at speeds up to 2.200 rpm.

With the integrated power electronics and the high-resolution absolute encoder, we provide a compact high-performance drive to our customers.

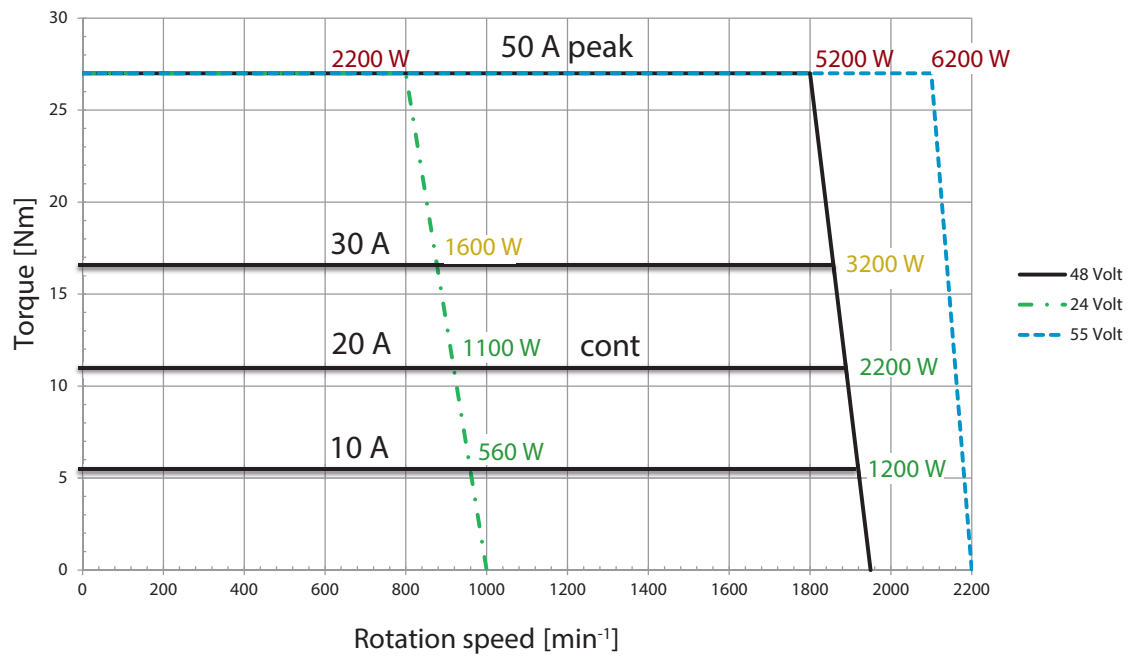
Key features:

- Direct-drive
- Outstanding dynamics
- Excellent positioning accuracy
- Peak performance 5.200 W
- Peak torque 27 Nm
- Compact design 165x165x130 mm
- Integrated motor control
- Low voltage up to 48 V_{DC}
- Hollow-shaft diameter 50 mm
- Based on the well-established RoboDrive technology
- Water cooling optional

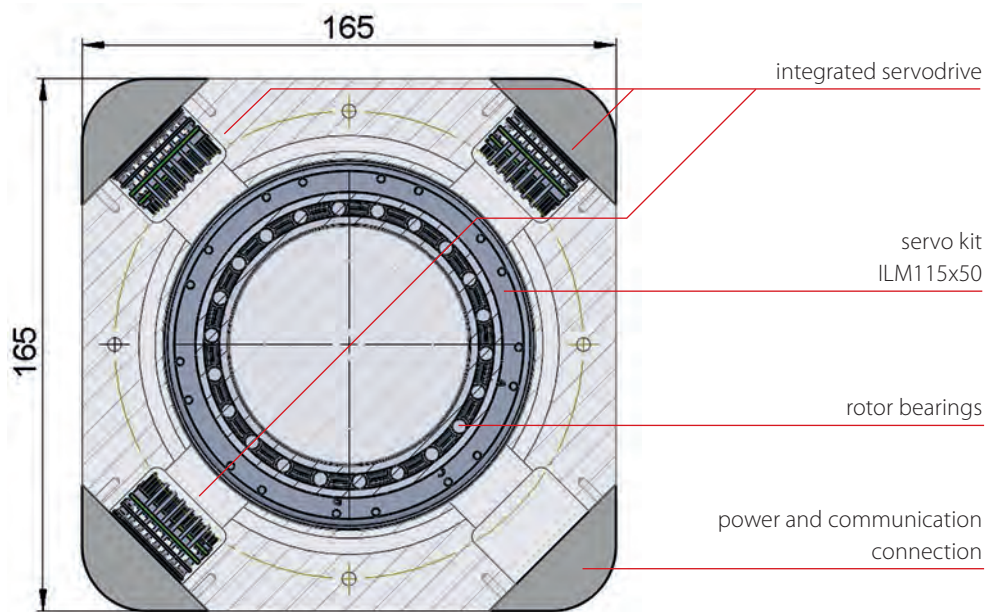
Basis data

	RD115x50-IMD
Power P [W]	2,200
Rated torque T_r [Nm]	11
Peak torque T_{max} [Nm]	27
Rated voltage U_r [V]	48
Rotation speed n_{max} at U_r [rpm]	1,900
Rated current I_r [A]	20
Copper losses P_{Lr} at T_r and 20°C [W]	75
Torque constant k_t at 20°C [Nm/A]	0,560
Motor constant k_M at 20°C [Nm/√W]	1.41
Rotor inertia J [kgcm ²]	73.3
Max. efficiency η [%]	92
Tilting torque [Nm]	800
Axial load capacity [N]	3,000
Radial load capacity [N]	12,000

Operational Range RD115x50-IMD



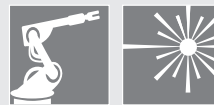
Schematic structure





SDB-40-100

Universal Servo Inverter



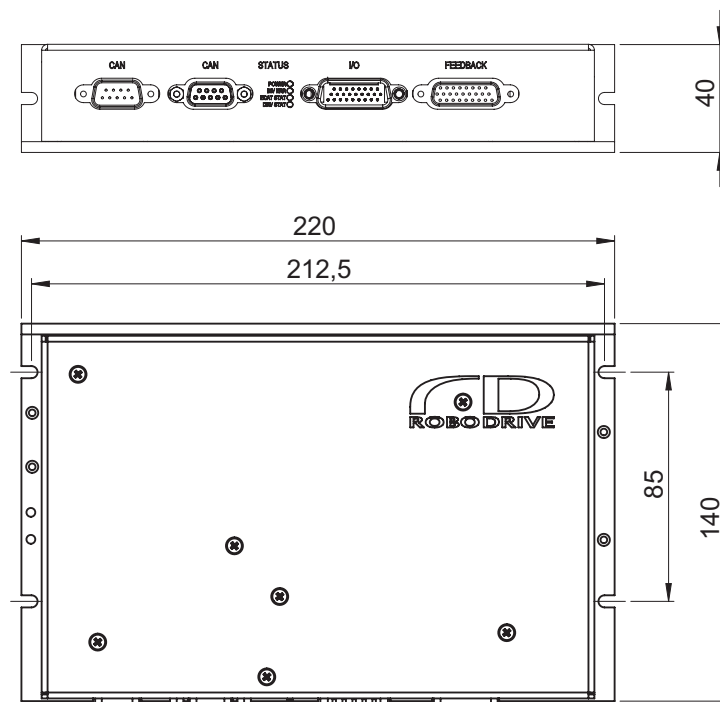
The servo inverter SDB-40-100 is intended to power permanent magnet synchronous servo motors. It is rated for DC-link voltages between 20 V and 100 V and continuous phase currents up to 40 A. The three cascaded control loops for torque/current, speed, and position can be operated with up to 100 kHz sampling rate. Thus, the high-performance current and position/speed acquisition enable cutting-edge control bandwidth and first-class disturbance suppression. The SDB-40-100 is compatible with all common position-transducer interfaces including BiSS, SinCos, TTL incremental, Hall, Endat 2.2, and Hiperface DSL.

The servo drive can be controlled by a PLC or an IPC through EtherCAT® with the highest update rates on the market to set new standards in highly dynamical axis synchronization.

Key features::

- Phase currents (continuous) up to 40 A
- Input-voltage range $20 V_{DC} - 100 V_{DC}$
- Highly dynamical cascaded control (all control loops up to 100 kHz)
- Highly dynamical field-bus communication (up to 30 kHz)
- All common position sensors supported
- Digital data logging (up to 100 kHz)

Dimensions



Connector pinning

MOTOR / EXT. RESISTOR		STO-IN (linked thru AND conjunction)		FEEDBACK	
PE	Protective earth (housing)	S1+	High side STO CH 1	1	RS485 CLK +
U	Motor phase U	S1-	Low side STO CH 1	2	RS485 CLK -
V	Motor phase V	S2+	High side STO CH 2	3	RS485 DAT+
W	Motor phase W	S2-	Low side STO CH 2	4	RS485 DAT-
UDC	High side brake resistor (= DCIN+)			5	RS422 DATB + / Inc0 +
CH	Low side brake resistor (= DCIN- if chopper switch is closed)			6	RS422 DATB - / Inc0 -
				7	RS422 A +
				8	RS422 A -
				9	DGND (≠PE, ≠CAN GND)
				10	RS422 B +
				11	RS422 B -
				12	Sin +
				13	Sin -
				14	Cos +
				15	Cos -
				16	VCC 12 V
				17	VCC 5 V
				18	Shield (= FE; for cable shields)
				19	TempSens +
				20	TempSens -
				21	Shield (= FE; for cable shields)
				22	Hall A
				23	Hall B
				24	Hall C
				25	DGND (≠FE, ≠CAN GND)
				26	Shield (=FE; for cable shields)

POWER (also supplies signal electronics)	
PE	Protective earth (housing)
DCIN-	Low side DC link
DCIN+	High side DC link

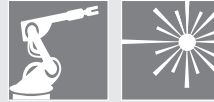
24V-SUPPLY (optional supply backup for signal electronics)	
+	High side
-	Low side

CAN (male & female connectors are looped thru; 120Ω termination required)	
1	Not connected
2	CAN low
3	CAN GND (≠PE, ≠DGND)
4	Not connected
5	Shield
6	CAN GND (≠PE, ≠DGND)
7	CAN high
8	Not connected
9	Not connected

I/O	
1	Digital In 0
2	Digital In 1
3	Digital Out 0
4	Digital Out 1
5	Digital Out GND
6	Analog In 0
7	Analog Out 0
8	Analog Out 1
9	Not connected
10	Digital In 2
11	Digital In 3
12	Digital In GND
13	Digital Out 2
14	Digital Out 3
15	Analog In 1
16	DGND
17	Analog Out 2
18	Analog Out 3
19	Functional earth (FE, =shield)
20	Not connected
21	FE (=shield)
22	Digital Out VCC
23	FE (=shield)
24	DGND
25	FE (=shield)
26	Not connected

SDB-40-100

Universal Servo Inverter



General

Supported motor type

Permanent magnet synchronous machines

Max. continuous phase current

40 A (sink peak)

Max. phase current (sine peak)

70 A (sine peak) for 5 Sec.

DC-link voltage U_{DC}

$20 V_{DC} - 100 V_{DC}$

Max. continuous apparent power (continuous)

3.4 kVA

Ambient temperature

Admissible range -20°C ... +50°C

Extended range +50°C ... +70°C (mit -2 A/K derating)

Standard cascade control

Current/torque controller (PI controller)

Sampling rate 100 kHz (reducible)

Maximum bandwidth* 9 – 10 kHz

Control approach Field-oriented control (FOC)

Feed forward Feed forward q-current

Compensations Back-emf compensation

Iron saturation (implementation pending)

Magnet temperature (implementation pending)

Velocity controller (PID controller; symmetric optimum)

Sampling rate 100 kHz (reducible)

Maximum bandwidth ≤ 1 kHz (depending on transducer resolution)

Feed forward Feed forward speed

Filter Low-pass & notch filter

Position controller (P controller)

Sampling rate 100 kHz (reducible)

PWM Frequency

max. 50 kHz (= 1/2 current-controller sampling rate)

Max. voltage output

$1.0 u_{DC}$ (space-vector modulation)

Available operating modes

Cyclic Synchronous Torque (CST)

Cyclic Synchronous Velocity (CSV)

Cyclic Synchronous Position (CSP)

Profile Torque Mode (PTM) (implementation pending)

Profile Velocity Mode (PVM) (implementation pending)

Profile Position Mode (PPM) (implementation pending)

Homing

Controllable current pointer (implementation pending)

* Bandwidth is defined by a -3 dB drop of the magnitude response of the respective control loop. The statement assumes optimal PI control parameters chosen at the limit between aperiodic and incipient periodical behavior.

Feedback / Sensors

Current-measurement

Resolution ≤ 70 mA
Shunt measurement (in two phase legs)
Sigma Delta A/D conversion

Compatible position-sensor interfaces

Inkremental transducer (RS422; 5 V/12 V supply)
Sin-Cos Geber (1 Vss)
BiSS (RS485)
Digitale Hall
EnDat 2.2 (RS485; implementation pending)
Hiperface DSL (RS485; implementation pending)

Velocity calculation

Numerical differentiation

Compatible temperature sensors

PT1000	(-40°C ... +250°C)
PT100	(-40°C ... +250°C)
KTY1000	(-40°C ... +240°C)
NTC	(-5°C ... +150°C)

Communication interfaces

Field bus

EtherCAT® Max. update rate: 30 kHz
CAN over EtherCAT® (CoE, profil via CiA402)
Distributed clock (synch. jitter ≤ 1 μ s)
Other field buses on request

Digitale I/Os (for in- and outputs)

24 V-HTL Level
5 V-TTL (through alternative hardware assembly)
Galvanically isolated

Analog I/Os (not galvanically isolated)

2 Inputs	Resolution: 12 Bit
	Sampling rate: 100 kHz
4 Outputs	Resolution: 10 Bit

Safety features

Safe Torque Off (STO)

SIL3 (according to EN61800-5-2; certification pending)

Protection features

Overcurrent detection

Phase current (admissible range: 0 A to 80 A)
DC-link current (admissible range: - 75 A ... + 75 A)

DC-link overvoltage detection

Configurable between 20 V and 100 V

Temperature protection

Temperature sensors
(near B6 bridge, brake chopper and on CPU)
I²t Model
Interface for external sensor
(see compatible temperature sensors)

Brake chopper (chopping device onboard)

Internal chopper
(controlled by a configurable hysteresis controller)
Resistor must be connected externally
(max. continuous current: 40 A)

Protection against false polarity (electronical)

DC link
External 24 V_{DC} link
STO
Digital inputs

Interfaces for system set up and maintenance

PC Software

RoboDrive –TorqueFACTory (via EtherCAT®)
Flashing firmware updates (FoE)

Digital data logging (digital scope)

All relevant control parameters and state variables available
Logging time up to 10 s at 100 kHz

EMV and standards

Developed according to EN61800-3 and
EN61800-5-1 (operating reliability)

Mounting data

Mass

1085 g

Dimensions

220x140x40 [mm]

RoboDrive, a Brand of the TQ-Group

The leading high-torque density and precision drives for flexible applications

Our proven RoboDrive-technology provides flexible drive solutions for the highest demands to overcome technological limits. It represents dynamics, reliability, precision and lightweight. This makes it ideal for many applications such as robotics, medical, aerospace, automation and laser industries, which profit from the benefits of RoboDrive technology.

RoboDrive electric motors and drives are bringing new levels of efficiency and productivity to compact robotic solutions. www.robodrive.com/en.



As an electronics service provider, E²MS supplier and OEM, TQ-Group offers the complete range of services from development, through production and service right up to product life cycle management. The services cover assemblies, equipment and systems including hardware, software and mechanics.

Through the combination of electronics services and finished system components, TQ offers customer-specific products as ODM products and thereby addresses customers who would like to receive finished products and at the same time benefit from the advantages of a customer-specific solution. With the RoboDrive department, TQ offers best quality motors developed and made in Germany.

The TQ-Group employs approx. 1,400 colleagues at their 12 sites, including 160 development engineers. Further information on TQ can be found at www.tq-group.com/en.



Notes

