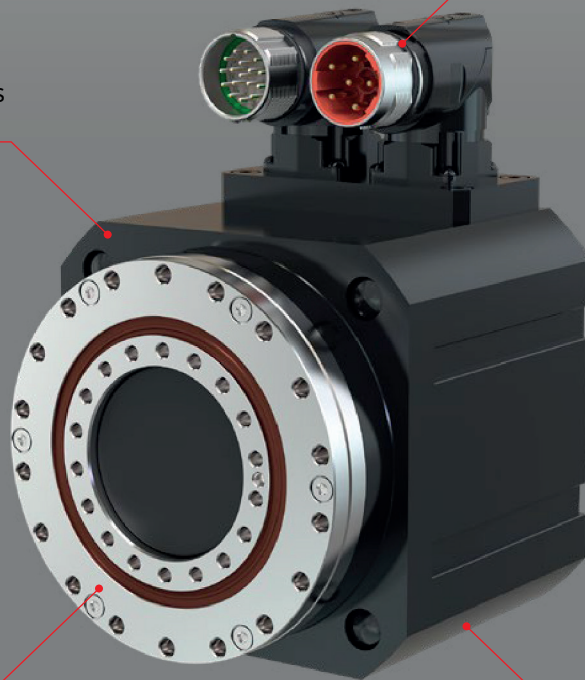




DS series

Various combinations of voltages
and motor feedback systems

Zero-backlash reduction gear



Very high power density

Optimal price range

STANDARD SOLUTION

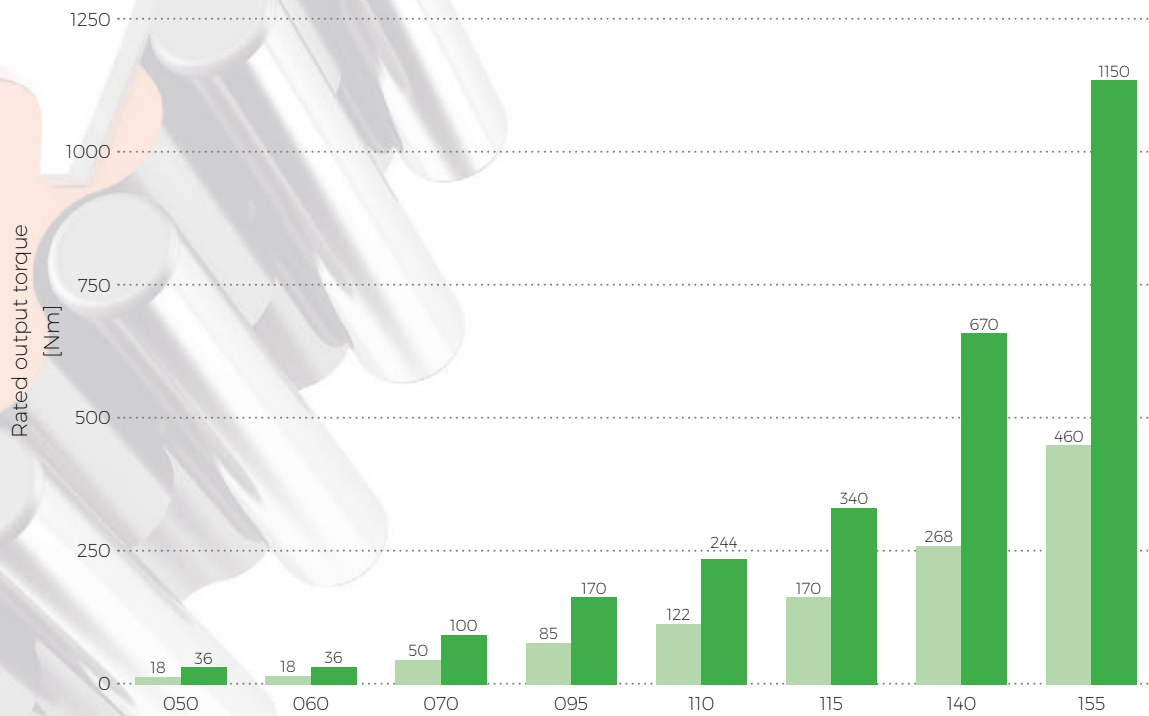
8.1 DS series



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 **DriveSpin® 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 satisfy customer requirements in many cases. Rated output torque range of the DS is from 18 Nm to 460 Nm.

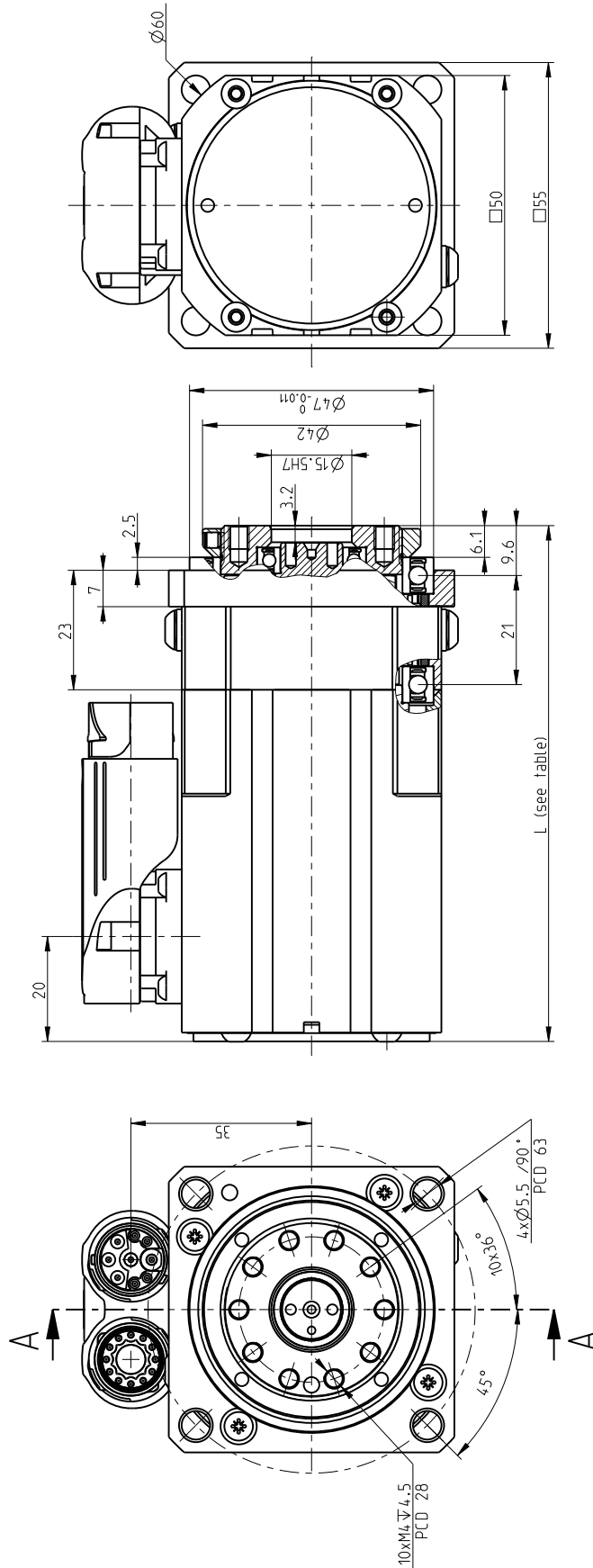


DS

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

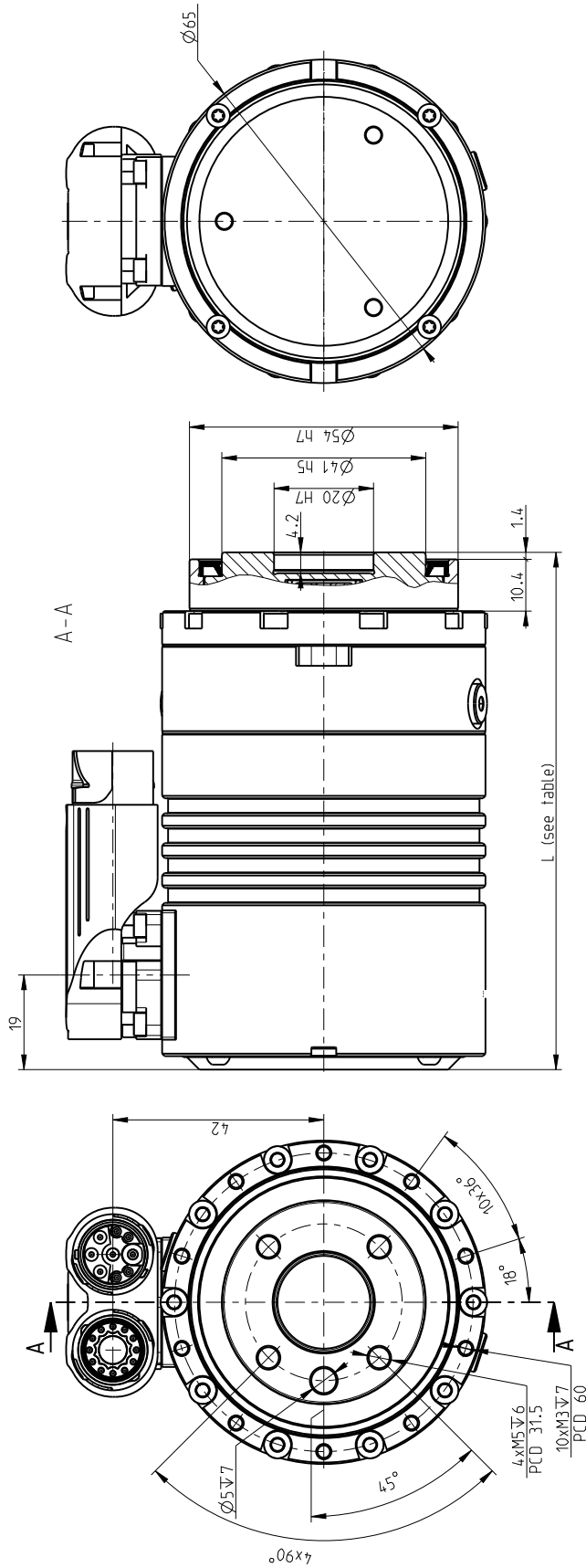


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 050	OA	99	0.9	135	1.4
	OB,OC	107	1.2	138	1.4
	OD,DE	106	1.2	133	1.3
	OC	130	1.2	-	-
	OK,OL	144	1.2	155	1.4

DS 060 - i - abcde-fg-xy



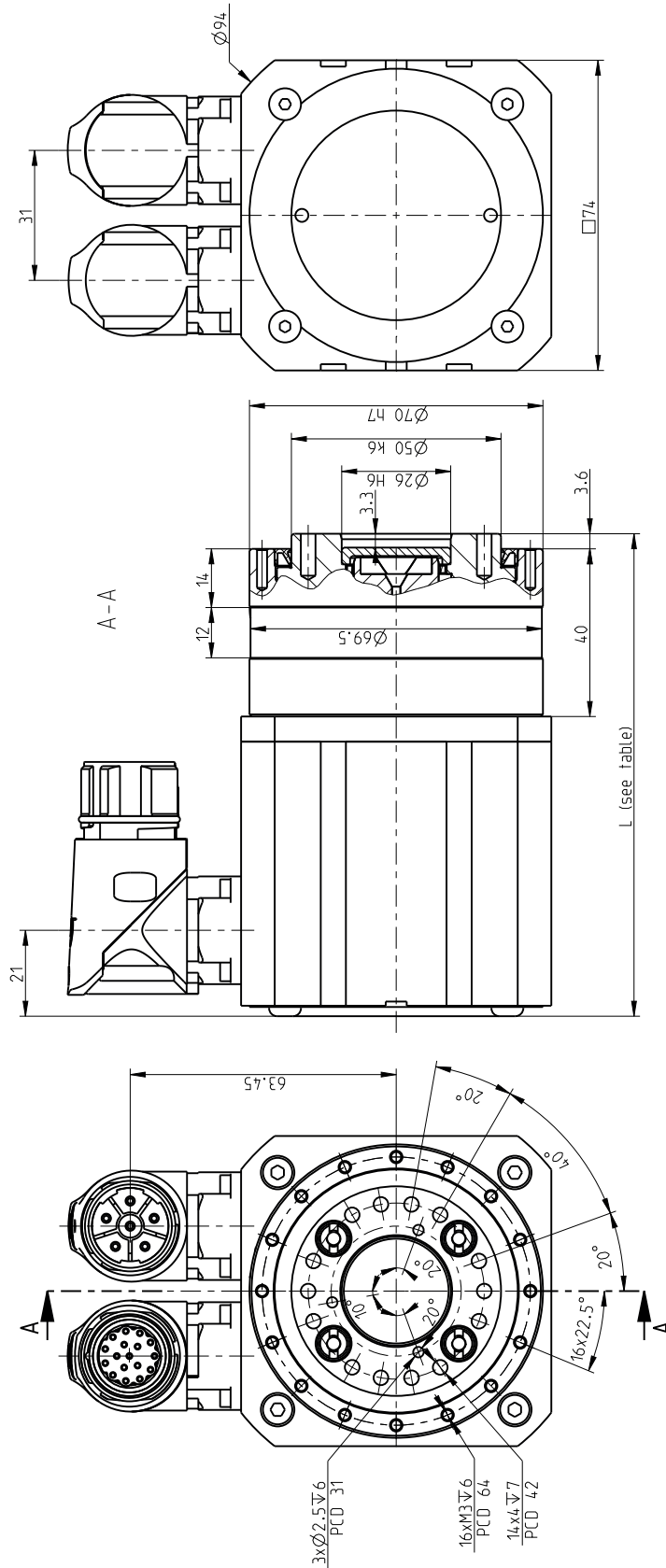
DS 060 - i - abcde-fg-xy



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	OA	104	1.3	119	1.4
	OB,OC	110	1.3	125	1.3
	OD,OE	115	1.3	130	1.4
	OJ	110	1.3	125	1.4

DS

DS 070 - i - abcde-fg-xy

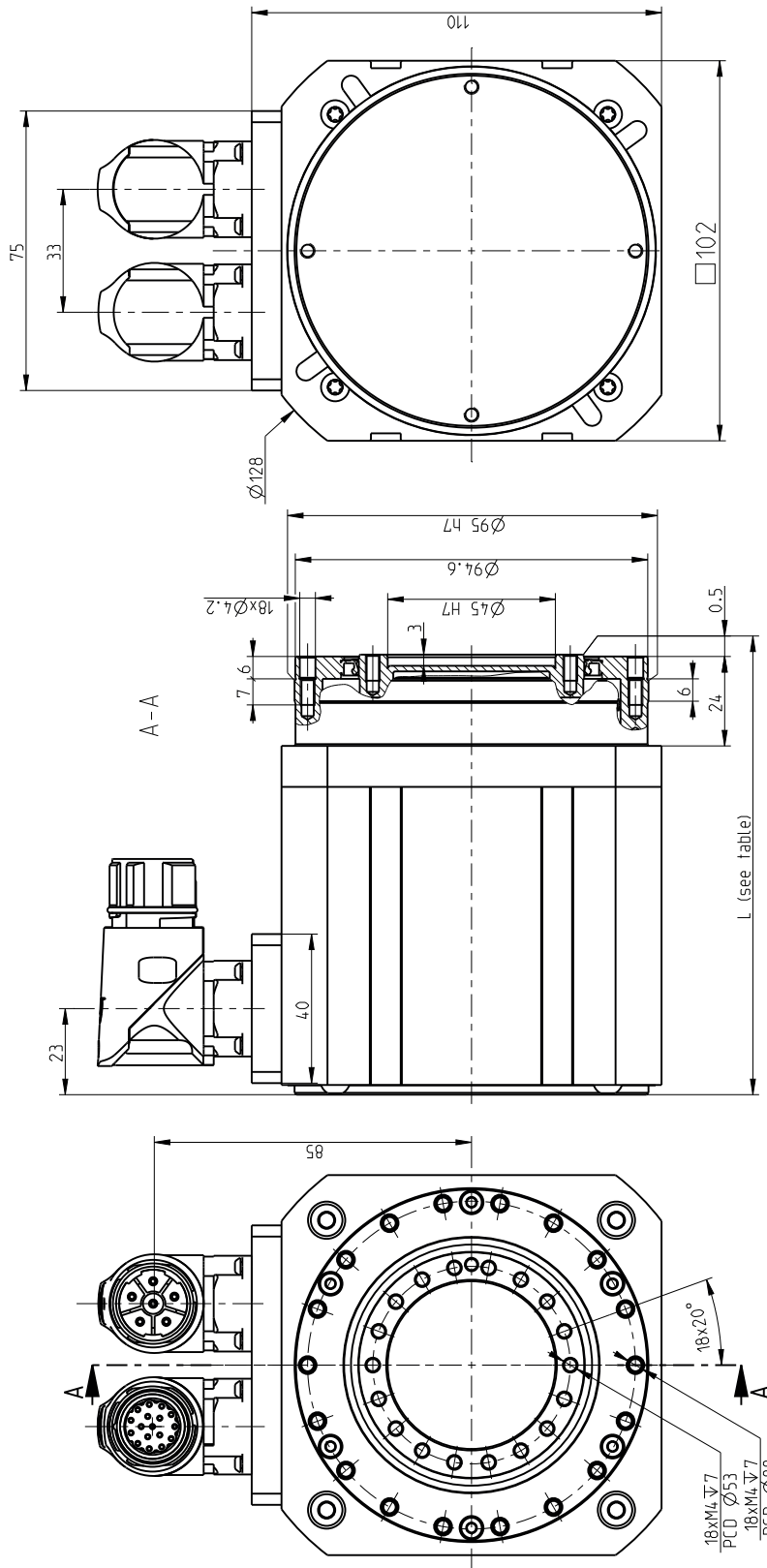


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 070	OA	115	2.3	194	3.4
	OB,OC	137	2.4	178	3.4
	OD,OE	148	2.6	195	3.5
	OH	148	2.6	195	3.5
	OP,OQ	-	-	137	2.4

DS 070 - i - abcde-fg-xy

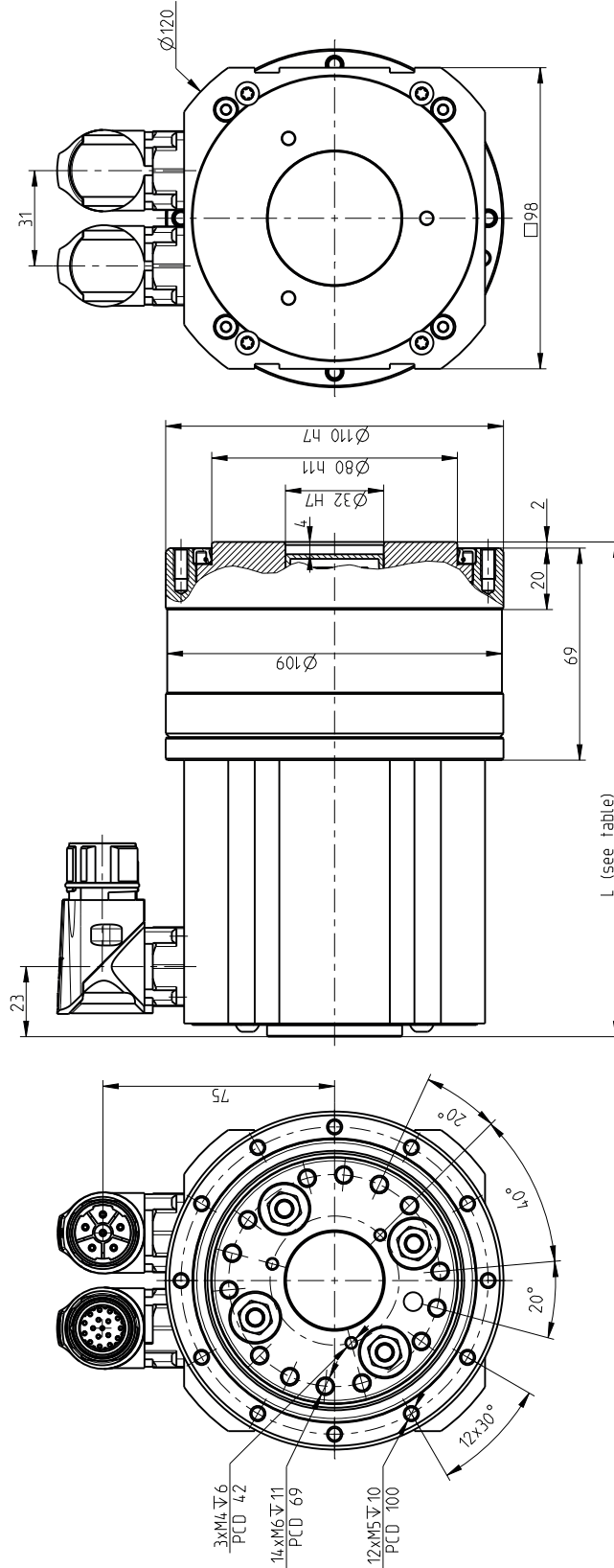
DS 095 - i - abcde-fg-xy

DS 095 - i - abcde-fg-xy

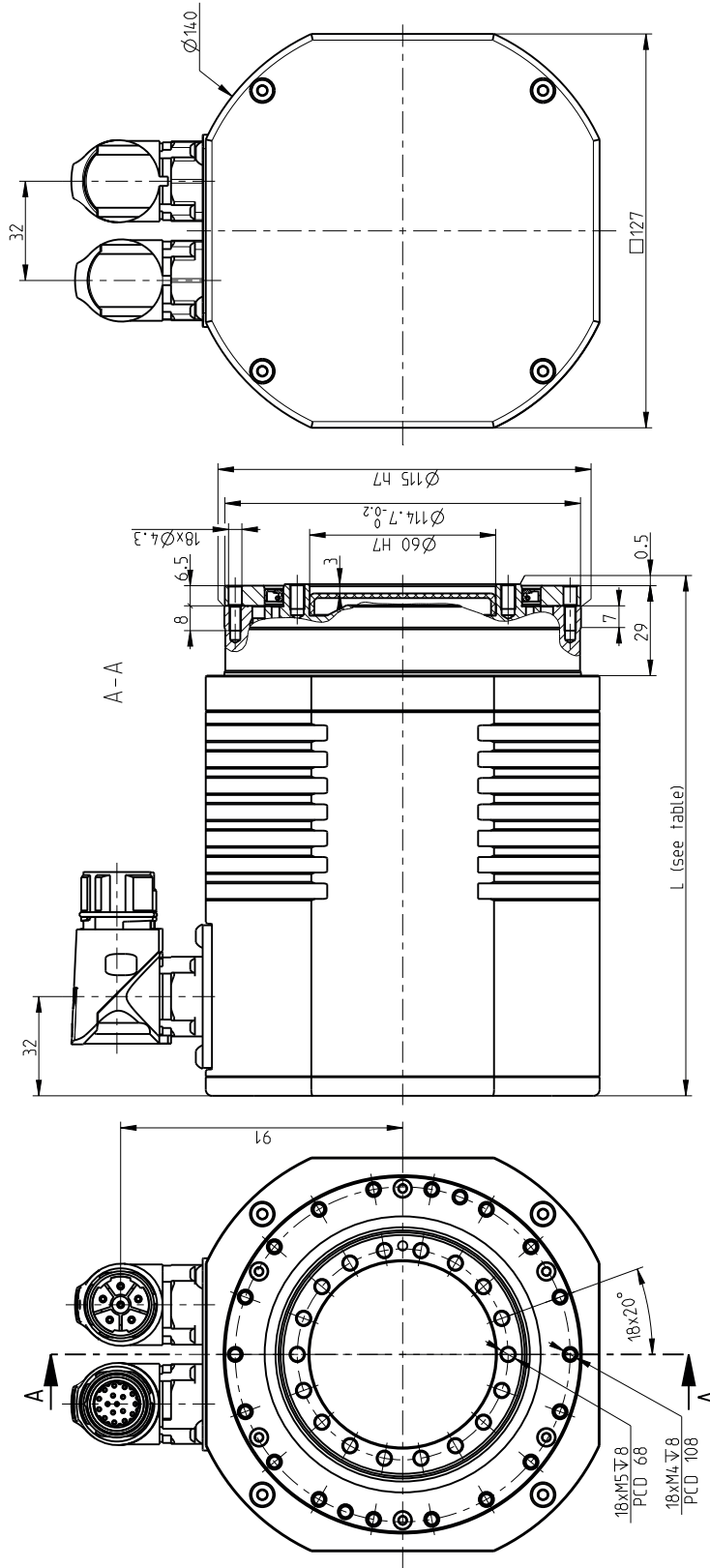


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 095	OA	118	4,9	138	5,8
	OH	146	5,4	161	6,2
	OB,OC	139	5,2	149	5,9
	OD,OE	127	5,0	141	5,8
	OC,OH,OF	146	5,4	161	6,2
	OD,OE	127	5,0	141	5,8
	OP,OQ	139	5,2	149	5,9
	OK,OL	139	5,2	149	5,9

DS 110 - i - abcde-fg-xy

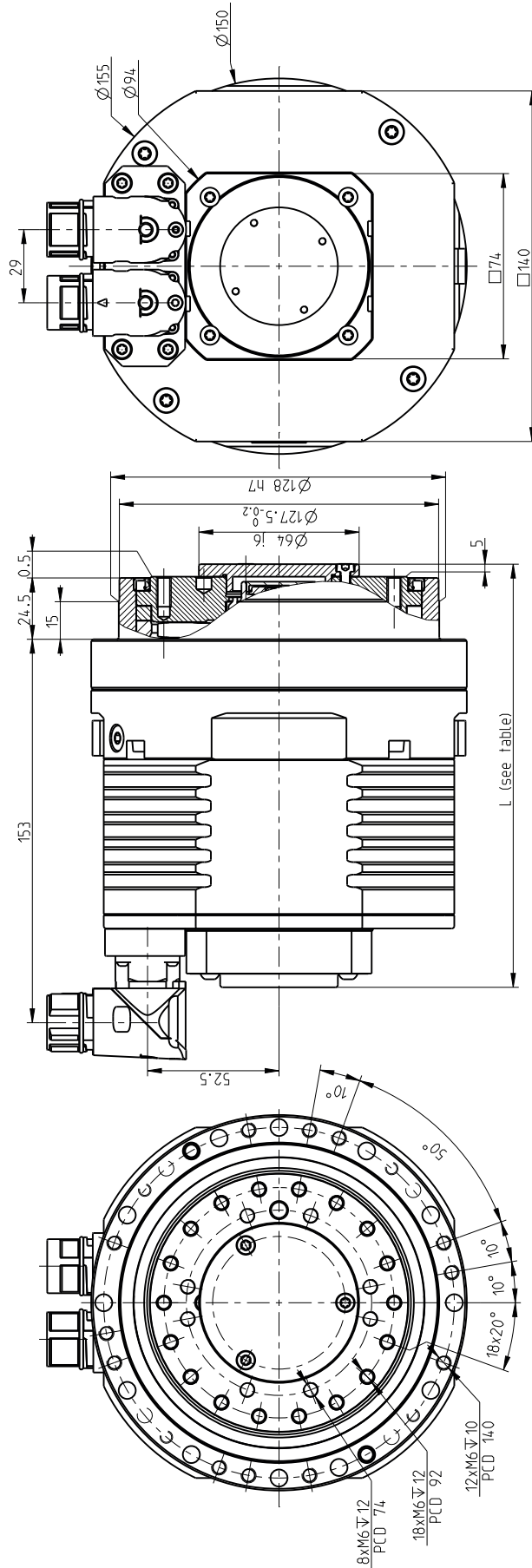


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DS 110	OA	161	8.2	213	9.1
	OB,OC	193	8.8	245	9.7
	OD,OE	202	8.6	242	9.6
	OH	202	8.6	242	9.6

DS 115 - i - abcde-fg-xy
DS 115 - i - abcde-fg-xy


Size	Feedback type (d)	Without brake		With brake	
		Dimension L \pm 0.5 [mm]	Weight m [kg]*	Dimension L \pm 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

DS 140 - i - abcde-fg-xy

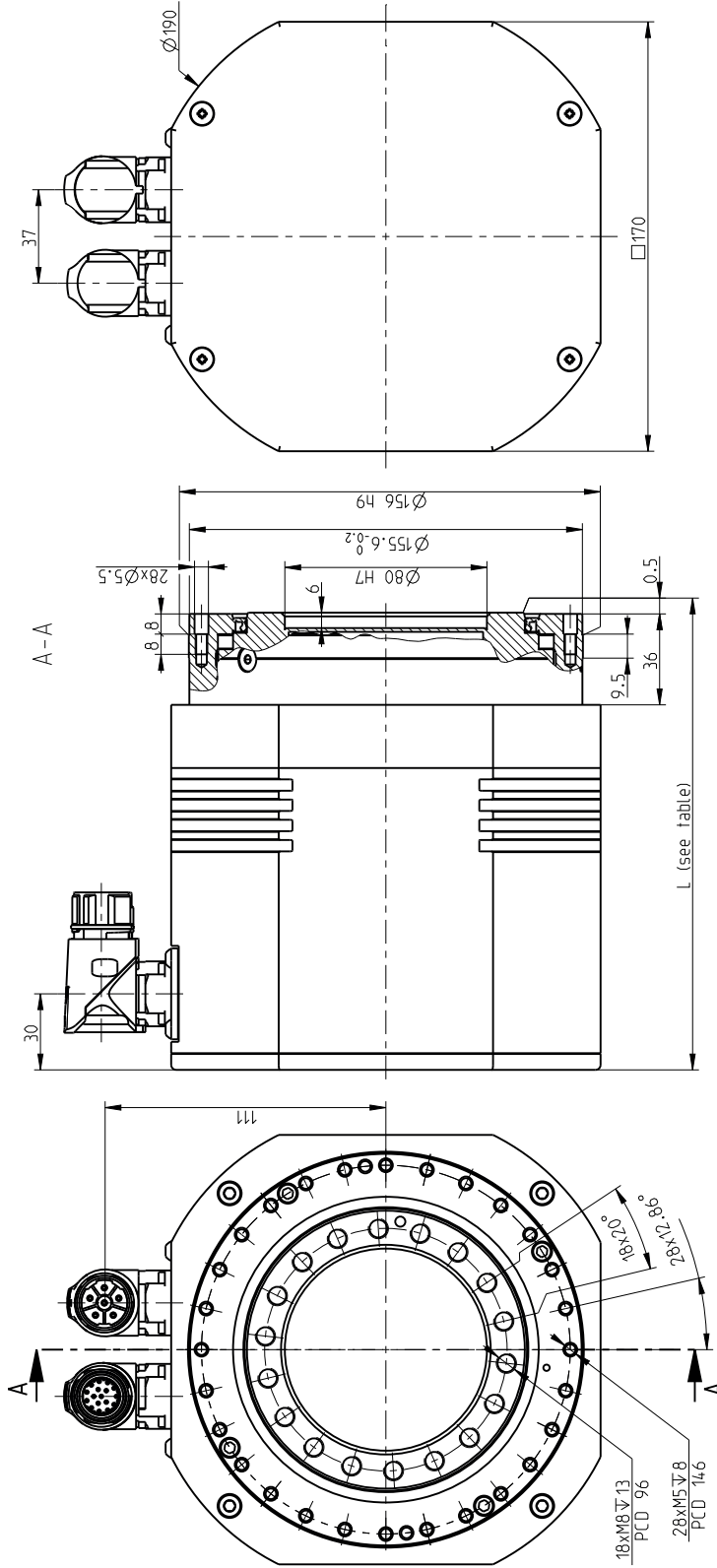


Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg]	Dimension L ± 0.5 [mm]	Weight m [kg]
DS140	OA	148	11	181	12.1
	OB,OC	165	11	208	12.1
	OD,OE	165	11	208	12.1
	OH	199	11	226	12.1

DS 155 - i - abcde-fg-xy



DS 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] *
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_{amax} [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 $F_a \neq 0$ 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 fulfilled). If $M_c \neq 0$ 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_{rmax} 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 $F_{rmax} = 0.044/(a_2+0.0305)$ [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)		

DS

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_p, n_p can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preferred for intermittent duty cycles (S3-S8): the output speed in applications 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_{amax} [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 $F_a \neq 0$ 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 fulfilled). If $M_c \neq 0$ 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_{rmax} 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 $F_{rmax} = 0.044/(a_2+0.0305)$ [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	On request	24	320	560
3 000	4 000	4 000	4 000	4 000	4 000		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)			

DS

IMPORTANT NOTES:

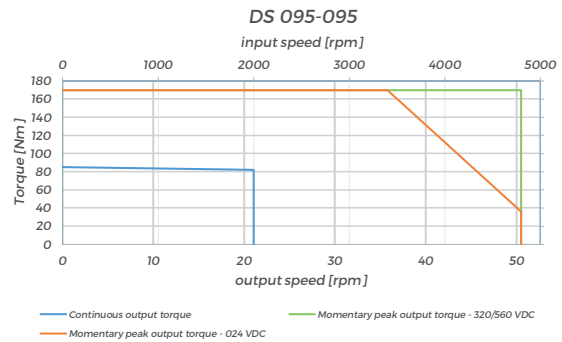
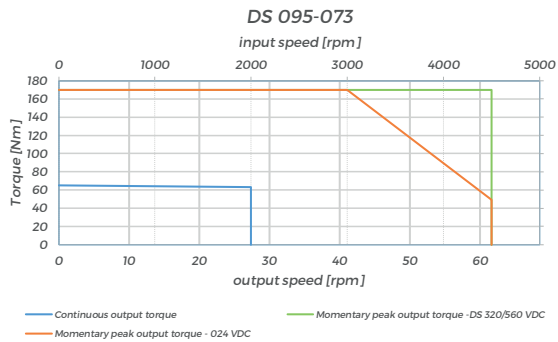
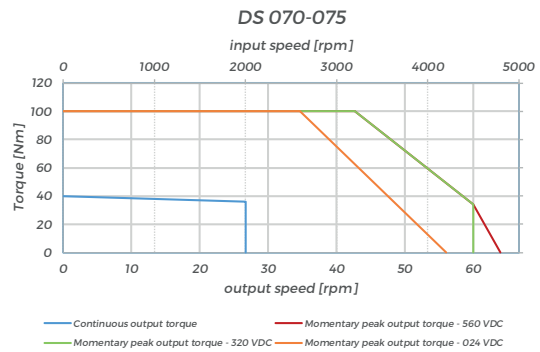
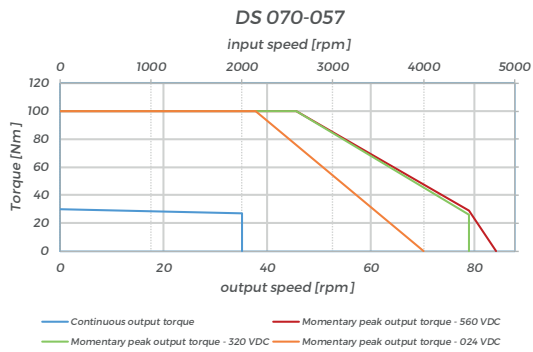
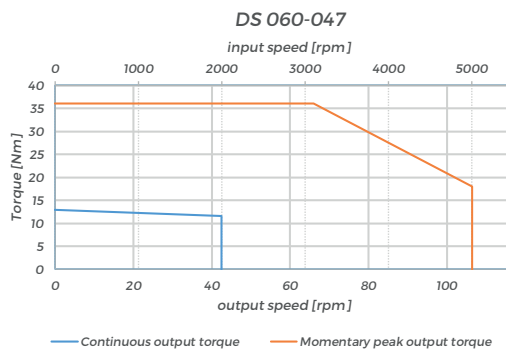
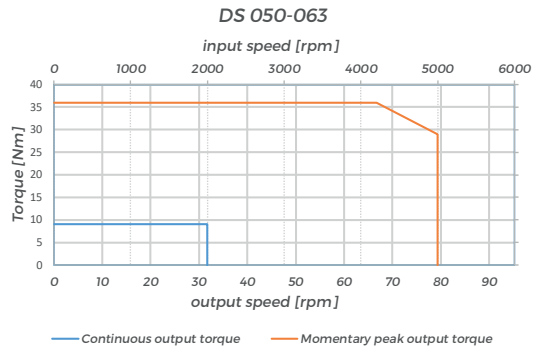
- Load values in the table are valid for the nominal life of $L_{10} = 6\,000$ hours. Service life for average torque T_a and average speed n_a other than T_p, n_p can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preferred for intermittent duty cycles (S3-S8): the output speed in applications 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.

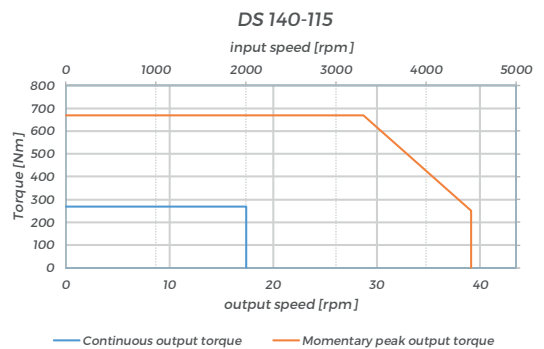
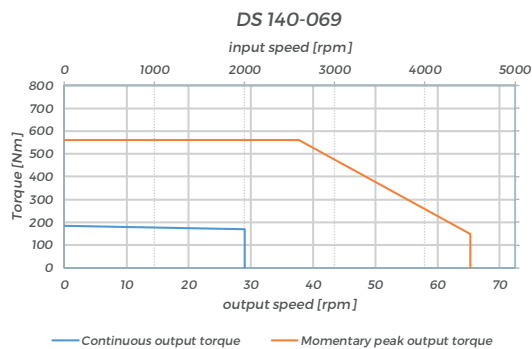
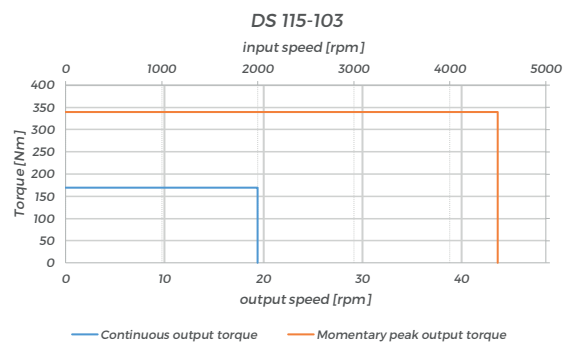
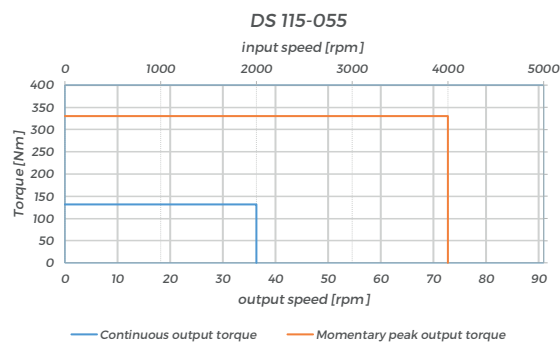
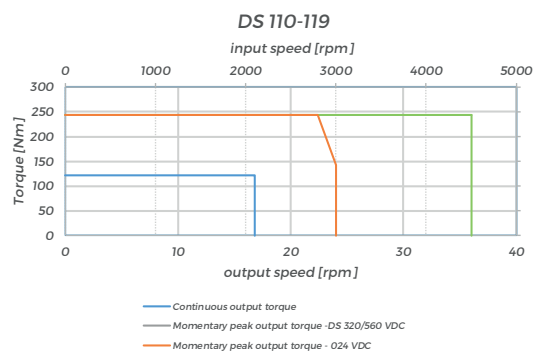
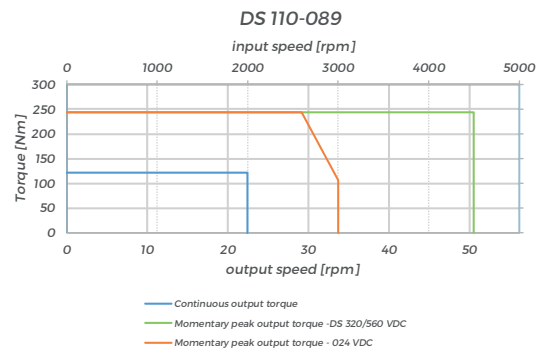
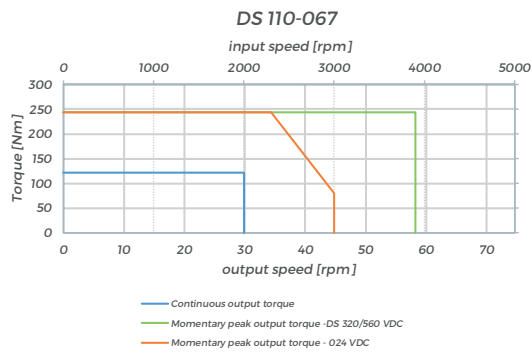
Tab. 8.1c: Inertia at input (DS actuator without brake)

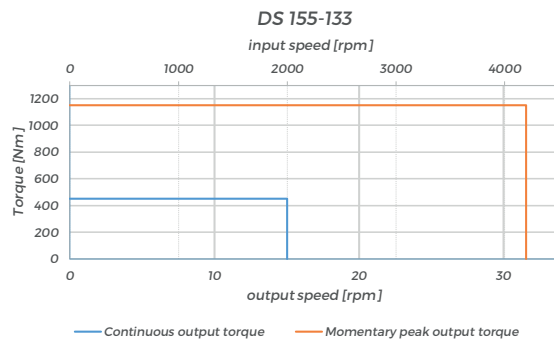
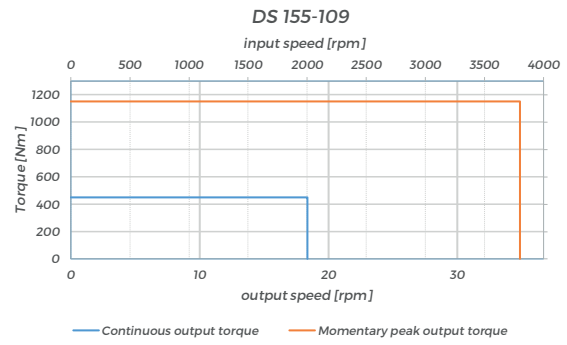
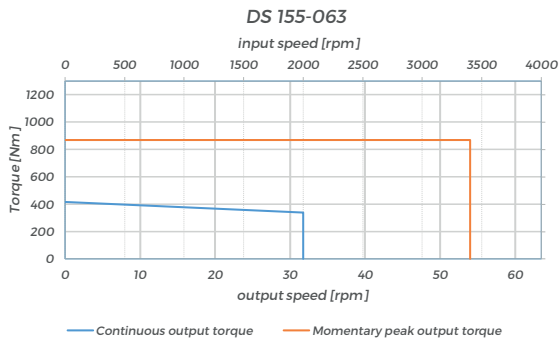
Feedback type (d)	$J_{w/o\ brake}$	DS 050	DS 060	DS 070	DS 095	DS 110	DS 115	DS 140	DS 155
OA	10^{-4} kgm^2	0.080	0.073	0.509	1.657	1.825	5.803	5.745	16.069
OB	10^{-4} kgm^2	0.061	0.073	0.488	1.646	1.814	5.784	5.736	16.039
OC	10^{-4} kgm^2	0.061	0.073	0.488	1.646	1.814	5.784	5.736	16.039
OD	10^{-4} kgm^2	0.062	0.074	0.504	1.640	1.830	5.780	5.728	16.085
OE	10^{-4} kgm^2	0.062	0.074	0.504	1.640	1.830	5.780	5.728	16.085
OF	10^{-4} kgm^2	–	–	–	1.661	–	–	–	–
OG	10^{-4} kgm^2	0.061	–	–	1.661	–	–	–	–
OH	10^{-4} kgm^2	–	–	0.504	1.661	1.830	5.903	5.770	16.085
OJ	10^{-4} kgm^2	–	0.073	–	–	–	5.903	–	–
OK	10^{-4} kgm^2	0.060	–	–	1.640	–	5.788	–	16.039
OL	10^{-4} kgm^2	0.060	–	–	1.640	–	5.788	–	16.039
ON	10^{-4} kgm^2	–	–	–	–	–	5.795	–	16.082
OP	10^{-4} kgm^2	–	–	0.484	1.640	–	–	–	–
OQ	10^{-4} kgm^2	–	–	0.484	1.640	–	–	–	–
OR	10^{-4} kgm^2	–	–	–	–	–	–	–	–
OS	10^{-4} kgm^2	–	–	–	–	–	–	–	–

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
OA	10^{-4} kgm^2	0.121	0.083	0.878	1.707	2.193	5.926	12.100	16.210
OB	10^{-4} kgm^2	0.101	0.081	0.856	1.695	2.182	5.907	12.120	16.230
OC	10^{-4} kgm^2	0.101	0.081	0.856	1.695	2.182	5.907	12.120	16.230
OD	10^{-4} kgm^2	0.101	0.082	0.871	1.689	2.196	5.903	12.100	16.210
OE	10^{-4} kgm^2	0.101	0.082	0.871	1.689	2.196	5.903	12.100	16.210
OF	10^{-4} kgm^2	–	–	–	1.711	–	–	–	–
OG	10^{-4} kgm^2	–	–	–	1.711	–	–	–	–
OH	10^{-4} kgm^2	–	–	0.871	1.711	2.196	5.926	12.100	16.450
OJ	10^{-4} kgm^2	–	0.081	–	–	–	5.926	–	–
OK	10^{-4} kgm^2	0.100	–	–	1.690	–	5.901	–	16.360
OL	10^{-4} kgm^2	0.100	–	–	1.690	–	5.901	–	16.360
ON	10^{-4} kgm^2	–	–	–	–	–	5.918	–	16.180
OP	10^{-4} kgm^2	–	–	–	1.690	–	–	–	–
OQ	10^{-4} kgm^2	–	–	–	1.690	–	–	–	–
OR	10^{-4} kgm^2	–	–	–	–	–	–	–	–
OS	10^{-4} kgm^2	–	–	–	–	–	–	–	–







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