NOZAG
Antriebstechnik

HIGH PRECISION ACTUATORS

DriveSpin®
CATALOGUE
Edition II/2020

SPINEA

HIGH PRECISION ACTUATORS

DriveSpin®

DS series 162 – 181 

DSH series 182 – 201 

DSM series 202 – 215 

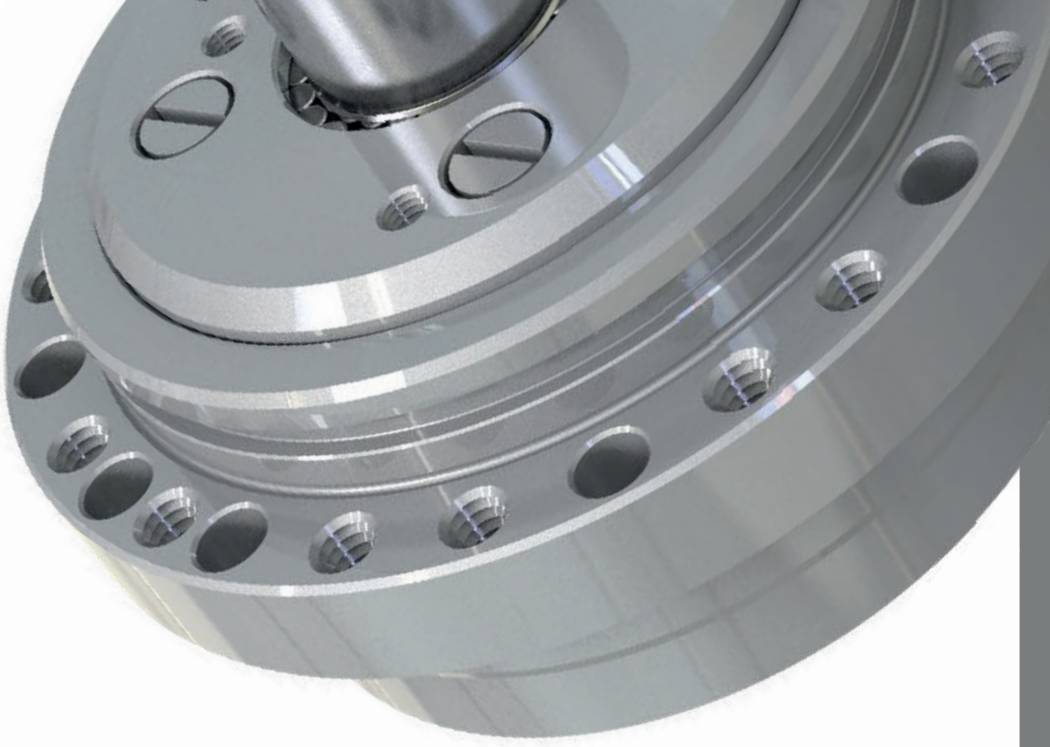
DSF series 216 – 227 

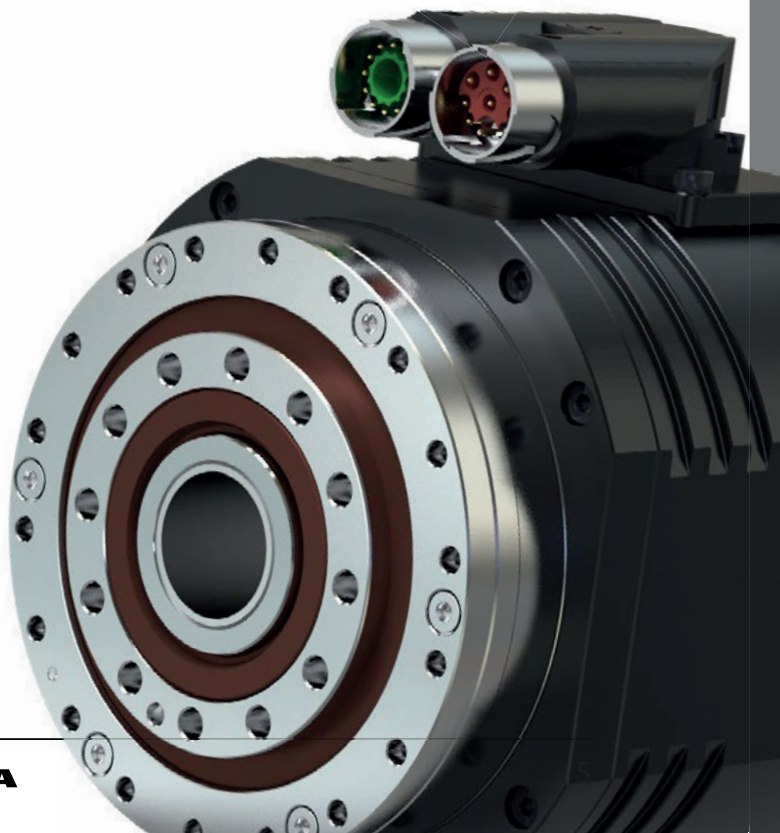
SPECIAL SOLUTION

YourSpin

Customized gears 250 – 253

Customized actuators 254 – 255





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SPINEA
EXCELLENCE IN MOTION

SPINEA, s.r.o. is a modern Slovak engineering company, engaged in the development, manufacturing and sales of high-precision reduction gears, sold under the trademark TwinSpin®. An invention of a Slovak engineer was the impulse for the company establishment in 1994. The TwinSpin® high precision reduction gears are serially manufactured, based on the grant of an international patent. The TwinSpin® gears belong to a category of hi-tech products and represent a unique technical solution, which integrates radial-axial bearings with a high precision reduction gear into a single compact unit. The products of the company are suitable for applications, which require high reduction-gear ratio, high kinematic precision, zero-backlash motion, high torque capacity, high rigidity, compact design in a limited installation space as well as low weight. They are widely used in automation and industrial robotics, in the field of machine tools manufacturing, in navigation and camera equipment, medical systems and in many other fields.

SPINEA TECHNOLOGIES

SPINEA Technologies, s.r.o. is a young research and development technology company, which is engaged in continuous development in the field of electrical actuators based on the G and TS-I bearing reducer platform, as well as development of customer-oriented mechatronic units. The company was founded at the end of 2012 through separation of the electric drives department from the parent company SPINEA s.r.o., while the impulse was to bring unique technologies, methods, and solutions for the industrial market, followed by their implementation into the production process.

7. DriveSpin® - General information

The DriveSpin® (DS) is the combination of the TwinSpin® high precision reduction gear, featuring excellent mechanical properties, and the AC servomotor in a compact unit. The excellent parameters are guaranteed by more than 20-year experience in the manuacture of reduction gears by SPINEA, s.r.o.

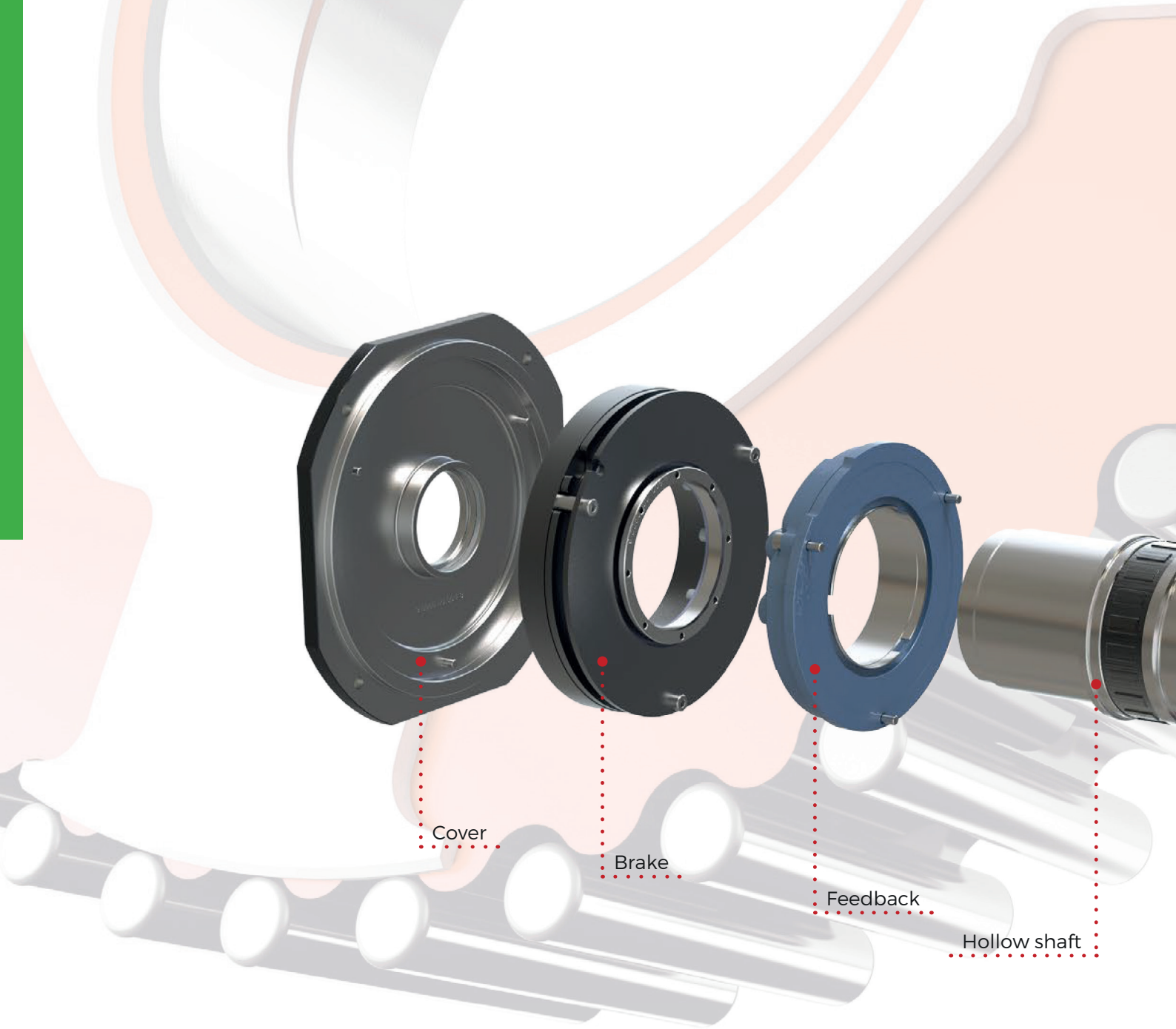
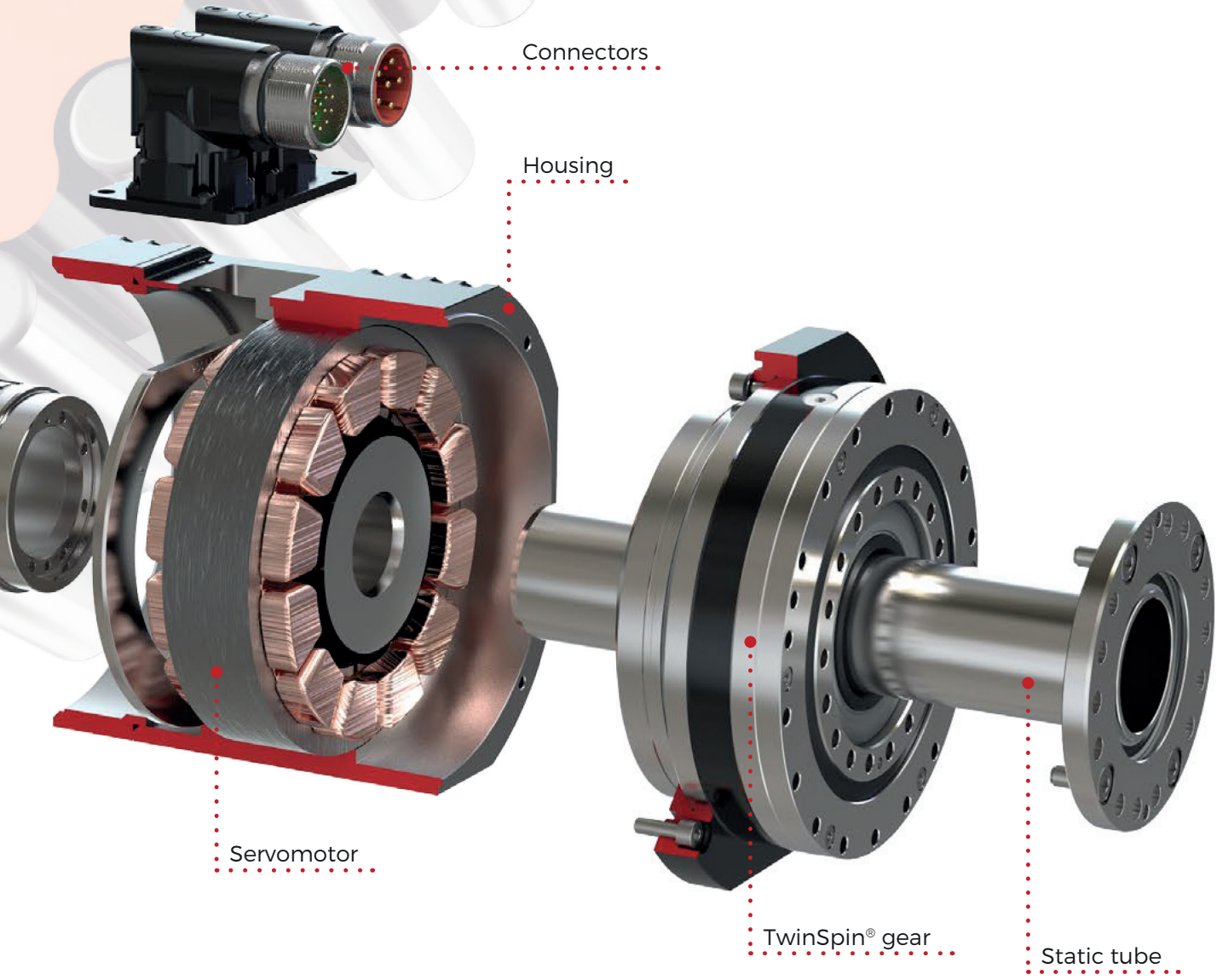


Fig. 7.a: DriveSpin® actuators components

The actuators feature:

- high precision and accuracy
- high tilting and torsional stiffness
- low vibrations
- compact dimensions
- low weight
- long service life
- easy installation



DriveSpin®

Advantages

Actuators are sophisticated mechatronic drive nodes (devices) that combine a high-precision cycloid gearbox (bearing reducer), a servomotor, and feedback sensors. DriveSpin® electric actuators meet the most demanding customer requirements in all areas of industry. With optimum price/performance ratio, they reliably provide parameters such as high accuracy, high tilt, and torsional stiffness, low weight, compact design, low vibration, IP degree of protection, or a wide range of suitable technical solutions.

Uniquely balanced design

The DriveSpin® electric actuators feature a unique integration of a high-load-capacity reduction gear containing a unique reduction mechanism with an AC servomotor that meets even the most demanding requirements for dynamic performance.

Unique precision and accuracy

The DriveSpin® electric actuator, using a patented proprietary design of the bearing reduction gear, represents the most precise and accurate solution in its product category.

High moment capacity

The DriveSpin® actuators are outstanding for their high moment capacity, implemented in a zero-backlash design with an excellent power-to-size ratio and load capacity of the radial-axial bearings integrated in the DriveSpin® actuator.

Feedback sensor variability

The DriveSpin® electric actuators can be supplied with a wide range of feedback systems, such as EnDat®, HIPERFACE®, and Resolver.

Custom solution

Our technical and development department is prepared to adjust the DriveSpin® according to the customer specifications in terms of connectivity, mechanical design, motor characteristic, feedback systems as well as demands on the high IP protection class requirements.

Technical support

Our team of specialists is available for you to solve any issues. The use of first-class materials and the very process of the manufacturing of high precision DriveSpin® electric actuators are secured by ISO 9000 certificates.

DS series

DSH series

DSM series

DSF series

8. DriveSpin® series

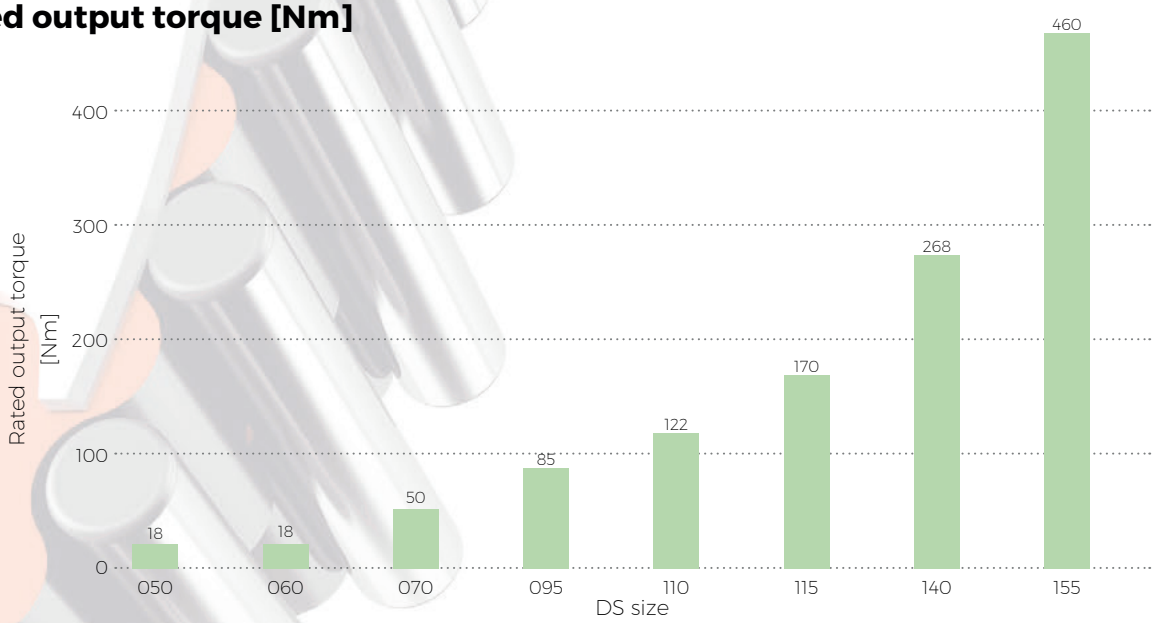
Actuators known under the trademark DriveSpin® are most commonly used in automation, robotics, automotive industry as well as in general mechanical engineering, as part of various industrial equipment used for positioning in a variety of mechanical nodes.
The product portfolio is characterized by four basic type designs:

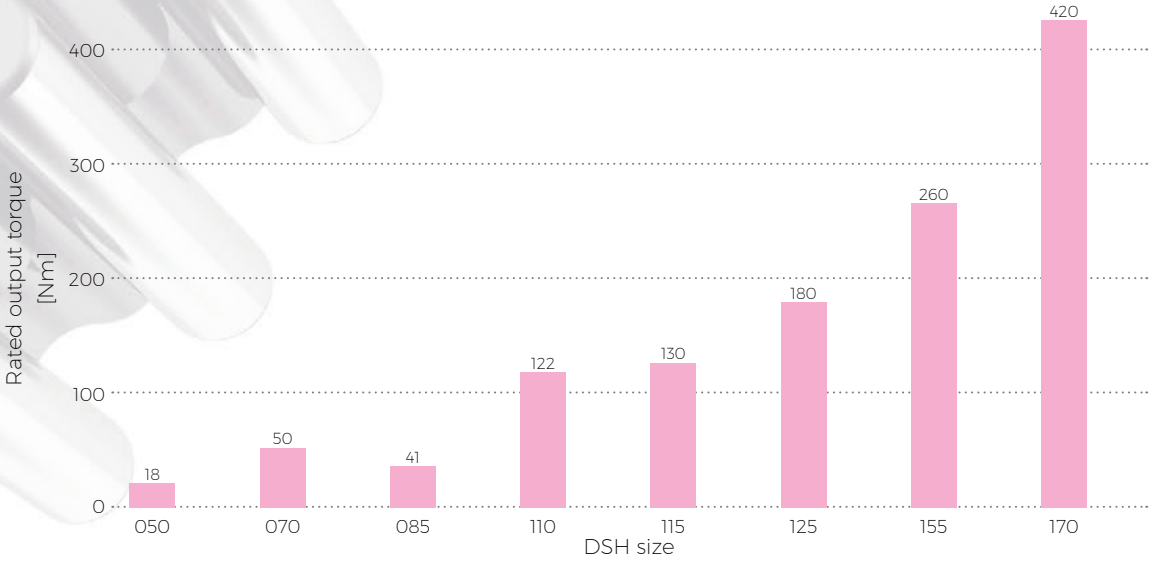
DS - Standard actuator
DSH - Hollow-shaft actuator (with hole)
DSM - Actuator in modular design
DSF - Flat, the shortest possible solution (reduced)

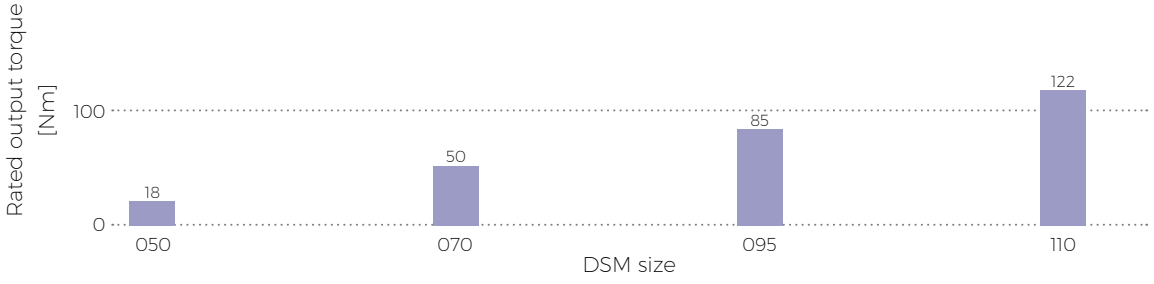
Product portfolio of DS/DSH/DSM/DSF actuators

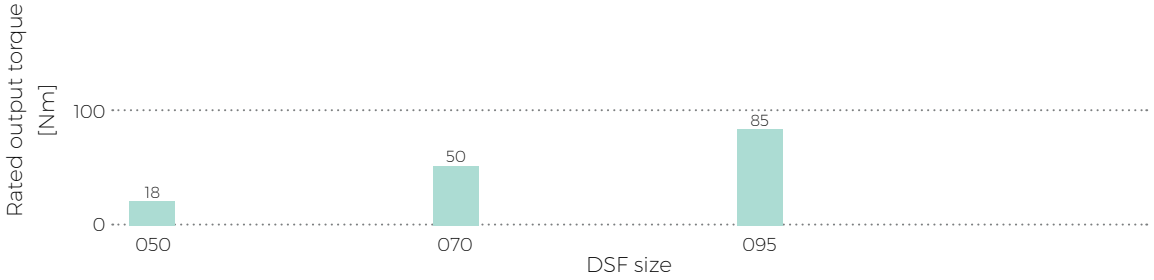
Type	Size										
	050	060	070	085	095	110	115	125	140	155	170
DS (STANDARD)	✓	✓	✓	×	✓	✓	✓	×	✓	✓	×
DSM (MODULAR)	✓	×	✓	×	✓	✓	×	×	×	×	×
DSH (HOLLOWSHAFT)	✓	×	✓	✓	×	✓	✓	✓	×	✓	✓
DSF (FLAT)	✓	×	✓	×	✓	×	×	×	×	×	×

Rated output torque [Nm]









Ordering code

All SPINEA actuators are determined by unique ordering code. This code specifies all necessary parameters of the actuator, like actuator size, transmission rate, voltage ratings, feedback type etc.
If you are unable to specify a certain part of the ordering code, please provide a letter in the sense of the general code. This is also the case if you need advice regarding special requirements of your application. In both cases, our technical support will contact you to achieve the optimal solution.
We are ready to produce separate cabling for your application requirements. The possible configurations are based on Tab. 8.6: Ordering code for Cable

Note:
When selecting the position sensor of the DS xxx-abcde-fg-xy, you can choose one of the basic feedback types. When creating a business-technical offer, the feedback type will be replaced with a more specific position sensor number.

Ordering code example

DSH 115-103-4500B0-AH-00

00 : Special modification - **Standard connector**

A- : Wiring diagram - **Power connection**
-H : Wiring diagram - **Signal connection**

4----- : DC bus voltage - **560 V**
-5---- : Temperature sensor - **PT 1000**
--0--- : Brake - **No**
---0B- : Feedback type - **Absolute Singleturn Encoder Hiperface**
-----0 : Type of electrical connection - **Straight connectors**

103: Reduction ratio - **103**

115: Actuator size - **115**

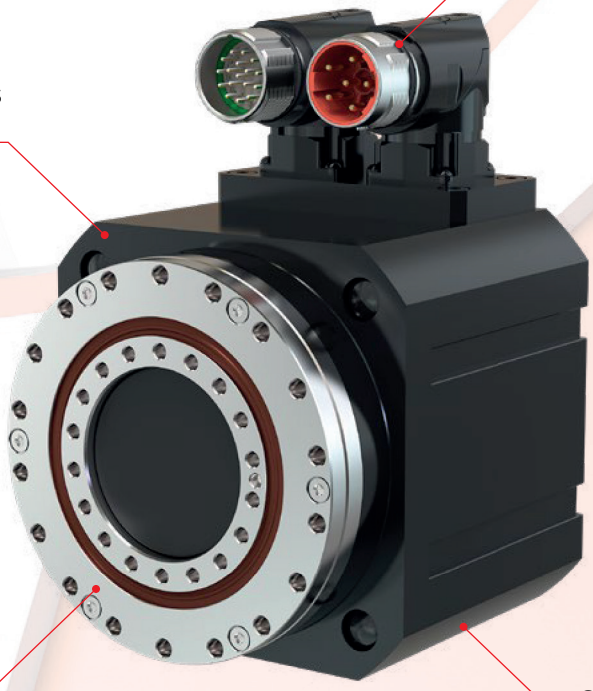
DSH: **DriveSpin® Hollowshaft**

Tab. 8.a: DriveSpin® ordering specifications

DS_	-	070	-	057	-	3	1	B	0A	4	-	A	J	-	00
Name		**Size**		**i**		**a**	**b**	**c**	**d**	**e**		**f**	**g**	**x**	**y**
Type		**Actuator size**		**Ratio**		**DC bus voltage**	**Temperature sensor**	**Brake**	**Feedback type**	**Type of electrical connection**		**Wiring diagram**		**Special modification**	
												Power	**Signal**		
DS standard DSH hollowshaft DSM modular DSF flat		050		063		1: 24 VDC 3: 320 VDC 4: 560 VDC S: Special upon request	1: PTC 111-K13 5: PT 1000 S: Special upon request	0: No B: Yes	0A Resolver 0B Absolute Singleturn Encoder Hiperface 0C Absolute Multiturn Encoder Hiperface 0D Absolute Singleturn Encoder EnDat 0E Absolute Multiturn Encoder EnDat 0F Absolute Singleturn Encoder EnDat + sin/cos 0G Absolute Multiturn Encoder EnDat + sin/cos 0H Incremental sin/cos Encoder + sin/cos Commutation 0J Incremental A/B/I Encoder + Block Commutation 0K: Absolute Singleturn Encoder Hiperface DSL 0L: Absolute Multiturn Encoder Hiperface DSL 0M: Absolute Singleturn Encoder BiSS 0N: Absolute Multiturn Encoder BiSS 0P: Absolute Singleturn Encoder DRIVE-CLiQ 0Q: Absolute Multiturn Encoder DRIVE-CLiQ 0R: Absolute Multiturn Fanuc 0S: Absolute Singleturn Fanuc	0: Straight connectors 1: Connector on terminal cable directed upward [7] 2: Hybrid straight connector 3: Hybrid angled rotable connector 4: Angled rotable connectors 5: Terminal cable directed upward [7] 6: Y-tec angular connector, rotable 7: Terminal cable directed forward [7] 8: Terminal cable directed backward [7] B: Connector on terminal cable directed forward [7] C: Connector on terminal cable directed backward [7]	For more information see page 232 - 237		Terminal cable length 00 Standard connector 10 Standard cable length L=1m xy Custom design Cable lengths and other modifications. For more information contact manufacturer.	
		060 [1]		047											
		070		057, 075											
		085 [2]		047, 085											
		095 [5]		073, 095											
		110		067, 089, 119											
		115 [3]		055, 103											
		125 [2]		049, 099											
		140 [1]		069, 115											
		155 [3]		109											
		170 [3]		069, 125											

[1] only DS
[2] only DSH
[3] only DS, DSH
[4] only DS, DSH, DSM
[5] only DS, DSM, DSF
[7] The standard length (L=1m)

DriveSpin®


Zero-backlash reduction gear
Various combinations of voltages and motor feedback systems
Very high power density
Oprimal price range

DriveSpin®

DS series

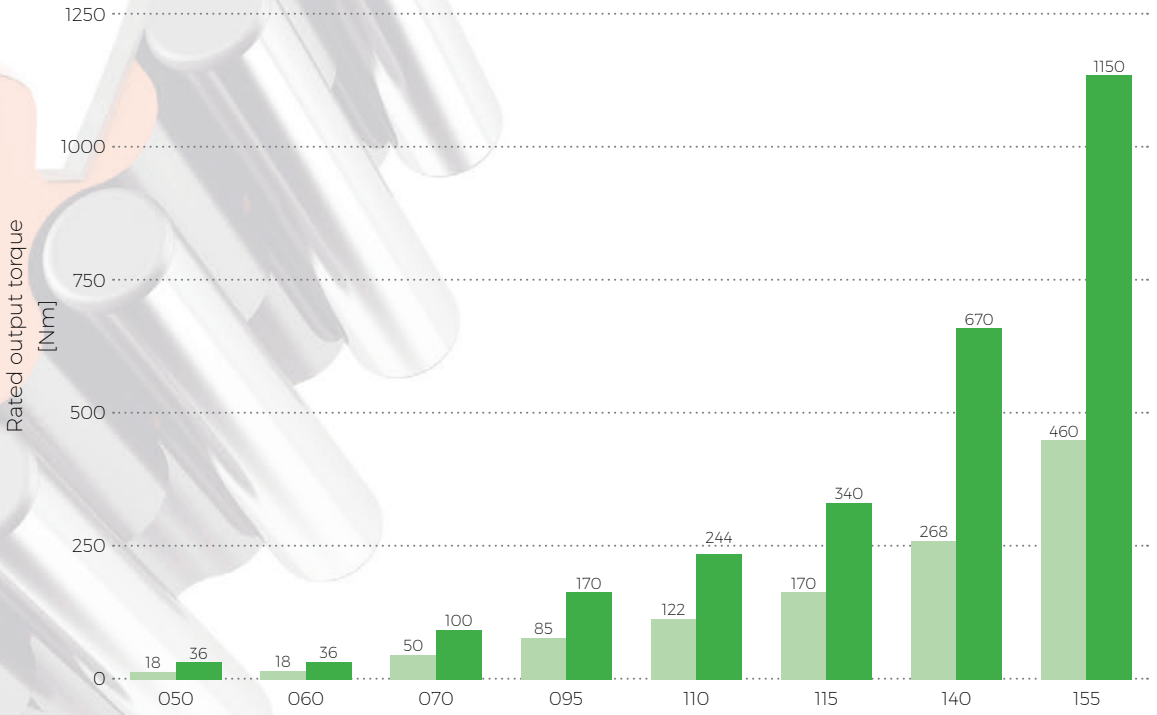
STANDARD SOLUTION

8.1 DS series

Advantages

- **low lost motion**
- **low moment of inertia**
- **high reduction ratio**
- **high kinematic accuracy**
- **high moment overload capacity**
- **high capacity of the integrated radial-axial output bearings**
- **high dynamic performance**

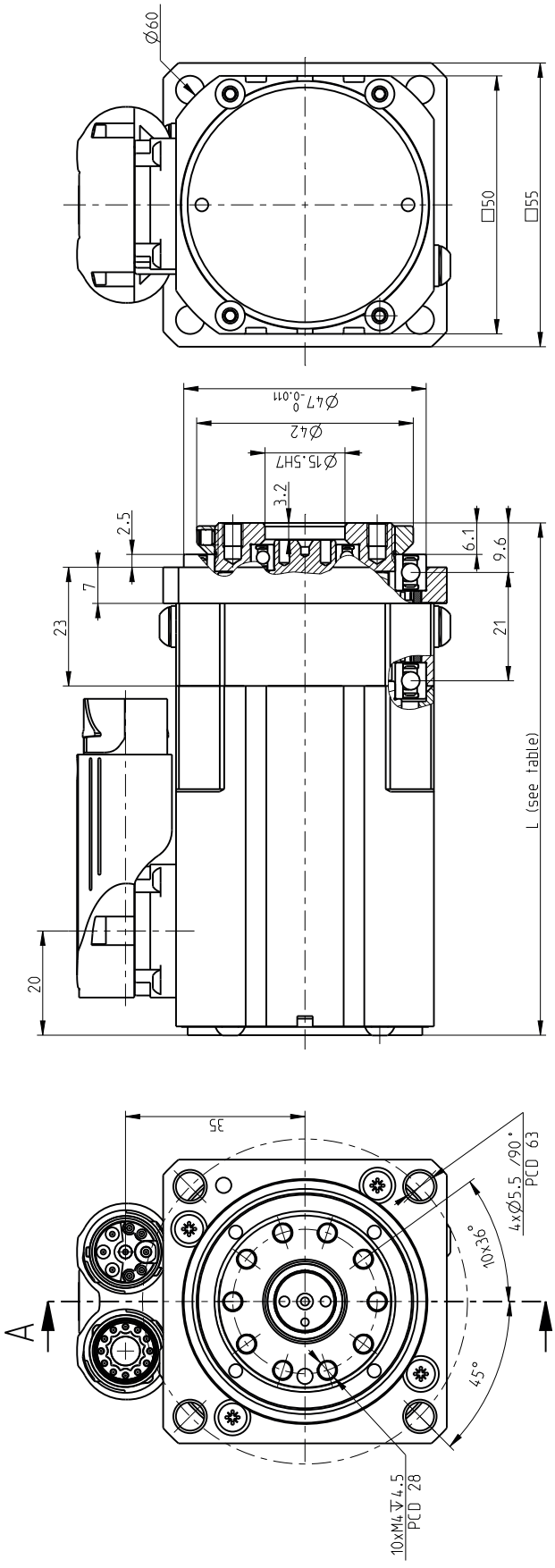
The **Drive**Spin® **DS** electric rotary actuators, as the basic type of actuators, provide rotary motion and the transfer of output torque with a high radial-axial load capacity and are the most accurate and precise solution in their category. The DS actuators are characterized by high dynamics, highly flexible drive solution, guaranteed by an AC servomotor, and high robustness and overload capacity of TwinSpin® reduction gear. DriveSpin® high variability of voltage, brake feedback and electrical connections will satisfly customer requirements in many cases. Rated output torque range of the DS is from 18 Nm to 460 Nm.



Tab. 8.1.a: Rated output torque

Size		050	060	070	095	110	115	140	155
Rated output torque	T_R [Nm]	18	18	50	85	122	170	268	460
Acceleration/ braking output torque	T_{acc} [Nm]	36	36	100	170	244	340	670	1150

DS 050 - i - abcde-fg-xy



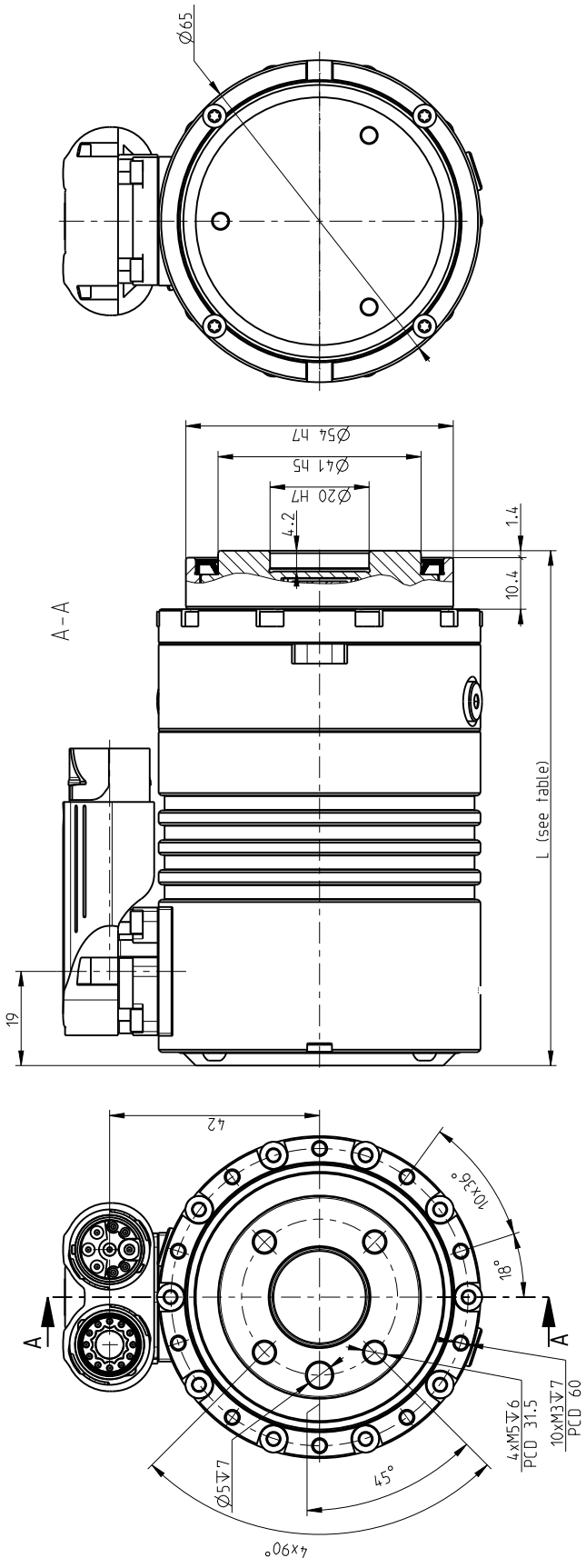
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 050	OA	99	0.9	135	1.4
	OB,OC	107	1.2	138	1.4
	OD,DE	106	1.2	133	1.3
	OG	130	1.2	-	-
	OK,OL	144	1.2	155	1.4

DS 050 – i – abcde-fg-xy

DS 060 - i - abcde-fg-xy

Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 060	0A	104	1.3	119	1.4
	0B,0C	110	1.3	125	1.3
	0D,0E	115	1.3	130	1.4
	0J	110	1.3	125	1.4

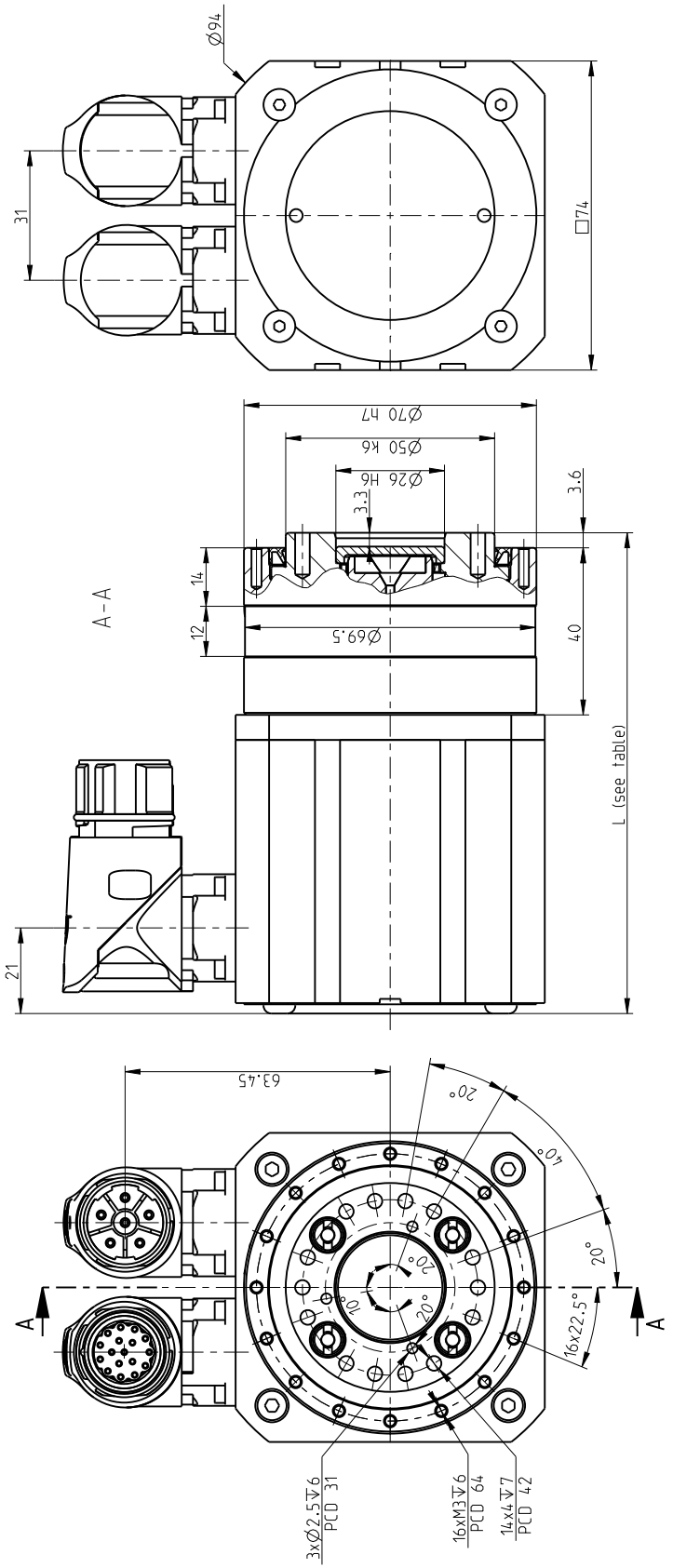
Projection



DS 060 – i – abcde-fg-xy

DS

DS 070 - i - abcde-fg-xy

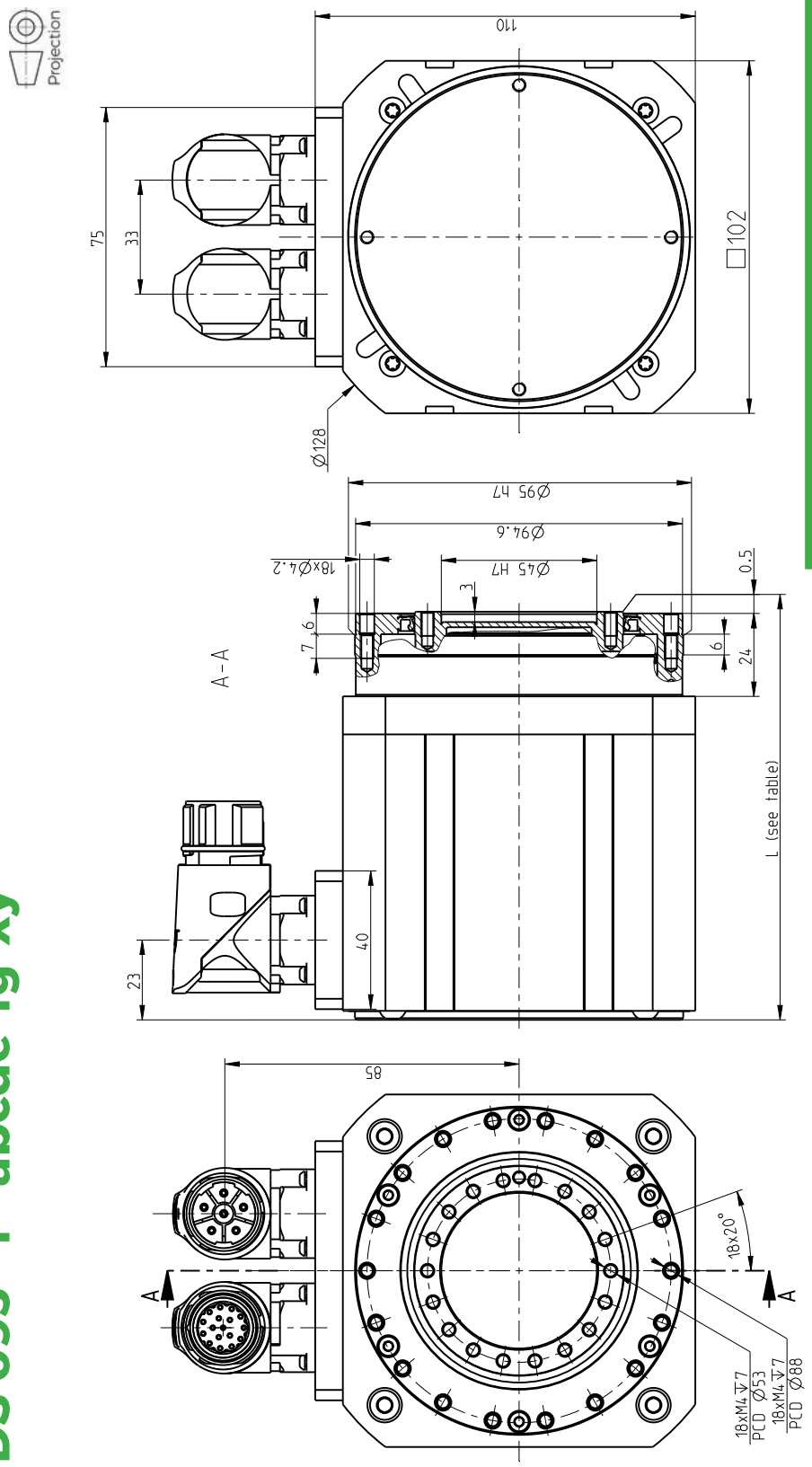


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 070	OA	115	2.3	194	3.4
	OB,OC	137	2.4	178	3.4
	OD,OE	148	2.6	195	3.5
	OH	148	2.6	195	3.5
	OP,OQ	-	-	137	2.4

DS 070 – i – abcde-fg-xy

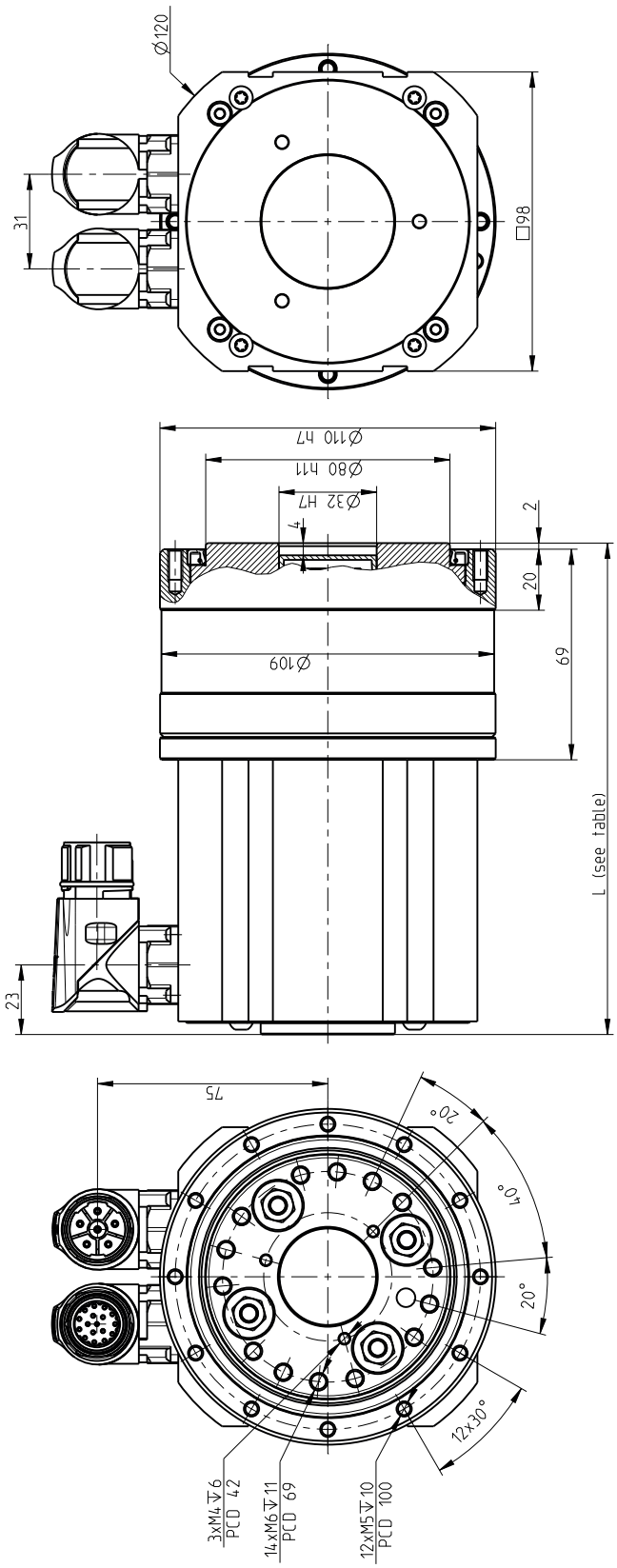
DS 095 - i - abcde-fg-xy

DS 095 - i - abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 095	OA	118	4.9	138	5.8
	OH	146	5.4	161	6.2
	OB.OC	139	5.2	149	5.9
	OD.OE	127	5.0	141	5.8
	OG.OH.OF	146	5.4	161	6.2
	OD.OE	127	5.0	141	5.8
	OP.OQ	139	5.2	149	5.9
	OK.OL	139	5.2	149	5.9

DS 110 - i - abcde-fg-xy



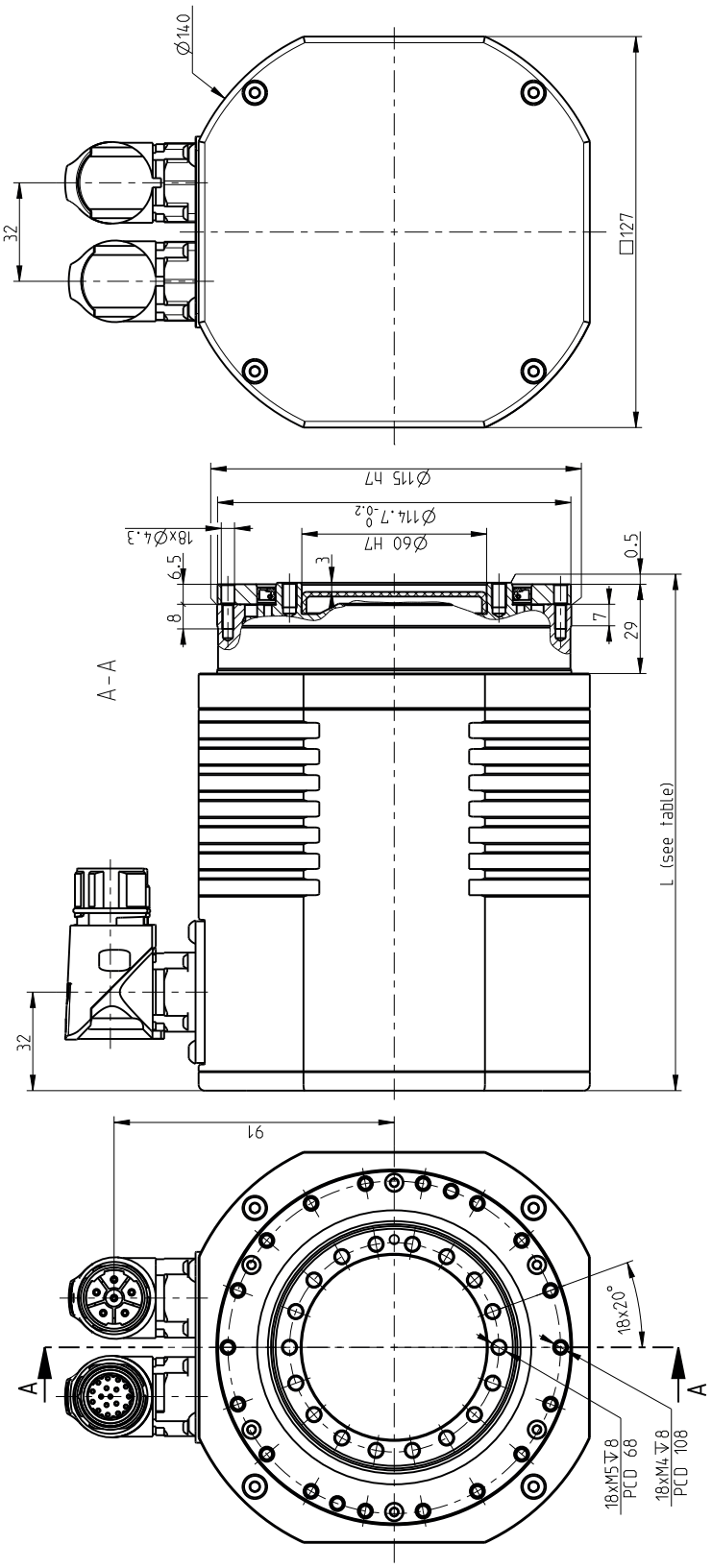
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 110	OA	161	8.2	213	9.1
	OB,OC	193	8.8	245	9.7
	OD,OE	202	8.6	242	9.6
	OH	202	8.6	242	9.6

DS 110 – i – abcde-fg-xy

DS 115 - i - abcde-fg-xy

Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 115	OA	165	8.6	165	9.0
	OB,OC	165	8.6	165	9.0
	OD,OE	165	8.6	165	9.0
	OH	175	8.6	175	9.0
	OJ	165	8.6	165	9.0
	OK,OL	165	8.6	165	9.0
	ON	165	8.6	165	9.0

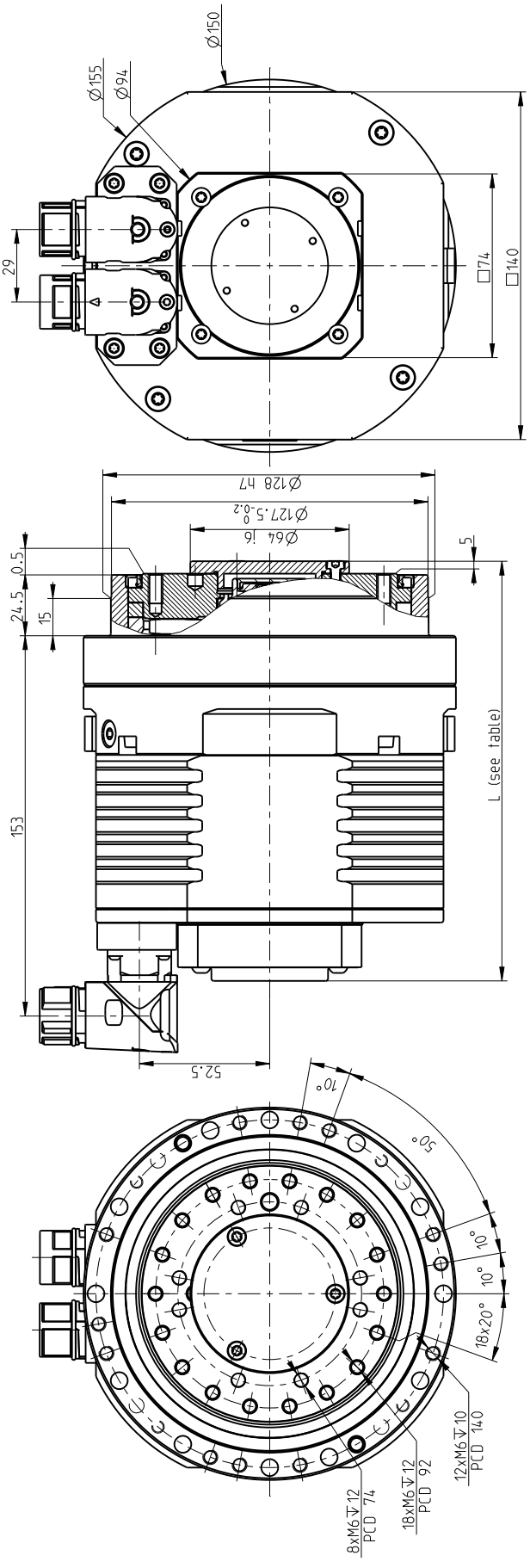
Projection



DS 115 - i - abcde-fg-xy

DS

DS 140 - i - abcde-fg-xy

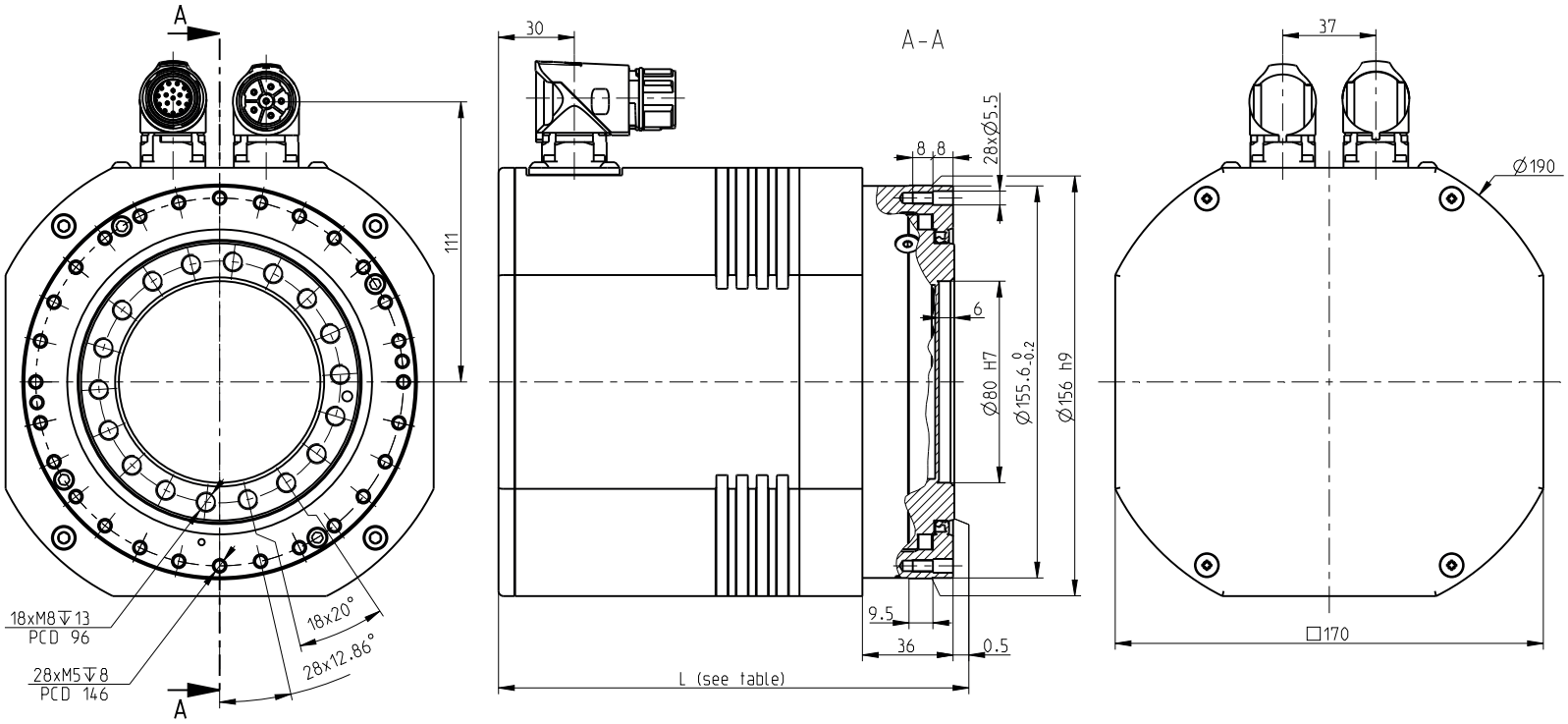


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 140	OA	148	11	181	12.1
	OB.OC	165	11	208	12.1
	OD.OE	165	11	208	12.1
	OH	199	11	226	12.1

DS 140 – i – abcde-fg-xy

DS 155 – i – abcde-fg-xy

Projection



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0,5 [mm]	Weight m [kg] *	Dimension L ± 0,5 [mm]	Weight m [kg] *
DS 155	OA	181	14.2	181	16.2
	OB,OC	181	14.4	181	16.2
	OD,OE	181	14.4	181	16.2
	OH	181	14.7	181	16.5
	OK,OL	181	14.6	181	16.4
	ON	181	14.4	181	16.2

Tab. 8.1b: DS series technical data table

Reduction Gear parameters		Tolerance	DS 050		
Reduction ratio	i		63		
Rated output torque	T_R [Nm]		18		
Acceleration/braking output torque	T_{acc} [Nm]		36		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [9]	n_{max} [rpm]		5 000		
Allowable moment [2][3]	M_{cmax} [Nm]		44		
Tilting stiffness [1][6]	M_t [Nm/arcmin]		4		
Torsional stiffness [1][7]	k_t [Nm/arcmin]		2.5		
Lost motion	LM [arcmin]		< 1.5		
Hysteresis	H [arcmin]		< 1.5		
Rated radial force [2]	F_{rR} [kN]		1.44 [8]		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		1.9		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3 500	3 500	3 500
Motor rated torque	M_n [Nm]	+/- 10%	0.23	0.23	0.23
Motor rated current	I_n [A_{rms}]		7.1	0.58	0.58
Motor stall torque	M_o [Nm]	+/- 10%	0.24	0.24	0.24
Motor stall current	I_o [A_{rms}]		7.4	0.6	0.6
Motor peak torque	M_{max} [Nm]	+/- 10%	1	1	1
Motor peak current	I_{max} [A]		30.8	2.5	2.5
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%	2.7	36	36
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%	0.032	0.4	0.4
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%	0.2	36	36
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%	0.2	36	36
Number of poles	2p		6	6	6
Electromagnetic brake DC supply	[V_{dc}]		24, Special		
Electromagnetic brake torque at input	[Nm]		0.4		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y(star-configuration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3 900 rpm for ratio 67 ; 4 500 rpm for ratios 89, 119
6) The parameter depends on the version of high precision reduction gear.
7) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
8) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$ = 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
9) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
10) 4 500 rpm for ratio 73 ; 4 800 rpm for ratio 95
11) 4 000 rpm for ratio 55 ; 4 500 rpm for ratio 103
12) 3 400 rpm for ratio 63 ; 3 800 rpm for ratio 109 ; 4 200 rpm for ratio 133

Tab. 8.1b: DS series technical data table - continued

DS 060			DS 070			DS 095		
47			57, 75			73, 95		
18			50			85		
36			100			170		
2 000			2 000			2 000		
5 000			5 000			4 500 / 4 800 [10]		
52			142			410		
19			35			120		
3.3			7			15		
< 1			< 1.5			< 1		
< 1			< 1.5			< 1		
2.4			2.8			3.5		
4.6			4.1			11.1		
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560	24	320	560
3 000	3 000	3 000	2 500	4 500	4 500	4 000	4 000	4 000
0.4	0.4	0.4	0.88	0.76	0.76	1.4	1.4	1.4
8.3	0.63	0.63	13	1.2	0.7	27	5.6	3.1
0.45	0.45	0.45	0.9	0.9	0.9	1.6	1.6	1.6
9.34	0.71	0.71	13.3	1.42	0.83	31	6.4	3.5
1.3	1.3	1.3	3	3	3	5.5	5.5	5.5
27	2	2	44.3	4.7	2.8	106.1	22	12.1
4.4	58	58	5.7	68.3	105.6	4.4	25	47
0.05	0.63	0.63	0.0677	0.63	1.09	0.052	0.25	0.46
0.2	32	32	0.13	17	40.5	0.052	1.2	4.36
0.3	51	51	0.25	34.4	87	0.11	2.84	8.71
6	6	6	10	10	10	10	10	10
24, Special			24, Special			24, Special		
4.5			4.5			2		
IP 64			IP 64			IP 64		
F			F			F		
RAL 9005			RAL 9005			RAL 9005		
3			3			3		
Y(star-configuration)			Y(star-configuration)			Y(star-configuration)		

IMPORTANT NOTES:

- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer
- Please consult the maximum speed in duty cycle with the manufacturer
- The values in the table refer to the ambient temperature of 20˚C to 25˚C
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer

Tab. 8.1b: DS series technical data table - continued

Reduction Gear parameters		Tolerance	DS 110		
Reduction ratio	i		67, 89, 119		
Rated output torque	T_R [Nm]		122		
Acceleration/braking output torque	T_{acc} [Nm]		244		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [9]	n_{max} [rpm]		3 900 / 4 500 [5]		
Allowable moment [2][3]	M_{cmax} [Nm]		740		
Tilting stiffness [1][6]	M_t [Nm/arcmin]		150		
Torsional stiffness [1][7]	k_t [Nm/arcmin]		22		
Lost motion	LM [arcmin]		< 1		
Hysteresis	H [arcmin]		< 1		
Rated radial force [2]	F_{rR} [kN]		9.3		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		13.1		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		2 500	3 000	3 000
Motor rated torque	M_n [Nm]	+/- 10%	3.4	3.2	3.2
Motor rated current	I_n [A_{rms}]		37	4.9	2.8
Motor stall torque	M_o [Nm]	+/- 10%	3.8	3.8	3.8
Motor stall current	I_o [A_{rms}]		41	6	3
Motor peak torque	M_{max} [Nm]	+/- 10%	11	11	11
Motor peak current	I_{max} [A]		120	17	10
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%	8	57	103
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%	0.09	0.65	1.14
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%	0.027	1.4	4.5
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%	0.15	7.4	24
Number of poles	2p		10	10	10
Electromagnetic brake DC supply	[V_{dc}]		24, Special		
Electromagnetic brake torque at input	[Nm]		4.5		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y(star-configuration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3 900 rpm for ratio 67 ; 4 500 rpm for ratios 89, 119
6) The parameter depends on the version of high precision reduction gear.
7) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
8) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$ = 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
9) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
10) 4 500 rpm for ratio 73 ; 4 800 rpm for ratio 95
11) 4 000 rpm for ratio 55 ; 4 500 rpm for ratio 103
12) 3 400 rpm for ratio 63 ; 3 800 rpm for ratio 109 ; 4 200 rpm for ratio 133

Tab. 8.1b: DS series technical data table - continued

DS 115			DS 140			DS 155		
55, 103			69, 115			63, 109, 133		
170			268			460		
340			670			1 150		
2 000			2 000			2 000		
4 000 / 4 500 [11]			4 500			3 400 / 3 800 / 4 200 [12]		
550			1 160			1 640		
220			380			900		
32			62			87		
< 0.5			< 1			< 0.5		
< 1			< 1			< 1		
4			11.5			8.3		
12			17			26		
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560	24	320	560
3 000	4 000	4 000	4 000	4 000	4 000	On request	4 000	4 000
4	4	4	4	4	4		5	5
84	6.33	3.8	74.1	5.6	3.2		10	6
4	4	4	4.5	4.5	4.5		11	11
84	6.33	3.8	83.3	6.3	3.6		21.9	13.5
10	10	10	13.5	13.5	13.5		23	23
231	15.82	10.45	250	18.8	11		45.9	27.6
4.1	54.1	93.3	4.76	63	111		44	77
0.05	0.63	1.05	0.054	0.72	1.26		0.5	0.83
0.011	0.83	2.3	0.0055	1	3		0.15	0.4
0.02	3.65	10.5	0.04	7	22		0.57	1.7
10	10	10	10	10	10		24	24
24, Special			24, Special			24, Special		
4.5			4.5			12		
IP 64			IP 64			IP 64		
F			F			F		
RAL 9005			RAL 9005			RAL 9005		
3			3			3		
Y(star-configuration)			Y(star-configuration)			Y(star-configuration)		

IMPORTANT NOTES:

- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer.
- Please consult the maximum speed in duty cycle with the manufacturer.
- The values in the table refer to the ambient temperature of 20˚C to 25˚C.
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer.

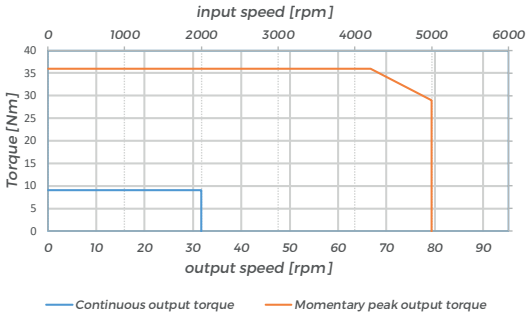
Tab. 8.1c: Inertia at input (DS actuator without brake)

Feedback type (d)	$J_{w/o\ brake}$	DS 050	DS 060	DS 070	DS 095	DS 110	DS 115	DS 140	DS 155
0A	10^{-4} kgm²	0.080	0.073	0.509	1.657	1.825	5.803	5.745	16.069
0B	10^{-4} kgm²	0.061	0.073	0.488	1.646	1.814	5.784	5.736	16.039
0C	10^{-4} kgm²	0.061	0.073	0.488	1.646	1.814	5.784	5.736	16.039
0D	10^{-4} kgm²	0.062	0.074	0.504	1.640	1.830	5.780	5.728	16.085
0E	10^{-4} kgm²	0.062	0.074	0.504	1.640	1.830	5.780	5.728	16.085
0F	10^{-4} kgm²	–	–	–	1.661	–	–	–	–
0G	10^{-4} kgm²	0.061	–	–	1.661	–	–	–	–
0H	10^{-4} kgm²	–	–	0.504	1.661	1.830	5.903	5.770	16.085
0J	10^{-4} kgm²	–	0.073	–	–	–	5.903	–	–
0K	10^{-4} kgm²	0.060	–	–	1.640	–	5.788	–	16.039
0L	10^{-4} kgm²	0.060	–	–	1.640	–	5.788	–	16.039
0N	10^{-4} kgm²	–	–	–	–	–	5.795	–	16.082
0P	10^{-4} kgm²	–	–	0.484	1.640	–	–	–	–
0Q	10^{-4} kgm²	–	–	0.484	1.640	–	–	–	–
0R	10^{-4} kgm²	–	–	–	–	–	–	–	–
0S	10^{-4} kgm²	–	–	–	–	–	–	–	–

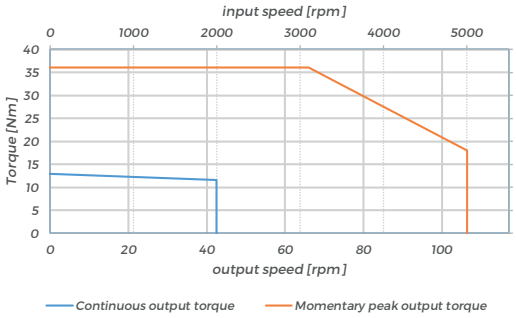
Tab. 8.1d: Inertia at input (DS actuator with brake)

Feedback type (d)	$J_{w/brake}$	DS 050	DS 060	DS 070	DS 095	DS 110	DS 115	DS 140	DS 155
0A	10^{-4} kgm²	0.121	0.083	0.878	1.707	2.193	5.926	12.100	16.210
0B	10^{-4} kgm²	0.101	0.081	0.856	1.695	2.182	5.907	12.120	16.230
0C	10^{-4} kgm²	0.101	0.081	0.856	1.695	2.182	5.907	12.120	16.230
0D	10^{-4} kgm²	0.101	0.082	0.871	1.689	2.196	5.903	12.100	16.210
0E	10^{-4} kgm²	0.101	0.082	0.871	1.689	2.196	5.903	12.100	16.210
0F	10^{-4} kgm²	–	–	–	1.711	–	–	–	–
0G	10^{-4} kgm²	–	–	–	1.711	–	–	–	–
0H	10^{-4} kgm²	–	–	0.871	1.711	2.196	5.926	12.100	16.450
0J	10^{-4} kgm²	–	0.081	–	–	–	5.926	–	–
0K	10^{-4} kgm²	0.100	–	–	1.690	–	5.901	–	16.360
0L	10^{-4} kgm²	0.100	–	–	1.690	–	5.901	–	16.360
0N	10^{-4} kgm²	–	–	–		–	5.918	–	16.180
0P	10^{-4} kgm²	–	–	–	1.690	–	–	–	–
0Q	10^{-4} kgm²	–	–	–	1.690	–	–	–	–
0R	10^{-4} kgm²	–	–	–		–	–	–	–
0S	10^{-4} kgm²	–	–	–		–	–	–	–

DS 050-063



DS 060-047



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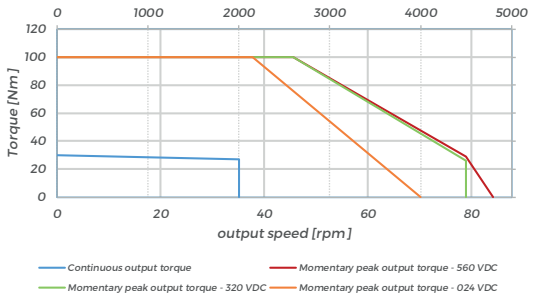

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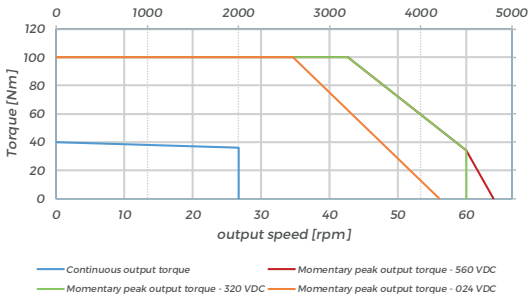

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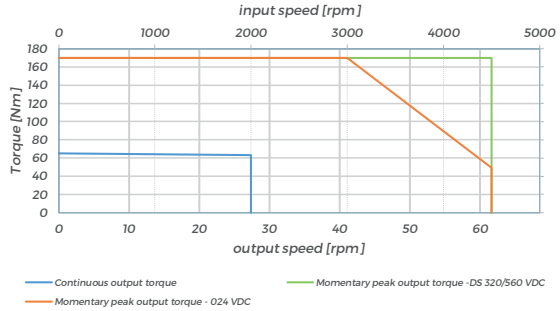
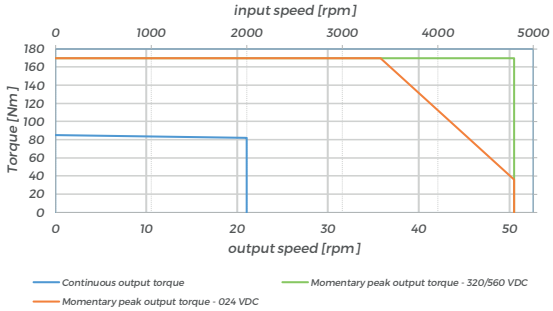
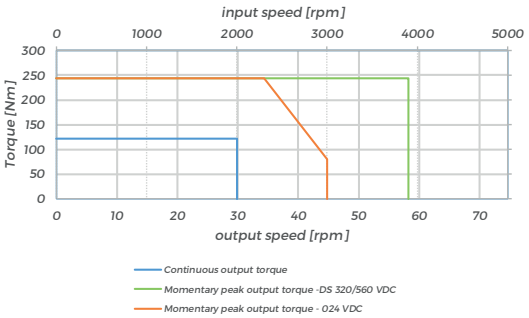


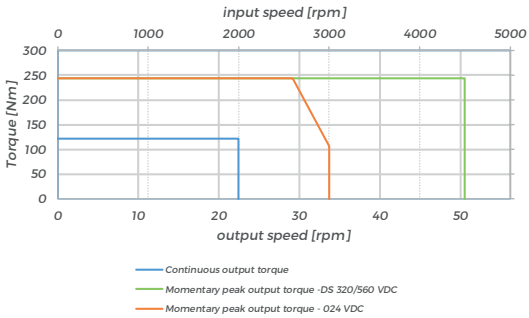
DS 095-095



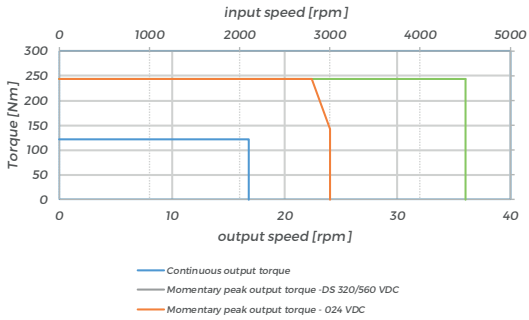
DS 110-067



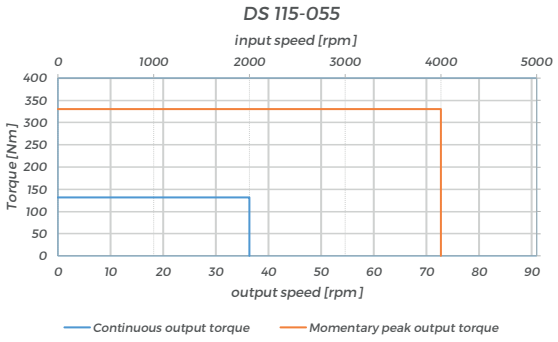
DS 110-089



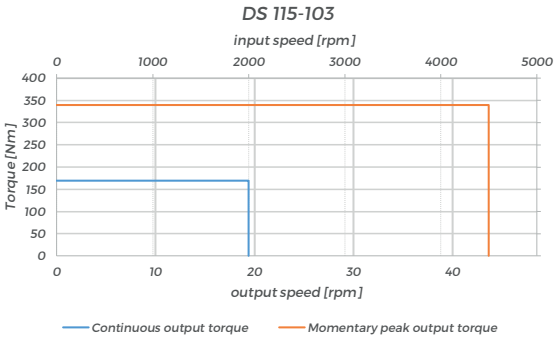
DS 110-119



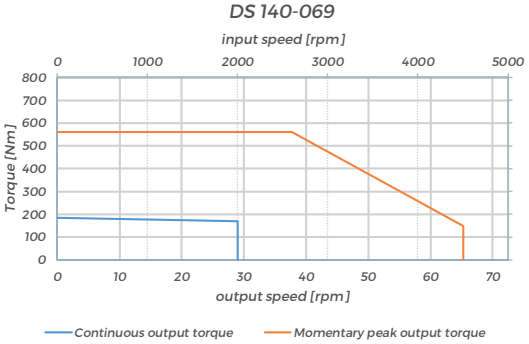
DS 115-055



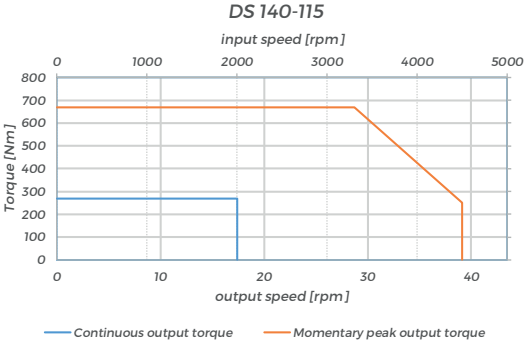
DS 115-103



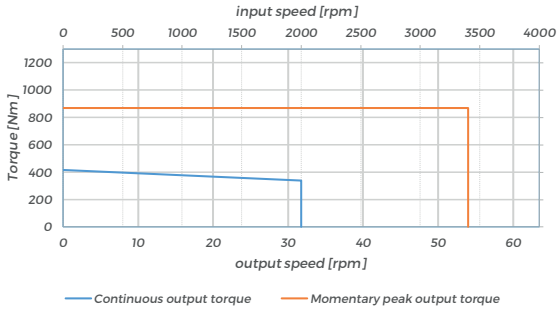
DS 140-069



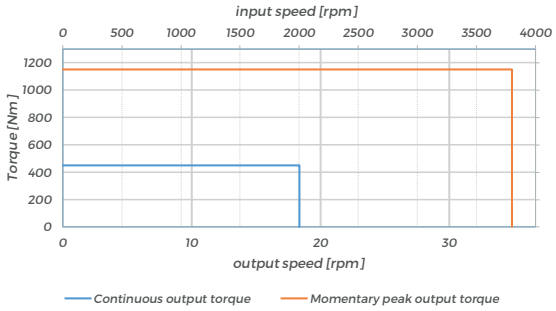
DS 140-115



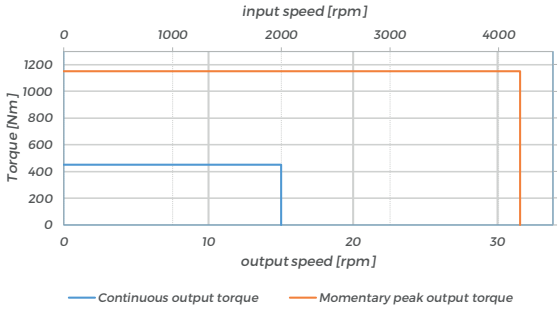
DS 155-063



DS 155-109



DS 155-133



DriveSpin®


Hollowshaft
High torque overload capacity
True hollow based on G series
Static tube

DriveSpin®

DSH series

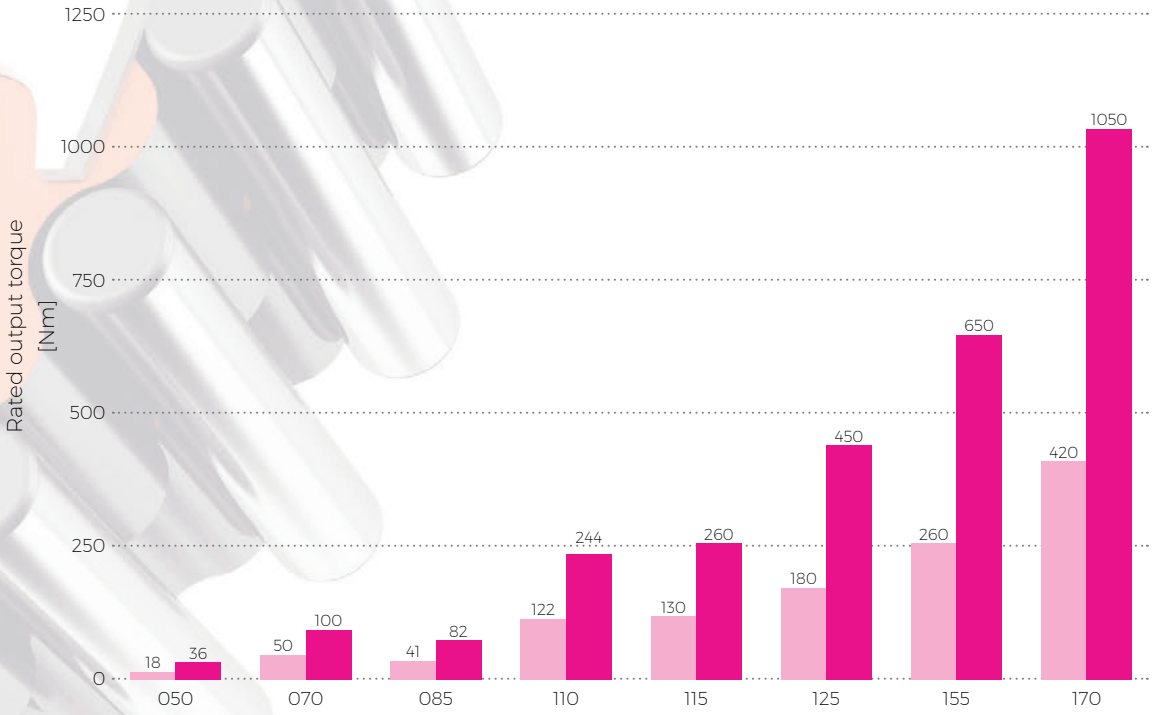
WHEN AIR IS BETTER THAN STEEL

8.2 DSH series

Advantages

- **low lost motion**
- **low moment of inertia**
- **high reduction ratio**
- **high kinematic accuracy**
- **high moment overload capacity**
- **high capacity of the integrated radial-axial output bearings**
- **high dynamic performance**

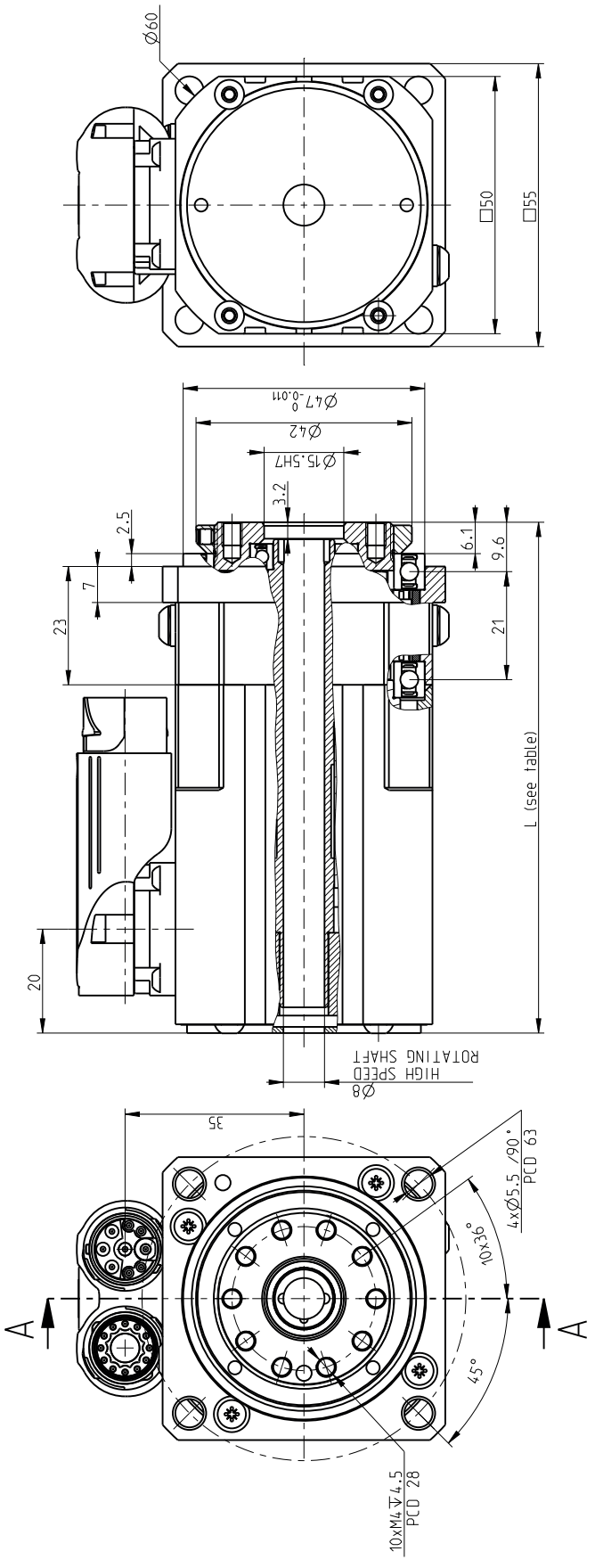
The **Drive**Spin® **DSH** electric actuators are characterized by the short axial length and by the possibility to use a through hole for routing cables, pipes, and drive shafts. Fully sealed compact actuators equipped with zero-backlash reduction gears have high power density, large hole inner diameter, from 8 to 40mm. Excellent positioning accuracy and positioning repeatability. DSH maintain radial-axial and torque load capacity and are characteristic with high overload capacity of reduction gear and of AC servomotor, featuring high dynamics. The voltage and feedback variability will widely satisfy all of customers requirements. This allows even demanding tasks such as exact positioning or fast movement of heavy loads to be performed with a high degree of repetitive accuracy. Rated output torque is from 18 Nm to 420 Nm.



Tab. 8.2a: Rated output torque

Size		050	070	085	110	115	125	155	170
Rated output torque	T_R [Nm]	18	50	41	122	130	180	260	420
Acceleration/ braking output torque	T_{acc} [Nm]	36	100	82	244	260	450	650	1050

DSH 050 - i - abcde-fg-xy



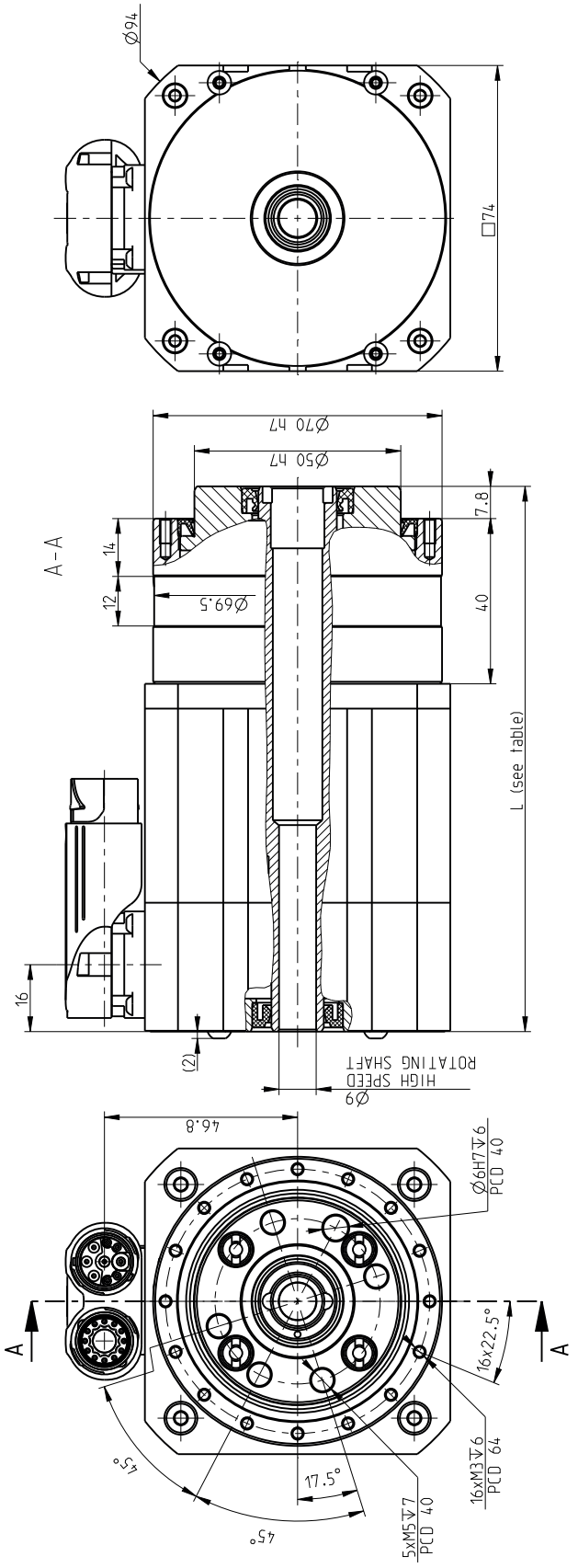
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 050	0A	107	1.2	-	-

Hollowshaft rotates at motor speed

DSH 050 – i – abcde-fg-xy

DSH 070 - i - abcde-fg-xy

Projection



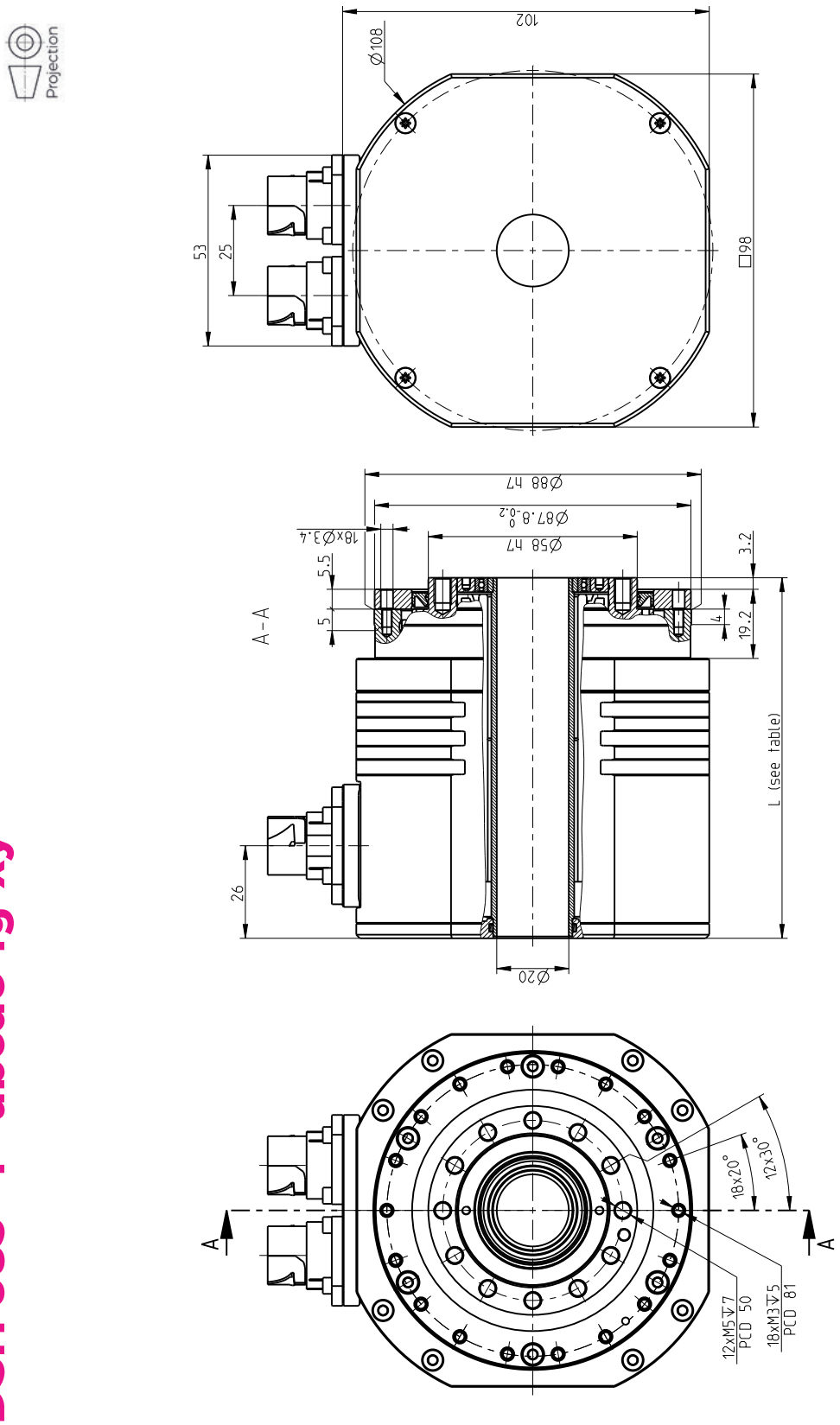
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 070	0A	153	2.3		
	0B,0C	133	2.1		

Hollowshaft rotates at motor speed

DSH 070 – i – abcde-fg-xy

DSH

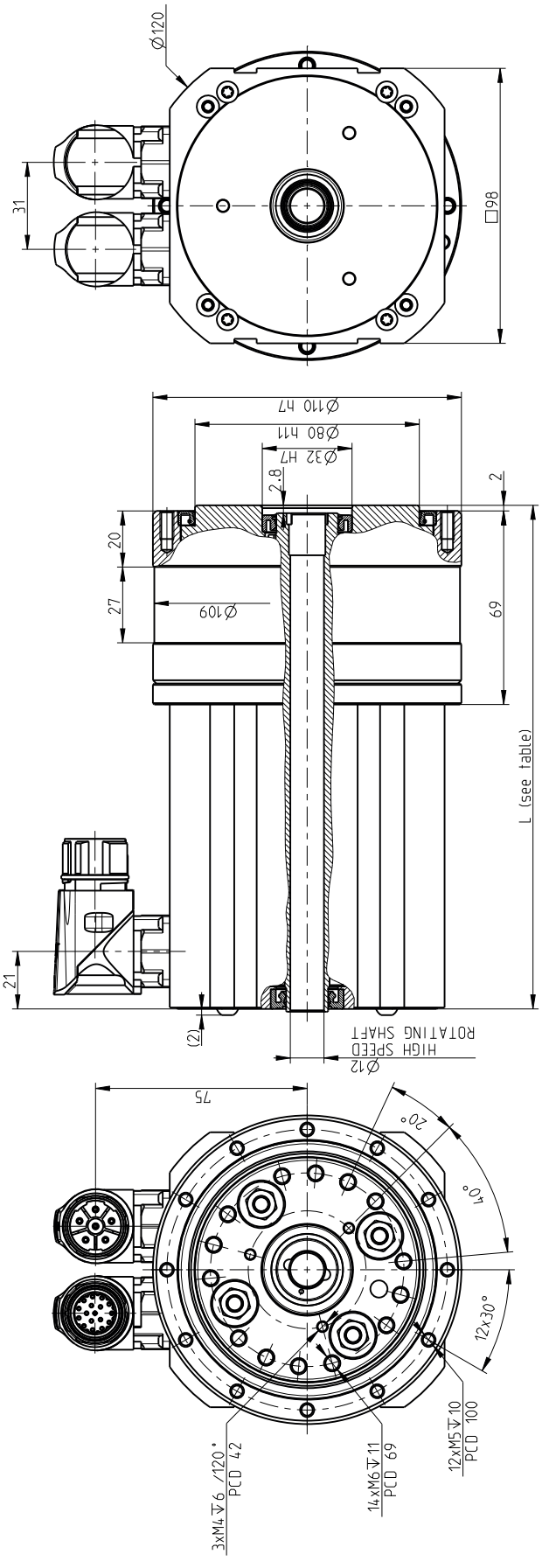
DSH 085 - i - abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 085	OA	120	4.2	150	4.6
	OB,OC	120	3.8	150	4.4
	OD,OE	120	3.7	150	4.5
	ON	120	3.5	150	4.3

DSH 085 – i – abcde-fg-xy

DSH 110 - i - abcde-fg-xy



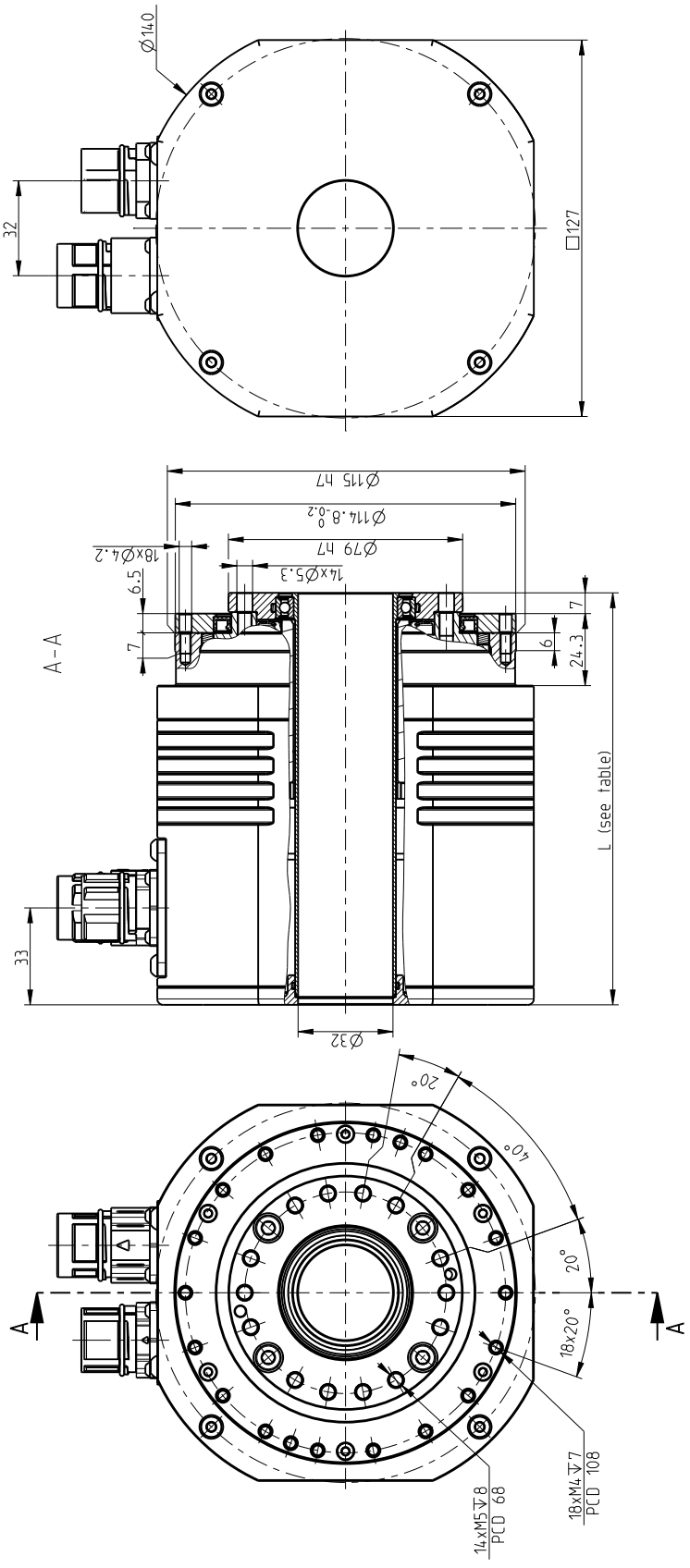
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 110	OA	181	8.7		

Hollowshaft rotates at motor speed

DSH 110 – i – abcde-fg-xy

DSH

DSH 115 - i - abcde-fg-xy



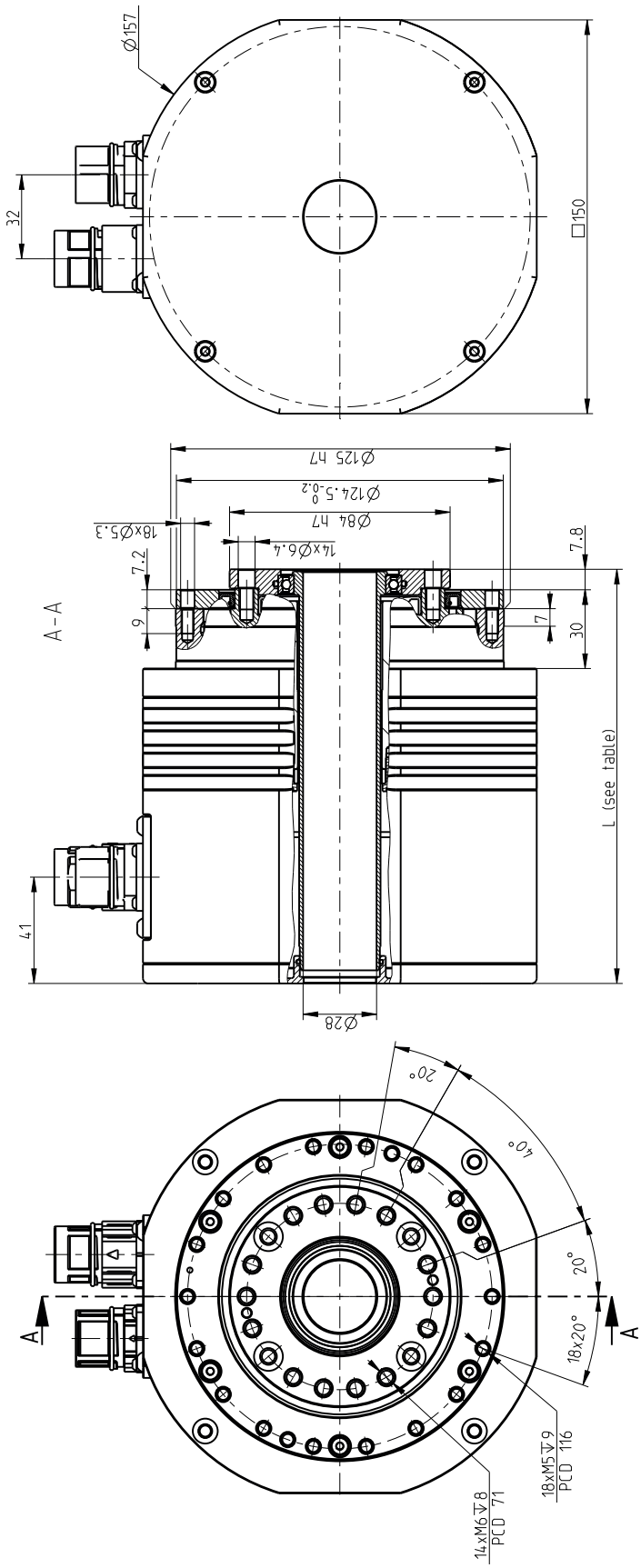
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 115	OA	144	7.3	168	8.3
	OB	139	6.5	165	7.5
	OD.OE	139	6.5	165	7.5
	OF	139	6.5	165	7.5

DSH 115 – i – abcde-fg-xy

DSH 125 - i - abcde-fg-xy

DSH 125 – i – abcde-fg-xy

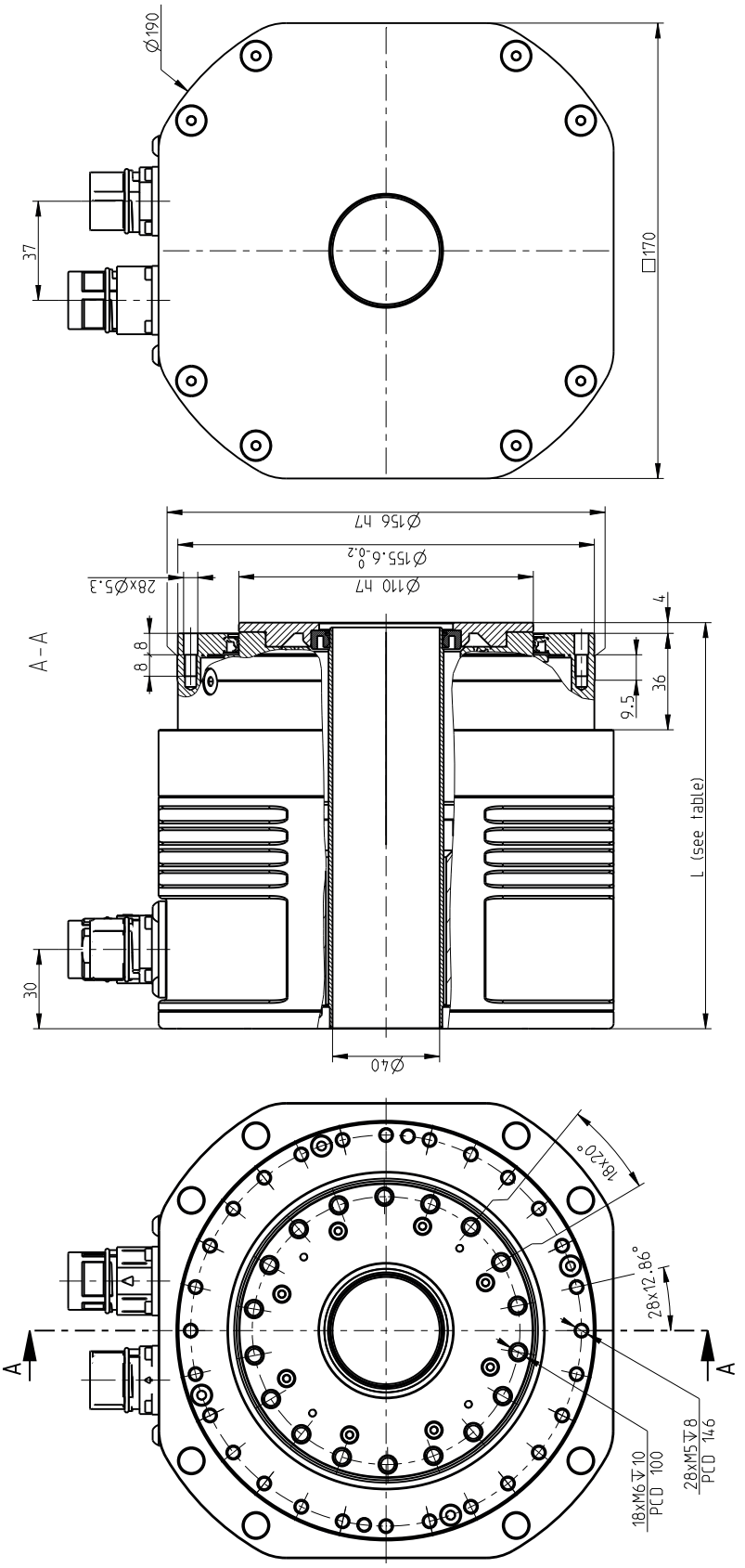
Projection



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 125	OA	158	11.2	186	12.9
	OB,OC	158	10.4	186	11.7
	OD,OE	158	10.4	186	11.7
	ON	158	9.0	186	10.3

DSH

DSH 155 - i - abcde-fg-xy

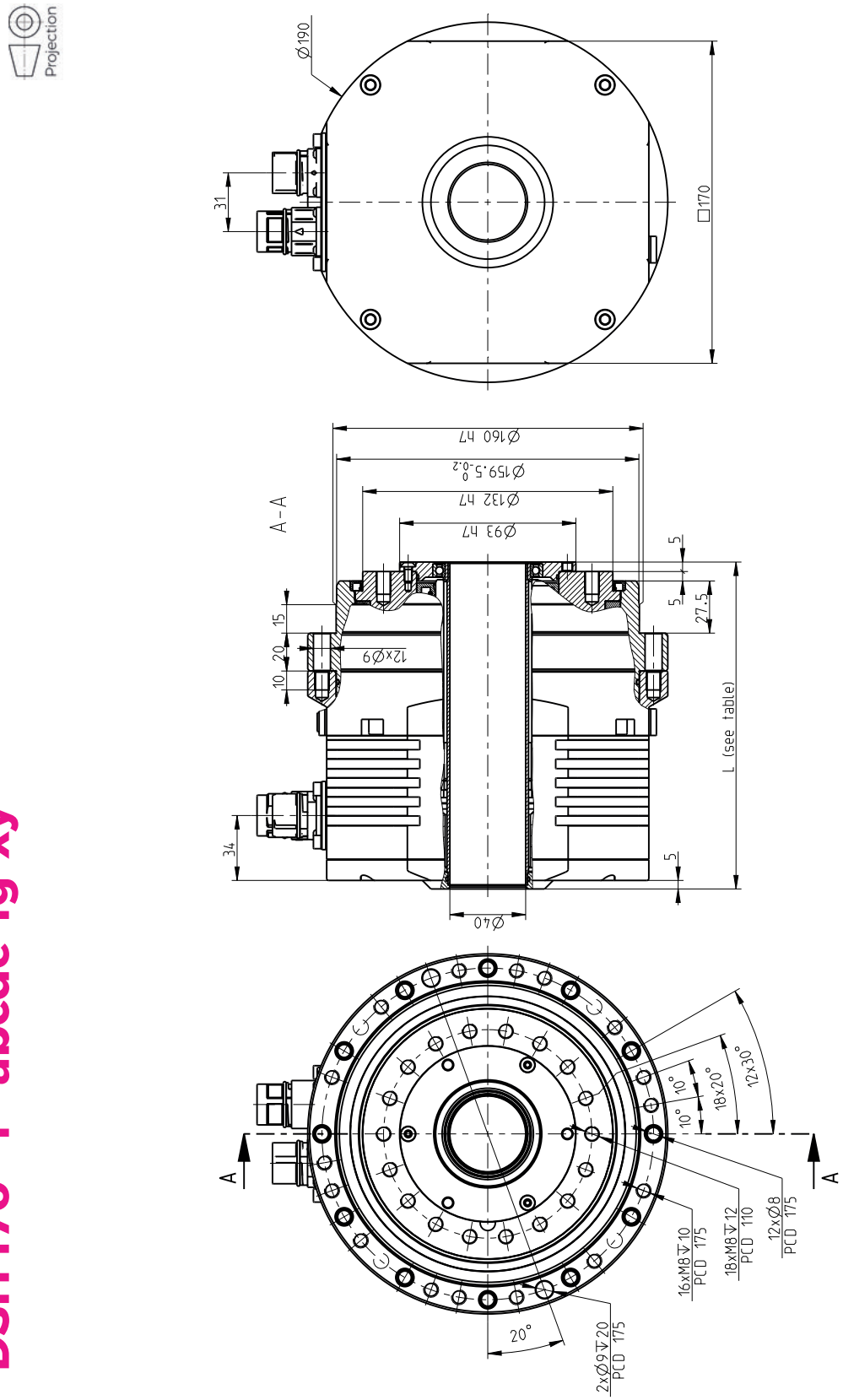


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 155	OA	152	13.1	175	14.3
	OB	152	11.8	175	13.0
	OD.OE	152	11.6	175	13.7
	OF	152	11.6s	175	13.7

DSH 155 – i – abcde-fg-xy

DSH 170 - i - abcde-fg-xy

Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSH 170	OA	188	26.0	235	27.0
	OB.OC	172	24.5	219	25.5
	OD.OE	172	24.0	219	25.0
	ON	172	22.0	219	23.0



DSH 170 – i – abcde-fg-xy

DSH

Tab. 8.2b: DSH series technical data table

Reduction Gear parameters		Tolerance	DSH 050		
Reduction ratio	i		63		
Hollowshaft diameter	Ød [mm]		8 [14]		
Rated output torque	T_R [Nm]		18		
Acceleration/braking output torque	T_{acc} [Nm]		36		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [9]	n_{max} [rpm]		5 000		
Allowable moment [2][3]	M_{cmax} [Nm]		44		
Tilting stiffness [1][6]	M_t [Nm/arcmin]		4		
Torsional stiffness [1][7]	k_t [Nm/arcmin]		2.5		
Lost motion	LM [arcmin]		< 1.5		
Hysteresis	H [arcmin]		< 1.5		
Rated radial force [2]	F_{rR} [kN]		1.44 [8]		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		1.9		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3 500	3 500	3 500
Motor rated torque	M_n [Nm]	+/- 10%	0.23	0.23	0.23
Motor rated current	I_n [A_{rms}]		7.1	0.58	0.58
Motor stall torque	M_o [Nm]	+/- 10%	0.24	0.24	0.24
Motor stall current	I_o [A_{rms}]		7.4	0.6	0.6
Motor peak torque	M_{max} [Nm]	+/- 10%	1	1	1
Motor peak current	I_{max} [A]		30.8	2.5	2.5
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%	2.7	36	36
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%	0.032	0.4	0.4
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%	0.2	36	36
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%	0.2	36	36
Number of poles	2p		6	6	6
Electromagnetic brake DC supply	[V_{dc}]		24. Special		
Electromagnetic brake torque at input	[Nm]		0.4		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y(star-configuration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3 900 rpm for ratio 67 ; 4 500 rpm for ratios 89, 119
6) The parameter depends on the version of high precision reduction gear.
7) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
8) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$ = 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
9) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
10) 3 200 rpm for ratio 69 ; 3 700 rpm for ratio 125
11) 3 800 rpm for ratio 47 ; 4 500 rpm for ratio 85
12) 2 500 rpm for ratio 55 ; 3 400 rpm for ratio 103
13) 2 400 rpm for ratio 49 ; 3 800 rpm for ratio 99
14) Hollowshaft rotates at motor speed

Tab. 8.2b: DSH series technical data table - continued

DSH 070			DSH 085			DSH 110		
57, 75			47, 85			67, 89, 119		
9 [14] or 12 [14]			14 or 20			12 [14]		
50			41			122		
100			82			244		
2 000			2 000			2000		
5 000			3 800 / 4 500 [11]			3900 / 4500 [5]		
142			220			740		
35			85			150		
7			10			22		
< 1.5			< 1			< 1		
< 1.5			<1			< 1		
2.8			2			9.3		
4.1			6					
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560	24	320	560
2 500	4 500	4 500	2 500	3 000	3 000	2 500	3 000	3 000
0.88	0.76	0.76	2.1	2.1	2.1	3.4	3.2	3.2
13	1.2	0.7	42	4.2	2.1	37	4.9	2.8
0.9	0.9	0.9	2.3	2.3	2.3	3.8	3.8	3.8
13.3	1.42	0.83	46	4.6	2.3	41	6	3
3	3	3	5.8	5.8	5.8	11	11	11
44.3	4.7	2.8	130	13.03	6.52	120	17	10
5.7	68.3	105.6	4.37	49.1	87.4	8	57	103
0.0677	0.63	1.09	0.05	0.5	1	0.09	0.65	1.14
0.13	17	40.5	0.017	2.1	6.7	0.027	1.4	4.5
0.25	34.4	87	0.04	5.2	17	0.15	7.4	24
10	10	10	16	16	16	10	10	10
24. Special			24. Special			24. Special		
4.5			1.5			4.5		
IP 64			IP 64			IP 64		
F			F			F		
RAL 9005			RAL 9005			RAL 9005		
3			3			3		
Y (star-configuration)			Y (star-configuaration)			Y (star-configuaration)		

IMPORTANT NOTES:

- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer
- Please consult the maximum speed in duty cycle with the manufacturer
- The values in the table refer to the ambient temperature of 20˚C to 25˚C
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer

Tab. 8.2b: DSH series technical data table - continued

Reduction Gear parameters		Tolerance	DSH 115		
Reduction ratio	i		55, 103		
Hollowshaft diameter	Ød [mm]		32		
Rated output torque	T_R [Nm]		130		
Acceleration/braking output torque	T_{acc} [Nm]		260		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [9]	n_{max} [rpm]		2 500 / 3 400 [12]		
Allowable moment [2][3]	M_{cmax} [Nm]		550		
Tilting stiffness [1][6]	M_t [Nm/arcmin]		220		
Torsional stiffness [1][7]	k_t [Nm/arcmin]		23		
Lost motion	LM [arcmin]		< 1		
Hysteresis	H [arcmin]		< 1		
Rated radial force [2]	F_{rR} [kN]		4		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		12.5		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3 500	3 500	3 500
Motor rated torque	M_n [Nm]	+/- 10%	2.9	2.9	2.9
Motor rated current	I_n [A_{rms}]		46	3.5	2
Motor stall torque	M_o [Nm]	+/- 10%	3	3	3
Motor stall current	I_o [A_{rms}]		47.6	3.6	2
Motor peak torque	M_{max} [Nm]	+/- 10%	8.5	8.5	8.5
Motor peak current	I_{max} [A]		135	10.1	5.8
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%	5.6	75	131
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%	0.06	0.84	1.47
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%	0.011	2	6
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%	0.03	5	16
Number of poles	2p		20	20	20
Electromagnetic brake DC supply	[V_{dc}]		24. Special		
Electromagnetic brake torque at input	[Nm]		5		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y (star-configuaration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3 900 rpm for ratio 67 ; 4 500 rpm for ratios 89, 119
6) The parameter depends on the version of high precision reduction gear.
7) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
8) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$ = 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
9) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
10) 3 200 rpm for ratio 69 ; 3 700 rpm for ratio 125
11) 3 800 rpm for ratio 47 ; 4 500 rpm for ratio 85
12) 2 500 rpm for ratio 55 ; 3 400 rpm for ratio 103
13) 2 400 rpm for ratio 49 ; 3 800 rpm for ratio 99
14) Hollowshaft rotates at motor speed

Tab. 8.2b: DSH series technical data table - continued

DSH 125			DSH 155			DSH 170		
49, 99			109			69, 125		
27			40			40		
180			260			420		
450			650			1 050		
2 000			2 000			2 000		
2 400 / 3 800 [13]			3 000			3 200 / 3 700 [10]		
880			1 640			2 000		
280			900			1 100		
29			67			110		
< 1			< 1			< 1		
< 1			< 1			< 1		
4.4			8			19.2		
13.8			26			27.9		
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560	24	320	560
4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000	4 000
4	4	4	3.8	3.8	3.8	5	5	5
74.1	5.6	3.2	67.2	5	3	133	10	6
4.5	4.5	4.5	5	5	5	11	11	11
83.3	6.3	3.6	88	6.6	4	293	21.9	6
13.5	13.5	13.5	16	16	16	23	23	23
250	18.8	11	283	21.2	14	612	45.9	27.6
4.76	63	111	5	67	112	3.3	44	77
0.054	0.72	1.26	0.057	0.75	1.27	0.038	0.5	0.83
0.0055	1	3.3	0.005	1	2.5	0.00085	0.15	0.4
0.04	7	22	0.014	2	7	0.0032	0.57	1.7
10	10	10	24	24	24	24	24	24
24, Special			24, Special			24, Special		
5			5			19		
IP 64			IP 64			IP 64		
F			F			F		
RAL 9005			RAL 9005			RAL 9005		
3			3			3		
Y (star-configuration)			Y (star-configuration)			Y (star-configuration)		

IMPORTANT NOTES:

- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer
- Please consult the maximum speed in duty cycle with the manufacturer
- The values in the table refer to the ambient temperature of 20˚C to 25˚C
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer

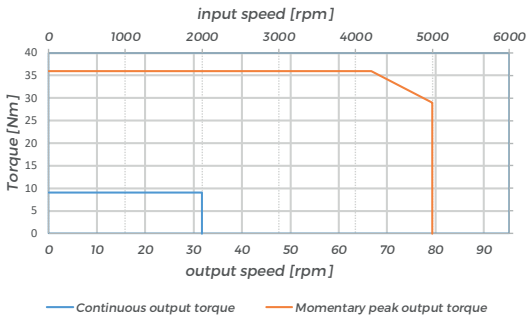
Tab. 8.2c: Inertia at input (DSH actuator without brake)

Feedback type (d)	$J_{w/o\ brake}$	DSH 050	DSH 070	DSH 085	DSH 110	DSH 115	DSH 125	DSH 155	DSH 170
0A	10^{-4} kgm²	0.110	0.630	1.960	2.040	13.977	14.516	19.340	6.370
0B	10^{-4} kgm²	–	0.483	1.840	–	8.757	9.336	10.600	6.300
0C	10^{-4} kgm²	–	0.483	1.840	–	8.757	9.336	10.600	6.300
0D	10^{-4} kgm²	–	–	2.360	–	9.097	9.636	10.460	6.280
0E	10^{-4} kgm²	–	–	2.360	–	9.097	9.636	10.460	6.280
0F	10^{-4} kgm²	–	–	–	–	9.097	9.636	10.460	–
0J	10^{-4} kgm²	0.091	–	–	–	–	–	–	–
0N	10^{-4} kgm²	0.105	–	2.060	–	–	10.624	–	6.270

Tab. 8.2d: Inertia at input (DSH actuator with brake)

Feedback type (d)	$J_{w/o\ brake}$	DSH 050	DSH 070	DSH 085	DSH 110	DSH 115	DSH 125	DSH 155	DSH 170
0A	10^{-4} kgm²	0.143	–	2.380	–	15.080	15.937	24.428	6.430
0B	10^{-4} kgm²	–	–	2.200	–	9.860	15.757	15.249	6.430
0C	10^{-4} kgm²	–	–	2.200	–	9.860	10.757	15.249	6.430
0D	10^{-4} kgm²	–	–	2.810	–	10.200	11.057	15.550	6.430
0E	10^{-4} kgm²	–	–	2.810	–	10.200	11.057	15.550	6.430
0F	10^{-4} kgm²	–	–	–	–	10.200	11.057	15.550	–
0J	10^{-4} kgm²	0.125	–	–	–	–	–	–	–
0N	10^{-4} kgm²	0.138	–	2.520	–	–	12.044	–	6.420

DSH 050-063



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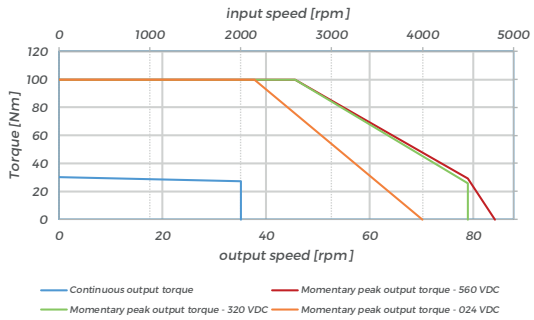

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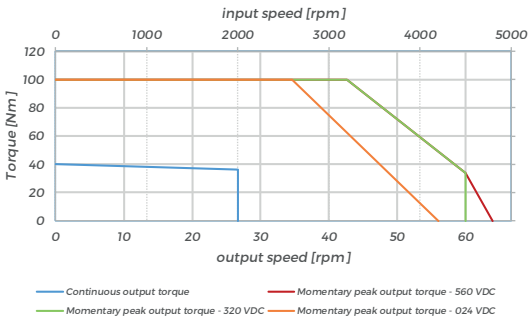

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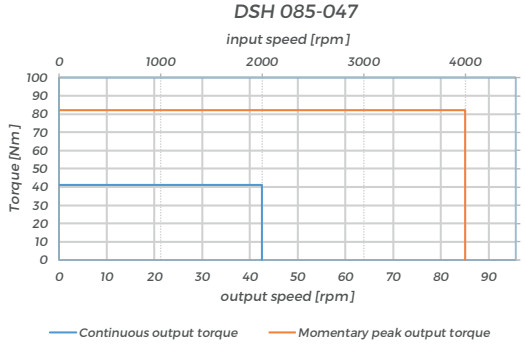
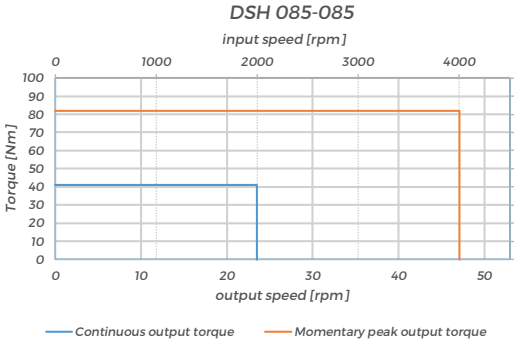


DSH 085-085



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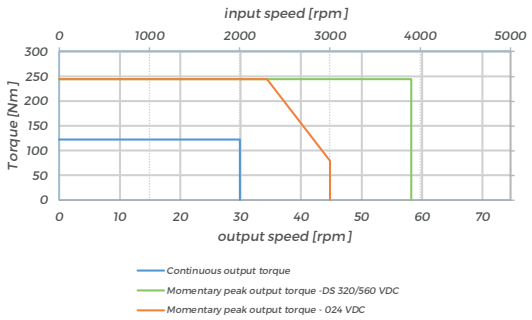

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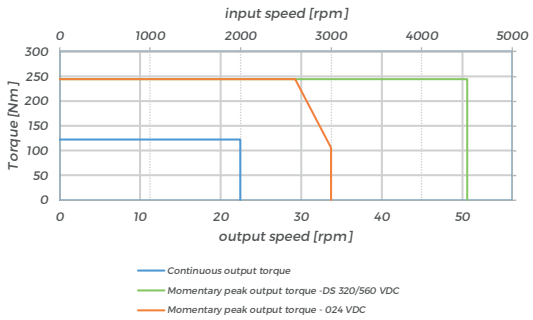

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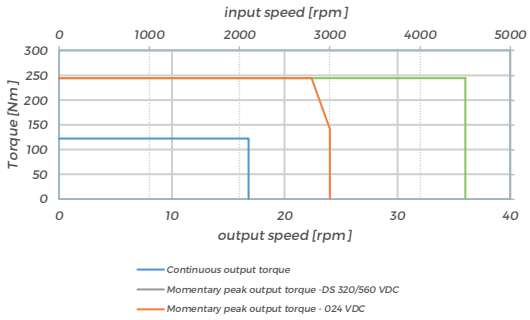

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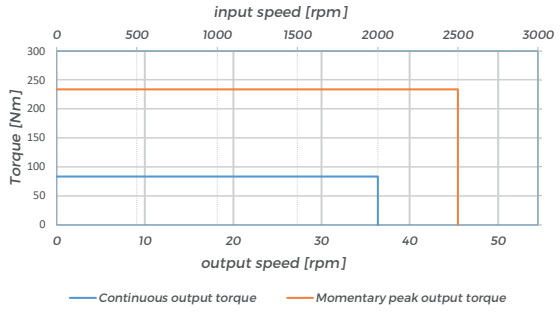
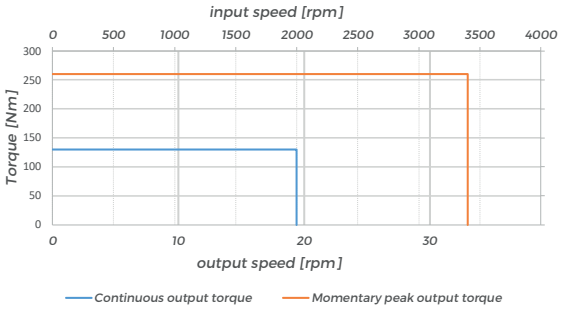
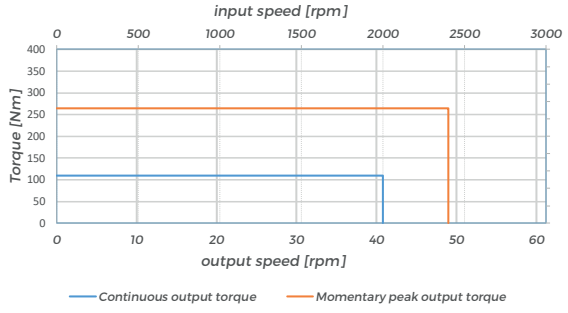


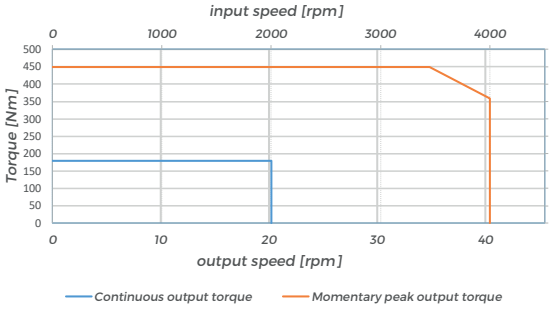
DSH 115-103



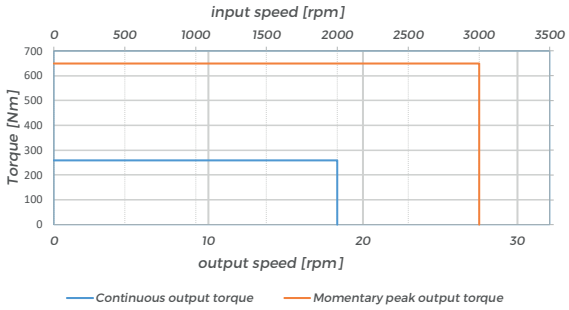
DSH 125-049



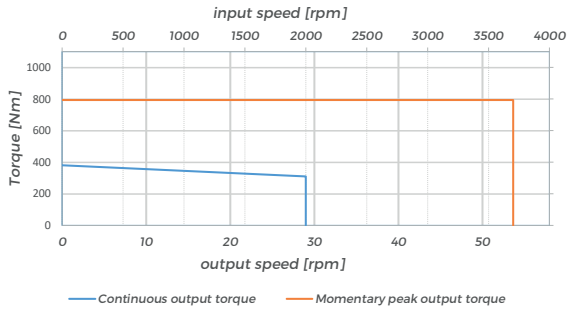
DSH 125-099



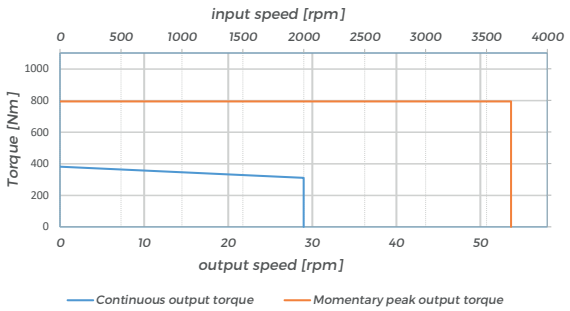
DSH 155-109



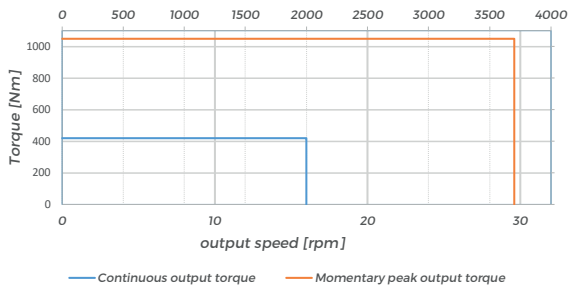
DSH 170-069 d=35mm



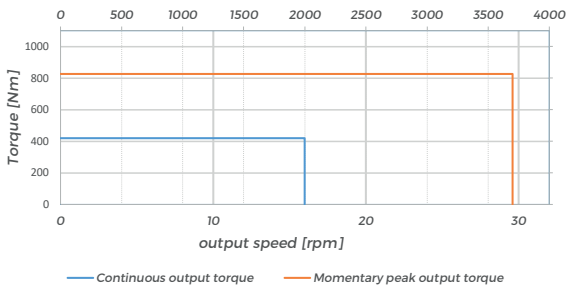
DSH 170-069 d=40mm



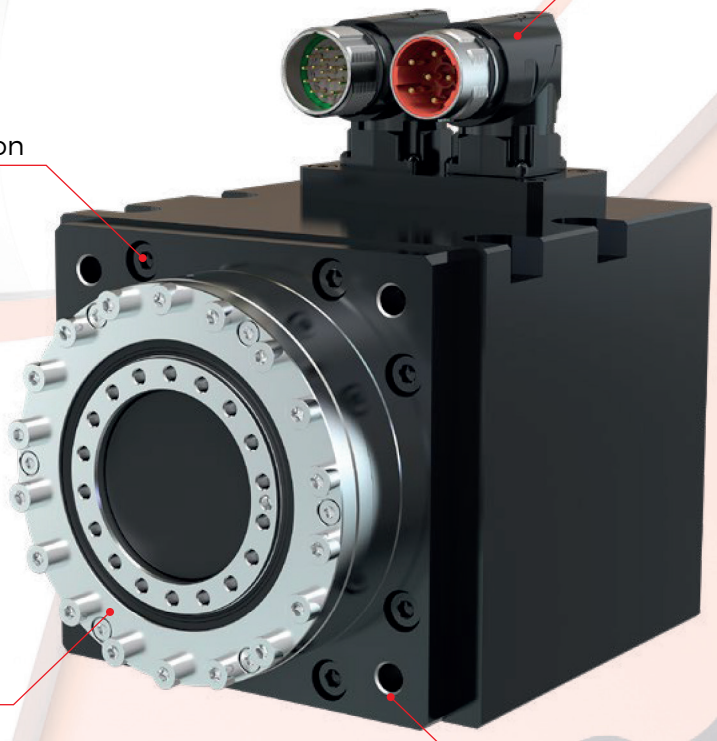
DSH 170-125 d=35mm



DSH 170-125 d=40mm



DriveSpin®


Multi point connection
Making x axis solution
Robust and overload design
Any design of the body

DriveSpin®

DSM series

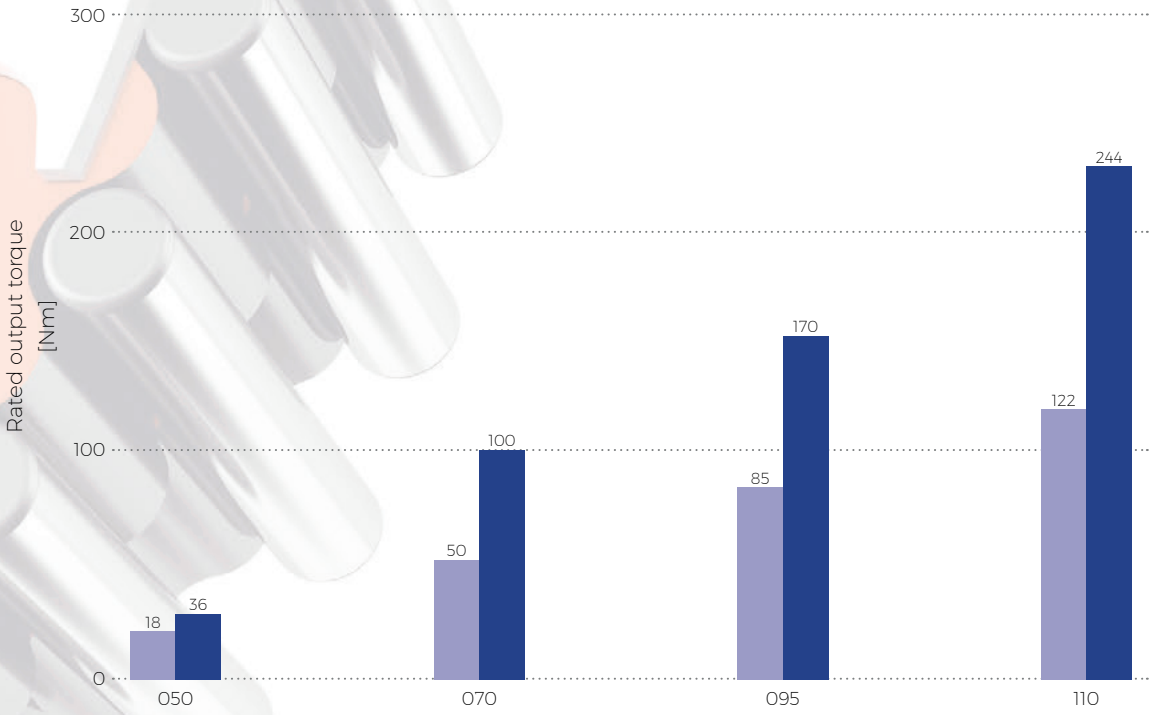
MOUNT IT YOUR WAY

8.3 DSM series

Advantages

- **low lost motion**
- **low moment of inertia**
- **high reduction ratio**
- **high kinematic accuracy**
- **high moment overload capacity**
- **high capacity of the integrated radial-axial output bearings**
- **high dynamic performance**

The **Drive**Spin® **DSM** modular rotary positioning modules provide controlled rotary motion and transfer of torque with a high positioning accuracy and precision. The output flange of the module allows capturing both radial and axial forces. The modules feature a special design, which allows versatile connections, also without additional devices. Actuators can be combined in many ways using the modular system. The simple design integration ability and small dimensions allow creating kinematic assemblies from DSM modules for end effectors, but also for additional devices and positioners. The selection of a module size depends on the required load-carrying capacity and the number of degrees of freedom of the motion axis. The DSM Series is characterized by simple and quick assembly and reduces overall cost. Compact design ensures optimum mounting options and application possibilities, even in confined installation spaces. These actuators are used in applications with request of high torque density, precision and dynamics. Rated output torque is from 18 Nm to 122 Nm.

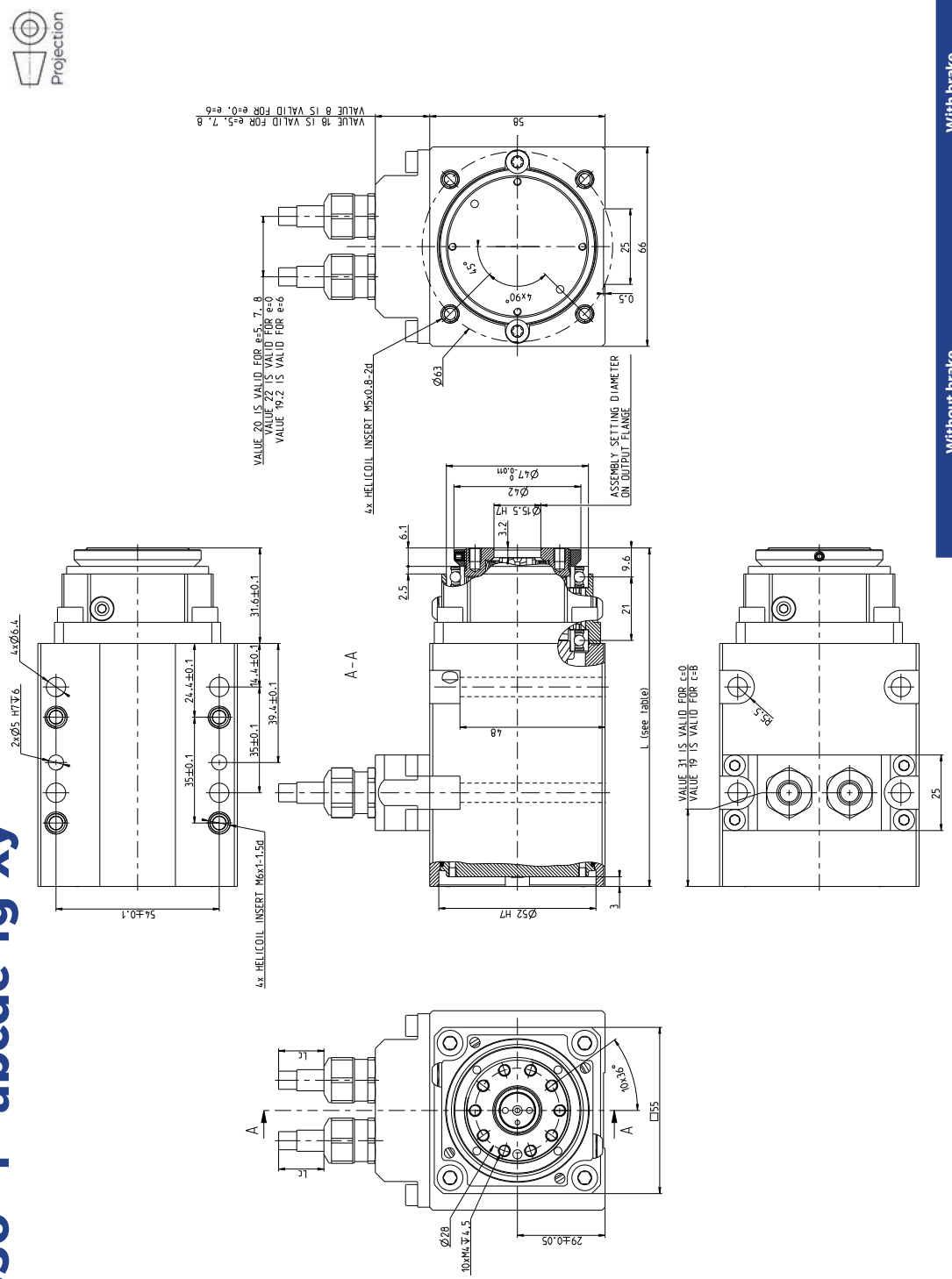


Tab. 8.3a: Rated output torque

Size		050	070	095	110
Rated output torque	T_R [Nm]	18	50	85	122
Acceleration/ braking output torque	T_{acc} [Nm]	36	100	170	244

DSM 050 - i - abcde-fg-xy

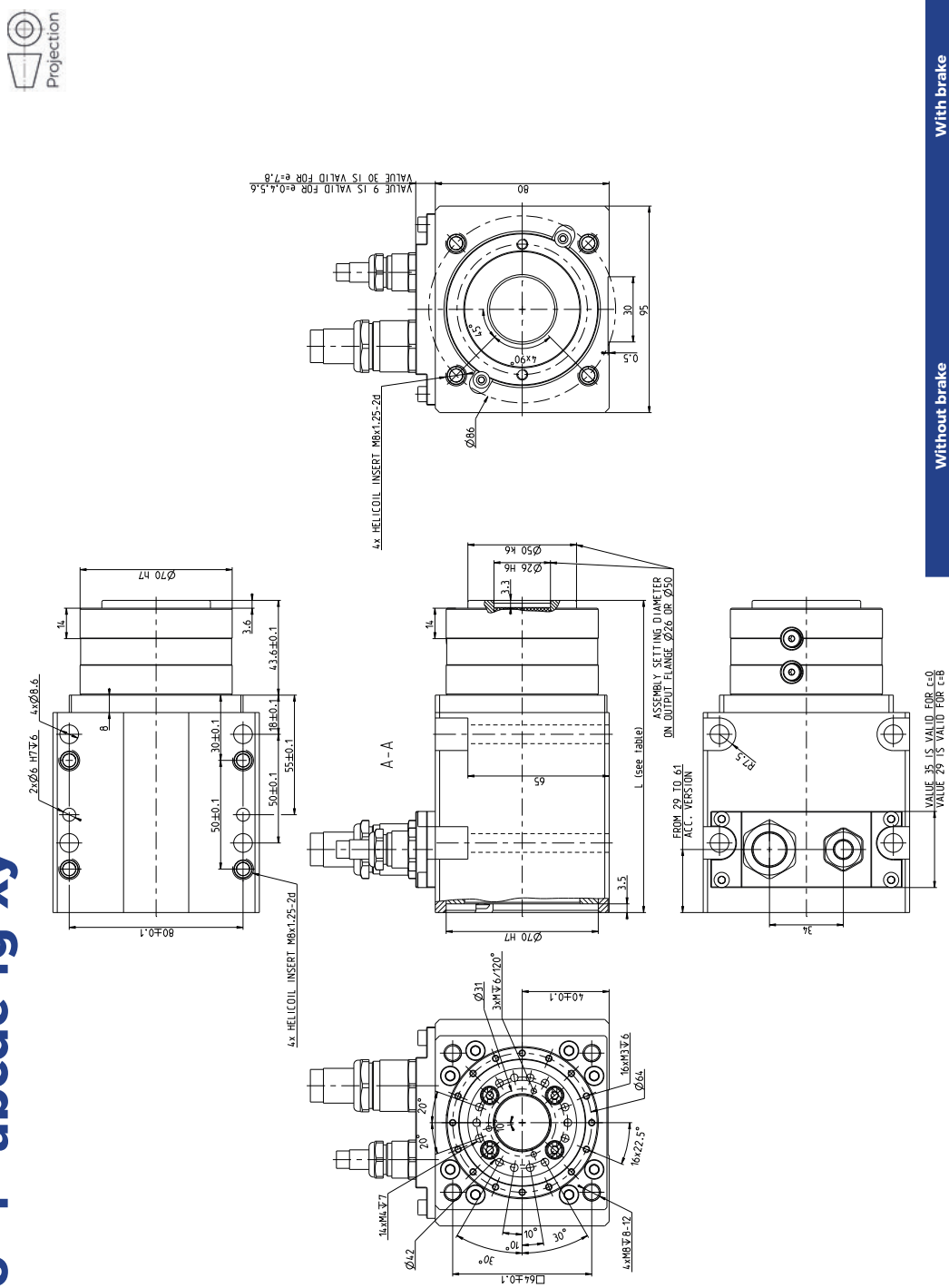
DSM 050 – i – abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSM 050	OA	112	1.4	142	1.6
	OB,OC	112	1.4	142	1.6
	OD,OE	112	1.4	142	1.6
	OK,OL	119	1.4	152	1.6

DSM 070 - i - abcde-fg-xy

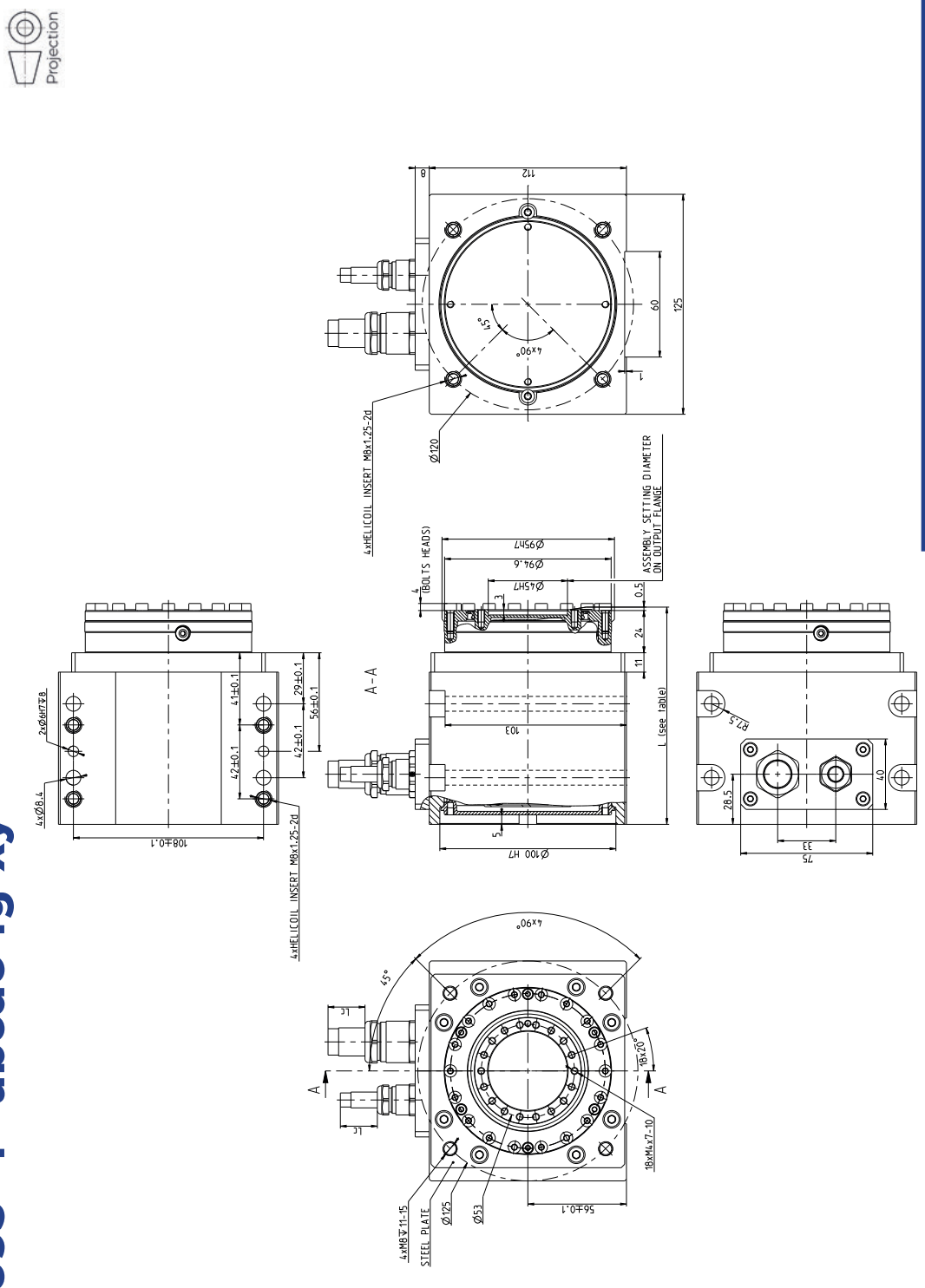
DSM 070 – i – abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSM 070	OA	144	3.2	177	4.2
	OB.OC	144	3.2	177	4.8
	OD.OE	144	3.1	177	4.1
	OH	154	3.4	199	4.6

DSM 095 - i - abcde-fg-xy

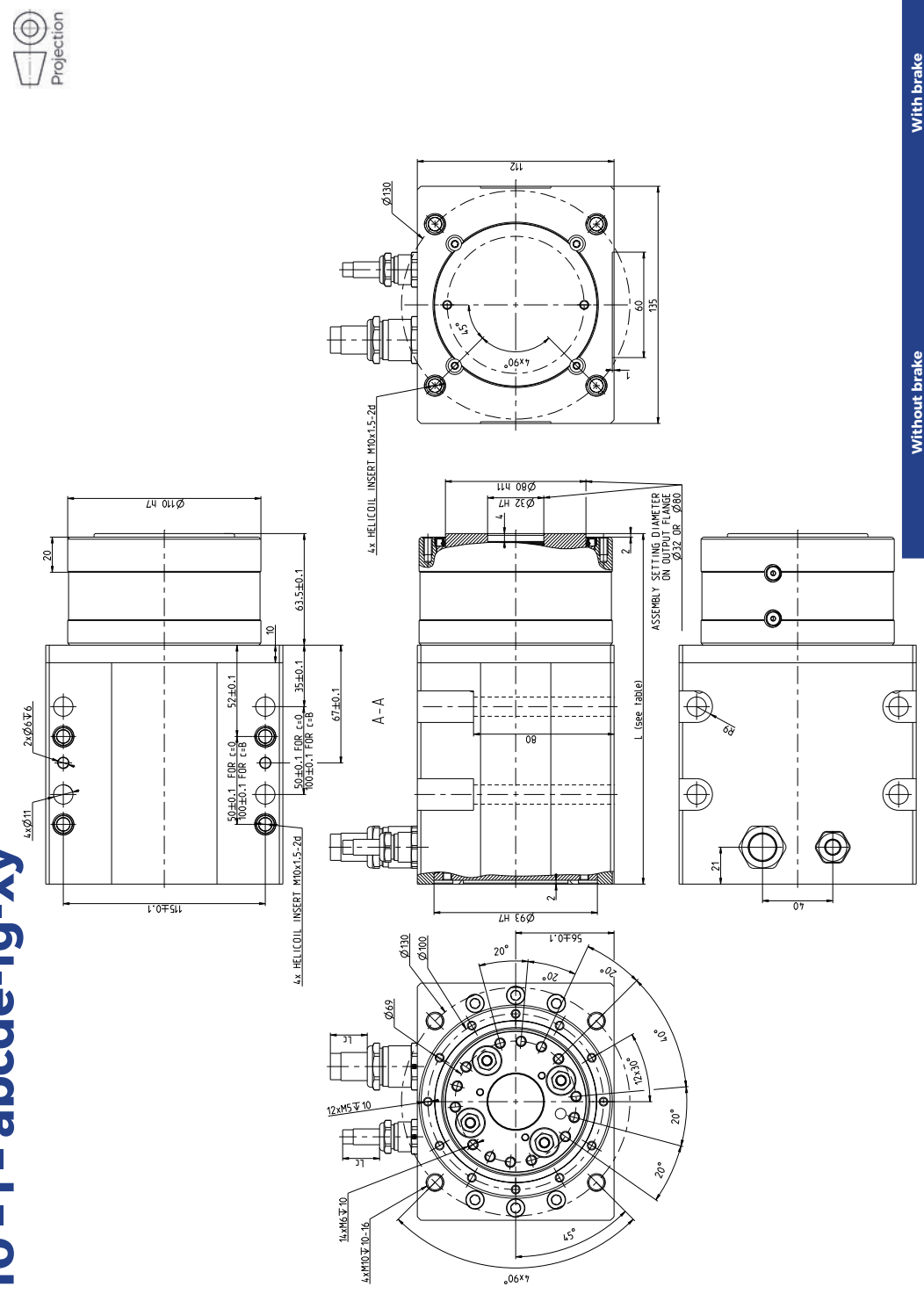
DSM 095 – i – abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSM 095	OA	122	5.9	145	6.5
	OB,OC	122	6.1	145	6.6
	OD,OE	122	6.0	145	6.7
	OG,OH,OF	142	6.6	165	7.3

DSM 110 - i - abcde-fg-xy

DSM 110 – i – abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSM 110	0A	200	10.5	252	12.4
	0B.0C	200	10.5	252	12.4
	0D.0E	200	10.6	252	12.5
	0H	200	10.6	252	12.5

Tab. 8.3b: DSM series technical data table

Reduction Gear parameters		Tolerance	DSM 050		
Reduction ratio	i		63		
Rated output torque	T_R [Nm]		18		
Acceleration/braking output torque	T_{acc} [Nm]		36		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [9]	n_{max} [rpm]		5 000		
Allowable moment [2][3]	M_{cmax} [Nm]		44		
Tilting stiffness [1][6]	M_t [Nm/arcmin]		4		
Torsional stiffness [1][7]	k_t [Nm/arcmin]		2.5		
Lost motion	LM [arcmin]		< 1.5		
Hysteresis	H [arcmin]		< 1.5		
Rated radial force [2]	F_{rR} [kN]		1.44 [8]		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		1.9		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3 500	3 500	3 500
Motor rated torque	M_n [Nm]	+/- 10%	0.23	0.23	0.23
Motor rated current	I_n [A_{rms}]		7.1	0.58	0.3
Motor stall torque	M_o [Nm]	+/- 10%	0.24	0.24	0.24
Motor stall current	I_o [A_{rms}]		7.4	0.6	0.3
Motor peak torque	M_{max} [Nm]	+/- 10%	1	1	1
Motor peak current	I_{max} [A]		30.8	2.5	1.25
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%	2.7	36	67
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%	0.032	0.4	0.8
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%	0.2	36	122
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%	0.2	36	130
Number of poles	2p		6	6	6
Electromagnetic brake DC supply	[V_{dc}]		24, Special		
Electromagnetic brake torque at input	[Nm]		0.4		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y(star-configuration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3 900 rpm for ratio 67 ; 4 500 rpm for ratios 89, 119
6) The parameter depends on the version of high precision reduction gear.
7) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
8) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$ = 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
9) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
10) 4 500 rpm for ratio 73 ; 4 800 rpm for ratio 95

Tab. 8.3b: DSM series technical data table - continued

DSM 070			DSM 095			DSM 110		
57, 75			73, 95			67, 89, 119		
50			85			122		
100			170			244		
2 000			2 000			2 000		
5 000			4 500 / 4 800 [10]			3 900 / 4 500 [5]		
142			410			740		
35			120			150		
7			15			22		
< 1.5			< 1			< 1		
< 1.5			< 1			< 1		
2.8			3.5			9.3		
4.1			11.1			13.1		
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560	24	320	560
2 500	4 500	4 500	4 000	4 000	4 000	2 500	3 000	3 000
0.88	0.76	0.76	1.4	1.4	1.4	3.4	3.2	3.2
13	1.2	0.7	27	5.6	3.1	37	4.9	2.8
0.9	0.9	0.9	1.6	1.6	1.6	3.8	3.8	3.8
13.3	1.42	0.83	31	6.4	3.5	41	6	3
3	3	3	5.5	5.5	5.5	11	11	11
44.3	4.7	2.8	106.1	22	12.1	120	17	10
5.7	68.3	105.6	4.4	25	47	8	57	103
0.0677	0.63	1.09	0.052	0.25	0.46	0.09	0.65	1.14
0.13	17	40.5	0.052	1.2	4.36	0.027	1.4	4.5
0.25	34.4	87	0.11	2.84	8.71	0.15	7.4	24
10	10	10	10	10	10	10	10	10
24, Special			24, Special			24, Special		
4.5			2			4.5		
IP 64			IP 64			IP 64		
F			F			F		
RAL 9005			RAL 9005			RAL 9005		
3			3			3		
Y(star-configuration)			Y(star-configuration)			Y(star-configuration)		

IMPORTANT NOTES:

- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer
- Please consult the maximum speed in duty cycle with the manufacturer
- The values in the table refer to the ambient temperature of 20˚C to 25˚C
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer

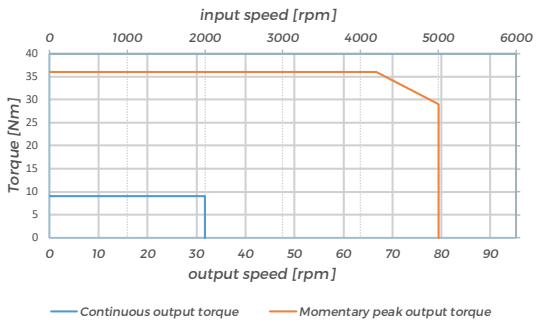
Tab. 8.3c: Inertia at input (DSM actuator without brake)

Feedback type (d)	$J_{w/o\ brake}$	DSM 050	DSM 070	DSM 095	DSM 110
0A	10^{-4} kgm²	0.062	0.420	1.657	1.825
0B	10^{-4} kgm²	0.061	0.487	1.646	1.814
0C	10^{-4} kgm²	0.061	0.487	1.646	1.814
0D	10^{-4} kgm²	0.037	0.416	1.640	1.830
0E	10^{-4} kgm²	0.037	0.416	1.640	1.830
0F	10^{-4} kgm²	–	–	1.661	–
0G	10^{-4} kgm²	–	–	1.661	–
0H	10^{-4} kgm²	–	0.416	1.661	1.830
0K	10^{-4} kgm²	0.060	–	–	–
0L	10^{-4} kgm²	0.060	–	–	–

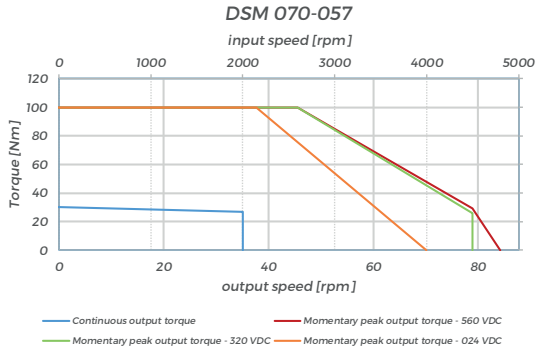
Tab. 8.3d: Inertia at input (DSM actuator with brake)

Feedback type (d)	$J_{w/o\ brake}$	DSM 050	DSM 070	DSM 095	DSM 110
0A	10^{-4} kgm²	0.121	0.780	1.707	2.193
0B	10^{-4} kgm²	0.101	0.853	1.695	2.182
0C	10^{-4} kgm²	0.101	0.853	1.695	2.182
0D	10^{-4} kgm²	0.101	0.778	1.689	2.196
0E	10^{-4} kgm²	0.101	0.778	1.689	2.196
0F	10^{-4} kgm²	–	–	1.711	–
0G	10^{-4} kgm²	–	–	1.711	–
0H	10^{-4} kgm²	–	0.778	1.711	2.196
0K	10^{-4} kgm²	0.100	–	–	–
0L	10^{-4} kgm²	0.100	–	–	–

DSM 050-063



DSM 070-057



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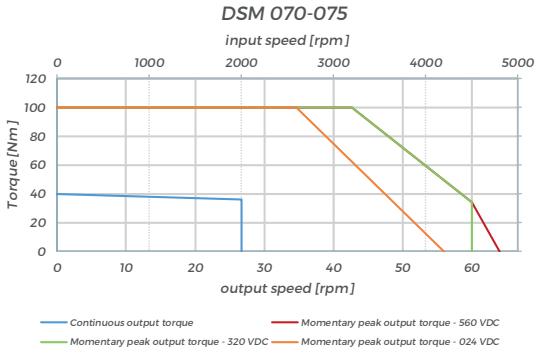
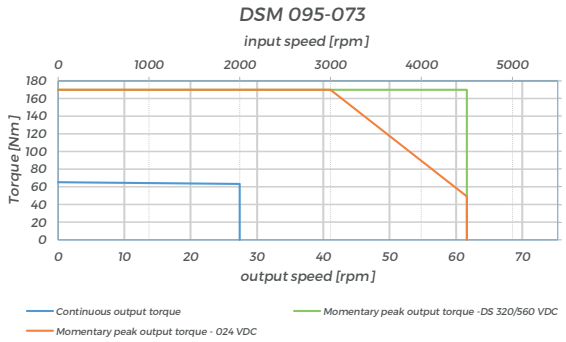
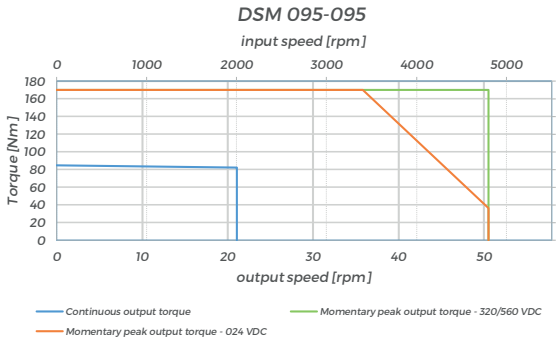
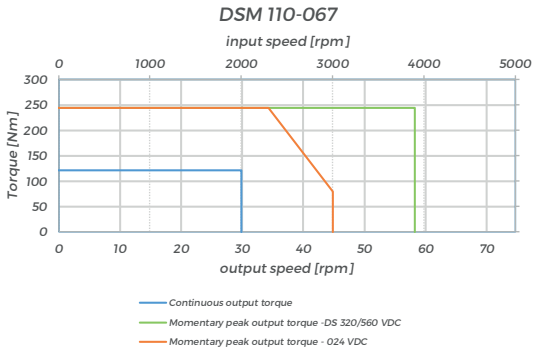


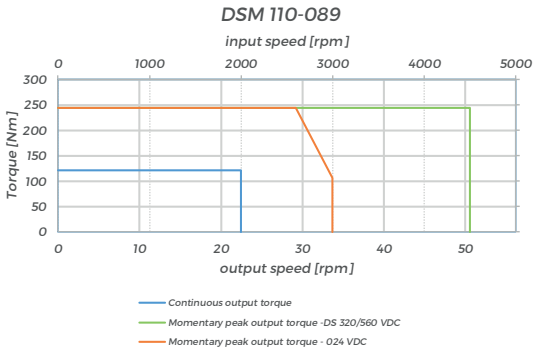
DSM 095-073

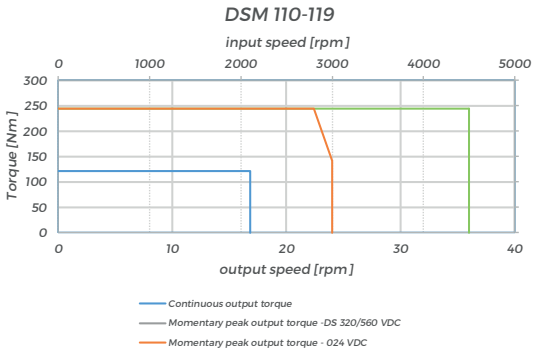


DSM 095-095

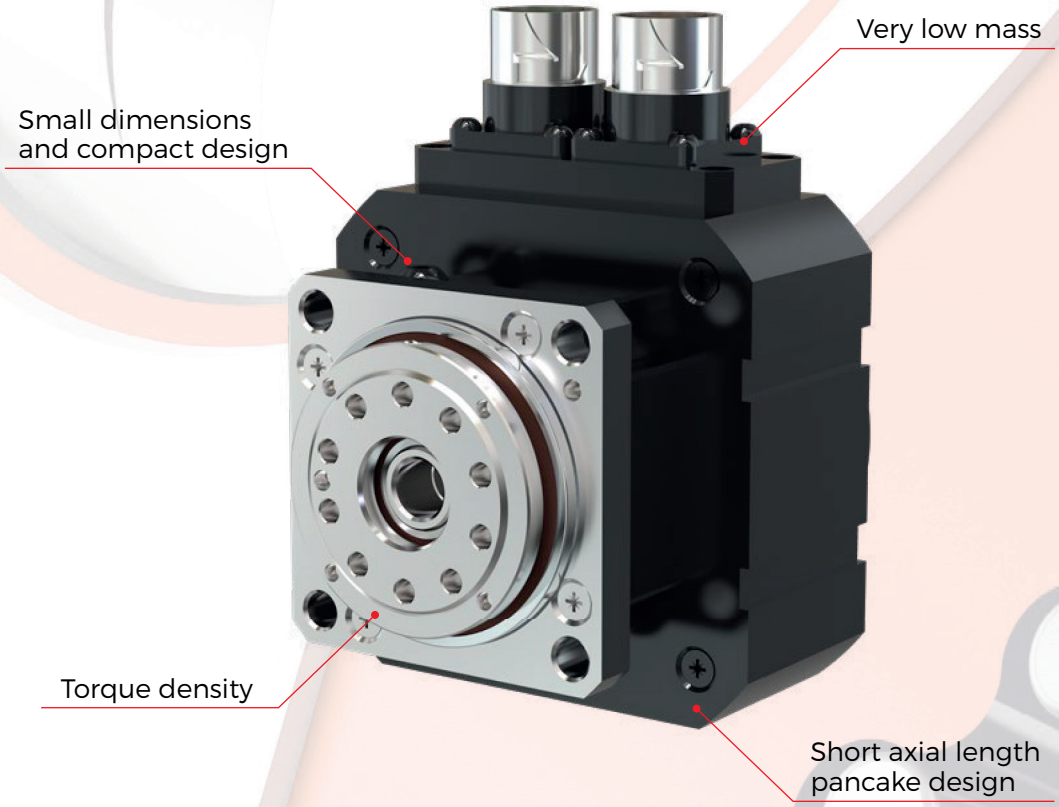



DSM 110-067
input speed [rpm]
0
1000
2000
3000
4000
5000
300
250
200
150
100
50
0
Torque [Nm]
0
10
20
30
40
50
60
70
output speed [rpm]
Continuous output torque
Momentary peak output torque -DS 320/560 VDC
Momentary peak output torque - 024 VDC


DSM 110-089
input speed [rpm]
0
1000
2000
3000
4000
5000
300
250
200
150
100
50
0
Torque [Nm]
0
10
20
30
40
50
output speed [rpm]
Continuous output torque
Momentary peak output torque -DS 320/560 VDC
Momentary peak output torque - 024 VDC


DSM 110-119
input speed [rpm]
0
1000
2000
3000
4000
5000
300
250
200
150
100
50
0
Torque [Nm]
0
10
20
30
40
output speed [rpm]
Continuous output torque
Momentary peak output torque -DS 320/560 VDC
Momentary peak output torque - 024 VDC

DriveSpin®

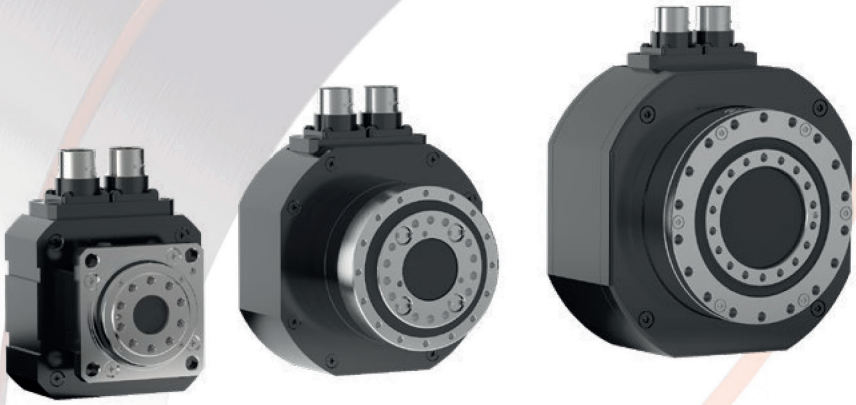

Very low mass
Small dimensions
and compact design
Torque density
Short axial length
pancake design

DriveSpin®

DSF series

AND YET IT IS FLAT

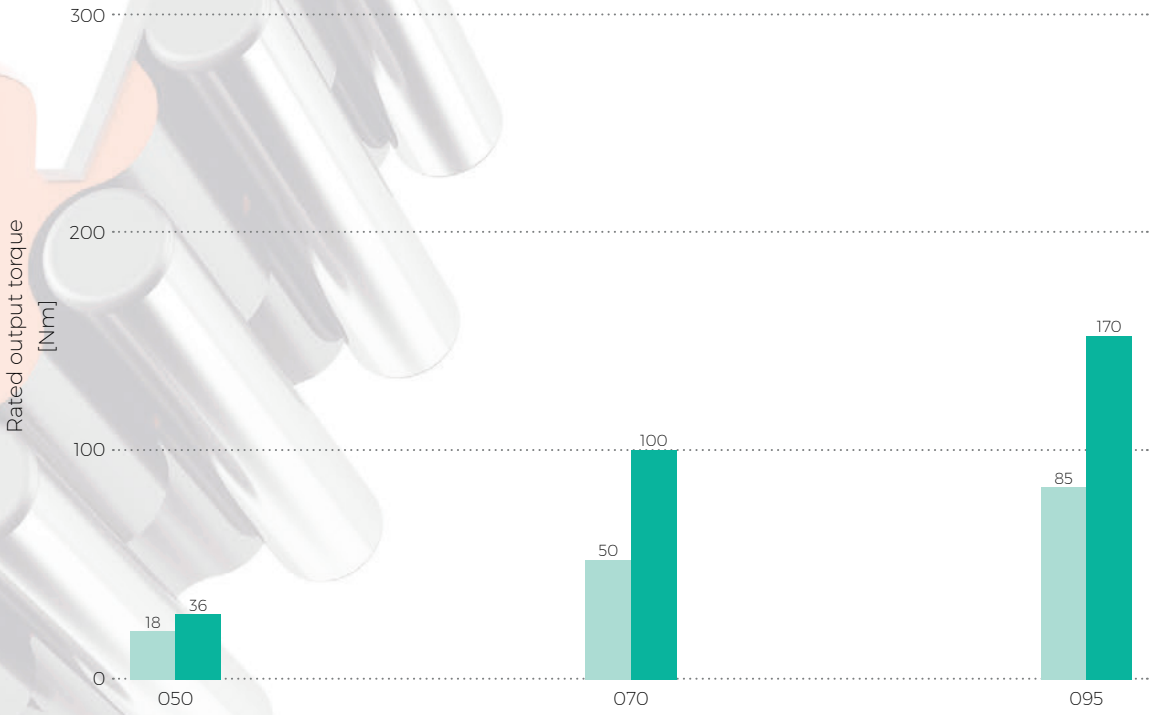
8.4 DSF series



Advantages

- **low mass**
- **compact design**
- **extremely short axial length**
- **high torque density**
- **high dynamic performance**
- **high moment overload capacity**

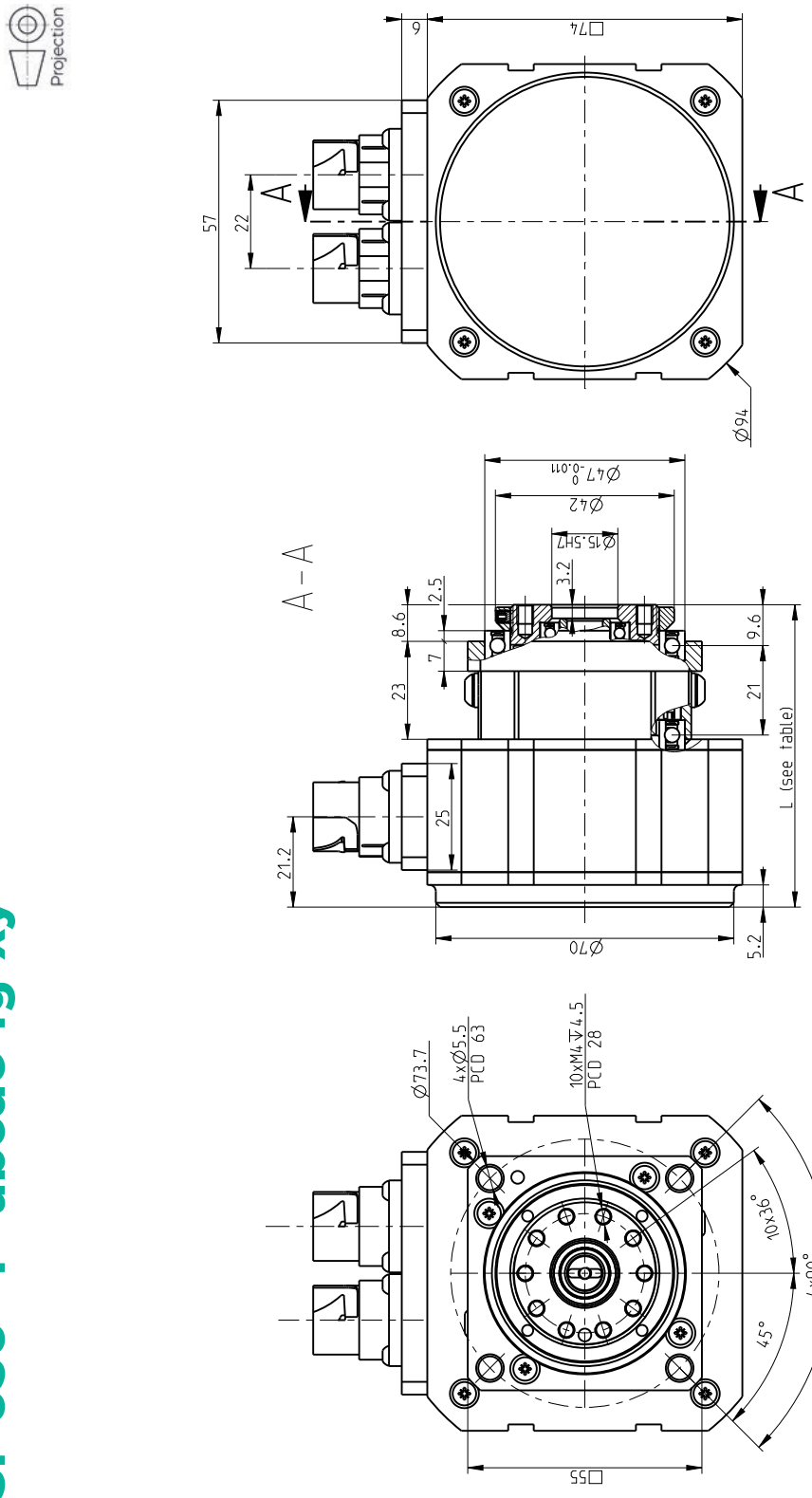
The **Drive**Spin® **DSF** "flat" series of electric actuators is characterized by the extremely short axial length with focus on maintaining the key features of the DriveSpin®. The DSF series was designed to be the most compact solution with very low mass and small dimensions. The DS "Flat" series consists of TwinSpin® reduction gear, servomotor and various feedback systems to be fully compatible with customer requirements. The TwinSpin® reduction gear used in the DSF actuators secures high accuracy, positioning repeatability, torsional stiffness as well as high carrying load due to the implemented bearing systems. Rated torque range of the DSF series is from 12Nm to the 85 Nm.



Tab. 8.4.a: Rated output torque

Size		050	070	095
Rated output torque	T_R [Nm]	18	50	85
Acceleration/ braking output torque	T_{acc} [Nm]	36	100	170

DSF 050 - i - abcde-fg-xy

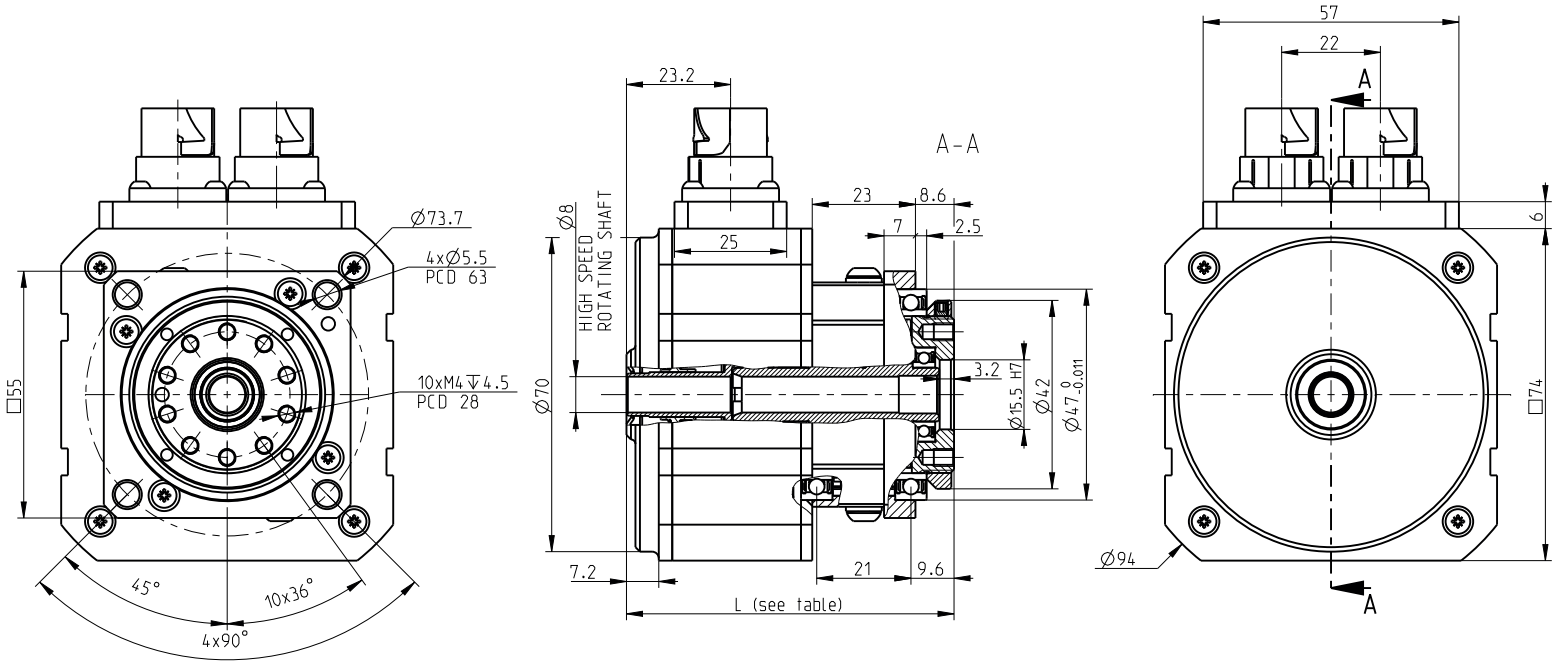


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0,5 [mm]	Weight m [kg] *	Dimension L ± 0,5 [mm]	Weight m [kg] *
DSF 050	OD,OE	71	1.2	94	1.4
	OJ	71	1.2	94	1.4
	ON	71	1.2	94	1.4

DSF 050 – i – abcde-fg-xy

DSF 050 – i – abcde-fg-xy
with hollowshaft

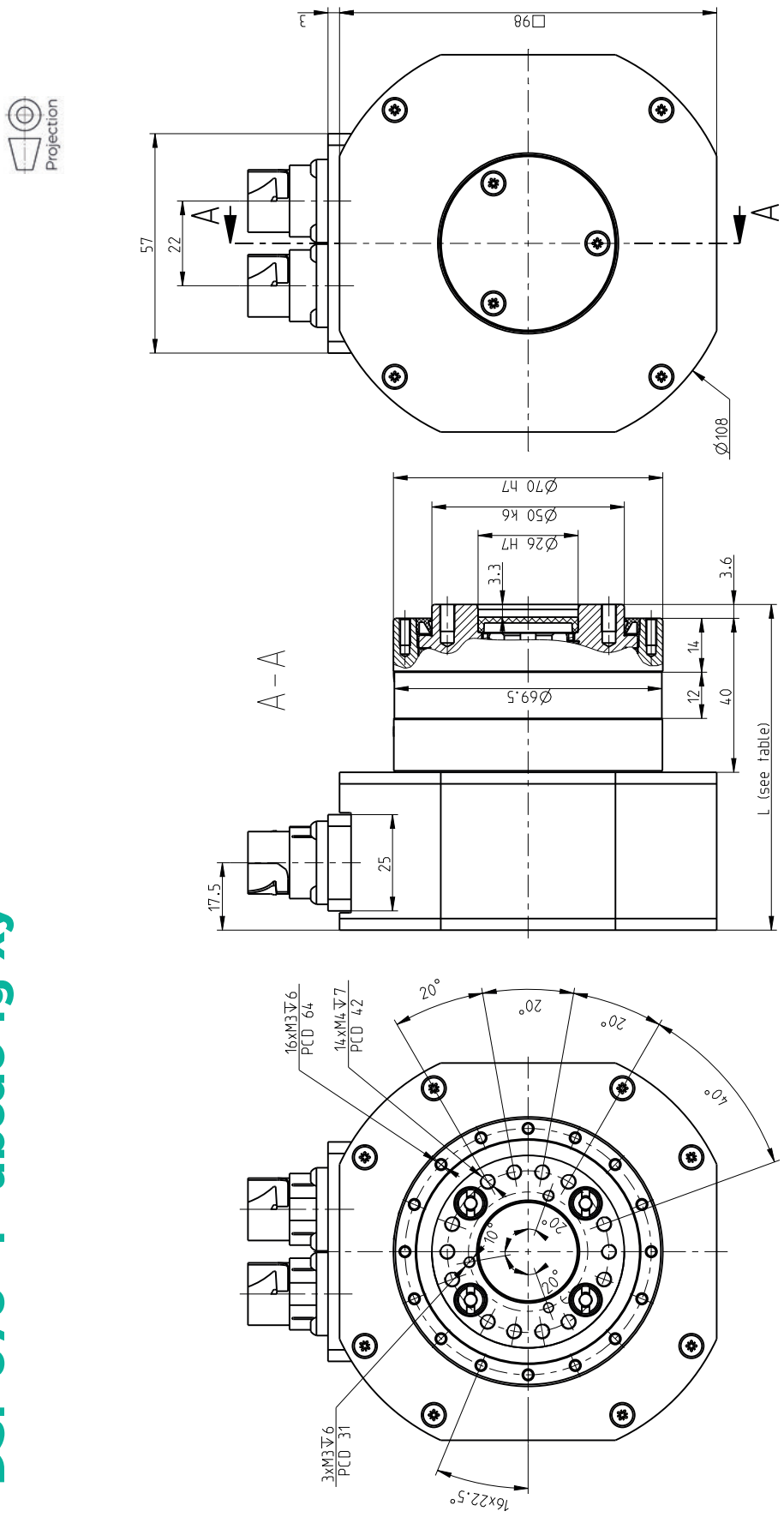
Projection



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0,5 [mm]	Weight m [kg] *	Dimension L ± 0,5 [mm]	Weight m [kg] *
DSF 050	0A	75	1.2	100	1.4
	0J	73	1.2	100	1.4
	0N	75	1.2	105	1.4

Hollowshaft rotates at motor speed

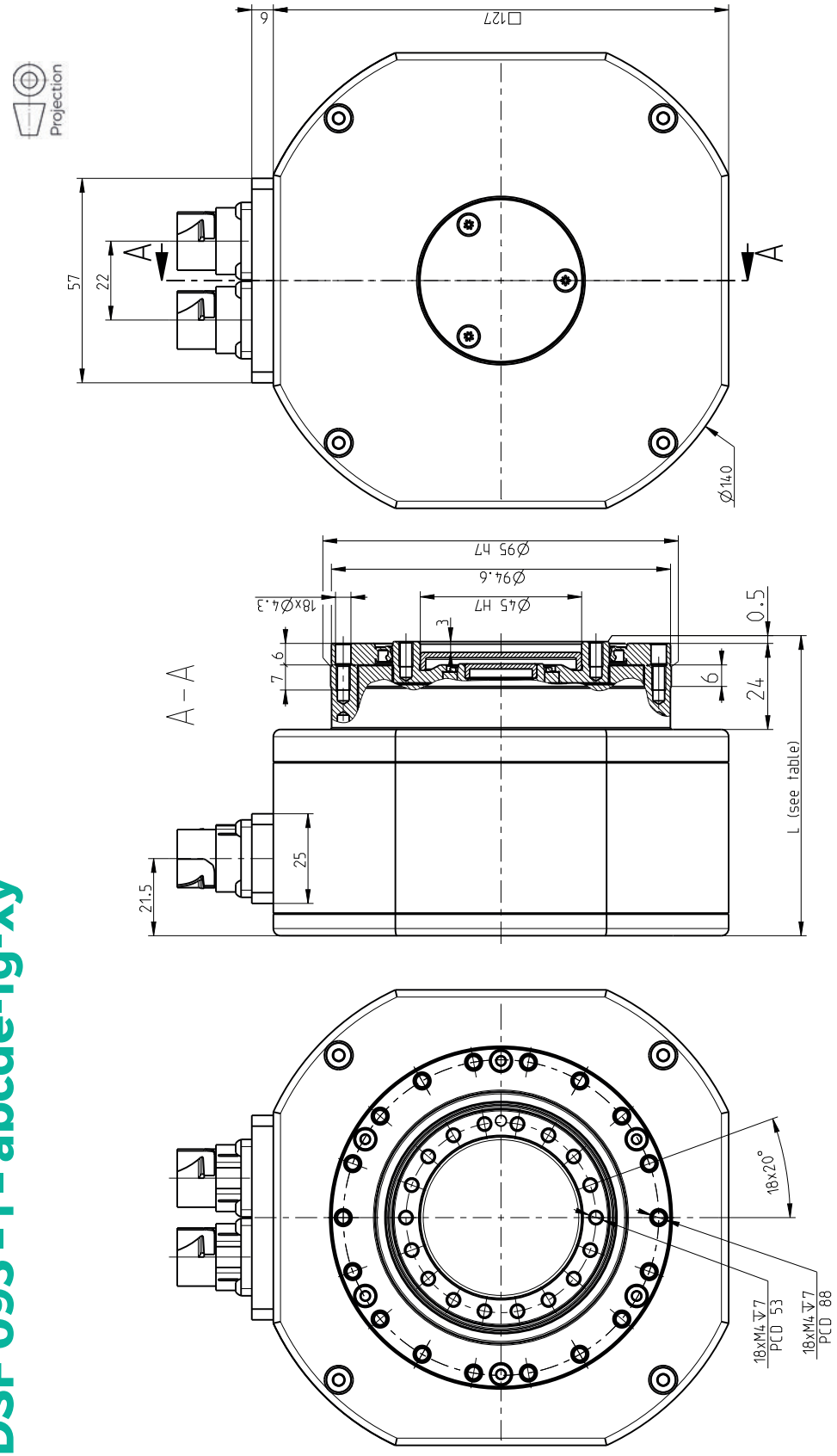
DSF 070 - i - abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSF 070	OA	92	3.5	-	-
	OB.OC	97	3.5	-	-
	OD.OE	92	3.5	-	-
	OM.ON	85	3.5	-	-

DSF 070 – i – abcde-fg-xy

DSF 095 - i - abcde-fg-xy



Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSF 095	OA	93	4.5	-	-
	OB,OC	93	4.5	-	-
	OD,OE	93	4.5	-	-
	OJ	93	4.5	-	-
	OM,ON	82	4.5	-	-

DSF 095 – i – abcde-fg-xy

Tab. 8.4.b: DSF series technical data table

Reduction Gear parameters		Tolerance	DSF 050		
Reduction ratio	i		63		
Rated output torque	T_R [Nm]		18		
Acceleration/braking output torque	T_{acc} [Nm]		36		
Rated input speed	n_r [rpm]		2 000		
Maximum allowable input speed [8]	n_{max} [rpm]		5 000		
Allowable moment [2][3]	M_{cmax} [Nm]		44		
Tilting stiffness [1][5]	M_t [Nm/arcmin]		4		
Torsional stiffness [1][6]	k_t [Nm/arcmin]		2.5		
Lost motion	LM [arcmin]		< 1.5		
Hysteresis	H [arcmin]		< 1.5		
Rated radial force [2]	F_{rR} [kN]		1.44 [7]		
Maximum axial force [2][4]	$F_{a\,max}$ [kN]		1.9		
Gear lubrication			Grease Castrol TRIBOL GR TT 1 PD		
Reduction gear limit temperature	[°C]		60 °C		
Standard ambient temperature range	[°C]		-10 °C to +40 °C		
Motor parameters					
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		On request	3 500	3 500
Motor rated torque	M_n [Nm]	+/- 10%		0.3	0.3
Motor rated current	I_n [A_{rms}]			2	2
Motor stall torque	M_o [Nm]	+/- 10%		0.3	0.3
Motor stall current	I_o [A_{rms}]			2	2
Motor peak torque	M_{max} [Nm]	+/- 10%		1.2	1.2
Motor peak current	I_{max} [A]			8	8
Motor back-EMF constant	K_E [V_{peak}/krpm]	+/- 10%		12	12
Motor torque constant	K_T [Nm/A_{rms}]	+/- 10%		0.15	0.15
Terminal resistance (L-L)	R_{2ph} [Ω]	+/- 10%		4.4	4
Terminal inductance (L-L)	L_{2ph} [mH]	+/- 20%		6	6
Number of poles	2p			10	10
Electromagnetic brake DC supply	[V_{dc}]		24, Special		
Electromagnetic brake torque at input	[Nm]		0.4		
Protection class			IP 64		
Motor Insulation class			F		
Paint			RAL 9005		
Motor number of phases			3		
Motor type of connection			Y(star-configuration)		

1) Mean statistical value
2) Load at output speed 32 rpm for size 050, other sizes at 15 rpm
3) Moment M_c max at F_a=0. If F_a≠0 see Glossary
4) Axial force F_a max for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) The parameter depends on the version of high precision reduction gear.
6) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
7) For size 050 this is value of MAXIMUM RADIAL FORCE $F_{r\,max}$ for a_2=0; F_a=0 and at 32 rpm output speed. For a_2>0; F_a=0 at 32 rpm output speed $F_{r\,max}$= 0.044/(a_2+0.0305) [kN]. a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary.
8) Instantaneous speed peak that may occur within the working cycle. Note please the temperature on the gear case that should not exceed significantly 60°C
9) 4 500 rpm for ratio 73 : 4 800 rpm for ratio 95

Tab. 8.4.b: DSF series technical data table - continued

DSF 070			DSF 095		
57. 75			73. 95		
50			85		
100			170		
2 000			2 000		
5 000			4 500 / 4 800 [9]		
142			410		
35			120		
7			15		
< 1.5			< 1		
< 1.5			< 1		
2.8			3.5		
4.1			11.1		
Grease Castrol TRIBOL GR TT 1 PD			Grease Castrol TRIBOL GR TT 1 PD		
60 °C			60 °C		
-10 °C to +40 °C			-10 °C to +40 °C		
24	320	560	24	320	560
On request	3 000	3 000	On request	2 500	2 500
	1	1		1.8	1.8
	2	1.12		2.6	1.5
	1.08	1.08		1.8	1.8
	2.2	1.2		2.6	1.5
	3	3		4.3	4.3
	6	3.4		6.2	3.6
	44.37	84		61.2	111
	0.5	0.89		0.692	1.2
	5.2	14.5		3.9	14
	9.8	30		7.8	26
	16	16		20	20
-			-		
-			-		
IP 64			IP 64		
F			F		
RAL 9005			RAL 9005		
3			3		
Y(star-configuration)			Y(star-configuration)		

IMPORTANT NOTES:

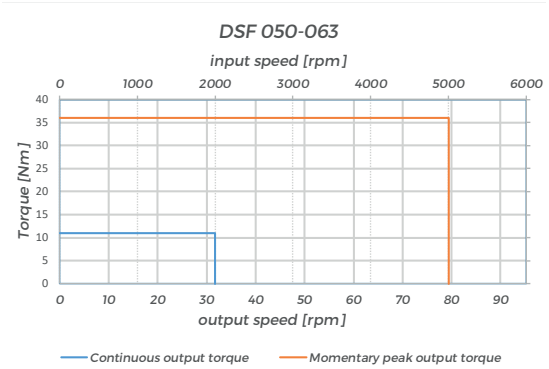
- Load values in the table are valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent duty cycles (S3-S8); the output speed in aplications is inverted-variable. The S1 continuous duty cycle needs to be consulted with manufacturer
- Please consult the maximum speed in duty cycle with the manufacturer
- The values in the table refer to the ambient temperature of 20˚C to 25˚C
- For ambient temperatures lower than -10˚C pre-heating might be considered please consult manufacturer

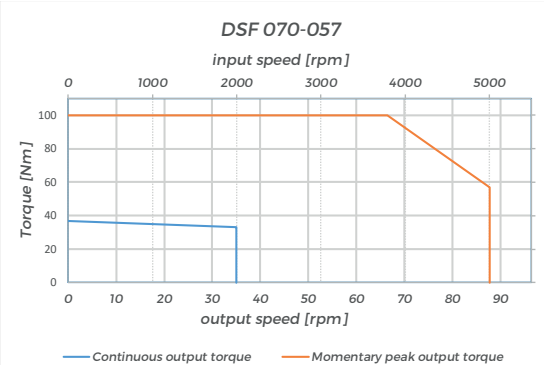
Tab. 8.4.c: Inertia at input (DSF actuator without brake)

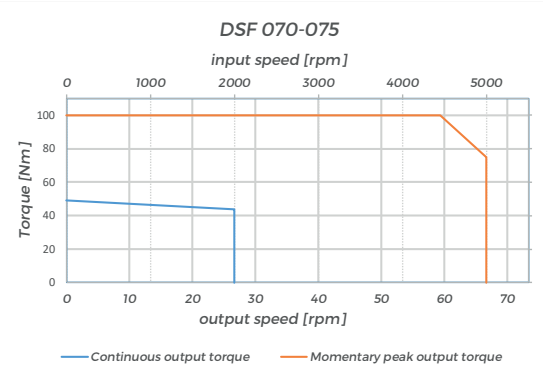
Feedback type (d)	$J_{w/o\ brake}$	DSF 050	DSF 070	DSF 095
0A	10^{-4} kgm²	–	0.637	3.349
0B	10^{-4} kgm²	–	0.615	3.330
0C	10^{-4} kgm²	–	0.615	3.330
0D	10^{-4} kgm²	0.094	0.617	3.332
0E	10^{-4} kgm²	0.094	0.617	3.332
0J	10^{-4} kgm²	0.091	–	3.330
0M	10^{-4} kgm²	–	0.630	3.346
0N	10^{-4} kgm²	0.105	0.630	3.346

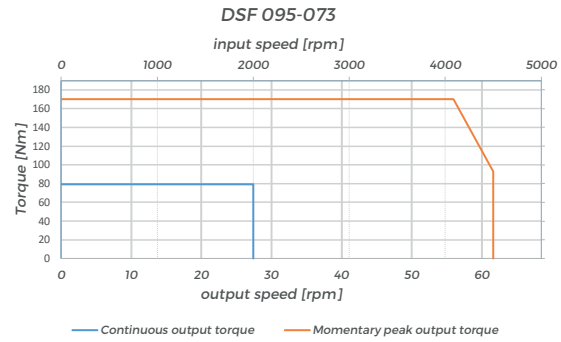
Tab. 8.4.d: Inertia at input (DSF actuator with brake)

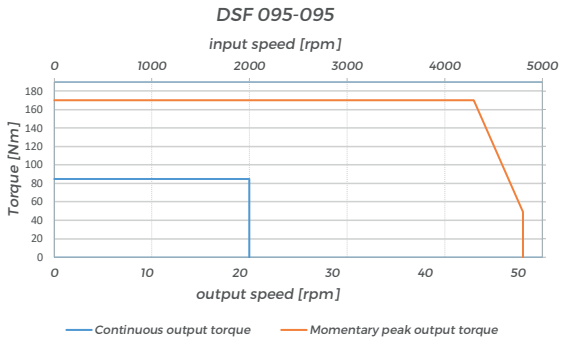
Feedback type (d)	$J_{w/o\ brake}$	DSF 050	DSF 070	DSF 095
0A	10^{-4} kgm²	–	–	–
0B	10^{-4} kgm²	–	–	–
0C	10^{-4} kgm²	–	–	–
0D	10^{-4} kgm²	0.104	–	–
0E	10^{-4} kgm²	0.104	–	–
0J	10^{-4} kgm²	0.102	–	–
0M	10^{-4} kgm²	–	–	–
0N	10^{-4} kgm²	0.118	–	–


DSF 050-063
input speed [rpm]
0 1000 2000 3000 4000 5000 6000
Torque [Nm]
0 5 10 15 20 25 30 35 40
0 10 20 30 40 50 60 70 80 90
output speed [rpm]
Continuous output torque
Momentary peak output torque


DSF 070-057
input speed [rpm]
0 1000 2000 3000 4000 5000
Torque [Nm]
0 20 40 60 80 100
0 10 20 30 40 50 60 70 80 90
output speed [rpm]
Continuous output torque
Momentary peak output torque


DSF 070-075
input speed [rpm]
0 1000 2000 3000 4000 5000
Torque [Nm]
0 20 40 60 80 100
0 10 20 30 40 50 60 70
output speed [rpm]
Continuous output torque
Momentary peak output torque


DSF 095-073
input speed [rpm]
0 1000 2000 3000 4000 5000
Torque [Nm]
0 20 40 60 80 100 120 140 160 180
0 10 20 30 40 50 60
output speed [rpm]
Continuous output torque
Momentary peak output torque


DSF 095-095
input speed [rpm]
0 1000 2000 3000 4000 5000
Torque [Nm]
0 20 40 60 80 100 120 140 160 180
0 10 20 30 40 50
output speed [rpm]
Continuous output torque
Momentary peak output torque

8.5 Configuration matrix

Tab. 8.5.a: Feedback availability matrix

(d)	Feedback type	DS 050	DS 060	DS 070	DS 095	DS 110	DS 115	DS 140	DS 155
0A	Resolver	✓	✓	✓	✓	✓	✓	✓	✓
0B	Absolute Singleturn Encoder Hiperface	✓	✓	✓	✓	✓	✓	✓	✓
0C	Absolute Multiturn Encoder Hiperface	✓	✓	✓	✓	✓	✓	✓	✓
0D	Absolute Singleturn Encoder EnDat	✓	✓	✓	✓	✓	✓	✓	✓
0E	Absolute Multiturn Encoder EnDat	✓	✓	✓	✓	✓	✓	✓	✓
0F	Absolute Singleturn Encoder EnDat + sin/cos	O	O	✓	O	O	O	✓	O
0G	Absolute Multiturn Encoder EnDat + sin/cos	O	O	✓	O	O	O	✓	O
0H	Incremental sin/cos Encoder + sin/cos Commutation	×	✓	✓	✓	✓	✓	✓	✓
0J	Incremental A/B/I Encoder + Block Commutation	✓	✓	✓	O	O	✓	O	O
0K	Absolute Singleturn Encoder Hiperface DSL	✓	×	✓	✓	✓	✓	O	✓
0L	Absolute Multiturn Encoder Hiperface DSL	✓	×	✓	✓	✓	✓	O	✓
0M	Absolute Singleturn Encoder BiSS	O	×	O	O	O	✓	O	✓
0N	Absolute Multiturn Encoder BiSS	O	×	O	O	O	✓	O	✓
0P	Absolute Singleturn Encoder DRIVE-CLiQ	O	×	✓	✓	✓	O	O	O
0Q	Absolute Multiturn Encoder DRIVE-CLiQ	O	×	✓	✓	✓	O	O	O
0R	Absolute Multiturn Fanuc	×	×	✓	✓	✓	O	O	O
0S	Absolute Singleturn Fanuc	×	×	✓	✓	✓	O	O	O

✓ *Available* × *Not available* O *On request*

Tab. 8.5.b: Feedback types and signal wiring diagrams matrix

(d)	Feedback type	(g) Signal wiring diagram		Position Feedback
0A	Resolver	I	for Terminal cable	Analogue sin/cos tracks
		J	for Connectors	
0B	Absolute Singleturn Encoder Hiperface	G	for Terminal cable	via Hiperface protocol
		H	for Connectors	
0C	Absolute Multiturn Encoder Hiperface	G	for Terminal cable	via Hiperface protocol
		H	for Connectors	
0D	Absolute Singleturn Encoder EnDat	A	for Terminal cable	via Endat protocol
		B	for Connectors	
0E	Absolute Multiturn Encoder EnDat	A	for Terminal cable	via Endat protocol
		B	for Connectors	
0F	Absolute Singleturn Encoder EnDat + sin/cos	C	for Terminal cable	via Endat protocol
		D	for Connectors	
0G	Absolute Multiturn Encoder EnDat + sin/cos	C	for Terminal cable	via Endat protocol
		D	for Connectors	
0H	Incremental sin/cos Encoder + sin/cos Commutation	E	for Terminal cable	1Vpp sin/cos tracks
		F	for Connectors	
0J	Incremental A/B/I Encoder + Block Commutation	N	for Terminal cable	Rectangular A/B tracks and Index mark once per revolution
		O	for Connectors	
0K	Absolute Singleturn Encoder Hiperface DSL	J1	for Terminal cable	via Hiperface DSL protocol
		H1	for Connectors	
0L	Absolute Multiturn Encoder Hiperface DSL	J1	for Terminal cable	via Hiperface DSL protocol
		H1	for Connectors	
0M	Absolute Singleturn Encoder BiSS	R	for Terminal cable	via BiSS protocol
		S	for Connectors	
0N	Absolute Multiturn Encoder BiSS	R	for Terminal cable	via BiSS protocol
		S	for Connectors	
0P	Absolute Singleturn Encoder DRIVE-CLiQ	T	for Terminal cable	via Drive-CliQ protocol
		U	for Connectors	
0Q	Absolute Multiturn Encoder DRIVE-CLiQ	T	for Terminal cable	via Drive-CliQ protocol
		U	for Connectors	
0R	Absolute Multiturn Fanuc	A	for Terminal cable	via Fanuc serial αi protocol
		B	for Connectors	
0S	Absolute Singleturn Fanuc	A	for Terminal cable	via Fanuc serial αi protocol
		B	for Connectors	

Tab. 8.5.a: Feedback availability matrix - continued

DSM 050	DSM 070	DSM 095	DSM 110	DSH 050	DSH 070	DSH 085	DSH 110	DSH 115	DSH 125	DSH 155	DSH 170	DSF 050	DSF 070	DSF 095
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	O	✓	✓
✓	✓	✓	✓	O	×	✓	O	✓	✓	✓	✓	O	✓	✓
✓	✓	✓	✓	O	×	✓	O	✓	✓	✓	✓	O	✓	✓
✓	✓	✓	✓	×	O	✓	O	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	×	O	✓	O	✓	✓	✓	✓	✓	✓	✓
O	O	O	O	×	O	O	O	O	O	O	O	O	O	O
O	O	O	O	×	×	O	×	×	×	×	O	O	O	O
×	✓	✓	✓	×	×	O	×	×	×	×	O	×	O	O
O	O	O	O	✓	✓	O	O	O	O	O	O	✓	O	O
✓	O	O	O	×	×	×	×	×	×	×	×	O	O	O
✓	O	O	O	×	×	×	×	×	×	×	×	O	O	O
O	✓	O	O	✓	O	✓	O	O	✓	O	O	✓	✓	✓
O	✓	O	O	✓	✓	✓	O	O	✓	O	✓	✓	✓	✓
O	×	O	O	×	O	×	O	×	×	×	O	O	O	O
O	×	O	O	×	O	×	O	×	×	×	O	O	O	O
×	O	O	O	×	O	×	O	×	×	×	O	×	O	O
×	O	O	O	×	O	×	O	×	×	×	O	×	O	O

✓ *Available* × *Not available* O *On request*

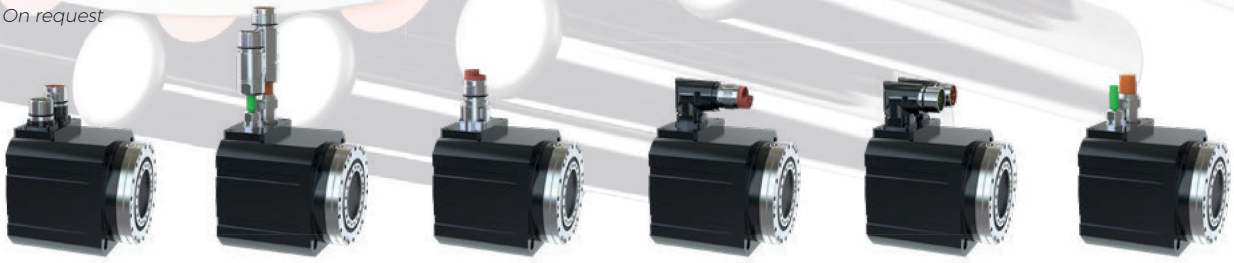
Tab. 8.5.b: Feedback types and signal wiring diagrams matrix - continued

Position resolution	Commutation type	Additional Incremental signals	Additional signals Resolution
1 line per revolution	via Position Feedback Absolute Position	–	–
Number of bits per revolution	via Position Feedback Absolute Position	1Vpp sin/cos 1)	Number of lines per revolution
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	1Vpp sin/cos 1)	Number of lines per revolution
Number of bits per revolution	via Position Feedback Absolute Position	–	–
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
Number of bits per revolution	via Position Feedback Absolute Position	1Vpp sin/cos	Number of lines per revolution
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	1Vpp sin/cos	Number of lines per revolution
Number of lines per revolution	1 sin/cos track over one revolution for coarse absolute position of commutation angle		1 line per revolution
Number of counts per revolution	U/V/W states (Halls states) for block commutation		Motor poles dependant
Number of bits per revolution	via Position Feedback Absolute Position	–	–
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
Number of bits per revolution	via Position Feedback Absolute Position	–	–
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
Number of bits per revolution	via Position Feedback Absolute Position	–	–
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
Number of bits per revolution	via Position Feedback Absolute Position	–	–

Tab. 8.5.d: Type of electrical connection (e) and power wiring diagrams (f)

Type and size	DC Bus Voltage	(e) = 0		(e) = 1		(e) = 2			(e) = 3		
		Straight connectors 923/623	Straight connectors 915/615	Connector on cable directed upward 923/623	Connector on cable directed upward 915/615	Hybrid Straight connectors 723 (Hiperface DSL only)	Hybrid Straight connectors 923 (Hiperface DSL only)	Hybrid Straight connectors 915 (Hiperface DSL only)	Hybrid Angled rotable connectors 723 (Hiperface DSL only)	Hybrid Angled rotable connectors 923 (Hiperface DSL only)	Hybrid Angled rotable connectors 915 (Hiperface DSL only)
DSx xxx	(a)	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×
DSx 050	24VDC	×	✓	✓	o	o	o	o	o	o	o
	320VDC										
	560VDC										
DS 060	24VDC	×	✓	✓	o	o	o	o	o	o	o
	320VDC										
	560VDC										
DSx 070	24VDC	✓	o	✓	o	o	o	o	o	o	o
	320VDC										
	560VDC										
DSH 085	24VDC	✓	o	✓	o	o	o	o	o	o	o
	320VDC										
	560VDC										
DSx 095	24VDC	✓	×	✓	×	o	o	×	o	o	×
	320VDC		o		o			o			o
	560VDC										
DSx 110	24VDC	✓	×	✓	×	×	×	×	×	×	×
	320VDC		o		o	o	o	o	o	o	o
	560VDC										
DSx 115	24VDC	×	×	×	×	×	×	×	×	×	×
	320VDC	✓	o	✓	o	o	o	o	o	o	o
	560VDC										
DSH 125	24VDC	×	×	×	×	×	×	×	×	×	×
	320VDC	✓	o	✓	o	o	o	o	o	o	o
	560VDC										
DS 140	24VDC	×	×	×	×	×	×	×	×	×	×
	320VDC	✓	o	✓	o	o	o	o	o	o	o
	560VDC										
DSx 155	24VDC	×	×	×	×	×	×	×	×	×	×
	320VDC	✓	o	✓	o	o	o	o	o	o	o
	560VDC										
DSH 170	24VDC	×	×	×	×	×	×	×	×	×	×
	320VDC	✓	o	✓	o	o	o	o	o	o	o
	560VDC										

✓ *Available*
× *N/A - Not available*
o *On request*



(e) = 0 (e) = 1 (e) = 2 (e) = 3 (e) = 4 (e) = 5

Tab. 8.5.d: Type of electrical connection (e) and power wiring diagrams (f) - continued

DC Bus Voltage	(e) = 4		(e) = 5	(e) = 6	(e) = 7	(e) = 8	(e) = B		(e) = C	
	Angled rotable connectors 923/623	Angled rotable connectors 915/615	Cable upwards	Y-tec connector 915/615	Cable forwards	Cable backwards	Connector on cable directed forward 923/623	Connector on cable directed forward 915/615	Connector on cable directed backward 923/623	Connector on cable directed backward 915/615
(a)	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×	✓/o/×
24VDC	×	o	✓	✓	✓	✓	✓	o	✓	o
320VDC										
560VDC										
24VDC	×	o	✓	✓	✓	✓	✓	o	✓	o
320VDC										
560VDC										
24VDC	✓	o	✓	✓	o	o	✓	o	✓	o
320VDC										
560VDC										
24VDC	✓	o	✓	✓	o	o	✓	o	✓	o
320VDC										
560VDC										
24VDC	✓	×	✓	×	o	o	✓	×	✓	×
320VDC		o		o				o		o
560VDC										
24VDC	✓	×	✓	×	o	o	o	×	o	×
320VDC		o		o			✓	o	✓	o
560VDC										
24VDC	×	×	✓	×	o	o	×	×	×	×
320VDC	✓	o		o			✓	o	✓	o
560VDC										
24VDC	×	×	✓	×	o	o	×	×	×	×
320VDC	✓	o		o			✓	o	✓	o
560VDC										
24VDC	×	×	o	×	o	✓	×	×	×	×
320VDC	✓	o		o			✓	o	✓	o
560VDC										
24VDC	×	×	✓	×	o	o	×	×	×	×
320VDC	✓	o		o			✓	o	✓	o
560VDC										
24VDC	×	×	✓	×	✓	✓	×	×	×	×
320VDC	✓	✓		✓			✓	o	✓	o
560VDC										

✓ *Available*
× *N/A - Not available*
o *On request*

(e) = 6

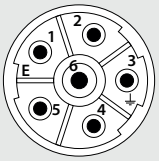
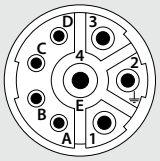
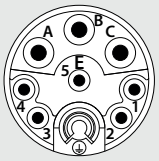
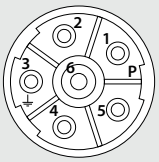
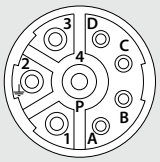
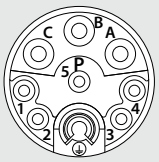
(e) = 7

(e) = 8

(e) = B

(e) = C

Tab. 8.5.e: Power connection: Connectors and Terminal cable

Connector type	923 (6 pin, rotation E)		923 (8 pin, rotation E)		923 (8 pin, rotation E)		Terminal cable		
Power wiring diagram (f)	A		B		C		D		
	Pin	Signal	Pin	Signal	Pin	Signal	Colour	Mark	Signal
	1	U	1	U	1	Brake+ [1]	Green/Yellow		PE
	2	V	2	PE	2	Brake- [1]	–	1	U
	3	PE	3	W	3	therm+ [2]	–	2	V
	4	Brake+ [1]	4	V	4	therm- [2]	–	3	W
	5	Brake- [1]	A	Brake+ [1]	5	N/C	White	or 4	Brake+ [1]
	6	W	B	Brake- [1]	A	U	Brown	or 5	Brake- [1]
	–	–	C	N/C	B	V			
	–		D	N/C	C	W			
	–	–	–	–	PE	PE			
Pinout (for actuators with connectors and cables directed upwards / forwards / backwards with connector, e=0, 1, 4, 6, B, C	Connector type 923 (6 pin, rotation E)		Connector type 923 (8 pin, rotation E)		Connector type 915 (9 pin, rotation E)				
									
Pinout (for cables between actuator and servo drive, CAB-POW-XXX-XX-XXX-XXX)	Connector type 923 (6 pin, rotation P)		Connector type 923 (8 pin, rotation P)		Connector type 915 (9 pin, rotation P)				
									

NOTES:

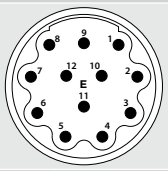
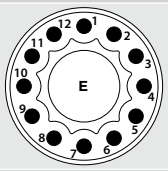
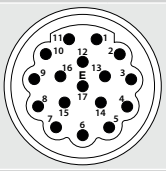
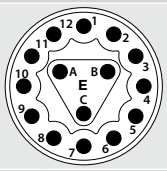
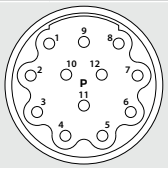
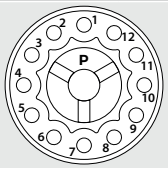
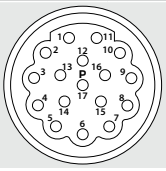
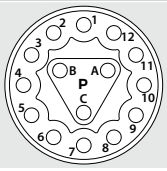
- *N/C - Not Connected*
- *[1] Only connected in actuators with option Electromagnetic brake*
- *[2] Only connected in combination with Signal wiring diagram (g)=0*

NOTES:

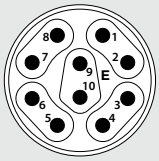
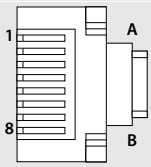
- N/C - Not Connected
- 1) BAT use with EBI 135 and EBI 1135 with multiturn function powered via battery instead of **Sensor** which is internally connected to corre sponding supply line, and may be used for remote sense and control of power supply
- 2) Only connected in combination with Signal wiring diagram (g)=0
- 3) C/D signals for sin/cos commutation
- 4) In case of type of electrical connection with connector type 915/615 series thermistor are connected in **POWER** part of wiring diagram **(f) = C** to pins **3 = therm+** and **4 = therm-**
- 5) U/V/W signals for block commutation

Tab. 8.5.f: Signal connection: Connectors

Connector type	623 (12 pin, rotation E) 615 (12 pin, rotation E)					623 (17 pin, rotation E) 615 (15 pin, rotation E)		
Signal wiring diagram (g)	B	B	H	J	S	D	F (Only 623 17 pin connector)	O
Feedback type (d)	EnDat	Fanuc αi	Hiperface	Reslover	BiSS-C	EnDat + sin/cos	Incremental sin/cos + sin/cos commutation	Incremental A/B/I + block commutation
Pin	Signal							
1	Up (supply)	Up (supply)	Us (supply)	N/C	Us (supply)	B-	A+	A+
2	Sensor Up/UBAT [1]	Sensor Up	GND (supply)	therm+	N/C	0 V (supply)	A-	A-
3	0 V (supply)	0 V (supply)	+COS	S4	GND (supply)	A-	R+	B+
4	Sensor 0V/ 0 VBAT [1]	Sensor 0V	REFCOS	S3	N/C	Up (supply)	D- [3]	B-
5	DATA+	DATA+	REFSIN	R2 (supply)	MA+	DATA+	C+ [3]	I+
6	DATA-	DATA-	+SIN	therm-	MA-	N/C	C- [3]	I-
7	CLOCK+	Request+	therm+	S2	SLO+	therm+	0 V (supply)	U+ [5]
8	CLOCK-	Request-	therm-	S1	SLO-	CLOCK+	therm+	U- [5]
9	N/C	N/C	DATA+	R1 (supply)	N/C	B+	therm-	V+ [5]
10	N/C	N/C	DATA-	N/C	N/C	Sensor 0 V [2]	Up (supply)	V- [5]
11	therm+	therm+	N/C	N/C	therm+	A+	B+	W+ [5]
12	therm-	therm-	N/C	N/C	therm-	Sensor Up [2]	B-	W- [5]
13	N/C	N/C	N/C	N/C	N/C	DATA-	R-	Us (supply)
14	N/C	N/C	N/C	N/C	N/C	therm-	D+ [3]	GND (supply)
15	N/C	N/C	N/C	N/C	N/C	CLOCK-	Sensor 0 V [2]	therm+ [4]
16	N/C	N/C	N/C	N/C	N/C	N/C	Sensor Up [2]	therm- [4]
17	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C

Pinout (for actuators with connectors and cables directed upwards / forwards / backwards with connector, e=0, 1, 4, 6, B, C	Connector type 623 (12 pin, rotation E)	Connector type 615 (12 pin, rotation E)	Connector type 623 (17 pin, rotation E)	Connector type 615 (15 pin, rotation E)
				
Pinout (for cables between actuator and servo drive, CAB-POW-XXX--XX-XXX-XXX)	Connector type 623 (12 pin, rotation P)	Connector type 615 (12 pin, rotation P)	Connector type 623 (17 pin, rotation P)	Connector type 615 (15 pin, rotation P)
				

Tab. 8.5.f: Signal connection: Connectors - continued

Connector type	**617 (10 pin, rotation E)**	**Connector type**	**Connector**
Signal wiring diagram (g)	**U**	**Signal wiring diagram (g)**	**T**
Feedback type (d)	**Drive-CLiQ**	**Feedback type (d)**	**Drive-CLiQ**
Pin		**Pin**	
1	TxP	1	TxP
2	TxN	2	TxN
3	N/C	3	RxP
4	N/C	4	N/C
5	RxP	5	N/C
6	RxN	6	RxN
7	N/C	7	N/C
8	N/C	8	N/C
9	Up (supply)	A	Vdc
10	0 V (supply)	B	0 V (supply)
Pinout (for actuators with connectors and cables directed upwards / forwards / backwards with connector, e=0, 1, 4, 6, B, C	Connector type 617 (10 pin, rotation E)		
			

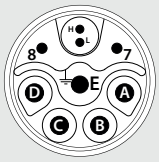
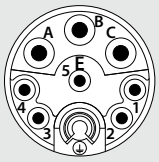
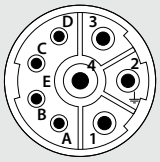
Tab. 8.5.g: Signal connection: Terminal cable

Signal wiring diagram (g)		A	A	C	E	G	I	N	R	T
Feedback type (d)		EnDat	Fanuc αi	EnDat + sin/cos	Incremental sin/cos + sin/cos commutation	Hiperface	Resolver	Incremental A/B/I + block commutation	BiSS-C	Drive-CLiQ
Cable DIN 47100		Signal								
Core	Colour									
1	White	therm+	therm+	therm+	therm+	therm+	therm+	therm+	therm+	N/C
2	Brown	therm-	therm-	therm-	therm-	therm-	therm-	therm-	therm-	N/C
3	Green	Up (supply)	Up (supply)	Up (supply)	Up (supply)	Us (supply)	R1 (supply)	Us (supply)	Us (supply)	Up (supply)
4	Yellow	0 V (supply)	0 V (supply)	0 V (supply)	0 V (supply)	GND (supply)	R2 (supply)	GND (supply)	GND (supply)	0 V (supply)
5	Grey	DATA+	DATA+	DATA+	D+ [3]	DATA+	S1	A+	SLO+	RXP
6	Pink	DATA-	DATA-	DATA-	D- [3]	DATA-	S2	A-	SLO-	RXN
7	Blue	CLOCK+	Request+	CLOCK+	C+ [3]	+SIN	S3	B+	MA+	TXP
8	Red	CLOCK-	Request-	CLOCK-	C- [3]	+COS	S4	B-	MA-	TXN
9	Black	Sensor Up/UBAT [1]	Sensor Up	Sensor Up [2]	Sensor Up [2]	REFSIN	N/C	I+	N/C	N/C
10	Violet	Sensor 0V/ 0 VBAT [1]	Sensor 0V	Sensor 0V [2]	Sensor 0V [2]	REFCOS	N/C	I-	N/C	N/C
11	Grey/Pink	N/C	N/C	A+	A+	N/C	N/C	U+ [5]	N/C	N/C
12	Red/Blue	N/C	N/C	A-	A-	N/C	N/C	U- [5]	N/C	N/C
13	White/Green	N/C	N/C	B+	B+	N/C	N/C	V+ [5]	N/C	N/C
14	Brown/Green	N/C	N/C	B-	B-	N/C	N/C	V- [5]	N/C	N/C
15	White/Yellow	N/C	N/C	N/C	R+	N/C	N/C	W+ [5]	N/C	N/C
16	Yellow/Brown	N/C	N/C	N/C	R-	N/C	N/C	W- [5]	N/aC	N/C
17	White/Grey	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C	N/C

NOTES:

- N/C - Not Connected
- [1] BAT use with EBI 135 and EBI 1135 with multiturn function powered via battery instead of **Sensor** which is internally connected to corresponding supply line, and may be used for remote sense and control of power supply
- [2] Only connected in combination with Signal wiring diagram (g)=0
- [3] C/D signals for sin/cos commutation
- [4] In case of type of electrical connection with connector type 915/615 series thermistor are connected in **POWER** part of wiring diagram **(f) = C** to pins **3 = therm+** and **4 = therm-**
- [5] U/V/W signals for block commutation

Tab. 8.5.h: Hybrid connection: Connectors and Terminal cable

Connector type	**723 (7+2 pin, rotation E)**		**923 (8 pin, rotation E)**		**923 (8 pin, rotation E)**		**Terminal cable**		
Hybrid wiring diagram (f) - Power + Hiperface DSL	**H0**		**H1**		**H2**		**J1**		
	Pin	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Colour**	**Mark**	**Signal**
	A	U	1	Brake+ [1)]	1	U	Green/Yellow	–	PE
	B	V	2	Brake- [1)]	2	PE	–	1	U
	C	W	3	DSL+	3	W	–	2	V
	D	N/C	4	DSL-	4	V	–	3	W
	PE	PE	5	N/C	A	Brake+ [1)]	White	or 4	Brake+ [1)]
	H	DSL+	A	U	B	Brake- [1)]	Black	or 5	Brake- [1)]
	L	DSL-	B	W	C	DSL+	White		DSL+
	7	Brake+ [1)]	C	V	D	DSL-	Blue		DSL-
	8	Brake- [1)]	PE	PE					
Pinout (for actuators with hybrid connectors, e=2,3)	Connector type 723 (7+2 pin, rotation E)		Connector type 915 (9 pin, rotation E)		Connector type 923 (8 pin, rotation E)				
									

NOTES:

- N/C - Not Connected
- [1)] Only connected in actuators with option Electromagnetic brake

Technical specifications of thermistors

Tab. 8.5.i: PTC 111-K13

T_{NAT} = 140 °C	
Resistance values according to DIN 44081 and DIN 44082	
Temperature range T [°C]	**Resistance R [Ω]**
-20 to 120	R ≤ 250
120 to 135	R ≤ 550
135 to 145	R ≤ 1 330
> 155	R ≤ 4 000

Tab. 8.5.j: PT 1000

Temperature range T [°C]	Resistance R [Ω]
-40	843
-30	882
-20	922
-10	961
0	1 000
10	1 039
20	1 078
30	1 117
40	1 155
50	1 194
60	1 232
70	1 271
80	1 309
90	1 347
100	1 385
110	1 423
120	1 461
130	1 498
140	1 536
150	1 573
160	1 611
170	1 648
180	1 685
190	1 722
200	1 759
210	1 795
220	1 832
230	1 868
240	1 905
250	1 941

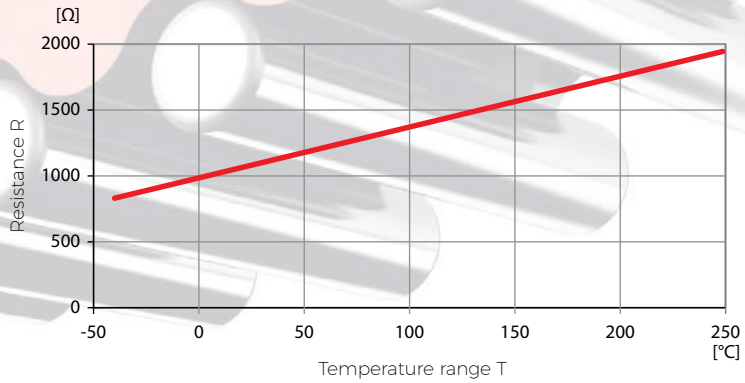
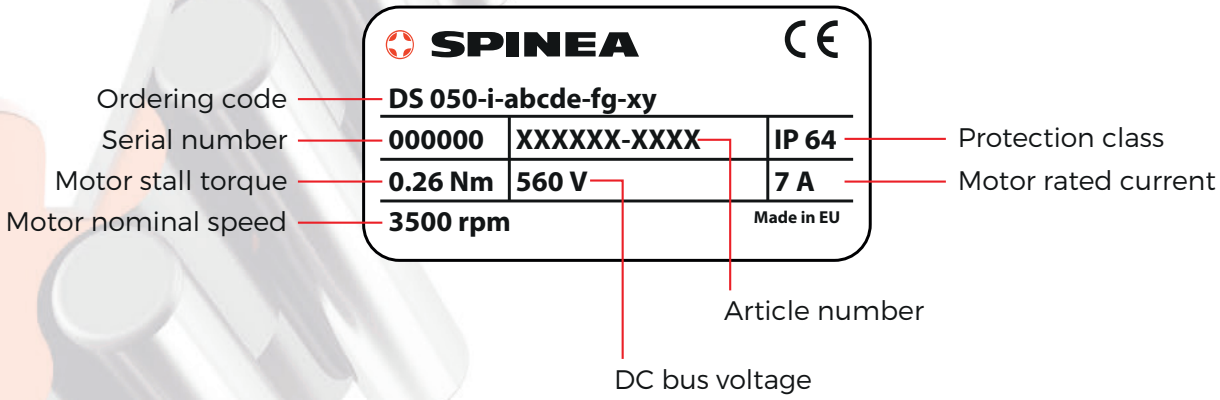
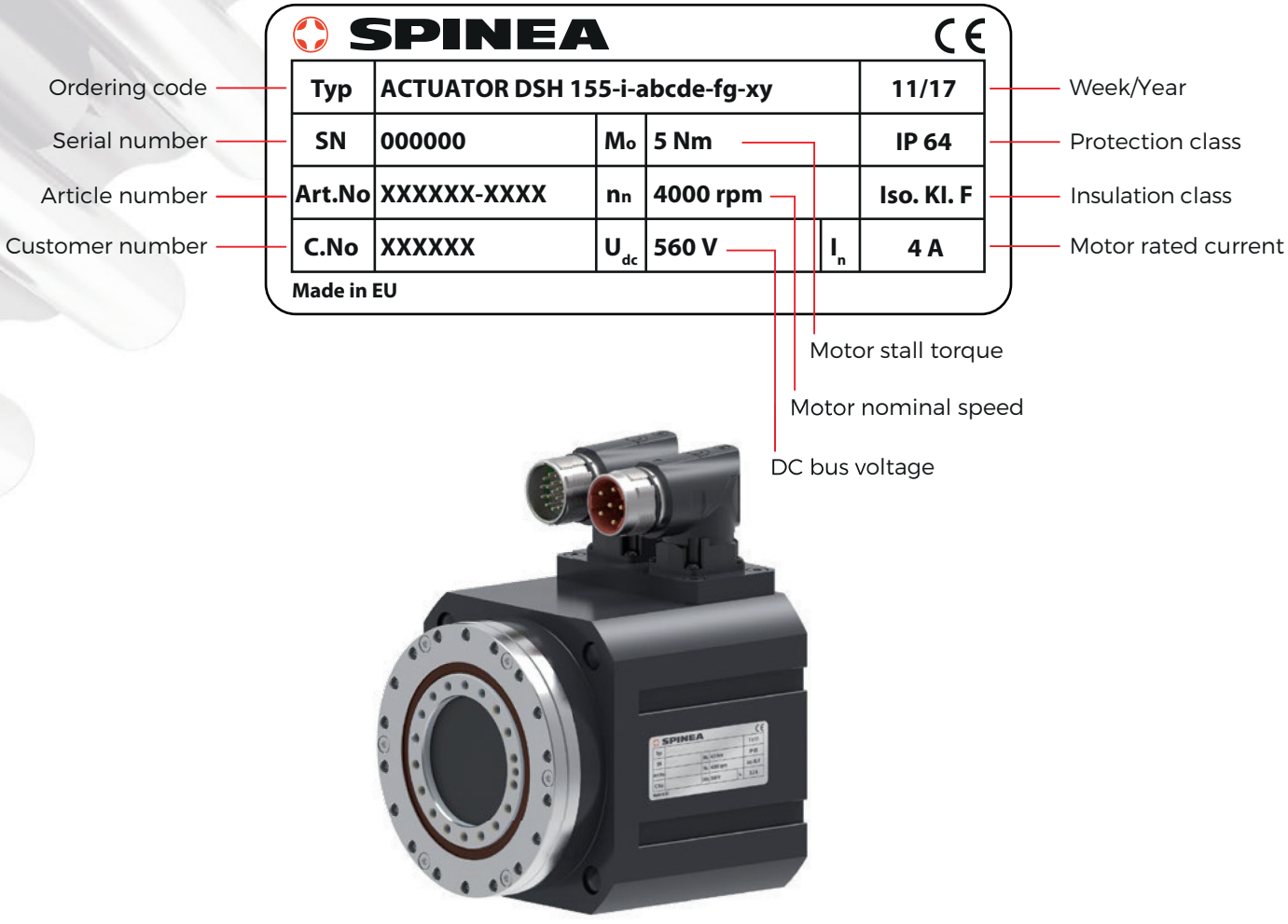


Fig. 8.5k: Resistance / Temperature PT 1000

DS•DSH•DSM•DSF 050, 060 Identification Labels



DS•DSH•DSM•DSF 070, 085, 095, 110, 115, 125, 140, 155, 170 Identification Labels



Tab. 8.6: Ordering code for Cable

Description	Length	Connection type on actuator side	Wiring diagram on actuator side	Connection on servo drive side	Wiring diagram on servo drive side	Ordering code
Power cable, PUR 7x0.5 mm2, shielded, 6 pin female Intercontec connector	On XXX position, defined as XX,X meters (for example code 305 represent 30.5 meters)	923 (6 pin), rotation P	A	Without connector - free end	D	CAB-POW-XXX-00-01A-00D
Power cable, PUR 7x0.5 mm2, shielded, 8 pin female Intercontec connector		923 (8 pin), rotation P	B		D	CAB-POW-XXX-00-02B-00D
Power cable, PUR 7x0.5 mm2, shielded, 9 pin female Intercontec connector		915 (9 pin), rotation P	C		D	CAB-POW-XXX-00-03C-00D
Power cable, PUR 4x1 mm2 + 2x0.5 mm2, shielded, C-track compatible, 6 pin female Intercontec connector		923 (6 pin), rotation P	A		D	CAB-POW-XXX-10-01A-00D
Power cable, PUR 4x1 mm2 + 2x0.5 mm2, shielded, C-track compatible, 8 pin female Intercontec connector		923 (8 pin), rotation P	B		D	CAB-POW-XXX-10-02B-00D
Power cable, PUR 4x1 mm2 + 2x0.5 mm2, shielded, C-track compatible, 9 pin female Intercontec connector		915 (9 pin), rotation P	C		D	CAB-POW-XXX-10-03C-00D
Power cable, PUR 4x1.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 6 pin female Intercontec connector		923 (6 pin), rotation P	A		D	CAB-POW-XXX-11-01A-00D
Power cable, PUR 4x1.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 8 pin female Intercontec connector		923 (8 pin), rotation P	B		D	CAB-POW-XXX-11-02B-00D
Power cable, PUR 4x1.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 9 pin female Intercontec connector		915 (9 pin), rotation P	C		D	CAB-POW-XXX-11-03C-00D
Power cable, PUR 4x2.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 6 pin female Intercontec connector		923 (6 pin), rotation P	A		D	CAB-POW-XXX-12-01A-00D
Power cable, PUR 4x2.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 8 pin female Intercontec connector		923 (8 pin), rotation P	B		D	CAB-POW-XXX-12-02B-00D
Power cable, PUR 4x2.5 mm2 + 2x0.5 mm2, shielded, C-track compatible, 9 pin female Intercontec connector		915 (9 pin), rotation P	C		D	CAB-POW-XXX-12-03C-00D
Power cable, PUR 4x4 mm2 + 2x1 mm2, shielded, C-track compatible, 6 pin female Intercontec connector		923 (6 pin), rotation P	A		D	CAB-POW-XXX-13-01A-00D
Power cable, PUR 4x4 mm2 + 2x1 mm2, shielded, C-track compatible, 8 pin female Intercontec connector		923 (8 pin), rotation P	B		D	CAB-POW-XXX-13-02B-00D
Power cable, PUR 4x4 mm2 + 2x1 mm2, shielded, C-track compatible, 9 pin female Intercontec connector		915 (9 pin), rotation P	C		D	CAB-POW-XXX-13-03C-00D
Signal cable, PUR 10x0.14 mm2, shielded, C-track compatible, 12 pin female Intercontec connector	On XXX position, defined as XX,X meters (for example code 305 represent 30.5 meters)	623 (12 pin), rotation P	B/H/J/S	Without connector - free end	A/G/I/R	CAB-SIG-XXX-00-01B (or H/J/S)-00A(or G/I/R)
Signal cable, PUR 10x0.25 mm2, shielded, C-track compatible, 12 pin female Intercontec connector		623 (12 pin), rotation P	B/H/J/S		A/G/I/R	CAB-SIG-XXX-01-01B (or H/J/S)-00A(or G/I/R)
Signal cable, PUR 18x0.14 mm2, shielded, C-track compatible, 17 pin female Intercontec connector		623 (17 pin), rotation P	D/F/O		C/E/N	CAB-SIG-XXX-02-02D (or F/O)-00C(or E/N)
Signal cable, PUR 18x0.14 mm2, shielded, C-track compatible, 15 pin female Intercontec connector		615 (15 pin), rotation P	D/F/O		C/E/N	CAB-SIG-XXX-02-04D (or F/O)-00C(or E/N)

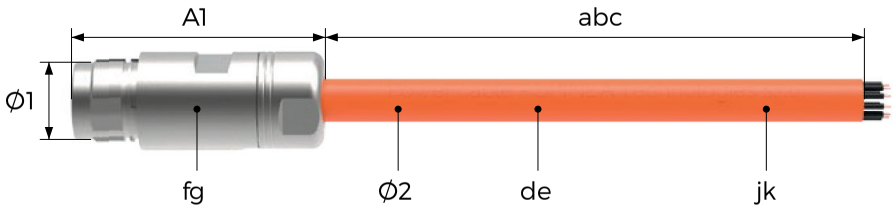
NOTES:

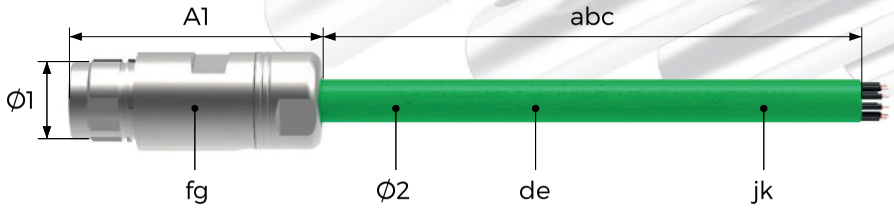
- *Please consider cable length limits for used feedback type and cross sections of power cables*

Ordering code example

CAB POW-305-00-01A-00D

- 00–: **Connection type on Servo drive side**
- ––D: **Wiring diagram on Servo drive side**
- 01–: **Connection type on Actuator side**
- ––A: **Wiring diagram on Actuator side**
- 00: Cable type - **Power cable PUR 7x0.5 mm²**
- 305: Lenght of calbe - **30.5 meters**
- POW: **Power cable**
- CAB: **Cable**





Type	abc	Cable length
POW	XXX	Defined as XX.X meters (for example code 305 represent 30.5)
SIG		

Type	jk	Cable length
POW	00	Without connector - free end
SIG	00	Without connector - free end

Type	de	Cable	ϕ2 (mm)
POW	00	PUR 7x0.5 mm²	7.2
	10	PUR 4x1 mm² + 2x0.5 mm²	9.6
	11	PUR 4x1.5 mm² + 2x0.5mm²	11
	12	PUR 4x2.5 mm² + 2x0.5mm²	12.8
	13	PUR 4x4 mm² + 2x1 mm²	14.8
SIG	00	PUR 10x0.14 mm2	6.3
	01	PUR 10x0.25 mm²	6.9
	02	PUR 18x0.14 mm²	7.3

Type	fg	Connector on actuator side	ϕ1 (mm)	ϕA (mm)
POW	01	923 (6 pin), rotation P	28	64
	02	923 (8 pin), rotation P	28	64
	03	915 (9 pin), rotation P	18.7	42
SIG	01	623 (12 pin), rotation P	26	55
	02	623 (17 pin), rotation P	26	55
	04	623 (15 pin), rotation P	18.7	42

8.7 Performance conditions and technical terminology

TwinSpin®

Trademark of high precision reduction gear.

DriveSpin®

The combination of TwinSpin® high precision reduction gear, permanent magnet synchronous motor (further referred as PMSM, motor or electromotor), thermistor sensor and position feedback sensor. Optionally also power off parking electromagnetic brake can be built-in. Thermistor is inside PMSM windings for overheat protection. PMSM, position feedback sensor and electromagnetic brake are placed on shaft (also referred as input shaft) of TwinSpin®. Loads are usually connected to output flange of TwinSpin® which is also output flange of DriveSpin®.

Input speed

It refers to speed of input shaft of TwinSpin® reduction gear driven by PMSM of DriveSpin®.

Output speed

It refers to the speed of output flange of DriveSpin® to drive connected loads.

Input torque

It refers to torques at input shaft of TwinSpin® reduction gear generated by PMSM. (Note: Electromagnetic brake also generates torque at input but is not included in this term instead defined as braking torque at input).

Output torque

It refers either to limiting torques developed either on the output flange of DriveSpin® or calculated values of torque generated by PMSM including ratio and losses in gearbox, additional seals or bearings.

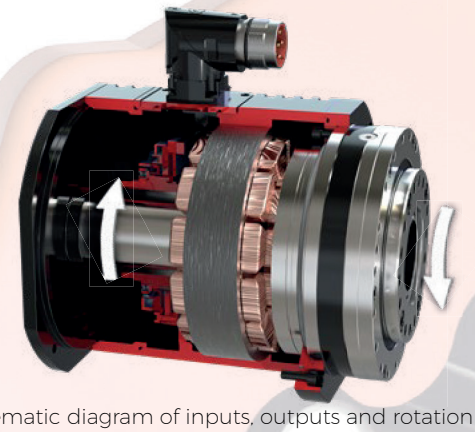


Fig. 8.8: Schematic diagram of inputs, outputs and rotation direction

Ratio

Expresses number of motor turns at input shaft needed to make one whole rotation of load at output flange of DriveSpin® actuator. Speed of load at output flange is reversed in contrary to electromotor speed, so for calculation purpose a negative ratio might be considered in control

Hollowshaft diameter

Defines DSH series diameter of hollow through bore. Standard versions of DSH 085, 115, 125, 155, 170 have built-in static tube which prevents from contact with rotating input shaft which rotates at electromotor speed. Hollowshafts are for example used to lead hydraulic, pneumatic or electric media through cables, pipes or by some other means to supply additional components which might reduce space or eventually protects this supplies.

Rated output torque, Rated input speed, Service life

The nominal service life of TwinSpin® reduction gear as a main component of actuator DriveSpin® is determined by service life of the bearings on the input shaft. This nominal service life is limited by the material fatigue of the bearings. It does not take into account other factors that may be a limit to the practical service life, such as insufficient lubrication contamination or overload. The nominal service life is only statistical value. It denotes time in operation under rated conditions during which 10% of a large number of reduction gears get damaged due to material fatigue. For further details or special calculations for your specific application please contact the Sales Department.

Motor rated torque

Nominal value of torque developed by PMSM for continuous operation, when the continuous nominal current is applied to the windings.

Continuous output torque

Actuator calculated output torque from PMSM rated performance including reducer ratio, efficiency and rated output torque of reducer.

Motor rated current

Is the nominal value of the electric RMS current used to obtain the continuous nominal torque from the electromotor.*)

Motor stall torque

Is the value of torque produced at zero speed for continuous functioning *).

Motor stall current

The nominal value of the electric RMS current used to obtain the stall torque from the electromotor.*)

Motor peak torque

The nominal value of torque developed for a limited period of time, when the peak current is applied to the windings.

Momentary peak output torque

Actuator peak output torque for limited period of time during acceleration and deceleration phase of duty cycle for acceleration or deceleration of inertial loads. It is calculated from PMSM peak performance including reducer ratio, efficiency and Acceleration/Braking Torque limits of reducer.

Motor peak current

It is the value of the electric current used to obtain the peak torque from the electromotor.

Motor back-EMF constant

It is the ratio of terminal to terminal peak voltage generated in the windings when motor rotor is mechanically rotated at a speed of 1000 rpm.

Motor torque constant

Is the ratio of the developed torque to the applied RMS current for the electromotor specific winding.*)

Terminal resistance (L-L)

The winding resistance measured between any two leads of the winding in particular configuration at 25 °C. Might differ to catalogue values with dependence to type of connection or cable lengths.

Terminal inductance (L-L)

The winding inductance measured between any two leads of the winding in particular configuration at 25 °C at 1 kHz. Permanent magnets of rotor influences measured value of inductance which is varying over each electrical cycle.

Number of poles

Is the number of permanent magnet poles of the rotor (p is the number of pole pairs).

Electromagnetic brake DC supply

For DriveSpin® with option electromagnetic brake (c) ≠ 0 (see ordering code), it is voltage required to release/disengage electromagnetic power off brake. For special modifications please contact our sales department.

Electromagnetic brake torque (at motor)

For DriveSpin® with option electromagnetic brake (c) ≠ 0 (see ordering code), it is value of torque generated by electromagnetic brake at the input shaft of built-in reduction gear mechanism. It is nominal value at standard working conditions stated by manufacturer.

Protection class

The degree of protection according to IS/IEC 60034-5. Assumes DriveSpin® mounted in accordance with assembly instructions and in case of connectors (see type of electrical connection) with counterparts properly connected.

Motor insulation class

Defines maximum winding temperature and permissible winding temperature rise in relation to predefined allowed ambient temperature range. (Reduction gear limit temperature must be also taken into consideration). Winding classification F for thermal class 155 °C. Each 10 °C rise above the rating may reduce the motor lifetime by one half. For example electromotor operating at 180 °C have an estimated life of 8 500 hours with class F.

Paint

Standardly RAL 9005 black colour. For special painting please contact our sales department.

Motor number of phases, Motor type of connection

Defines electromotor windings arrangement and count.

Inertia at input

Represents calculated value of sum of inertia of all rotating parts at input shaft see Fig. 8.8. For dynamic applications where high accuracy and responsiveness is needed reflected load inertia JL in should be less than 5-times of inertia at input JL out. For calculation of reflected inertia of load to input shaft use following equation:

$$J_{L\,in} = \frac{J_{L\,out}}{i^2}$$

$J_{L\,in}$ – reflected inertia to input shaft
$J_{L\,out}$ – load inertia
i – gear ratio

Duty cycle

IEC 60034-1 (the International Electrotechnical Commission) duty cycles designations:

Tab. 8.8: Duty cycles

S1	Continuous duty	The motor works at a constant load for enough time to reach temperature equilibrium.
S2	Short-time duty	The motor works at a constant load, but not long enough to reach temperature equilibrium. The rest periods are long enough for the motor to reach ambient temperature.
S3	Intermittent periodic duty	Sequential, identical run and rest cycles with constant load. Temperature equilibrium is never reached. Starting current has little effect on temperature rise.
S4	Intermittent periodic duty with starting	Sequential, identical start, run and rest cycles with constant load. Temperature equilibrium is not reached, but starting current affects temperature rise.
S5	Intermittent periodic duty with electric braking	Sequential, identical cycles of starting, running at constant load and running with no load. No rest periods.
S6	Continuous operation with intermittent load	Sequential, identical cycles of running with constant load and running with no load. No rest periods.
S7	Continuous operation with electric braking	Sequential identical cycles of starting, running at constant load and electric braking. No rest periods.
S8	Continuous operation with periodic changes in load and speed	Sequential, identical duty cycles run at constant load and given speed, then run at other constant loads and speeds. No rest periods.
S9	Duty with non-periodic load and speed variations	Load and speed vary periodically within the permissible operating range. Frequent overloading may occur.
S10	Duty with discrete constant loads and speeds	Duty with discrete number of load/speed combinations, with these maintained long enough to reach thermal equilibrium.

Thermal Equilibrium is the state reached when the temperature rise of the machine does not vary by more than 2K = 2 °C per hour. High precision reduction gears are preferred for intermittent duty cycles (S3-S8). The S1 continuous duty cycles needs to be consulted with manufacturer.

*) The stated values are for frameless electromotor mounted on a standard aluminum heat sink during the process of motor manufacture.

8.9 Assembly

Values of the axial and radial run-out of the output flange

Tab. 8.9.a: Values of the axial and radial run-out of the output flange

Type	T [mm]	Z [mm]
050	0.006	0.015
060	0.007	0.020
070	0.007	0.020
095	0.02	0.03
110	0.008	0.025
115	0.03	0.05
140	0.009	0.025
155	0.02	0.04

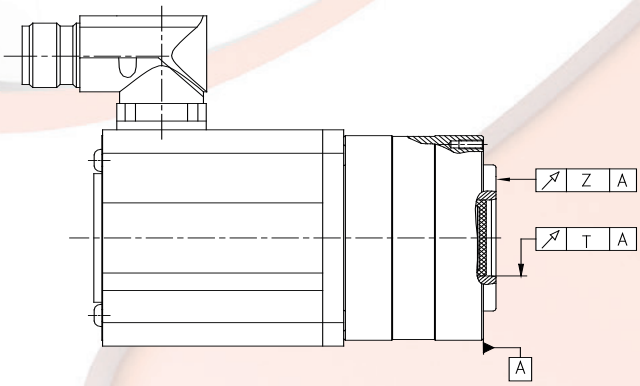


Fig. 8.9.a: Axial and radial runout to base A

Installation of components on the output flange of the electric actuator

Before the installation, remove the layer of preservation oil from the surface of the reduction gear part of the actuator by means of a clean and dry cloth. Degrease the contact surfaces of the friction connections. During the cleaning, take care the degreasing agent does not get into the reduction gear part of the actuator. The contact surfaces of the reduction gear part of the actuator are not protected against corrosion. If you need more information, please contact the SPINEA Sales Department or our regional representative. During the assembly of screw connections, proceed as follows: Screw a screw into a functional thread until the screw head sits on the part being connected. Screw in all screws in that way and only then tighten them with a wrench. Tighten the screws twice in turns with the required torque. Tighten the screws gradually because otherwise irregular tightening of the connection and thus also deformation of the connection of the parts may occur. Tighten the screws along the perimeter of a circle in a cross-like manner, i.e. as shown in Fig. 8.9.a. In the case of a connection subjected to shocks and cyclical loads, it is necessary to secure the connection against self-loosening.

Fig. 8.9.a: Tighten the screws along the perimeter of a circle in a cross-like manner

For the safe transmission of torque it is always necessary to use the full number of the screws! The tightening torques of the screws are specified in Tab. 8.9.b.

Tab. 8.9.b: Tightening torques of screws

Screw	Tightening torque [Nm]	Clamping force [N]	Screw material class and specification
M3	1.9	3 100	ISO 898 T1 10.9 or 12.9
M4	4.3	5 300	
M5	8.4	8 800	
M6	14	12 400	
M8	35	22 750	
M10	70	36 200	

The allowed torques transmitted by the connection screws on the output flange and the casing are contained in Tab. 8.9.c.

Tab. 8.9.c: Allowable torques transmitted through connecting screws

Type	Output flange			Case		
	Number x screw	Pitch diameter [mm]	Transmitted torque [Nm]	Number x screw	Pitch diameter [mm]	Transmitted torque [Nm]
050	10xM4	28	100	4xM5	63	165
060	8xM4	34	108	16xM3	64	238
070	14xM4	42	233	16xM3	64	238
085	12xM5	50	470	18xM3	81	400
095	18xM4	53	450	18xM4	88	760
110	14xM6	69	898	12xM5	100	792
115	18xM5	68	173	18xM4	108	173
125	18xM6	71	1 190	18xM5	116	1 380
140	14xM6	92	2 090	12xM6	140	1 562
	8xM6	74				
155	18xM8	96	2 950	28xM5	146	2 700
155 H*	18xM6	100	1 600	28xM5	146	2 700
170 H*	18xM8	110	3 380	12xM8	175	3 580

*) Hollowshaft actuators.

8.10 FAQ

Feedback encoders:

01. Q: Is it possible to implement feedback encoder which is not in standard range or even implement my own feedback encoder??
    A: Yes, we can implement any type of feedback encoder if there is no hardware or mounting limit. In specific cases we can make custom solution for you and implement your feedback encoder.
02. Q: How can I implement safety function with feedback encoders?
    A: We can use single Functional Safety encoder or use 2 independent encoders to provide full safety function for your application.
03. Q: How it's possible make more precise control of drive?
    A: There are 2 ways how to do it. First is use feedback encoder with better resolution and second is use feedback encoder on output flange of reduction gear.

Servomotors:

01. Q: What kind of servomotors are you using?
    A: We are using Permanent Magnet Synchronous Motors (PMSM).
02. Q: Can I choose DC BUS voltage which is not from your standard range?
    A: Our standard DC BUS voltage is 24 V, 320 V and 560 V but we can implement servomotor with your requested DC BUS voltage after check by our engineers.
03. Q: How can I control servomotor without standard feedback encoder?
    A: We can provide you solution with hall sensors inside servomotor for application with low resolution requirements.
04. Q: Is it possible to use different torque or speed of used servomotors in standard DriveSpin® series?
    A: If our standard DriveSpin® series doesn't fit your requirements, we can implement different servomotor or design new one based on your requirements.

Ingress Protection (IP):

01. Q: How can I improve protection of standard DriveSpin®?
    A: Ingress Protection of our standard product range is IP 64. If your application requires higher IP, we can design all components of DriveSpin® actuators to reach IP 65, 66 or even 67.

DriveSpin® mechanical design:

01. Q: Is it possible to prepare special design of actuator housing?
    A: If housing of standard DriveSpin® series is not suitable for you, we can prepare any special design of actuator housing where you can define shape of housing, mounting elements or fixation points which are required for your project.
02. Q: Can I make actuator from any TwinSpin® Reduction gear?
    A: Yes, if you will choose TwinSpin® reduction gear and define other electro-mechanical parameters, we can prepare complete solution for you.
03. Q: Do I need to develop completely new product if I have some specific request?
    A: In many cases it is not necessary to develop completely new product, just change existing mechanical or electrical part of actuator based on your request.

Electrical connection:

01. Q: Is it possible to use different connectors for standard DriveSpin® series?
    A: Yes, we can implement your special connector for applications where it is required.
02. Q: Can I use only one connector instead of 2?
    A: For some application it is possible. We have in our product range Hybrid connectors or we can use any other connector which will fit technical requirements, for example maximal current for power pins or avaliable quantity of signal pins for used feedback encoder.

Brakes:

01. Q: Can I use brake in actuator?
    A: Yes, we can implement standard 24 V electromagnetic brake for static applications where brake hold the load in absence of power.
02. Q: It is possible to use brake for dynamic applications as well?
    A: Yes it is possible, but in this case calculation of brake parameters is different than in static application brake and need to be consulted with manufacturer.
03. Q: What other modifications are avaliable for brakes?
    A: We can implement brakes with different voltage, hand release and other special modifications.

Accessories:

01. Q: Do you have avaliable any accessories to actuators?
    A: We have avaliable Cables between servo drive and actuator with standard used connectors and length up to 99.9 meters.

REACH COMPLIANCE

CE

RoHS 2002/95/EC

9. YourSpin - General information

CUSTOMERS / SPECIAL SOLUTIONS

Customer requirements often call for special solutions. Thanks to many years of experience in technical support and engineering, we realize highly professional solutions according to customer requirements. We design various design modifications of standard products and solutions of higher assembled units TwinSpin® series G, T, E, H and M, DriveSpin® in series DS, DSH, DSM, DSF and RotoSpin modules. Our technical support is based on professional recommendations for various applications of TwinSpin®, DriveSpin® and RotoSpin in industrial segments such as robotics, automation, metalworking, medicine, camera systems, security and others. The advantages of these special solutions are their compact and modular design, easy connection to the supporting structure and technically applied sealing elements

Advantages

- **compact design**
- **modular design**
- **easy connection with the support structure**
- **technically applied sealing elements**

9.1 Customers / Special reduction gears

TwinSpin® **reduction gear with right angle gearbox**

Advantages

- **possibility of a right-angle motor connection**
- **higher input speeds**
- **smaller servomotor dimensions**
- **low lost motion and hysteresis on output**
- **compact solution**

The high precision reduction gear with the possibility of a right-angle motor connection also allows the increase of the total reduction ratio by using an input right-angle reduction gear. This allows to use a servomotor with a lower torque and a higher speed, i.e. a smaller motor. This solution is available for the whole line of E series reduction gears.

Note: For more information please contact the SPINEA sales department.

TwinSpin® **hollow shaft reduction gear with a pre-stage**

Advantages

- **high-precision reduction gear**
- **possibility to have a motor in an offset position**
- **high reduction ratio in two stages**
- **coupling and motor flange provide easy motor mounting**
- **pre-greased and fully sealed solution**

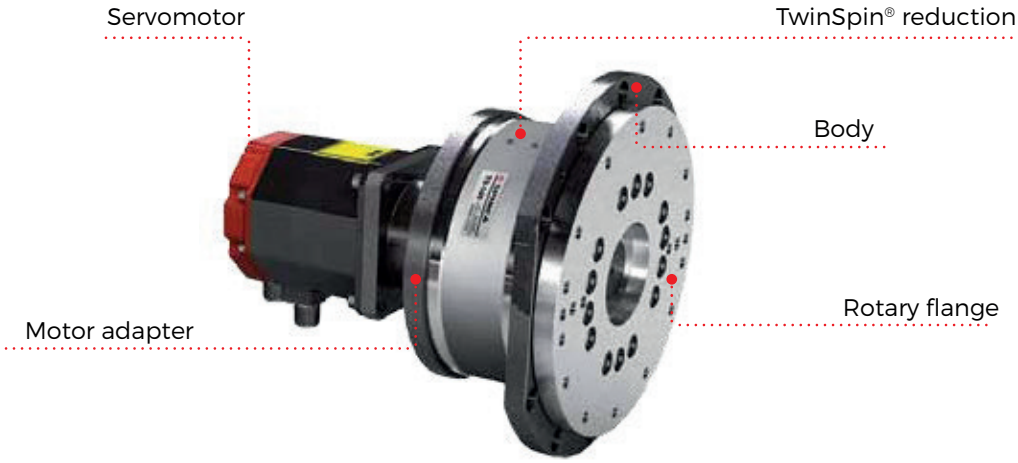
A TwinSpin® hollow shaft reduction gear with a pre-stage and offset motor position - a solution for applications that require a completely sealed node with a large through hole for passing cables, tubing or additional shafts.

Note: For more information please contact the SPINEA sales department.

9.2 Customers / Special solutions

RotoSpin - **High precision rotary modules**

The rotary positioning module, which is offered under the RotoSpin brand, is designed for the building of positioning devices and rotary tables, which are used in automated and robotized workplaces. The RotoSpin module features a high reduction ratio, high kinematic precision, low backlash motion, high torque capacity, low weight, and a compact design.



RotoSpin - **Rotary modules - series A**

Advantages

- **possibility to build into circular holes**
- **low weigh and small dimensions**
- **wide area of use**
- **easy attachment**

The RotoSpin A are called flange ones. They feature a flange design, which allows the module's attachment and building into a structure with a circular hole. According to their size, RotoSpins A are manufactured in four size categories with load capacities of 60, 250, 500, and 1000 kg respectively. Due to their small dimensions and low weight, the RS-A modules are used mainly in moving parts of positioning devices. If the RS modules are loaded with a higher than allowed moment or shock load, we use them in combination with a support bearing.

Note: For more information please contact the SPINEA sales department.

RotoSpin - **Rotary modules - series B**

Advantages

- **possibility to attach to flat surfaces**
- **compact design**
- **wide area of use**
- **easy attachment**

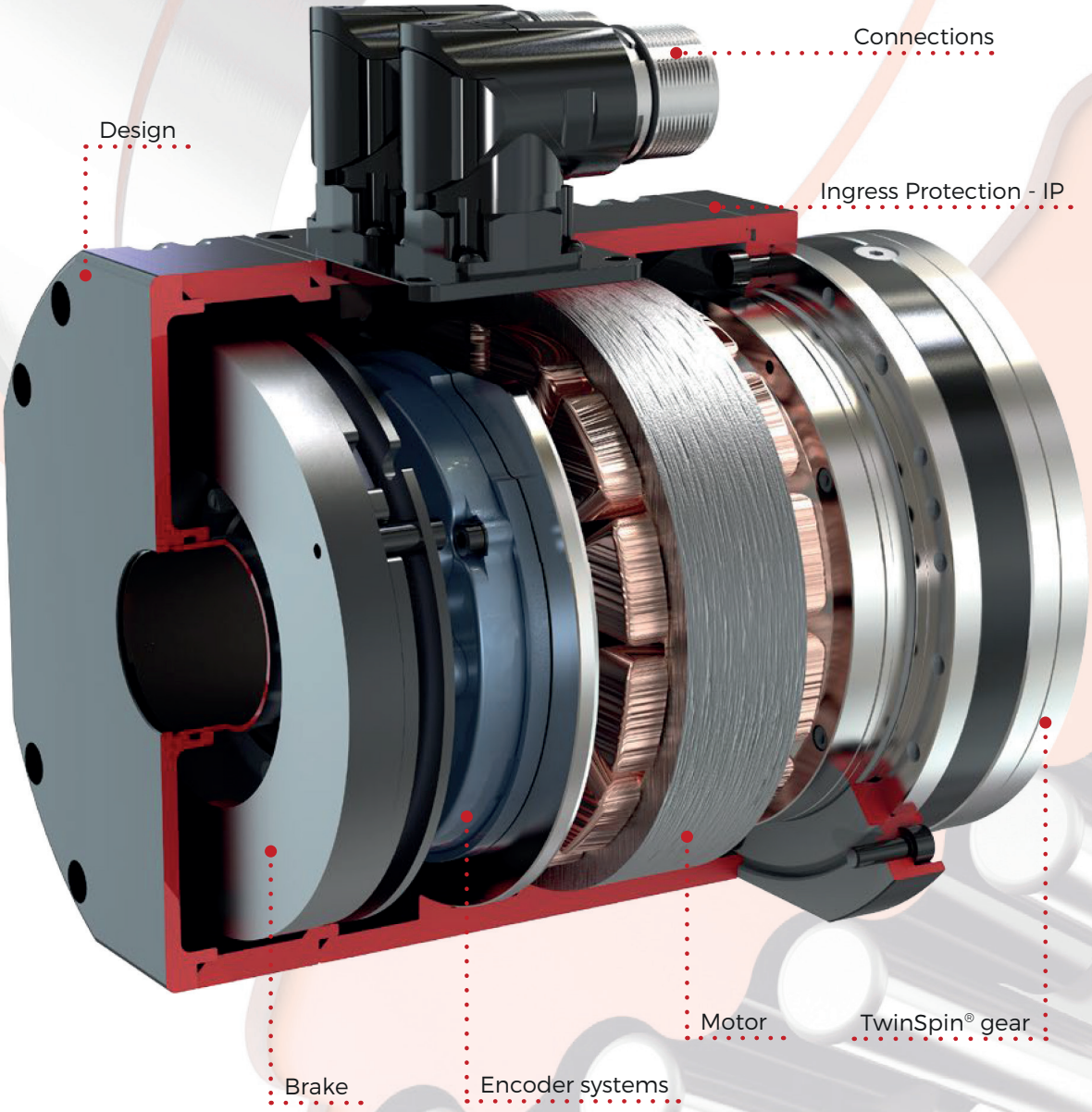
The RotoSpin B are called box ones. They feature a box design, which allows the module's easy attachment to a flat surface by means of feet. According to their size, RotoSpins B are manufactured in four size categories with load capacities of 60, 250, 500, and 1000 kg respectively. We supply the RS1000 module in two versions according to the foot width. The B version with narrow feet is used where it is necessary to support a long workpiece or welded piece by means of a support module. The module with wide feet is marked as RS 1000-BX and it is used for the clamping of short workpieces without support modules.

Note: For more information please contact the SPINEA sales department.

9.3 Customers / Special actuators

DriveSpin® **actuators - design "Your actuators"**

The rotary electric actuator can be designed and manufactured according to your specific application requirements. The input and output technical specification can be designed and optimized for you



Advantages

- **create your own design**
- **integrate unique mechatronics componenets (Servomotor, Encoder)**
- **make your own color design**
- **optimize input and output characteristcs of the actuator according to your application**

Motor
Motors are directly implemented to DriveSpin®, without any need for aditional coupling. This helps to reduce weight and dimensions of whole solution. Main type of motor is synchronous motor with permanent magnets. Standard verisons of motor implemented in DriveSpin® are 24V, 320V and 560V. Low voltage range is possible to modify to 36V 48V and 60V, high voltage to 680V. These motors are custom solution and they are modified to suit our customer. If there is special requirement or our solution is not suitable for you we can implement any frameless motor and calculate final parameters of DriveSpin®.

Encoder systems
DriveSpin® actuators with cycloidal gearbox excel in terms of precision positioning however this would not be possible without the implementation of position feedback sensors. Our primary industries such as robotics, machine tool, dental machines, CNCS require different accuracy standards. Thus, requirements for motion control differ on application. Therefore, our company consults your needs and requirements. Our specialists will analyze your application and find the best solution in terms of accuracy, precision measurement, robustness as well as compatibility with your control system. Actuator series DS, DSH, DSM as well as DSF come with a wide variety of feedback systems. Our portfolio includes sensors from basic feedback systems used in most servo drives such as incremental encoders to next generation protocol encoders such as (EnDat 2.2, Hiperface DSL, BiSS-C). Technical parameters like resolution, sensor protocol, single vs. multiturn are specified in the process of development of the custom product. Supported encoder systems: HIPERFACE®, HIPERFACE® DSL, EnDat 2.2, Resolver, BiSS Interface, DRIVE-CLiQ, FANUC.

Brake
Brakes in our actuators are mostly used in static applications which statically hold the load in absence of power. Usually is used electromagnetic brake, where in currentless state (without connected DC voltage) the armature becomes engaged with brake disk and after application of DC voltage to brake, magnetic field is neutralized and brake released to free rotation of actuator. Electromagnetic brakes are also used in dynamic applications where actuator use brake for deceleration or as safety brake, but these application requires different calculation and implementation to the actuator. Standard in our product range is 24 VDC electromagnetic brake for static applications, but we can implement also 12 VDC electromagnetic brakes, brake with handle release or any other brakes developed for servomotors.

Connections
Electrical as well as mechanical connection used for standard DS, DSH, DSM and DSF are all available in this catalogue. However, our electrical and mechanical engineering team can adjust most of the connection possibilities according to the requirements of the end customer.

Design
Every piece of DriveSpin® series, either DS, DSM, DSH or DSF, has its own unique design. If you require specific design of the housing or mounting flange, or if you need to adjust design to your own aplication, our specialists are ready to prepare a solution according to your demands. It is also possible to place a special ID plate (e.g. QR code) to meet your production processes. Of course, the use of your specific colouring is also possible.

Ingress Protection - IP
Ingress Protection of our standard product range is IP 64. If your application requires higher IP, we can design all components of DriveSpin® actuators to reach IP 65, 66 or even 67.

Testing
All our products from the DS, DSH, DSM and DSF series are subjected to testing, they are standardly tested and comply with the European standards, CE. Our company dispose with various test benches, which can be used for simulation of various duty cycles according to the customer specification. We are able to provide for you independent testing of our products according to your requirements and our capabilities.

Note: For more information please contact the SPINEA sales department.

10. General information

10.1 Maintenance

The reduction gear does not require any special maintenance. During its installation please observe the respective dimensional and positional tolerances of the centering diameters (Chapter 5.3). The reduction gear is a high-precision product, therefore it requires careful manipulation, installation, and demounting.
Any tampering with the reduction gear (disassembly, assembly) constitutes immediate loss of warranty. If a reduction gear fails due to a fault in its manufacturing or a material defect, please inform the manufacturer, who will carry out professional repair or replacement.

10.2 Delivery conditions

The reduction gear is delivered completely assembled, without fixing screws, filled with grease, and in a protective package. Not all series are fully sealed as a standard. Each reduction gear is identified with a type label, containing the following data:

- manufacturer
- product type and size
- reduction ratio
- model
- serial number

10.3 Transport and storage

The reduction gears should be transported in closed transport vehicles, in containers secured against movement or overturning. The mode of transport should follow the mutual agreement between the customer and the supplier. In addition, the product must be protected against the elements, aggressive vapours, dust, and mechanical damage. The manufacturer recommends to store TwinSpin® reduction gears in the original transport package.
The standard packaging in the original package ensures corrosion protection for the period of 6 months during storage in closed rooms with the ambient temperature from 5°C to 25°C and the relative humidity up to 60%. After 6 months it is necessary to preserve the reduction gear again.

10.4 Warranty

The warranty is specified in the General Delivery Terms of SPINEA, s.r.o.. For more information visit our website: www.spinea.com

10.5 Final statement

Any design changes, modifications and improvements, aimed at increasing the technological level of the reduction gear, which, however, do not change the main technical parameters, installation and connection dimensions, may be performed by the manufacturer without prior consent from the customer. Any design changes and/or modifications affecting the critical properties and parameters of the reduction gear are subject to an approval procedure.

10.6 Cautions concerning the application of the TwinSpin® high precision reduction gear

If the end user of the product works in the military field or if the product is to be used for the manufacturing of weapons, the product may be subject to trade controls and export regulations. Before the exporting of the product therefore please check the export and trade control terms and conditions and take the required actions.

- If a fault or a malfunction of the product may directly endanger human lives or if the product is used in devices that may damage the human health (nuclear, space, healthcare facilities, various security systems, etc.), regular checks are essential. In such a case please contact our sales agent or our nearest business office.

- Although this product has been manufactured under strict quality control, if it is to be used in machines that, in the event of a malfunction, may seriously endanger human lives or damage equipment, it is essential to adopt appropriate safety measures.

- If this product is to be used in a special environment (clean rooms, food industry, etc.), please contact our sales agent or our nearest business office.

For more information contact our sales department, or visit our website: www.spinea.com

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03 / 2020