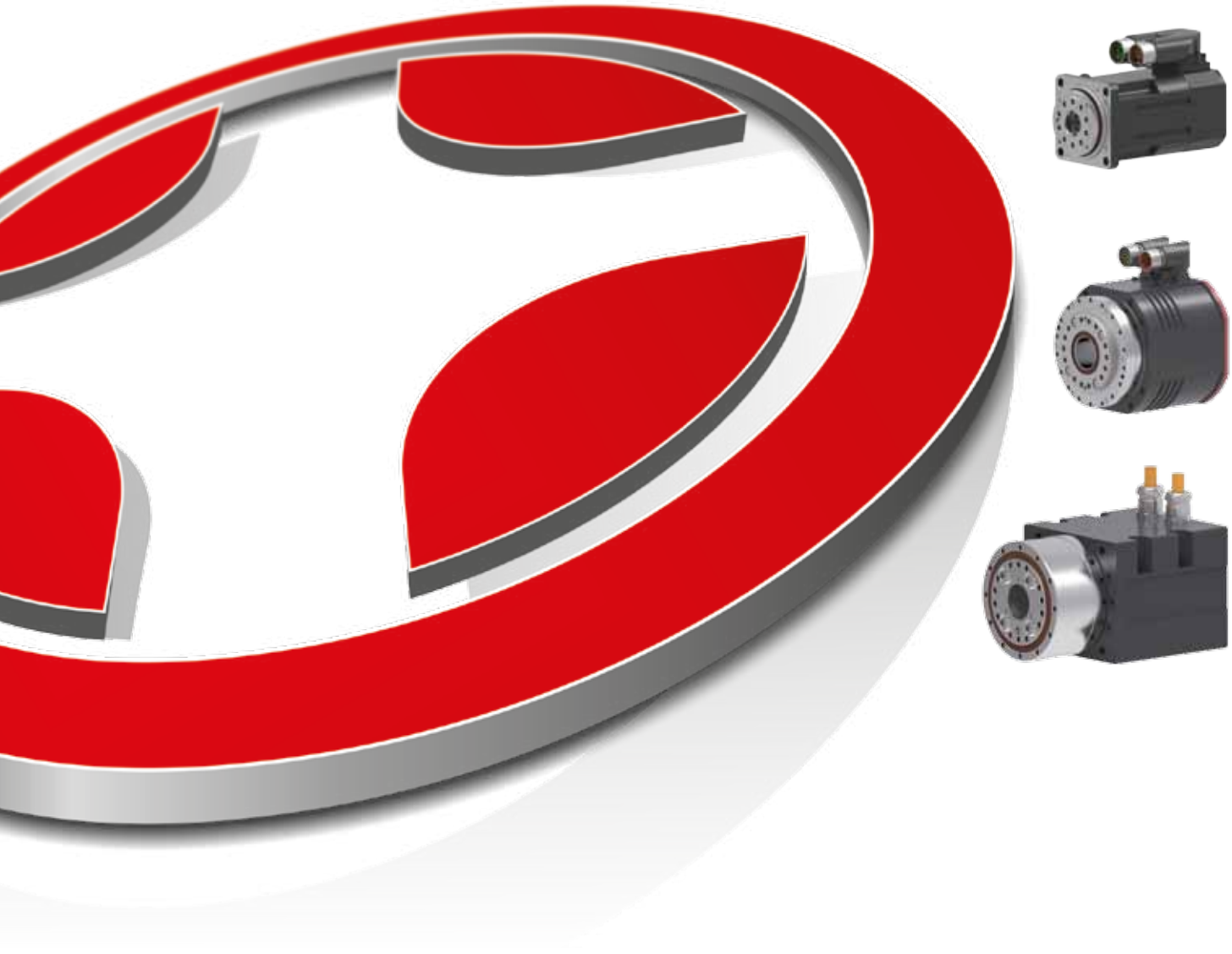
SPINEA TECHNOLOGIES

SPINEA
EXCELLENCE IN MOTION



DriveSpin

HIGH PRECISION ACTUATORS

HOCHPRÄZISE AKTUATOREN

EDITION I/2018

The DRIVESPIN Catalogue, as well as other up-to date version of the catalogues and publications, are available on our websites at www.spinea-technologies.com and www.spinea.com in the Download sections. To obtain a printed version of the catalogue, please contact the SPINEA Sales Department or your local sales representative. The latest information is available on the website.

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Die in diesem Katalog enthaltenen Spezifikationen unterliegen Innovationsänderungen, die keiner vorherigen Ankündigung bedürfen.
Ausgabe I/2018

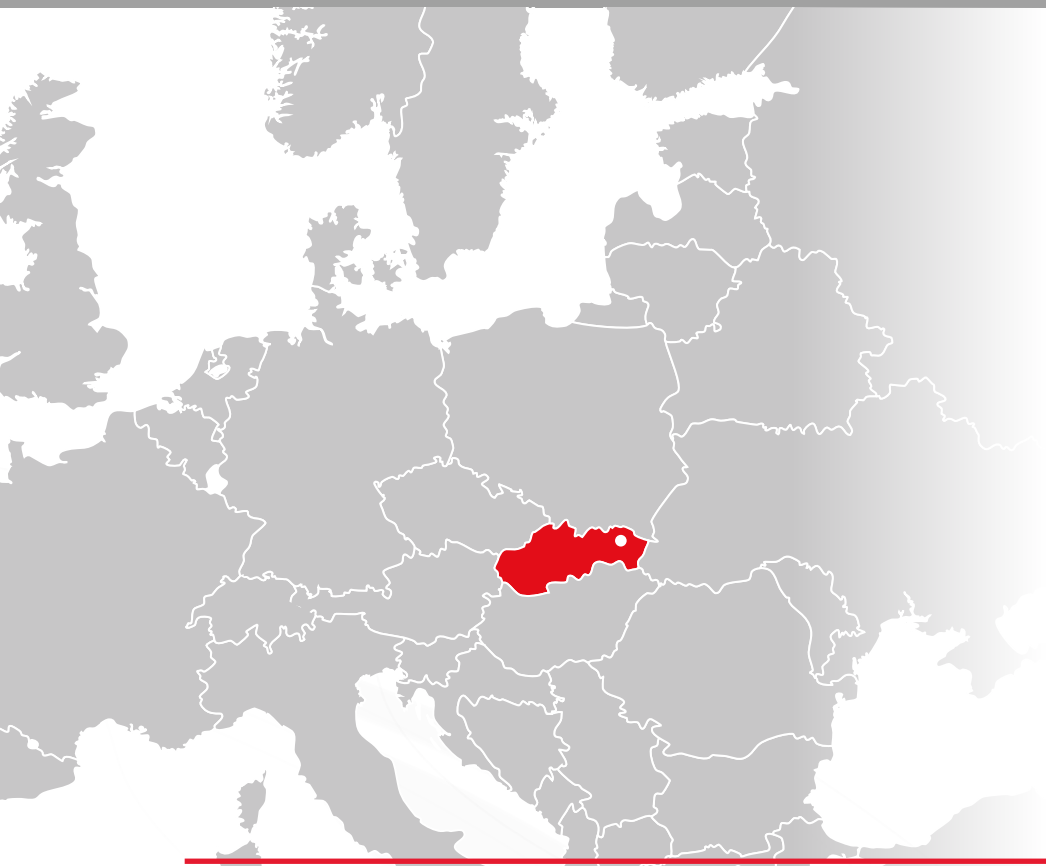
Contents

SPINEA TECHNOLOGIES

SPINEA
EXCELLENCE IN MOTION

SPINEA Technologies, s.r.o. is a young technological company involved in the continual development of innovative ideas and their subsequent application. SPINEA Technologies s.r.o. started in 2013 with the goal is to bring unique products and technologies to the commercial market.

SPINEA, s.r.o. is a modern Slovak mechanical engineering company involved in the development, manufacture and sale of high precision reduction gears and actuators under the DriveSpin trademark. The company was started in 1994 and the impulse for its was started invention of a Slovak design engineer. DriveSpin actuators are manufactured serially on the basis of a granted international patent.

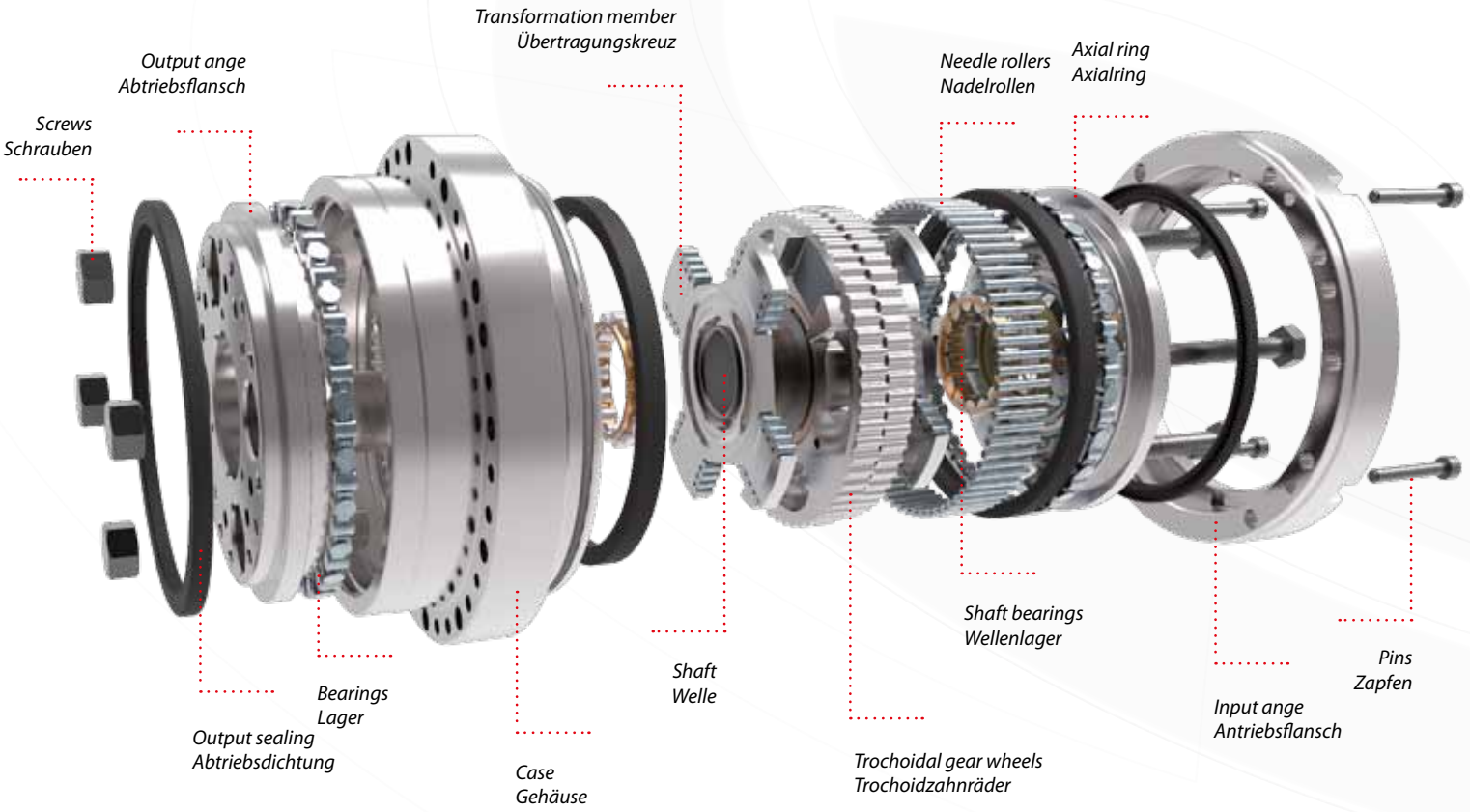


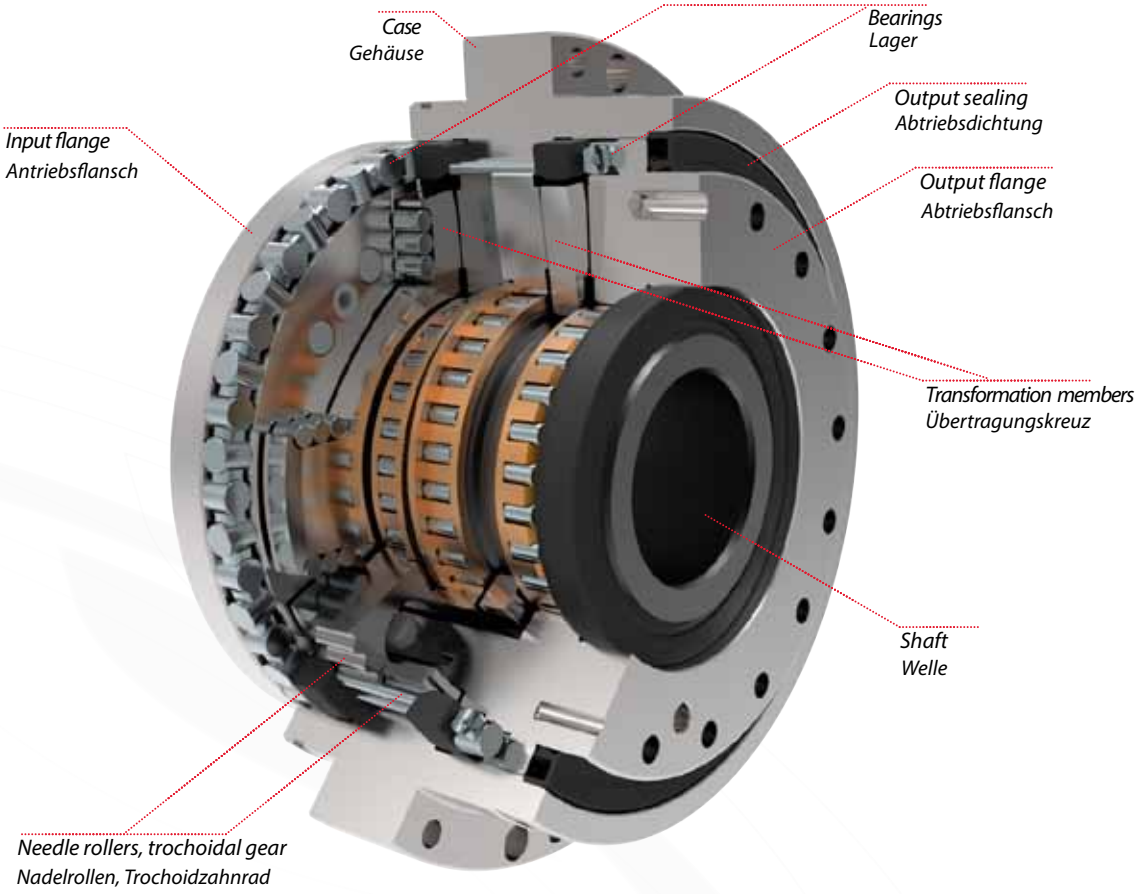
SPINEA Technologies, s.r.o. ist ein junges technologisches Unternehmen, das sich mit der kontinuierlichen Entwicklung innovativer Ideen und ihrer Umsetzung befasst. SPINEA Technologies s.r.o. wurde 2013 gegründet mit dem Ziel, neue einzigartige Produkte und Technologien auf den Markt zu bringen.

SPINEA s.r.o. ist ein modernes slowakisches Maschinenbauunternehmen, das sich mit der Entwicklung, Herstellung und dem Vertrieb von hochpräzisen Untersetzungsgetrieben und Aktuatoren befasst, die unter der Handelsmarke DriveSpin verkauft werden. Das Unternehmen wurde 1994 als Reaktion auf eine Erfindung eines slowakischen Konstrukteurs gegründet. DriveSpin Aktuatoren werden serienmäßig auf Grundlage eines internationalen Patents hergestellt.

The high precision reduction gear offered under the TwinSpin (TS) trademark is based on a reduction mechanism and a new design solution of the radial-axial output flange. It represents a new generation of systems for the transfer of energy. The term "TwinSpin" indicates the full integration of very high precision trochoidal gears with a radial-axial bearing in a single unit. This new transmission concept allows to use high precision TS reduction gears in the joints of robots, in rotary tables, and in handling and transport systems. The high precision TS reduction gears are designed for applications that require a high reduction ratio, high kinematic precision, low lost motion, high moment capacity, and high stiffness of a compact structure in a limited installation space, as well as low weight.

Das hochpräzise Untersetzungsgetriebe, das unter der Handelsmarke TwinSpin (TS) verkauft wird, basiert auf einem Reduzierungsmechanismus und einem neuen Design des radial-axialen Abtriebflansches. Es handelt sich um eine neue Generation von Systemen für die Energieübertragung. Der Begriff „TwinSpin" bezeichnet die Verbindung eines hochpräzisen Trochoidzahnrads mit einem Radial-Axial-Lager zu einer Baueinheit. Dieses neue Übertragungskonzept ermöglicht den Einsatz hochpräziser TS Untersetzungsgetriebe in den Gelenken von Robotern, Drehtischen und in Förder- und Transportsystemen. Die hochpräzisen TS Untersetzungsgetriebe wurden entworfen für Anwendungen, bei denen es auf ein hohes Untersetzungsverhältnis, hohe kinematische Genauigkeit, geringe Lost Motion und hohe Drehmomentkapazität ankommt, sowie die hohe Steifigkeit der Kompaktbauweise bei eingeschränktem Einbauraum und geringes Gewicht.





Advantages

- zero-backlash reduction gears,
- high moment capacity,
- excellent positioning accuracy and repeatability,
- high torsional and tilting stiffness,
- small dimensions and low weight,
- high reduction ratios,
- high efficiency,
- long service life,
- easy installation.

Vorteile

- *spielfreies Untersetzungsgetriebe,*
- *hohe Momentkapazität,*
- *hervorragende Positions- und Wiederholgenauigkeit,*
- *hohe Torsions- und Kippsteifigkeit,*
- *kleine Abmessungen, geringes Gewicht,*
- *hohe Untersetzungsverhältnisse,*
- *hoher Wirkungsgrad,*
- *lange Lebensdauer,*
- *einfache Montage.*

DriveSpin

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- 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.

- *geringe Lost Motion,*
- *niedriges Trägheitsmoment,*
- *hohes Untersetzungsverhältnis,*
- *hohe kinematische Genauigkeit,*
- *hohe Momentüberlastbarkeit,*
- *hohe Kapazität der eingebauten Radial-Axial-Abtriebslager,*
- *hohe dynamische Leistung.*

DriveSpin

Is the combination of the high precision TwinSpin 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 manufacture of reduction gears by SPINEA, s.r.o.

ist die Verbindung des hochpräzisen TwinSpin Untersetzungsgetriebes mit hervorragenden mechanischen Eigenschaften mit dem AC Servomotor in kompakter Bauweise. Hinter der Zuverlässigkeit der Parameter stehen mehr als 20 Jahre Erfahrung mit der Herstellung von Untersetzungsgetrieben von SPINEA, s.r.o.

The actuators feature:

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

Die Aktuatoren zeichnen sich aus durch:

- *hohe Präzision und Genauigkeit,*
- *hohe Kipp- und Torsionssteifigkeit,*
- *niedrige Schwingungen,*
- *kleine Einbauabmessungen,*
- *geringes Gewicht,*
- *lange Lebensdauer,*
- *einfache Montage.*

Product portfolio of DS/DSH/DSM actuators
Produktportfolio der DS/DSH/DSM Aktuatoren

DriveSpin	Size *Baugröße*						
DS STANDARD	**050**	**070**	**095** New	**110**	**115** Coming soon	**140**	**155** Coming soon
DS MODULAR	**050**	**070**	**095** New	**110**	-	-	-
DS HOLLOWSHAFT	**050**	**070**	-	**110**	**115** New	-	**155**

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 the dynamics.

Ausgewogenes Design

Die elektrischen DriveSpin Aktuatoren vereinen auf einmalige Weise ein hoch belastbares Untersetzungsgetriebe mit einzigartigem Reduktionsmechanismus in einem AC Servomotor, der auch den höchsten Anforderungen an die Dynamik genügt.

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 category.

Einzigartige Präzision und Genauigkeit

Der elektrische DriveSpin Aktuator nutzt ein eigenes patentiertes Design für das Lager-Untersetzungsgetriebe und stellt die präziseste und genaueste Lösung in seiner Kategorie dar.

Voltage variability

The DriveSpin electric actuator is available in all standard as well as special voltage models of the driving part, meeting all requirements for the dynamics, robustness, and electric compatibility.

Spannungsvariabilität

Elektrische DriveSpin Aktuatoren sind mit Motoren lieferbar, de für Standardspannungen, aber auch für spezielle Spannungen ausgelegt sind, wobei alle Ansprüche, die an die Dynamik, Robustheit und elektrische Kompatibilität gestellt werden, erfüllt sind.

Feedback sensor variability

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

Feedbackvariabilität

Die elektrischen DriveSpin Aktuatoren sind mit einer großen Bandbreite von Feedback-Systemen lieferbar. Dazu gehören u.a. EnDat®, HIPERFACE® und Resolver.

Technical support

Our professionally prepared 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.

Technischer Support

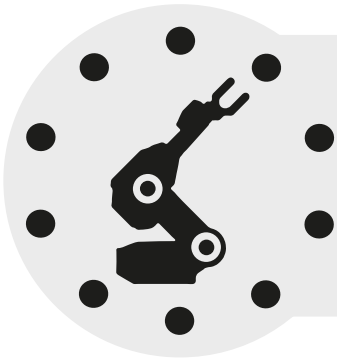
Unser professionelles geschultes Team von Spezialisten steht Ihnen für die Lösung Ihrer Probleme zur Verfügung. Die Verwendung erstklassigen Materials und der Herstellungsprozess selbst von hochpräzisen elektrischen DriveSpin Aktuatoren ist über ISO 9000 Zertifikate sichergestellt.

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.

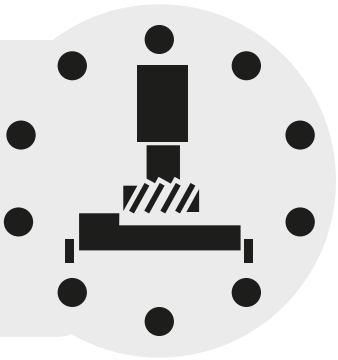
Hohe Momentkapazität

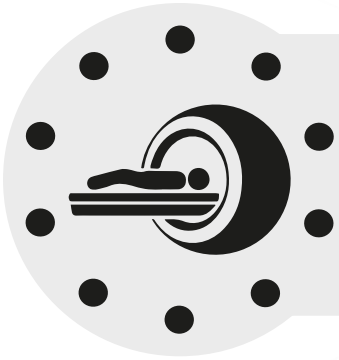
DriveSpin Aktuatoren zeichnen sich durch eine hohe Momentkapazität, implementiert in eine spielfreie Ausführung mit hervorragendem Leistungs-Größe-Verhältnis und Belastbarkeit der in die DriveSpin Aktuatoren integrierten Radial-Axial-Lager aus.



Robotics
6-axis robots, SCARA robots, gantry robots...
Robotik
6-Achsen-Roboter, SCARA-Roboter, Portalroboter...

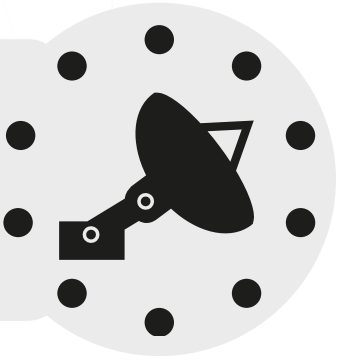
Machine tools
Lathes and milling machines, grinding machines, pipe benders, cutting tools, magazines, tool changers...
Werkzeugmaschinen
Dreh- und Fräsmaschinen, Schleifmaschinen, Rohrbiegemaschinen, Zuschneidemaschinen, Magazine, Werkzeugwechsler...

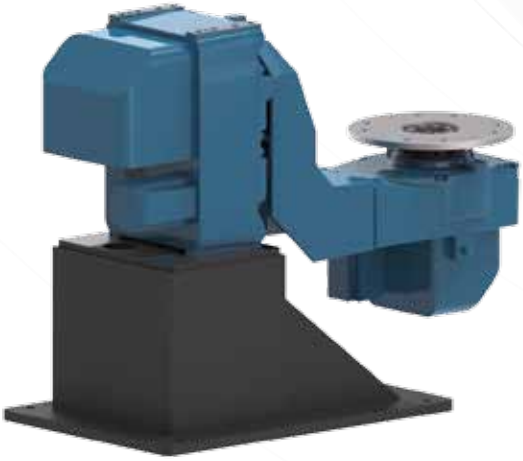




Medical equipment
Medical and rehabilitation devices, scanners, denture grinders, other medical equipment...
Medizintechnik
Medizinische und Rehabilitationsgeräte, Scanner, Prothesenschleifer, andere medizinische Ausrüstung...

Defence and security industry
Radars, navigation equipment, surveillance and camera systems, security and defence equipment...
Verteidigungs- und Sicherheitsindustrie
Radare, Navigationsausrüstung, Überwachungs- und Kamerasysteme, Sicherheits- und Verteidigungsausrüstung...



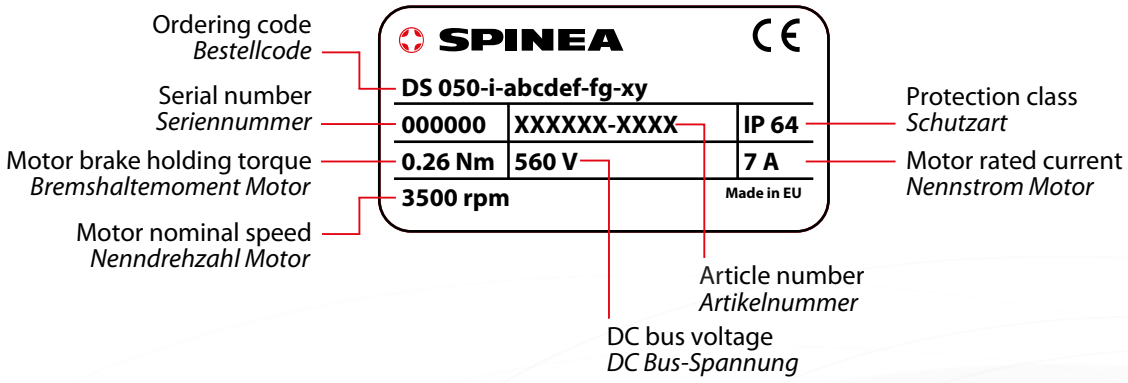


SPINEA and SPINEA Technologies References
SPINEA und SPINEA Technologies Referenzliste

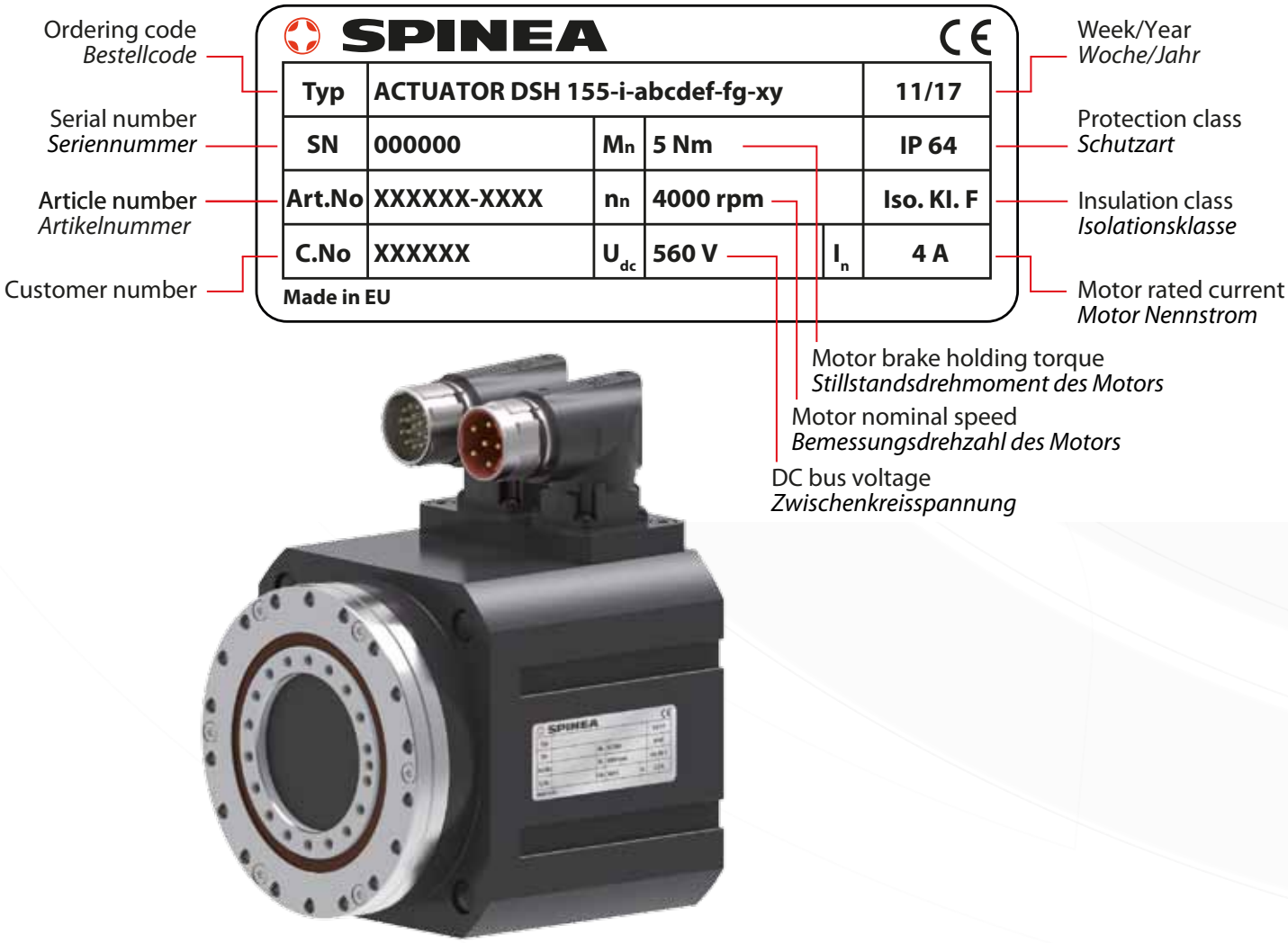
KUKA
ABB
COMAU ROBOTICS
RRROBOTICA
PCI PROCESS CONCEPTION INGÉNIERIE
TOS KUŘIM ALTA GROUP
TAJMAC – ZPS

DMG MORI
DOOSAN
WFL MILLTURN TECHNOLOGIES
WAFIOS
ENGEL
TOSHULIN
Wittmann
MÄGERLE KÖRBER SOLUTIONS
TRUMPF

DS/DSH/DSM 050 Identification Labels / *Typenschilder*



DS/DSH/DSM 070, 095, 110, 115, 140, 155 Identification Labels / *Typenschilder*



DS_	070	057	3	1	B	0 1	4	A	J	0 0
	size	i	a	b	c	d	e	f	g	x y

Type designatio ***Typenbeze-ichnung***	**Actuator size** ***Aktuator-größe***	**Reduction ratio** ***Untersetzung-sverhältnis***	**DC bus voltage** ***DC Bus-Spannung***	**Temperatu-re sensor** ***Temperatur-fühler***	**Brake** ***Bremse***	**Feedback type** ***Sensortyp***	**Type of electrical connection** ***Elektrischer Anschluss***	**Wiring diagram** ***Schaltplan***		**Special modification** ***Sonder-modifikation***
								Power	**Signal**	
DS - standard *Standard* DSH - hollowshaft *Hohlwelle* DSM - modular *modular*	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 / *Nein* B: Yes / *Ja*	01 Resolver 02 Absolute Singleturn Encoder Hiperface 03 Absolute Multiturn Encoder Hiperface 04 Absolute Singleturn Encoder EnDat 05 Absolute Multiturn Encoder EnDat 06 Absolute Singleturn Encoder EnDat + sin/cos 07 Absolute Multiturn Encoder EnDat + sin/cos 08 Incremental sin/cos Encoder + sin/cos Commutation 09 Incremental A/B/I Encoder + Block Commutation	0: Straight connectors, perpendicular to center line 4: Angled rotable connectors 5: Terminal cable directed upward [3] 6: Y-tec angular connector, rotable 7: Terminal cable directed forward [3] 8: Terminal cable directed backward [3] 9: I-tec angled connector 0: Gerade Anschlüsse, senkrecht zur Mittellinie 4: Gewinkelte drehbare Anschlüsse 5: Klemmenkabel nach oben [3] 6: Y-tec winkliger Anschluss, drehbar 7: Klemmenkabel nach vorn [3] 8: Klemmenkabel nach hinten [3] 9: I-tec winkliger Anschluss	For more information see page 18-20 Tab. 3.1-3.3 and chapters Power connection and Signal connection on page 64-70		Terminal cable length *Klemmen-kabellänge* 00 Stanadrd connector 10 Stanadrd cable legth L=1m xy custom design
	095 [1]	043, 095								
	110	067, 089, 119								
	115 [2]	103								
	140	069, 115								
	155 [2]	109								

Ordering code example / *Beispiel Bestellcode:*

DSH 115-103-450020-AH- 00

00 – Standard connector

Ax – wiring diagram, power connection / *Schaltplan, Stromanschluss*
xH – wiring diagram, signal connection / *Schaltplan, Signalanschluss*

4xxxxx – DC bus voltage, 560 V / *DC Bus-Spannung, 560 V*
x5xxxx – temperature sensor, PT 1000 / *Temperaturfühler, PT 1000*
xx0xxx – Brake, No / *Bremse, Nr.*
xxx02x – feedback type absolute singleturn encoder HIPERFACE / *Feedback type, eintouriger Absolutwertgeber HIPERFACE*
xxxxx0 – Straight connectors, perpendicular to center line / *elektrischer Anschluss, gerade Anschlüsse, senkrecht zur Mittellinie*

103 – reduction ratio, 103 / *Übersetzung*

115 – actuator size, 115 / *Aktuatorgröße*

DSH - DriveSpin Hollowshaft / *DriveSpin Hohlwelle*

[1] only DS and DSM
[2] only DSH
[3] The standard length (L=1m)
Standardlänge (L=1m)

Tab. 3.1: Type designation and size of actuator

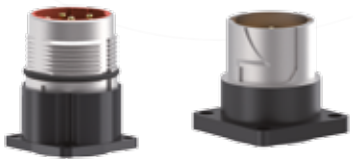
(d)	Feedback type	DS 050	DSH 050	DSM 050	DS 070	DSH 070	DSM 070	DS 095	DSM 095	DS 110	DSH 110	DSM 110	DSH 115	DS 140	DSH 155
01	Resolver	✓	✓	✓	✓	✓	✓	✓	o	✓	✓	✓	✓	✓	✓
02	Absolute Singleturn Encoder Hiperface	✓	o	✓	✓	✓	✓	✓	✓	✓	o	✓	✓	✓	✓
03	Absolute Multiturn Encoder Hiperface	✓	o	✓	✓	✓	✓	✓	✓	✓	o	✓	o	✓	o
04	Absolute Singleturn Encoder EnDat	✓	×	✓	✓	o	✓	✓	✓	✓	o	✓	✓	✓	✓
05	Absolute Multiturn Encoder EnDat	o	o	o	o	o	o	o	o	o	o	o	o	o	o
06	Absolute Singleturn Encoder EnDat + sin/cos	o	×	o	o	o	o	o	o	o	o	o	✓	o	✓
07	Absolute Multiturn Encoder EnDat + sin/cos	o	×	o	o	×	o	o	o	o	×	o	×	o	×
08	Incremental sin/cos Encoder + sin/cos Commutation	×	×	×	✓	×	✓	✓	✓	✓	×	✓	×	✓	×
09	Incremental A/B/I Encoder + Block Commutation	o	o	o	o	o	o	o	o	o	o	o	o	o	o

✓ *available*
× *not available*
o *on request*

Tab. 3.2: Type of electrical connection and power wiring diagrams

		(e) = 0				(e) = 4				(e) = 5		(e) = 6		(e) = 7		(e) = 8	
Type DS	**DC Bus Voltage**	Straight connectors 923/623		Straight connectors 915/615		Angled rotable connectors 923/623		Angled rotable connectors 915/615		Cable upwards		Y-tec connector 915/615		Cable forwards		Cable backwards	
DSx xxx	**(a)**	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)	✓/×	Power wiring diag. (f)
DSx 050	24VDC 320VDC 560VDC	×	Not Available	✓	C	×	Not Available	o	C	✓	D	✓	C	✓	D	✓	D
DSx 070	24VDC 320VDC 560VDC	✓	A	o	C	✓	A	o	C	✓	D	✓	C	o	D	o	D
DSx 095	24VDC 320VDC 560VDC	✓	A	× o	Not Available C	✓	A	× o	Not Available C	✓	D	× o	Not Available C	o	D	o	D
DSX 110	24VDC 320VDC 560VDC	✓	A	× o	Not Available C	✓	A	× o	Not Available C	✓	D	× o	Not Available C	o	D	o	D
DSH 115	24VDC 320VDC 560VDC	× ✓	Not Available A	× o	Not Available C	× ✓	Not Available A	× o	Not Available C	✓	D	× o	Not Available C	o	D	o	D
DS 140	24VDC 320VDC 560VDC	× ✓	Not Available A	× o	Not Available C	× ✓	Not Available A	× o	Not Available C	o	D	× o	Not Available C	o	D	✓	D
DSH 155	24VDC 320VDC 560VDC	× ✓	Not Available A	× o	Not Available C	× ✓	Not Available A	× o	Not Available C	✓	D	× o	Not Available C	o	D	o	D

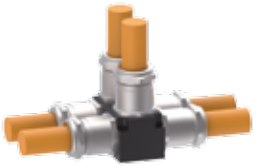
✓ *available*
× *not available*
o *on request*



Straight connector / Gerader Anschluss

Angled rotable connector / Gewinkelter Anschluss

Y-tec connector / Y-tec Anschluss



Terminal Cable / Klemmenkabel

Tab. 3.3: Feedback types and signal wiring diagrams

(d)	Feedback type	(g) Signal wiring diagram		Position Feedback	Position resolution	Commutation type	Additional Incremental signals	Additional signals Resolution
01	**Resolver**	I	for Terminal cable	Analogue sin/cos tracks	1 line per revolution	via Position Feedback Absolute Position	–	–
		J	for Connectors					
02	**Absolute Singelturn Encoder Hiperface**	G	for Terminal cable	via Hiperface protocol	Number of bits per revolution	via Position Feedback Absolute Position	1Vpp sin/cos [1)]	Number of lines per revolution
		H	for Connectors					
03	**Absolute Multiturn Encoder Hiperface**	G	for Terminal cable	via Hiperface protocol	Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	1Vpp sin/cos [1)]	Number of lines per revolution
		H	for Connectors					
04	**Absolute Singelturn Encoder Endat**	A	for Terminal cable	via Endat protocol	Number of bits per revolution	via Position Feedback Absolute Position	–	–
		B	for Connectors					
05	**Absolute Multiturn Encoder Endat**	A	for Terminal cable	via Endat protocol	Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	–	–
		B	for Connectors					
06	**Absolute Singelturn Encoder Endat + sin/cos**	C	for Terminal cable	via Endat protocol	Number of bits per revolution	via Position Feedback Absolute Position	1Vpp sin/cos	Number of lines per revolution
		D	for Connectors					
07	**Absolute Multiturn Encoder Endat + sin/cos**	C	for Terminal cable	via Endat protocol	Number of bits per revolution + Number of revolutions	via Position Feedback Absolute Position	1Vpp sin/cos	Number of lines per revolution
		D	for Connectors					
08	**Incremental sin/cos Encoder + sin/cos Commutation**	E	for Terminal cable	1Vpp sin/cos tracks	Number of lines per revolution	1 sin/cos track over one revolution for coarse absolute position of commutation angle		1 line per revolution
		F	for Connectors					
09	**Incremental A/B/I Encoder + Block Commutation**	N	for Terminal cable	Rectangular A/B tracks and Index mark once per revolution	Number of counts per revolution	U/V/W states (Halls states) for block commutation		Motor poles dependant
		O	for Connectors					

[1)] *although it is defined as part of Hiperface Protocol*

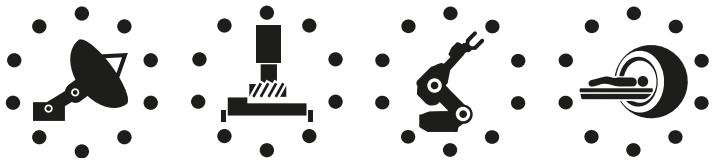
DriveSpin DS

DS - DriveSpin Standard

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 their reduction gears. The voltage and **feedback variability** will satisfy customer requirements of top performances as torque, **stiffness and precision**. Actuators are optimized for use with the application inverter or the **multi-axis servo** inverter in combination with the controller. **Rated output torque is from 18 Nm to 268 Nm.**

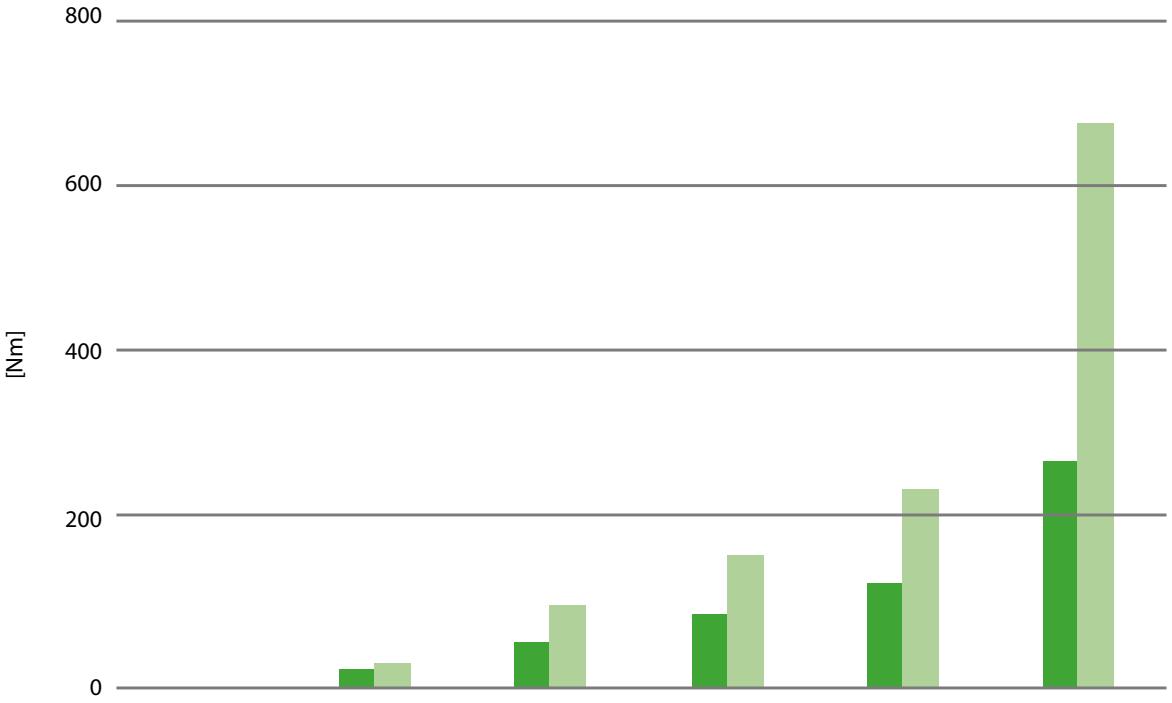
DS - DriveSpin Standard

*Die elektrischen **DriveSpin DS** Rotativ-Aktuatoren, als Grundausführung des Aktuators, bieten Rotationsbewegung und Übertragung des Abtriebsdrehmoments **mit hoher radial-axialer Belastbarkeit**. Unbestritten stellen sie die genaueste und präziseste Lösung in ihrer Kategorie dar. Die DS Aktuatoren zeichnen sich aus durch **hohe Dynamik** und eine hochflexible Antriebslösung, dank des AC Servomotors, sowie hohe Robustheit und Überlastungsfähigkeit des Untersetzungsgetriebes. Spannungs- und **Feedbackvariabilität** erfüllen höchste Kundenansprüche wie Drehmoment, **Steifigkeit und Präzision**. Die Aktuatoren werden optimal mit einem Wechselrichter oder dem **Mehrachs-Servo** Wechselrichter in Kombination mit der Steuerung genutzt. **Nenn-Abtriebsdrehmoment 18 Nm bis 268 Nm.***



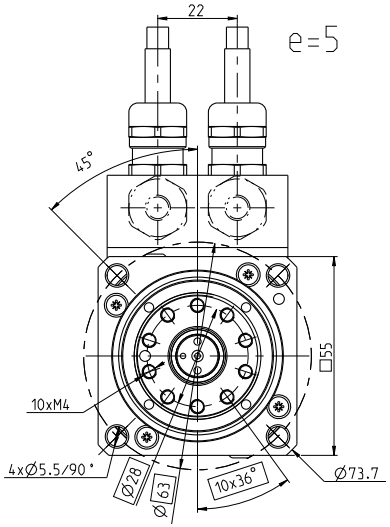
- LOW LOST MOTION,
- LOW MOMENT OF INERTIA,
- HIGH REDUCTION RATIO,
- HIGH KINEMATIC ACCURACY,
- HIGH MOMENT OVERLOAD CAPACITY,
- HIGH CAPACITY OF THE INTEGRATED RADIAL-AXIAL OUTPUT BEARINGS,
- HIGH DYNAMIC PERFORMANCE.

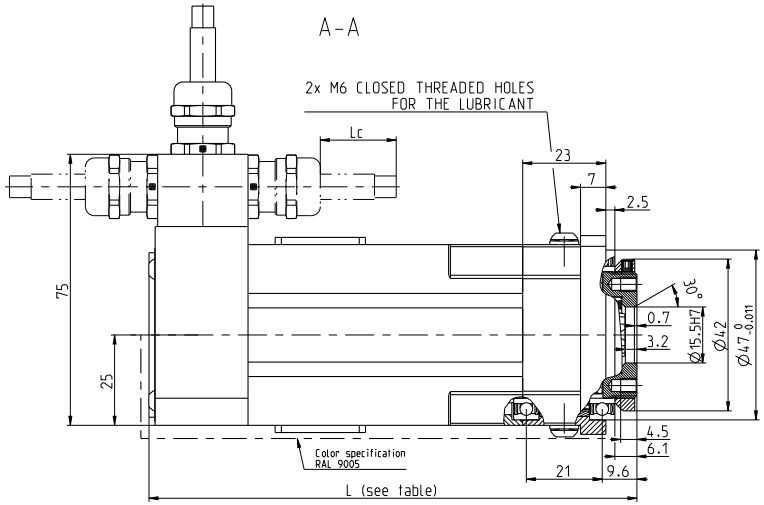
- *GERINGE LOST MOTION,*
- *NIEDRIGES TRÄGHEITSMOMENT,*
- *HOHES UNTERSETZUNGSVERHÄLTNIS,*
- *HOHE KINEMATISCHE GENAUIGKEIT,*
- *HOHE MOMENTÜBERLASTBARKEIT,*
- *HOHE KAPAZITÄT DER EINGEBAUTEN RADIAL-AXIAL-ABTRIEBSLAGER,*
- *HOHE DYNAMISCHE LEISTUNG.*

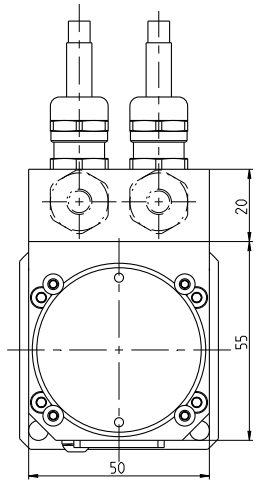


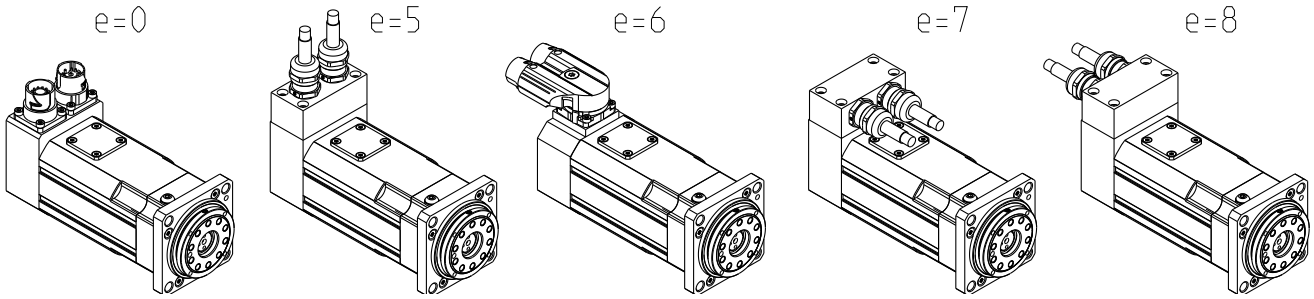
Size / *Größe*		DS 50	DS 70	DS 95	DS 110	DS 140
Rated output torque *Nenn-Abtriebsdrehmoment*	T_r [Nm]	18	50	85	122	268
Acceleration/braking output torque *Beschleunigung/ Brems-Abtriebsdrehmoment*	T_{max} [Nm]	36	100	170	244	670

DS 050





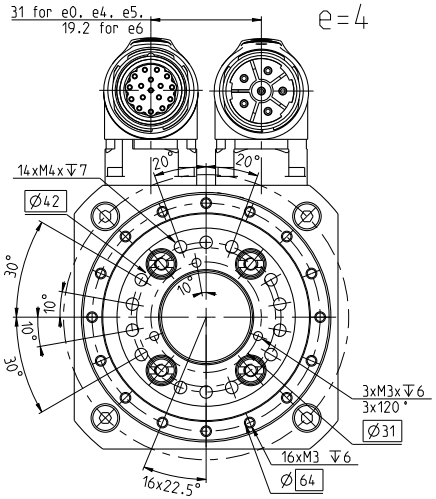


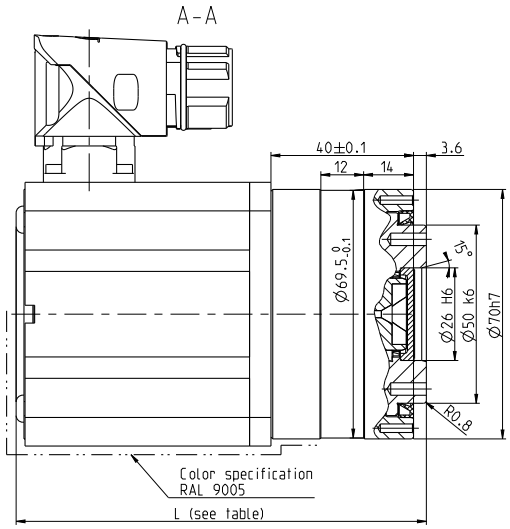


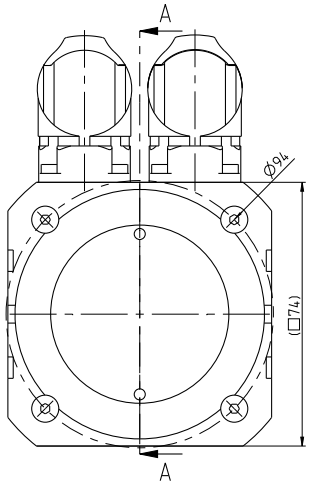
Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DS 050	01	99	0,9	135	1,4
	02,03	107	1,2	138	1,4
	04,05	106	1,2	133	1,3

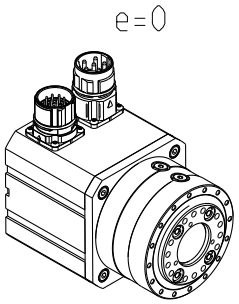
** weight parameters are informative*

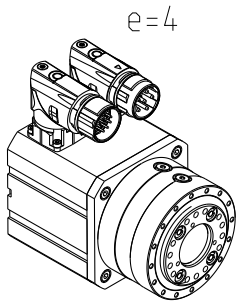
DS 070

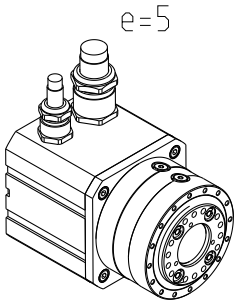


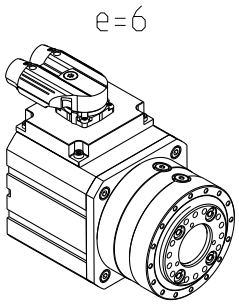






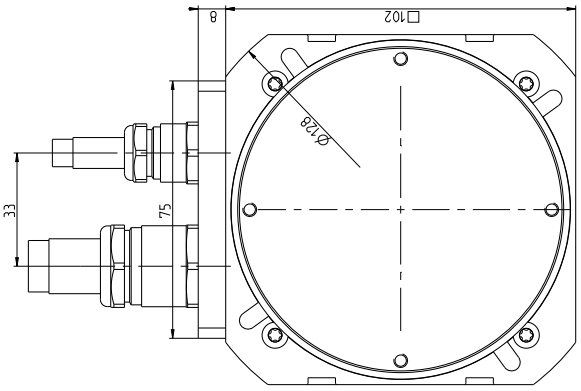


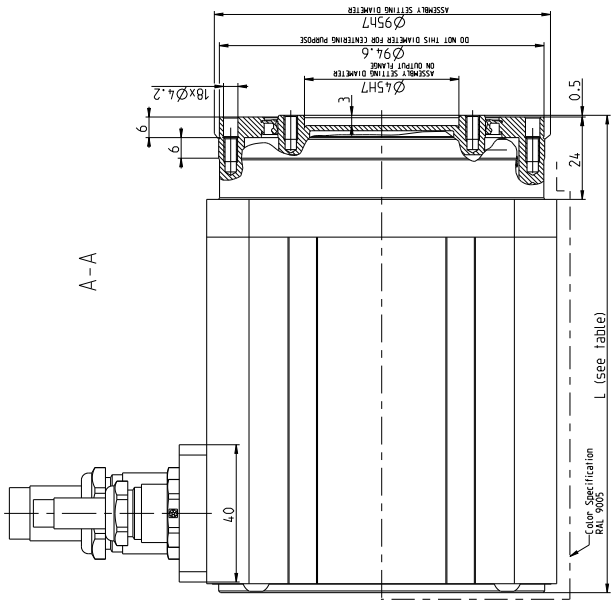


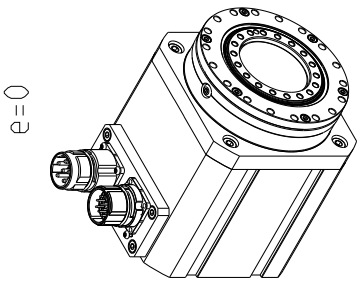


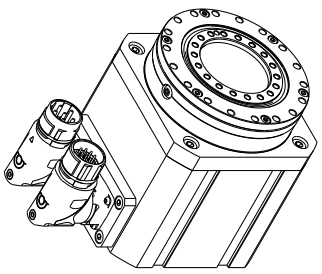
		Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
Size *Size*	Feedback type (d) *Feedback type (d)*	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DS 070	01	115	2,3	194	3,4
	02,03	137	2,4	178	3,4
	04,05	148	2,6	195	3,5
	08	148	2,6	195	3,5

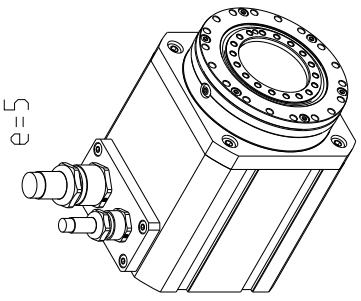
** weight parameters are informative*



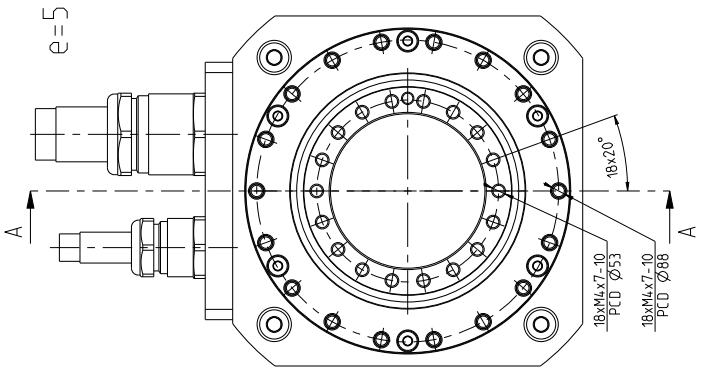








DS 095

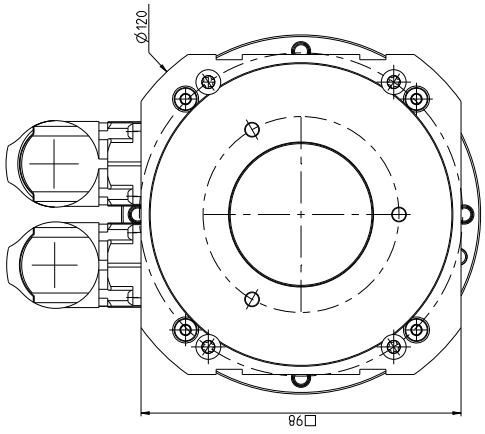


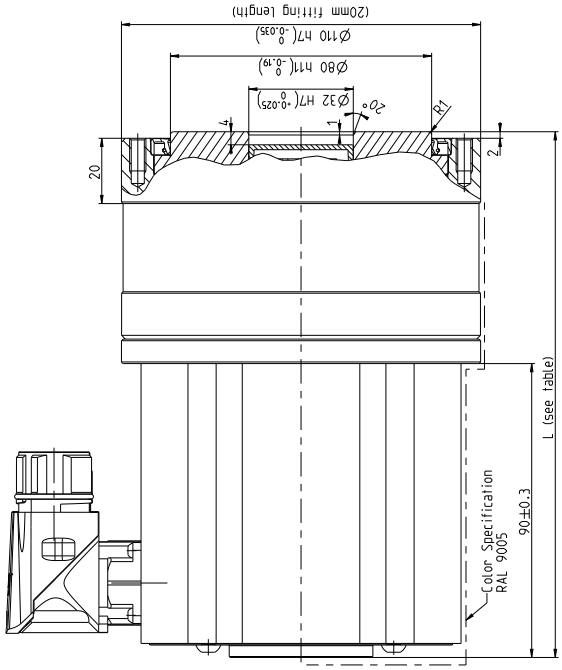
Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DS 095	01	118	4,9	138	5,8
	08	146	5,4	161	6,2
	02,03	127	5,2	141	6
	04,05	127	5	141	5,8

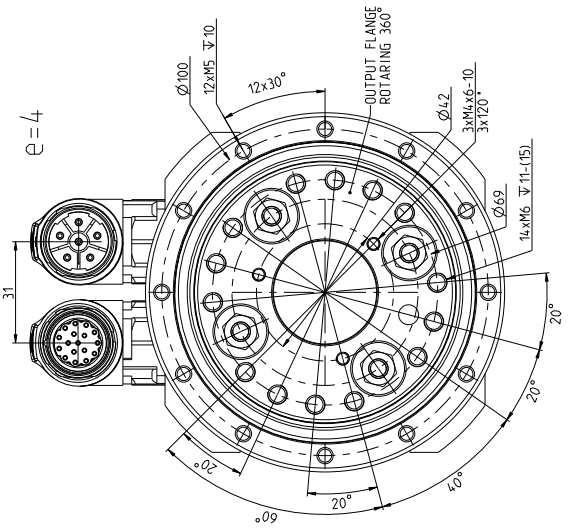
** weight parameters are informative*

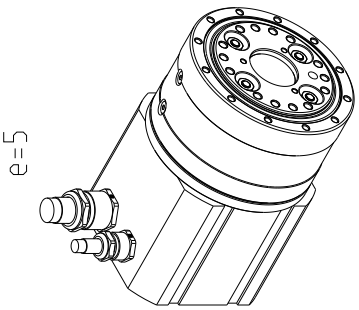
Drawings
DriveSpin DS 110

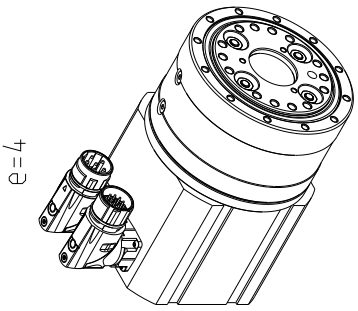
DS 110

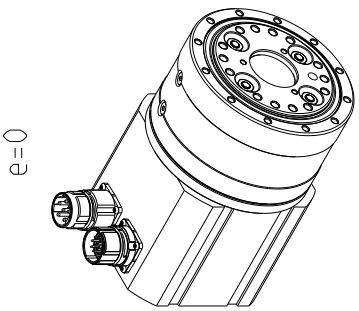








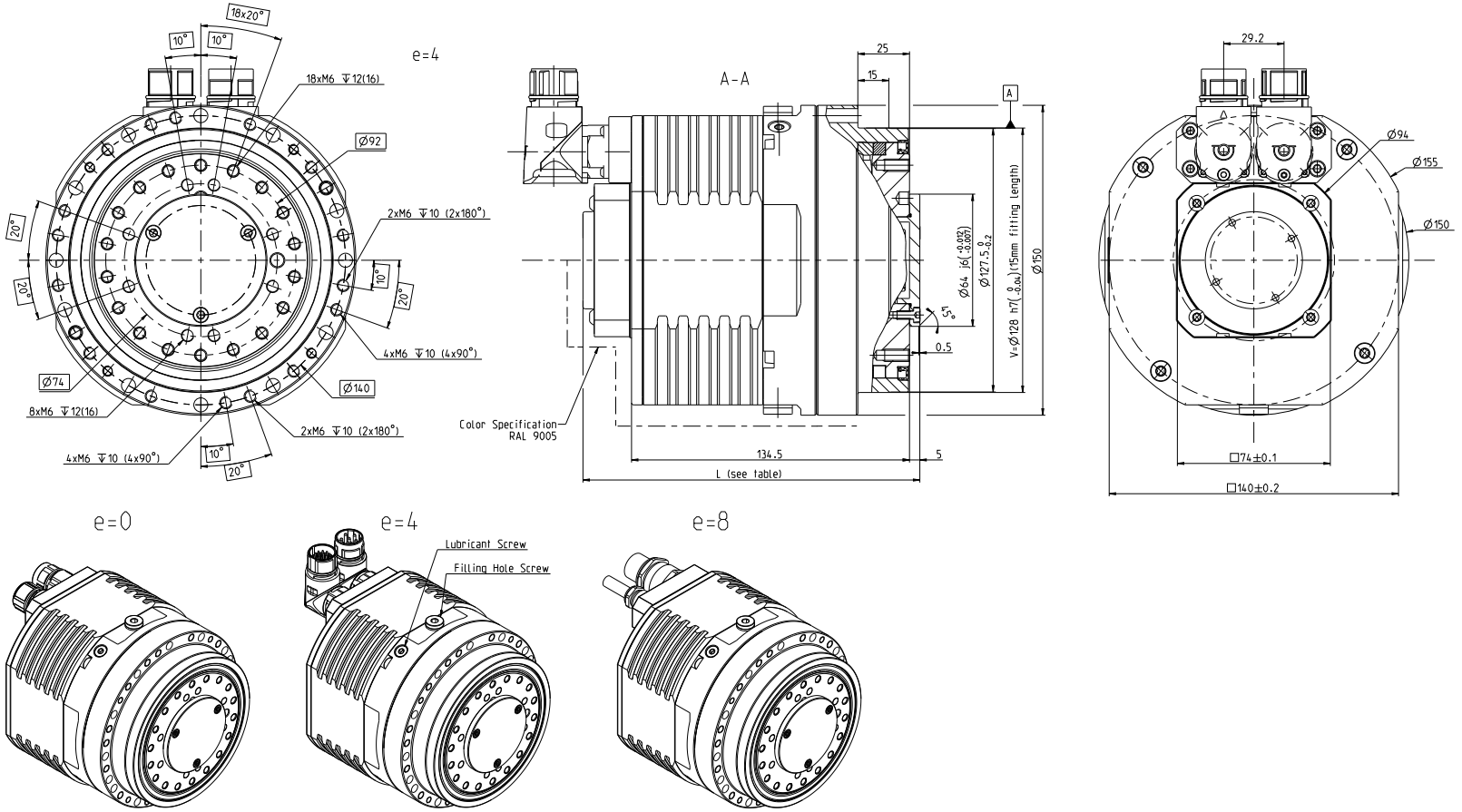




Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DS 110	01	161	8,2	213	9,1
	02,03	193	8,8	245	9,7
	04,05	202	8,6	242	9,6
	08	202	8,6	242	9,6

** weight parameters are informative*

DS 140



		Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
Size *Size*	Feedback type (d) *Feedback type (d)*	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DS 140	01	148	11	181	12,1
	02,03	165	11	208	12,1
	04,05	165	11	208	12,1
	08	199	11	226	12,1

** weight parameters are informative*

Technical Parameters
Technische Parameter

Tab. 4.1: Technical parameters DS

Parameter		**Tolerance**	**DS 050**		
Reduction ratio *Untersetzungsverhältnis*	i		63		
Rated output torque *Nenn-Abtriebsdrehmoment*	T_r [Nm]		18		
Acceleration/braking output torque *Beschleunigung/Brems-Abtriebsdrehmoment*	T_{max} [Nm]		36		
Rated input speed *Nenn-Antriebsgeschwindigkeit*	n_r [rpm]		2000		
Maximum allowable input speed [9] *Max. zulässige Eingangsgeschwindigkeit* [9]	n_{max} [rpm]		5000		
Maximum tilting moment [2)3)]	M_{cmax} [Nm]		44		
Tilting stiffness [1)6)] *Kippsteifigkeit* [1)6)]	M_t [Nm/arcmin]		4		
Torsional stiffness [1)7)] *Torsionssteifigkeit* [1)7)]	k_t [Nm/arcmin]		2,5		
Lost motion *Lost Motion*	LM [arcmin]		< 1.5		
Hysteresis *Hysterese*	H [arcmin]		< 1.5		
Rated radial force [2)] *Nenn-Radiallast* [2)]	F_{rR} [kN]		1,44 [8)]		
Maximum axial force [2)4)] *Max. Axialkraft* [2) 4)]	$F_{a\,max}$ [kN]		1,9		
Gear lubrication			Grease Castrol Optitemp TT1		
Reduction gear limit temperature	[°C]		65 °C		
Standard ambient temperature range	[°C]		-10 °C do +40 °C		
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3500	3500	3500
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)		
Inertia at input (actuator without brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm^2		0,080		
Feedback type (d)=02,03	10^{-4} kgm^2		0,061		
Feedback type (d)=04,05	10^{-4} kgm^2		0,062		
Feedback type (d)=08	10^{-4} kgm^2		–		
Inertia at input (actuator with brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm^2		0,121		
Feedback type (d)=02,03	10^{-4} kgm^2		0,101		
Feedback type (d)=04,05	10^{-4} kgm^2		0,101		
Feedback type (d)=08	10^{-4} kgm^2		–		

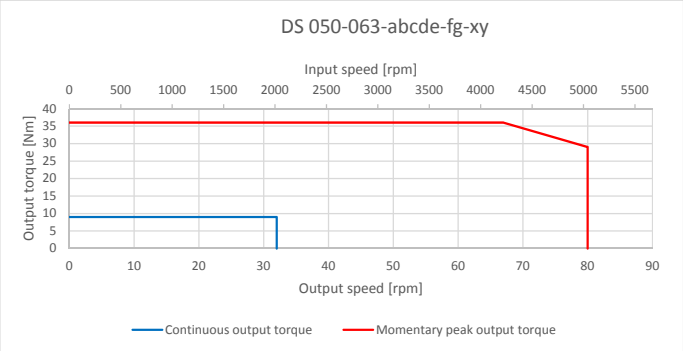
Tab. 4.1: Continue

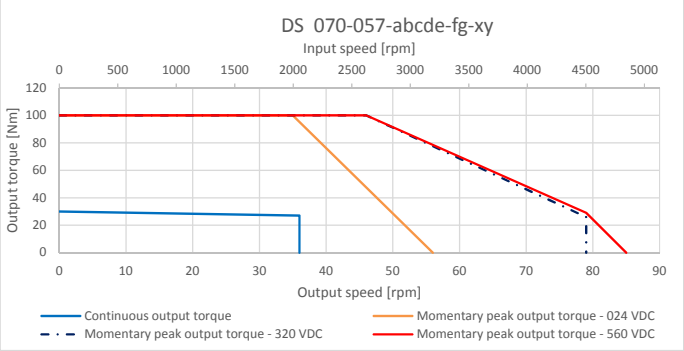
DS 070			DS 095			DS 110			DS 140		
57, 75			73, 95			67, 89, 119			69, 115		
50			85			122			268		
100			170			244			670		
2000			2000			2000			2000		
5000			4500			3900/4500 [5]			4500		
142			410			740			1160		
35			120			150			380		
7			15			22			62		
< 1.5			< 1			< 1			< 1		
< 1.5			< 1			< 1			< 1		
2,8			3,5			9,3			11,5		
4,1			11,1			13,1			17		
Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1		
65 °C			65 °C			65 °C			65 °C		
-10 °C do +40 °C			-10 °C do +40 °C			-10 °C do +40 °C			-10 °C do +40 °C		
24	320	560	24	320	560	24	320	560	24	320	560
2500	4500	4500	4000	4000	4000	2500	3000	3000	4000	4000	4000
0,88	0,76	0,76	1,4	1,4	1,4	3,4	3,2	3,2	4	4	4
13	1,2	0,7	27	5,6	3,1	37	4,9	2,8	74,1	5,6	3,2
0,9	0,9	0,9	1,6	1,6	1,6	3,8	3,8	3,8	4,5	4,5	4,5
13,3	1,42	0,83	31	6,4	3,5	41	6	3	83,3	6,3	3,6
3	3	3	5,5	5,5	5,5	11	11	11	13,5	13,5	13,5
44,3	4,7	2,8	106,1	22	12,1	120	17	10	250	18,8	11
5,7	68,3	105,6	4,4	25	47	8	57	103	4,76	63	111
0,0677	0,63	1,09	0,052	0,25	0,46	0,09	0,65	1,14	0,054	0,72	1,26
0,13	17	40,5	0,052	1,2	4,36	0,027	1,4	4,5	0,0055	1	3
0,25	34,4	87	0,11	2,84	8,71	0,15	7,4	24	0,04	7	22
10	10	10	10	10	10	10	10	10	10	10	10
24, Special			24, Special			24, Special			24, Special		
0,4			0,4			0,4			0,4		
IP 64			IP 64			IP 64			IP 64		
F			F			F			F		
RAL 9005			RAL 9005			RAL 9005			RAL 9005		
3			3			3			3		
Y(star-configuration)			Y(star-configuration)			Y(star-configuration)			Y(star-configuration)		
0,509			1,657			1,825			5,745		
0,487			1,646			1,814			5,736		
0,504			1,640			1,830			5,728		
0,504			1,661			1,830			5,770		
0,878			1,707			2,193			6,113		
0,853			1,695			2,182			6,101		
0,871			1,689			2,196			6,095		
0,871			1,711			2,196			6,117		

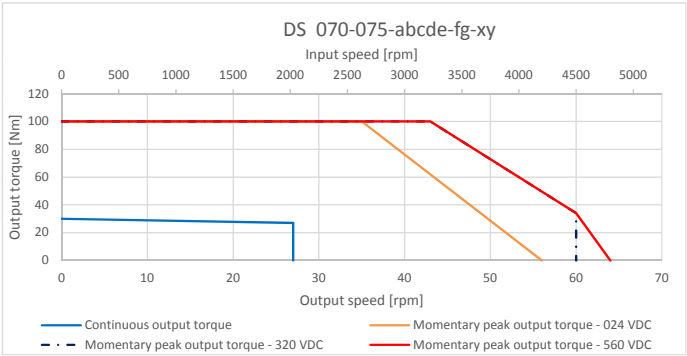
1) Mean statistical value
2) Load at output speed 32rpm for size 050, other sizes at 15rpm
3) Tilting moment $M_{c\,max}$ at F_a=0. If F_a≠0 see Glossary
4) Axial force $F_{a\,max}$ for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3900 rpm for ratio 67 ; 4500 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 $F_{r\,max}$=44/(a_2+0,0305). a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary
9) Depend on duty cycle. Higher input speed may still be possible. Please consult the manufacturer

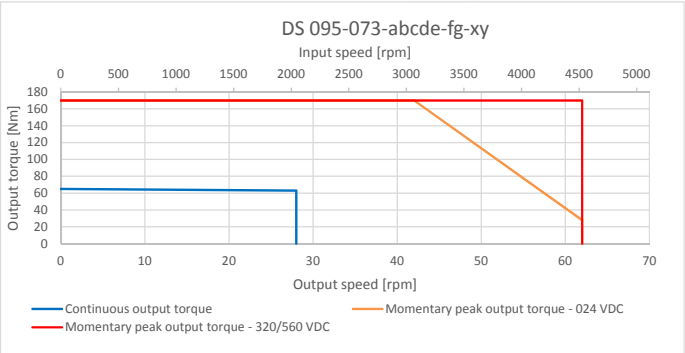
Important notes:
• Load values in the table are valid for the nominal lifetime L_{10}=6000 hours. Service life for average torque Ta and average speed na other than rated n_r, T_r can be recalculated. Please contact manufacturer with estimated duty cycle.
• High precision reduction gears are preffered 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

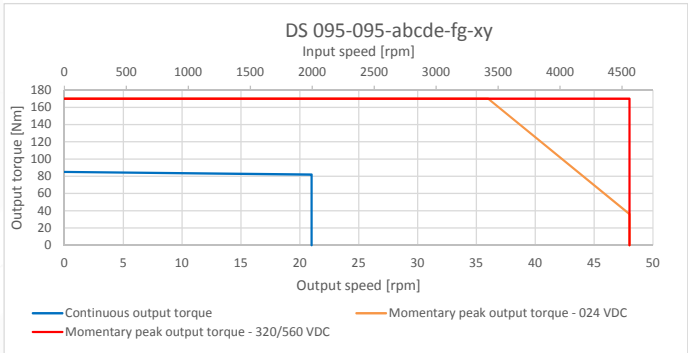
Performance Characteristics / *Leistungskennlinie*



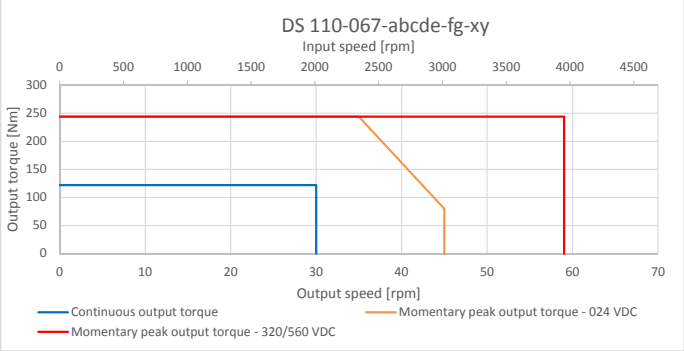


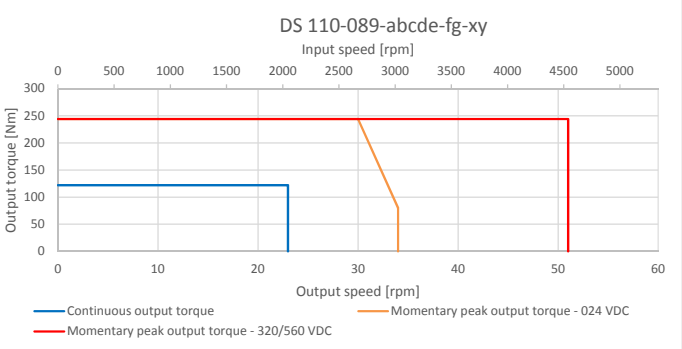


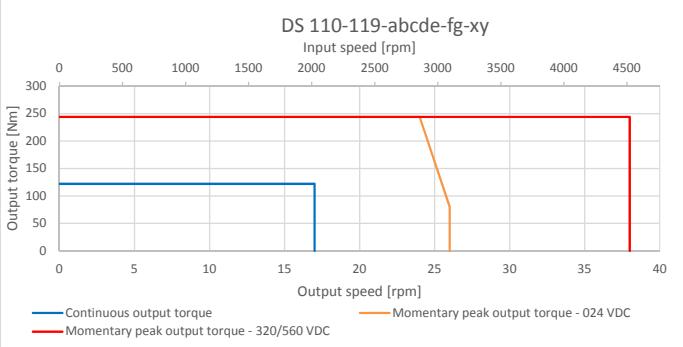


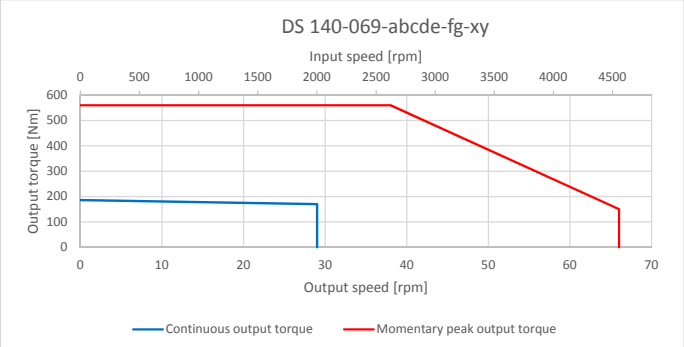


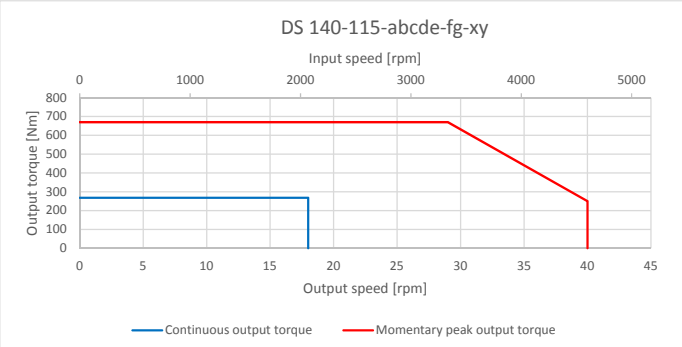
Performance Characteristics
Leistungskennlinie











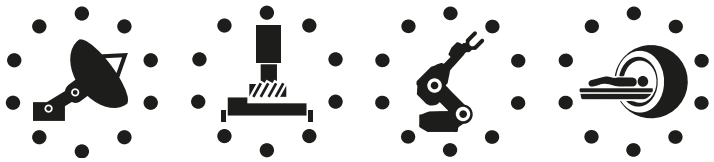
DriveSpin DSH

DSH - DriveSpin Hollowshaft

The **DSH** electric actuators are characterized by the short axial lenght and by the possiblity 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 maintaining 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 260 Nm.**

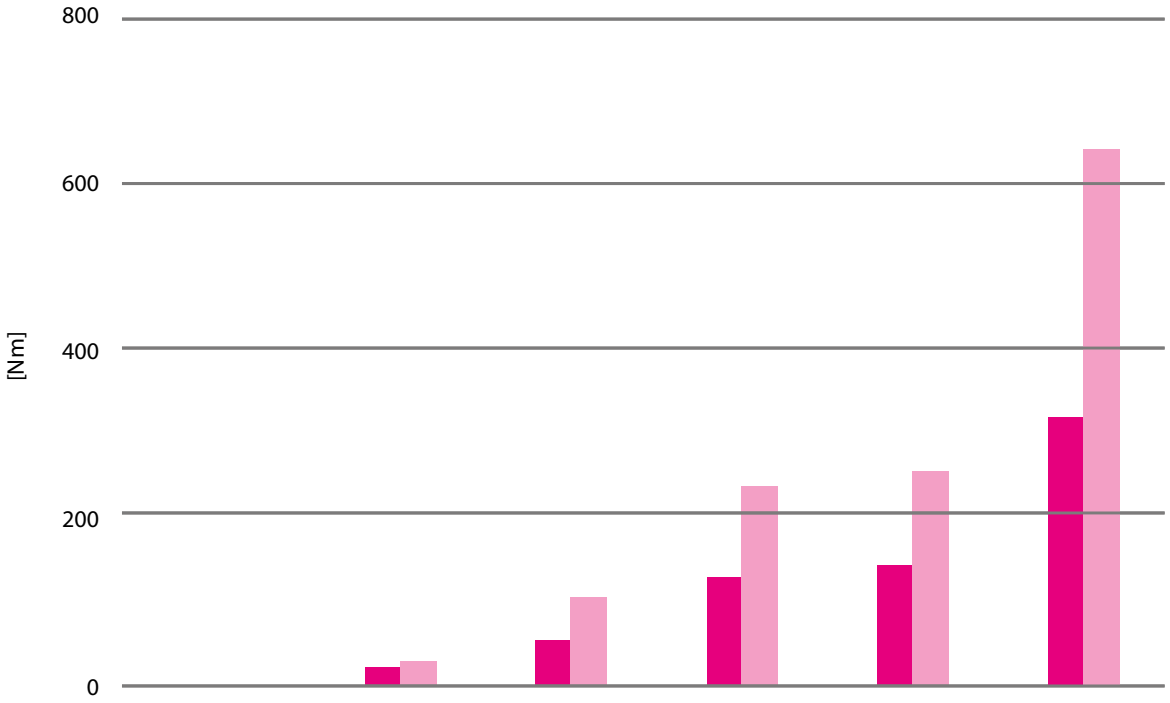
DSH - DriveSpin Hollowshaft

*Die elektrischen **DSH** Aktuatoren zeichnen sich aus durch kurze Axiallänge und eine Durchlaufbohrung für die Verlegung von Kabeln, Rohren und Antriebswellen. **Vollständig versiegelte kompakte Aktuatoren, ausgerüstet mit spielfreien Untersetzungsgetrieben, haben eine hohe Leistungsdichte und einen großen Lochdurchmesser von 8 bis 40mm.** Ausgezeichnete Positionsgenauigkeit und -wiederholbarkeit. DSH halten die radial-axiale und Drehmomentbelastkeit, typisch die hohe Überlastbarkeit des Untersetzungsgetriebes und des hochdynamischen AC Servomotors. Die Spannungs- und **Feedbackvariabilität** erfüllt alle Anforderungen der Kunden. So werden anspruchsvolle Aufgaben gemeistert, wie exakte Positionierung oder schnelle Beförderung schwerer Lasten mit einer hochgradigen **Wiederholgenauigkeit. Nenn-Antriebsdrehmoment 18 Nm bis 260 Nm.***



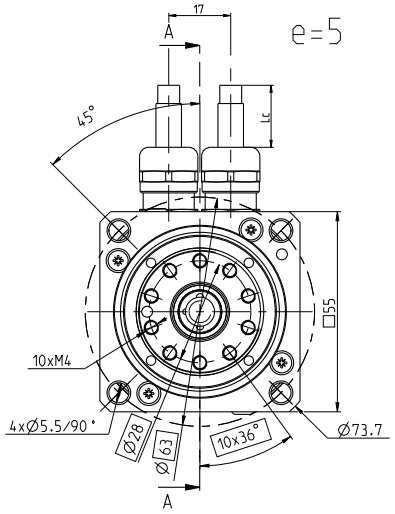
- LOW LOST MOTION,
- LOW MOMENT OF INERTIA,
- HIGH REDUCTION RATIO,
- HIGH KINEMATIC ACCURACY,
- HIGH MOMENT OVERLOAD CAPACITY,
- HIGH CAPACITY OF THE INTEGRATED RADIAL-AXIAL OUTPUT BEARINGS,
- HIGH DYNAMIC PERFORMANCE.

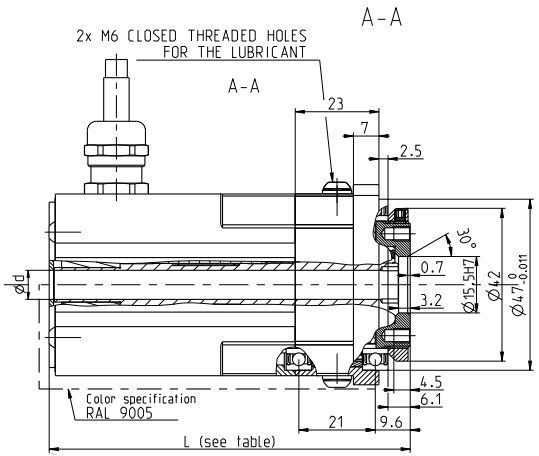
- *GERINGE LOST MOTION,*
- *NIEDRIGES TRÄGHEITSMOMENT,*
- *HOHES UNTERSETZUNGSVERHÄLTNIS,*
- *HOHE KINEMATISCHE GENAUIGKEIT,*
- *HOHE MOMENTÜBERLASTBARKEIT,*
- *HOHE KAPAZITÄT DER EINGEBAUTEN RADIAL-AXIAL-ABTRIEBSLAGER,*
- *HOHE DYNAMISCHE LEISTUNG.*

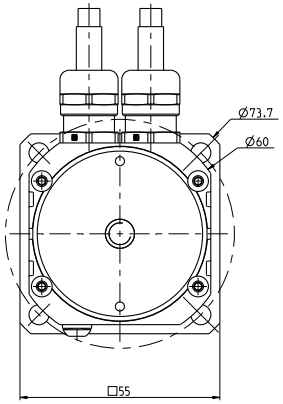


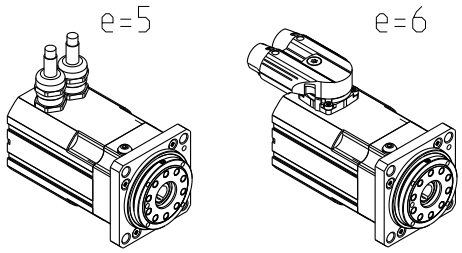
Size / *Größe*		DSH 50	DSH 70	DSH 110	DSH 115	DSH 155
Rated output torque *Nenn-Abtriebsdrehmoment*	T_r [Nm]	18	50	122	130	260
Acceleration/braking output torque *Beschleunigung/ Brems-Abtriebsdrehmoment*	T_{max} [Nm]	36	100	244	260	650
Hollowshaft diameter *Hochwelle*	d [mm]	8	9 or 12	12	32	40

DSH 050







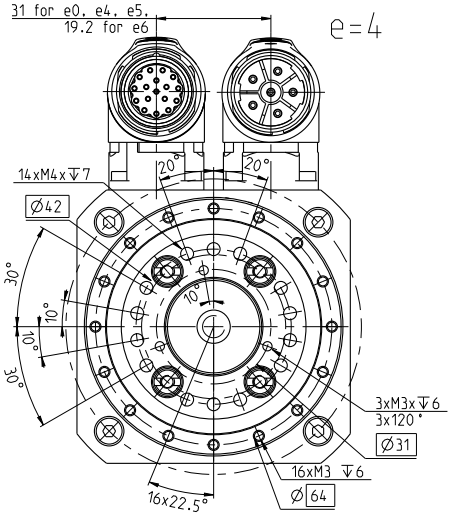


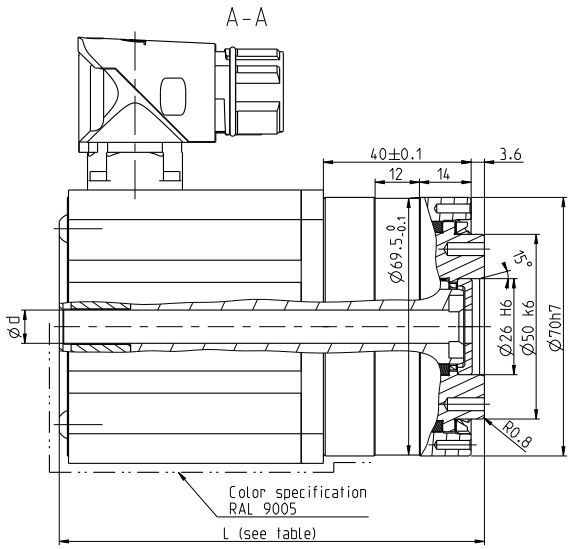
* Hollow shaft rotates at motor speed.

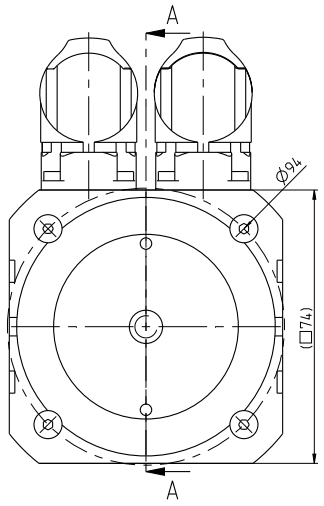
Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*		Hollowshaft diameter ø [mm] *Hollowshaft diameter*
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	
DSH 050	01	107	0,9	-	-	d = 8

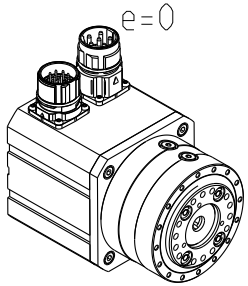
** weight parameters are informative*

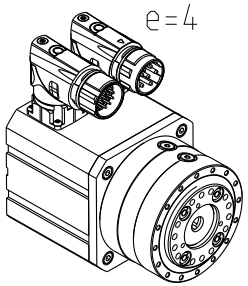
DSH 070

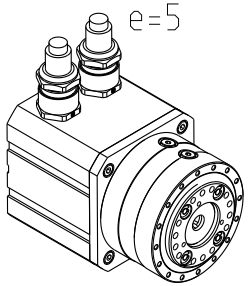


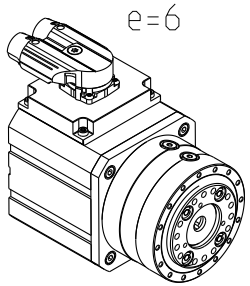










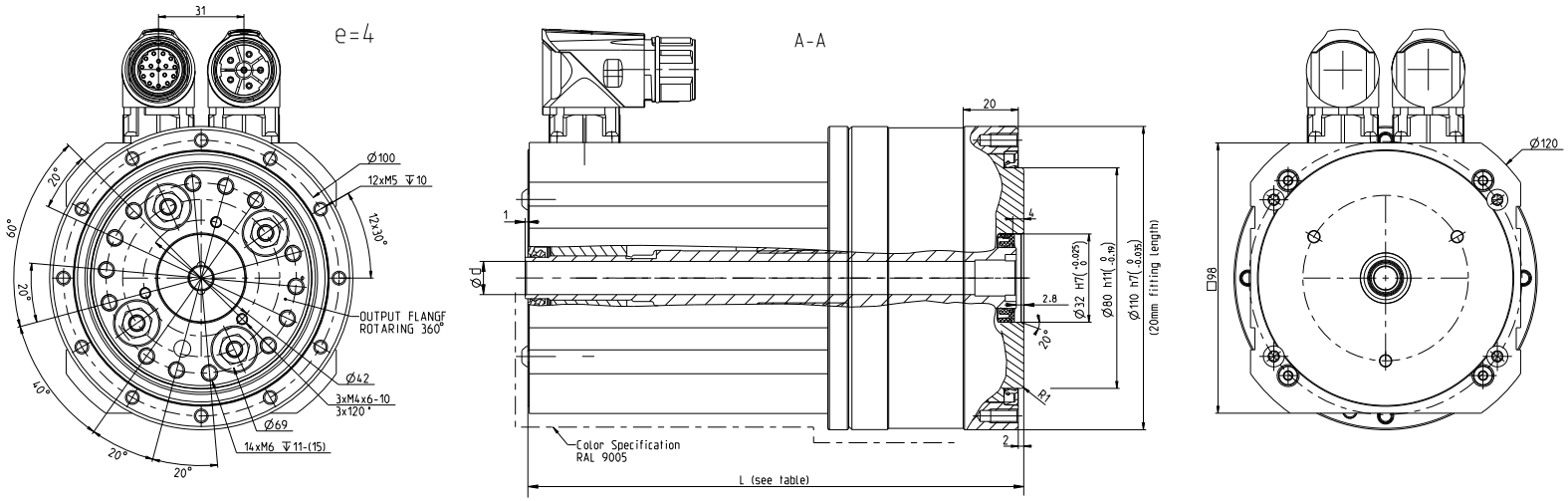


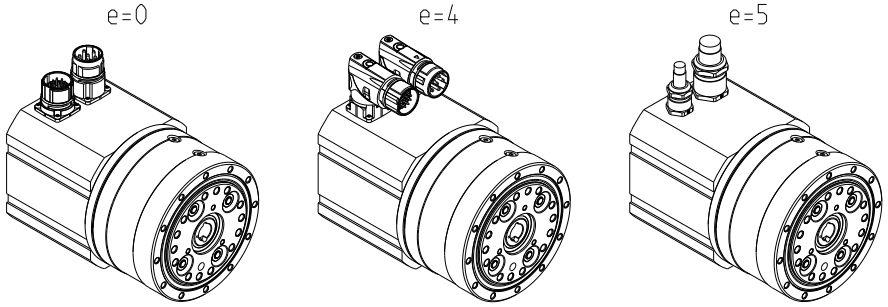
* Hollow shaft rotates at motor speed.

Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*		Hollowshaft diameter ø [mm] *Hollowshaft diameter*
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	
DSH 070	01	153	2,3	-	-	d = 12
	02,03	133	2,1	-	-	d = 9

** weight parameters are informative*

DSH 110



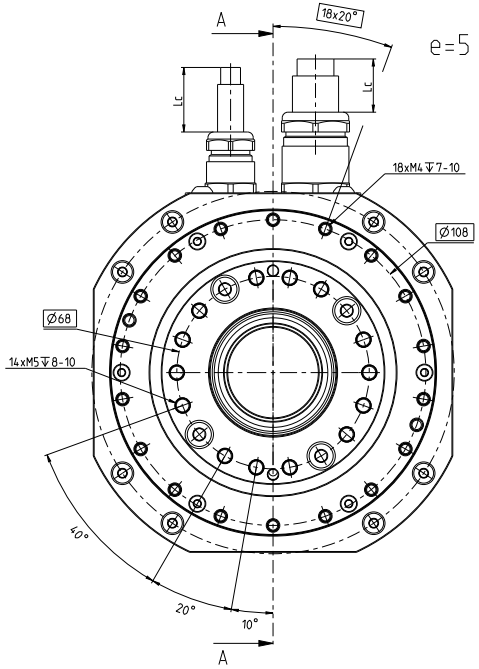


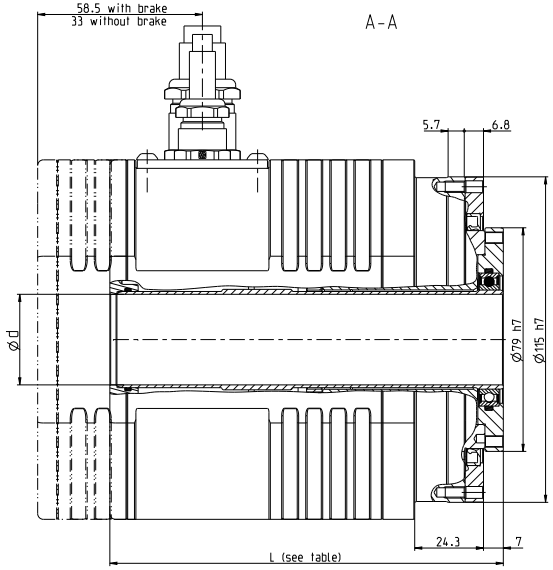
* Hollow shaft rotates at motor speed.

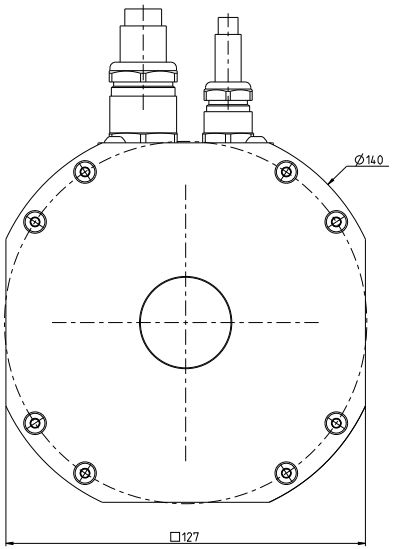
		Without brake / *Ohne Bremse*		With brake / *Mit Bremse*		
Size *Size*	Feedback type (d) *Feedback type (d)*	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Hollowshaft diameter ø [mm] *Hollowshaft diameter*
DSH 110	01	181	8,7	-	-	d = 12

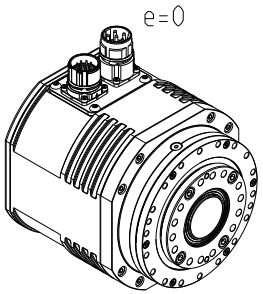
** weight parameters are informative*

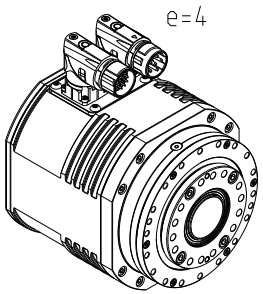
DSH 115

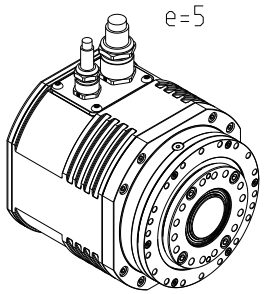










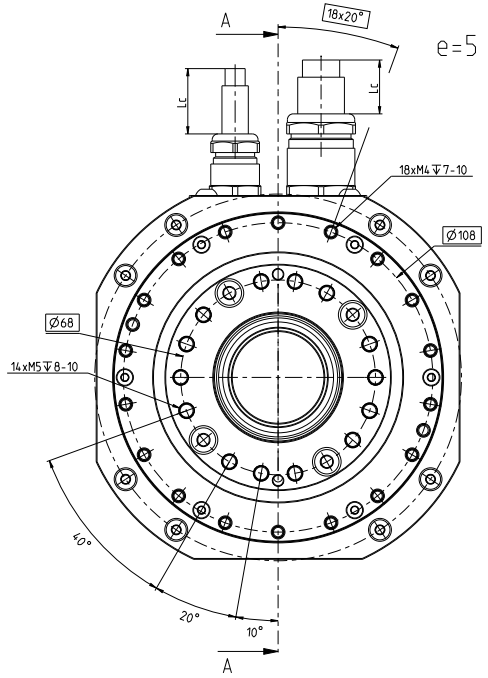


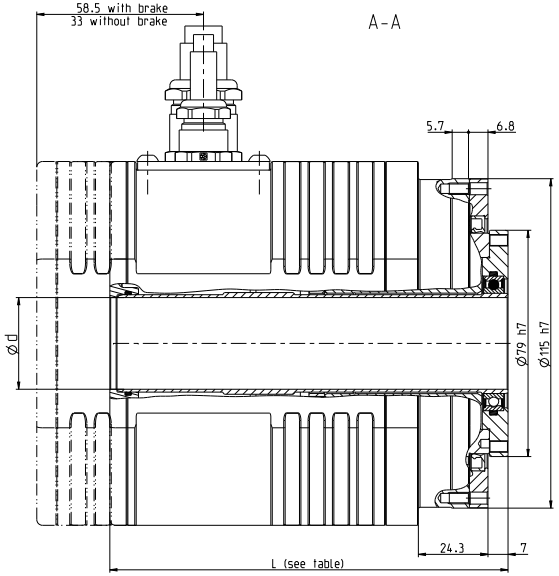
*The hollow shaft with static tube

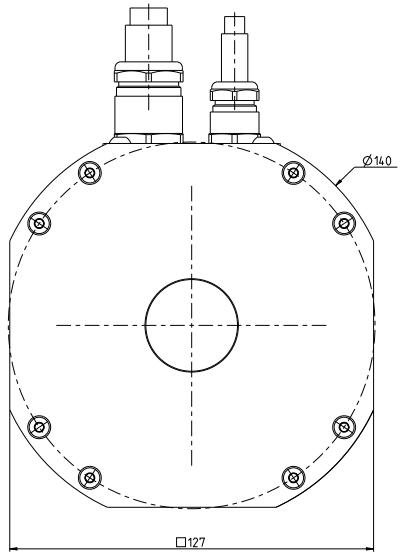
		Without brake / *Ohne Bremse*		With brake / *Mit Bremse*		
Size *Size*	Feedback type (d) *Feedback type (d)*	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Hollowshaft diameter ø [mm] *Hollowshaft diameter*
DSH 115	01	144	7,3	168	8,3	d = 32
	02	139	6,5	165	7,5	
	04,05	139	6,5	165	7,5	
	06	139	6,5	165	7,5	

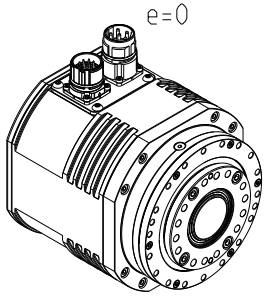
** weight parameters are informative*

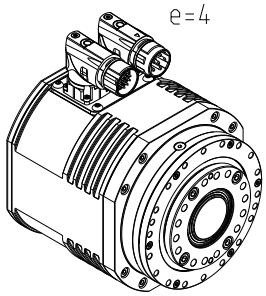
DSH 155

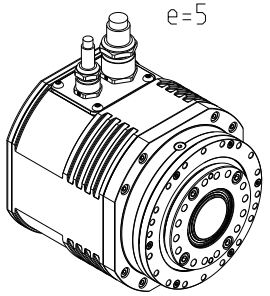












Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse* Dimension L ± 0,5 [mm] / *Maß*	Without brake / *Ohne Bremse* Weight m [kg] * *Weight m [kg]**	With brake / *Mit Bremse* Dimension L ± 0,5 [mm] / *Maß*	With brake / *Mit Bremse* Weight m [kg] * *Weight m [kg]**	Hollowshaft diameter ø [mm] *Hollowshaft diameter*
DSH 155	01	152	13,1	172	14,3	d = 40
	02	152	11,8	172	13	
	04,05	152	11,6	172	13,7	
	06	152	11,6	172	13,7	

*The hollow shaft with static tube

** weight parameters are informative*

Technical Parameters
Technische Parameter

Tab. 5.1: Technical parameters DS

Parameter		**Tolerance**	**DS 050**		
Ratio	i		63		
Hollowshaft diameter	Ød [mm]		8		
Rated output torque	T_r [Nm]		18		
Acceleration/Braking Torque	T_{max} [Nm]		36		
Rated input speed	n_r [rpm]		2000		
Maximum allowable input speed [9]	n_{max} [rpm]		5000		
Maximum tilting 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 Optitemp TT1		
Reduction gear limit temperature	[°C]		65 °C		
Standard ambient temperature range	[°C]		-10 °C do +40 °C		
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3500	3500	3500
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)		
Inertia at input (actuator without brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm²		0,080		
Feedback type (d)=02,03	10^{-4} kgm²		–		
Feedback type (d)=04,05	10^{-4} kgm²		–		
Feedback type (d)=08	10^{-4} kgm²		–		
Inertia at input (actuator with brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm²		–		
Feedback type (d)=02,03	10^{-4} kgm²		–		
Feedback type (d)=04,05	10^{-4} kgm²		–		
Feedback type (d)=08	10^{-4} kgm²		–		

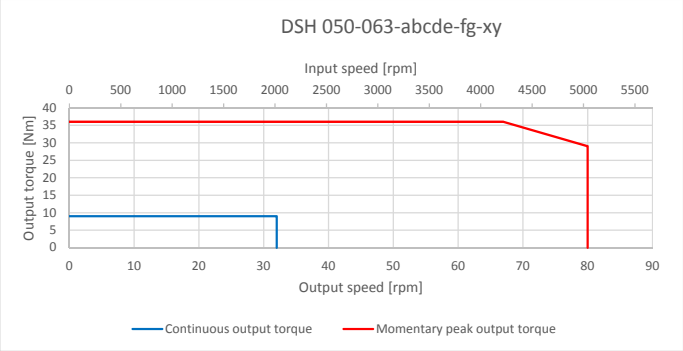
Tab. 5.1: Continue

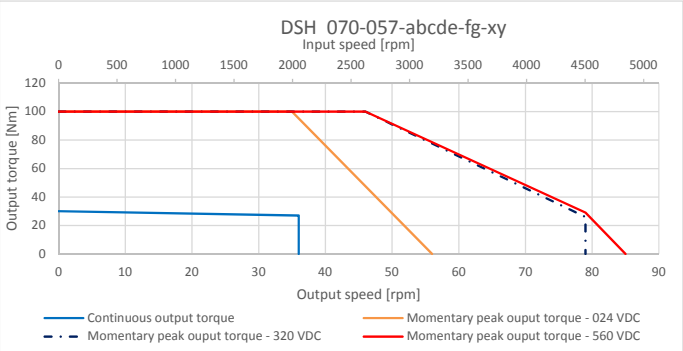
DSH 070			DSH 110			DSH 115			DSH 155		
57, 75			67, 89, 119			103			109		
9 or 12			12			32			40		
50			122			130			260		
100			244			260			650		
2000			2000			2000			2000		
5000			3900/4500 [5]			4000			4000		
142			740			550			1640		
35			150			220			920		
7			22			23			67		
< 1.5			< 1			< 1			< 1		
< 1.5			< 1			< 1			< 1		
2,8			9,3			4			8,3		
4,1			13,1			12,5			26,1		
Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1		
65 °C			65 °C			65 °C			65 °C		
-10 °C do +40 °C			-10 °C do +40 °C			-10 °C do +40 °C			-10 °C do +40 °C		
24	320	560	24	320	560	24	320	560	24	320	560
2500	4500	4500	2500	3000	3000	3500	3500	3500	4000	4000	4000
0,88	0,76	0,76	3,4	3,2	3,2	2,9	2,9	2,9	3,8	3,8	3,8
13	1,2	0,7	37	4,9	2,8	46	3,5	2	67,2	5	3
0,9	0,9	0,9	3,8	3,8	3,8	3	3	3	5	5	5
13,3	1,42	0,83	41	6	3	47,6	3,6	2	88	6,6	4
3	3	3	11	11	11	8,5	8,5	8,5	16	16	16
44,3	4,7	2,8	120	17	10	135	10,1	5,8	283	21,2	14
5,7	68,3	105,6	8	57	103	5,6	75	131	5	67	112
0,0677	0,63	1,09	0,09	0,65	1,14	0,06	0,84	1,47	0,057	0,75	1,27
0,13	17	40,5	0,027	1,4	4,5	0,011	2	6	0,005	1	2,5
0,25	34,4	87	0,15	7,4	24	0,03	5	16	0,014	2	7
10	10	10	10	10	10	20	20	20	24	24	24
24, Special			24, Special			24, Special			24, Special		
4,5			4,5			5			5		
IP 64			IP 64			IP 64			IP 64		
F			F			F			F		
RAL 9005			RAL 9005			RAL 9005			RAL 9005		
3			3			3			3		
Y(star-configuration)			Y(star-configuration)			Y(star-configuration)			Y(star-configuration)		
0,630			2,040			13,977			29,289		
0,483			–			8,797			19,296		
–			–			9,097			19,586		
–			–			9,097			19,586		
–			–			15,080			31,895		
–			–			9,900			21,902		
–			–			10,200			22,192		
–			–			10,200			22,192		

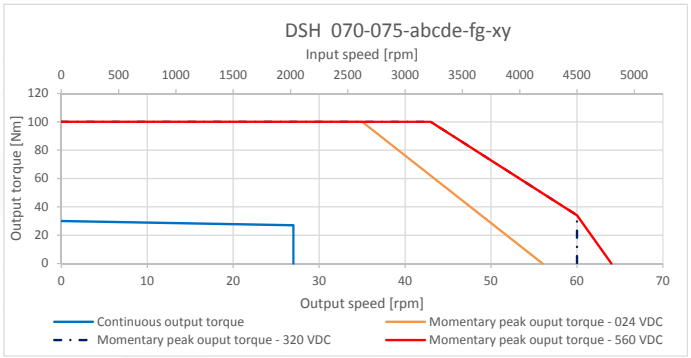
1) Mean statistical value
2) Load at output speed 32rpm for size 050, other sizes at 15rpm
3) Tilting moment $M_{c\,max}$ at F_a=0. If F_a≠0 see Glossary
4) Axial force $F_{a\,max}$ for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3900 rpm for ratio 67 ; 4500 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 $F_{r\,max}$=44/(a_2+0,0305). a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary
9) Depend on duty cycle. Higher input speed may still be possible. Please consult the manufacturer

Important notes:
• Load values in the table are valid for the nominal lifetime L_{10}=6000 hours. Service life for average torque Ta and average speed na other than rated n_r, T_r can be recalculated. 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

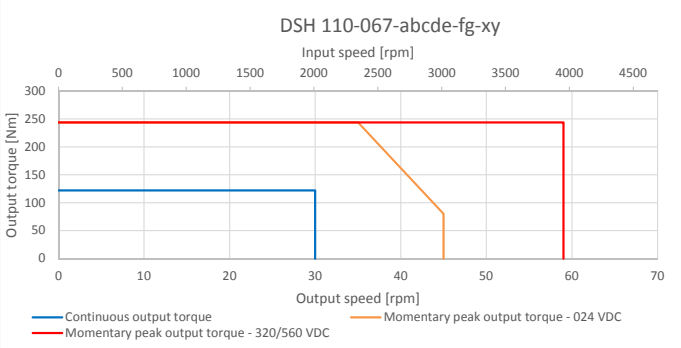
Performance Characteristics / *Leistungskennlinie*

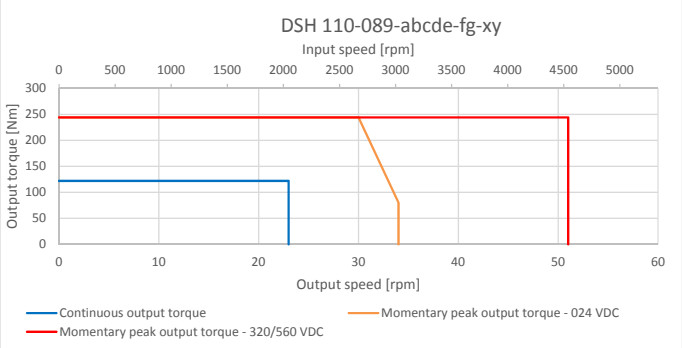


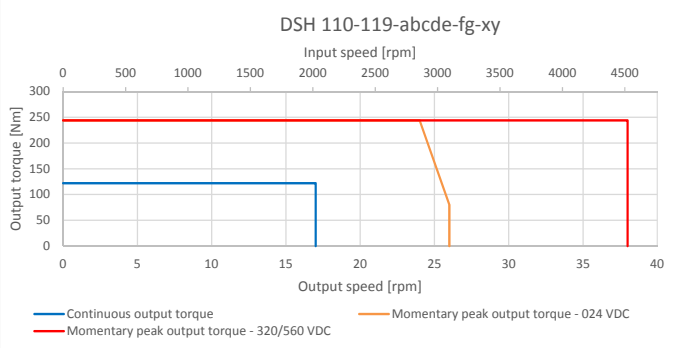


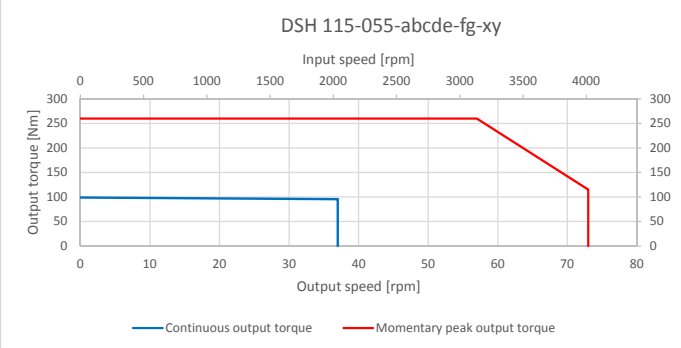


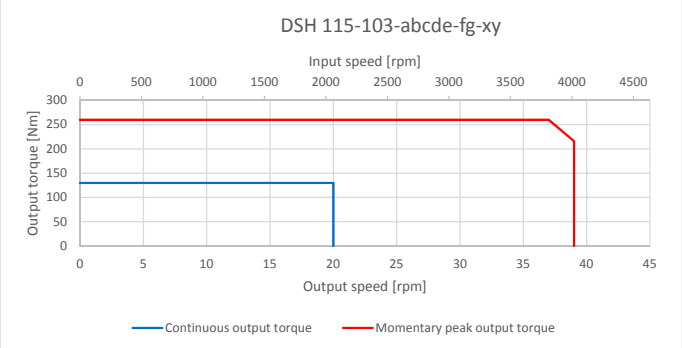
Performance Characteristics
Leistungskennlinie

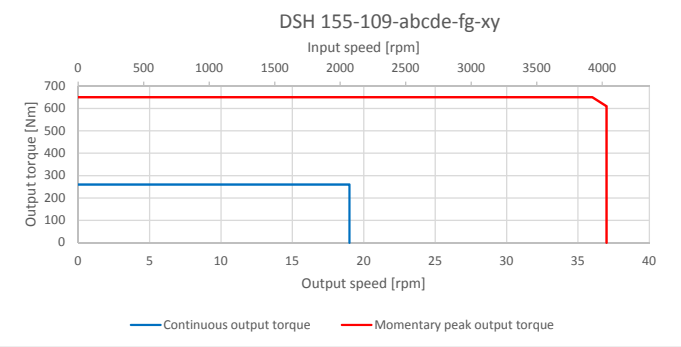












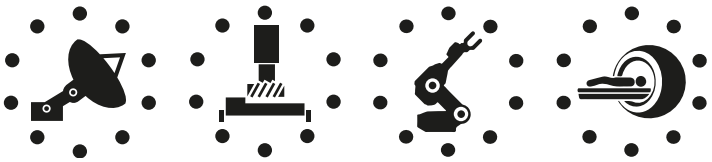
DriveSpin DSM

DSM - DriveSpin Modular

The **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.**

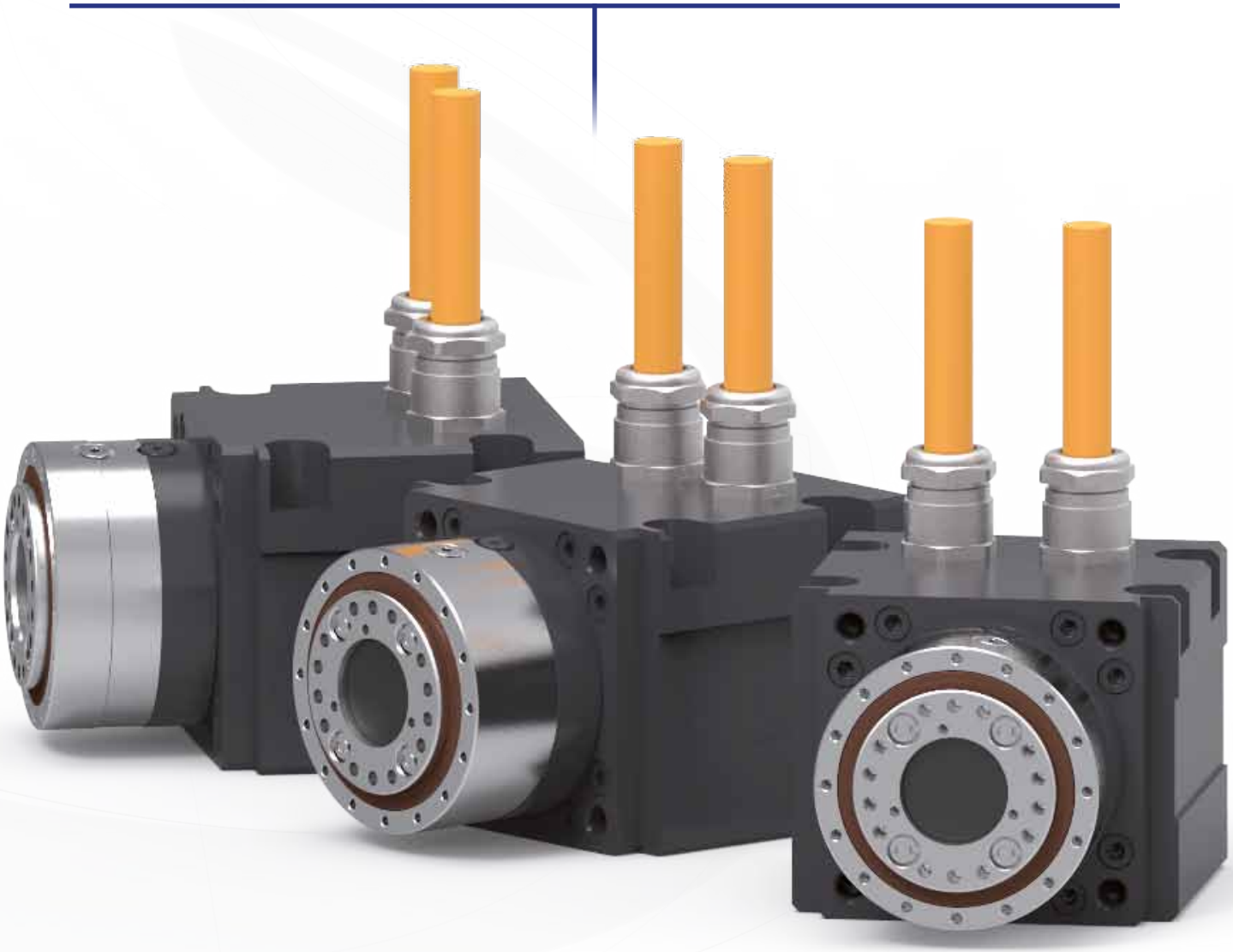
DSM - DriveSpin Modular

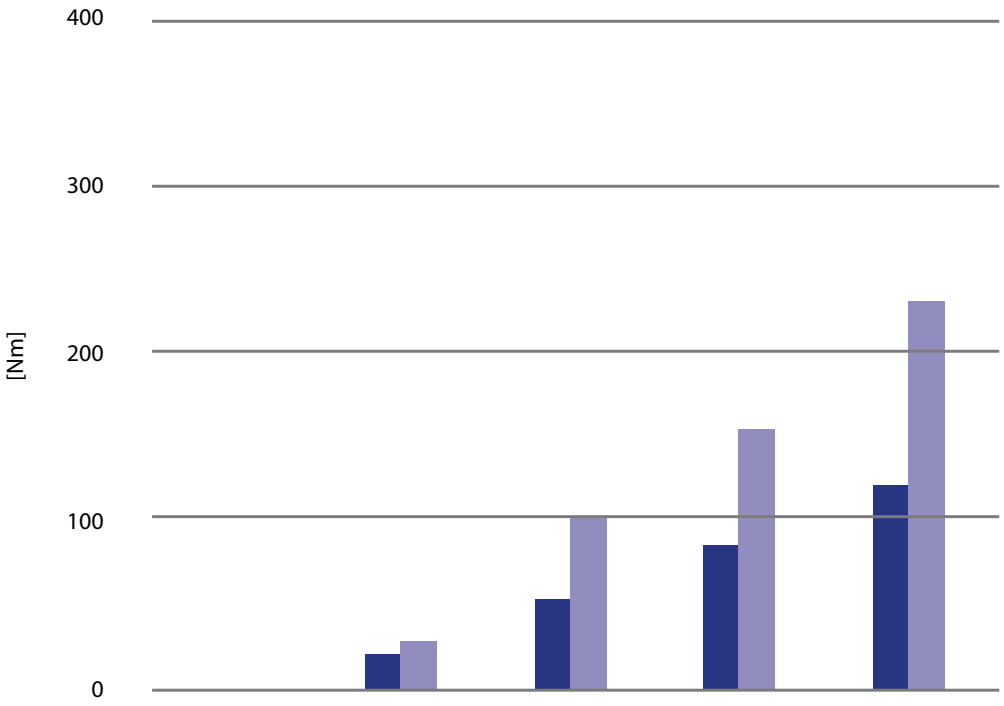
*Die modularen DSM Rotations-Positionierungs-Module bieten gesteuerte Rotationsbewegungen und hochpräzise und positionsgenaue Drehmomentübertragung. Der Abtriebsflansch des Moduls ermöglicht die Aufnahme sowohl der Radial- wie auch der Axialkräfte. Die Module weisen ein **spezielles Design** auf, für vielfältige Anschlüsse ohne Zusatzeinrichtungen. Dank des modularen Systems können Aktuatoren auf **vielfältige Weise** kombiniert werden. Durch die simple einbaufähige Konstruktion und die geringen Abmessungen können kinematische Einheiten gebaut werden, aus DSM Modulen **für Endeffektoren**, aber auch für zusätzliche Geräte und Positionierer. Die geeignete Modulgröße ist abhängig von der benötigten **Lastaufnahme-Kapazität** und der Anzahl der Freiheitsgrade der Bewegungsachse. Die DSM Serie zeichnet sich aus durch simplen und schnellen Zusammenbau und reduziert so die Gesamtkosten. Durch das **kompakte Design stehen optimale Montageoptionen** und Anwendungsmöglichkeiten zur Verfügung, selbst bei begrenztem Aufstellraum. These actuators are used in applications with request of high torque density, precision and dynamics. **Nenn-Abtriebsdrehmoment 18 Nm bis 122 Nm.***



- 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.

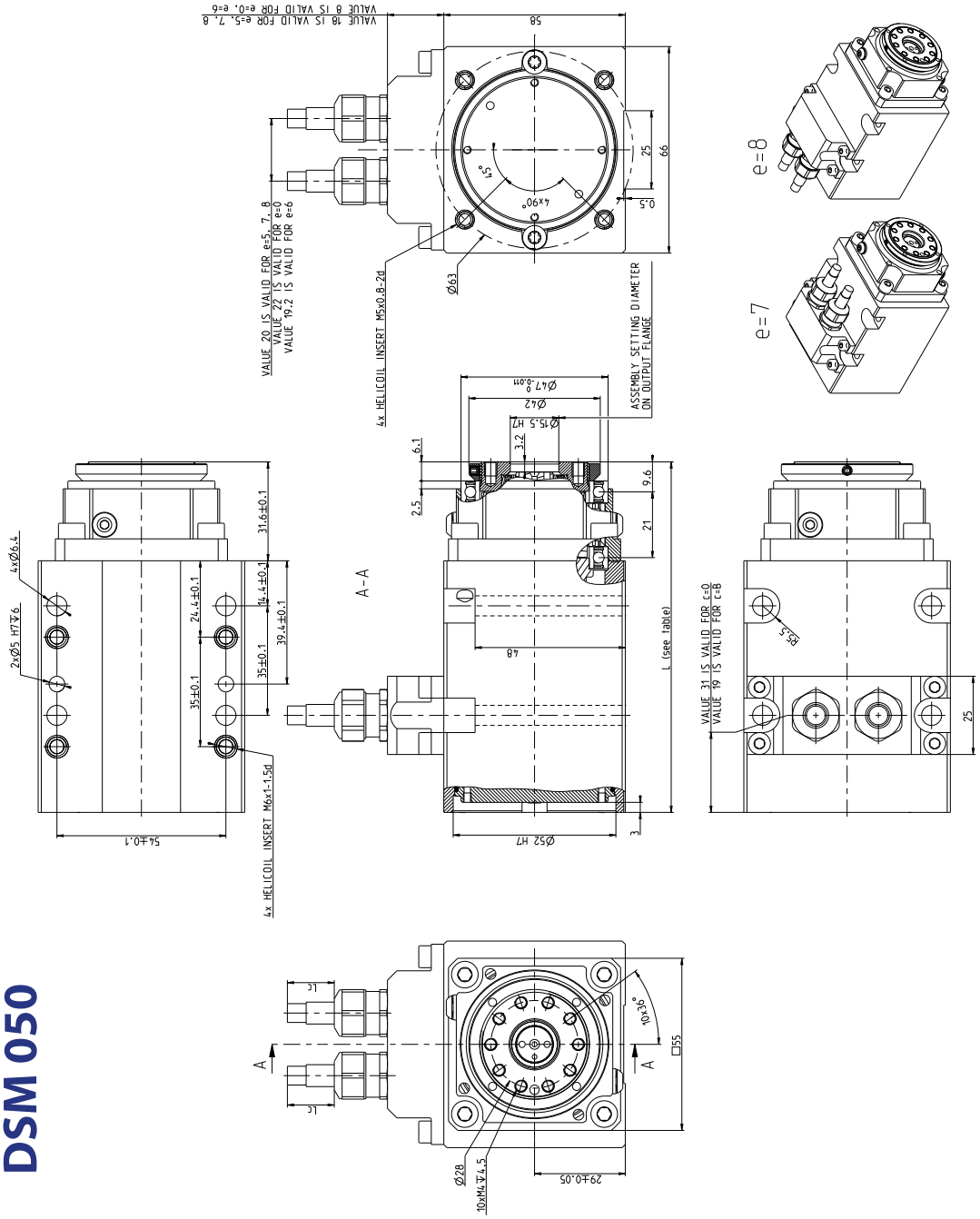
- *GERINGE LOST MOTION,*
- *NIEDRIGES TRÄGHEITSMOMENT,*
- *HOHES UNTERSETZUNGSVERHÄLTNIS,*
- *HOHE KINEMATISCHE GENAUIGKEIT,*
- *HOHE MOMENTÜBERLASTBARKEIT,*
- *HOHE KAPAZITÄT DER EINGEBAUTEN RADIAL-AXIAL-ABTRIEBSLAGER,*
- *HOHE DYNAMISCHE LEISTUNG.*





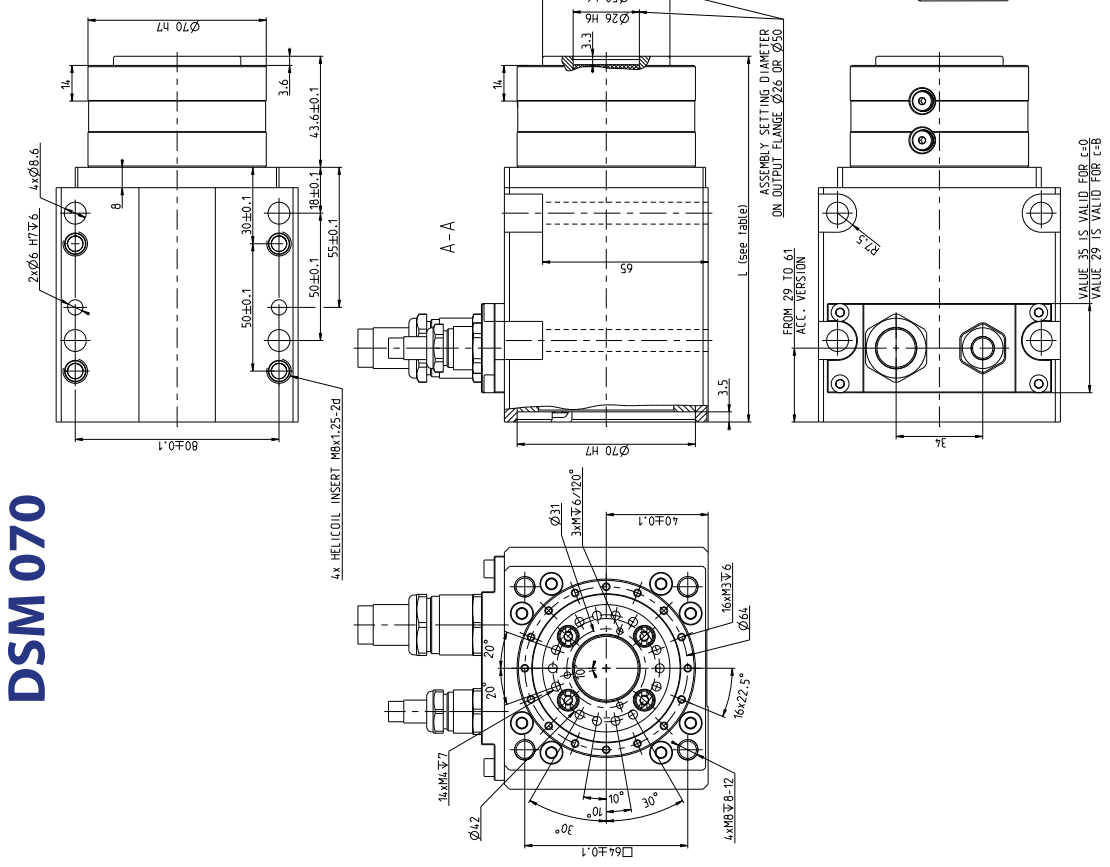
Size / *Größe*		DSM 50	DSM 70	DSM 95	DSM 110
Rated output torque *Nenn-Abtriebsdreh-moment*	T_r [Nm]	18	50	85	122
Acceleration/braking output torque *Beschleunigung/ Brems-Abtriebsdreh-moment*	T_{max} [Nm]	36	100	170	244

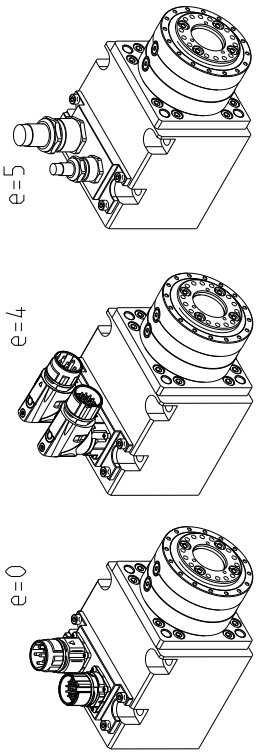
DSM 050

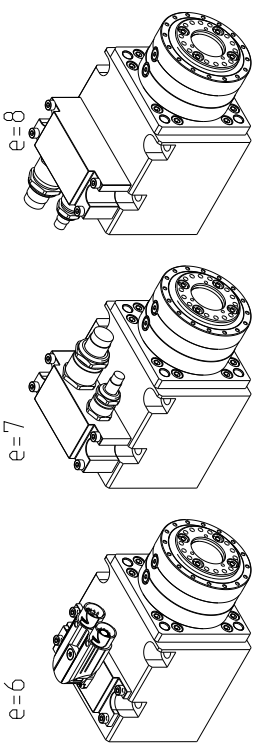


Size / Size	Feedback type (d) / Feedback type (d)	Without brake / Ohne Bremse		With brake / Mit Bremse	
		Dimension L ± 0,5 [mm] / Maß	Weight m [kg] * / Weight m [kg]*	Dimension L ± 0,5 [mm] / Maß	Weight m [kg] * / Weight m [kg]*
DSM 050	01	144	1,4	177	1,6
	02,03	154	1,4	199	1,6
	04,05	144	1,4	177	1,6

** weight parameters are informative*



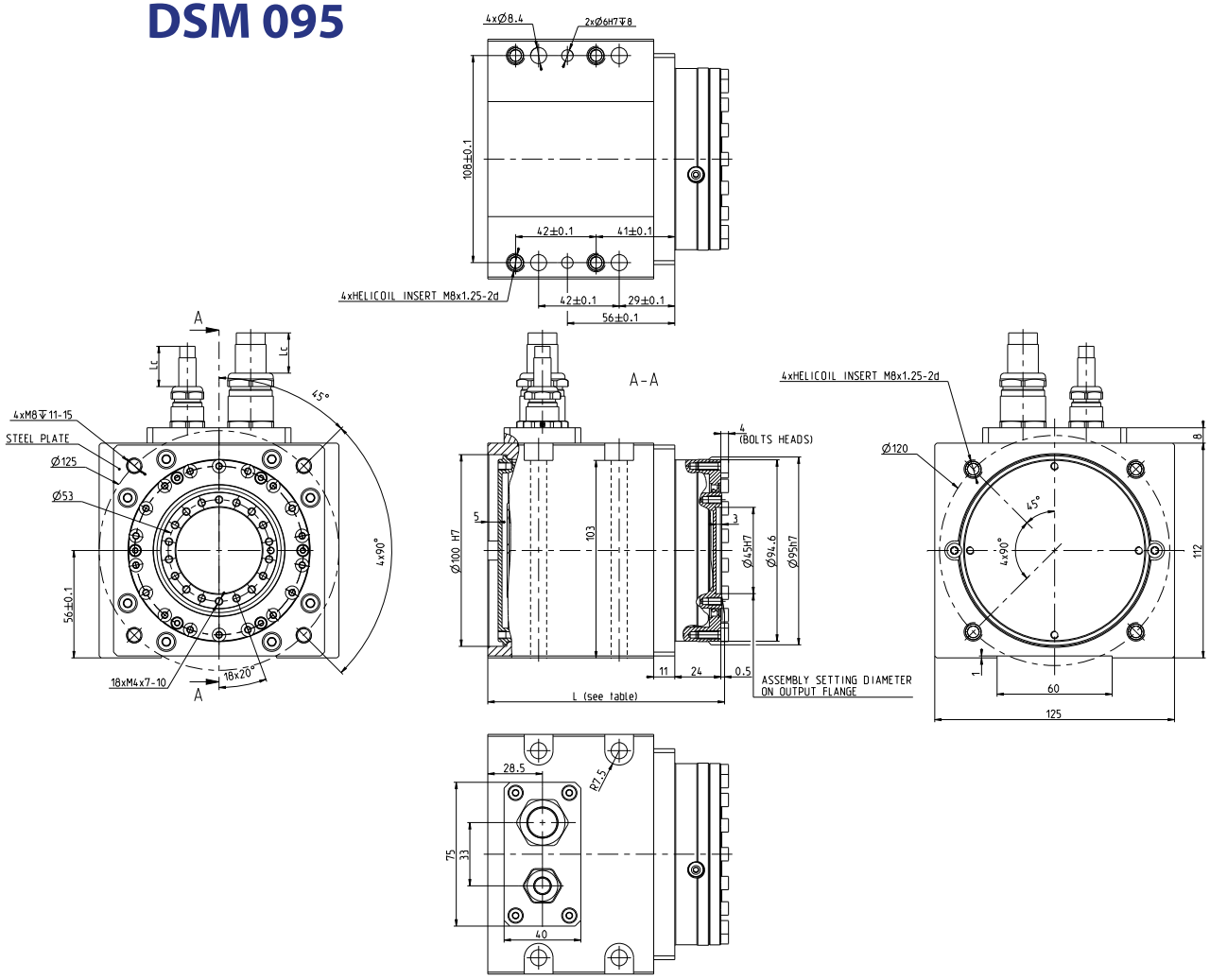




Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DSM 070	01	144	4,1	177	4,8
	02,03	144	4	177	4,8
	04,05	144	4	177	4,7
	08	154	4,3	199	5,3

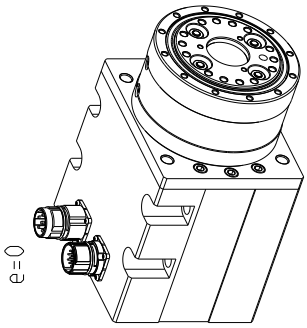
** weight parameters are informative*

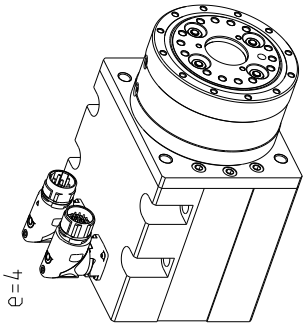
DSM 095

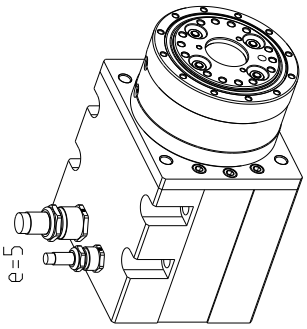


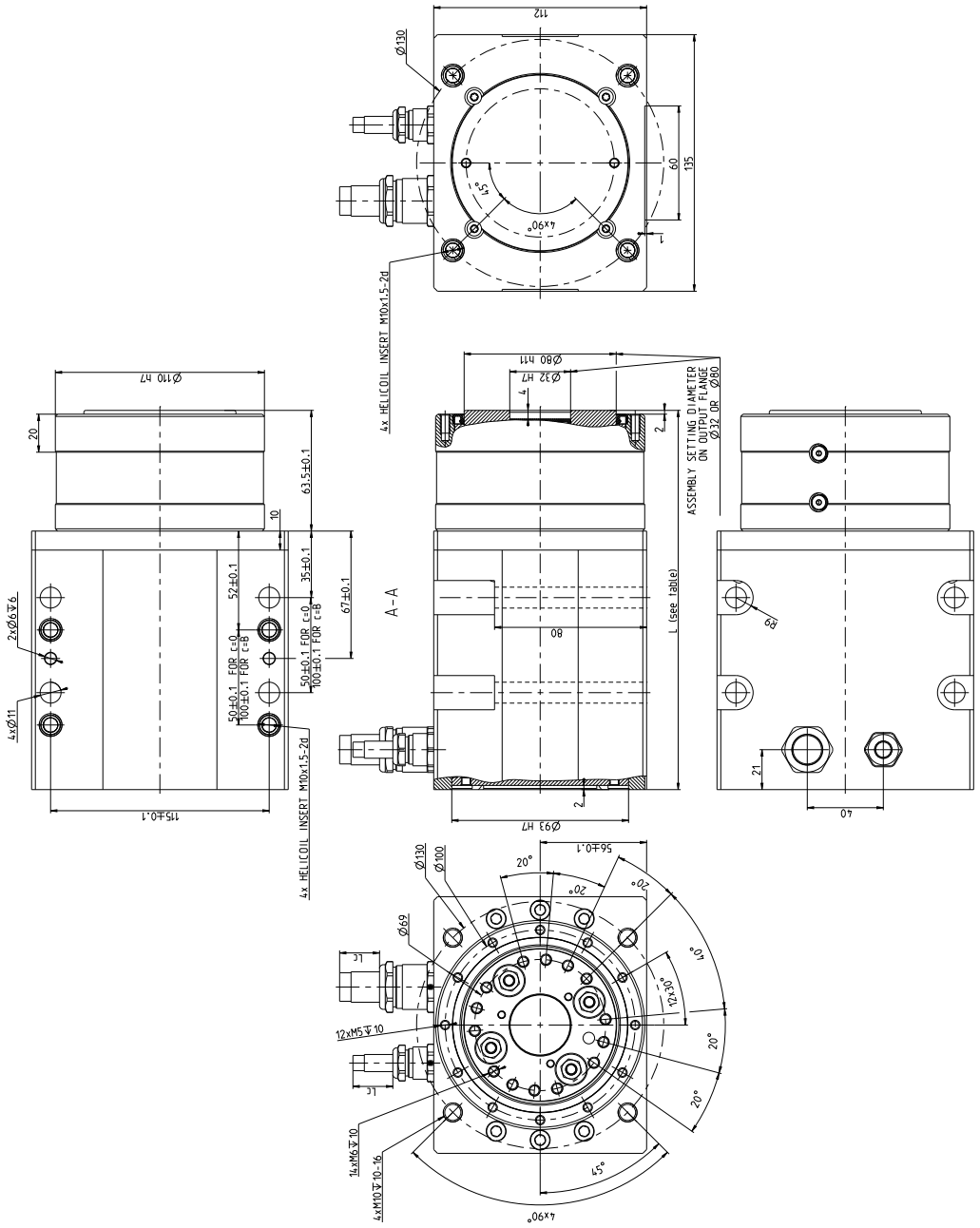
Size *Size*	Feedback type (d) *Feedback type (d)*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
		Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DSM 095	08	142	6,6	165	7,3
	02,03	122	6,1	145	6,6
	04,05	122	6	145	6,7

** weight parameters are informative*









DSM 110

Size *Size*	Without brake / *Ohne Bremse*		With brake / *Mit Bremse*	
	Feedback type (d) *Feedback type (d)*	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**	Dimension L ± 0,5 [mm] / *Maß*	Weight m [kg] * *Weight m [kg]**
DSM 110	01	200	10,5	252	12,4
	02,03	200	10,5	252	12,4
	04,05	200	10,6	252	12,5
	08	200	10,6	252	12,5

** weight parameters are informative*

Technical Parameters
Technische Parameter

Tab. 6.1: Technical parameters DS

Parameter		**Tolerance**	**DS 050**		
Ratio	i		63		
Rated output torque	T_r [Nm]		18		
Acceleration/Braking Torque	T_{max} [Nm]		36		
Rated input speed	n_r [rpm]		2000		
Maximum allowable input speed [9]	n_{max} [rpm]		5000		
Maximum tilting 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 Optitemp TT1		
Reduction gear limit temperature	[°C]		65 °C		
Standard ambient temperature range	[°C]		-10 °C do +40 °C		
DC BUS voltage	U_{dc} [V_{dc}]	+/- 10%	24	320	560
Motor rated speed	n_n [rpm]		3500	3500	3500
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)		
Inertia at input (actuator without brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm^2		0,080		
Feedback type (d)=02,03	10^{-4} kgm^2		0,061		
Feedback type (d)=04,05	10^{-4} kgm^2		0,062		
Feedback type (d)=08	10^{-4} kgm^2		–		
Inertia at input (actuator with brake)	$J_{w/obrake}$				
Feedback type (d)=01	10^{-4} kgm^2		0,121		
Feedback type (d)=02,03	10^{-4} kgm^2		0,101		
Feedback type (d)=04,05	10^{-4} kgm^2		0,101		
Feedback type (d)=08	10^{-4} kgm^2		–		

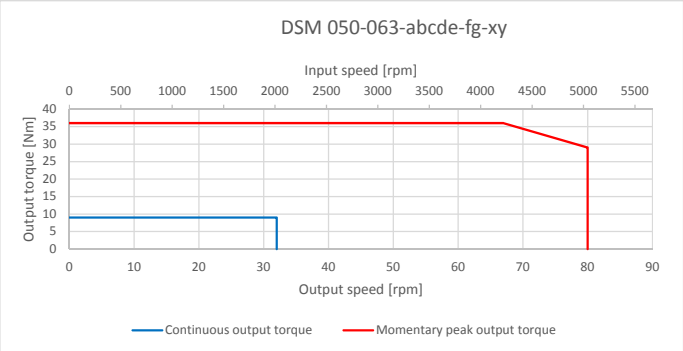
Tab. 6.1: Continue

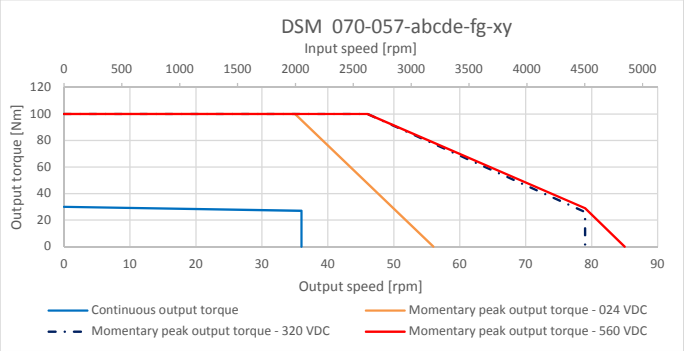
DSM 070			DSM 095			DSM 110		
57, 75			73, 95			67, 89, 119		
50			85			122		
100			170			244		
2000			2000			2000		
5000			4500			3900/4500 [5)]		
142			410			740		
35			120			150		
7			15			22		
< 1.5			< 1			< 1		
< 1.5			< 1			< 1		
2,8			3,5			9,3		
4,1			11,1			13,1		
Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1			Grease Castrol Optitemp TT1		
65 °C			65 °C			65 °C		
-10 °C do +40 °C			-10 °C do +40 °C			-10 °C do +40 °C		
24	320	560	24	320	560	24	320	560
2500	4500	4500	4000	4000	4000	2500	3000	3000
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)		
0,509			1,657			1,825		
0,488			1,646			1,814		
0,482			1,640			1,830		
0,504			1,661			1,830		
0,878			1,707			2,193		
0,853			1,695			2,182		
0,752			1,689			2,196		
0,871			1,711			2,196		

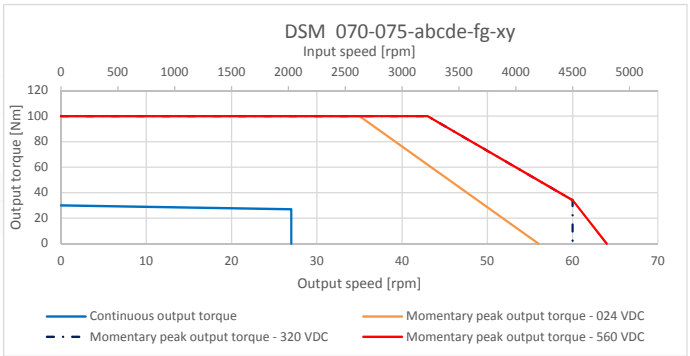
1) Mean statistical value
2) Load at output speed 32rpm for size 050, other sizes at 15rpm
3) Tilting moment $M_{c\,max}$ at F_a=0. If F_a≠0 see Glossary
4) Axial force $F_{a\,max}$ for M_c=0 (In case of size 050 also F_r=0 condition has to be fullfiled). If M_c≠0 see Glossary
5) 3900 rpm for ratio 67 ; 4500 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 $F_{r\,max}$=44/(a_2+0,0305). a_2 represents the distance of the radial force centre from the front of the output flange in meters see Glossary
9) Depend on duty cycle. Higher input speed may still be possible. Please consult the manufacturer

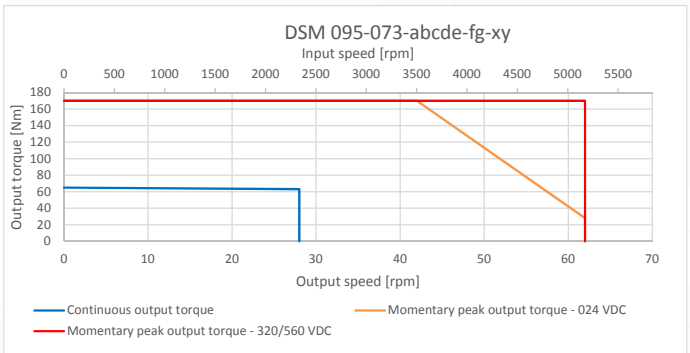
Important notes:
• Load values in the table are valid for the nominal lifetime L_{10}=6000 hours. Service life for average torque Ta and average speed na other than rated n_r, T_r can be recalculated. Please contact manufacturer with estimated duty cycle.
• High precision reduction gears are preffered 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

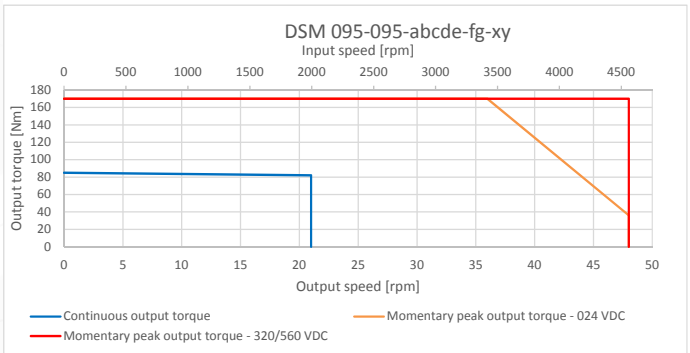
Performance Characteristics / *Leistungskennlinie*



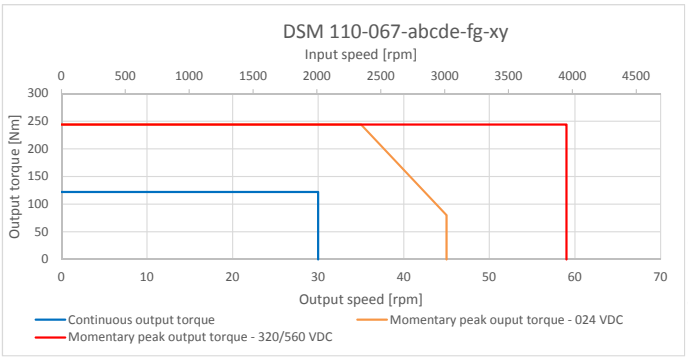


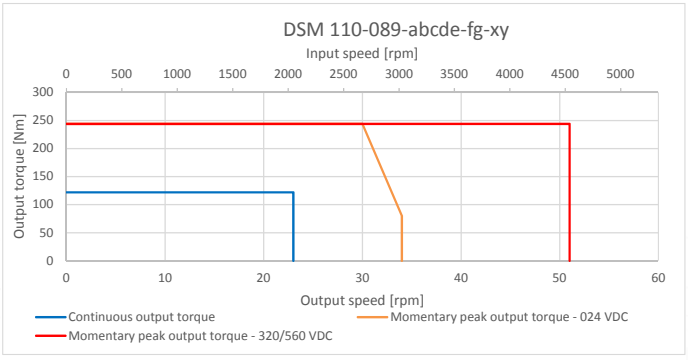


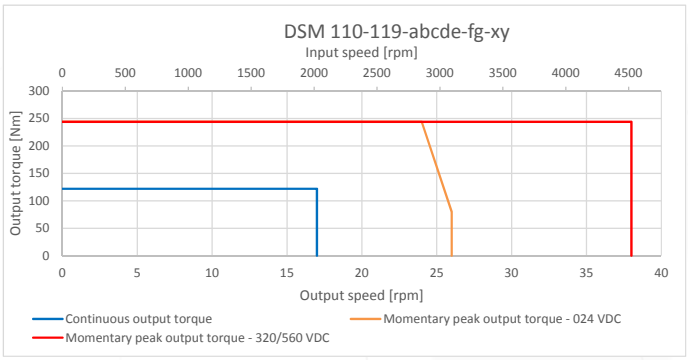




Performance Characteristics
Leistungskennlinie

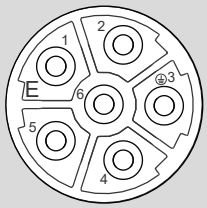






(f)	Power pins assignement	
A	**Pin**	**Signal**
	1	U
	2	V
	3	PE
	4	Brake+ [1]
	5	Brake- [1]
	6	W

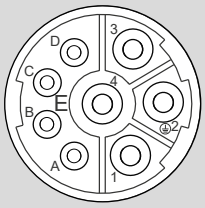
Connector type 923 6 pin rotation E



1) only connected in actuators with option Electromagnetic brake

(f)	Power pins assignement	
B	**Pin**	**Signal**
	1	U
	2	PE
	3	W
	4	V
	A	Brake+ [1]
	B	Brake- [1]
	C	N/C
	D	N/C

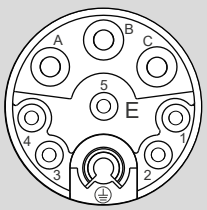
Connector type 923 8 pin rotation E



1) only connected in actuators with option Electromagnetic brake

(f)	Power pins assignement	
C	**Pin**	**Signal**
	1	Brake+ [1]
	2	Brake- [1]
	3	therm+ [2]
	4	therm- [2]
	5	N/C
	A	U
	B	W
	C	V
	PE	PE

Connector type 915 9 pin rotation E



1) only connected in actuators with option Electromagnetic brake
2) only connected in combination with Signal wiring diagram (g)=O

(f)	Terminal cable cores assignement		
D	**Colour**	**Mark**	**Signal**
	Green-Yellow		PE
		1	U
		2	V
		3	W
	White	or 4	Brake+ [1]
	Brown	or 5	Brake- [1]

1) only connected in actuators with option Electromagnetic brake

Terminal cable / *Signalanschlüsse*

(g)	Terminal cable colour assignement		
	cable DIN47100		EnDat
A	**Core**	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	Up (supply)
	4	Yellow *gelb*	0 V (supply)
	5	Grey *grau*	DATA+
	6	Pink *pink*	DATA-
	7	Blue *blau*	CLOCK+
	8	Red *rot*	CLOCK-
	9	Black *schwarz*	Sensor Up/U_{BAT} [1)]
	10	Violet *violett*	Sensor 0 V /0 V_{BAT} [1)]

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

(g)	Terminal cable colour assignement		
	cable DIN47100		EnDat + sin/cos
C	**Core**	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	Up (supply)
	4	Yellow *gelb*	0 V (supply)
	5	Grey *grau*	DATA+
	6	Pink *pink*	DATA-
	7	Blue *blau*	CLOCK+
	8	Red *rot*	CLOCK-
	9	Black *schwarz*	Sensor Up [1)]
	10	Violet *violett*	Sensor 0 V [1)]
	11	Grey/Pink	A+
	12	Red/Blue	A-
	13	White/Green *weiß/ grün*	B+
	14	Brown/Green *braun /grün*	B-

1) Sensor is internally connected to corresponding supply line, and may be used for remote sense and control of power supply

(g)	Terminal cable colour assignement		
E	**cable DIN47100**		**Incremental sin/cos + sin/cos commutation**
	Core	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	Up (supply)
	4	Yellow *gelb*	0 V (supply)
	5	Grey *grau*	D+
	6	Pink *pink*	D-
	7	Blue *blau*	C+
	8	Red *rot*	C-
	9	Black *schwarz*	Sensor Up [1)]
	10	Violet *violett*	Sensor 0 V [1)]
	11	Grey/Pink	A+
	12	Red/Blue	A-
	13	White/Green *weiß/ grün*	B+
	14	Brown/Green *braun /grün*	B-
	15	White/Yellow *weiß/ gelb*	R+
	16	Yellow/Brown *gelb/braun*	R-

1) Sensor is internally connected to corresponding supply line, and may be used for remote sense and control of power supply
Note: C/D signals for sin/cos commutation

(g)	Terminal cable colour assignement		
G	**cable DIN47100**		**Hiperface**
	Core	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	Us (supply)
	4	Yellow *gelb*	GND (supply)
	5	Grey *grau*	Data+
	6	Pink *pink*	Data-
	7	Blue *blau*	+SIN
	8	Red *rot*	+COS
	9	Black *schwarz*	REFSIN
	10	Violet *violett*	REFCOS

(g)	Terminal cable colour assignement		
I	**cable DIN47100**		**Resolver**
	Core	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	R1 (supply)
	4	Yellow *gelb*	R2 (supply)
	5	Grey *grau*	S1 (cos+)
	6	Pink *pink*	S2 (sin+)
	7	Blue *blau*	S3 (cos-)
	8	Red *rot*	S4 (sin-)

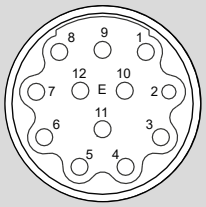
(g)	Terminal cable colour assignement		
N	**cable DIN47100**		**Incremental A/B/I + block commutation**
	Core	**Colour**	**Signal**
	1	White *weiß*	therm+
	2	Brown *braun*	therm-
	3	Green *grün*	Us (supply)
	4	Yellow *gelb*	GND (supply)
	5	Grey *grau*	A+
	6	Pink *pink*	A-
	7	Blue *blau*	B+
	8	Red *rot*	B-
	9	Black *schwarz*	I+
	10	Violet *violett*	I-
	11	Grey/Pink	U+
	12	Red/Blue	U-
	13	White/Green *weiß/ grün*	V+
	14	Brown/Green *braun /grün*	V-
	15	White/Yellow *weiß/ gelb*	W+
	16	Yellow/Brown *gelb/braun*	W-

Note : U/V/W signals for block commutation

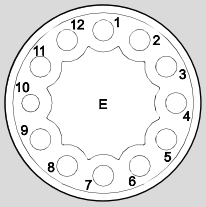
Connectors / *Signalanschlüsse*

(g)	Pins signal assignement	
B	Connector	EnDat
	PIN	Signal
	1	Up (supply)
	2	Sensor Up/U_{BAT} 1)
	3	0 V (supply)
	4	Sensor 0V/ 0 V_{BAT} 1)
	5	DATA+
	6	DATA-
	7	CLOCK+
	8	CLOCK-
	9	N/C
	10	N/C
	11	therm+
	12	therm-

Connector type 623 12pin rotation E



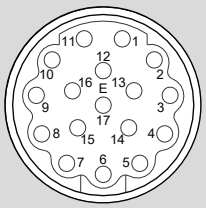
Connector type 615 12pin rotation E



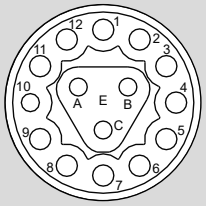
1) BAT use with EBI 135 and EBI 1135 with multiturn function powered via battery instead of Sensor which is internally connected to corresponding supply line, and may be used for remote sense and control of power supply
Note : N/C = not connected

(g)	Pins signal assignement	
D	Connector	EnDat + sin/cos
	PIN	Signal
	1	B-
	2	0 V (supply)
	3	A-
	4	Up (supply)
	5	DATA+
	6	N/C
	7	therm+
	8	CLOCK+
	9	B+
	10	Sensor 0 V 1)
	11	A+
	12	Sensor Up 1)
	13 or A	DATA-
	14 or B	therm-
	15 or C	CLOCK-
	16	N/C
	17	N/C

Connector type 623 17pin rotation E



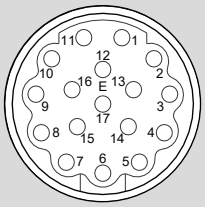
Connector type 615 15pin rotation E



1) Sensor is internally connected to corresponding supply line, and may be used for remote sense and control of power supply
Note : N/C = not connected

(g)	Pins signal assignement	
F	**Connector**	**Incremental sin/cos + sin/cos commutation**
	PIN	**Signal**
	1	A+
	2	A-
	3	R+
	4	D-
	5	C+
	6	C-
	7	0 V (supply)
	8	therm+
	9	therm-
	10	Up (supply)
	11	B+
	12	B-
	13	R-
	14	D+
	15	Sensor 0 V [1)]
	16	Sensor Up [1)]
	17	N/C

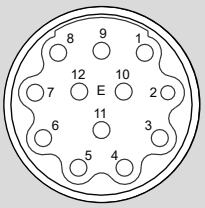
Connector type 623 17pin rotation E



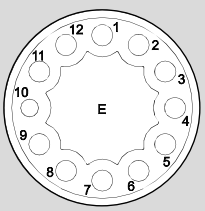
1) Sensor is internally connected to corresponding supply line, and may be used for remote sense and control of power supply
Note : N/C = not connected
Note : C/D signals for sin/cos commutation

(g)	Pins signal assignement	
H	**Connector**	**Hiperface**
	PIN	**Signal**
	1	Us (supply)
	2	GND (supply)
	3	+COS
	4	REFCOS
	5	REFSIN
	6	+SIN
	7	therm+
	8	therm-
	9	DATA+
	10	DATA-
	11	N/C
	12	N/C

Connector type 623 12pin rotation E



Connector type 615 12pin rotation E

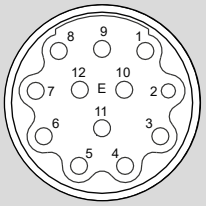


Note : N/C = not connected

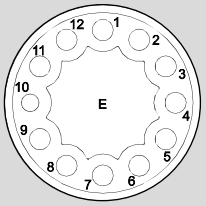
(g)	Pins signal assignement	
J	**Connector**	**Resolver**
	PIN	**Signal**
	1	N/C
	2	therm+
	3	S4 (sin-)
	4	S3 (cos-)
	5	R2 (supply)
	6	therm-
	7	S2 (sin+)
	8	S1 (cos+)
	9	R1 (supply)
	10	N/C
	11	N/C
	12	N/C

Note : N/C = not connected

Connector type 623 12pin rotation E

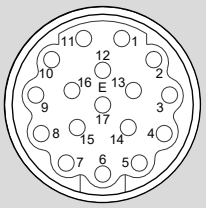


Connector type 615 12pin rotation E

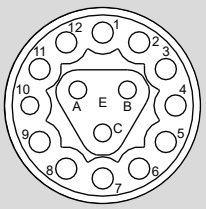


(g)	Pins signal assignement	
O	**Connector**	**Incremental A/B/I + block commutation**
	PIN	**Signal**
	1	A+
	2	A-
	3	B+
	4	B-
	5	I+
	6	I-
	7	U+
	8	U-
	9	V+
	10	V-
	11	W+
	12	W-
	13 or A	Us (supply)
	14 or B	GND (supply)
	15	therm+ [1)]
	16	therm- [1)]
	17	N/C

Connector type 623 17pin rotation E



Connector type 615 15pin rotation E



1) 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-
Note : N/C = not connected
Note : U/V/W signals for block commutation

Technical specifications of thermistors

Tab. 8.1: PTC 111-K13

T_{NAT}=140°C

Resistance values according to DIN 44081 and DIN 44082
Widerstandswerte gemäß DIN 44081 und DIN 44082

Temperature range ***Temperaturbereich*** **T [°C]**	**Resistance** ***Widerstand*** **R [Ω]**
-20°C do 120°C	R≤250 Ω
120°C do 135°C	R≤550 Ω
135°C do 145°C	R≥1330 Ω
>155°C	R>4000 Ω

Technische Spezifikationen für Thermistoren

Tab.8.2: PT 1000

Temperature range ***Temperaturbereich*** **T (°C)**	**Resistance** ***Widerstand*** **R (Ω)**
-40	843
-30	882
-20	922
-10	961
0	1000
10	1039
20	1078
30	1117
40	1155
50	1194
60	1232
70	1271
80	1309
90	1347
100	1385
110	1423
120	1461
130	1498
140	1536
150	1573
160	1611
170	1648
180	1685
190	1722
200	1759
210	1795
220	1832
230	1868
240	1905
250	1941

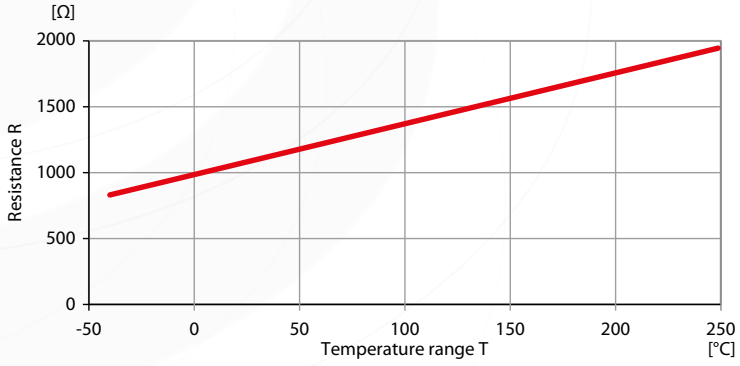


Fig. 8.1: Resistance /Temperature PT 1000

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 on or by output flange of DriveSpin or to calculated values of torque generated by PMSM including ratio and losses in gearbox, additional seals or bearings.

Fig. 9.1: 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 115 and DSH 155 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.

The service life for a given speed and load values can be calculated as follows:

$$L_h = k.\frac{n_R}{n_a}.\left(\frac{T_R}{T_a}\right)^{\frac{10}{3}} \text{ [hrs]}$$

Eq. 9.1: Lifetime Calculation

k -6000 hours service life [hrs]
L_h –required service life [hrs]
T_a –average output torque [Nm]
n_a –average input speed [rpm]
T_R –rated output torque [Nm]
n_R –rated input speed [rpm]

Acceleration/Braking torque

Maximum allowable torque during acceleration or deceleration phase of duty cycle. It is limit torque used for acceleration or braking of inertial loads of driven mechanism. This torque may be applied as often as needed unless average torque of cycle does not exceed rated torque of DriveSpin.

Maximum allowable input speed

TwinSpin limit input speed. For higher speeds than stated in data tables please contact your supplier.

Maximum tilting moment, Rated radial force, Maximum axial force (All sizes except 050)

Radial and axial loads acts independently thanks to integrated radial-axial output bearings. The allowed radial load is provided in parameter tables. The tilting moment is expressed as follows:

a radial force F_r arm [m]
b axial force F_a arm [m]
M_c tilting moment [Nm]
F_r radial load [N]
F_a axial load [N]

$$M_c = F_r . a + F_a . b$$

a Hebelarm F_r [m]
b Hebelarm F_a [m]
M_c Kippmoment [Nm]
F_r Radialkraft [N]
F_a Axialkraft [N]

Eq. 9.2: Tilting moment calculation

The allowable load for the tilting moment (M_c) and the axial force (F_a) is shown in Figure 9.2. Point with coordinates (M_c, F_a) must lie in the area under the line of the selected actuator. For example DS 140, at output speed of 15 rpm, L_{10} =6000 hrs and tilting moment M_c = 680 Nm, the maximum axial force may be 7 kN. The allowable radial and axial loads determine the allowable dynamic load that can be applied on a reduction gear. For further details please consult with sales department.

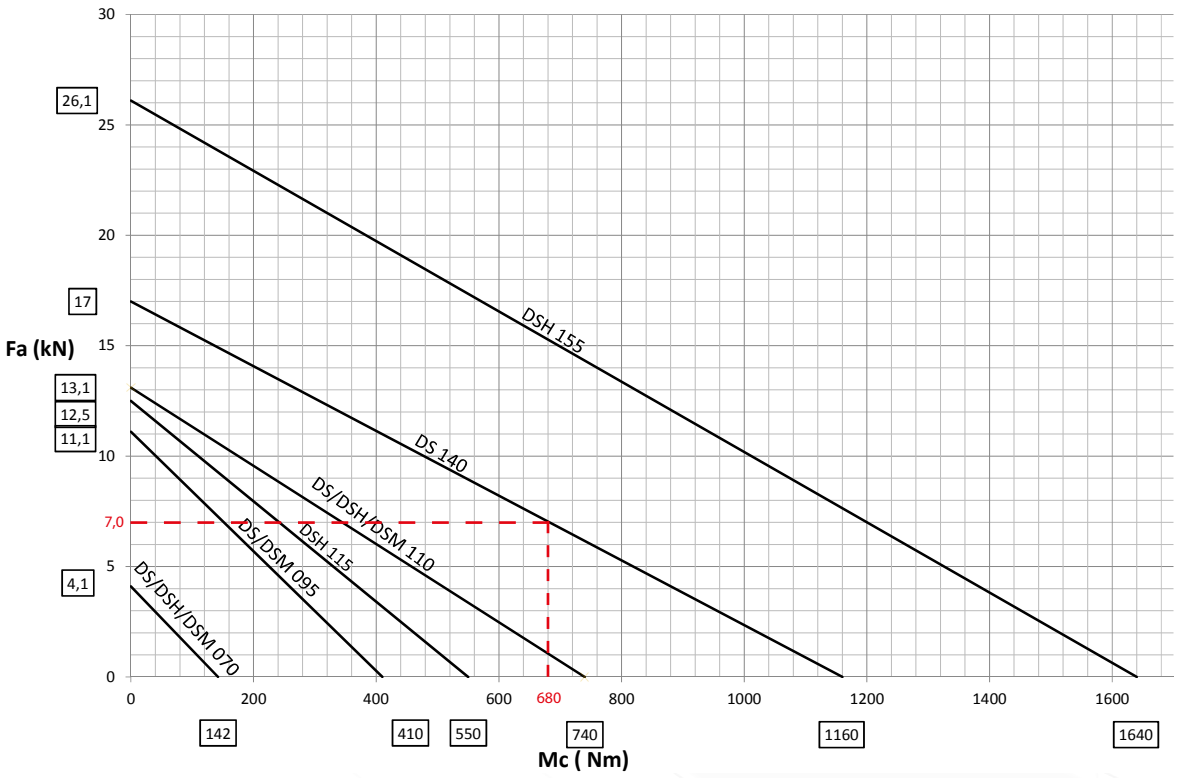


Fig. 9.2: Allowable load for the tilting moment and the axial force

Maximum tilting moment, Maximum radial force, Maximum axial force (Size 050)

The output flange of DS/DSM/DSH 050 series is able to transmit external loads from the radial force F_r, axial force F_a and tilting moment M_c. The tilting moment is expressed as follows:

$$M_c = F_r . a + F_a . b$$

M_c - tilting moment [Nm]
F_r - radial force [N]
F_a - axial force [N]

b - arm of force F_a [m]
a1 - perpendicular distance between the centre of the output bearings and the face of the output flange [m]
a2 - perpendicular distance between the vector of force F_r and the face of the output flange [m]
a3 - perpendicular distance between the centre of the output bearing A and the face of the output flange [m]
a =a1+a2 - arm of force F_r in relation to the centre of the output bearings [m]
A, B - identification of the bearings
A - bearing of the output side of the reduction gear
B - bearing of the input side of the reduction gear

RAx, RAy, RBx, RBy – identification of reaction on x-axis (axial direction) and y-axis (radial direction) in bearings A,B
L1 - distance between the centres of the output bearings [m]
L2 = a2+a3 - perpendicular distance between the vector of force F_r and the centre of the output bearing A [m]

M_c - Kippmoment [Nm]
F_r - Radialkraft [N]
F_a - Axialbelastung [N]

b - arm der Kraft F_a [m]
a1 - die Entfernung von der Mitte zwischen den Eingangslagern bis die Stirn des Abtriebsflansches [m]
a2 - die Entfernung von der Kraftwirkung F_r von der Stirn des Abtriebs flansches [m]
a3 - die Entfernung von der Mitte des Ausgangslagers A bis die Stirn des Abtriebsflansches [m]
a =a1+a2 - die Hebelarm der Kraftwirkung F_r bis die Mitte zwischen den Ausgangslager [m]
A, B - die Bezeichnung der Ausgangslager
A - der Lager aus der Außenseite des Getriebes
B - der Lager aus der Innenseite des Getriebes

RAx, RAy,RBx, RBy - die Bezeichnungen der Reaktien in der Achse x (Axialrichtung) und in der Achse y (Radialrichtung) in den Lagern A,B
L1 - gegenseitige Entfernung zwischen den Mitten der Eingangslager [m]
L2 = a2+a3 - die Entfernung der Kraftwirkung F_r von der Mitte des Ausgangslagers A [m]

Eq. 9.3: Tilting moment calculation

The tilting moment applied to the most loaded bearing A according Figure 9.3 is expressed as follows:

$$M_c = F_r (a2 + a3) + F_a b = F_r . L2 + F_a b$$

Eq. 9.4: Tilting moment to the most loaded bearing

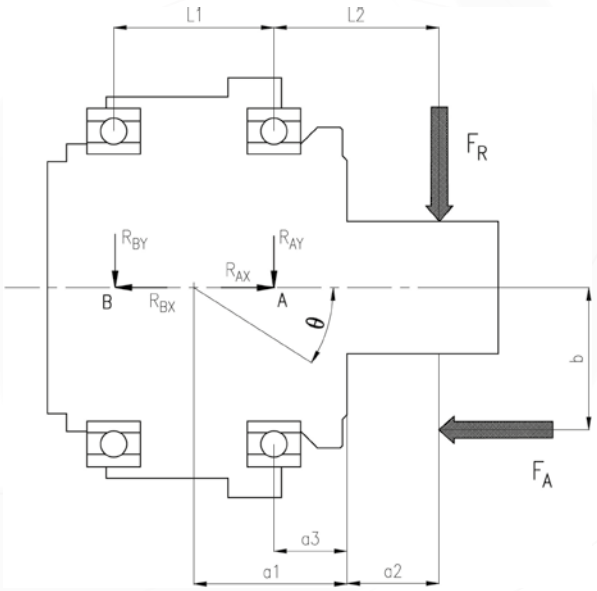


Fig. 9.3: Loading of size 050 and the angle of tilt

Tab. 9.1: Distance a1, a3 and L1 from Figure 9.3	
TS series M	**TS 50**
Distance / *Wert a1[m]*	0,02
Distance / *Wert a3[m]*	0,0095
Distance / *Wert L1[m]*	0,021

When checking external loads of the size 050 DriveSpin, proceed as follows:

a) Allowable axial load
$F_a \leq F_{a\,max}$
According to Tab. 9.5

b) Allowable tilting moment
$M_c \leq M_{c\,max}$
According to Tab. 9.6

c) Allowable radial load
$F_r \leq F_{r\,max}$
According to Tab. 9.7

d) Equivalent load
$P_{rA} \leq P_{r\,max}$
According to Tab. 9.4

Load capacity of output bearings of size 050

The standard version of the TwinSpin reduction gears used in DriveSpin size 050 has two sealed (2RS) deep groove ball bearings. Tab. 9.2 describes the basic dynamic and static load capacity of the two bearings and Tab. 9.3 is used for the calculation of the equivalent loading of one output deep groove ball bearing of the DriveSpin 050 size.

Tab. 9.2: Capacity of size 050 deep groove ball bearings	
TwinSpin M series reduction gear / *TwinSpin Getriebe der M-Baureihe*	**TS 50**
Basic dynamic load capacity C_r [kN] / *dynamische Grundtragfähigkeit C_r [kN]*	4,75
Basic static load capacity C_{or} [kN] / *statische Grundtragfähigkeit C_{or} [kN]*	3,85

Tab. 9.3: Calculation of the equivalent load of one deep groove ball bearing of size 050							
		Rx/Co	e	Rx/Ry <= e		Rx/Ry > e	
				X	Y	X	Y
Equivalent Radial Load *Äquivalente Radial-belastung*	Dynamic equivalent radial load *Dynamische äquivalente Radialbelastung* *Pr = X . Ry + Y . Rx* Values X and Y are in the table on the right *Die Werte X a Y befinden sich in der Tabelle rechts* Static equivalent radial load *Statische äquivalente Radi-albelastungPor = 0.6 Ry + 0.5 Rx* if value / *wenn der Wert Por < Ry, Por = Ry*	0,014 0,028 0,056 0,084 0,11 0,17 0,28 0,42 0,56	0,19 0,22 0,26 0,28 0,30 0,34 0,38 0,42 0,44	1	0	0,56	2,30 1,99 1,71 1,55 1,45 1,31 1,15 1,04 1,00

Where Rx, Ry are reactions in bearings A, B, i.e. identified as RAx, RAy, RBx, RBy, according to Figure 9.3.

Allowable load of output bearings of size 050

The table of nominal values Tab. 9.7 shows the allowable radial force $F_{r\,max}$, allowable axial load $F_{a\,max}$ and allowable tilting moment $M_{c\,max}$ applied to the output flange of the DriveSpin size 050 according to Figure 9.3. This is the load at which the gear achieves the nominal service life of its output bearings L_{10}= 6000 hrs at the nominal output speed $n_{r\,out}$ = 32rpm.

Service life of the output ball bearing for an equivalent radial load and the equivalent radial load can be determined from the formulas:

$$L_{10} = \frac{10^6}{60.n} \cdot \left(\frac{C_r}{P_r}\right)^3$$

Eq. 9.5: Service life calculation of the output ball bearing

L_{10} – service life [hrs]
n – operational speed [rpm]
C_r – basic dynamic load of the bearing [N]
P_r – equivalent radial load [N]

$$P_r = \frac{C_r}{(L_{10}.60.n.10^{-6})^{\frac{1}{3}}}$$

Eq. 9.6: Equivalent radial load

Tab. 9.4: Equivalent maximum radial load of size 050 output bearing	
M series high precision reduction gear (L_{10} = k, n =$n_{r\,out}$) *Präzisionsgetriebe der M-Baureihe (L_{10} = k, n =$n_{r\,out}$)*	TS 50
Ratio i *Übersetzungsverhältnis i*	63
Equivalent max. radial load of the output bearing $P_{r\,max}$ [N] *äquivalente max. Radialbelastung des Ausgangslagers $P_{r\,max}$[N]*	2 100

Allowable axial load of size 050

Tab. 9.5 shows the maximum allowable axial load $F_{a\,max}$, where the arm of the force is b=0 (Figure 9.3) and F_r=0 and M_c=0.

Tab. 9.5: Allowed axial load on the output bearings of size 050	
M series high precision reduction gear / *Getriebe der M Baureihe* **(L_{10} = k, n = $n_{r\,out}$)**	TS 50
Ratio i / *Übersetzungsverhältnis i*	63
Allowable axial load $F_{a\,max}$ [N] /erlaubte Axialbelastung $F_{a\,max}$ [N] **(F_r = 0, M_c = 0, b = 0)**	1 900

Allowable tilting moment of size 050

When only an external tilting moment M_c is applied to the output flange of the DriveSpin size 050, the following applies to the maximum value $M_{c\,max}$ of the moment in Tab. 9.6:

$$M_{c\,max} = P_{r\,max} \cdot L_1$$

Eq. 9.7: Maximum value of applied tilting moment calculation

Tab. 9.6: Allowable tilting moment at the output flange of size 050	
M series high precision reduction gear / *Getriebe der M Baureihe* (L_{10} = k, n = $n_{r\,out}$)	TS 50
Allowable tilting moment $M_{c\,max}$ [Nm] / *erlaubtes Kippmoment $M_{c\,max}$ [Nm]*	44

Allowable radial load of size 050

The allowable radial load values $F_{r\,max}$ when F_a =0 (Tab. 9.7) are calculated from formula:

$$F_{r\,max} = \frac{M_{c\,max}}{(a_2 + a_3 + L_1)}$$

Eq. 9.8: Allowable radial load calculation

Tab. 9.7: Allowable radial load on output flange of size 050	
M series high precision reduction gear / *Getriebe der M Baureihe* (L_{10} = k, n = $n_{r\,out}$, F_a = 0)	TS 50
Allowable radial load / *Erlaubte Radialbelastung* $F_{r\,max}$ [N]	44 / (a2 + 0,0305)
Allowable radial load for / *erlaubte Radialbelastung* a_2 = 0 , $F_{r\,max}$ [N]	1440 N

Where a2 is the perpendicular distance between the vector of force F_r and the face of the output flange in [m]. Figure 9.3

Allowable load on the output flange of DriveSpin size 050 when both radial and axial force are applied

When both radial force F_r and axial force F_a are applied to the output flange, according to Tab. 9.3, the equivalent load is calculated as follows:

$$PrA = X.\left(\frac{\left(F_a.b + F_r.(a_2 + a_3)\right)}{L_1 - F_r}\right) + Y.F_a$$

$$PrA = X.\left(\frac{M_c}{L_1 - F_r}\right) + Y.F_a$$

Eq. 9.9: Equivalent load when both radial and axial force applied

Where the coefficients X and Y are calculated according to Tab. 9.4 as follows:

$$\frac{RAx}{C_{or}} = \frac{F_a}{C_{or}} \rightarrow X, Y$$

$$\frac{RAx}{RAy} = \frac{F_a}{\left(\frac{\left(F_a.b + F_r.(a_2 + a_3)\right)}{L_1 - F_r}\right)} \rightarrow X, Y$$

$$\frac{RAx}{RAy} = \frac{F_a}{\left(\frac{M_c}{L_1 - F_r}\right)} \rightarrow X, Y$$

Eq. 9.10: Coefficients X and Y calculation

Tilting stiffness

The DriveSpin actuators are able to withstand external forces and moment loads by means of integrated output bearings. When output flange is loaded, the flange deflection angle is proportional to the applied tilting moment. Tilting stiffness M_t is a tilting moment at which the output flange deviates by an angle Θ=1'. The M_t values are specified in parameter tables and the tilting angle of the output flange can be determined as follows:

$$\Theta = \frac{F_r.a + F_a.b}{M_t}$$

Θ -output flange tilting angle [arcmin]
M_t –moment rigidity [Nm/arcmin]
Fr –radial load [N]
F_a –axial load [N]
a –arm of force F_r [m] (a=a1+a2, a1=L/2)
b –arm of force F_a [m]

Eq. 9.11: Tilting angle of output flange

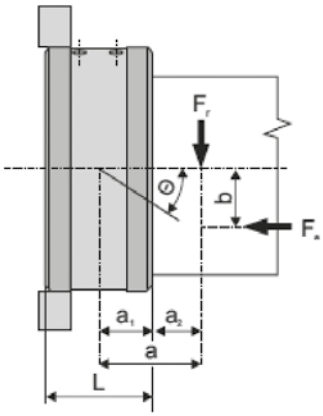


Fig. 9.4: Load and the tilting moment on the output flange

Torsional stiffness

With the input shaft of actuator/reducer locked and torque applied to the output flange of the actuator/reducer the torsional stiffness represents the elastic rotation of output in relevance to applied torque. The measured values of twist in relevance to applied torque creates a hysteresis curve see Figure 9.5:

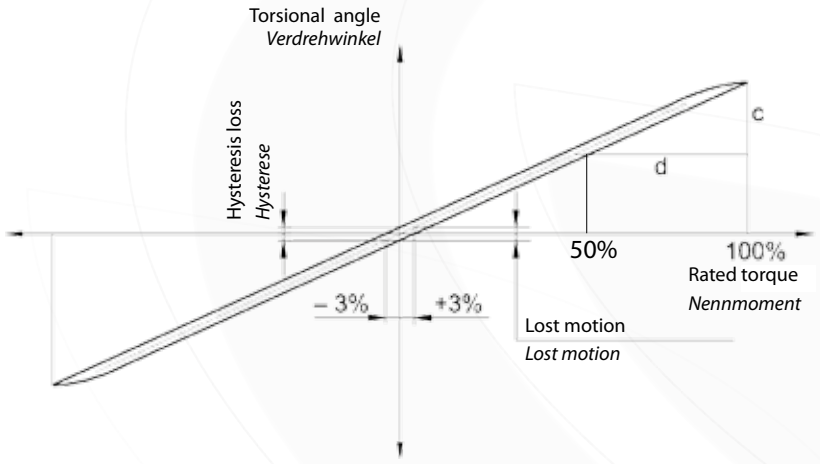


Fig. 9.5: Hysteresis curve

On the basis of this measurement torsional stiffness k_t is defined as follows:

$$k_t = \frac{d}{c}$$

Eq. 9.12: Torsional stiffness

Torsional stiffness values are statistical values for particular reduction ratio.

Lost motion

The transmission mechanism of TwinSpin reduction gears used in DriveSpin actuators is manufactured and assembled in such a way that there is a zero backlash in the gear. Lost motion values are provided in parameter tables. It is value that defines stiffness of movement of output flange in low torque region of +/-3% rated torque of hysteresis curve see Figure 9.5.

Hysteresis

Hysteresis curve in the region of no torque applied at the output flange expresses the amount of friction in the reduction gear. Hysteresis loss occurs as a result of the internal friction in the reduction gears. This loss is stated in parameters as Hysteresis H.

Gear Lubrication

TwinSpin reduction gears used in DriveSpin actuators are lubricated with grease Castrol OPTITEMP TT1. It is forbidden to mix the lubricant used for the lubrication of the reduction gear with other types of lubricants. In case of different lubrication contact sales department.
High temperatures and high speeds and loading will reduce the service life of the lubricant. In many case relubrication will not be necessary because the reduction gear is filled for a long life. As a guideline, 20 000 hours of operation may be considered as service life.
When the reduction gear is in operation, the temperature of the lubricant should not exceed the maximum temperature defined by the lubricant manufacturer. Otherwise it is necessary to take into consideration possible loss of lubricating properties of used lubricant.

Tab. 9.8: Range of use and lifetime of lubricants

Lubricant *Schmiermittel*	**Type** *Type*	**Range of use** *Einsatzbereich*
Castrol OPTITEMP TT1	Grease / *Fett*	-60°C - + 120°C

Since the thermal conditions inside and on the surface of the reduction gear are less extreme in standard operation than the range of use for the lubricant, the lifetime of the lubricant filling is higher than it is stated in corresponding table by manufacturer.

Reduction gear limit temperatures

In extreme duty cycles the reduction gear surface warming should not exceed 40°C at ambient temperatures of 20°C to 25°C. For special environments, environments with ambient temperature higher than 40°C, worse conditions for heat dissipation or some other cases where is a risk of heat causing damage to actuator the cooling of actuator is to be consulted, please contact our sales department. For applications with low ambient temperatures pre-heating of actuator might have a favorable effect on actuator performance. In both cases of extreme environmental conditions please consult the choice of actuator with our sales department.

Standard ambient temperature range

The DriveSpin actuators are designed for the ambient temperature range of -10°C to +40°C However performance in whole standard ambient temperature range may differ. For further information please contact sales department. For different ambient temperatures please contact our sales department.

Working environmental conditions

DriveSpins and its version described in this catalogue are designed for altitudes up to 1000 meters above sea level and standard ambient temperature range. For other working environmental conditions please contact our sales department.

DC BUS voltage

Designed terminal to terminal peak value of voltage generated in the winding of PMSM by inverter to reach rated performance.

Note: With regards to servo amplifier selection there are drives with rectifier which rectifies 1phase 230V+/-10% at 50Hz into a DC bus voltage corresponding to 320VDC and for 3phase 400V +/-10% at 50Hz supplied drive rectifies into a DC bus voltage corresponding to 560 VDC (both refers to Standard European Grid). For low voltage DC bus servo amplifiers do not contain rectifier and are usually supplied directly with DC voltage. Low voltage DC bus designed actuators can be used in application where safe voltage is required or for example where supply is done through battery.

Motor rated speed

Is the nominal value of the rotor angular velocity (at input shaft) for which the electromotor develop the continuous nominal torque, when the continuous nominal current and the design voltage is applied to the windings.

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 DriveSpins 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 DriveSpins 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

Define 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 8500 hours with class F.

Paint

Standardly RAL 9005 black color. 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 Figure 9.1. 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 Jm. 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

Eq. 9.13: Calculation of reflected inertia of load to input shaft.

Duty cycle

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

Tab. 9.9: 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.

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

Werte der axialen und radialen Laufabweichung des Abtriebsflansches

Tab. 10.1: Values of the axial and radial run-out of the output flange
Werte der axialen und radialen Laufabweichung des Abtriebsflansches

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

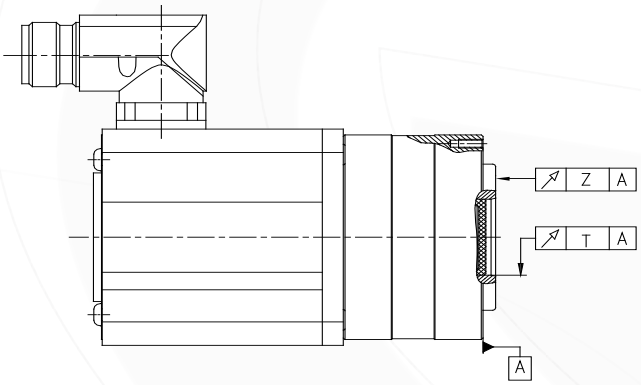


Fig. 10.1: Axial and radial runout to base A

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 Figure 10.2. In the case of a connection subjected to shocks and cyclical loads, it is necessary to secure the connection against self-loosening.

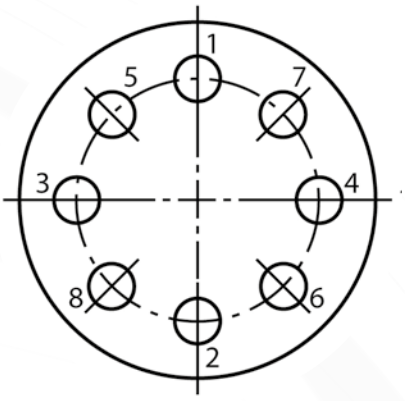


Fig. 10.2: Tighten the screws along the perimeter of a circle in a cross-like manner

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. 10.2.

Tab. 10.2: Tightening torques of screws / *Anzugsmomente der Schrauben*			
Screw *Schraube*	**Tightening torque** ***Anzugsmoment*** [Nm]	**Clamping force** ***Klemmkraft*** [N]	**Screw material class and specification** ***Festigkeitsklasse und Spezifikationen der Schrauben***
M3	1.9	3100	ISO 898 T1 10.9 or / *oder* 12.9
M4	4.3	5300	
M5	8.4	8800	
M6	14	12 400	

The allowed torques transmitted by the connection screws on the output flange and the casing are contained in Tab. 10.3.

Tab. 10.3: Allowed torques transmitted by the connecting screws on the output flange and casing *Zulässige Antriebsmomente, übertragen von der Schraubverbindung auf Abtriebsflansch und Gehäuse*						
Type	Output flange / *Abtriebsflansch*			Case / *Gehäuse*		
	Number x screw ***Anzahl x Schraube***	**Pitch diameter** ***Teilungs-durchmesser*** [mm]	**Transmitted torque** ***Übertragenes Drehmoment*** [Nm]	**Number x screw** ***Anzahl x Schraube***	**Pitch diameter** ***Teilungs-durchmesser*** [mm]	**Transmitted torque** ***Übertragenes rehmoment*** [Nm]
DS/DSH/DSM 050	10xM4	28	100	4xM5	63	165
DS/DSH/DSM 070	14xM4	42	233	16xM3	64	238
DS/DSM 095	18x M4	53	85	18xM4	88	85
DS/DSH/DSM 110	14xM6	69	898	12xM5	100	792
DSH 115	18x M5	68	173	18xM4	108	173
DS 140	14xM6	92	1 740	12xM6	127	1 410
	DSH 155	74				
DSH 155	8xM6	146	1 300	18xM6	100	1 480

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. The reduction gear is a high-precision product, therefore it requires careful manipulation, installation, and demounting.
Any tampering with the (disassembly, assembly) constitutes immediate loss of warranty. If a fails due to a fault in its manufacturing or a material defect, please inform the manufacturer, who will carry out professional repair or replacement.

Instandhaltung

Das Untersetzungsgetriebe benötigt keine besondere Instandhaltung. Beim Einbau müssen die jeweilgen Maß- und Lagetoleranzen der Mittendurchmesser eingehalten werden. Das Untersetzungsgetriebe ist ein hochpräzises Erzeugnis. Bei der Handhabung, Installation
und Demontage ist Sorgfalt aufzuwenden. Bei unautorisierten Eingriffen in das (Demontage, Montage) geht der Garantieanspruch verloren. Bei Ausfall aufgrund von Herstellungs- oder Materialfehlern bitte den Hersteller informieren. Dieser übernimmt fachmännische Reparatur oder Austausch.

Delivery conditions

DriveSpin is delivered completely assembled, without fixing screws, filled with grease, and in a protective package. Each actuator is identified with a type label, see identification label.

Lieferbedingungen

DriveSpin wird komplett zusammengebaut geliefert, ohne Befestigungsschrauben, geschmiert und geschützt verpackt. Jedes Aktuatore trägt ein Typenschild mit folgenden Angaben.

Transport of actuators

Within 14 days after its reception, inspect the delivery for possible damage during transport. Immediately inform the transport agent, if damage has occurred. In such a case also make sure the release for operation is prevented.
During transport, observe the recommended measures:
• Suitable climatic conditions according to Category 2K3 of the EN 50178 standard;
• Allowed transport temperature -25 to +70°C, max. allowed temperature change 20°C/h;
• Allowed relative humidity during transport = 5% to 95% without condensation;
• Air pressure according to 2K3 is 70 to 106 kPa;
• Transport is only allowed to be done by qualified persons and in the original recyclable packaging;
• If the packaging is damaged, inspect the actuator for visible damage. Inform the transport agent and possibly the manufactuer.

Transport von Aktuatoren

Bitte untersuchen Sie innerhalb von 14 Tagen nach Erhalt die Lieferung auf mögliche Transportschäden. Im Falle eines Schadens sofort das Transportunternehmen informieren. In einem solchen Fall ist sicherzustellen, dass die Betriebsfreigabe unterdrückt ist.
Während des Transports sind folgende Maßnahmen zu beachten:
• Angemessene klimatische Bedingungen gemäß Klasse 2K3 der EN 50178;
• Zulässige Transporttemperatur -25 bis +70°C, max. zulässiger Temperaturwechsel 20°C/h;
• Zulässige relative Feuchtigkeit während des Transports = 5% bis 95% ohne Kondensation;
Der Luftdruck gemäß 2K3 ist 70 bis 106 kPa;
• Der Transport ist nur zulässig von qualifizierten Personen und in der originalen wiederverwendbaren Verpackung;
• Wenn die Verpackung beschädigt ist, Aktuator auf sichtbare Schäden prüfen. Transportunternehmen informieren, möglicherweise auch den Hersteller.

Warranty

The warranty is specified in the General Delivery Terms and Conditions.

Final statement

Any design changes, modifications and improvements, aimed at increasing the technological level of the reduction gear, which, however, does 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.

General

• During the handling it is necessary to avoid handling metal surfaces without surface protection (functional surfaces) with bare hands.
• Use the FIFO procedure for picking products after their delivery from warehouses.
• Each warehouse has to be equipped with a humidity meter and a thermometer.
• Inspection of the packaging should be done at least once in 6 months, depending on the storage conditions. (Early discovery of damaged packaging makes it easier to identify the extent and source of the problem. Thus we are able to make sure that the packaging is well closed, undamaged and it meets all quality criteria.)
• Store in closed storage rooms in line with the general storage conditions.
• The storage period starts running on the day of the acceptance of the delivery of actuators.
• The date of the acceptance of the delivery should be recorded for the need to specify the expiry of the storage period and possible application of a preservation procedure to prolong the storage period.
• Single-piece packaging should be stored in the position according to the mark (BZ11) – with that mark upright which is labeled at packaging.

Improper warehousing may cause irreversible damage to the DS actuator.

Garantie

Garantie ist in der allgemeinen Lieferbedingungen angegeben.

Schlußbestimmungen

Konstruktionsänderungen oder Ergänzungen, zwecks der Verbesserung des Getriebes, die technischen Eigenschaften, Installations - und Einbauabmessungen nicht verändern, können vom Hersteller ohne vorherige gegenseitige Vereinbarung durchgeführt werden. Alle Konstruktionsänderungen und Verbesserungen, die wesentlichen Merkmale des Getriebes beeinflüssen, bedürfen einer entsprechenden Abstimmung.

Allgemein

• Es ist darauf zu achten, dass metallische Oberflächen ohne Abdeckung (funktionelle Oberflächen) nicht mit bloßen Händen berührt werden.
• Entnehmen Sie Produkte nach dem FIFO Verfahren nach ihrer Lieferung aus dem Lager.
• Jedes Lager ist mit einem Feuchtigkeitsmesser und einem Thermometer auszustatten.
• Die Verpackung ist mindestens einmal alle 6 Monate zu überprüfen; abhängig von den Lagerbedingungen. (Wenn eine Beschädigung einer Verpackung frühzeitig entdeckt wird, ist es leichter, Umfang und Ursache des Problems herauszufinden. Auf diese Weise kann sichergestellt werden, dass die Verpackung richtig geschlossen ist, unbeschädigt, und alle Qualitätskriterien erfüllt.)
• Die Lagerung muss in geschlossenen Lagerräumen gemäß den allgemeinen Lagerungsbedingungen erfolgen.
• Der Lagerzeitraum beginnt mit dem Tag der Lieferannahme der Aktuatoren.
• Das Datum der Lieferannahme sollte gegebenenfalls notiert werden, um den Ablauf des Lagerzeitraum festzulegen und mögliche Konservierungsmaßnahmen einzusetzen, zur Verlängerung des Lagerzeitraums.
• Einteilige Verpackungen sind gemäß der Markierung (BZ11) zu lagern, diese Markierung nach oben.

Unvorschriftsmäßige Lagerung kann zu irreversiblen Schäden am DS Aktuator führen.

Storing for less than 6 months

Short-term storage conditions

• Suitable climatic conditions according to category 1K4 of the EN 50178 standard
• Storage temperature: +5 to 25°C, max. allowed change in temperature 10°C/h
• Storage humidity: < 60% RH without condensation
• Storage area: Indoor, with an elevation 1000 m MSL or less Environment without dust, corrosive gases and without direct sunlight.
• Storage pressure: 86 to 106 kPa
• Store only in the original packaging from the manufacturer.
• Prevent contact of the actuator with chemical substances.
• Prevent direct sunlight and artificial light with a high ultraviolet light component.
• Prevent aeration.

Storage area

The storage area should be
• without vibrations, closed, in a cold, dry place, sufficiently air-conditioned
• protected against attacks by insects and rodents

Lighting

It is necessary to avoid:
• exposure to direct sunlight
• artificial light with a high ultraviolet light component
• ultraviolet/fluorescent light sources
• mercury discharge lamps

Temperature and humidity

• ideal storage temperature is +5°C to + 25°C
• maintain the temperature constant, if possible; avoid short-term fluctuations
• maintain distance at least one meter from heat radiators, without drafts
• humidity < 60%

Ozone and gases

During the whole period avoid storing in immediate closeness of:
• ozone and exhaust gases
• solvent vapours, petrol, chemicals, acids, disinfecting agents, rubber-solving agents
• strong electric discharges, sparkling (electric motors)

Lagerung unter 6 Monaten

Bedingungen für kurzzeitige Lagerung

• Angemessene klimatische Bedingungen gemäß Klasse 1K4 der EN 50178
• Lagerungstemperatur: +5 bis 25°C, max. zulässiger Temperaturwechsel 10°C/h
• Lagerfeuchtigkeit: < 60% RH ohne Kondensation
• Lagerungsbereich: Innen, bis zu einer Höhe von 1000 m MSL Umgebung staubfrei, ohne korrosive Gase, keine direkte Sonneneinstrahlung.
• Lagerungsdruck: 86 bis 106 kPa
• Lagerung nur in der Originalverpackung des Herstellers.
• Der Aktuator darf nicht mit chemischen Substanzen in Berührung kommen.
• Direkte Sonneneinstrahlung und künstliche Beleuchtung mit hohem ultravioletten Anteil vermeiden.
• Luftzufuhr vermeiden.

Lagerbereich

Der Lagerbereich sollte folgendermaßen beschaffen sein
• keine Erschütterungen, geschlossen, an einem kühlen, trockenen Ort, ausreichend belüftet
• geschützt vor Insekten und Nagetieren

Beleuchtung

Auf jeden Fall vermeiden:
• direktes Sonnenlicht
• künstliches Licht mit hohem ultravioletten Anteil
• ultraviolette/fluoreszierende Lichtquellen
• Quecksilberdampflampen

Temperatur und Feuchtigkeit

• ideale Lagertemperatur: +5°C bis + 25°C
• Temperatur möglichst konstant halten; kurzzeitige Schwankungen vermeiden
• Mindestabstand von Heizkörpern ein Meter, keiner Zugluft
• Feuchtigkeit < 60%

Ozone und Gase

Während des gesamten Zeitraums nicht in der Nähe von
• Ozon und Abgasen
• Lösemitteldämpfen, Benzin, Chemikalien, Säuren, Desinfektionsmitteln, Gummi-Lösungsmitteln
• starken elektrischen Entladungen, Zündungen (Elektromotoren) lagern

REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)

Regulation (EC) No. 1907/2006 of the European Parliament and of the Council concerning the registration, evaluation, authorisation and restriction of chemicals.

REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)

Verordnung (EG) Nr. 1907/2006 des Europäischen Parlaments und des Rates zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe.

RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment)

Directive 2011/65/EU of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment)

Richtlinie 2011/65/EU des Europäischen Parlaments und des Rates zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten.

CE (Conformité Européenne)

The product is in conformity with the relevant basic European technical standards applicable to the product.

CE (Conformite Europeenne)

Das Produkt entspricht den für das Produkt geltenden grundlegenden europäischen technischen Normen.

SPINEA TECHNOLOGIES

SPINEA
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