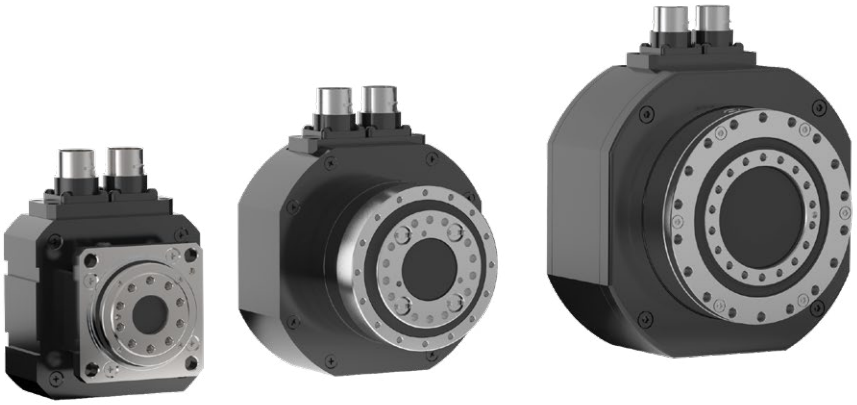
SPINEA
BY TIMKEN

DriveSpin®

DSF series

AND YET IT IS FLAT

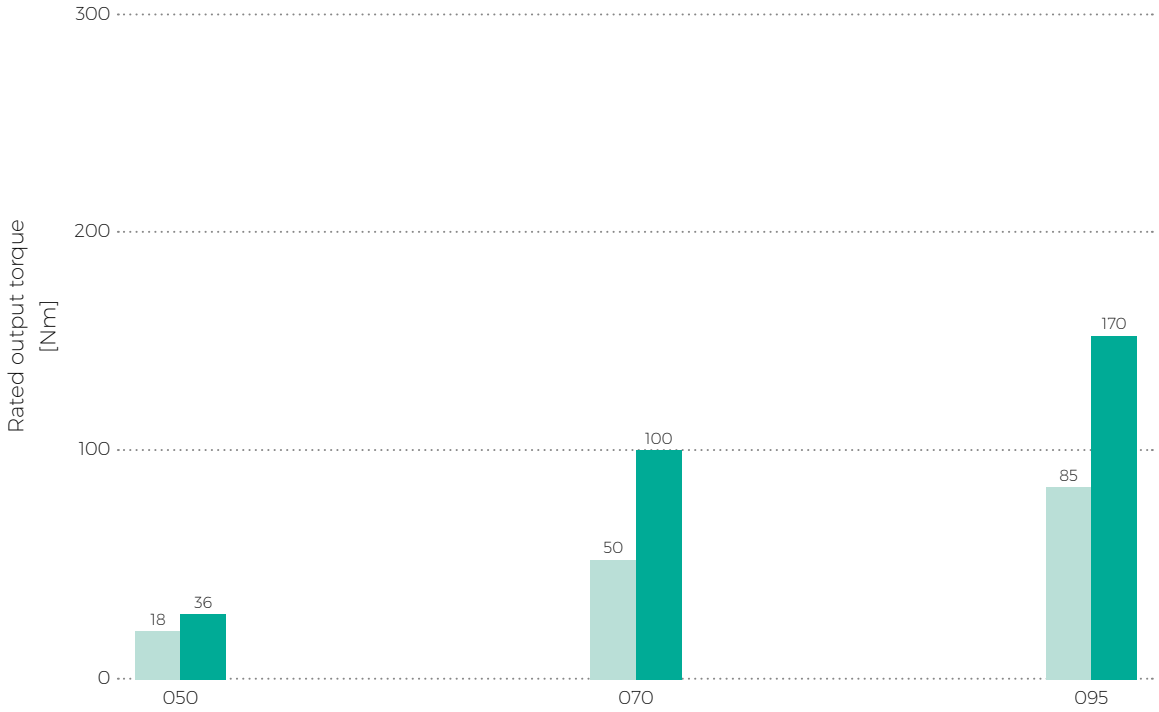
8.4 DSF series



Advantages

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

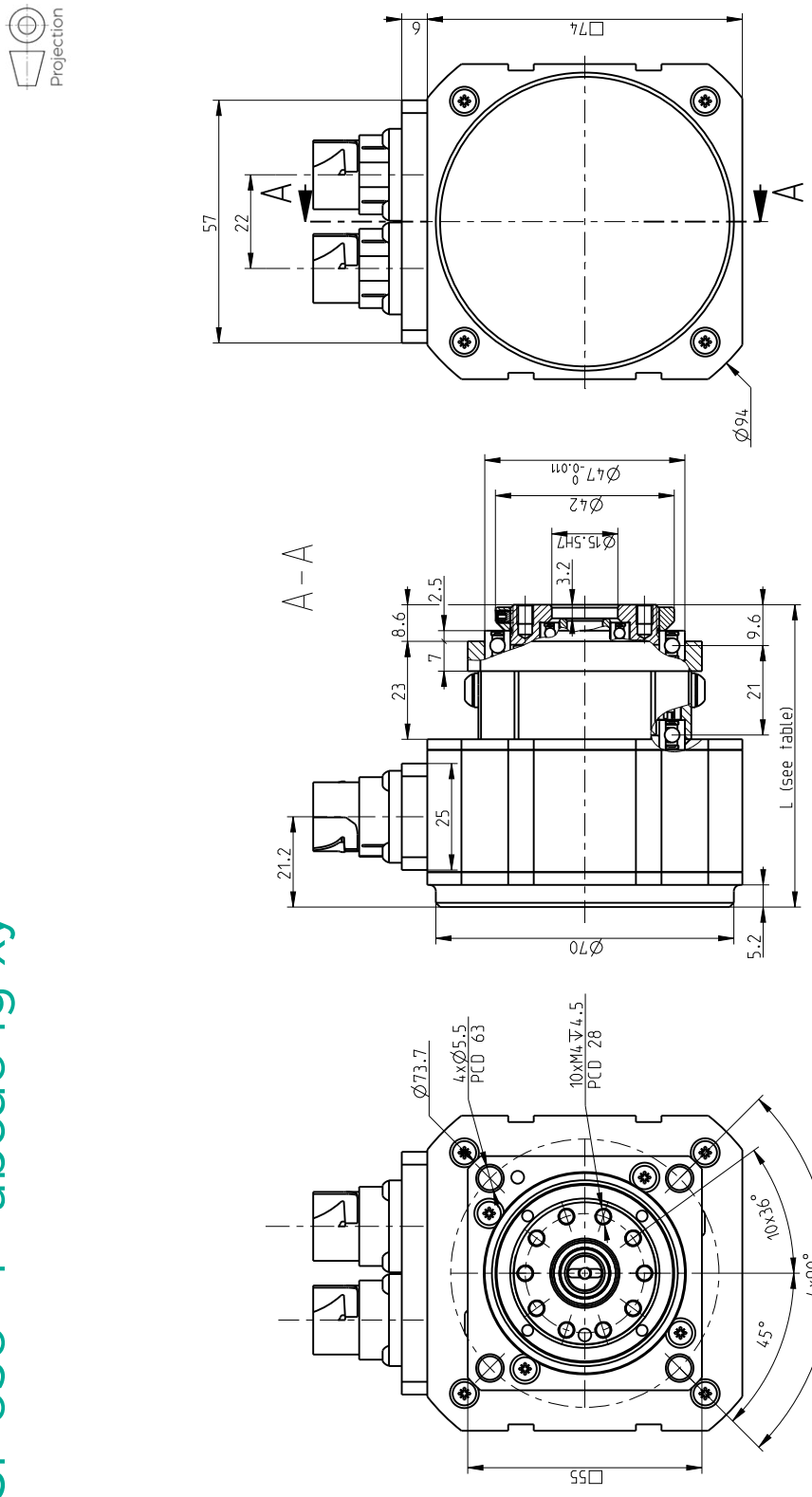
The **Drive**Spin® **DSF** "flat" series of electric actuators is characterized by the extremely short axial length with focus on maintaining the key features of the DriveSpin®. The DSF series was designed to be the most compact solution with very low mass and small dimensions. The DS "Flat" series consists of TwinSpin® reduction gear, servomotor and various feedback systems aimed at ensuring full compatibility with customer requirements. The TwinSpin® reduction gear used in DSF actuators ensures 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 varies within 12Nm – 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



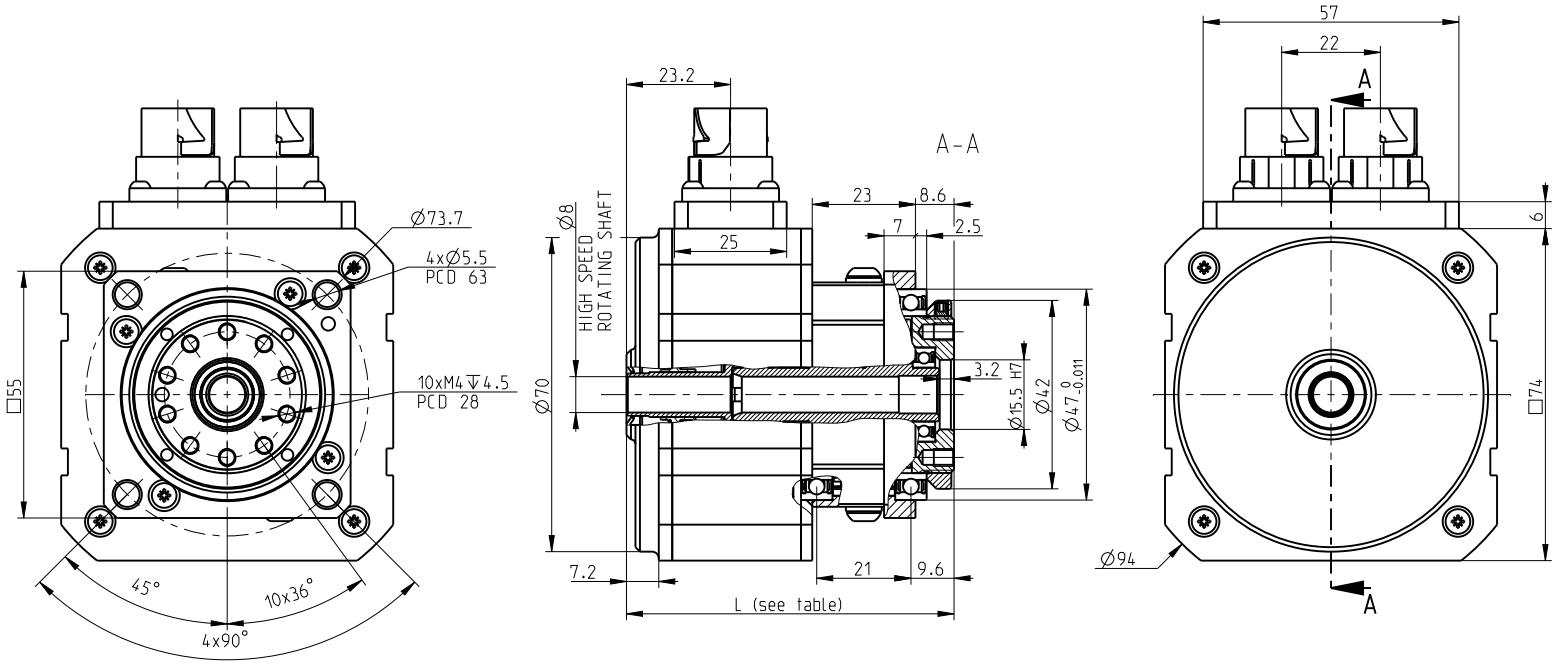
Size	Feedback type (d)	Without brake		With brake	
		Dimension L ± 0.5 [mm]	Weight m [kg] *	Dimension L ± 0.5 [mm]	Weight m [kg] *
DSF 050	OD.OE	71	1.2	94	1.4
	OJ	71	1.2	94	1.4
	ON	71	1.2	94	1.4

DSF 050 – i – abcde-fg-xy

DSF 050 – i – abcde-fg-xy

with hollowshaft

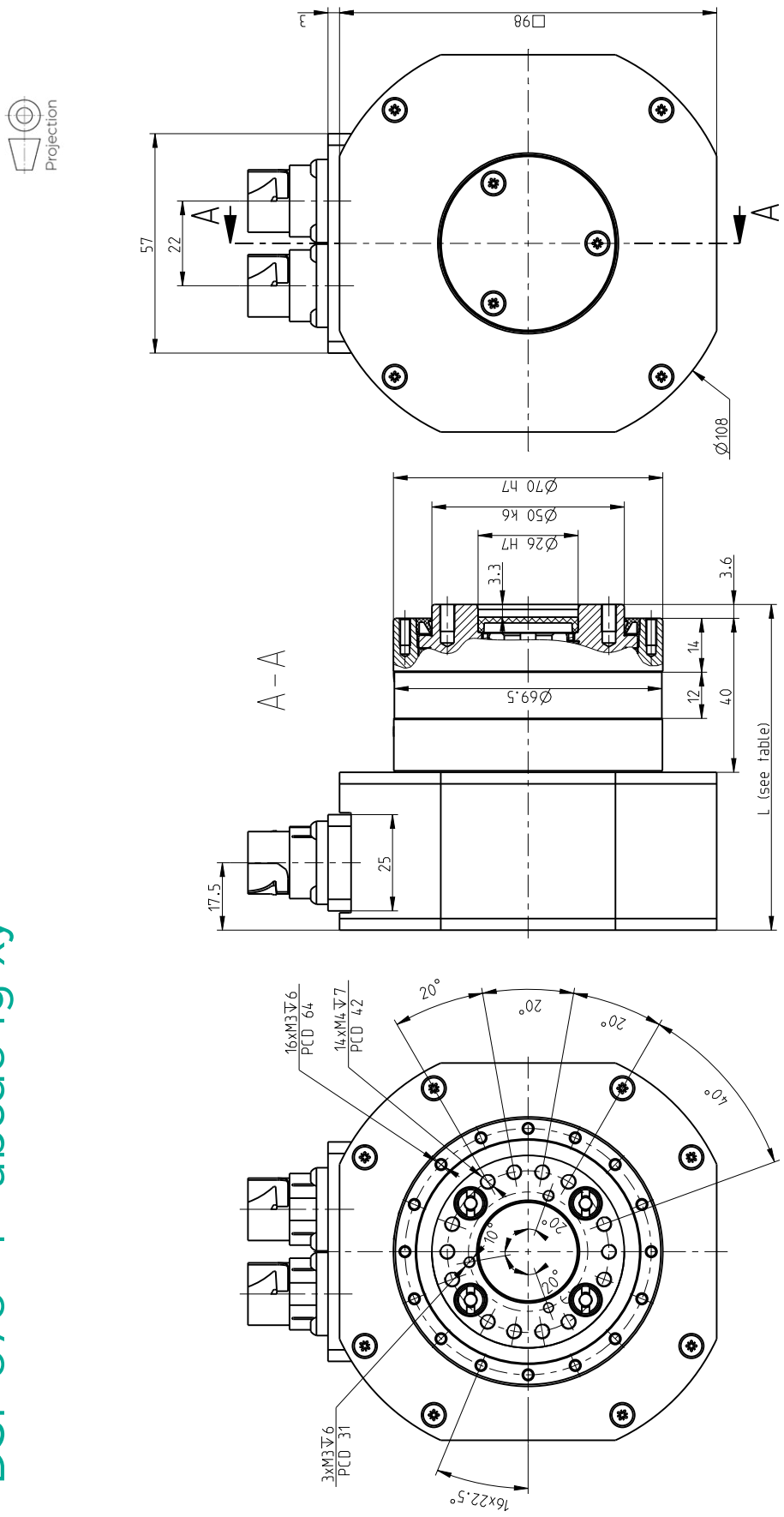
Projection



Hollowshaft rotates at motor speed

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

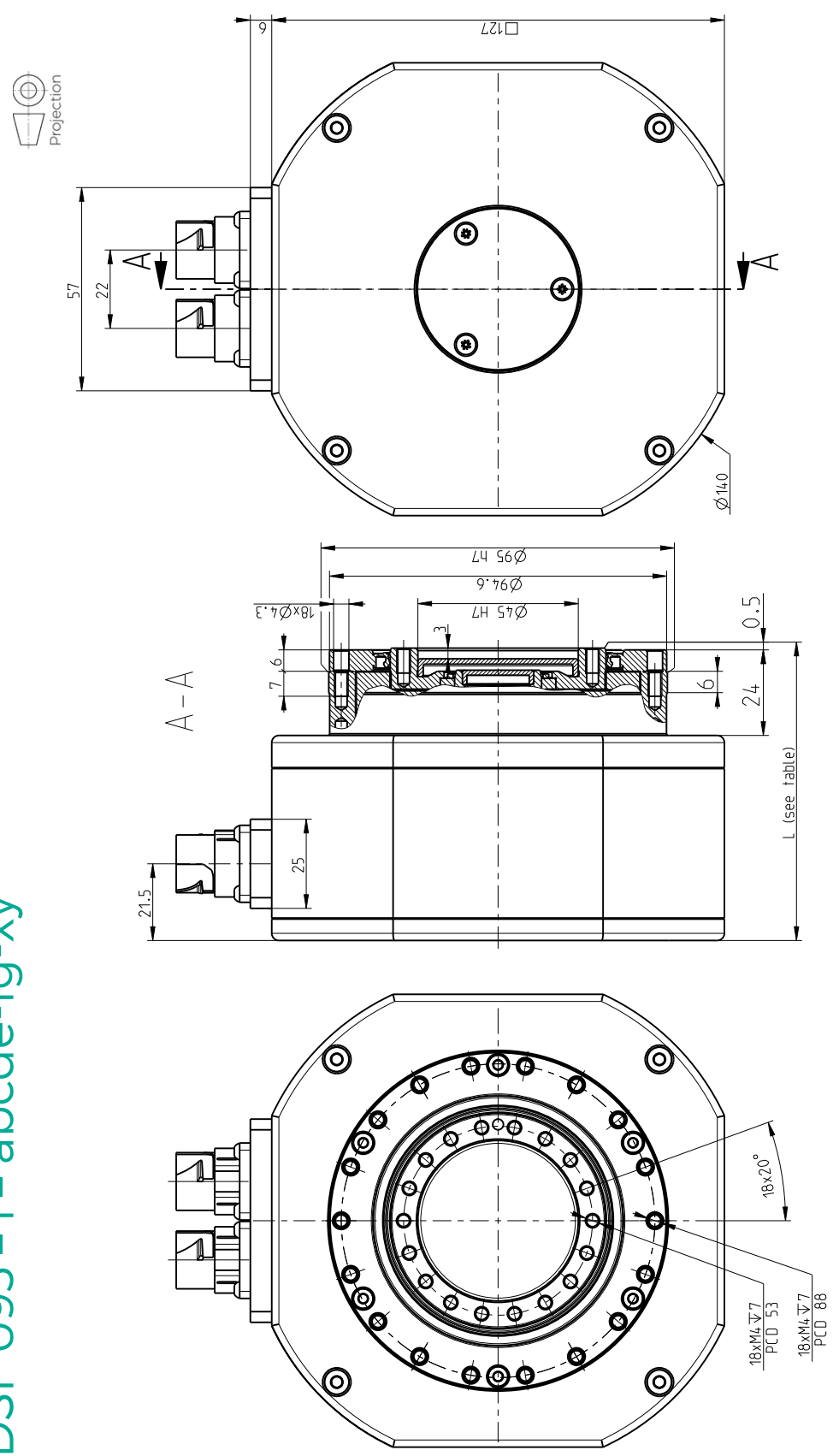
DSF 070 - i - abcde-fg-xy



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	0A	92	3.5	-	-
	0B,0C	97	3.5	-	-
	0D,0E	92	3.5	-	-
	0M,0N	85	3.5	-	-

DSF 070 – i – abcde-fg-xy

DSF 095 - i - abcde-fg-xy



Size	Without brake			With brake		
	Feedback type (d)	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

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 high precision reduction gear version.
6) The parameter depends on the version, ratio and lost motion of the high precision reduction gear.
7) For size 050 it 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 significantly exceed 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:

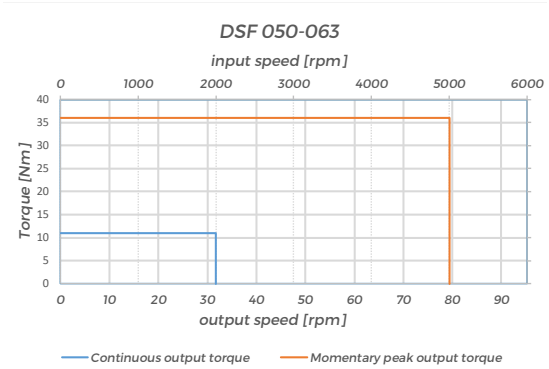
- Load values in the table apply to valid for the nominal life of L_{10} = 6 000 hours. Service life for average torque T_a and average speed n_a other than T_R ,n_R can be calculated. Please contact manufacturer with estimated duty cycle.
- High precision reduction gears are preffered for intermittent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

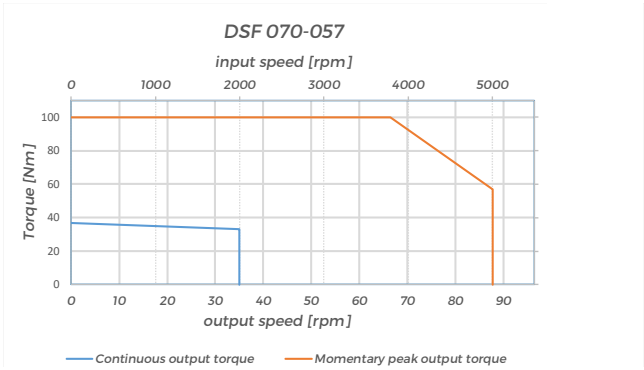
Tab. 8.4.c: Inertia at input (DSF actuator without brake)

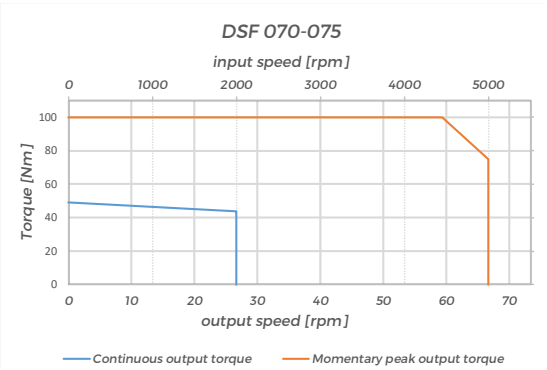
Feedback type (d)	$J_{w/o\ brake}$	DSF 050	DSF 070	DSF 095
0A	10^{-4} kgm²	–	0.637	3.349
0B	10^{-4} kgm²	–	0.615	3.330
0C	10^{-4} kgm²	–	0.615	3.330
0D	10^{-4} kgm²	0.094	0.617	3.332
0E	10^{-4} kgm²	0.094	0.617	3.332
0J	10^{-4} kgm²	0.091	–	3.330
0M	10^{-4} kgm²	–	0.630	3.346
0N	10^{-4} kgm²	0.105	0.630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

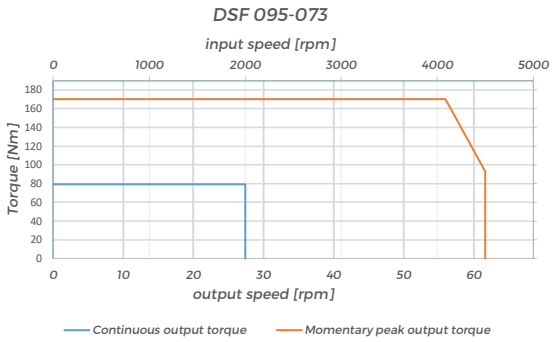
Tab. 8.4.d: Inertia at input (DSF actuator with brake)

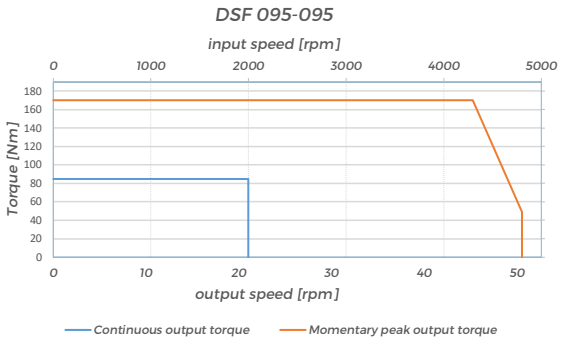
Feedback type (d)	$J_{w\ brake}$	DSF 050	DSF 070	DSF 095
0A	10^{-4} kgm²	–	–	–
0B	10^{-4} kgm²	–	–	–
0C	10^{-4} kgm²	–	–	–
0D	10^{-4} kgm²	0.104	–	–
0E	10^{-4} kgm²	0.104	–	–
0J	10^{-4} kgm²	0.102	–	–
0M	10^{-4} kgm²	–	–	–
0N	10^{-4} kgm²	0.118	–	–


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