

GPA *Servo Planetary Geared Motors*



Dynamic performance from a single compact unit



No matter which drive solution you imagine, we make your dreams come true.

True to our slogan (one stop shopping) we offer you a complete programme of electronic and mechanical drive systems which is distinguished by reliability and efficiency.

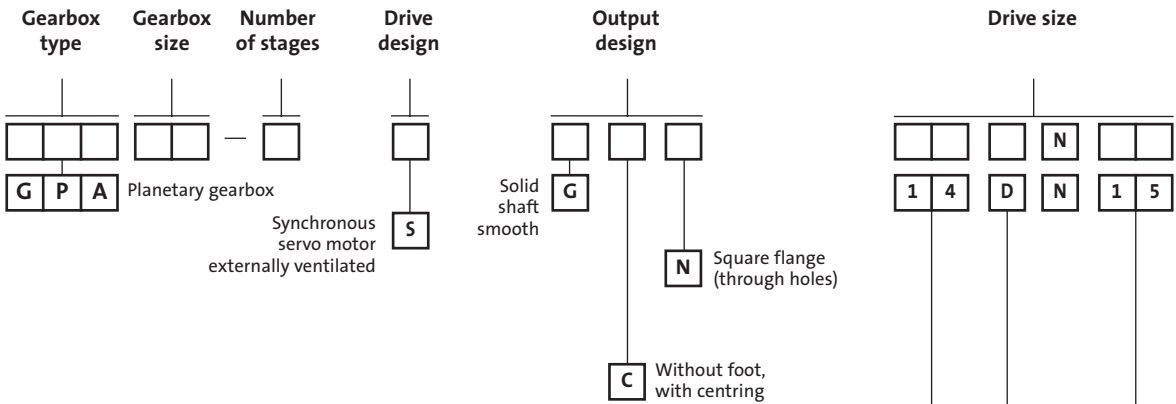
The scope of our programme includes frequency inverters, servo controllers, variable-speed drives, speed reduction gearboxes, motors, brakes, clutches, decentralised I/O and operator and display units.



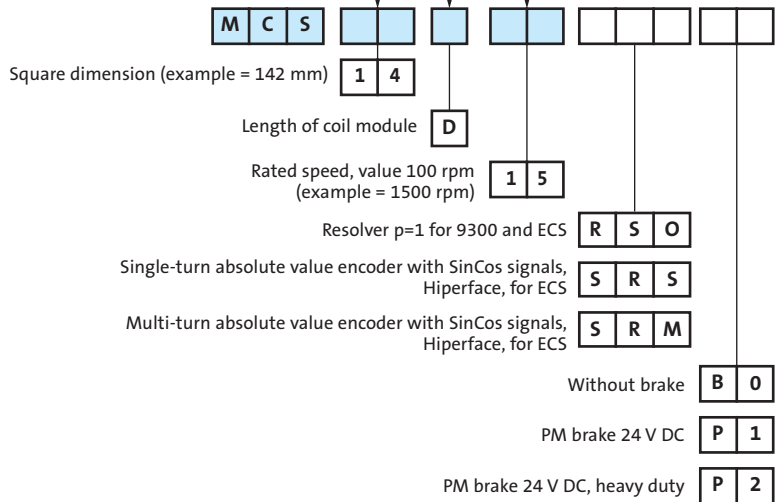
Many well-known companies use Lenze products in various applications.

Product key

Servo planetary geared motors



Extended servo motor key



Notes on ordering see page 1-9

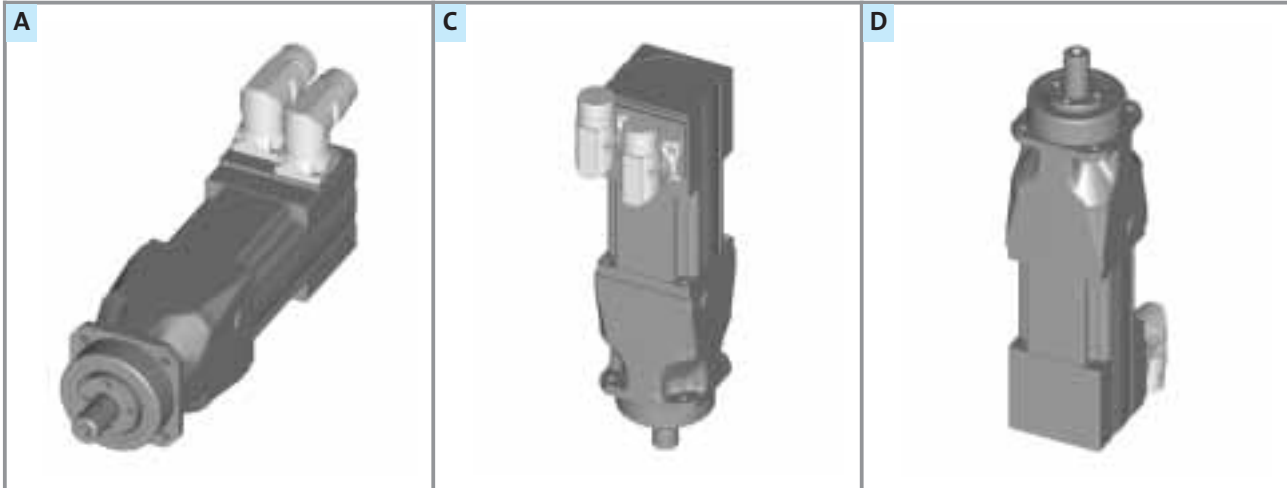
Example order see page 1-10

Fax orders see page 1-12

Mounting positions | Servo planetary geared motors

Mounting position (A, C, D)

GPA



Lenze | An introduction

Lenze is the competent partner for your application. Lenze is not only a supplier for single components but also offers solutions for complete drive systems including planning, execution and commissioning.

Furthermore, a worldwide service and distribution network lets you engage a qualified customer advisory service and an after sales service that is fast and extensive.

Our quality assurance system for design, production, sales and service is certified according to DIN ISO 9001 : 2000. Our environmental management system is also certified to DIN EN ISO 14001.

Our customers set the standards for measuring the quality of our products. Our task is to meet your requirements, since customer orientation is a Lenze principle demanding the best quality.

See for yourself.



A worldwide service –
Our team of experts provides reliable and
professional assistance.

A true system | Drive and automation technology

Products which are setting the pace in terms of technology and complete drive solutions for machine and system production - just what Lenze is all about. We provide our customers with frequency and servo inverters with powers up to 400 kW. We support both central control cabinet solutions and decentralised drive concepts, e.g. with motor inverters with IP65 type of protection.

Both standard three-phase AC motors and synchronous and asynchronous servo motors are available to complement the various controllers, all of which can be combined with various types of gearboxes. Human Machine Interfaces, decentralised I/O systems and modules for fieldbus interfacing are also available for exchanging information.

Lenze boasts extensive application know-how in all manner of industries. This knowledge has been applied in the design of the controller and PC software, providing an efficient means of implementing numerous standard applications using simple parameter settings.

An all-round service comprising component selection advice, training, commissioning support and even a helpline which can be accessed all over the world and independent system engineering completes the offer.



9300 servo inverter



ECS servo system for multi-axis application



Communication modules



9300 vector frequency inverter



8200 vector frequency inverter



8200 motec motor inverter



starttec motor starter



PC software



Software packages



Servo motors

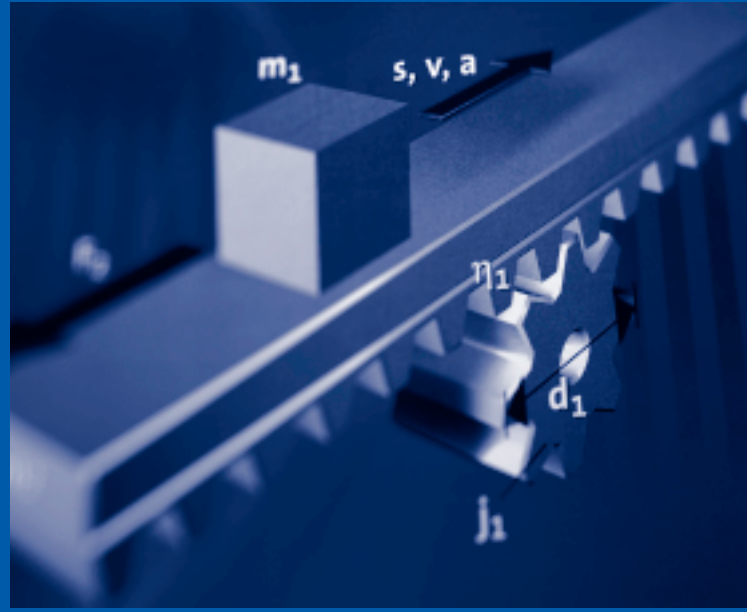


Small drives



Brakes and clutches





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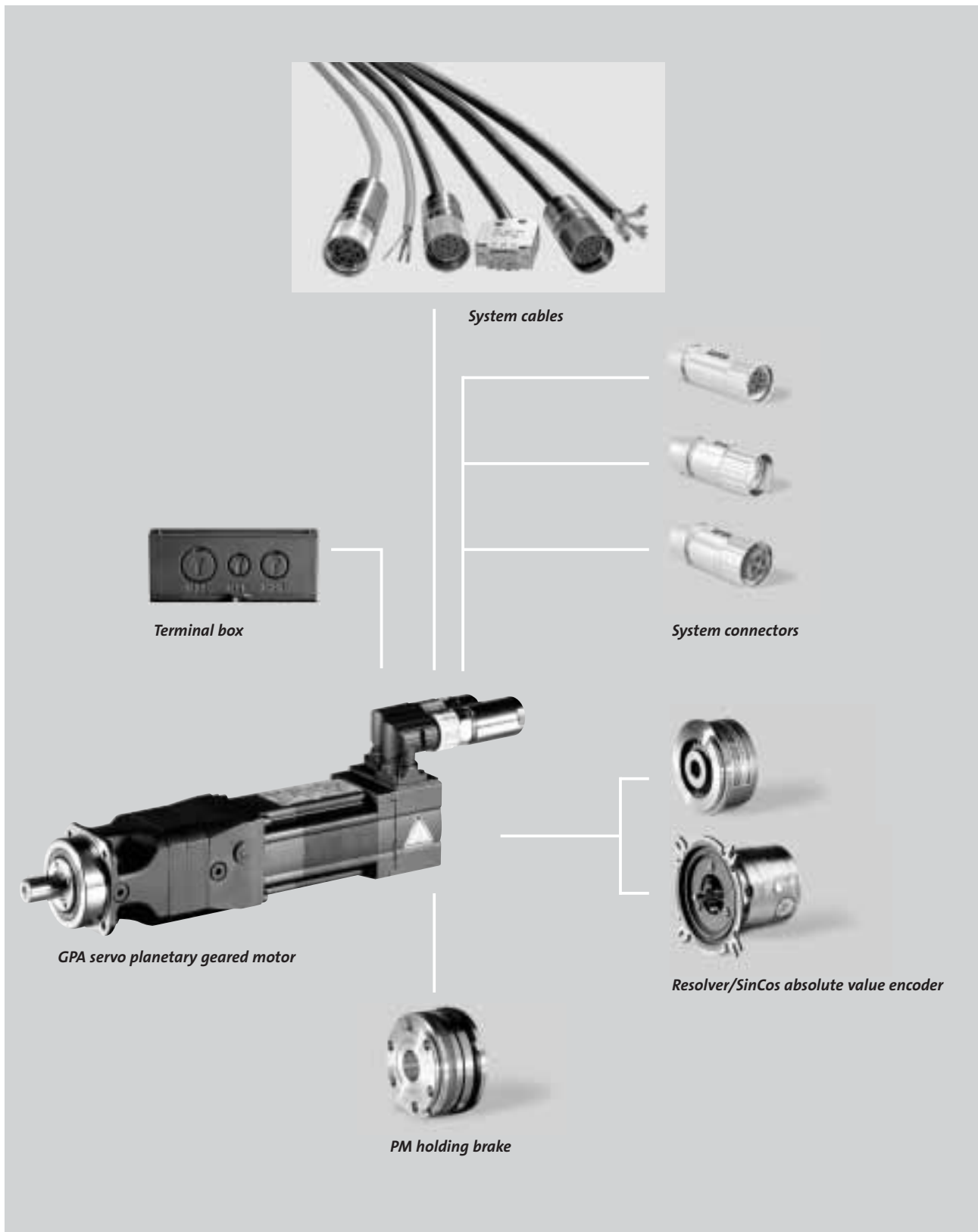
Lenze worldwide _____

5



General | Servo planetary geared motors

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GPA servo planetary geared motors

Today, the demands placed on servo drive systems are tougher than ever. With the Lenze Global Drive System, we can offer a perfectly co-ordinated package of geared motors and controllers.

With many years of experience in the field of electromechanical drive technology and, in particular, servo technology, we have been able to steadily adapt our gearboxes, motors and drive controllers to increasing requirements in terms of dynamic performance, accuracy and drive behaviour.

The result is something we can be proud of: gearboxes and geared motors based on the tried and tested G-motion range, enhanced by the addition of servo planetary geared motors.

Complete intelligent drive solutions from Lenze

The benefits for customers are clear: gearboxes, servo motors and drive controllers can be selected, supplied and easily commissioned as a unit – without compromise.

Potential applications

Servo planetary gearboxes are additional to the existing range of gearboxes and are used for applications in materials handling, packaging and conveyor technology – everywhere there is a requirement for minimal backlash combined with maximum power density.



GPA servo planetary geared motors

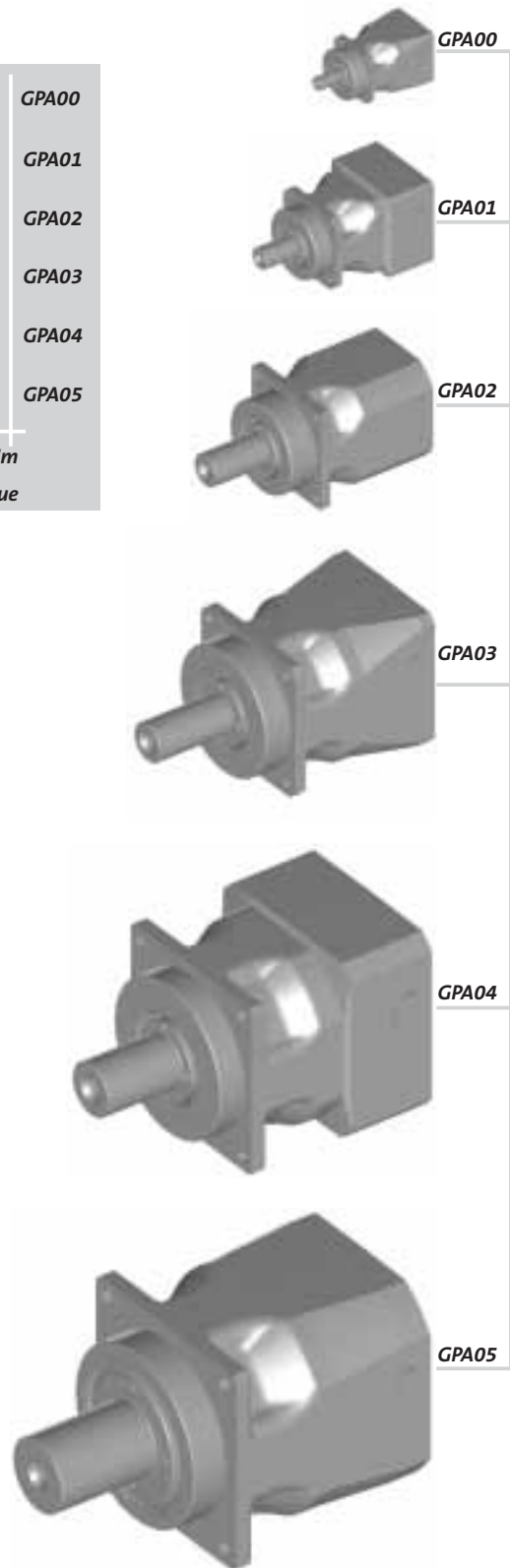
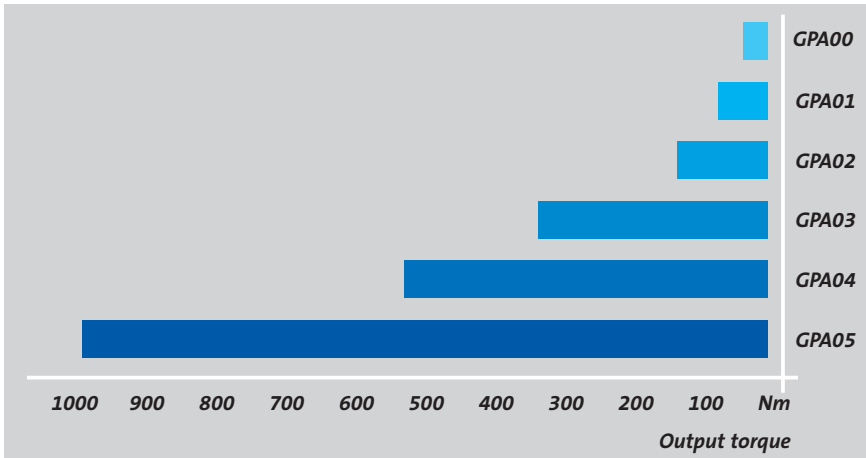


ECS servo controller



9300 servo inverter

Servo planetary gearbox



Quiet

The optimised geometry of the gear teeth reduces the amount of noise generated, resulting in a drive which runs very smoothly and evenly. High inverter switching frequencies (up to 16 kHz) also help to reduce noise.

Compact

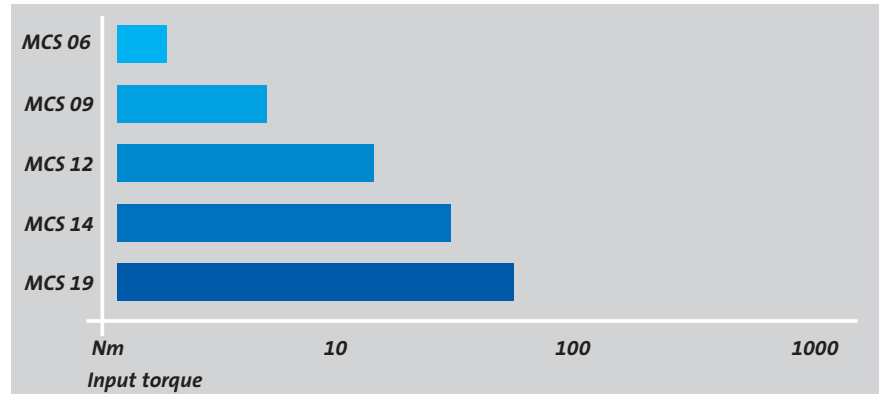
Small yet highly dynamic drive units are made possible by combining the high power density of the servo planetary gearboxes with the advantages of new compact servo motors.

Reduced backlash

The low backlash connections of the Lenze planetary gearboxes and the high torsional rigidity combine to provide very low backlash compared to conventional gearboxes. The use of backlash-free permanent magnet holding brakes also ensures that a position can be held when no current is applied to the drive.



MCS motors



Making the most of technological advantages

Thanks to the new SEpT design^{*)}, the MCS synchronous servo motors generate a distortion-free, purely sinusoidal working field.

This ensures excellent concentricity and a maximum power density. The optimised field form eliminates troublesome detent torques.

^{*)} SEpT: Single Element Pole Technology

Easy to install

The process of installing and (if necessary) removing GPA servo planetary geared motors is quick and uncomplicated. With the easily accessible mounting holes and plug-in motor connections, fast installation and commissioning times are guaranteed.



General Abbreviations

α		Angle of action of radial force	k		Operating factor (corresponding to DIN 3990)
φ	-	Ratio step	k_1		Intensity of gearbox load capacity
η	[%]	Mechanical efficiency	k_j		Load-matching factor
η_G	[%]	Mechanical efficiency of gearbox	k_L		Overload factor
AC		AC current/voltage	k_{n1}		Speed reduction factor ambient temperature
c		Load capacity of servo geared motors	k_{n2}		Speed reduction factor mounting position
cos φ		Power factor of motor	k_{n3}		Speed reduction factor operating time/average speed
cos φ_N		Power factor of asynchronous motors	k_m		Speed correction factor average speed
DC		Direct current/voltage	KE_{LL} [V/1000 rpm]		Voltage constant (phase-to-phase)
DT		Operating time	Kt_0 [Nm/A]		Torque constant at standstill
f_a		Effective direction factor at output shaft	L_{phase} [mH]		Winding inductance per phase
f_{chopp} [kHz]		Switching frequency	m [kg]		Mass
f_N [Hz]		Rated frequency	M_A [Nm]		Motor starting torque
f_w		Load application factor at output shaft	M_B [Nm]		Brake holding torque
f_z		Additional radial force factor for transmission element	M_{eff} [Nm]		Effective torque at output
F_a [N]		Acting axial force	M_L [Nm]		Load torque
$F_{a Tab}$ [N]		Table value for axial force	$M_{L max}$ [Nm]		Maximum load torque
$F_{a perm}$ [N]		Permissible axial force	$M_{L z}$ [Nm]		Load torque per time segment
F_r [N]		Acting radial force	M_{max} [Nm]		Maximum motor torque
$F_{r Tab}$ [N]		Table value for radial force	M_N [Nm]		Rated torque
$F_{r perm}$ [N]		Permissible radial force	$M_{S z}$ [Nm]		Acceleration torque
i		Ratio	$M_{S eff}$ [Nm]		Effective torque
I_B [A]		Rated brake current	M_z [Nm]		Output torque per time segment
I_{max} [A]		Maximum current	$M_{p max}$ [Nm]		Maximum output torque of profile
I_N [A]		Rated current	M_0 [Nm]		Continuous standstill torque
I_{RN} [A]		Continuous current for drive controller	M_1 [Nm]		Driving torque
$I_{R max}$ [A]		Maximum current for drive controller	M_2 [Nm]		Output torque
I_0 [A]		Continuous standstill current	$M_{2 max}$ [Nm]		Maximum output torque
J_B [kgm ²]		Moment of inertia of brake	$M_{2 GN}$ [Nm]		Rated gearbox torque $c=1$ on output
J_{GM} [kgm ²]		Moment of inertia of geared motor reduced to motor shaft	n_L [rpm]		Load speed
J_L [kgm ²]		Moment of inertia of load on output shaft	$\Delta n_{L z}$ [rpm]		Load speed per time segment
J_{Motor} [kgm ²]		Moment of inertia of motor	n_{max} [rpm]		Maximum speed
			n_N [rpm]		Rated speed
			n_m [rpm]		Average speed
			n_1 [rpm]		Drive speed
			$n_{1 max}$ [rpm]		Maximum drive speed
			n_2 [rpm]		Output speed
			$n_{2 ref}$ [rpm]		Output speed at rated motor speed
			$n_{2 therm}$ [rpm]		Thermal limit speed at output



P_N	[kW]	Rated power	T	[s]	Load cycle time
P_V	[kW]	Inverter power loss	t_L	[%]	Runtime at maximum torque
P_1	[kW]	Driving power	T_U	[°C]	Ambient operating temperature
			Δt_z	[s]	Individual time segments
R_{UV}	[Ω]	Winding resistance	U_B	[V]	Rated brake voltage
S_N	[kW]	Output power of inverter	U_N	[V]	Rated voltage
			U_M	[V]	Rated motor voltage

CE	Communauté Européene	NEMA	National Electrical Manufacturers Association
CSA	Canadian Standards Association		
DIN	Deutsches Institut für Normung	UL	Underwriters Laboratory
EMC	Electromagnetic compatibility	UR	Underwriters Laboratory recognised component
EN	European standard		
IEC	International Electrotechnical Commission	VDE	Verband deutscher Elektrotechniker
IM	International Mounting Code		
IP	International Protection Code		

Basis for the data specified in the Catalogue

Outputs, torques and speeds

The outputs, torques and speeds specified in the catalogue are rounded values and apply for

- ▶ daily running time of 8 h, 240 days a year
- ▶ ambient temperature up to 30°C
- ▶ operating time 70% of day
- ▶ average speed 80% of design speed
- ▶ site altitude up to 1000 m amsl
- ▶ mounting positions and construction types listed in the catalogue (selection table relates to mounting position A)
- ▶ standard lubricant

Under different operating conditions the values obtained may vary from those listed here.

For extreme operating conditions please consult your Lenze agent.

Load capacity c of gearbox

Characteristic value for the load capacity of Lenze gearboxes and geared motors.

- ▶ c is the ratio of the permissible rated torque of the gearbox to the rated torque delivered by the drive component (e.g. the integrated Lenze motor).
- ▶ c must always be greater than the operating factor k determined for the application.

Operating factor k (corresponding to DIN 3990)

Takes account of the influence of actual fluctuating loads over the intended runtime of geared motors.

k depends on

- ▶ the type of load
- ▶ the intensity of the load
- ▶ transient influences



We aim to process your order quickly and accurately, so we need you to give us full ordering details.

The following checklist and ordering procedure should help.

Checklist

In order to process your order quickly and accurately we need:

- ▶ Your address and order data.
- ▶ Our product key for the individual products in this catalogue.
- ▶ Your delivery details, such as delivery date and delivery address.

Ordering procedure

Use these step-by-step instructions and fax templates to ensure you specify all the necessary order data correctly.

Ordering your made-to-measure drive is easy:

- ▶ Copy the fax template.
See page 1-2.
- ▶ Enter the details of your order.
- ▶ Send or fax the template to your local Lenze agent.
A list of Lenze sales offices can be found at the end of this catalogue.



General

Example order

- **Cross-reference**
- Result

1. Dimension the drive system

- **Drive dimensioning, dimensioning** (section 2)

2. Specify the type designation

- **Product key** (fold-out page),
selection table (section 3)
- Gearbox type, gearbox size, number of stages,
example: **GPA02-2**
- Drive design, motor frame size, ratio,
example: **S, 09FN38, i = 20,000**

3. Specify the output design

- **Product key** (fold-out page),
drive dimensioning, gearbox design (section 2)
- Solid shaft, smooth, without foot, with centring, with
square flange (**G, C, N**)

4. Specify the mounting position

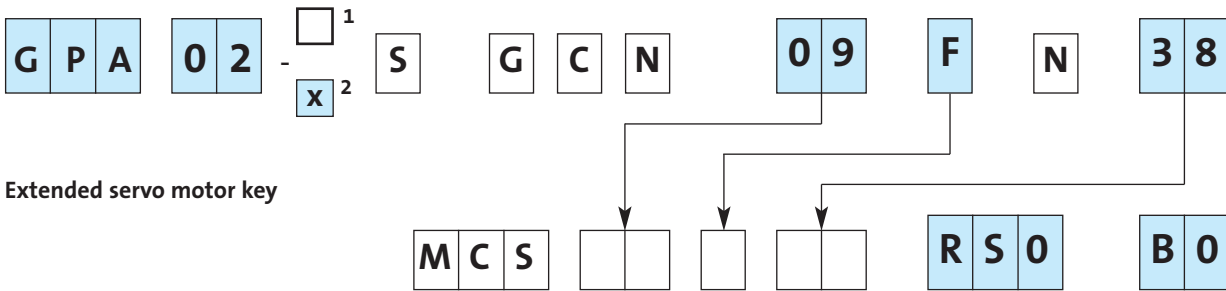
- **Product key** (fold-out page),
example: mounting position A

5. Specify motor options

- **Drive dimensioning, versions**
servo motors (section 2)
servo motors (section 4)
example: resolver (**RSO**)
without brake (**B0**)
circular plug connectors
degree of protection IP54



Quantity i =



Other ordering information

Mounting position

A C D

Colour

Paint to RAL 9005 (standard)

Gearbox options

Shaft sealing rings

Viton (standard)

Motor options

Electrical connection

Separate circular plug connectors
Power/brake
Encoder/temperature

Terminal box
Power/brake
Encoder/temperature

Thermal protection

KTY sensor (standard)

Degree of protection

IP54

IP65



General

Fax order for servo planetary geared motors

To the Lenze sales office

Page __ of __

Order

Quotation

Fax no. _____

From _____

Customer no.

--	--	--	--	--	--	--	--	--	--

Company _____

Street/PO Box _____

Order no. _____

Town/postcode _____

Contact name _____

Department _____

Date _____ Signature _____

Telephone no. _____

Delivery address (if different from above)

Street/PO Box _____

Town/postcode _____

Invoice address (if different from above)

Street/PO Box _____

Town/postcode _____

Requested delivery date _____

Despatch information _____

1



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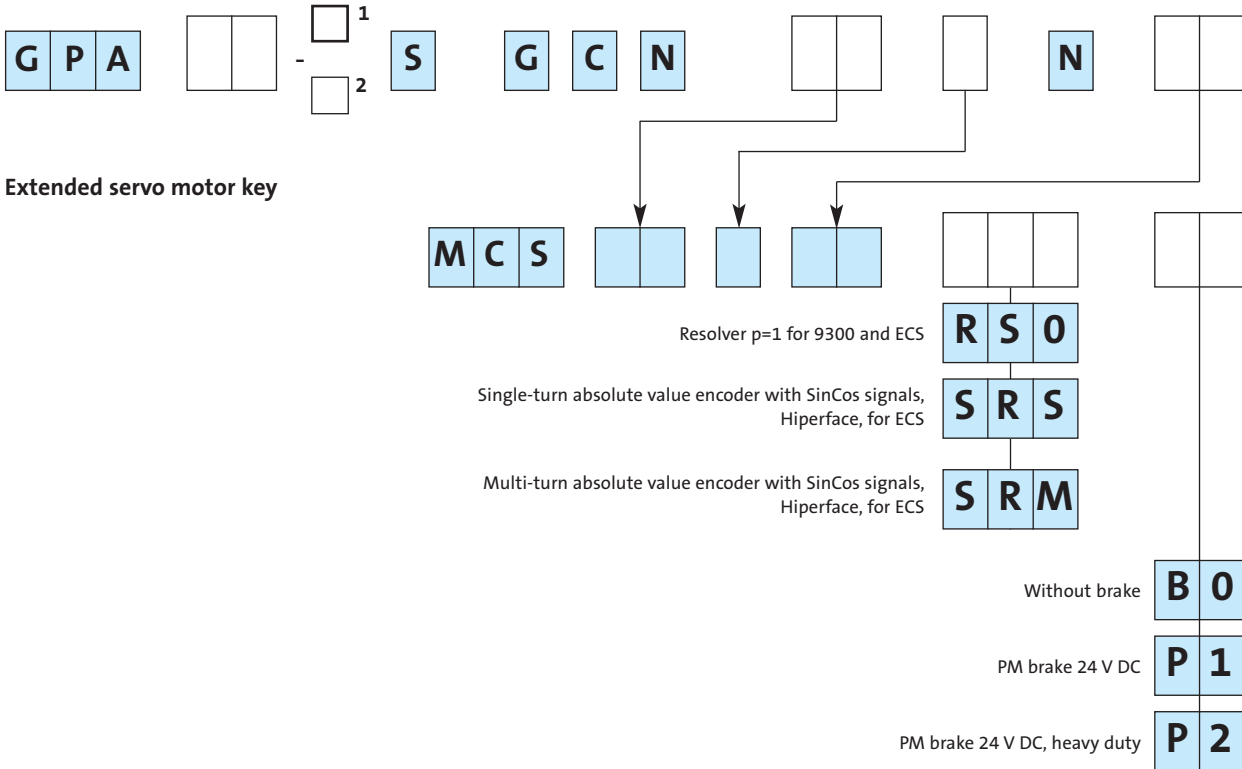
Customer no.

Quantity

Page __ of __

Order no.

i =



Other ordering information

Mounting position

A C D

Colour

Paint to RAL 9005 (standard)

Gearbox options

Shaft sealing rings

Viton (standard)

Motor options

Electrical connection

Separate circular plug connectors
Power/brake
Encoder/temperature

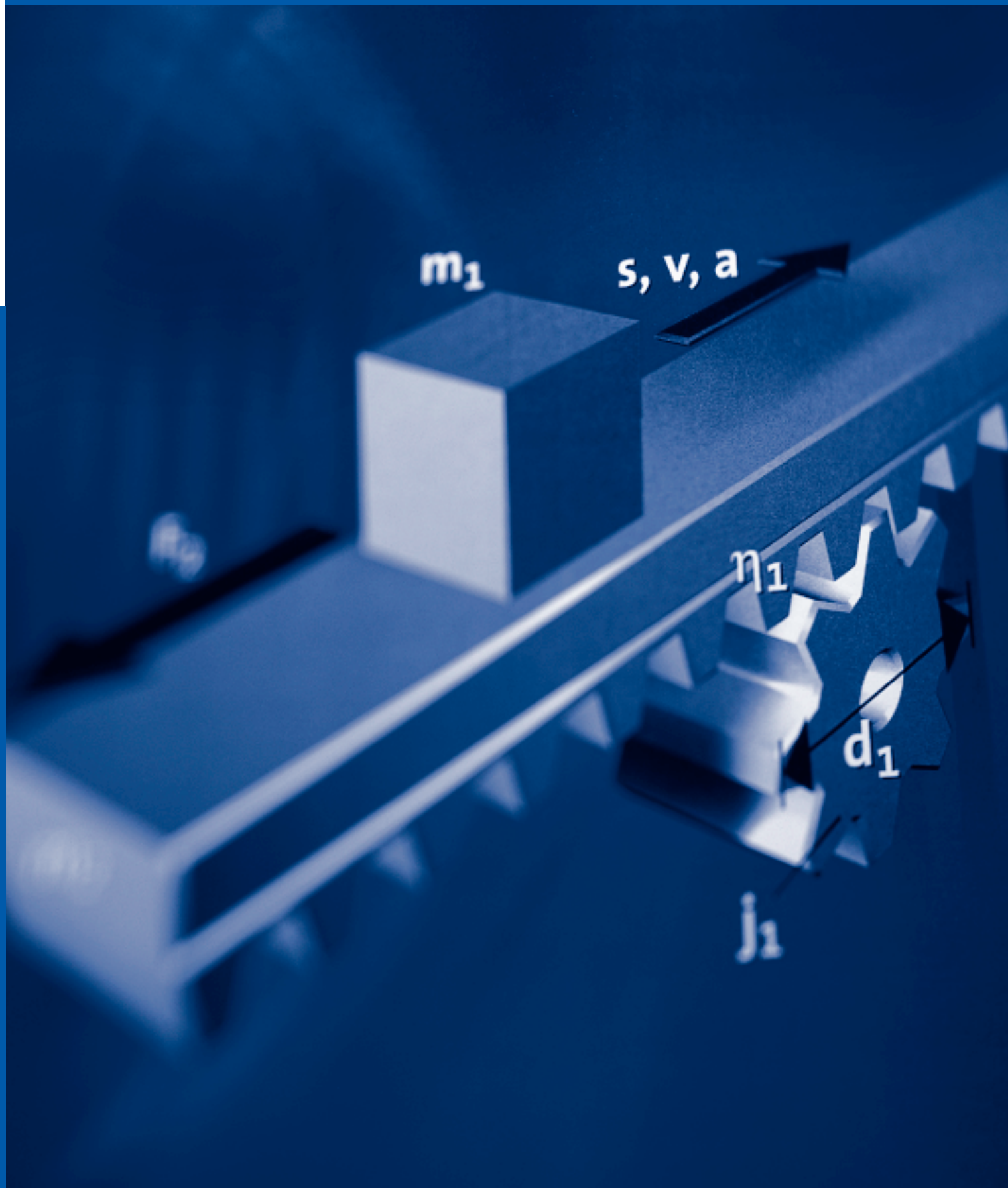
Terminal box
Power/brake
Encoder/temperature

Thermal protection

KTY sensor (standard)

Degree of protection

IP54 IP65



Dimensioning

Our service	2-2
Determination of the axial and radial forces	2-3
Determination of the required gearbox load capacity	2-3
Intensity and load classes	2-4
Operating factors	2-4
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Gearbox designs

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Servo motor designs

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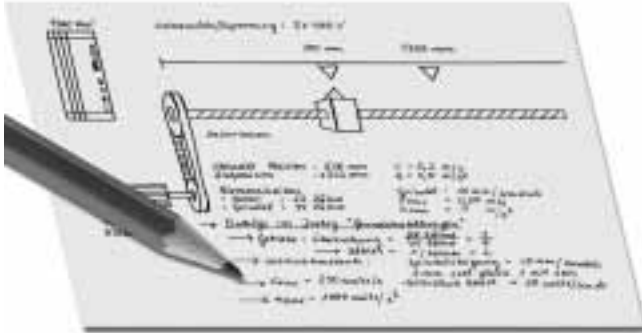
Our service

Lenze would like to help you optimise your project planning. Drive dimensioning and specification is the basis of any system design process. This involves not only the calculation of torques and ratings but also the physical and eco-

nomonic co-ordination of the individual Lenze drive components.

Your local agent can help you with drive dimensioning. Please talk to us.

Does this tedious process look familiar?



Using the Drive Solution Designer, Lenze sales staff can help you to complete your entire project planning process, quickly, efficiently and accurately, without the need for preliminary sketches.



The original application data and the results from the Drive Solution Designer are compiled in a single document, and the Lenze sales staff can then check the drive dimensioning with an integral diagnostic tool to ensure that the drive meets all your requirements. The graphical analysis provi-

des clear and comprehensive information about the drive load and drive configuration. The hardware requirements needed for the solution are documented to simplify the ordering process and to speed up delivery of your solution.

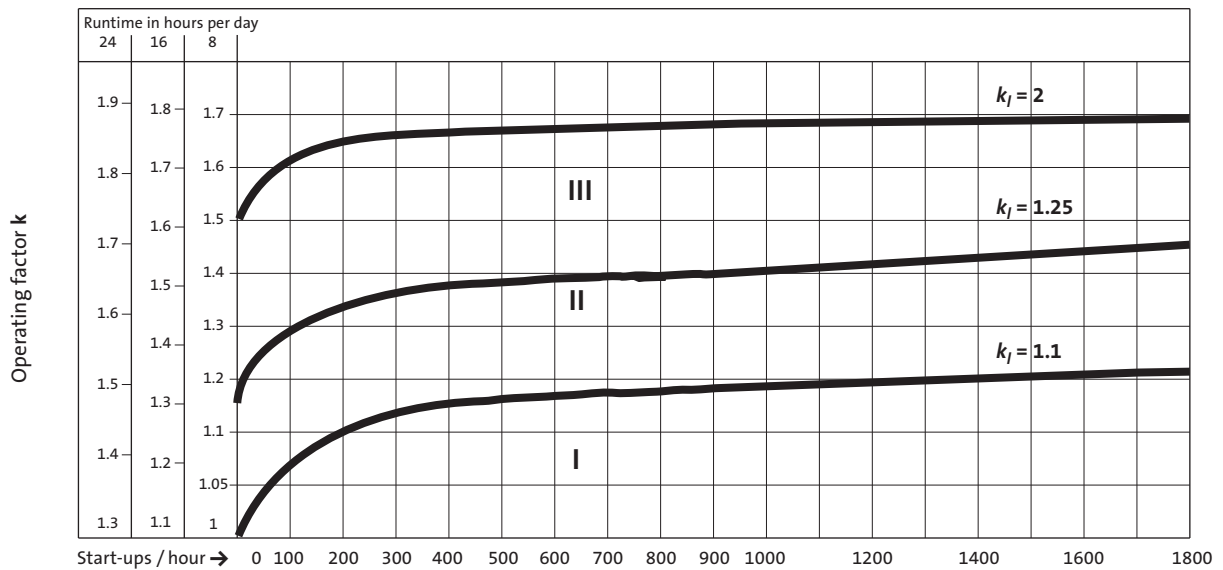


Determination of the axial and radial forces acting on the gearbox shaft		
	Calculation	Check
Transmission element	$f_z = \underline{\hspace{2cm}}$	
Radial force (from input variable or from transmission element)	$F_r = 2000 \cdot \frac{M_{max} \cdot f_z}{d_w [mm]}$	$F_r \leq F_{r, perm} = F_{r, Tab}$
Axial force	$F_a = \underline{\hspace{2cm}}$	$F_a \leq F_{a, perm} = F_{a, Tab}$ where $F_r = 0$
⇒ $f_z \rightarrow$ page 2-4, $F_{r, Tab} = F_{a, Tab} \rightarrow$ Permissible radial and axial forces → Technical data page 3-2		
Determination of the required load capacity		
Intensity	$k_l = \frac{M_{L, max}}{M_2}$	$k_l = \underline{\hspace{2cm}}$
Operating factor		$k = \underline{\hspace{2cm}}$
⇒ $k \rightarrow$ page 2-4		
	Check	Selection
Load capacity	$c \geq k$	$c = \underline{\hspace{2cm}}$ [Nm]
⇒ $c \rightarrow$ Selection tables page 3-5		

Intensity and load class

Intensity k_I	Load class
$k_I \leq 1.1$	I
$1.1 < k_I \leq 1.25$	II
$1.25 < k_I \leq 2$	III

Determine the operating factor k for the machine from the diagram.
Interpolation between the curves is permissible.



Additional radial force factor for transmission elements

Transmission element	f_z
Gear wheels	1.12
Sprockets	1.25... 1.4
Toothed-belt pulleys	1.5
Narrow V-belts, depending on initial stress	1.5...2.0



General data

Gearbox type		GPA
Housing	Design Material	Cuboid Cast iron with nodular graphite
Solid shaft	Design Tolerance Material	Smooth without keyway Centre hole in accordance with DIN 332 Page 2 k6 Tempering steel C45
Toothed parts	Design	Spur toothing Optimised tooth flanks and profile geometry
Pinions+ sun wheel	Design Material	Case-hardened and tooth flanks ground Case-hardened steel 17 Cr Ni Mo 6
Internal gearing	Design Material	Shaped or broached Ductile cast iron EN-GJS-700-2
Ratios	Design	All ratios are mathematically exact
Shaft-hub connection		Keyed connection with special splined shaft profile
Shaft sealing rings	Design Material	With dust lip FP (Viton)
Bearings	Design	Ball bearings/tapered-roller bearings/needle bearings, depending on frame size
Lubricants	Design Quantities	In accordance with DIN 51502 Depending on mounting position, see operating instructions
Mechanical efficiency	At rated torque	$0.95 \leq \eta \leq 0.97$
Noise emissions		Below the emission values specified under VDI guideline 2159
Degree of protection	Design	IP54 or IP65

Overview of models

Gearbox type	Gearbox size	No. of stages	Drive design	Shafts		Housing		Output design		Lubricants	Colour
				Solid shaft, smooth	Without foot, with centring	Flange					
						With square flange (through holes)					
Product key				G	C	N					
				d x l [mm]		$\varnothing a$ [mm]	$\square a_1$ [mm]				
GPA	00	1 2	S	16 x 28	●	80	65	●	●		
	01	1 2		22 x 36	●	100	80	●	●		
	02	1 2		32 x 58	●	140	102	●	●		
	03	1 2		40 x 82	●	188	142	●	●		
	04	1 2		55 x 82	●	250	182	●	●		
	05	1 2		75 x 105	●	290	212	●	●		



General data

Degree of protection	IP54 or IP65
Thermal class (VDE 0530)	Utilisation in accordance with thermal class F Insulation system (enamel-insulated wire) in accordance with thermal class H
UL conformity	UR, recognised component
Insulation resistance	Maximum voltage amplitude $\hat{U} = 1.5 \text{ kV}$ Maximum rate of voltage rise $du/dt = 5 \text{ kV}/\mu\text{s}$
Vibrational severity	N
Radial eccentricity, axial eccentricity, concentricity (DIN 2955)	N
Temperature monitoring	Continuous temperature sensor (KTY 83-110) combined with 2 x PTC 150°C (KTY only on MCS 06)
Connection	2 circular connectors rotating through 180° for a) motor and brake, b) resolver and temperature sensor or terminal box (terminal box not available on MCS 06)
Temperature range	-20 to +40°C without power reduction (without brake) -10 to +40°C without power reduction (with brake)
Surface temperature	Up to 140°C
Site altitude	Up to 1000 m amsl without power reduction
Demagnetising limit	$> 5 \cdot I_N$
Maximum torque	$> 4 \cdot M_N$
Phase angle sensor	Resolver SinCos encoder
Bearings	Deep-groove ball bearings with high-temperature resistant grease, 2 sealing discs, locating bearings on B side
Brake	With or without permanent-magnet holding brake on B side
Fan	–

Overview of models

Version		MCS synchronous servo motors				
		MCS06	MCS09	MCS12	MCS14	MCS19
Speed	1000 ... 1500 rpm				●	●
	1500 ... 2500 rpm			●	●	
	3000 ... 4000 rpm		●	●	●	●
	4000 ... 5000 rpm	●	●	●		
Tacho generator / position encoder	Resolver	●	●	●	●	●
	Single-turn Hiperface SinCos absolute encoder SRS	●	●	●	●	●
	Multi-turn Hiperface SinCos absolute encoder SRM	●	●	●	●	●
Brake	Without brake	●	●	●	●	●
	With PM brake 24 V	●	●	●	●	●
	With PM brake, heavy duty		●	●	●	
Connection type	Circular connector for power and encoders	●	●	●	●	●
	Terminal box for power and encoders		●	●	●	●
Degree of protection	IP54 or IP65	●	●	●	●	●
Cooling	Natural ventilation without fan	●	●	●	●	●
Approvals	UR approval	●	●	●	●	●



MCS 06F



MCS 09H



MCS 12L





Planetary gearboxes

Servo planetary
geared motors

Technical data

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Backlash at output _____	3-3
Torsional rigidity _____	3-3
Weights _____	3-4

Selection tables

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Dimensions

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Motor connection for terminal box _____	3-16



Permissible radial and axial forces

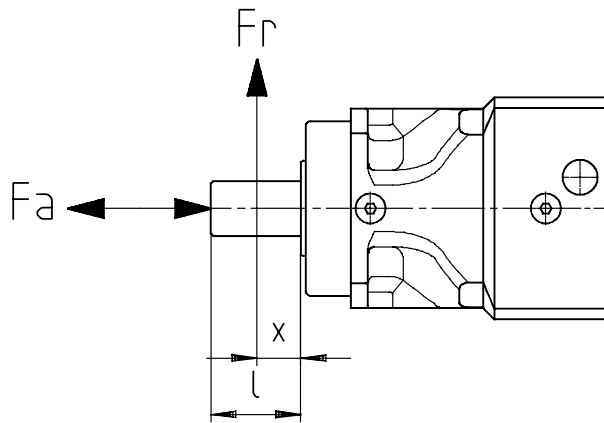
Permissible radial forces

$$F_{rperm} = F_{rTab} \quad \text{where } F_a = 0$$

Permissible axial forces

$$F_{aperm} = F_{aTab} \quad \text{where } F_r = 0$$

Factory consultation required if F_r and $F_a \neq 0$



3

Application of force F_r : Centre of shaft journal ($x = l/2$)
 F_{aTab} only valid for $F_r = 0$

n_2 [rpm]	GPA00		GPA01		GPA02		GPA03		GPA04		GPA05	
	F_{rTab} [N]	F_{aTab} [N]	F_{rTab} [N]	F_{aTab} [N]	F_{rTab} [N]	F_{aTab} [N]	F_{rTab} [N]	F_{aTab} [N]	F_{rTab} [N]	F_{aTab} [N]	F_{rTab} [N]	F_{aTab} [N]
1000	1550	2300	2325	3200	3700	5400	4950	9400	7170	13500	11390	22500
900	1600		2400		3825		5125		7400		11750	
800	1675		2475		3950		5300		7670		12180	
700	1725		2600		4125		5525		7980		12680	
600	1825		2700		4325		5775		8360		13280	
500	1925		2850		4550		6100		8830		14020	
400	2050		3050		4875		6525		9450		15000	
300	2250		3350		5300		7100		10300		16350	
200	2525		3775		6000		8025		11630		18000	
† 100	2600		3800		6000		9000		14000		18000	
$F_{r max.}$	2600	3800	6000	9000	14000	18000						



Backlash

	Backlash (measured at 2% of rated gearbox output torque) Standard [arcmin]
GPA□□ - 1	max. 6'
GPA□□ - 2	max. 8'

Torsional rigidity

	Torsional rigidity [Nm/arcmin]		Torsional rigidity [Nm/arcmin]
GPA00 - 1	3	GPA00 - 2	2.8
GPA01 - 1	8.8	GPA01 - 2	8
GPA02 - 1	23	GPA02 - 2	20
GPA03 - 1	47	GPA03 - 2	42
GPA04 - 1	145	GPA04 - 2	125
GPA05 - 1	225	GPA05 - 2	195



Planetary gearboxes

Technical data

Weights

Servo geared motor GPA□□ - □S GCN	Motor frame size																		
	06C N41	06F N41	C6I N41	09F N38	09H N41 N35	12H N15	12L N20 N41 N36	14D N15 N32	14H N15 N32	14L N15	14P N14 N32 N30	19F N14 N30	19J N14	19P N14 N30					
GPA00 - 1	3.9	4.3	5.0	7.3	8.2														
GPA01 - 1		5.6	6.3	8.6	9.5	13	16	16											
GPA02 - 1				12	13	16	19	19	17	22	27	31	31						
GPA03 - 1						24	27	27	25	30	34	39	39	37	44	54	54		
GPA04 - 1														53	60	70	70		
GPA05 - 1														68	75	85	85		
GPA00 - 2	4.7	5.1	5.8																
GPA01 - 2	6.2	6.6	7.3	9.6	11														
GPA02 - 2				14	15	18		21											
GPA03 - 2						30	33	33	31	36	40		45						
GPA04 - 2														62	69		79		
GPA05 - 2														90	97	107	107		
Built-on motor accessories	Additional weights																		
Resolver	0			0			0			0			0						
Brake	P1			0.3			0.8			0.9			1.9						
	P2			0.5			1.2			3.1			4.3						
SinCos absolute value encoder	0.4			0.2			0.3			0.3			0.3						

Weight in [kg], with oil, for mounting position A, all values approximate

Planetary gearboxes

Selection tables for servo geared motors



M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
3	1350	5.7	3.000	10	A004	6	9321	20	4.40E-05	GPA00 - 1S GCN 06FN41 MCS06FN41...S00
4	1350	4.5	3.000	10	A004	8	9321	20	5.20E-05	GPA00 - 1S GCN 06IN41 MCS06IN41...S00
5	1013	5.3	4.000	14	A004	8	9321	25	3.80E-05	GPA00 - 1S GCN 06FN41 MCS06FN41...S00
6	1013	4.3	4.000	13	A004	10	9321	25	4.60E-05	GPA00 - 1S GCN 06IN41 MCS06IN41...S00
6	810	4.3	5.000	17	A004	10	9321	25	3.50E-05	GPA00 - 1S GCN 06FN41 MCS06FN41...S00
6	405	2.6	10.000	19	A004	12	9321	15	2.50E-05	GPA00 - 1S GCN 06CN41 MCS06CN41...S00
7	810	3.4	5.000	17	A004	13	9321	25	4.30E-05	GPA00 - 1S GCN 06IN41 MCS06IN41...S00
8	579	3.0	7.000	24	A004	14	9321	25	3.40E-05	GPA00 - 1S GCN 06FN41 MCS06FN41...S00
9	253	2.7	16.000	29	A004	18	9321	25	2.90E-05	GPA00 - 2S GCN 06CN41 MCS06CN41...S00
10	579	2.4	7.000	23	A004	18	9321	25	4.20E-05	GPA00 - 1S GCN 06IN41 MCS06IN41...S00
11	405	3.8	10.000	34	A004	20	9321	45	5.80E-05	GPA01 - 1S GCN 06FN41 MCS06FN41...S00
12	938	2.1	4.000	38	A008	20	9322	25	1.66E-04	GPA00 - 1S GCN 09FN38 MCS09FN38...S00
12	405	1.3	10.000	32	A004	20	9321	15	3.30E-05	GPA00 - 1S GCN 06FN41 MCS06FN41...S00
14	405	3.1	10.000	33	A004	26	9321	45	6.60E-05	GPA01 - 1S GCN 06IN41 MCS06IN41...S00
15	1013	1.7	4.000	39	A008	29	9323	25	2.06E-04	GPA00 - 1S GCN 09HN41 MCS09HN41...S00
15	750	1.6	5.000	40	A008	26	9322	25	1.63E-04	GPA00 - 1S GCN 09FN38 MCS09FN38...S00
15	405	1.0	10.000	32	A004	26	9321	15	4.10E-05	GPA00 - 1S GCN 06IN41 MCS06IN41...S00
16	145	4.3	28.000	51	A004	32	9321	70	2.60E-05	GPA01 - 2S GCN 06CN41 MCS06CN41...S00
18	253	1.4	16.000	40	A004	31	9321	25	3.70E-05	GPA00 - 2S GCN 06FN41 MCS06FN41...S00
18	253	3.8	16.000	54	A004	31	9321	70	3.80E-05	GPA01 - 2S GCN 06FN41 MCS06FN41...S00
19	810	1.3	5.000	40	A008	37	9323	25	2.03E-04	GPA00 - 1S GCN 09HN41 MCS09HN41...S00
21	536	3.4	7.000	67	A008	36	9322	72	1.89E-04	GPA01 - 1S GCN 09FN38 MCS09FN38...S00
22	1175	2.5	3.000	59	A016	40	9324	56	8.03E-04	GPA01 - 1S GCN 12HN35 MCS12HN35...S00
23	253	1.1	16.000	40	A004	40	9321	25	4.50E-05	GPA00 - 2S GCN 06IN41 MCS06IN41...S00
23	253	3.0	16.000	52	A004	40	9321	70	4.60E-05	GPA01 - 2S GCN 06IN41 MCS06IN41...S00
23	203	3.0	20.000	67	A004	38	9321	70	3.60E-05	GPA01 - 2S GCN 06FN41 MCS06FN41...S00
26	579	2.8	7.000	68	A008	52	9323	72	2.29E-04	GPA01 - 1S GCN 09HN41 MCS09HN41...S00
26	500	5.0	3.000	83	A016	59	9324	135	1.08E-03	GPA02 - 1S GCN 14DN15 MCS14DN15...S00
28	900	5.8	4.000	63	A016	75	9325	170	9.95E-04	GPA02 - 1S GCN 14DN36 MCS14DN36...S00
28	881	5.8	4.000	79	A016	53	9324	170	9.15E-04	GPA02 - 1S GCN 12HN35 MCS12HN35...S00
28	203	2.4	20.000	65	A004	50	9321	70	4.40E-05	GPA01 - 2S GCN 06IN41 MCS06IN41...S00
29	881	2.4	4.000	79	A016	53	9324	70	7.82E-04	GPA01 - 1S GCN 12HN35 MCS12HN35...S00
29	500	1.9	3.000	59	A008	44	9323	56	8.03E-04	GPA01 - 1S GCN 12HN15 MCS12HN15...S00
30	375	1.5	10.000	80	A008	51	9322	46	1.86E-04	GPA01 - 1S GCN 09FN38 MCS09FN38...S00
30	375	3.6	10.000	96	A008	51	9322	110	2.68E-04	GPA02 - 1S GCN 09FN38 MCS09FN38...S00
32	1350	1.7	3.000	80	A032	67	9325	56	1.13E-03	GPA01 - 1S GCN 12LN41 MCS12LN41...S00



Planetary gearboxes

Selection tables for servo geared motors

M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
32	145	2.2	28.000	94	A004	54	9321	70	3.40E-05	GPA01 - 2S GCN 06FN41 MCS06FN41...S00
35	720	4.6	5.000	78	A016	93	9325	170	9.64E-04	GPA02 - 1S GCN 14DN36 MCS14DN36...S00
35	705	4.6	5.000	99	A016	67	9324	170	8.84E-04	GPA02 - 1S GCN 12HN35 MCS12HN35...S00
35	375	4.7	4.000	111	A016	79	9324	170	9.95E-04	GPA02 - 1S GCN 14DN15 MCS14DN15...S00
36	405	3.0	10.000	97	A008	74	9323	110	3.08E-04	GPA02 - 1S GCN 09HN41 MCS09HN41...S00
37	405	1.2	10.000	80	A008	74	9323	46	2.26E-04	GPA01 - 1S GCN 09HN41 MCS09HN41...S00
38	375	4.3	4.000	79	A008	59	9323	170	9.15E-04	GPA02 - 1S GCN 12HN15 MCS12HN15...S00
39	375	1.8	4.000	79	A008	59	9323	70	7.82E-04	GPA01 - 1S GCN 12HN15 MCS12HN15...S00
40	1075	3.3	3.000	109	A032	70	9325	135	1.69E-03	GPA02 - 1S GCN 14HN32 MCS14HN32...S00
40	650	1.4	3.000	80	A016	72	9324	56	1.13E-03	GPA01 - 1S GCN 12LN20 MCS12LN20...S00
40	145	1.7	28.000	91	A004	70	9321	70	4.20E-05	GPA01 - 2S GCN 06IN41 MCS06IN41...S00
42	1013	3.9	4.000	139	A032	89	9325	170	1.25E-03	GPA02 - 1S GCN 12LN41 MCS12LN41...S00
43	1013	1.6	4.000	100	A032	89	9325	70	1.11E-03	GPA01 - 1S GCN 12LN41 MCS12LN41...S00
44	300	3.8	5.000	139	A016	99	9324	170	9.64E-04	GPA02 - 1S GCN 14DN15 MCS14DN15...S00
46	500	2.9	3.000	109	A016	75	9324	135	1.69E-03	GPA02 - 1S GCN 14HN15 MCS14HN15...S00
46	234	3.6	16.000	151	A008	80	9322	170	2.08E-04	GPA02 - 2S GCN 09FN38 MCS09FN38...S00
47	234	1.5	16.000	100	A008	80	9322	70	1.66E-04	GPA01 - 2S GCN 09FN38 MCS09FN38...S00
48	300	3.5	5.000	99	A008	74	9323	170	8.84E-04	GPA02 - 1S GCN 12HN15 MCS12HN15...S00
50	1075	2.7	3.000	159	A048	121	9326	135	2.61E-03	GPA02 - 1S GCN 14LN32 MCS14LN32...S00
50	514	3.3	7.000	110	A016	130	9325	170	9.40E-04	GPA02 - 1S GCN 14DN36 MCS14DN36...S00
50	504	3.3	7.000	138	A016	93	9324	170	8.60E-04	GPA02 - 1S GCN 12HN35 MCS12HN35...S00
51	504	1.4	7.000	100	A016	93	9324	70	7.69E-04	GPA01 - 1S GCN 12HN35 MCS12HN35...S00
52	488	3.2	4.000	139	A016	96	9324	170	1.25E-03	GPA02 - 1S GCN 12LN20 MCS12LN20...S00
53	810	3.2	5.000	174	A032	112	9325	170	1.21E-03	GPA02 - 1S GCN 12LN41 MCS12LN41...S00
53	488	1.3	4.000	100	A016	96	9324	70	1.11E-03	GPA01 - 1S GCN 12LN20 MCS12LN20...S00
54	806	3.1	4.000	145	A032	93	9325	170	1.60E-03	GPA02 - 1S GCN 14HN32 MCS14HN32...S00
57	253	2.9	16.000	152	A008	115	9323	170	2.48E-04	GPA02 - 2S GCN 09HN41 MCS09HN41...S00
58	253	1.2	16.000	100	A008	100	9323	70	2.06E-04	GPA01 - 2S GCN 09HN41 MCS09HN41...S00
58	188	2.9	20.000	188	A008	100	9322	170	1.98E-04	GPA02 - 2S GCN 09FN38 MCS09FN38...S00
59	1000	4.7	3.000	201	A048	152	9326	290	7.17E-03	GPA03 - 1S GCN 19FN30 MCS19FN30...S00
60	214	5.7	7.000	194	A016	139	9324	360	1.08E-03	GPA03 - 1S GCN 14DN15 MCS14DN15...S00
61	1075	2.2	3.000	200	A064	141	9326	135	3.74E-03	GPA02 - 1S GCN 14PN32 MCS14PN32...S00
62	375	2.7	4.000	145	A016	100	9324	170	1.60E-03	GPA02 - 1S GCN 14HN15 MCS14HN15...S00
62	214	2.7	7.000	194	A016	139	9324	170	9.40E-04	GPA02 - 1S GCN 14DN15 MCS14DN15...S00
65	390	2.6	5.000	174	A016	120	9324	170	1.21E-03	GPA02 - 1S GCN 12LN20 MCS12LN20...S00
66	806	2.5	4.000	211	A048	161	9326	170	2.52E-03	GPA02 - 1S GCN 14LN32 MCS14LN32...S00

Planetary gearboxes

Selection tables for servo geared motors



M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
67	500	2.0	3.000	200	A032	132	9325	135	2.61E-03	GPA02 - 1S GCN 14LN15 MCS14LN15...S00
68	645	2.5	5.000	182	A032	117	9325	170	1.57E-03	GPA02 - 1S GCN 14HN32 MCS14HN32...S00
68	214	2.5	7.000	138	A008	104	9323	170	8.60E-04	GPA02 - 1S GCN 12HN15 MCS12HN15...S00
69	214	1.0	7.000	100	A008	100	9323	70	7.69E-04	GPA01 - 1S GCN 12HN15 MCS12HN15...S00
72	360	3.0	10.000	157	A016	186	9325	220	1.04E-03	GPA03 - 1S GCN 14DN36 MCS14DN36...S00
72	353	3.0	10.000	197	A016	133	9324	220	9.59E-04	GPA03 - 1S GCN 12HN35 MCS12HN35...S00
72	203	2.3	20.000	190	A008	144	9323	170	2.38E-04	GPA02 - 2S GCN 09HN41 MCS09HN41...S00
74	579	2.3	7.000	244	A032	156	9325	170	1.19E-03	GPA02 - 1S GCN 12LN41 MCS12LN41...S00
77	475	3.7	3.000	253	A032	171	9325	290	7.17E-03	GPA03 - 1S GCN 19FN14 MCS19FN14...S00
77	300	2.2	5.000	182	A016	125	9324	170	1.57E-03	GPA02 - 1S GCN 14HN15 MCS14HN15...S00
79	750	4.4	4.000	268	A048	202	9326	360	6.93E-03	GPA03 - 1S GCN 19FN30 MCS19FN30...S00
81	806	2.1	4.000	250	A064	188	9326	170	3.66E-03	GPA02 - 1S GCN 14PN32 MCS14PN32...S00
82	134	2.0	28.000	250	A008	140	9322	170	1.91E-04	GPA02 - 2S GCN 09FN38 MCS09FN38...S00
83	1000	3.4	3.000	283	A064	163	9326	290	1.12E-02	GPA03 - 1S GCN 19JN30 MCS19JN30...S00
83	645	2.0	5.000	250	A048	201	9326	170	2.49E-03	GPA02 - 1S GCN 14LN32 MCS14LN32...S00
88	450	1.5	3.000	200	A032	154	9325	135	3.74E-03	GPA02 - 1S GCN 14PN14 MCS14PN14...S00
89	375	1.9	4.000	250	A032	176	9325	170	2.52E-03	GPA02 - 1S GCN 14LN15 MCS14LN15...S00
89	150	2.4	10.000	277	A016	198	9324	220	1.04E-03	GPA03 - 1S GCN 14DN15 MCS14DN15...S00
92	1000	3.1	3.000	312	A064	175	9326	290	1.67E-02	GPA03 - 1S GCN 19PN30 MCS19PN30...S00
92	279	1.8	7.000	244	A016	167	9324	170	1.19E-03	GPA02 - 1S GCN 12LN20 MCS12LN20...S00
93	461	3.7	7.000	255	A032	163	9325	360	1.69E-03	GPA03 - 1S GCN 14HN32 MCS14HN32...S00
95	461	1.8	7.000	250	A032	163	9325	170	1.55E-03	GPA02 - 1S GCN 14HN32 MCS14HN32...S00
97	150	2.2	10.000	197	A008	148	9323	220	9.59E-04	GPA03 - 1S GCN 12HN15 MCS12HN15...S00
98	600	5.3	5.000	335	A048	253	9326	550	8.45E-03	GPA04 - 1S GCN 19FN30 MCS19FN30...S00
100	600	3.5	5.000	335	A048	253	9326	360	6.84E-03	GPA03 - 1S GCN 19FN30 MCS19FN30...S00
101	145	1.7	28.000	250	A008	202	9323	170	2.31E-04	GPA02 - 2S GCN 09HN41 MCS09HN41...S00
102	645	1.7	5.000	250	A064	235	9326	170	3.62E-03	GPA02 - 1S GCN 14PN32 MCS14PN32...S00
103	356	3.4	4.000	337	A032	228	9325	360	6.93E-03	GPA03 - 1S GCN 19FN14 MCS19FN14...S00
104	107	1.6	35.000	250	A008	175	9322	170	1.90E-04	GPA02 - 2S GCN 09FN38 MCS09FN38...S00
107	405	2.0	10.000	348	A032	223	9325	220	1.29E-03	GPA03 - 1S GCN 12LN41 MCS12LN41...S00
107	214	3.3	7.000	255	A016	174	9324	360	1.69E-03	GPA03 - 1S GCN 14HN15 MCS14HN15...S00
109	214	1.5	7.000	250	A016	174	9324	170	1.55E-03	GPA02 - 1S GCN 14HN15 MCS14HN15...S00
111	750	3.2	4.000	377	A064	217	9326	360	1.09E-02	GPA03 - 1S GCN 19JN30 MCS19JN30...S00
112	300	1.5	5.000	250	A032	221	9325	170	2.49E-03	GPA02 - 1S GCN 14LN15 MCS14LN15...S00
113	225	3.1	16.000	246	A016	292	9325	360	1.00E-03	GPA03 - 2S GCN 14DN36 MCS14DN36...S00
113	220	3.1	16.000	309	A016	209	9324	360	9.25E-04	GPA03 - 2S GCN 12HN35 MCS12HN35...S00



Planetary gearboxes

Selection tables for servo geared motors

M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
115	220	1.5	16.000	250	A016	209	9324	170	7.88E-04	GPA02 - 2S GCN 12HN35 MCS12HN35...S00
116	475	2.5	3.000	288	A032	186	9325	290	1.12E-02	GPA03 - 1S GCN 19JN14 MCS19JN14...S00
116	461	3.1	7.000	370	A048	282	9326	360	2.61E-03	GPA03 - 1S GCN 14LN32 MCS14LN32...S00
117	461	1.4	7.000	250	A048	250	9326	170	2.47E-03	GPA02 - 1S GCN 14LN32 MCS14LN32...S00
117	338	1.4	4.000	250	A032	206	9325	170	3.66E-03	GPA02 - 1S GCN 14PN14 MCS14PN14...S00
123	750	2.9	4.000	416	A064	233	9326	360	1.64E-02	GPA03 - 1S GCN 19PN30 MCS19PN30...S00
127	116	1.3	35.000	250	A008	250	9323	170	2.30E-04	GPA02 - 2S GCN 09HN41 MCS09HN41...S00
128	285	4.2	5.000	421	A032	285	9325	550	8.45E-03	GPA04 - 1S GCN 19FN14 MCS19FN14...S00
130	285	2.7	5.000	421	A032	285	9325	360	6.84E-03	GPA03 - 1S GCN 19FN14 MCS19FN14...S00
131	195	1.7	10.000	348	A016	239	9324	220	1.29E-03	GPA03 - 1S GCN 12LN20 MCS12LN20...S00
136	323	1.6	10.000	364	A032	233	9325	220	1.65E-03	GPA03 - 1S GCN 14HN32 MCS14HN32...S00
138	600	3.9	5.000	471	A064	271	9326	550	1.24E-02	GPA04 - 1S GCN 19JN30 MCS19JN30...S00
139	94	2.5	16.000	435	A016	310	9324	360	1.00E-03	GPA03 - 2S GCN 14DN15 MCS14DN15...S00
140	600	2.5	5.000	471	A064	271	9326	360	1.08E-02	GPA03 - 1S GCN 19JN30 MCS19JN30...S00
140	429	3.8	7.000	469	A048	354	9326	550	9.09E-03	GPA04 - 1S GCN 19FN30 MCS19FN30...S00
142	461	2.5	7.000	500	A064	329	9326	360	3.74E-03	GPA03 - 1S GCN 14PN32 MCS14PN32...S00
142	429	2.5	7.000	469	A048	354	9326	360	6.77E-03	GPA03 - 1S GCN 19FN30 MCS19FN30...S00
142	180	2.5	20.000	307	A016	365	9325	360	9.70E-04	GPA03 - 2S GCN 14DN36 MCS14DN36...S00
142	176	2.5	20.000	386	A016	261	9324	360	8.90E-04	GPA03 - 2S GCN 12HN35 MCS12HN35...S00
144	461	1.2	7.000	250	A064	250	9326	170	3.60E-03	GPA02 - 1S GCN 14PN32 MCS14PN32...S00
147	270	1.2	5.000	250	A032	250	9325	170	3.62E-03	GPA02 - 1S GCN 14PN14 MCS14PN14...S00
149	450	1.9	3.000	400	A048	355	9326	290	1.67E-02	GPA03 - 1S GCN 19PN14 MCS19PN14...S00
152	94	2.3	16.000	309	A008	232	9323	360	9.25E-04	GPA03 - 2S GCN 12HN15 MCS12HN15...S00
153	600	3.5	5.000	519	A064	291	9326	550	1.79E-02	GPA04 - 1S GCN 19PN30 MCS19PN30...S00
153	94	1.1	16.000	250	A008	232	9323	170	7.88E-04	GPA02 - 2S GCN 12HN15 MCS12HN15...S00
155	600	2.3	5.000	500	A064	291	9326	360	1.63E-02	GPA03 - 1S GCN 19PN30 MCS19PN30...S00
155	356	2.3	4.000	384	A032	247	9325	360	1.09E-02	GPA03 - 1S GCN 19JN14 MCS19JN14...S00
156	214	2.3	7.000	470	A032	309	9325	360	2.61E-03	GPA03 - 1S GCN 14LN15 MCS14LN15...S00
156	150	1.4	10.000	364	A016	249	9324	220	1.65E-03	GPA03 - 1S GCN 14HN15 MCS14HN15...S00
158	214	1.1	7.000	250	A032	250	9325	170	2.47E-03	GPA02 - 1S GCN 14LN15 MCS14LN15...S00
167	253	2.1	16.000	500	A032	350	9325	360	1.26E-03	GPA03 - 2S GCN 12LN41 MCS12LN41...S00
168	323	1.3	10.000	400	A048	400	9326	220	2.57E-03	GPA03 - 1S GCN 14LN32 MCS14LN32...S00
169	253	1.0	16.000	250	A032	250	9325	170	1.12E-03	GPA02 - 2S GCN 12LN41 MCS12LN41...S00
175	75	2.0	20.000	500	A016	388	9324	360	9.70E-04	GPA03 - 2S GCN 14DN15 MCS14DN15...S00
177	204	5.4	7.000	590	A032	399	9325	1000	8.64E-03	GPA05 - 1S GCN 19FN14 MCS19FN14...S00
181	204	3.0	7.000	590	A032	399	9325	550	9.09E-03	GPA04 - 1S GCN 19FN14 MCS19FN14...S00

Planetary gearboxes

Selection tables for servo geared motors



M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
183	204	1.9	7.000	500	A032	399	9325	360	6.77E-03	GPA03 - 1S GCN 19FN14 MCS19FN14...S00
190	75	1.9	20.000	386	A008	290	9323	360	8.90E-04	GPA03 - 2S GCN 12HN15 MCS12HN15...S00
191	429	5.0	7.000	659	A064	379	9326	1000	1.26E-02	GPA05 - 1S GCN 19JN30 MCS19JN30...S00
192	285	2.8	5.000	480	A032	309	9325	550	1.24E-02	GPA04 - 1S GCN 19JN14 MCS19JN14...S00
194	285	1.8	5.000	480	A032	309	9325	360	1.08E-02	GPA03 - 1S GCN 19JN14 MCS19JN14...S00
195	429	2.8	7.000	659	A064	379	9326	550	1.31E-02	GPA04 - 1S GCN 19JN30 MCS19JN30...S00
197	429	1.8	7.000	500	A064	379	9326	360	1.08E-02	GPA03 - 1S GCN 19JN30 MCS19JN30...S00
198	338	1.8	4.000	500	A048	473	9326	360	1.64E-02	GPA03 - 1S GCN 19PN14 MCS19PN14...S00
200	126	1.8	28.000	500	A016	366	9324	360	8.62E-04	GPA03 - 2S GCN 12HN35 MCS12HN35...S00
202	300	3.0	10.000	669	A048	506	9326	620	8.36E-03	GPA05 - 1S GCN 19FN30 MCS19FN30...S00
204	300	1.7	10.000	669	A048	506	9326	340	8.99E-03	GPA04 - 1S GCN 19FN30 MCS19FN30...S00
204	193	1.7	7.000	500	A032	360	9325	360	3.74E-03	GPA03 - 1S GCN 14PN14 MCS14PN14...S00
206	323	1.1	10.000	400	A064	400	9326	220	3.70E-03	GPA03 - 1S GCN 14PN32 MCS14PN32...S00
206	122	1.7	16.000	500	A016	375	9324	360	1.26E-03	GPA03 - 2S GCN 12LN20 MCS12LN20...S00
210	203	1.7	20.000	500	A032	438	9325	360	1.22E-03	GPA03 - 2S GCN 12LN41 MCS12LN41...S00
212	429	4.6	7.000	727	A064	408	9326	1000	1.81E-02	GPA05 - 1S GCN 19PN30 MCS19PN30...S00
214	202	1.7	16.000	500	A032	366	9325	360	1.61E-03	GPA03 - 2S GCN 14HN32 MCS14HN32...S00
216	429	2.5	7.000	727	A064	408	9326	550	1.86E-02	GPA04 - 1S GCN 19PN30 MCS19PN30...S00
218	429	1.6	7.000	500	A064	408	9326	360	1.63E-02	GPA03 - 1S GCN 19PN30 MCS19PN30...S00
245	94	1.5	16.000	500	A016	390	9324	360	1.61E-03	GPA03 - 2S GCN 14HN15 MCS14HN15...S00
247	270	2.2	5.000	774	A048	591	9326	550	1.79E-02	GPA04 - 1S GCN 19PN14 MCS19PN14...S00
249	270	1.4	5.000	500	A048	500	9326	360	1.63E-02	GPA03 - 1S GCN 19PN14 MCS19PN14...S00
258	98	1.4	20.000	500	A016	469	9324	360	1.22E-03	GPA03 - 2S GCN 12LN20 MCS12LN20...S00
261	143	2.3	10.000	843	A032	570	9325	620	8.36E-03	GPA05 - 1S GCN 19FN14 MCS19FN14...S00
263	202	1.4	16.000	500	A048	500	9326	360	2.53E-03	GPA03 - 2S GCN 14LN32 MCS14LN32...S00
264	143	1.3	10.000	843	A032	570	9325	340	8.99E-03	GPA04 - 1S GCN 19FN14 MCS19FN14...S00
267	204	3.6	7.000	672	A032	433	9325	1000	1.26E-02	GPA05 - 1S GCN 19JN14 MCS19JN14...S00
268	161	1.3	20.000	500	A032	457	9325	360	1.58E-03	GPA03 - 2S GCN 14HN32 MCS14HN32...S00
268	54	1.3	28.000	500	A008	406	9323	360	8.62E-04	GPA03 - 2S GCN 12HN15 MCS12HN15...S00
272	204	2.0	7.000	672	A032	433	9325	550	1.31E-02	GPA04 - 1S GCN 19JN14 MCS19JN14...S00
274	204	1.3	7.000	500	A032	433	9325	360	1.08E-02	GPA03 - 1S GCN 19JN14 MCS19JN14...S00
281	300	2.2	10.000	942	A064	542	9326	620	1.24E-02	GPA05 - 1S GCN 19JN30 MCS19JN30...S00
284	300	1.2	10.000	880	A064	542	9326	340	1.30E-02	GPA04 - 1S GCN 19JN30 MCS19JN30...S00
295	145	1.2	28.000	500	A032	500	9325	360	1.19E-03	GPA03 - 2S GCN 12LN41 MCS12LN41...S00
307	75	1.2	20.000	500	A016	488	9324	360	1.58E-03	GPA03 - 2S GCN 14HN15 MCS14HN15...S00
310	300	2.0	10.000	1039	A064	582	9326	620	1.79E-02	GPA05 - 1S GCN 19PN30 MCS19PN30...S00



Planetary gearboxes

Selection tables for servo geared motors

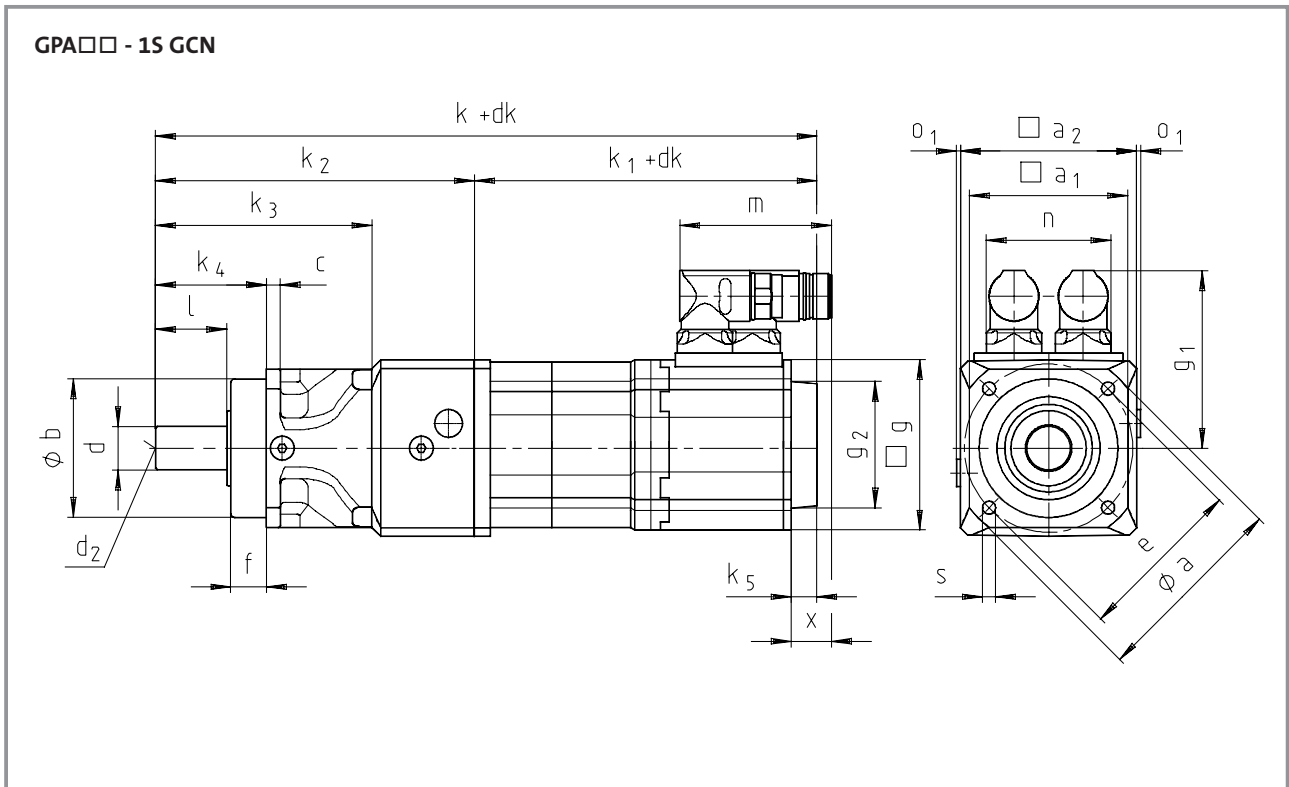
M ₂ [Nm]	n _{2 ref} [rpm]	c	i	M _{2 max} short-time on geared motor at				M _{2 GN} gearbox c = 1 n ₂ ≤ n _{2 ref} [Nm]	J _{GM} reduced to motor shaft [kgm ²]	Servo planetary geared motor Dimensions from page 3-12
				4 kHz		8 kHz				
				M _{2 max} [Nm]	Type ECS□	M _{2 max} [Nm]	Type EVS			
313	300	1.1	10.000	880	A064	582	9326	340	1.85E-02	GPA04 - 1S GCN 19PN30 MCS19PN30...S00
316	188	3.1	16.000	1050	A048	793	9326	1000	8.84E-03	GPA05 - 2S GCN 19FN30 MCS19FN30...S00
320	188	1.7	16.000	1050	A048	793	9326	550	7.23E-03	GPA04 - 2S GCN 19FN30 MCS19FN30...S00
322	202	1.1	16.000	500	A064	500	9326	360	3.67E-03	GPA03 - 2S GCN 14PN32 MCS14PN32...S00
330	161	1.1	20.000	500	A048	500	9326	360	2.50E-03	GPA03 - 2S GCN 14LN32 MCS14LN32...S00
343	193	2.9	7.000	1083	A048	827	9326	1000	1.81E-02	GPA05 - 1S GCN 19PN14 MCS19PN14...S00
348	193	1.6	7.000	1083	A048	827	9326	550	1.86E-02	GPA04 - 1S GCN 19PN14 MCS19PN14...S00
350	193	1.0	7.000	500	A048	500	9326	360	1.63E-02	GPA03 - 1S GCN 19PN14 MCS19PN14...S00
353	94	1.0	16.000	500	A032	500	9325	360	2.53E-03	GPA03 - 2S GCN 14LN15 MCS14LN15...S00
390	143	1.6	10.000	959	A032	618	9325	620	1.24E-02	GPA05 - 1S GCN 19JN14 MCS19JN14...S00
397	150	2.5	20.000	1312	A048	991	9326	1000	8.51E-03	GPA05 - 2S GCN 19FN30 MCS19FN30...S00
409	89	2.4	16.000	1322	A032	894	9325	1000	8.84E-03	GPA05 - 2S GCN 19FN14 MCS19FN14...S00
413	89	1.3	16.000	1100	A032	894	9325	550	7.23E-03	GPA04 - 2S GCN 19FN14 MCS19FN14...S00
440	188	2.2	16.000	1477	A064	850	9326	1000	1.28E-02	GPA05 - 2S GCN 19JN30 MCS19JN30...S00
445	188	1.2	16.000	1100	A064	850	9326	550	1.12E-02	GPA04 - 2S GCN 19JN30 MCS19JN30...S00
486	188	2.0	16.000	1629	A064	913	9326	1000	1.83E-02	GPA05 - 2S GCN 19PN30 MCS19PN30...S00
491	188	1.1	16.000	1100	A064	913	9326	550	1.67E-02	GPA04 - 2S GCN 19PN30 MCS19PN30...S00
499	135	1.2	10.000	1500	A048	1182	9326	620	1.79E-02	GPA05 - 1S GCN 19PN14 MCS19PN14...S00
514	71	1.9	20.000	1652	A032	1118	9325	1000	8.51E-03	GPA05 - 2S GCN 19FN14 MCS19FN14...S00
552	150	1.8	20.000	1846	A064	1062	9326	1000	1.25E-02	GPA05 - 2S GCN 19JN30 MCS19JN30...S00
560	107	1.8	28.000	1837	A048	1388	9326	1000	9.12E-03	GPA05 - 2S GCN 19FN30 MCS19FN30...S00
611	150	1.6	20.000	1900	A064	1141	9326	1000	1.80E-02	GPA05 - 2S GCN 19PN30 MCS19PN30...S00
611	89	1.6	16.000	1504	A032	970	9325	1000	1.28E-02	GPA05 - 2S GCN 19JN14 MCS19JN14...S00
723	51	1.4	28.000	1900	A032	1565	9325	1000	9.12E-03	GPA05 - 2S GCN 19FN14 MCS19FN14...S00
766	71	1.3	20.000	1881	A032	1212	9325	1000	1.25E-02	GPA05 - 2S GCN 19JN14 MCS19JN14...S00
778	107	1.3	28.000	1900	A064	1487	9326	1000	1.31E-02	GPA05 - 2S GCN 19JN30 MCS19JN30...S00
781	84	1.3	16.000	1900	A048	1853	9326	1000	1.83E-02	GPA05 - 2S GCN 19PN14 MCS19PN14...S00
859	107	1.2	28.000	1900	A064	1597	9326	1000	1.86E-02	GPA05 - 2S GCN 19PN30 MCS19PN30...S00
979	68	1.0	20.000	1900	A048	1900	9326	1000	1.80E-02	GPA05 - 2S GCN 19PN14 MCS19PN14...S00





Planetary gearboxes

Dimensions of servo geared motors



Planetary gearboxes

Dimensions of servo geared motors



Servo geared motor GPA□□ - 1S GCN		Motor frame size																					
		06C N41	06F N41	06I N41	09F N38	09H N41	12H N15 N35	12L N20 N41	14D N15 N36	14H N15 N32	14L N15 N32	14P N14 N32	19F N14 N30	19J N14 N30	19P N14 N30								
Motor																							
g		62			89			116			143				192								
g ₁		76			90			105			116	116	116	147	116	147	141	172	141	172	141	172	
g ₂		Resolver			Ø 67			Ø 72			Ø 78				Ø 78								
		Absolute value encoder			Ø 81			Ø 89			Ø 101				Ø 101								
k ₁		132	162	192	203	223	228	268	201	241	281	321	220	260	320								
dk		Resolver+brake			20			20			28				34	44	44						
		Absolute value encoder			51			49			50				49								
		Absolute value encoder +brake			71			69			78				83	93	93						
k ₅		Resolver			13			14			24				15								
		Absolute value encoder			64			63			74				64								
m		64			78			78			78	78	78	94	78	94	78	94	78	94	78	94	
n		58			63			63			63	63	63	80	63	80	63	80	63	80	63	80	
x		21			21			18			16	16	16	38	16	38	16	36	16	36	16	36	
Gearbox size		Housing width a ₂ Overall length k (resolver)																					
GPA00		a ₂			89																		
		k			265	295	325	336	356														
GPA01		a ₂			89			116															
		k			323	353	364	384	389	429													
GPA02		a ₂			102			116			142												
		k			412	432	437	477	410	450	490	530											
GPA03		a ₂			142			142			192												
		k			495	535	468	508	548	588	487	527	587										
GPA04		a ₂			192																		
		k			528	568	628																
GPA05		a ₂			212																		
		k			579	619	679																

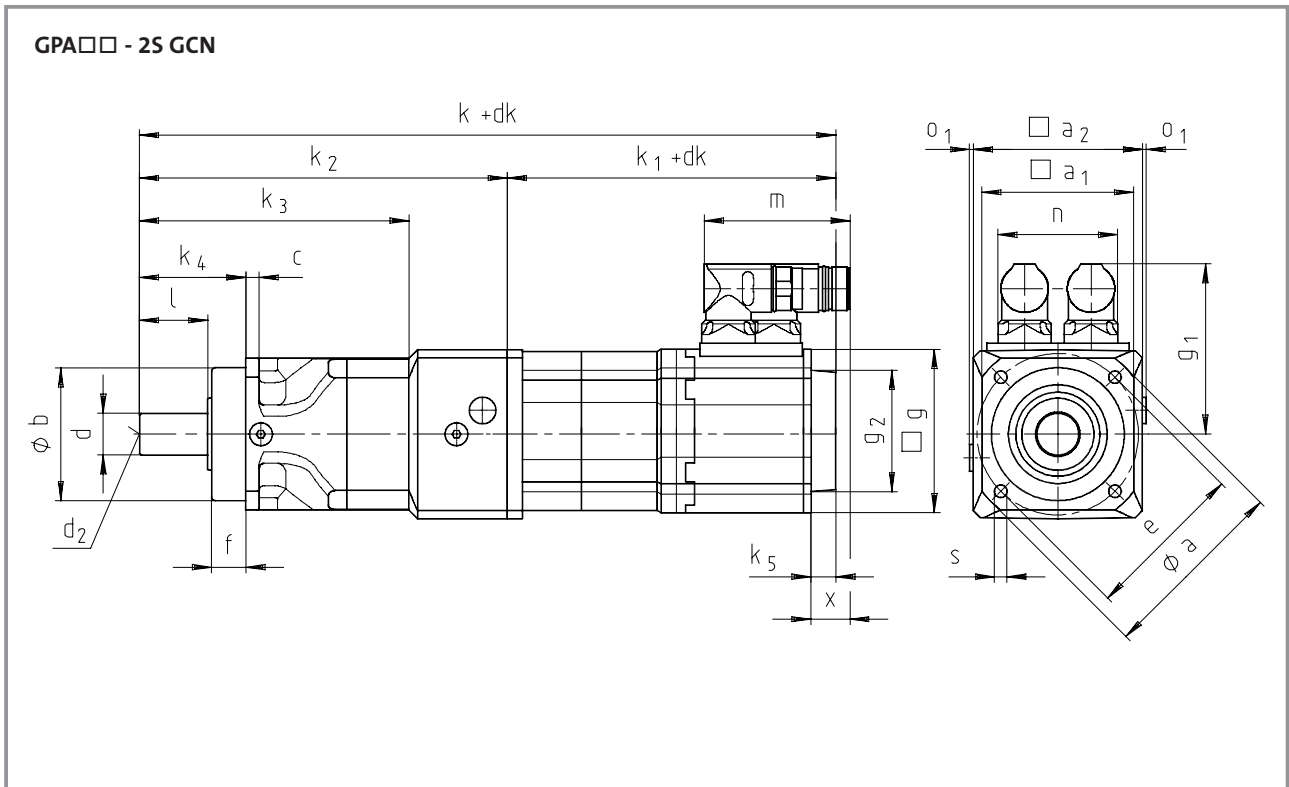
Gearbox size	Housing				Solid shaft			Output flange						
	k ₂	k ₃	k ₄	o ₁	d k6	l	d ₂ DIN 332	a	a ₁	b g6	c	e	f	s 4 x 90°
GPA00	133	94	48	2	16	28	D M5	80	65	60	6	68	18	5.5
GPA01	161	109	56	2	22	36	D M8	100	80	70	7	85	18	6.6
GPA02	209	146	88	2	32	58	D M12	140	102	90	10	120	28	9
GPA03	267	189	112	3	40	82	D M16	188	142	130	12	165	28	11
GPA04	308	213	112	3	55	82	D M20	250	182	160	15	215	27	13
GPA05	359	255	143	3	75	105	D M20	290	212	180	17	250	35	17

Dimensions in [mm]



Planetary gearboxes

Dimensions of servo geared motors



Planetary gearboxes

Dimensions of servo geared motors



Servo geared motor GPA□□ - 2S GCN	Motor frame size																						
	06C N41	06F N41	06I N41	09F N38	09H N41	12H N15 N35	12L N20 N41	14D N15 N36	14H N15 N32	14L N15 N32	14P N32	19F N14	N30	19J N14 N30	19P N14 N30								
Motor																							
g	62			89			116			143				192									
g₁	76			90			105			116	116	116	147	147	141	172	141	172	141	172			
g₂	Resolver			Ø 62			Ø 67			Ø 72				Ø 78									
	Absolute value encoder			Ø 86			Ø 81			Ø 89				Ø 101									
k₁	132	162	192	203	223	228	268	268	201	241	281	321	220	260	320								
dk	Resolver+brake			19			20			20				28		34	44	44					
	Absolute value encoder			82			51			49				50									
	Absolute value encoder +brake			100			71			69				78				83	93	93			
k₅	Resolver			0			13			14				24									
	Absolute value encoder			82			64			63				74									
m	64			78			78			78	78	78	94	94	78	94	78	94	78	94			
n	58			63			63			63	63	63	80	80	63	80	63	80	63	80			
x	21			21			18			16	16	16	38	38	16	36	16	36	16	36			

Gearbox size	Housing width a ₂ Overall length k (resolver)																
	a ₂	k			k			k			k			k			
GPA00	65	265	295	356													
GPA01	80	313	343	373	384	404											
GPA02	102				439	459	464	504									
GPA03	142				528	568	568	508	541	581	621						
GPA04	192													558	598	658	
GPA05	212													648	688	748	

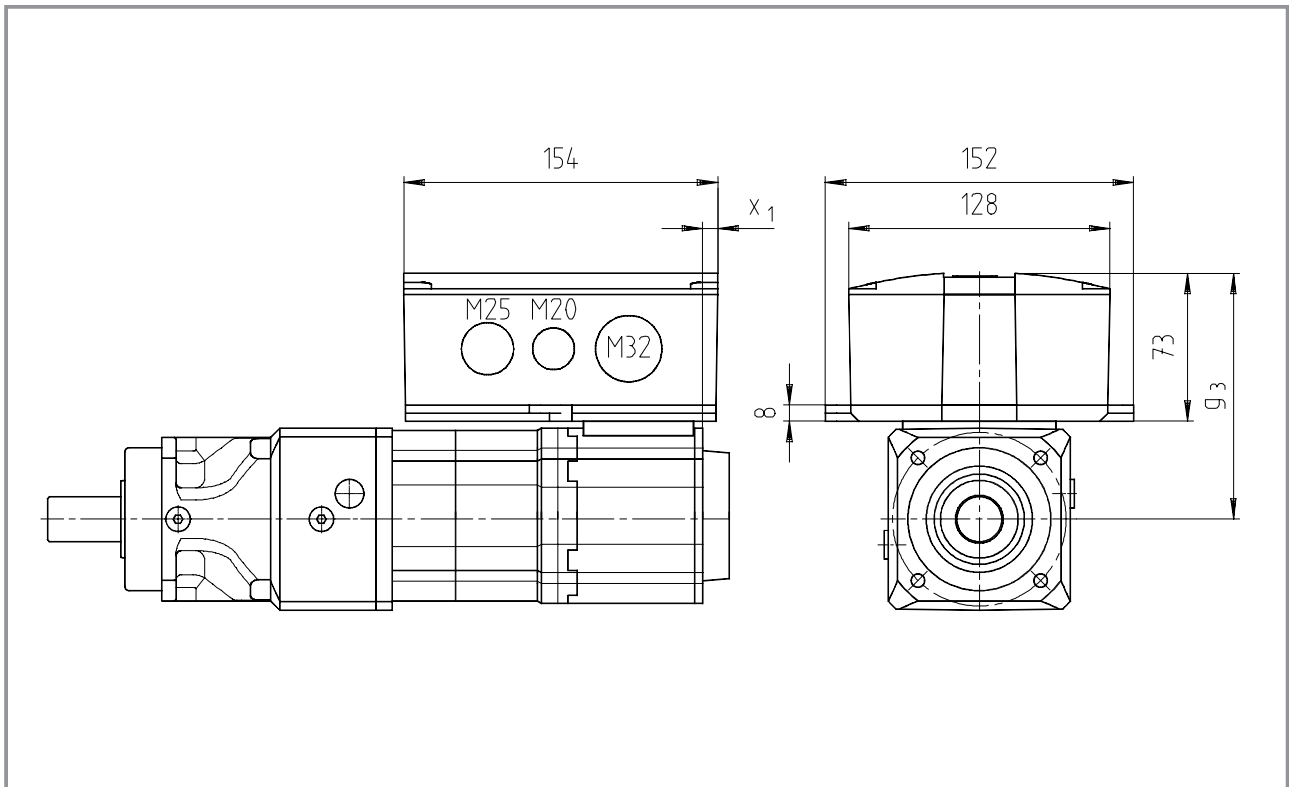
Gearbox size	Housing				Solid shaft			Output flange						
	k ₂	k ₃	k ₄	o ₁	d k6	l	d ₂ DIN 332	a	a ₁	b g6	c	e	f	s 4 x 90°
GPA00	164	125	48	2	16	28	D M5	80	65	60	6	68	18	5.5
GPA01	181	142	56	2	22	36	D M8	100	80	70	7	85	18	6.6
GPA02	236	184	88	2	32	58	D M12	140	102	90	10	120	28	9
GPA03	300	237	112	2	40	82	D M16	188	142	130	12	165	28	11
GPA04	338	261	112	3	55	82	D M20	250	182	160	15	215	27	13
GPA05	428	334	143	3	75	105	D M20	290	212	180	17	250	35	17

Dimensions in [mm]



Planetary gearboxes

Dimensions of servo geared motors



3

Servo geared motor GPA□□ - □S GCN		Motor frame size			
		09	12	14	19
Terminal box	g ₃	121	136	147	172
	x ₁	8	5	3	3

Dimensions in [mm]





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MCS 06 synchronous servo motors

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MCS 09 synchronous servo motors

Rated data 4-13
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Brake assignment 4-20

MCS 12 synchronous servo motors

Rated data 4-21
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Brake assignment 4-28

MCS 14 synchronous servo motors

Rated data 4-31
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MCS 19 synchronous servo motors

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For more information about servo controllers, please refer to the appropriate catalogues.

Go to “www.Lenze.com” or contact us direct.



Integrated servo motors

Overview of types

MCS synchronous servo motors

Motor	M_N Nm	n_N rpm	P_N kW	I_N A	M_0 Nm	I_0 A	M_{max} Nm	I_{max} A	J_{motor} (without brake) kgcm ²
MCS 06C41	0.6	4050	0.25	1.3	0.8	1.3	2.4	5.4	0.14
MCS 06F41	1.2	4050	0.51	1.5	1.5	1.5	4.4	5.3	0.22
MCS 06I41	1.5	4050	0.64	1.6	2.0	1.7	6.2	5.9	0.30
MCS 09F38	3.1	3750	1.2	2.5	4.2	3.0	15	15	1.50
MCS 09H41	3.8	4050	1.6	3.4	5.5	4.3	20	20	1.90
MCS 12H15	10.0	1500	1.9	3.8	11.4	4.1	29	12	7.3
MCS 12H35	7.5	3525	2.8	5.7	11.4	8.2	29	24	7.3
MCS 12L20	13.5	1950	2.8	5.9	15.0	6.2	56	28	10.6
MCS 12L41	11.0	4050	4.7	10.2	15.0	12.4	56	57	10.6
MCS 14D15	9.2	1500	1.45	4.5	11	5.0	29	17	8.1
MCS 14D36	7.5	3600	2.8	7.5	11	10.0	29	33	8.1
MCS 14H15	16.0	1500	2.5	6.6	21	8.5	55	26	14.2
MCS 14H32	14.0	3225	4.7	11.9	21	16.9	55	52	14.2
MCS 14L15	23.0	1500	3.6	9.7	28	12.0	77	37	23.4
MCS 14L32	17.2	3225	5.8	15	28	24.0	77	75	23.4
MCS 14P14	30.0	1350	4.2	10.8	37	12.2	105	46	34.7
MCS 14P32	21.0	3225	7.1	15.6	37	24.3	105	92	34.7
MCS 19F14	27	1425	4.0	8.6	32	9.9	86	31	65.0
MCS 19F30	21	3000	6.6	14.0	32	19.8	86	63	65.0
MCS 19I14	40	1425	6.0	12.3	51	15.2	129	45	105.0
MCS 19J30	29	3000	9.1	18.5	51	30.5	129	90	105.0
MCS 19P14	51	1350	7.2	14.3	64	17.5	190	60	160.0
MCS 19P30	32	3000	10.0	19.0	64	34.9	190	120	160.0



MCS 14H



MCS 19F

Integrated servo motors

MCS 06 synchronous servo motors



Rated data

Motor	M_N Nm	n_N rpm	P_N kW	U_N V	f_N Hz	I_N A	η %	M_0 Nm	I_0 A	M_{max} Nm	I_{max} A	J_{motor} without brake kgcm ²
MCS 06C41	0.6	4050	0.25	225	270	1.3	65	0.8	1.3	2.4	5.4	0.14
MCS 06F41	1.2	4050	0.51	320	270	1.5	77	1.5	1.5	4.4	5.3	0.22
MCS 06I41	1.5	4050	0.64	325	270	1.6	81	2.0	1.7	6.2	5.9	0.30

Motor	kE_{LL} - factor at 150°C V/1000 rpm	R_{UV} at 20°C Ω	R_{UV} at 150°C Ω	L_{phase} λ mH	kt_0 - factor at 150°C Nm/A	Type of power connector	Weight without brake kg	Maximum speed mech. rpm
MCS 06C41	36.6	27.1	36.5	51.0	0.66	EWS0001	1.8	8000
MCS 06F41	60.1	21.9	29.5	63.5	1.05		2.2	8000
MCS 06I41	73.4	18.8	25.4	60.2	1.21		2.9	8000



MCS 06C



MCS 06F



MCS 06I



Integrated servo motors

MCS 06 synchronous servo motors

Assignment of servo controllers

Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 4 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		2	4	8	12.7	17	20
Maximum current 0 Hz ^{1) 2)} [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz ^{1) 2)} [A]		4	8	16	32	48	64
Motor type							
MCS 06C41	M_N	0.6					
	M_0	0.8					
	$M_{max} \ n=0$	1.2					
	M_{max}	1.9					
MCS 06F41	M_N	1.2					
	M_0	1.5					
	$M_{max} \ n=0$	2.0					
	M_{max}	3.5					
MCS 06I41	M_N	1.5	1.5				
	M_0	2.0	2.0				
	$M_{max} \ n=0$	2.6	5.0				
	M_{max}	4.4	6.2				

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply



Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 8 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		1.4	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz ^{1) 2) 3)} [A]		1.5	3	6	12.1	18.1	24.2
Maximum current > 5 Hz ^{1) 2) 3)} [A]		2.7	5.3	10.7	21.3	32	42.7
Motor type							
MCS 06C41	M_N	0.6	0.6				
	M_0	0.8	0.8				
	$M_{max} n=0$	0.8	1.5				
	M_{max}	1.4	2.4				
MCS 06F41	M_N	1.1	1.2				
	M_0	1.4	1.5				
	$M_{max} n=0$	1.3	2.7				
	M_{max}	2.4	4.4				
MCS 06I41	M_N	1.3	1.5				
	M_0	1.6	2.0				
	$M_{max} n=0$	1.7	3.3				
	M_{max}	3.0	5.6				

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply



Integrated servo motors

MCS 06 synchronous servo motors

Assignment of servo controllers

Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 8 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.5	2.5	3.9	7	13	23.5	32	47	59	89
Maximum current 0 Hz ^{1) 2)} [A]		2.3	3.8	5.9	10.5	19.5	23.5	32	47	52	80
Maximum current > 5 Hz ^{1) 2)} [A]		2.3	3.8	5.9	10.5	19.5	35.25	48	70.5	88.5	133.5
Motor type											
MCS 06C41	M_N	0.6	0.6	0.6							
	$M_0^{4)}$	0.8	0.8	0.8							
	$M_{max} n=0$	1.2	1.8	2.4							
	M_{max}	1.2	1.8	2.4							
MCS 06F41	M_N	1.2	1.2	1.2							
	$M_0^{4)}$	1.5	1.5	1.5							
	$M_{max} n=0$	2.0	3.3	4.4							
	M_{max}	2.0	3.3	4.4							
MCS 06I41	M_N	1.4	1.5	1.5							
	$M_0^{4)}$	1.8	2.0	2.0							
	$M_{max} n=0$	2.6	4.2	6.2							
	M_{max}	2.6	4.2	6.2							

1) Caution: Limit I_{max} of device to I_{max} of motor

2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

4) On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz



Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 16 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38	58
Maximum current 0 Hz ¹⁾²⁾ [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33	45
Maximum current > 5 Hz ¹⁾²⁾ [A]		1.7	2.7	4.4	7.8	14.6	23	31.2	45.9	57	87
Motor type											
MCS 06C41	M_N	0.5	0.6	0.6							
	M_0 ⁴⁾	0.7	0.8	0.8							
	M_{max} n=0	0.9	1.4	2.1							
	M_{max}	0.9	1.4	2.1							
MCS 06F41	M_N	0.9	1.2	1.2							
	M_0 ⁴⁾	1.1	1.5	1.5							
	M_{max} n=0	1.5	2.4	3.8							
	M_{max}	1.5	2.4	3.8							
MCS 06I41	M_N	1.0	1.5	1.5	1.5						
	M_0 ⁴⁾	1.3	2.0	2.0	2.0						
	M_{max} n=0	1.9	3.0	4.8	6.2						
	M_{max}	1.9	3.0	4.8	6.2						

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

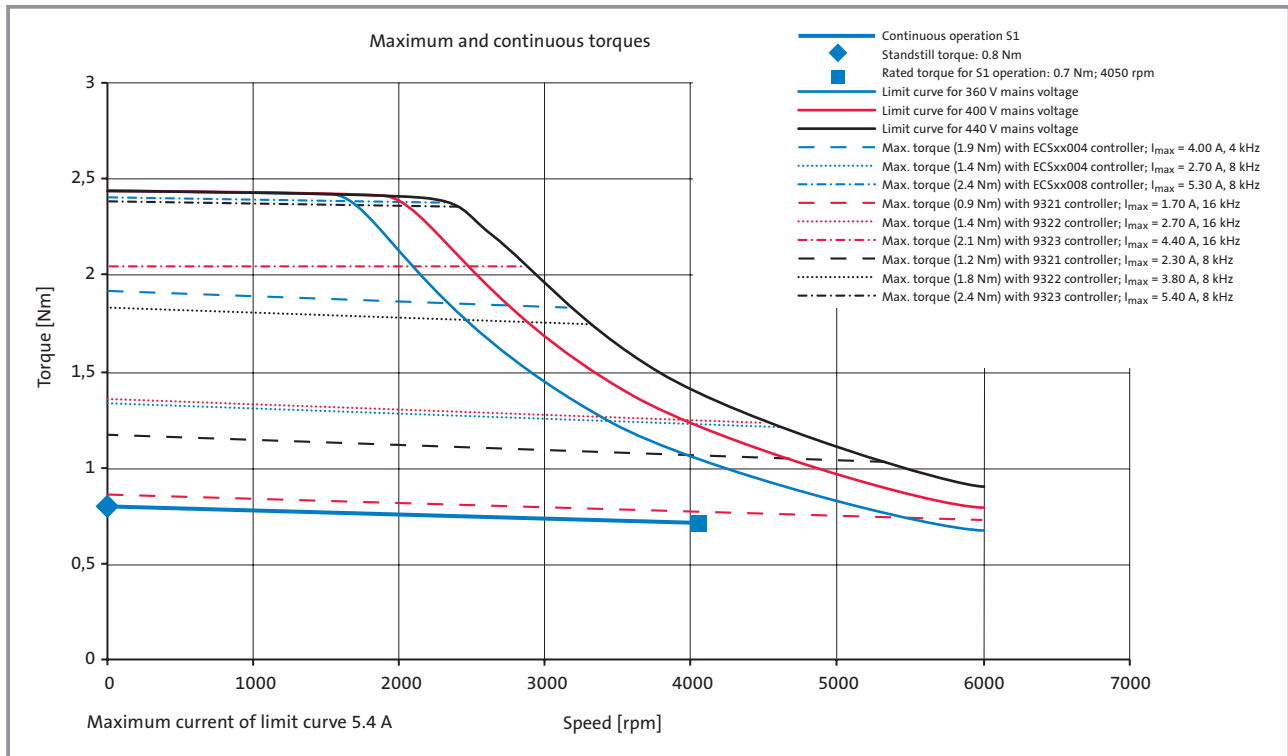


Integrated servo motors

MCS 06 synchronous servo motors

Torque characteristics

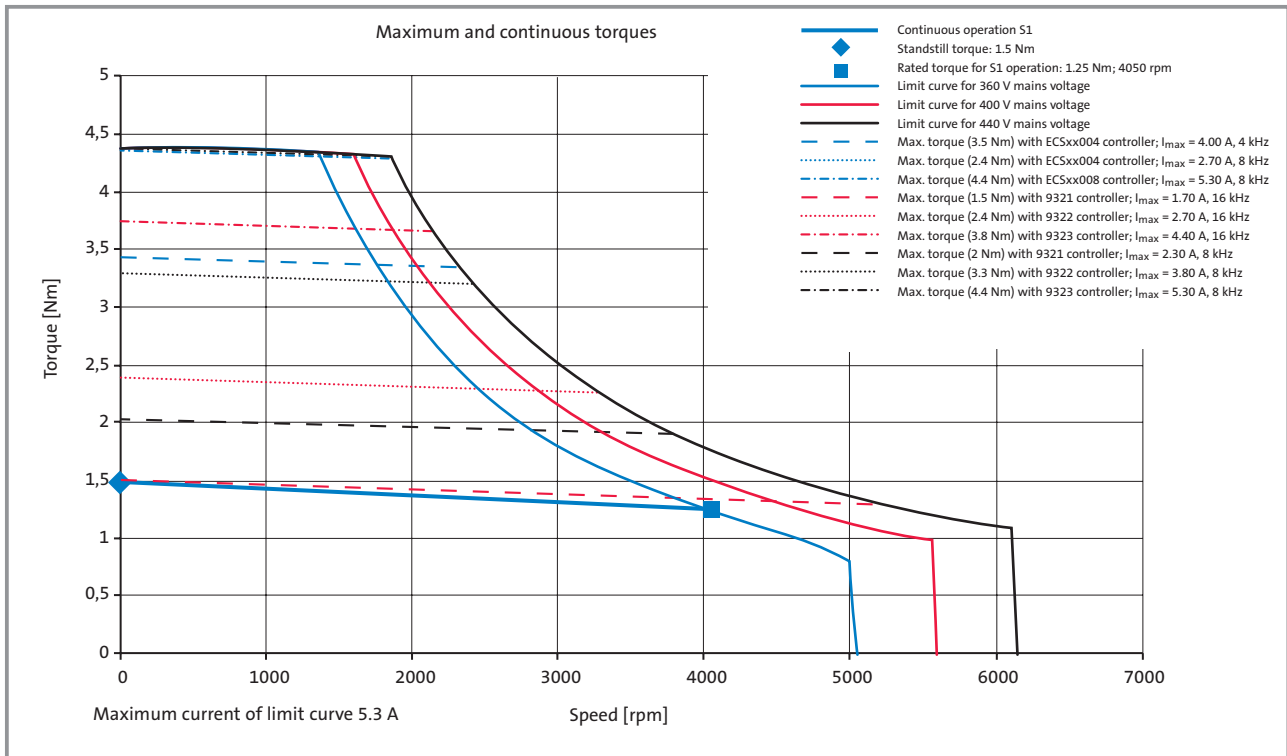
MCS 06C41



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



MCS 06F41



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

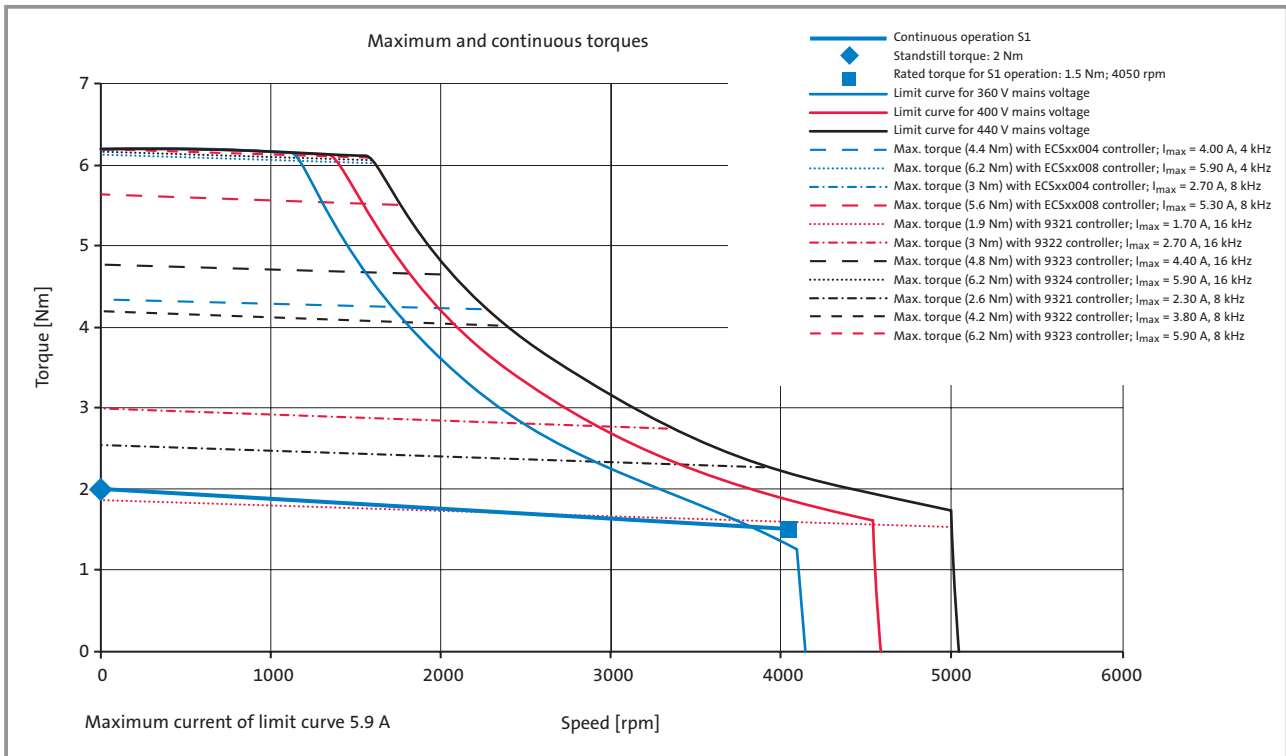


Integrated servo motors

MCS 06 synchronous servo motors

Torque characteristics

MCS 06I41



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



Brake assignment

The MCS synchronous servo motors can be fitted with integrated permanent-magnet holding brakes for 24 V DC.

The brakes are active when the supply voltage is switched off (closed-circuit principle).

If the brakes are used purely as holding brakes, virtually no wear occurs at the friction surfaces. Provided that the permissible switching energy is not exceeded, a minimum of 2000 emergency stop functions is possible.

MCS 06C41

MCS 06F41

MCS 06I41

Type	Size	Holding torque M_4 20°C Nm	Holding torque M_4 120°C Nm	Mean dynamic torque M_{1m} 120°C Nm	U_B ³⁾ +5% -10% V	I_B ²⁾ A	J_B kgcm ²	Engage-ment time $t1$ ¹⁾ ms	Disengage-ment time $t2$ ¹⁾ ms	Maximum switching energy per emergency stop at n=3000 rpm J	Weight kg
P1	04H	2.2	2	0.6	24	0.34	0.12	15	30	29.6	0.27

¹⁾ Engagement and disengagement times apply at the rated voltage ($\pm 0\%$) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.

²⁾ The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.

³⁾ Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	$J_{\text{motor with brake}}$ kgcm ²	Permissible $J_{\text{load}}/J_{\text{motor}}$
MCS 06C	P1	0.26	22.1
MCS 06F	P1	0.34	16.6
MCS 06I	P1	0.42	13.3

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the ohmic voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [V] = 0.08 \times l_{\text{cable}} [m] \times I_B [A]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.





Rated data

Motor	M_N Nm	n_N rpm	P_N kW	U_N V	f_N Hz	I_N A	η %	M_0 Nm	I_0 A	M_{max} Nm	I_{max} A	J_{motor} without brake kgcm ²
MCS 09F38	3.1	3750	1.2	330	250	2.5	90	4.2	3.0	15	15	1.50
MCS 09H41	3.8	4050	1.6	300	270	3.4	91	5.5	4.3	20	20	1.90

Motor	kE_{LL} - factor at 150°C V/1000 rpm	R_{UV} at 20°C Ω	R_{UV} at 150°C Ω	L_{phase} λ mH	kt_0 - factor at 150°C Nm/A	Type of power connector	Weight without brake kg	Maximum speed mech. rpm
MCS 09F38	79.8	5.2	7.0	24.6	1.40	EWS0001	5.2	7000
MCS 09H41	75.7	3.2	4.3	16.1	1.29		6.1	7000



Integrated servo motors

MCS 09 synchronous servo motors

Assignment of servo controllers

Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 4 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		2	4	8	12.7	17	20
Maximum current 0 Hz ^{1) 2)} [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz ^{1) 2)} [A]		4	8	16	32	48	64
Motor type							
MCS 09F38	M_N	2.5	3.1	3.1			
	M_0	2.8	4.2	4.2			
	$M_{max} \ n=0$	3.2	6.2	10.8			
	M_{max}	5.5	9.8	14.9			
MCS 09H41	M_N		3.8	3.8			
	M_0		5.2	5.5			
	$M_{max} \ n=0$		5.9	11.1			
	M_{max}		9.9	17.5			

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply



Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 8 kHz						
Type	ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]	1.4	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz ^{1) 2) 3)} [A]	1.5	3	6	12.1	18.1	24.2
Maximum current > 5 Hz ^{1) 2) 3)} [A]	2.7	5.3	10.7	21.3	32	42.7
Motor type						
MCS 09F38	M_N		3.1	3.1		
	M_0		3.8	4.2		
	$M_{max} n=0$		4.1	7.8		
	M_{max}		7.0	12.2		
MCS 09H41	M_N		3.0	3.8	3.8	
	M_0		3.5	5.5	5.5	
	$M_{max} n=0$		3.9	7.6	14.1	
	M_{max}		6.8	12.7	20.5	

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply



Integrated servo motors

MCS 09 synchronous servo motors

Assignment of servo controllers

Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 8 kHz										
Type	9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]	1.5	2.5	3.9	7	13	23.5	32	47	59	89
Maximum current 0 Hz ^{1) 2)} [A]	2.3	3.8	5.9	10.5	19.5	23.5	32	47	52	80
Maximum current > 5 Hz ^{1) 2)} [A]	2.3	3.8	5.9	10.5	19.5	35.25	48	70.5	88.5	133.5
Motor type										
MCS 09F38	M_N		3.1	3.1	3.1					
	M_0 ⁴⁾		3.5	4.2	4.2					
	$M_{max} \ n=0$		5.2	7.7	12.0					
	M_{max}		5.2	7.7	12.0					
MCS 09H41	M_N		2.8	3.8	3.8	3.8				
	M_0 ⁴⁾		3.2	5.0	5.5	5.5				
	$M_{max} \ n=0$		4.9	7.5	12.5	20.1				
	M_{max}		4.9	7.5	12.5	20.1				

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz



Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 16 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38	58
Maximum current 0 Hz ¹⁾²⁾ [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33	45
Maximum current > 5 Hz ¹⁾²⁾ [A]		1.7	2.7	4.4	7.8	14.6	23	31.2	45.9	57	87
Motor type											
MCS 09F38	M_N		2.2	3.1	3.1	3.1					
	M_0 ⁴⁾		2.5	4.1	4.2	4.2					
	$M_{max} n=0$		3.7	5.9	9.6	14.7					
	M_{max}		3.7	5.9	9.6	14.7					
MCS 09H41	M_N			3.2	3.8	3.8					
	M_0 ⁴⁾			3.7	5.5	5.5					
	$M_{max} n=0$			5.7	9.7	16.3					
	M_{max}			5.7	9.7	16.3					

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

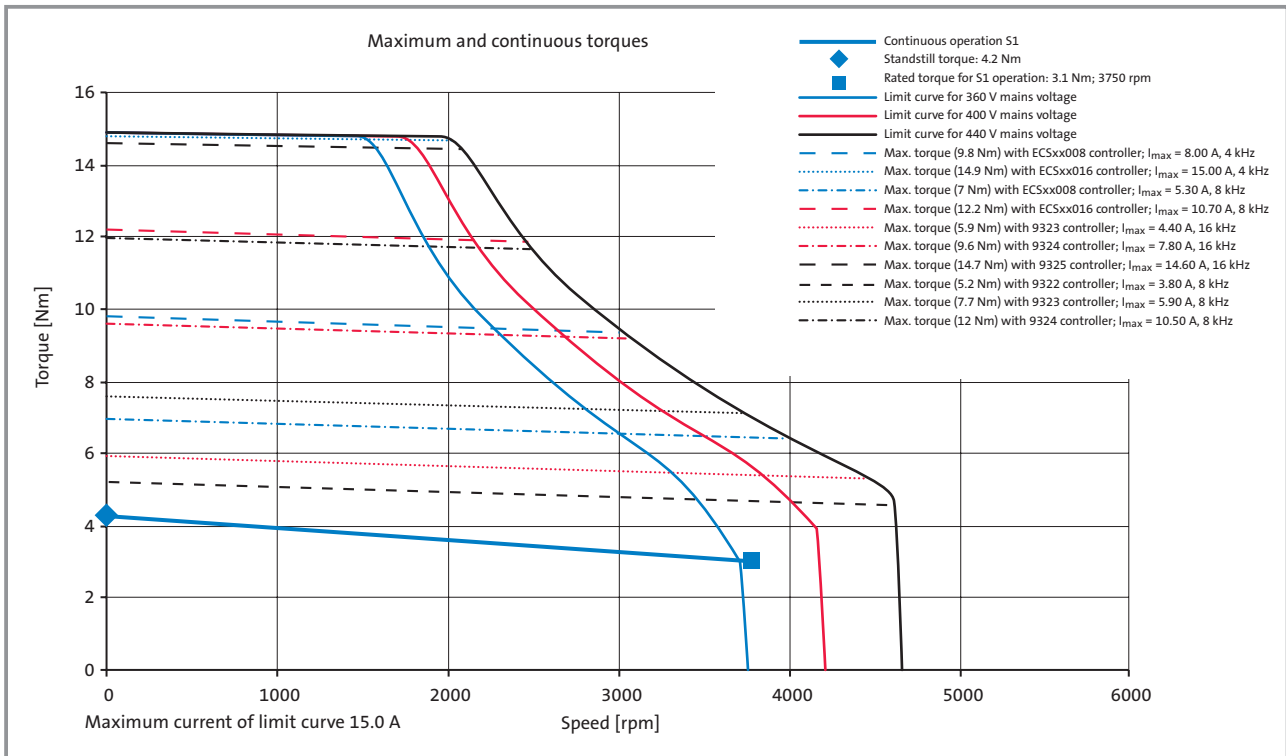


Integrated servo motors

MCS 09 synchronous servo motors

Torque characteristics

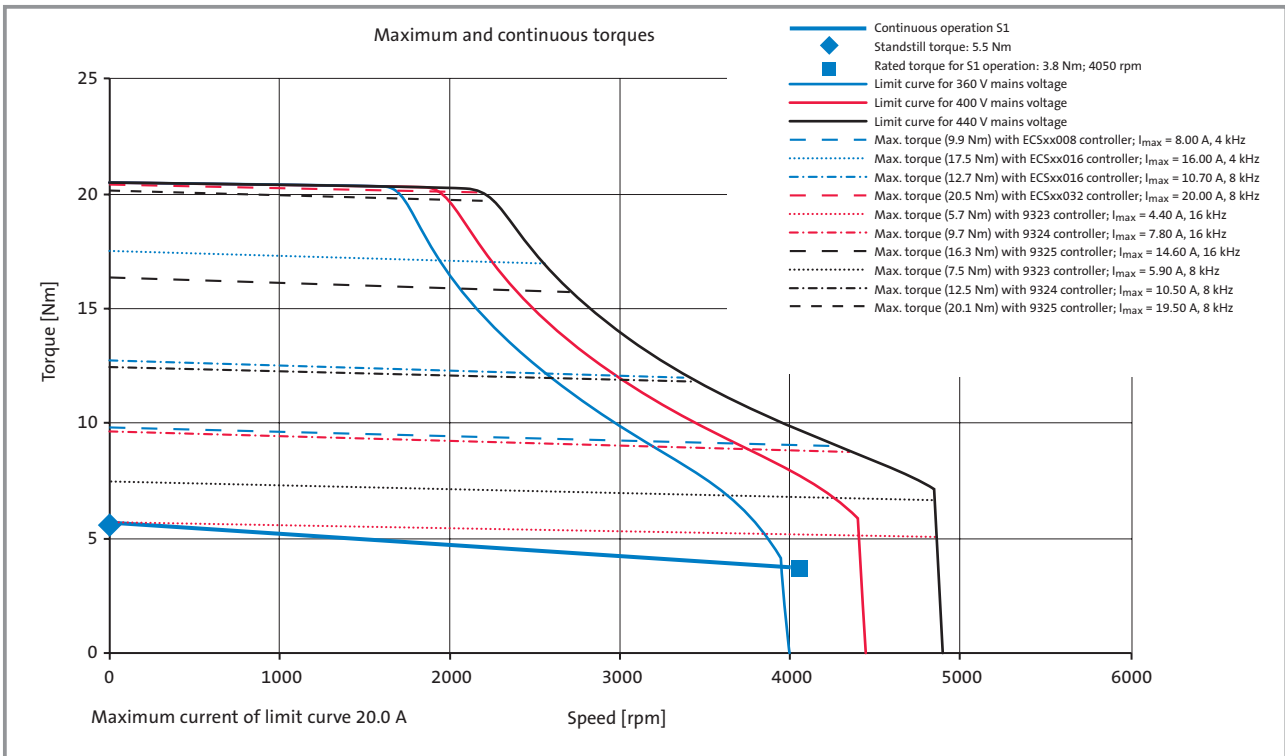
MCS 09F38



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



MCS 09H41



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



Integrated servo motors

MCS 09 synchronous servo motors

Brake assignment

The MCS synchronous servo motors can be fitted with integrated permanent-magnet holding brakes for 24 V DC.

The brakes are active when the supply voltage is switched off (closed-circuit principle).

If the brakes are used purely as holding brakes, virtually no wear occurs at the friction surfaces. Provided that the permissible switching energy is not exceeded, a minimum of 2000 emergency stop functions are possible.

MCS 09F

MCS 09H

Type	Size	Holding torque M_4 20°C Nm	Holding torque M_4 120°C Nm	Mean dynamic torque M_{1m} 120°C Nm	U_B ³⁾ +5% -10% V	I_B ²⁾ A	J_B kgcm ²	Engage-ment time $t1$ ¹⁾ ms	Disengage-ment time $t2$ ¹⁾ ms	Maximum switching energy per emergency stop at n=3000 rpm J	Weight kg
P1	07H	8.0	6	4.5	24	0.65	1.07	20	40	400	0.8
P2	07H	12	10	7.0	24	0.65	1.07	20	40	400	0.8

P1 Standard brake

P2 Heavy-duty brake

- 1) Engagement and disengagement times apply at the rated voltage ($\pm 0\%$) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.
- 2) The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.
- 3) Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	$J_{\text{motor with brake}}$ kgcm ²	Permissible $J_{\text{load}}/J_{\text{motor}}$
MCS 09F	P1	2.57	30.5
MCS 09H	P1	2.97	26.3
MCS 09F	P2	2.57	30.5
MCS 09H	P2	2.97	26.3

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the ohmic voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [V] = 0.08 \times l_{\text{cable}} [m] \times I_B [A]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.

Integrated servo motors

MCS 12 synchronous servo motors



Rated data

Motor	M_N Nm	n_N rpm	P_N kW	U_N V	f_N Hz	I_N A	η %	M_0 Nm	I_0 A	M_{max} Nm	I_{max} A	J_{motor} without brake kgcm ²
MCS 12H15	10.0	1500	1.6	300	100	3.8	88	11.4	4.1	29	12	7.3
MCS 12H35	7.5	3525	2.8	325	235	5.7	91	11.4	8.2	29	24	7.3
MCS 12L20	13.5	1950	2.8	330	130	5.9	90	15.0	6.2	56	28	10.6
MCS 12L41	11	4050	4.7	300	270	10.2	91	15.0	12.4	56	57	10.6

Motor	kE_{LL} - factor at 150°C V/1000 rpm	R_{UV} at 20°C Ω	R_{UV} at 150°C Ω	L_{phase} λ mH	kt_0 - factor at 150°C Nm/A	Type of power connector	Weight without brake kg	Maximum speed mech. rpm
MCS 12H15	172.9	5.7	7.7	42.1	2.79	EWS0001	9.5	6000
MCS 12H35	86.5	1.4	1.9	10.5	1.40		6000	
MCS 12L20	149.2	2.2	3.0	21.8	2.42		12.6	6000
MCS 12L41	74.6	0.5	0.7	5.5	1.21		6000	



MCS 12H



MCS 12L



Integrated servo motors

MCS 12 synchronous servo motors

Assignment of servo controllers

Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 4 kHz						
Type	ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]	2	4	8	12.7	17	20
Maximum current 0 Hz ^{1) 2)} [A]	2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz ^{1) 2)} [A]	4	8	16	32	48	64
Motor type						
MCS 12H15	M_N		10.0	10.0		
	M_0		11.2	11.4		
	$M_{max} n=0$		11.9	22.6		
	M_{max}		20.1	29.0		
MCS 12H35	M_N		5.3	7.5	7.5	
	M_0		5.6	11.2	11.4	
	$M_{max} n=0$		6.0	11.8	22.5	
	M_{max}		10.4	20.1	29.0	
MCS 12L20	M_N			13.5	13.5	
	M_0			15.0	15.0	
	$M_{max} n=0$			21.4	39.4	
	M_{max}			35.5	56.4	
MCS 12L41	M_N			8.6	11.0	11.0
	M_0			9.7	15.0	15.0
	$M_{max} n=0$			10.8	21.3	30.8
	M_{max}			19.0	35.5	49.6

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply



Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 8 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		1.4	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz ^{1) 2) 3)} [A]		1.5	3	6	12.1	18.1	24.2
Maximum current > 5 Hz ^{1) 2) 3)} [A]		2.7	5.3	10.7	21.3	32	42.7
Motor type							
MCS 12H15	M_N		7.1	10.0			
	M_0		7.5	11.4			
	$M_{max} n=0$		7.8	15.4			
	M_{max}		13.7	26.2			
MCS 12H35	M_N			7.0	7.5	7.5	
	M_0			7.4	11.4	11.4	
	$M_{max} n=0$			7.8	15.5	22.5	
	M_{max}			13.8	26.1	29.0	
MCS 12L20	M_N			12.1	13.5	13.5	
	M_0			12.8	15.0	15.0	
	$M_{max} n=0$			14.3	27.7	39.4	
	M_{max}			24.8	45.1	56.4	
MCS 12L41	M_N				9.2	11.0	11.0
	M_0				10.3	13.7	15.0
	$M_{max} n=0$				14.4	21.3	27.7
	M_{max}				24.7	35.5	45.2

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply



Integrated servo motors

MCS 12 synchronous servo motors

Assignment of servo controllers

Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 8 kHz										
Type	9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]	1.5	2.5	3.9	7	13	23.5	32	47	59	89
Maximum current 0 Hz ^{1) 2)} [A]	2.3	3.8	5.9	10.5	19.5	23.5	32	47	52	80
Maximum current > 5 Hz ^{1) 2)} [A]	2.3	3.8	5.9	10.5	19.5	35.25	48	70.5	88.5	133.5
Motor type										
MCS 12H15	M_N			10.0	10.0					
	M_0 ⁴⁾			10.9	11.4					
	M_{max} n=0			15.1	25.8					
	M_{max}			15.1	25.8					
MCS 12H35	M_N			7.5	7.5					
	M_0 ⁴⁾			9.8	11.4					
	M_{max} n=0			13.6	24.1					
	M_{max}			13.6	24.1					
MCS 12L20	M_N			13.5	13.5					
	M_0 ⁴⁾			15.0	15.0					
	M_{max} n=0			24.4	41.9					
	M_{max}			24.4	41.9					
MCS 12L41	M_N				11.0	11.0	11.0			
	M_0 ⁴⁾				15.0	15.0	15.0			
	M_{max} n=0				22.8	27.0	35.5			
	M_{max}				22.8	38.5	49.6			

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz



Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 16 kHz										
Type	9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]	1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38	58
Maximum current 0 Hz ¹⁾²⁾ [A]	1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33	45
Maximum current > 5 Hz ¹⁾²⁾ [A]	1.7	2.7	4.4	7.8	14.6	23	31.2	45.9	57	87
Motor type										
MCS 12H15	M_N			7.6	10.0	10.0				
	M_0 ⁴⁾			8.1	11.4	11.4				
	M_{max} n=0			11.4	19.6	29.0				
	M_{max}			11.4	19.6	29.0				
MCS 12H35	M_N			6.8	7.5	7.5				
	M_0 ⁴⁾			7.3	11.4	11.4				
	M_{max} n=0			10.1	18.5	19.3				
	M_{max}			10.1	18.5	27.9				
MCS 12L20	M_N			11.9	13.5	13.5	13.5			
	M_0 ⁴⁾			12.6	15.0	15.0	15.0			
	M_{max} n=0			18.5	32.8	34.1	44.2			
	M_{max}			18.5	32.8	47.9	56.4			
MCS 12L41	M_N				10.5	11.0	11.0	11.0		
	M_0 ⁴⁾				11.7	15.0	15.0	15.0		
	M_{max} n=0				17.4	18.2	24.2	34.1		
	M_{max}				17.4	26.5	34.7	47.8		

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

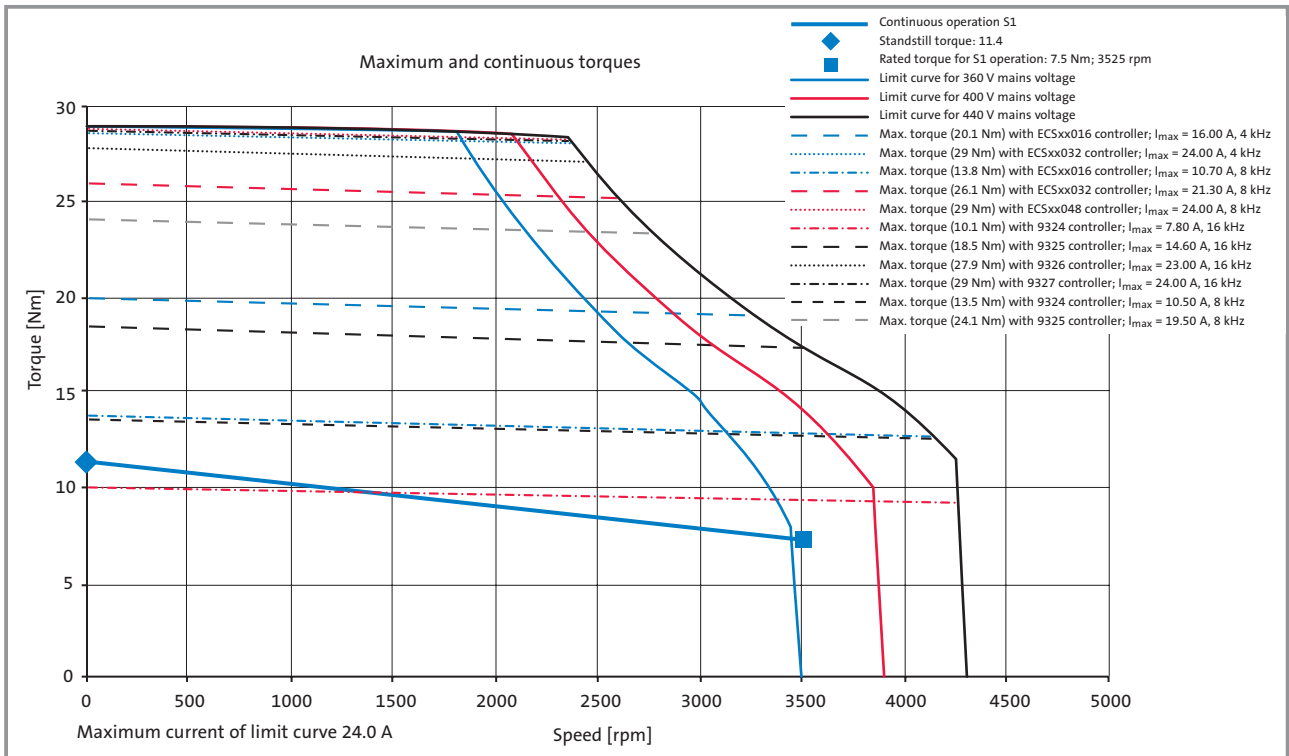


Integrated servo motors

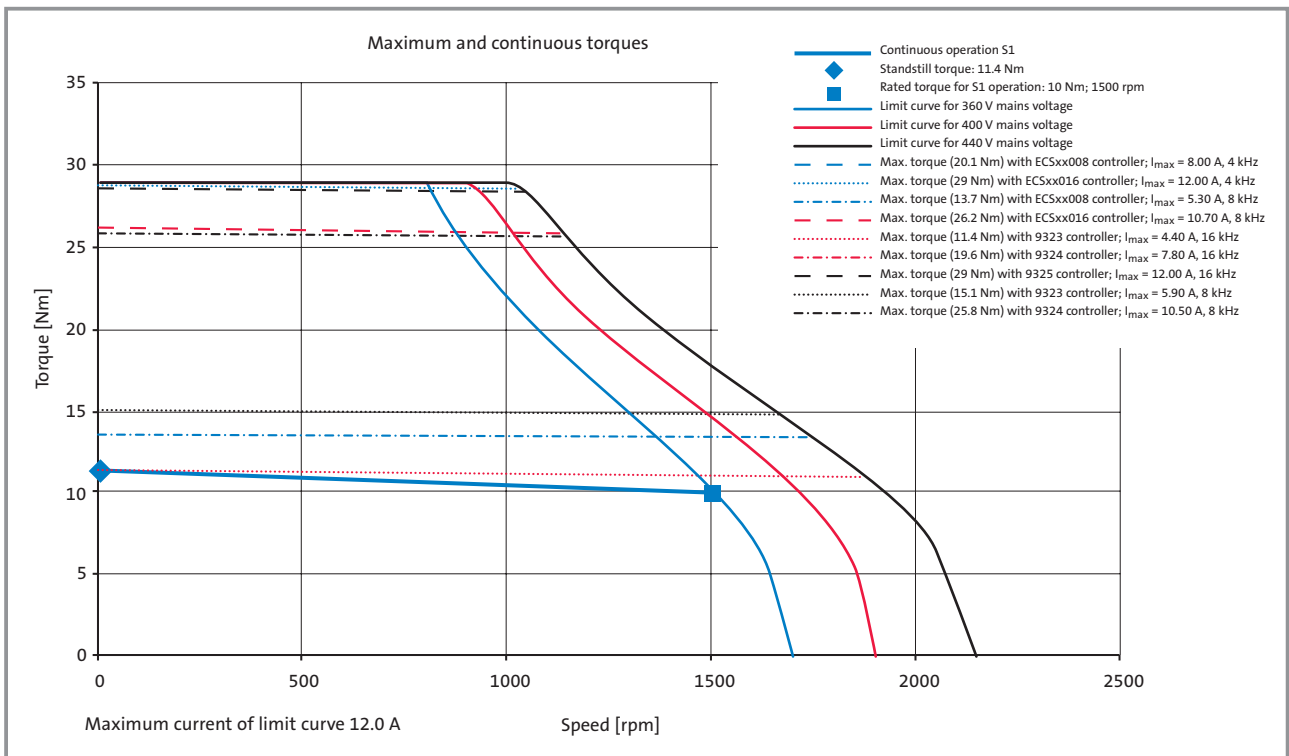
MCS 12 synchronous servo motors

Torque characteristics

MCS 12H35



MCS 12H15



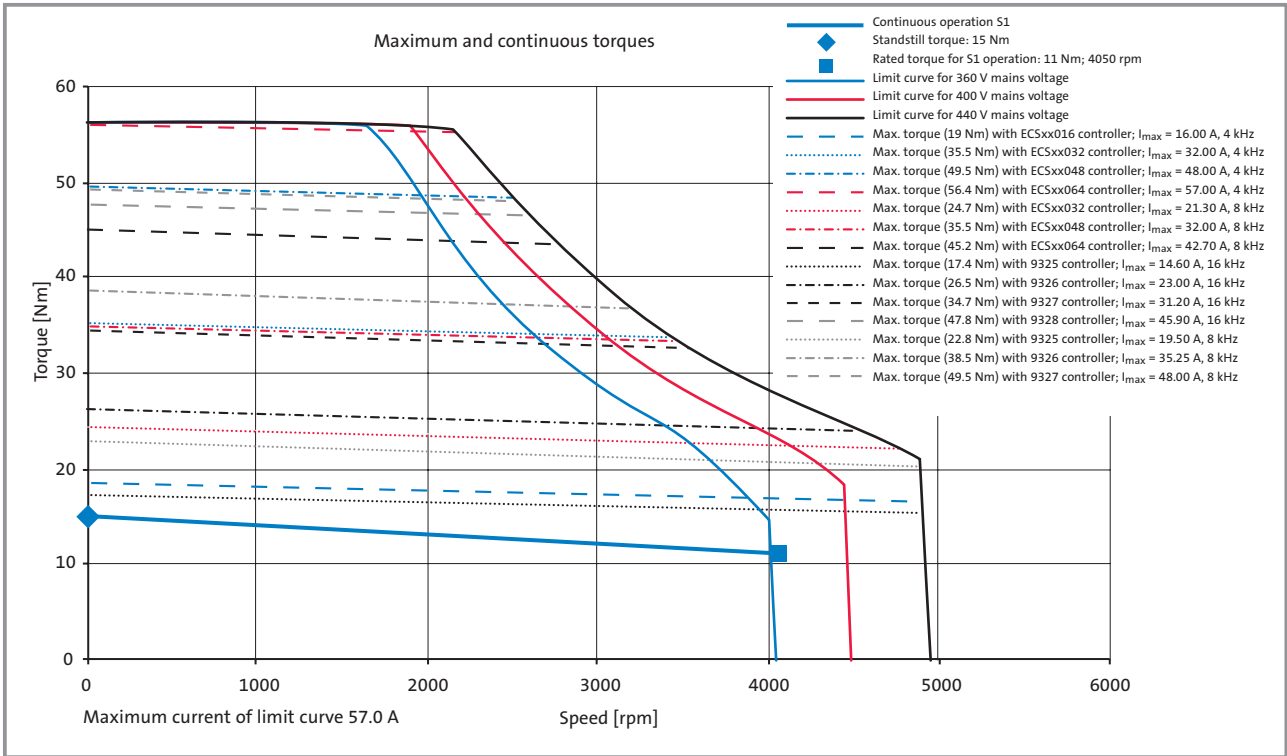
At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

Integrated servo motors

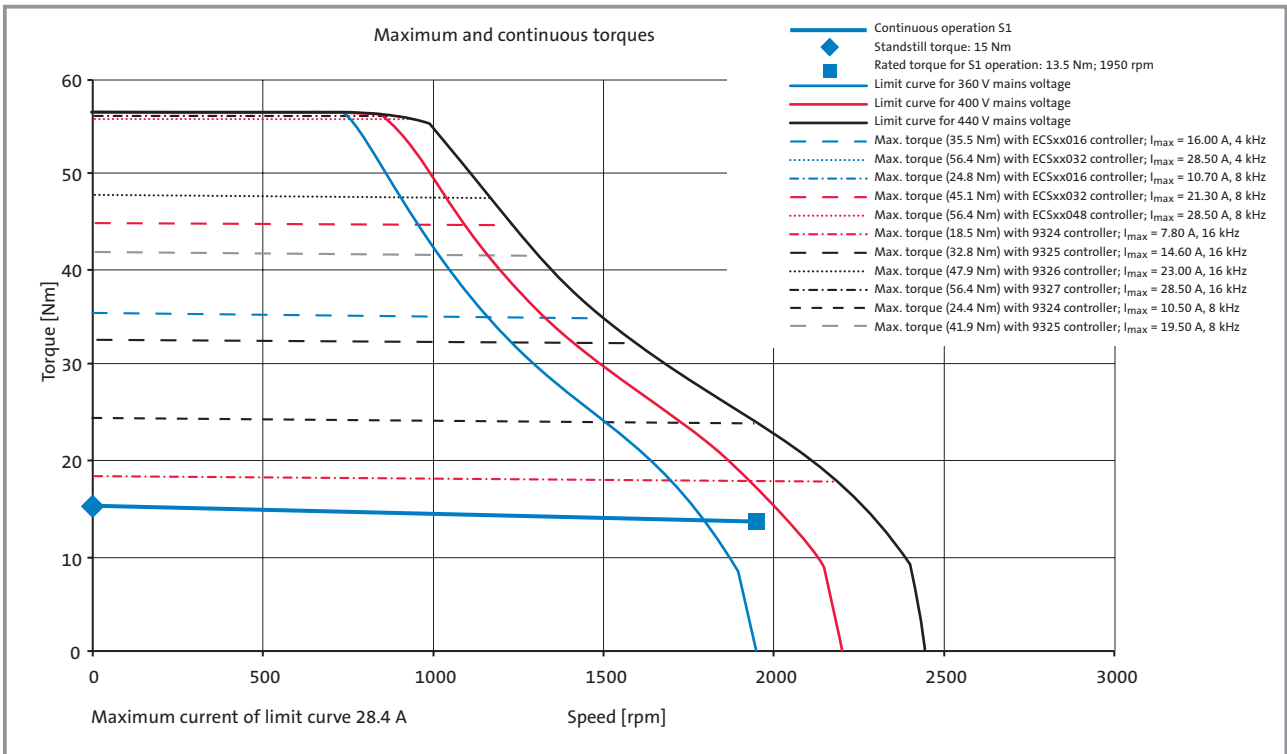
MCS 12 synchronous servo motors



MCS 12L41



MCS 12L20



At speeds of < 75 rpm check the servo controller derating where applicable.
 See "Servo controller assignment" tables.



Integrated servo motors

MCS 12 synchronous servo motors

Brake assignment

The MCS synchronous servo motors can be fitted with integrated permanent-magnet holding brakes for 24 V DC.

The brakes are active when the supply voltage is switched off (closed-circuit principle).

If the brakes are used purely as holding brakes, virtually no wear occurs at the friction surfaces. Provided that the permissible switching energy is not exceeded, a minimum of 2000 emergency stop functions are possible.

MCS 12H MCS 12L

Type	Size	Holding torque	Holding torque	Mean dynamic torque M_{1m} 120°C Nm	$U_B^{3)}$ +5% -10% V	$I_B^{2)}$ A	J_B kgcm ²	Engage- ment time	Disengage- ment time	Maximum switching energy per emergency stop at n= 3000 rpm J	Weight kg
		M_A 20°C Nm	M_A 120°C Nm					t1 ¹⁾ ms	t2 ¹⁾ ms		
P1	07H	12	10	7	24	0.65	1.07	13	43	400	0.9
P2	09H	24	19	12	24	0.71	3.13	16	90	890	1.2

P1 Standard brake

P2 Heavy-duty brake

- 1) Engagement and disengagement times apply at the rated voltage ($\pm 0\%$) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.
- 2) The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.
- 3) Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	J_{motor} with brake kgcm ²	Permissible J_{load}/J_{motor}
MCS 12H	P1	8.4	8.7
MCS 12L	P1	11.7	6.0
MCS 12H	P2	10.4	16.3
MCS 12L	P2	13.7	12.1

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the ohmic voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [V] = 0.08 \times l_{cable} [m] \times I_B [A]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.





Integrated servo motors

MCS 14 synchronous servo motors



MCS 14D

Integrated servo motors

MCS 14 synchronous servo motors



Rated data

Motor	M_N Nm	n_N rpm	P_N kW	U_N V	f_N Hz	I_N A	η %	M_0 Nm	I_0 A	M_{max} Nm	I_{max} A	J_{motor} without brake kgcm ²
MCS 14D15	9.2	1500	1.45	305	100	4.5	88	11	5.0	29	17	8.1
MCS 14D36	7.5	3600	2.8	295	240	7.5	92	11	10.0	29	33	8.1
MCS 14H15	16.0	1500	2.5	325	100	6.6	92	21	8.5	55	26	14.2
MCS 14H32	14.0	3225	4.7	295	215	11.9	93	21	16.9	55	52	14.2
MCS 14L15	23.0	1500	3.6	315	100	9.7	90	28	12.0	77	37	23.4
MCS 14L32	17.2	3225	5.8	275	215	15	93	28	24.0	77	75	23.4
MCS 14P14	30.0	1350	4.2	340	90	10.8	90	37	12.2	105	46	34.7
MCS 14P32	21.0	3225	7.1	315	215	15.6	93	37	24.3	105	92	34.7

Motor	$k_{E_{LL}}$ - factor at 150°C V/1000 rpm	R_{UV} at 20°C Ω	R_{UV} at 150°C Ω	L_{phase} λ mH	kt_0 - factor at 150°C Nm/A	Type of power connector	Weight without brake kg	Maximum speed mech. rpm
MCS 14D15	128.5	4.00	5.40	49.8	2.19	EWS0001	10.7	6000
MCS 14D36	64.2	1.00	1.35	12.5	1.09	EWS0001	10.7	6000
MCS 14H15	152.6	1.94	2.61	34.1	2.48	EWS0001	15.5	6000
MCS 14H32	76.3	0.48	0.65	8.5	1.24	EWS0001	15.5	6000
MCS 14L15	152.3	1.21	1.64	22.0	2.33	EWS0001	20.1	6000
MCS 14L32	76.2	0.30	0.41	5.5	1.16	EWS0012	20.1	6000
MCS 14P14	178.8	1.10	1.49	23.9	3.04	EWS0001	24.9	6000
MCS 14P32	89.4	0.28	0.37	6.0	1.52	EWS0012	24.9	6000



MCS 14H



MCS 14L



MCS 14P



Integrated servo motors

MCS 14 synchronous servo motors

Assignment of servo controllers

Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 4 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		2	4	8	12.7	17	20
Maximum current 0 Hz ^{1) 2)} [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz ^{1) 2)} [A]		4	8	16	32	48	64
Motor type							
MCS 14D15	M _N		8.2	9.2			
	M ₀		8.8	11.0			
	M _{max} n=0		9.6	17.9			
	M _{max}		16.0	28.3			
MCS 14D36	M _N			7.5	7.5		
	M ₀			8.8	11.0		
	M _{max} n=0			9.5	17.8		
	M _{max}			16.0	28.3		
MCS 14H15	M _N			16.0	16.0		
	M ₀			19.8	21.0		
	M _{max} n=0			22.3	41.2		
	M _{max}			37.1	54.8		
MCS 14H32	M _N				14.0	14.0	14.0
	M ₀				15.8	21.0	21.0
	M _{max} n=0				22.2	32.1	41.3
	M _{max}				37.1	51.9	54.8
MCS 14L15	M _N			19.0	23.0	23.0	
	M ₀			18.7	28.0	28.0	
	M _{max} n=0			21.9	42.1	59.9	
	M _{max}			37.6	68.5	77.1	
MCS 14L32	M _N				14.6	17.2	17.2
	M ₀				14.8	19.8	23.3
	M _{max} n=0				21.8	32.4	42.2
	M _{max}				37.6	53.9	68.5
MCS 14P14	M _N				30.0	30.0	
	M ₀				37.0	37.0	
	M _{max} n=0				49.1	70.0	
	M _{max}				80.0	105.1	
MCS 14P32	M _N				17.1	21.0	21.0
	M ₀				19.3	25.9	30.5
	M _{max} n=0				25.4	37.9	49.3
	M _{max}				43.9	63.0	80.0

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply



Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 8 kHz						
Type	ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]	1.4	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz ^{1) 2) 3)} [A]	1.5	3	6	12.1	18.1	24.2
Maximum current > 5 Hz ^{1) 2) 3)} [A]	2.7	5.3	10.7	21.3	32	42.7
Motor type						
MCS 14D15	M _N		9.2	9.2		
	M _{0.4)}		11.0	11.0		
	M _{max n=0}		12.3	22.7		
	M _{max}		20.5	29.0		
MCS 14D36	M _N			7.5	7.5	7.5
	M _{0.4)}			9.3	11.0	11.0
	M _{max n=0}			12.4	17.8	22.7
	M _{max}			20.5	28.3	29.0
MCS 14H15	M _N		12.8	16.0	16.0	
	M _{0.4)}		13.1	21.0	21.0	
	M _{max n=0}		14.8	29.0	41.2	
	M _{max}		25.9	47.2	54.8	
MCS 14H32	M _N				13.3	14.0
	M _{0.4)}				14.0	16.5
	M _{max n=0}				22.2	28.9
	M _{max}				37.1	47.3
MCS 14L15	M _N			20.2	23.0	23.0
	M _{0.4)}			19.8	26.4	28.0
	M _{max n=0}			29.1	42.1	54.3
	M _{max}			48.6	68.5	77.1
MCS 14L32	M _N				13.0	15.3
	M _{0.4)}				13.2	15.5
	M _{max n=0}				21.8	29.1
	M _{max}				37.6	48.7
MCS 14P14	M _N			23.6	30.0	30.0
	M _{0.4)}			25.8	34.3	37.0
	M _{max n=0}			34.0	49.1	63.4
	M _{max}			56.8	80.0	99.7
MCS 14P32	M _N					17.9
	M _{0.4)}					20.3
	M _{max n=0}					34.0
	M _{max}					56.9

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply



Integrated servo motors

MCS 14 synchronous servo motors

Assignment of servo controllers

Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 8 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.5	2.5	3.9	7	13	23.5	32	47	59	89
Maximum current 0 Hz ^{1) 3)} [A]		2.3	3.8	5.9	10.5	19.5	23.5	32	47	52	80
Maximum current > 5 Hz ^{1) 3)} [A]		2.3	3.8	5.9	10.5	19.5	35.25	48	70.5	88.5	133.5
Motor type											
MCS 14D15	M _N			8.0	9.2	9.2					
	M ₀ ⁴⁾			8.5	11.0	11.0					
	M _{max} n=0			12.1	20.2	29.0					
	M _{max}			12.1	20.2	29.0					
MCS 14D36	M _N				7.0	7.5	7.5				
	M ₀ ⁴⁾				7.7	11.0	11.0				
	M _{max} n=0				10.9	19.0	22.2				
	M _{max}				10.9	19.0	29.0				
MCS 14H15	M _N				16.0	16.0					
	M ₀ ⁴⁾				17.3	21.0					
	M _{max} n=0				25.4	43.9					
	M _{max}				25.4	43.9					
MCS 14H32	M _N					14.0	14.0	14.0			
	M ₀ ⁴⁾					16.2	21.0	21.0			
	M _{max} n=0					23.8	28.2	37.1			
	M _{max}					23.8	40.3	51.9			
MCS 14L15	M _N					23.0	23.0				
	M ₀ ⁴⁾					28.0	28.0				
	M _{max} n=0					45.0	52.9				
	M _{max}					45.0	73.9				
MCS 14L32	M _N					14.9	17.2	17.2	17.2		
	M ₀ ⁴⁾					15.2	27.4	28.0	28.0		
	M _{max} n=0					23.5	28.3	37.6	52.9		
	M _{max}					23.5	41.1	53.9	73.9		
MCS 14P14	M _N					30.0	30.0	30.0			
	M ₀ ⁴⁾					37.0	37.0	37.0			
	M _{max} n=0					52.5	61.8	80.0			
	M _{max}					52.5	86.4	105.1			
MCS 14P32	M _N					17.5	21.0	21.0	21.0		
	M ₀ ⁴⁾					19.8	35.8	37.0	37.0		
	M _{max} n=0					27.4	33.0	43.9	61.8		
	M _{max}					27.4	48.0	63.0	86.4		

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz



Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 16 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38	58
Maximum current 0 Hz ¹⁾³⁾ [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33	45
Maximum current > 5 Hz ¹⁾³⁾ [A]		1.7	2.7	4.4	7.8	14.6	23	31.2	45.9	57	87
Motor type											
MCS 14D15	M_N				9.2	9.2	9.2				
	M_0 ⁴⁾				11.0	11.0	11.0				
	M_{max} n=0				15.6	26.4	27.4				
	M_{max}				15.6	26.4	29.0				
MCS 14D36	M_N					7.5	7.5	7.5			
	M_0 ⁴⁾					10.6	11.0	11.0			
	M_{max} n=0					14.7	15.3	20.0			
	M_{max}					14.7	21.8	27.8			
MCS 14H15	M_N				12.6	16.0	16.0	16.0			
	M_0 ⁴⁾				12.8	21.0	21.0	21.0			
	M_{max} n=0				19.2	34.2	35.7	46.3			
	M_{max}				19.2	34.2	50.2	54.8			
MCS 14H32	M_N					11.4	14.0	14.0	14.0	14.0	
	M_0 ⁴⁾					12.1	19.0	21.0	21.0	21.0	
	M_{max} n=0					18.0	18.8	25.2	35.7	38.1	
	M_{max}					18.0	27.6	36.3	50.1	54.8	
MCS 14L15	M_N					23.0	23.0	23.0	23.0		
	M_0 ⁴⁾					22.6	28.0	28.0	28.0		
	M_{max} n=0					34.6	36.1	47.6	66.0		
	M_{max}					34.6	52.0	67.1	77.1		
MCS 14L32	M_N						17.2	17.2	17.2	17.2	
	M_0 ⁴⁾						17.9	24.3	28.0	28.0	
	M_{max} n=0						18.4	25.0	36.1	38.7	
	M_{max}						27.7	36.8	51.9	62.3	
MCS 14P14	M_N					26.9	30.0	30.0	30.0		
	M_0 ⁴⁾					29.4	37.0	37.0	37.0		
	M_{max} n=0					40.4	42.2	55.6	77.2		
	M_{max}					40.4	60.7	78.4	104.9		
MCS 14P32	M_N						20.6	21.0	21.0	21.0	
	M_0 ⁴⁾						23.3	31.7	37.0	37.0	
	M_{max} n=0						21.5	29.2	42.2	45.2	
	M_{max}						32.3	42.9	60.6	72.8	

1) Caution: Limit I_{max} of device to I_{max} of motor

2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

3) Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply

4) On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

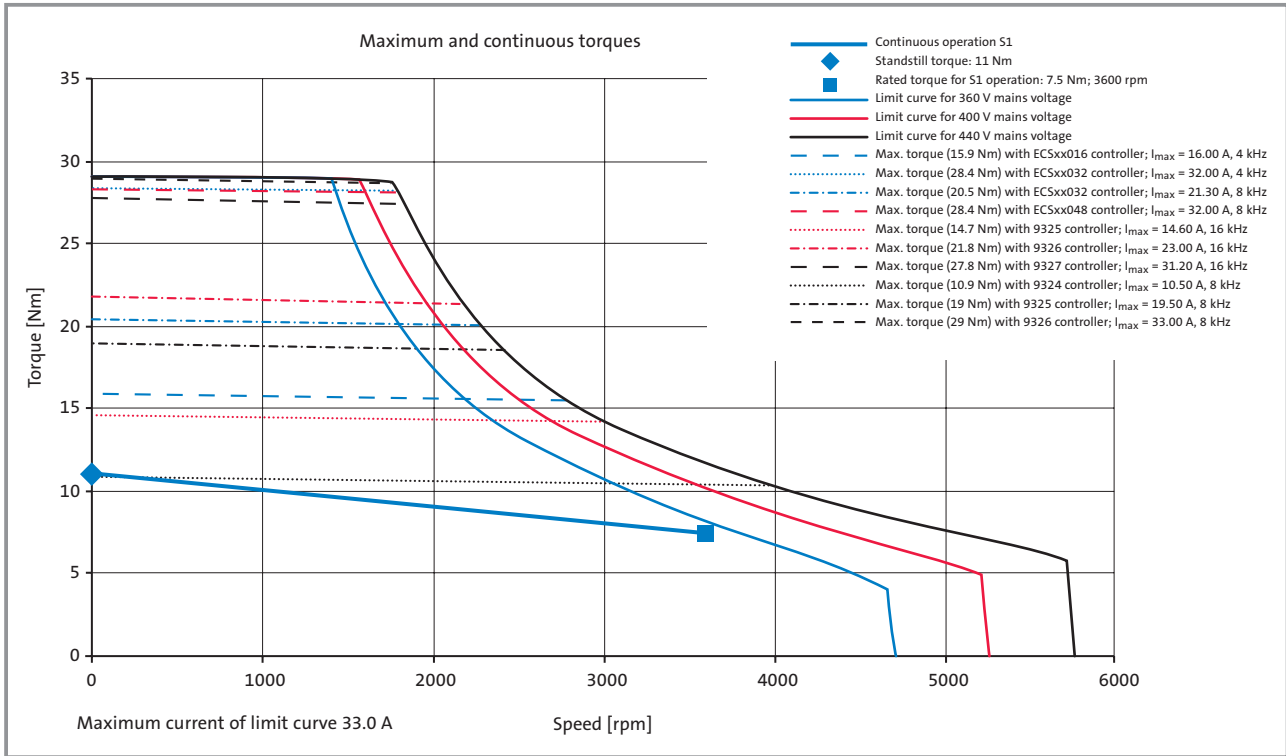


Integrated servo motors

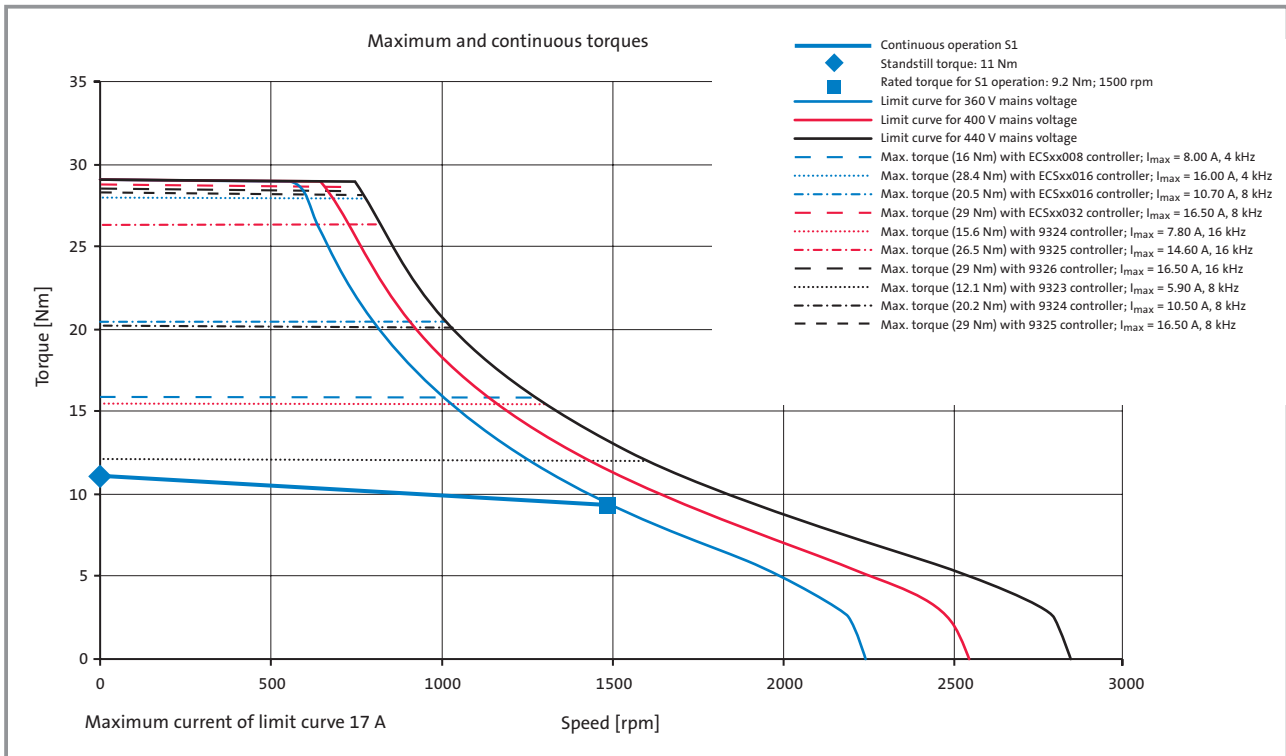
MCS 14 synchronous servo motors

Torque characteristics

MCS 14D36



MCS 14D15



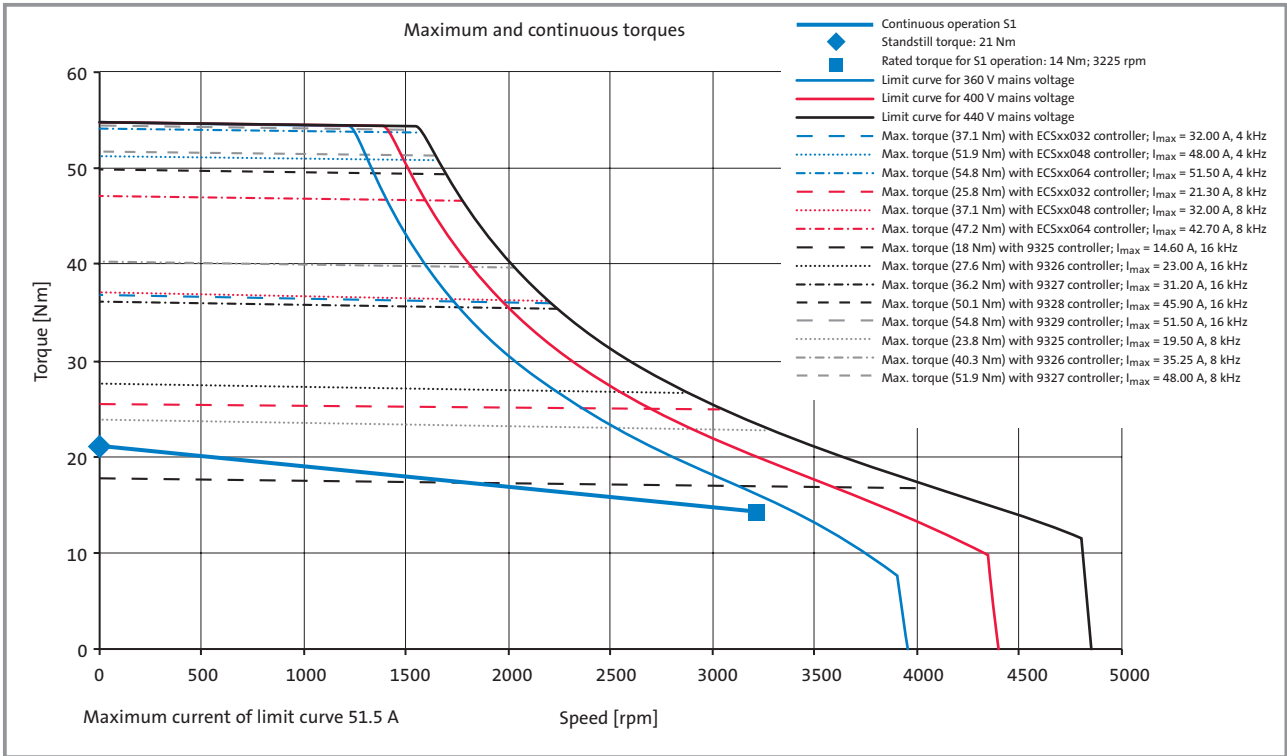
At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

Integrated servo motors

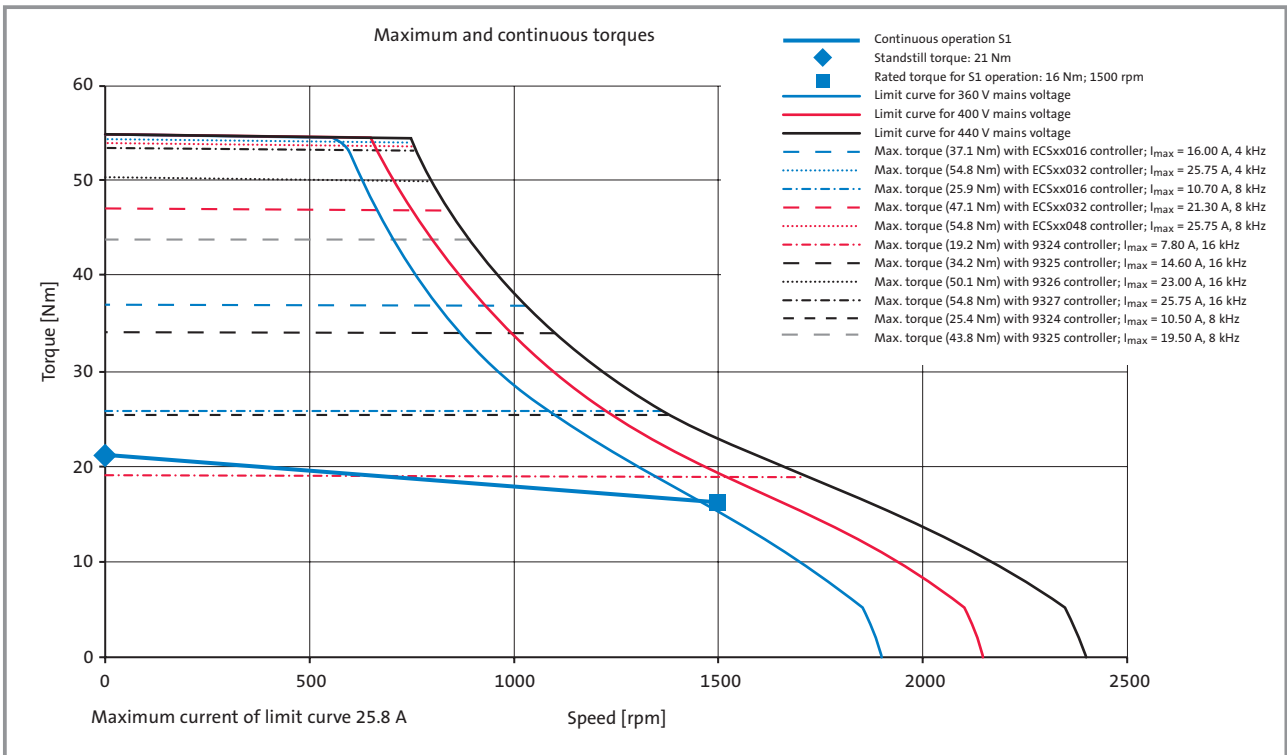
MCS 14 synchronous servo motors



MCS 14H32



MCS 14H15



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

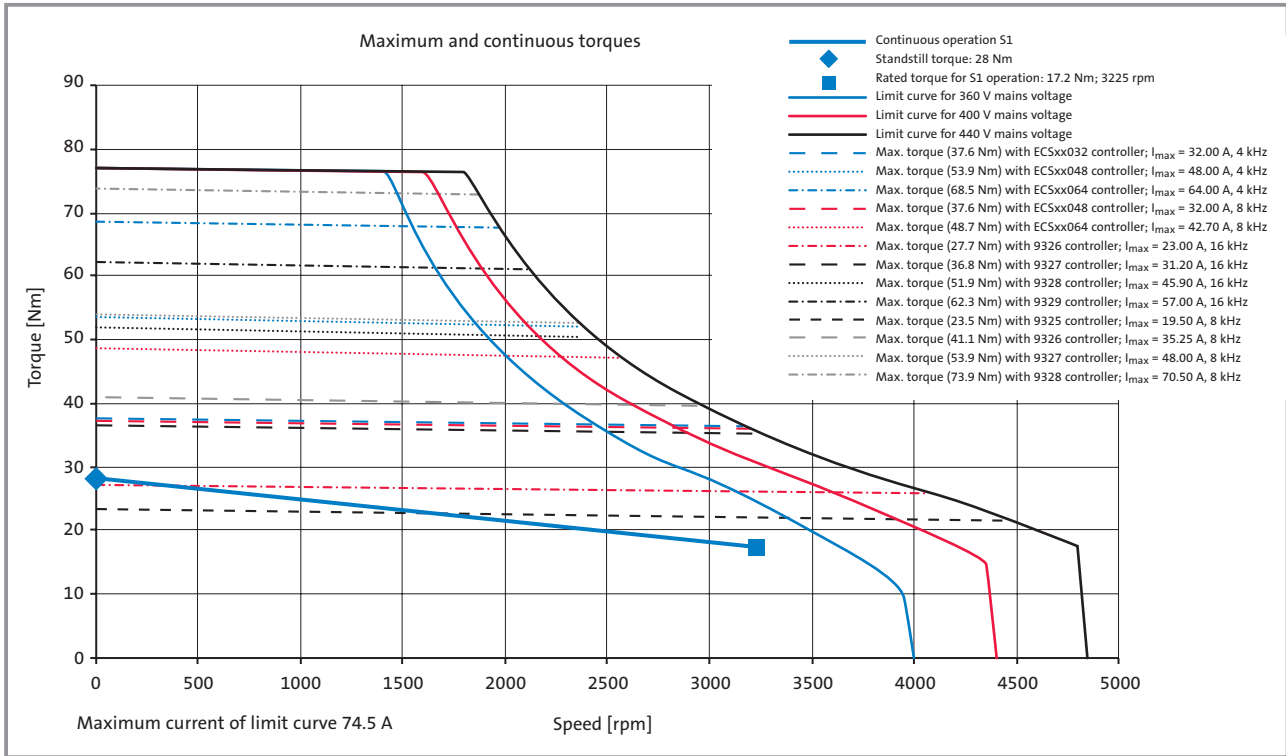


Integrated servo motors

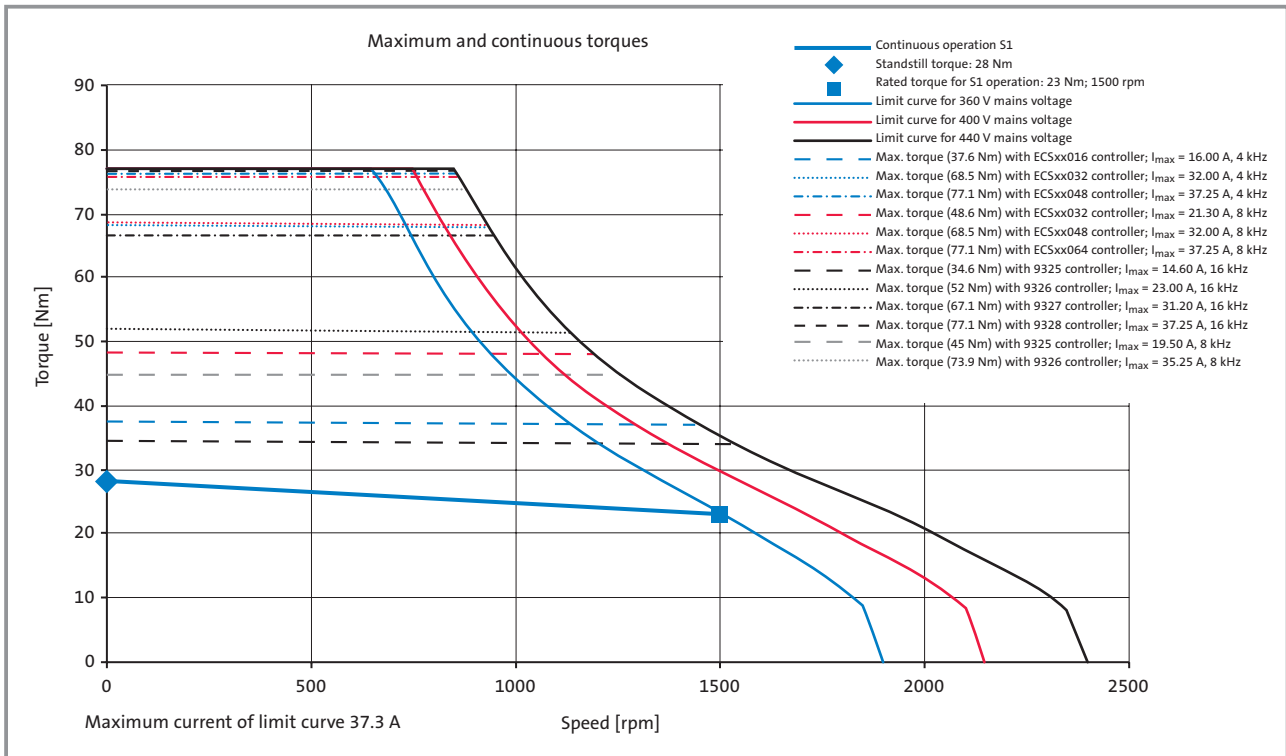
MCS 14 synchronous servo motors

Torque characteristics

MCS 14L32



MCS 14L15



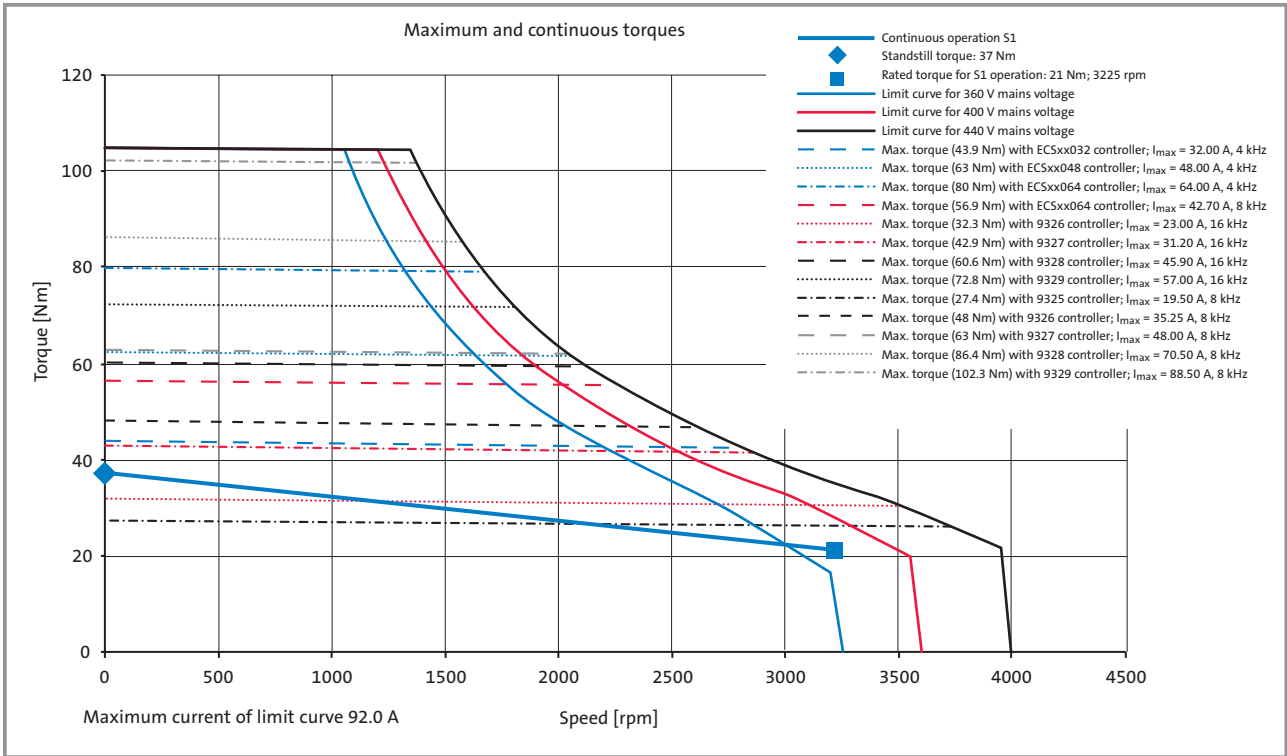
At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

Integrated servo motors

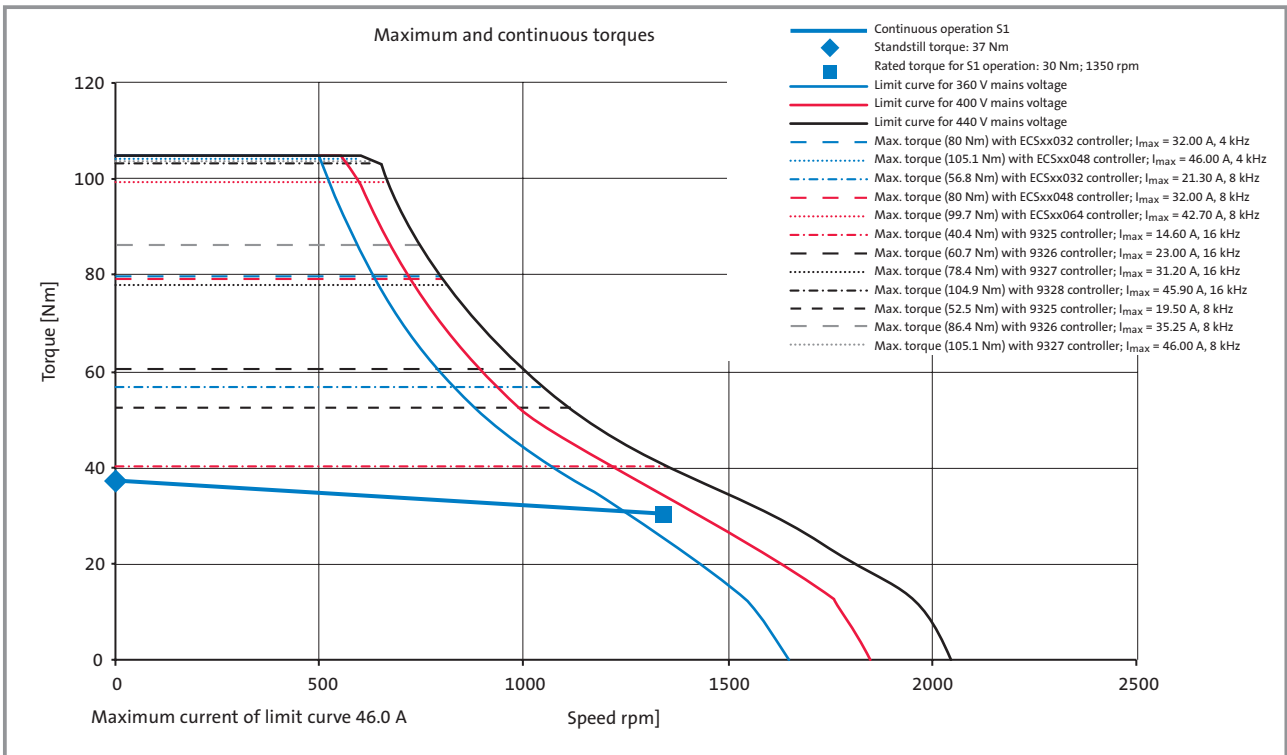
MCS 14 synchronous servo motors



MCS 14P32



MCS 14P14



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



Integrated servo motors

MCS 14 synchronous servo motors

Brake assignment

The MCS synchronous servo motors can be fitted with integrated permanent-magnet holding brakes for 24 V DC.

The brakes are active when the supply voltage is switched off (closed-circuit principle).

If the brakes are used purely as holding brakes, virtually no wear occurs at the friction surfaces. Provided that the permissible switching energy is not exceeded, a minimum of 2000 emergency stop functions are possible.

MCS 14D36, MCS 14D15
 MCS 14H32, MCS 14H15
 MCS 14L32, MCS 14L15
 MCS 14P32, MCS 14P14

Type	Size	Holding torque $M_{A, 20^{\circ}\text{C}}$ Nm	Holding torque $M_{A, 120^{\circ}\text{C}}$ Nm	Mean dynamic torque $M_{1m, 120^{\circ}\text{C}}$ Nm	U_B ³⁾ +5% -10% V	I_B ²⁾ A	J_B kgcm ²	Engage-ment time $t1$ ¹⁾ ms	Disengage-ment time $t2$ ¹⁾ ms	Maximum switching energy per emergency stop at n=3000 rpm J	Weight kg
P1	09H	22	18	8	24	0.88	3.20	15	150	640	1.9
P2	11H	37	32	15	24	0.93	12.4	96	113	2350	3.1

P1 Standard brake

P2 Heavy-duty brake

¹⁾ Engagement and disengagement times apply at the rated voltage ($\pm 0\%$) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.

²⁾ The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.

³⁾ Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	$J_{\text{motor with brake}}$ kgcm ²	Permissible $J_{\text{load}}/J_{\text{motor}}$
MCS 14D	P1	11.3	10.5
MCS 14H	P1	17.4	6.5
MCS 14L	P1	26.6	3.9
MCS 14P	P1	37.9	2.4
MCS 14D	P2	20.5	22.2
MCS 14H	P2	26.6	16.9
MCS 14L	P2	35.8	12.3
MCS 14P	P2	47.1	9.1

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the resistive voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [\text{V}] = 0.08 \times l_{\text{cable}} [\text{m}] \times I_B [\text{A}]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.

Integrated servo motors

MCS 19 synchronous servo motors



Rated data

Motor	M_N	n_N	P_N	U_N	f_N	I_N	η	M_0	I_0	M_{max}	I_{max}	J_{motor} without brake
	Nm	rpm	kW	V	Hz	A	%	Nm	A	Nm	A	kgcm ²
MCS 19F14	27	1425	4.0	335	95	8.6	92	32	9.9	86	31	65.0
MCS 19F30	21	3000	6.6	300	200	14.0	93	32	19.8	86	63	65.0
MCS 19J14	40	1425	6.0	330	95	12.3	92	51	15.2	129	45	105.0
MCS 19J30	29	3000	9.1	300	200	18.5	93	51	30.5	129	90	105.0
MCS 19P14	51	1350	7.2	330	90	14.3	92	64	17.5	190	60	160.0
MCS 19P30	32	3000	10.0	320	200	19.0	93	64	34.9	190	120	160.0

Motor	kE_{LL} - factor at 150°C	R_{UV} at 20°C	R_{UV} at 150°C	L_{phase} λ	kt_0 - factor at 150°C	Type of power connector	Weight without brake	Maximum speed mech.
	V/1000 rpm	Ω	Ω	mH	Nm/A		kg	rpm
MCS 19F14	194.5	1.30	1.75	20.8	3.23	EWS0001	23	4000
MCS 19F30	97.2	0.32	0.44	5.2	1.62	EWS0012	23	4000
MCS 19J14	199.1	0.65	0.88	12.8	3.31	EWS0001	30	4000
MCS 19J30	99.5	0.16	0.22	3.2	1.65	EWS0012	30	4000
MCS 19P14	216.4	0.54	0.73	9.6	3.66	EWS0001	40	4000
MCS 19P30	108.2	0.14	0.18	2.4	1.83	EWS0012	40	4000



MCS 19F



MCS 19J



MCS 19P



Integrated servo motors

MCS 19 synchronous servo motors

Assignment of servo controllers

Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 4 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		2	4	8	12.7	17	20
Maximum current 0 Hz ^{1) 2)} [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz ^{1) 2)} [A]		4	8	16	32	48	64
Motor type							
MCS 19F14	M _N			25.1	27.0		
	M ₀			25.9	32.0		
	M _{max} n=0			28.6	54.6		
	M _{max}			48.9	86.0		
MCS 19F30	M _N				19.1	21.0	21.0
	M ₀				20.5	27.5	32.0
	M _{max} n=0				27.2	40.5	53.0
	M _{max}				47.2	68.3	86.0
MCS 19J14	M _N				40.0	40.0	
	M ₀				42.6	51.0	
	M _{max} n=0				58.9	85.0	
	M _{max}				97.9	129.0	
MCS 19J30	M _N					26.6	29.0
	M ₀					28.4	33.4
	M _{max} n=0					42.6	56.9
	M _{max}					73.9	96.1
MCS 19P14	M _N				45.3	51.0	51.0
	M ₀				46.4	62.2	64.0
	M _{max} n=0				64.6	95.3	123.8
	M _{max}				110.5	157.9	190.0
MCS 19P30	M _N					28.6	32.0
	M ₀					31.2	36.7
	M _{max} n=0					45.8	61.1
	M _{max}					80.5	106.0

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply



Assignment of ECS servo system – axis modules

Rated and maximum torques at switching frequency of 8 kHz							
Type		ECS□□004	ECS□□008	ECS□□016	ECS□□032	ECS□□048	ECS□□064
Continuous current [A]		1.4	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz ^{1) 2) 3)} [A]		1.5	3	6	12.1	18.1	24.2
Maximum current > 5 Hz ^{1) 2) 3)} [A]		2.7	5.3	10.7	21.3	32	42.7
Motor type							
MCS 19F14	M _N				26.7	27.0	
	M ₀				27.5	32.0	
	M _{max} n=0				37.9	54.6	
	M _{max}				62.9	86.0	
MCS 19F30	M _N					17.0	20.0
	M ₀					18.3	21.5
	M _{max} n=0					27.2	36.3
	M _{max}					47.2	61.5
MCS 19J14	M _N					36.7	40.0
	M ₀					37.9	44.6
	M _{max} n=0					58.9	76.7
	M _{max}					97.9	124.2
MCS 19J30	M _N						
	M ₀						
	M _{max} n=0						
	M _{max}						
MCS 19P14	M _N					40.3	47.4
	M ₀					41.3	48.6
	M _{max} n=0					64.6	85.5
	M _{max}					110.5	142.8
MCS 19P30	M _N						
	M ₀						
	M _{max} n=0						
	M _{max}						

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

³⁾ Caution: Automatic switching to 4 kHz on ECS not taken into account; if automatic switching to 4 kHz is used, maximum torques at 4 kHz apply



Integrated servo motors

MCS 19 synchronous servo motors

Assignment of servo controllers

Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 8 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.5	2.5	3.9	7	13	23.5	32	47	59	89
Maximum current 0 Hz ^{1) 2)} [A]		2.3	3.8	5.9	10.5	19.5	23.5	32	47	52	80
Maximum current > 5 Hz ^{1) 2)} [A]		2.3	3.8	5.9	10.5	19.5	35.25	48	70.5	88.5	133.5
Motor type											
MCS 19F14	M_N				22.0	27.0	27.0				
	M_0 ⁴⁾				22.6	32.0	32.0				
	M_{max} n=0				33.0	58.2	68.3				
	M_{max}				33.0	58.2	86.0				
MCS 19F30	M_N				19.5	21.0		21.0			
	M_0 ⁴⁾					21.0	32.0	32.0			
	M_{max} n=0					29.3	35.3	47.2			
	M_{max}					29.3	51.6	68.3			
MCS 19J14	M_N					40.0	40.0	40.0			
	M_0 ⁴⁾					43.6	51.0	51.0			
	M_{max} n=0					63.1	74.7	97.9			
	M_{max}					63.1	106.2	129.0			
MCS 19J30	M_N						29.0	29.0	29.0	29.0	
	M_0 ⁴⁾						39.3	51.0	51.0	51.0	
	M_{max} n=0						36.8	50.2	72.5	79.6	
	M_{max}						55.3	73.9	104.7	127.7	
MCS 19P14	M_N					46.4	51.0	51.0			
	M_0 ⁴⁾					47.5	64.0	64.0			
	M_{max} n=0					69.5	83.2	110.5			
	M_{max}					69.5	120.6	157.9			
MCS 19P30	M_N						32.0	32.0	32.0	32.0	
	M_0 ⁴⁾						43.1	58.7	64.0	64.0	
	M_{max} n=0						39.6	53.9	78.8	86.9	
	M_{max}						59.4	80.5	116.1	143.7	

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz



Assignment of 93□□ servo controllers

Rated and maximum torques at switching frequency of 16 kHz											
Type		9321	9322	9323	9324	9325	9326	9327	9328	9329	9330
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38	58
Maximum current 0 Hz ^{1) 2)} [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33	45
Maximum current > 5 Hz ^{1) 2)} [A]		1.7	2.7	4.4	7.8	14.6	23	31.2	45.9	57	87
Motor type											
MCS 19F14	M_N					27.0	27.0	27.0			
	$M_0^{4)}$					31.4	32.0	32.0			
	$M_{max} n=0$					45.0	47.0	61.6			
	M_{max}					45.0	67.1	85.9			
MCS 19F30	M_N						21.0	21.0	21.0	21.0	
	$M_0^{4)}$						24.7	32.0	32.0	32.0	
	$M_{max} n=0$						23.0	31.2	45.2	48.5	
	M_{max}						34.5	46.1	65.6	79.4	
MCS 19J14	M_N					31.5	40.0	40.0	40.0		
	$M_0^{4)}$					32.5	51.0	51.0	51.0		
	$M_{max} n=0$					47.5	49.8	66.9	94.2		
	M_{max}					47.5	73.3	95.8	129.0		
MCS 19J30	M_N						24.0	29.0	29.0	29.0	29.0
	$M_0^{4)}$						25.6	34.8	51.0	51.0	51.0
	$M_{max} n=0$						24.0	32.6	48.0	51.7	69.6
	M_{max}						36.1	48.9	70.9	86.5	125.8
MCS 19P14	M_N						51.0	51.0	51.0	51.0	
	$M_0^{4)}$						56.0	64.0	64.0	64.0	
	$M_{max} n=0$						54.6	74.2	106.1	113.6	
	M_{max}						81.6	108.0	152.0	182.3	
MCS 19P30	M_N						25.8	32.0	32.0	32.0	32.0
	$M_0^{4)}$						28.1	38.1	56.1	64.0	64.0
	$M_{max} n=0$						25.8	35.0	51.5	55.6	75.6
	M_{max}						38.7	52.5	77.1	94.9	141.5

¹⁾ Caution: Limit I_{max} of device to I_{max} of motor

²⁾ Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

⁴⁾ On 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

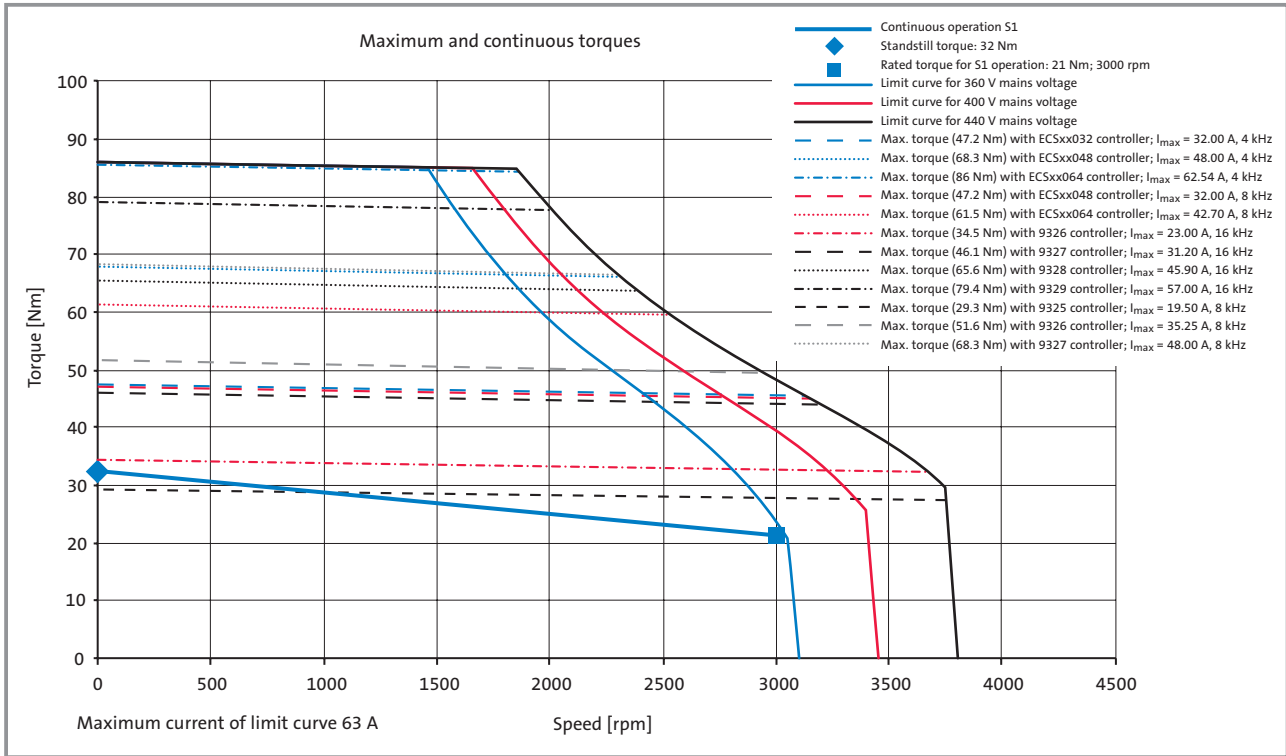


Integrated servo motors

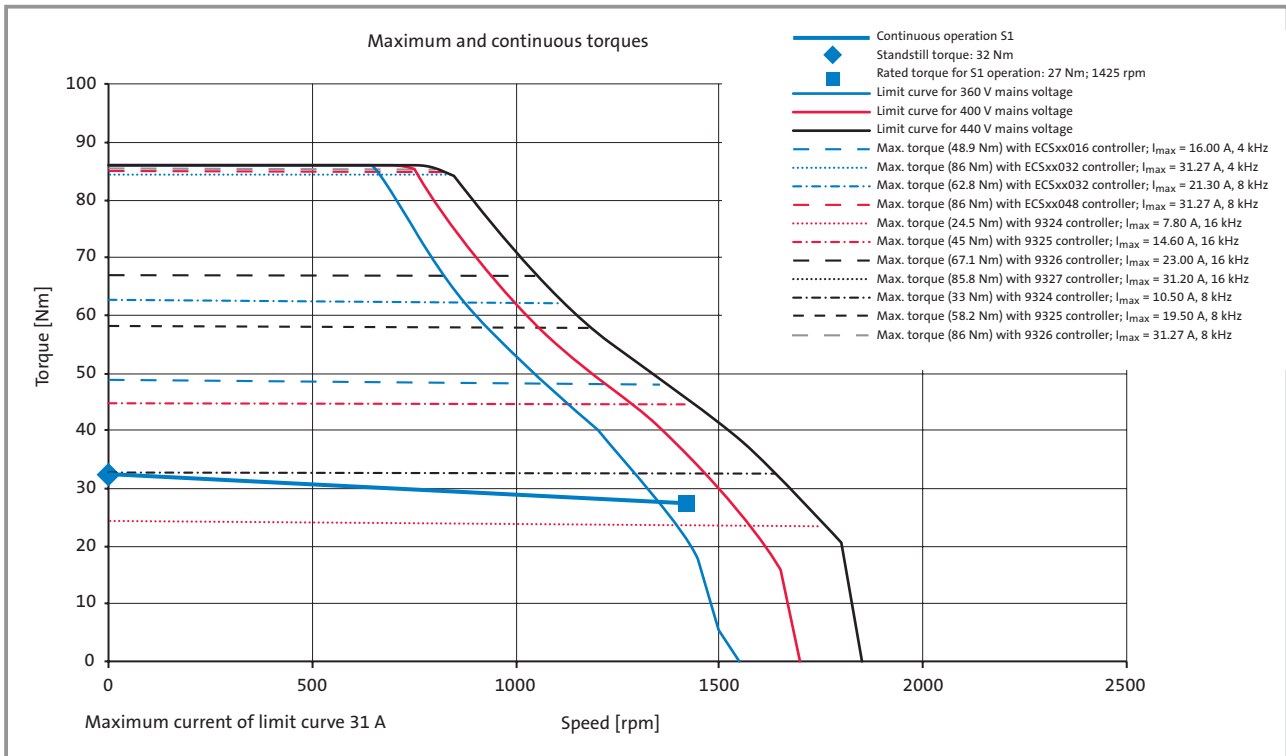
MCS 19 synchronous servo motors

Torque characteristics

MCS 19F30



MCS 19F14



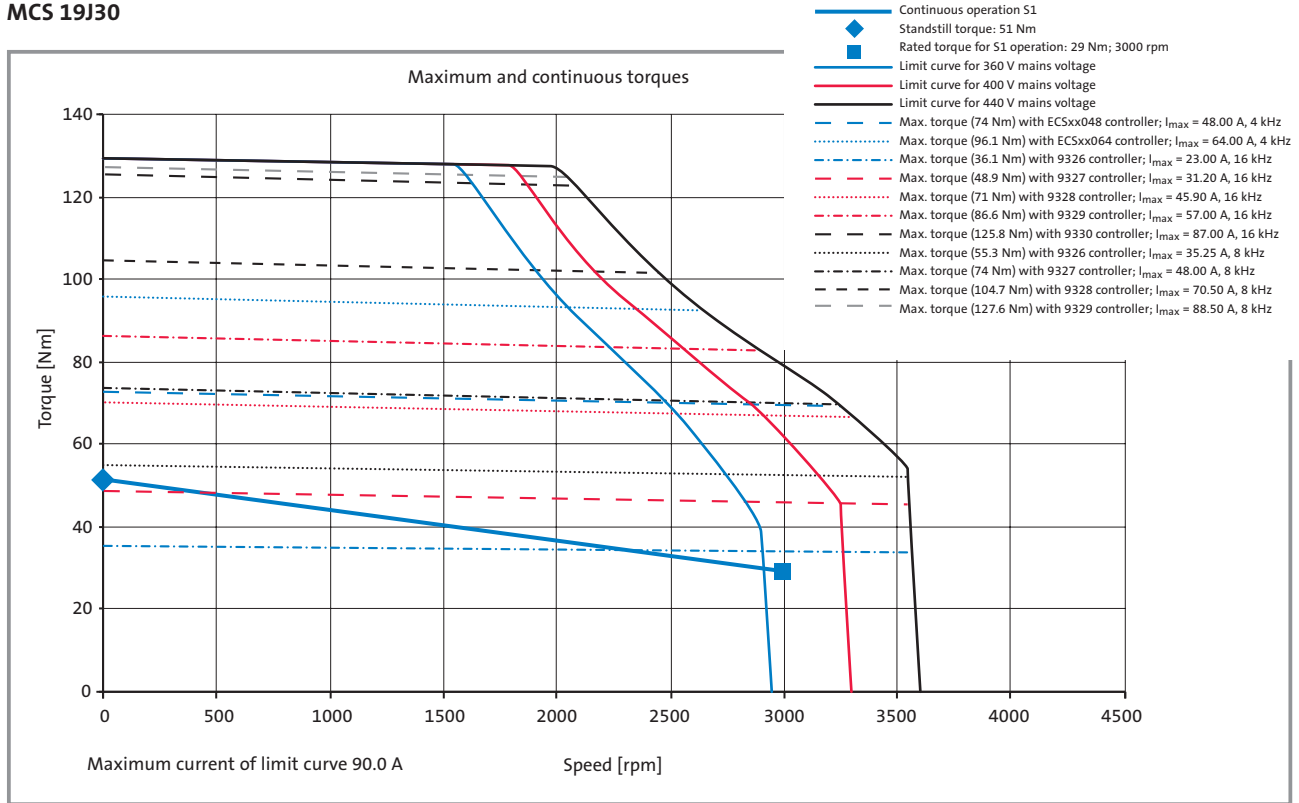
At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

Integrated servo motors

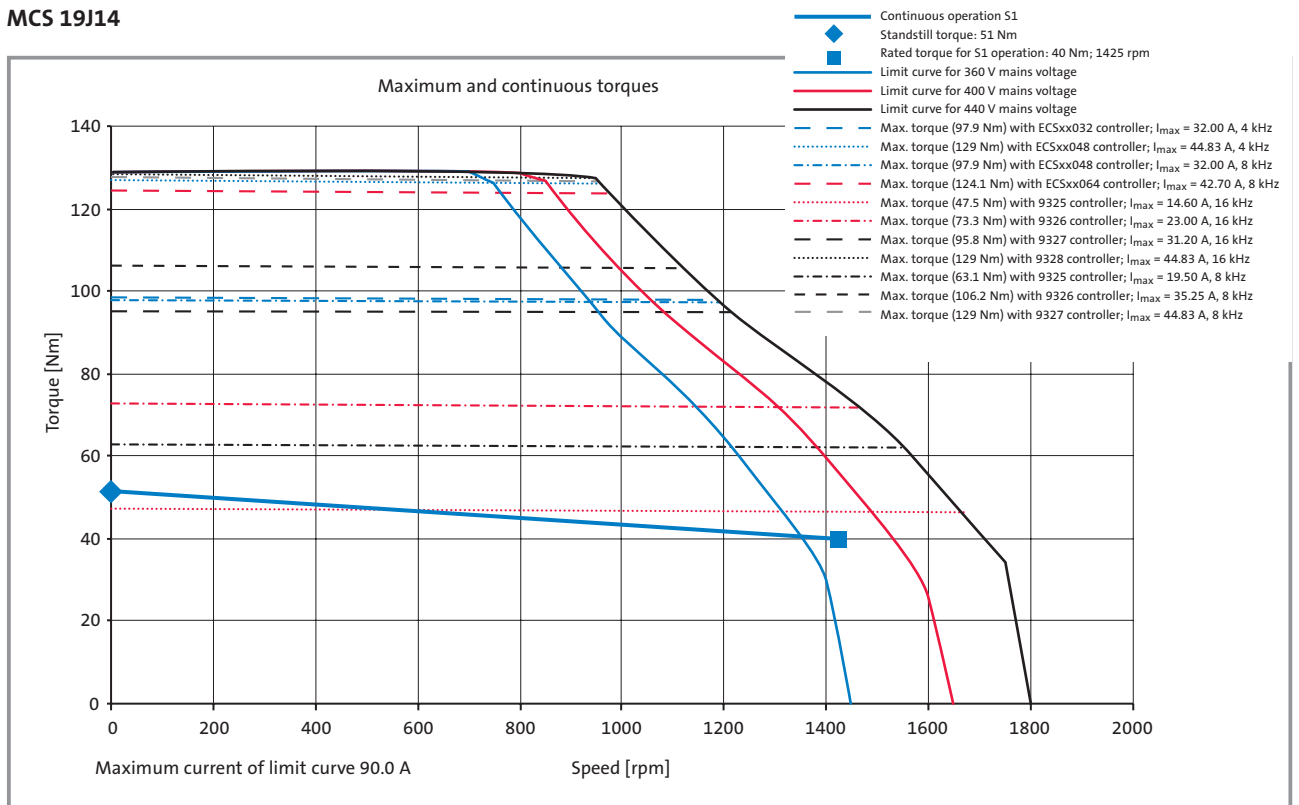
MCS 19 synchronous servo motors



MCS 19J30



MCS 19J14



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.

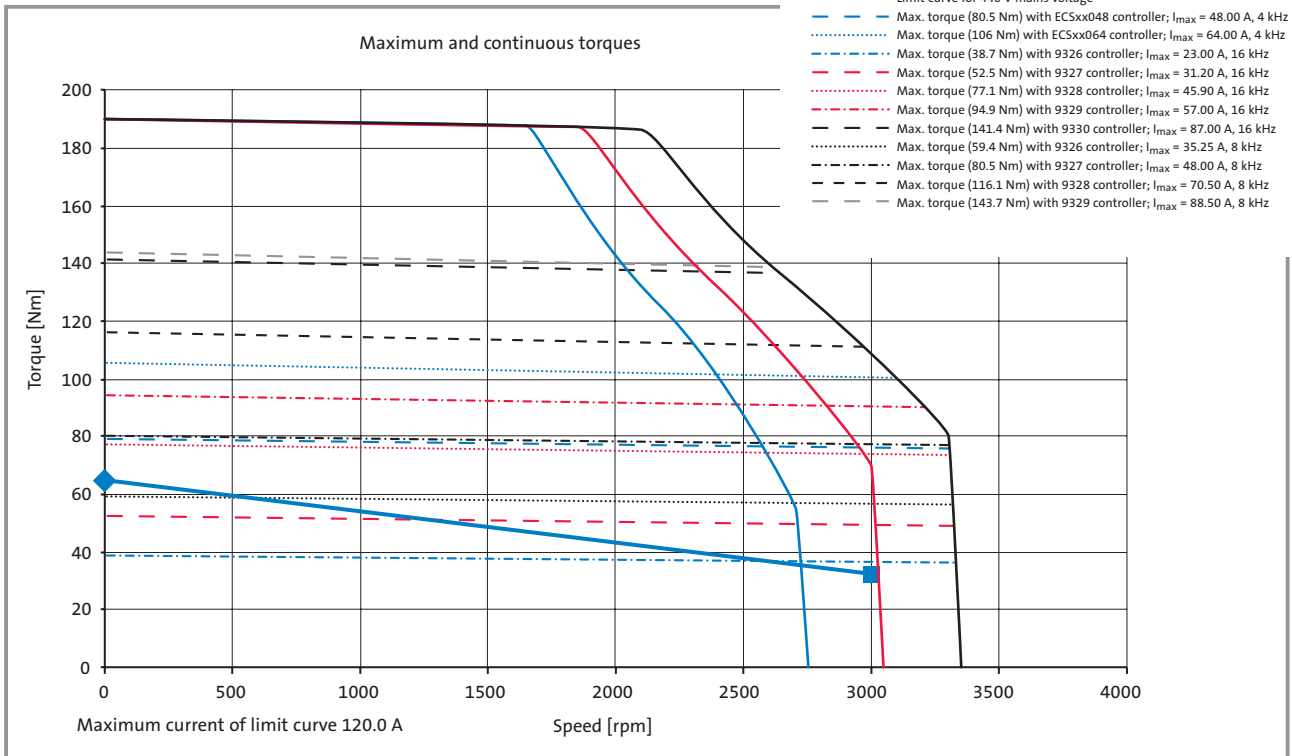


Integrated servo motors

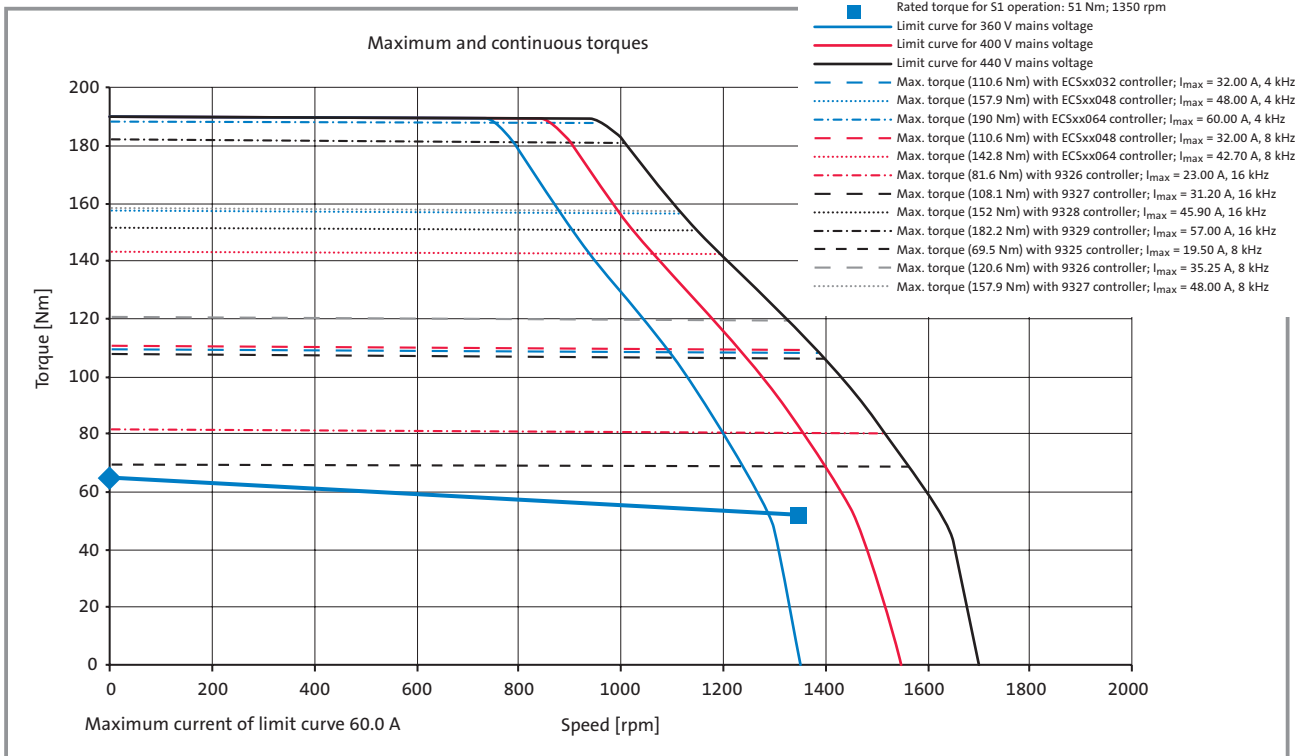
MCS 19 synchronous servo motors

Torque characteristics

MCS 19P30



MCS 19P14



At speeds of < 75 rpm check the servo controller derating where applicable.
See "Servo controller assignment" tables.



Brake assignment

The MCS synchronous servo motors can be fitted with integrated permanent-magnet holding brakes for 24 V DC.

The brakes are active when the supply voltage is switched off (closed-circuit principle).

If the brakes are used purely as holding brakes, virtually no wear occurs at the friction surfaces. Provided that the permissible switching energy is not exceeded, a minimum of 2000 emergency stop functions are possible.

MCS 19F30, MCS 19F15

Type	Size	Holding torque	Holding torque	Mean dynamic torque M_{1m} 120°C Nm	U_B ³⁾ +5% -10% V	I_B ²⁾ A	J_B kgcm ²	Engage- ment time $t1$ ¹⁾ ms	Disengage- ment time $t2$ ¹⁾ ms	Maximum switching energy per emergency stop at n= 3000 rpm J	Weight kg
		M_4 20°C Nm	M_4 120°C Nm								
P1	11H	37	32	15	24	0.93	12.4	96	113	2350	1.5

- ¹⁾ Engagement and disengagement times apply at the rated voltage ($\pm 0\%$) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.
- ²⁾ The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.
- ³⁾ Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	J_{motor} with brake kgcm ²	Permissible J_{load}/J_{motor}
MCS 19F	P1	77.4	5.2

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the resistive voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [V] = 0.08 \times l_{cable} [m] \times I_B [A]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.

MCS 19 brake assignment

Motor	Brake	
	P1	P2
MCS 19F□□	●	
MCS 19J□□		●
MCS 19P□□		●



Integrated servo motors

MCS 19 synchronous servo motors

Brake assignment

MCS 19J30, MCS 19J15
MCS 19P30, MC S19P15

Type	Size	Holding torque M_4 20°C Nm	Holding torque M_4 120°C Nm	Mean dynamic torque M_{1m} 120°C Nm	$U_B^{3)}$ +5% -10% V	$I_B^{2)}$ A	J_B kgcm ²	Engage- ment time t1 ¹⁾ ms	Disengage- ment time t2 ¹⁾ ms	Maximum switching energy per emergency stop at n= 3000 rpm J	Weight kg
P2	14H	100	80	43	24	1.29	30	30	90	2100	4.3

P2 Standard brake

- 1) Engagement and disengagement times apply at the rated voltage (±0%) and with a suppressor circuit for the brakes in the form of a varistor with switching on the DC side. The times may be longer without a suppressor circuit.
- 2) The currents are the maximum values when the brake is cold (value used for dimensioning the power supply). The values when the motor is at operating temperature are significantly lower.
- 3) Smoothed DC voltage, ripple < 1%

Permissible moments of inertia

Motor	Brake type	J_{motor} with brake kgcm ²	Permissible J_{load}/J_{motor}
MCS 19J	P2	135	2.2
MCS 19P	P2	190	1.2

If the permissible moments of inertia in the table are complied with, the maximum permissible switching energy of the brake will not be exceeded, and up to 2000 emergency stop functions can be performed from a speed of 3000 rpm.

Caution!

The brakes used are not fail-safe brakes in the sense that prospective disruptive factors, e.g. oil ingress, can lead to a reduction in torque.

If long motor supply cables are used, check the resistive voltage drop along the cable and compensate for it with a higher voltage at the cable entry.

For Lenze system cables:

$$U_B [V] = 0.08 \times l_{cable} [m] \times I_B [A]$$

If the wrong voltage (wrong magnitude, wrong polarity) is applied to the brake, the brake will be actuated and may overheat and be destroyed if the motor continues to run.

The shortest operating times for the brakes are achieved by switching the voltage to the DC side. A spark suppressor is required for interference suppression and to extend the service life of the relay contacts.



Feedback systems

The following feedback systems are available for the MCS range of motors, depending on the individual application and the degree of accuracy required.

Controller type	Resolver	Single-turn SinCos encoder	Multi-turn SinCos encoder
		SRS 50	SRM 50
93□□	●		
ECS servo system	●	●	●

Version with SinCos single- (SCS70) and multi-turn (SCM70) absolute value encoder for 93□□ on request.





Integrated servo motors

Built-on/built-in accessories

Feedback systems

Resolver

Stator-fed resolver with 2 stator windings offset by 90° and one rotor winding with transformer winding.

Code	RS0
Resolution	0.8'
Accuracy	±10'
Absolute positioning	1 revolution
Design	Brushless hollow-shaft "pancake" resolver
Max. speed (continuous)	8000 rpm
Max. speed (short-term)	10000 rpm
Input voltage	10 V amplitude
Input frequency	4 kHz
Stator/rotor ratio	0.3 ± 5%
Rotor impedance Z_{r0}	51 Ω + j90 Ω
Stator impedance Z_{s0}	102 Ω + j150 Ω
Impedance Z_{rs}	44 Ω + j76 Ω
Insulation resistance	>10 MΩ at 500 V DC
Number of pole pairs	1
Max. phase-angle error	±10 angular minutes

SinCos absolute value encoders

SRS 50/SRM 50 SinCos absolute value encoders

These encoder types are required where high levels of accuracy are needed for the use of MCS motors with axis modules of the ECS servo system.

Absolute value encoders with 2 sinusoidal signals offset by 90°, with 1024 cycles per revolution, and an RS485 serial interface for transmitting parameters and the absolute position within one (SRS 50) or 4096 (SRM 50) revolutions.

Code	SRS/SRM 50
Resolution	0.4'
Accuracy	±0.8'
Absolute positioning	1 revolution/4096 revolutions
Design	Brushless hollow-shaft encoder
Max. speed	9000 rpm
Frequency	1024 cycles/revolution
Output signals	2 sinusoidal signals offset by 90° at 1 V _{SS} , RS485 serial interface, asynchronous, half-duplex
Cut-off frequency	100 kHz
Supply voltage	7 ... 12 V
Current consumption	50 ... 100 mA



Temperature sensor

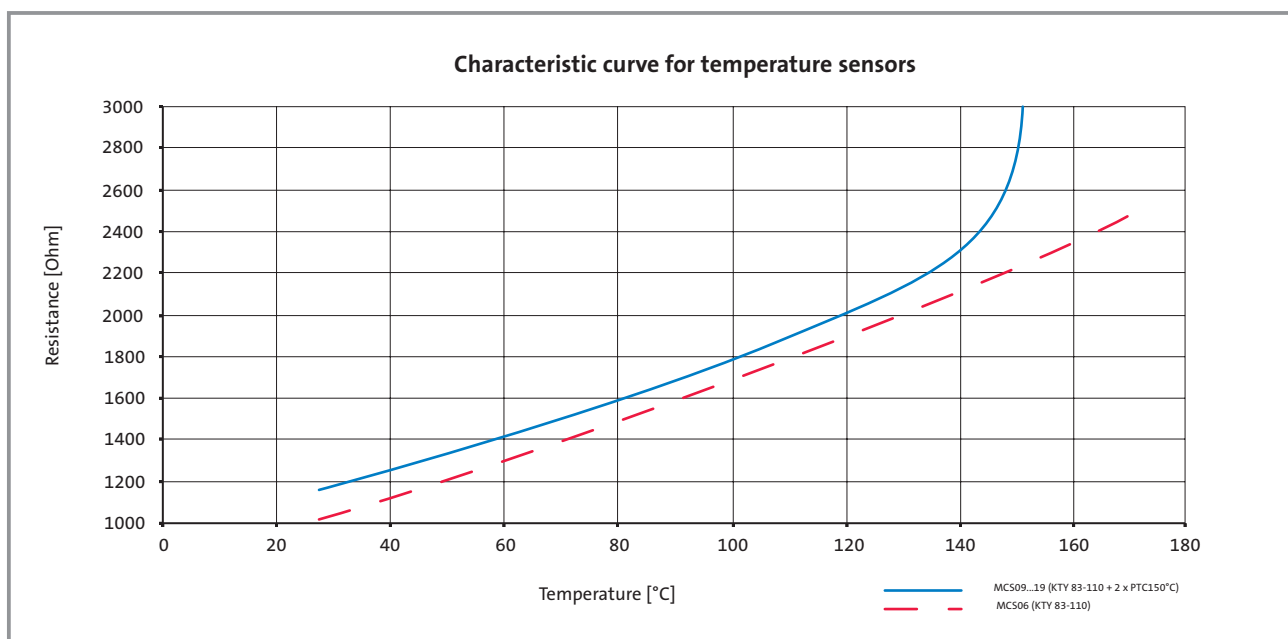
The temperature sensors used in MCS motors ensure the unequivocal and reliable detection of impermissible winding temperatures in all motor types and in all operating systems. The temperature information is transmitted to the servo controller via the system cable for the feedback system. To take account of different physical conditions there are two different temperature monitoring mechanisms on MCS motors:

MCS 06

On this motor the winding temperature of a winding phase is monitored with a KTY 83-110 temperature sensor. In the controller connected to it, this temperature is used to determine/monitor the temperature of the entire motor by means of a temperature model. This calculation model, which is tailored specifically to this motor, ensures that in the event of impermissible temperatures the overtemperature response configured in the controller is triggered promptly and reliably, even in the winding phases that are not directly monitored by the KTY.

MCS 09-MCS 19

These motors are monitored by means of 3 temperature sensors connected in series (1x KTY 83-110 + 2xPTC 150°C). This arrangement ensures that the temperature of the motor is determined with a high level of accuracy in the permitted operating range and that in the event of overtemperature in one of the winding phases the overtemperature response configured in the controller is triggered reliably.



If the sensor is supplied with a measured current of 1 mA, the above relationship applies between temperature and the measured resistance.

Note:

In order for it to operate correctly, the temperature sensor must be connected to the servo controller with the correct polarity.



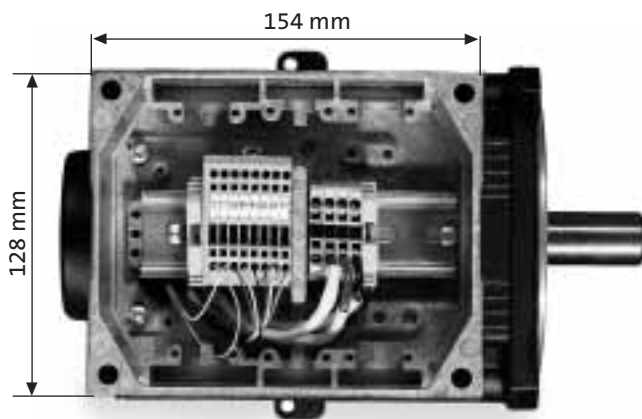
Integrated servo motors

Built-on/built-in accessories

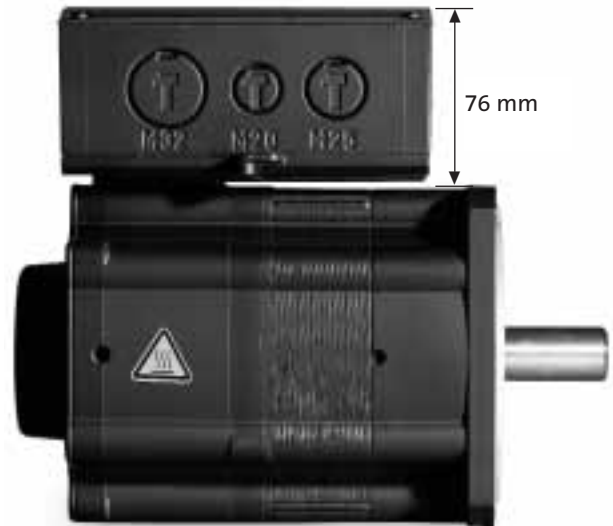
Terminal box

If an MCS servo motor is to be connected to an existing cable, or if no plug connection is required for other reasons, the motor can also be connected via a terminal box. In order to ensure the required vibration resistance of the cable connections with adequate contact pressure in long-term operation, the terminals are designed as tension spring terminals.

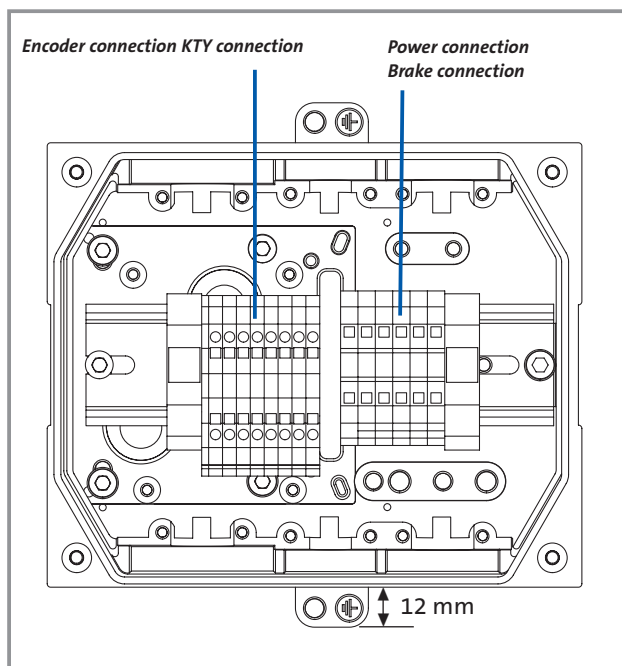
The terminal box is generously proportioned to allow space for customer wiring and has large shield contact surfaces for a secure EMC-compliant connection. The outgoing cable can be fed to the left or right, depending on requirements.



Top view of MCS 14D with terminal box



Side view of MCS 14D with terminal box



Internal view of terminal box

Cable gland openings:

- ▶ 2 x M20, 2 x M25, 2 x M32
- ▶ Openings are sealed off and can be opened by the customer as required.



Terminal assignment for power connection

Terminal	Connection	Lead colour
U	Motor phase	red or black
V	Motor phase	blue
W	Motor phase	black or red
PE	Brake	green and yellow
Y1	Brake	–
Y2	Brake	–

Permissible cable cross-sections for terminals for power connection

Motor	2.5 mm ²	4 mm ²	10 mm ²
MCS 09 (all sizes)	●	●*)	
MCS 12 (all sizes)	●	●*)	
MCS 14D, H	●	●*)	
MCS 14 L15	●	●*)	
MCS 14L32			●
MCS 14P14	●	●*)	
MCS 14P32			●
MCS 19F15	●	●*)	
MCS 19F30			●
MCS 19J15	●	●*)	
MCS 19J30			●
MCS 19P			●

*) If wire end ferrules are not used

Terminal assignment for feedback and temperature monitoring

Terminal	Resolver		Absolute value encoder (SRX50)			Cross-section mm ²
	Connection	Lead colour	Terminal	Connection	Lead colour	
S1	Thermostat		S1	Thermostat		0.14/0.21
S2	Thermostat		S2	Thermostat		0.14/0.21
T1	KTY temperature sensor (+)		T1	KTY temperature sensor (+)		0.14/0.21
T2	KTY temperature sensor (-)		T2	KTY temperature sensor (-)		0.14/0.21
P1	PTC thermistor		P1	PTC thermistor		0.14/0.21
P2	PTC thermistor		P2	PTC thermistor		0.14/0.21
B1	+REF	red/white	B1	VCC supply	red	0.14/0.21
B2	-REF	yellow/white	B2	Ground GND	blue	0.14/0.21
B3	–	–	B3	+COS	pink	0.14/0.21
B4	+ COS	red	B4	-COS	black	0.14/0.21
B5	- COS	black	B5	+SIN	white	0.14/0.21
B6	+ SIN	yellow	B6	-SIN	brown	0.14/0.21
B7	- SIN	blue	B7	RS485 data +	grey	0.14/0.21
–	–	–	B8	RS485 data -	green	0.14/0.21



Integrated servo motors

Accessories

Motor cables

To ensure easy, safe and fast connection of power supply, brakes and feedback systems, wherever MCS servo motors are used, we offer a comprehensive choice of preassembled system cables in lengths from 1 m to 100 m (other lengths available on request).

For easy, EMC-compliant connection of MCS servo motors to Lenze 93□□ servo controllers and the ECS servo system, Lenze has an extensive range of preassembled cables.

In the tables below you can select the best type of cable for your motor:

Motor cables

Motor	Connector type	Core cross-section [mm ²]	Length [m]	Order designation for motor cable	Cable diameter [mm]	Bending radius for laying	
						fixed	flexible*
MCS 06C41 MCS 06I41 MCS 09F38 MCS 09H41 MCS 12H15 MCS 12H35 MCS 12L20 MCS 14D15 MCS 14D36 MCS 14H15 MCS 19F14	EWS0001	1.5	1	EWLM001GM-015C	13.5	7.5 x d	15 x d
			2.5	EWLM002GM-015C	13.5	7.5 x d	15 x d
			5	EWLM005GM-015C	13.5	7.5 x d	15 x d
			10	EWLM010GM-015C	13.5	7.5 x d	15 x d
			15	EWLM015GM-015C	13.5	7.5 x d	15 x d
			20	EWLM020GM-015C	13.5	7.5 x d	15 x d
			25	EWLM025GM-015C	13.5	7.5 x d	15 x d
			30	EWLM030GM-015C	13.5	7.5 x d	15 x d
			35	EWLM035GM-015C	13.5	7.5 x d	15 x d
			40	EWLM040GM-015C	13.5	7.5 x d	15 x d
			45	EWLM045GM-015C	13.5	7.5 x d	15 x d
			50	EWLM050GM-015C	13.5	7.5 x d	15 x d
			75	EWLM075GM-015C	13.5	7.5 x d	15 x d
			100	EWLM100GM-015C	13.5	7.5 x d	15 x d
MCS 12L41 MCS 14H32 MCS 14L15 MCS 14P14 MCS 19J14 MCS 19P14	EWS0001	2.5	1	EWLM001GM-025	11.3	7.5 x d	15 x d
			2.5	EWLM002GM-025	11.3	7.5 x d	15 x d
			5	EWLM005GM-025	11.3	7.5 x d	15 x d
			10	EWLM010GM-025	11.3	7.5 x d	15 x d
			15	EWLM015GM-025	11.3	7.5 x d	15 x d
			20	EWLM020GM-025	11.3	7.5 x d	15 x d
			25	EWLM025GM-025	11.3	7.5 x d	15 x d
			30	EWLM030GM-025	11.3	7.5 x d	15 x d
			35	EWLM035GM-025	11.3	7.5 x d	15 x d
			40	EWLM040GM-025	11.3	7.5 x d	15 x d
			45	EWLM045GM-025	11.3	7.5 x d	15 x d
			50	EWLM050GM-025	11.3	7.5 x d	15 x d
			75	EWLM075GM-025	11.3	7.5 x d	15 x d
			100	EWLM100GM-025	11.3	7.5 x d	15 x d



Motor type	Connector type	Core cross-section [mm ²]	Length [m]	Order designation for motor cable	Cable diameter [mm]	Bending radius for laying	
						fixed	flexible*
MCS 19F30	EWS0012	4	1	EWLM001GM-040I	13.5	7.5 x d	15 x d
			2.5	EWLM002GM-040I	13.5	7.5 x d	15 x d
			5	EWLM005GM-040I	13.5	7.5 x d	15 x d
			10	EWLM010GM-040I	13.5	7.5 x d	15 x d
			15	EWLM015GM-040I	13.5	7.5 x d	15 x d
			20	EWLM020GM-040I	13.5	7.5 x d	15 x d
			25	EWLM025GM-040I	13.5	7.5 x d	15 x d
			30	EWLM030GM-040I	13.5	7.5 x d	15 x d
			35	EWLM035GM-040I	13.5	7.5 x d	15 x d
			40	EWLM040GM-040I	13.5	7.5 x d	15 x d
			45	EWLM045GM-040I	13.5	7.5 x d	15 x d
			50	EWLM050GM-040I	13.5	7.5 x d	15 x d
			75	EWLM075GM-040I	13.5	7.5 x d	15 x d
			100	EWLM100GM-040I	13.5	7.5 x d	15 x d
MCS 14L32 MCS 14P32 MCS 19J30 MCS 19P30	EWS0012	10	1	EWLM001GM-100I	19.5	7.5 x d	15 x d
			2.5	EWLM002GM-100I	19.5	7.5 x d	15 x d
			5	EWLM005GM-100I	19.5	7.5 x d	15 x d
			10	EWLM010GM-100I	19.5	7.5 x d	15 x d
			15	EWLM015GM-100I	19.5	7.5 x d	15 x d
			20	EWLM020GM-100I	19.5	7.5 x d	15 x d
			25	EWLM025GM-100I	19.5	7.5 x d	15 x d
			30	EWLM030GM-100I	19.5	7.5 x d	15 x d
			35	EWLM035GM-100I	19.5	7.5 x d	15 x d
			40	EWLM040GM-100I	19.5	7.5 x d	15 x d
			45	EWLM045GM-100I	19.5	7.5 x d	15 x d
			50	EWLM050GM-100I	19.5	7.5 x d	15 x d
			75	EWLM075GM-100I	19.5	7.5 x d	15 x d
			100	EWLM100GM-100I	19.5	7.5 x d	15 x d

* Sustained alternate bending not permissible

The motor cable assignments are designed in accordance with the permissible current loadings as specified in IEC 60204-1, laying system C, for continuous operating conditions at motor standstill current (I_0) at an ambient air temperature of 40°C for PVC-insulated cables. Under different conditions (laying system, ambient conditions, cable design, motor utilisation) it is the responsibility of the user to install an appropriate connection cable for the actual conditions and the applicable standards and regulations.



Motor cables suitable for trailing

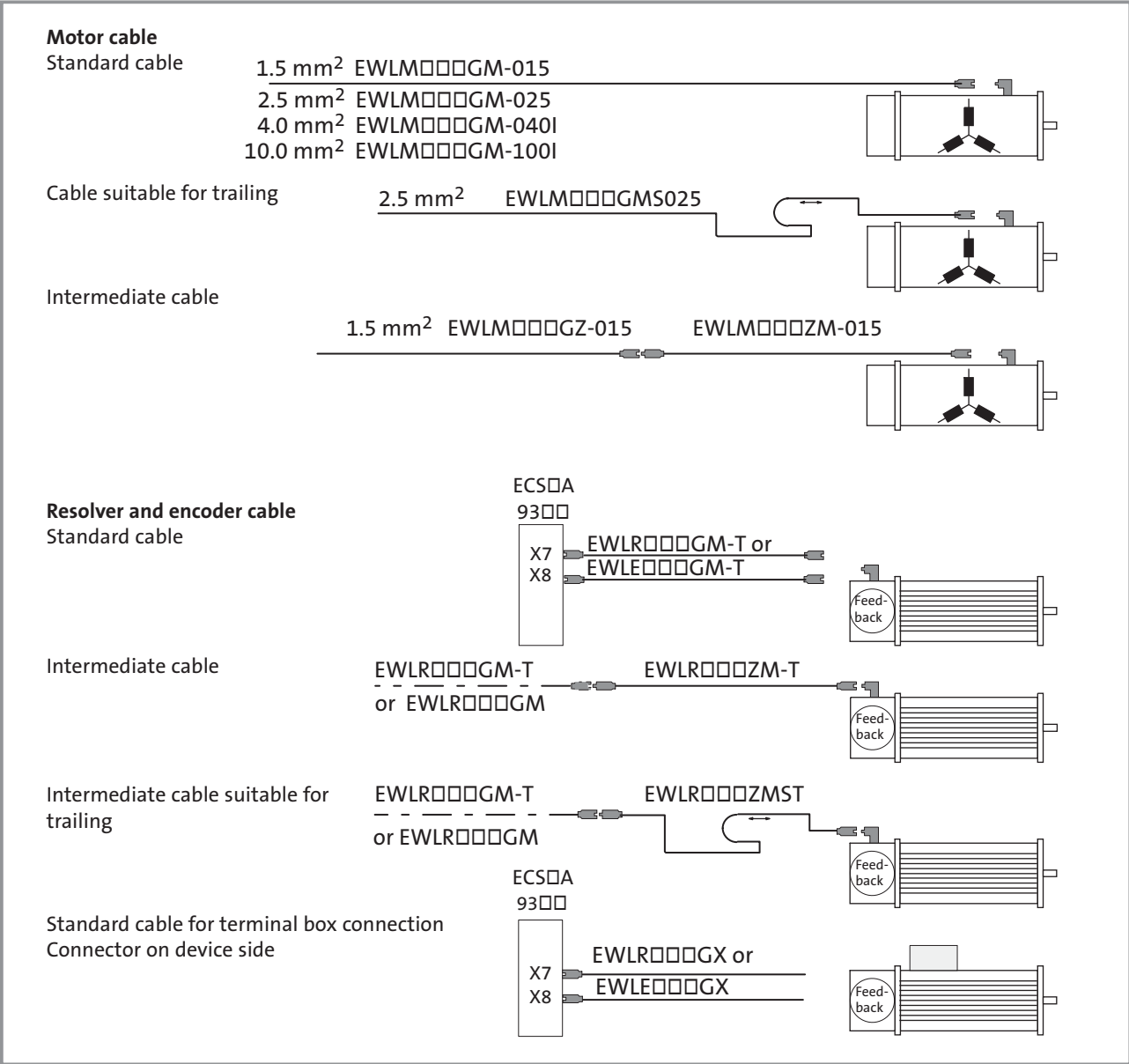
Motor type	Connector type	Core cross-section [mm ²]	Length [m]	Order designation for motor cable	Cable diameter [mm]	Bending radius for laying		
						fixed	trailing cable	
MCS 06C41	EWS0001	2.5	2.5	EWLM002GMS025	12.8	5 x d	10 x d	
MCS 06I41			5	EWLM005GMS025	12.8	5 x d	10 x d	
MCS 09F38			10	EWLM010GMS025	12.8	5 x d	10 x d	
MCS 09H41			15	EWLM015GMS025	12.8	5 x d	10 x d	
MCS 12H15			20	EWLM020GMS025	12.8	5 x d	10 x d	
MCS 12H35			25	EWLM025GMS025	12.8	5 x d	10 x d	
MCS 12L20			30	EWLM030GMS025	12.8	5 x d	10 x d	
MCS 12L41			40	EWLM040GMS025	12.8	5 x d	10 x d	
MCS 14D15			50	EWLM050GMS025	12.8	5 x d	10 x d	
MCS 14D36			75	EWLM075GMS025	12.8	5 x d	10 x d	
MCS 14H15			100	EWLM100GMS025	12.8	5 x d	10 x d	
MCS 14H32								
MCS 14L15								
MCS 14P14								
MCS 19F14								
MCS 19J14								
MCS 19P14								

The motor cable assignments are designed in accordance with the permissible current loadings as specified in IEC 60204-1, laying system C, for continuous operating conditions at motor standstill current (I_0) at an ambient air temperature of 40°C for PVC-insulated cables. Under different conditions (laying system, ambient conditions, cable design, motor utilisation) it is the responsibility of the user to install an appropriate connection cable for the actual conditions and the applicable standards and regulations.

Other cables that are suitable for trailing are available on request.



Overview of system cables





Resolver and encoder cables

Resolver – servo controller cable, including temperature monitoring

Cable length [m]	Order designation
2.5	EWLR002GM-T
5.0	EWLR005GM-T
10.0	EWLR010GM-T
15.0	EWLR015GM-T
20.0	EWLR020GM-T
25.0	EWLR025GM-T
30.0	EWLR030GM-T
35.0	EWLR035GM-T
40.0	EWLR040GM-T
45.0	EWLR045GM-T
50.0	EWLR050GM-T
75.0	EWLR075GM-T
100.0	EWLR100GM-T

Resolver – controller cable, terminal connection on the motor side, including temperature monitoring

Cable length [m]	Order designation
2.5	EWLR002GX-T
5.0	EWLR005GX-T
10.0	EWLR010GX-T
15.0	EWLR015GX-T
20.0	EWLR020GX-T
25.0	EWLR025GX-T
30.0	EWLR030GX-T
35.0	EWLR035GX-T
40.0	EWLR040GX-T
45.0	EWLR045GX-T
50.0	EWLR050GX-T
75.0	EWLR075GX-T
100.0	EWLR100GX-T

Resolver – adapter plug cable, including temperature monitoring

Cable length [m]	Order designation
2.5	EWLR002ZM-T
5.0	EWLR005ZM-T
10.0	EWLR010ZM-T
15.0	EWLR015ZM-T
20.0	EWLR020ZM-T
25.0	EWLR025ZM-T
30.0	EWLR030ZM-T
35.0	EWLR035ZM-T
40.0	EWLR040ZM-T
45.0	EWLR045ZM-T
50.0	EWLR050ZM-T

Resolver – adapter plug cable suitable for trailing, including temperature monitoring

Cable length [m]	Order designation
5.0	EWLR005ZMST
10.0	EWLR010ZMST
15.0	EWLR015ZMST
20.0	EWLR020ZMST
25.0	EWLR025ZMST
30.0	EWLR030ZMST
35.0	EWLR035ZMST
40.0	EWLR040ZMST
45.0	EWLR045ZMST
50.0	EWLR050ZMST
75.0	EWLR075ZMST
100.0	EWLR100ZMST



Absolute value encoder – controller cable, including temperature monitoring

Cable length [m]	Order designation
2.5	EWLE002GM-T
5.0	EWLE005GM-T
10.0	EWLE010GM-T
15.0	EWLE015GM-T
20.0	EWLE020GM-T
25.0	EWLE025GM-T
30.0	EWLE030GM-T
35.0	EWLE035GM-T
40.0	EWLE040GM-T
45.0	EWLE045GM-T
50.0	EWLE050GM-T
75.0	EWLE075GM-T
100.0	EWLE100GM-T

Absolute value encoder – controller cable, terminal connection on the motor side, including temperature monitoring

Cable length [m]	Order designation
2.5	EWLE002GX-T
5.0	EWLE005GX-T
10.0	EWLE010GX-T
15.0	EWLE015GX-T
20.0	EWLE020GX-T
25.0	EWLE025GX-T
30.0	EWLE030GX-T
35.0	EWLE035GX-T
40.0	EWLE040GX-T
45.0	EWLE045GX-T
50.0	EWLE050GX-T
75.0	EWLE075GX-T
100.0	EWLE100GX-T

Absolute value encoder – adapter plug cable suitable for trailing, including temperature monitoring

Cable length [m]	Order designation
5.0	EWLE005ZMST
10.0	EWLE010ZMST
15.0	EWLE015ZMST
20.0	EWLE020ZMST
25.0	EWLE025ZMST
30.0	EWLE030ZMST



Integrated servo motors

Accessories

System connectors for power connection

For applications where it is not possible to use a Lenze system cable but where motors with plug connections are to be used, Lenze can supply appropriate connectors which customers can use to assemble their own connecting cables.

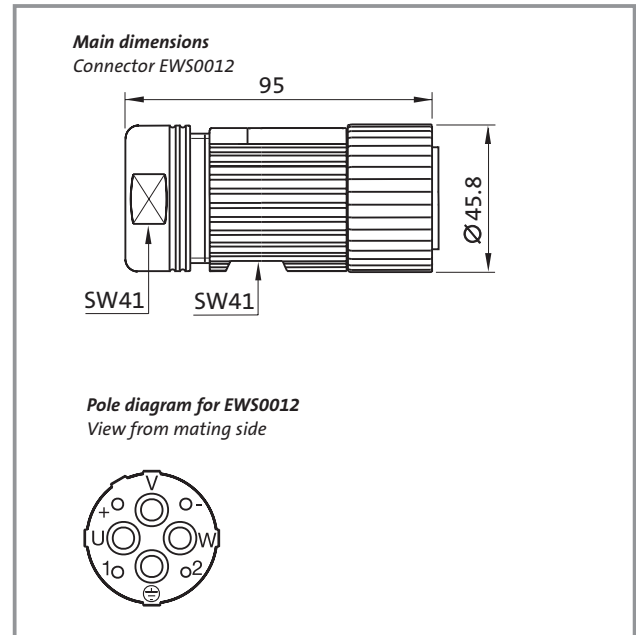
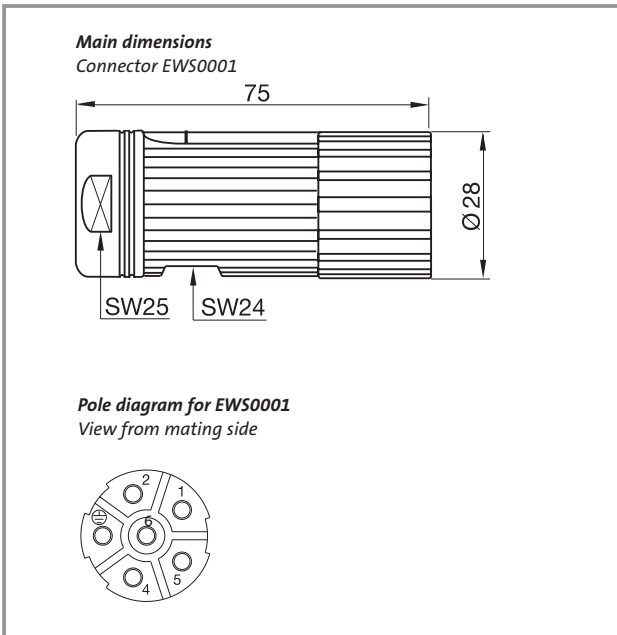
There are two different sizes available, depending on the power requirement of the motors. The assignment of connector type to motor frame size can be found in the table on page 3-6 and 3-7.



Power connector EWS0001



Power connector EWS0012



	Pin no.	Terminal designation
Holding brake +UB	1	Y1/BD1
Holding brake -UB	2	Y2/BD2
PE earthing	⊥	⊥
Motor phase U	4	U
Motor phase V	5	V
Motor phase W	6	W

Contact assignment for EWS0001

Order number: **EWS0001**

	Pin no.	Terminal designation
Holding brake +UB	+	Y1/BD1
Holding brake -UB	-	Y2/BD2
PE earthing	⊥	⊥
Motor phase U	U	U
Motor phase V	V	V
Motor phase W	W	W

Contact assignment for EWS0012

Order number: **EWS0012**



System connectors for feedback systems

Resolver

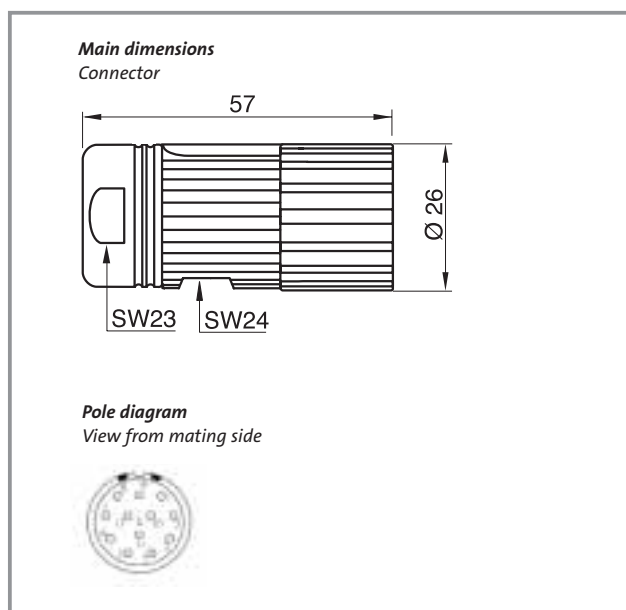


Connector for resolvers EWS 0006

SinCos absolute value encoders



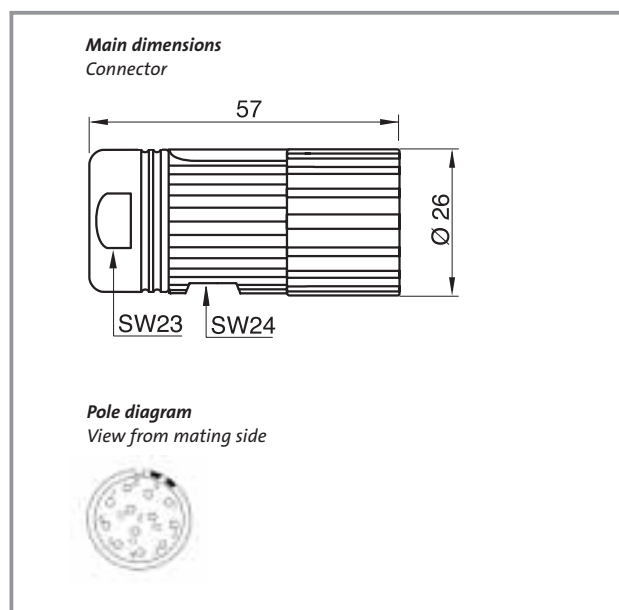
Connector for SinCos encoders EWS 0018



Pin no.	Terminal designation	Meaning
1	+Ref	Transformer windings (reference windings)
2	-Ref	
3		Not assigned
4	+Cos	Stator windings Cosine
5	-Cos	
6	+Sin	Stator windings Sine
7	-Sin	
8		Not assigned
9		
10		
11	+KTY	Temperature sensor + Temperature sensor -
12	-KTY	

Contact assignment for EWS0006

Order number: **EWS0006**



Pin no.	Terminal designation	Meaning
1	B	Track B/+Sin
2	\bar{A}	Track A inverse/-COS Track A/+COS
3	A	
4	+5 V	+5 V/+8 V supply Earth
5	GND	
6	\bar{Z}	Zero track inverse/-RS485 Zero track/+RS485
7	Z	
8		Not assigned
9	\bar{B}	Track B inverse/-SIN
10		Not assigned
11	+KTY	Temperature sensor + Temperature sensor -
12	-KTY	

Contact assignment for EWS0018

Order number: **EWS0018**

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