Servo motors

Dynamic, compact, reliable

Servo motors

Lenze

Lenze

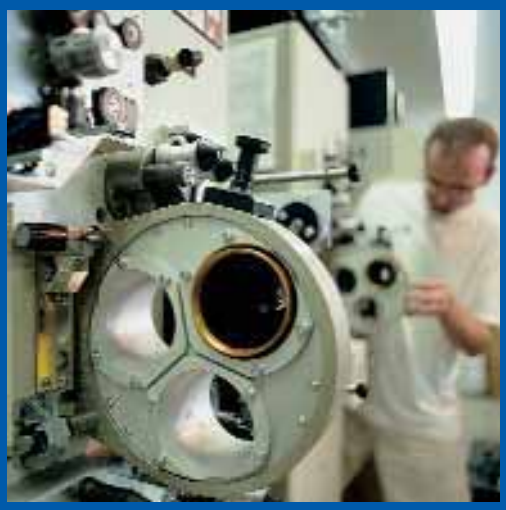
No matter which drive solution you imagine, we make your dreams come true.

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.

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PM holding brake

MCA asynchronous servo motors
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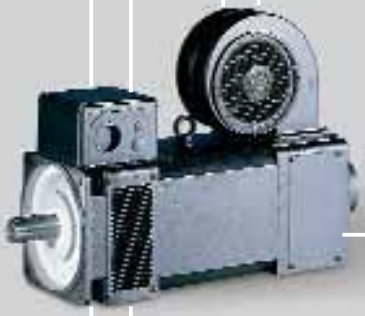
Spring-applied holding brake



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Resolvers/SinCos absolute value encoders
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Lenze servo motors

Dynamic,
compact, reliable

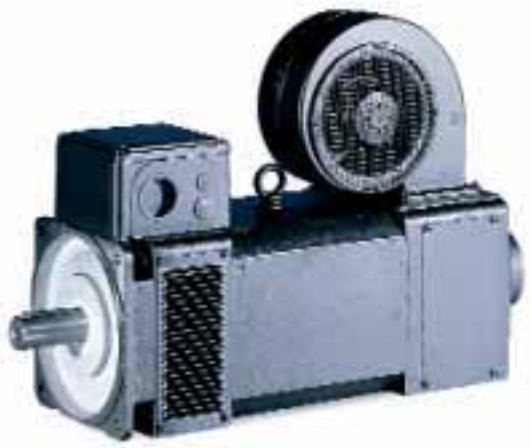
Lenze servo drives satisfy the highest demands in terms of quality and impress with their carefully considered and application-focused design. This enables them to meet the increasingly stringent demands that are now placed on drive systems by mechanical and system engineering companies. Servo motors that are an integral part of a drive axis are easy to install and offer an long, maintenance-free service life.

Lenze has developed three different ranges of servo motors for different applications. In all three, heavy-duty bearings with high-temperature resistant grease and a reinforced insulation concept ensure long and reliable operation – even under harsh operating conditions.

The synchronous servo motors of the MCS range have been designed for extremely dynamic applications with a high overload capacity. The through-blown asynchronous servo motors in the MDFQA range have been tailored to harsh continuous load operations. Finally, the MCA is a successful range of durable and universally applicable asynchronous servo motors for high-speed applications. All Lenze motors offer the same high levels of technical perfection, user-friendliness and ease of handling in a power range from 0.25 kW to 95 kW, with continuous torque values in the range from 0.5 Nm to 434 Nm and peak torque values of up to 1600 Nm.

MCS 06F

MCA 17N ... F10



MDFQA 132

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

9300 vector frequency inverter

8200 vector frequency inverter

8200 motec motor inverter

starttec motor starter

Communication modules

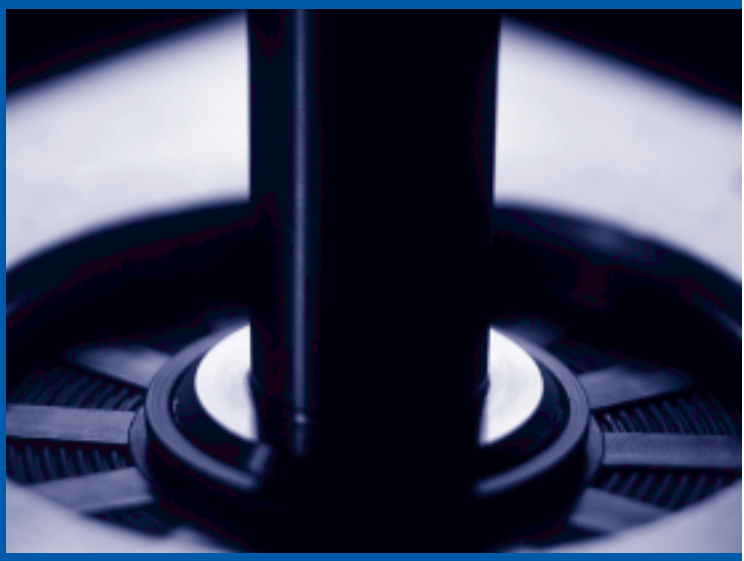
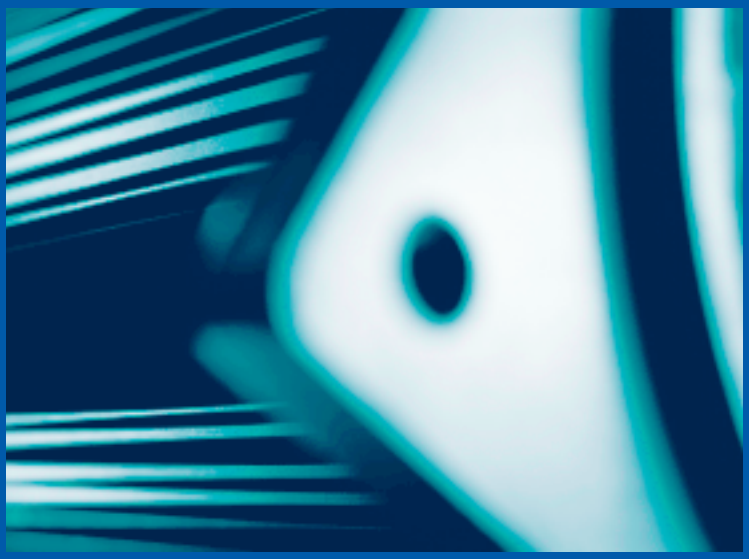
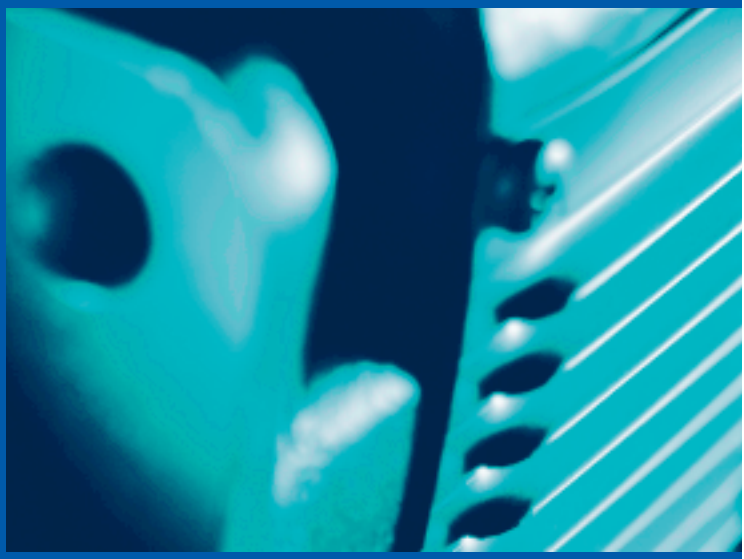
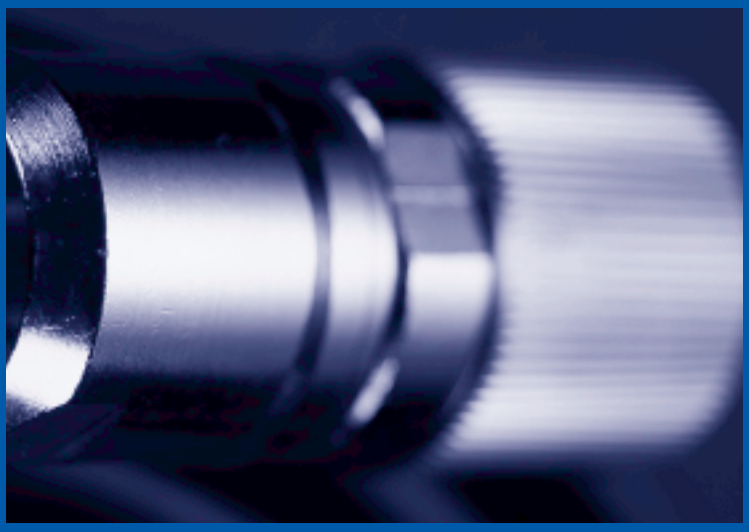
PC software

Software packages

Servo motors

Small drives

Brakes and clutches

Lenze

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General | MCS, MCA, MDFQA servo motors

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Designations used

AC		Alternating current/voltage
CE		Communauté Européenne
CSA		Canadian Standards Association
DC		Direct current/voltage
DIN		Deutsches Institut für Normung
EMC		Electromagnetic compatibility
EN		European standard
F_a	[N]	Applied axial force
f_r	[Hz]	Rated frequency
F_{r1}	[N]	Applied radial force in centre of shaft
F_{r2}	[N]	Applied radial force at shaft end
h	[mm]	Shaft height
i		Transmission ratio
I_0	[A]	Continuous standstill current
I_B	[A]	Rated current of brake
IEC		International Electrotechnical Commission
IM		International Mounting Code
I_{max}	[A]	Maximum current
I_r	[A]	Rated current
IP		International Protection Code
J_B	[kg m^2 · 10^{-4}]	Moment of inertia - brake
J_{load}	[kg m^2 · 10^{-4}]	Moment of inertia - load
J_{mot}	[kg m^2 · 10^{-4}]	Moment of inertia - motor
kE_{LL}	[V/1000 rpm]	Combined voltage constant
kt_0	[Nm/A]	Torque constant at standstill
$L_{1\sigma}$	[mH]	Stator leakage inductance
$L2\sigma'$	[mH]	Rotor leakage inductance (referred to stator)
L_h	[mH]	Mutual inductance
L_{phase}	[mH]	Winding inductance per phase
m	[kg]	Mass
M_0	[Nm]	Continuous standstill torque
M_B	[Nm]	Holding torque of brake
M_{cont}	[Nm]	Continuous torque
M_{load}	[Nm]	Torque of the loaded machine
M_{max}	[Nm]	Maximum torque
M_r	[Nm]	Rated torque
M_{perm}	[Nm]	Permissible torque
NEMA		National Electrical Manufacturers Association
n_{max}	[rpm]	Maximum speed
n_r	[rpm]	Rated speed
P_r	[kW]	Rated power
R_1	[Ω]	Winding resistance - phase
R_2'	[Ω]	Rotor resistance (referred to stator)
R_{UV}	[Ω]	Winding resistance between 2 terminals
U_B	[V]	Rated voltage of brake
UL		Underwriters Laboratory listed component
U_r	[V]	Rated voltage
UR		Underwriters Laboratory recognised component
VDE		Association of German Electrotechnical Engineers
η	[%]	Efficiency
$\eta_{gearbox}$		Gearbox efficiency

Lenze servo motors

Servo drive systems are nowadays subjected to the most stringent demands. The Global Drive System from Lenze has succeeded in ensuring that the differing drive unit components all complement each other perfectly. The Lenze servo motors have an important role to play in this system. Tailored to various applications, synchronous and asynchronous motors that have been optimised to satisfy the various requirements in terms of dynamic response, accuracy and drive behaviour, are available across a wide torque and power range.

Dynamic
All Lenze servo motors feature a low moment of inertia and a high overload capacity. Continuous temperature measurement using an integrated thermal sensor delivers an optimal control response that is more or less temperature independent.

When combined with 9300 range servo inverters or the ECS servo system, high speed precision, ideal smooth running characteristics and high angular accelerations can be achieved.

Precise
In combination with the specially designed neodymium iron boron (NdFeB) high-energy magnets, the new SEpT design *) enables a distortion-free, entirely sinusoidal working field to be generated on MCS synchronous servo motors. This ensures both excellent smooth running characteristics (due to the absence of field distortion) and maximum power density (as the working field is generated almost entirely from the induced energy). This optimised field form also eliminates practically all distorting cogging and latching torques.

Long service life
The high quality levels that Lenze demands of the components in question satisfy the requirements placed on modern drive systems in terms of operational reliability and service life. A reinforced insulation system with thermal reserve (enamel-insulated wire to temperature class H, for class F use) ensures the long operating life of the winding. The fully-encapsulated stator also ensures the winding is thoroughly protected, even in the event of severe vibration, and allows heat to be dissipated more effectively: the result is an increase in load capacity and a long trouble-free service life.

Pretensioned and generously dimensioned roller bearings with high-temperature resistant grease guarantee a long service life for the bearings as well.

*) SePT: Single Element Pole Technology.

Operational reliability
The IP54 version of the MCS and MCA series provides a good degree of protection from dust and water. If the drives require even more protection, the MCS and MCA motors are also available in an IP65 version.

CE conformity
All Lenze servo motors naturally meet the requirements of the following EU guidelines:
- CE conformity with the low voltage directive
- CE conformity with the electromagnetic compatibility directive for a typical drive configuration with inverter

The use of integrated system cables makes it easy to maintain electromagnetic compatibility.

UL certification
All Lenze servo motors in the MCS and MCA series are designed for use in the Americas and are supplied UR certified (exception: version with 205V brake).

No compromises where output speed is concerned
The large ratio range of Lenze gearboxes, combined with the small ratio step of 1.12, allows the required output speed range to be chosen very precisely. The ability to connect the gearboxes directly in the case of the MCS and MCA servo motors produces an extremely compact drive unit with a minimal unit volume. It goes without saying that all Lenze servo motors can also be combined with gearboxes in the conventional manner.

Adaptable
The modular structure of the motors and the concept-based variants will help you to choose the right solution for any application.

The numerous output designs of the motors and geared motors mean that the drives can be adapted to almost any drive task:

- Servo motors with cylindrical shaft end with or without keyway
- Servo geared motors with solid shaft, hollow shaft or hollow shaft with shrink disk
- Servo geared motors with or without flange, foot or centring
- A range of integral phase angle sensors allows the motors to be configured to achieve the required accuracy: resolvers are the standard solution with optimised response resulting from internal improvements in resolver accuracy, SinCos absolute value encoders for the greatest precision or even incremental encoders for general applications
- Tailored to the relevant motor type, permanent magnet or spring-applied holding brakes with differing torque ranges ensure exact positioning in all application scenarios, even when the drive is de-energised

Quiet
The high chopper frequencies of the inverters (up to 16 kHz) and a cleverly designed magnetic circuit result in extremely low noise levels. Optimised gear teeth geometry in the Lenze gearboxes prevents noise developing, while the internally ribbed cast iron gearbox housing also helps reduce noise levels.

Compact
The high power density of all Lenze servo motors encourages the development of small, highly dynamic drive units. The use of servo geared motors with direct mounting of the motors to the gearbox makes for particularly compact drives.

Reduced backlash
The use of zero backlash permanent magnet holding brakes enables defined holding of a position even if the drive has been disconnected from the power supply.

The low backlash joining elements on the Lenze gearboxes and high teeth quality due to precision manufacturing minimise output backlash on the servo geared motors in comparison with similar gearboxes.

For the highest requirements with respect to reduced backlash, all MCS and MCA servo motors can be combined with flange-mounted GPA series planetary gearboxes.
It goes without saying that here, as with all motor-gearbox combinations, we are committed to using friction-type connections, which can also reliably handle highly dynamic servo applications.

Special models
We can also provide special models tailored to meet the requirements of specific applications.

Easy to install
All Lenze servo motors are guaranteed to be extremely easy to install, with short down times whenever one needs to be replaced. All connectors on the MCS and MCA motors are keyed to prevent incorrect connection and can be turned through about 240° to allow them to be fitted and removed easily in all situations.

Easy-to-install housing format on MCS synchronous servo motors

Please contact us should you require more information.

Detailed Operating Instructions for all Lenze servo motors can be found on the Download pages at www.Lenze.de

Design overview - servo motors

Versions	MCS 06	MSC 09	MCS 12	MCS 14	MCS 19	MCA 10	MCA 13	MCA 14	MCA 17	MCA 19	MCA 21	MDxQA 100	MDxQA 112	MDxQA 132	MDxQA 160
Synchronous servo motor	●	●	●	●	●										
Asynchronous servo motor						●	●	●	●	●	●	●	●	●	●
Rated speed															
500...999 rpm													●	●	●
1000...1499 rpm				●	●							●	●	●	●
1500 ... 2499 rpm			●	●				●	●	●	●		●	●	●
2500 ... 2999 rpm												●	●		
3000 ... 3999 rpm		●	●	●	●	●	●	●	●	●	●				
4000 ... 4999 rpm	●	●	●				●	●	●	●	●				
5000 ... 6000 rpm	●	●													
Speed/position encoders															
Resolver	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
SinCos single or multiturn	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Incremental encoder						●	●	●	●	●	●	●	●	●	●
without												●	●	●	●
Design															
B5 FF75	●														
B5A 120 FF100		●				●									
B5A 160 FF130			●				●								
B5A 200 FF165				●				●	●						
B5A 250 FF215					●					●	●				
B5A 300 FF265											●	●			
B5A 400 FF350														●	
B14 C105						●									
B14 C160							●	●	●	●	●				
B35 A250 FF215												●			
B35 A300 FF265													●	●	
B35 A400 FF350															●
Shaft end (with and without keyway)															
11 x 23	●														
14 x 30		●				●									
19 x 40			●				●								
24 x 50				●				●	●						
28 x 60					●					●					
38 x 80											●	●	●		
55 x 110														●	●

MCS 06F

MCS 09H

MCS 12L

Design overview - servo motors

Versions	MCS 06	MCS 09	MCS 12	MCS 14	MCS 19	MCA 10	MCA 13	MCA 14	MCA 17	MCA 19	MCA 21	MDxQA 100	MDxQA 112	MDxQA 132	MDxQA 160
Synchronous servo motor	●	●	●	●	●										
Asynchronous servo motor						●	●	●	●	●	●	●	●	●	●
Brake															
without brake	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
with permanent-magnet brake, 24 V	●	●	●	●	●	●	●	●	●	●	●				
with permanent-magnet brake, 205 V						●	●	●	●	●	●				
with spring-applied brake, 24 V												●	●	●	●
with spring-applied brake, 24 V higher-torque												●	●	●	●
with spring-applied brake, 205 V												●	●	●	●
with spring-applied brake, 205 V higher-torque												●	●	●	●
Vibration level, concentricity, axial run-out (DIN 42955)															
normal	●	●	●	●	●	●	●					●	●	●	●
reduced								●	●	●	●				
Type of connection															
Two circular connectors for power and encoder(s)	●	●	●	●	●	●	●	●	●	●	●				
Terminal box for power/fan, plug-in connector for encoder						●	●	●	●	●	●	●	●	●	●
Terminal box for power and encoder(s)	●	●	●	●	●	●	●	●	●	●	●				
Type of protection															
IP54	●	●	●	●	●	●	●	●	●	●	●				
IP65 (naturally ventilated only)	●	●	●	●	●	●	●	●	●	●	●				
IP23s												●	●	●	●
Cooling															
Natural ventilation without a fan	●	●	●	●	●	●	●	●	●	●	●				
Blower, axial 1 ph, 230 V							●	●	●	●	●				
Blower, radial 3 ph, 400 V without filter												●	●	●	●
Blower, radial 3 ph, 400 V with filter												●	●		
Blower, radial 3 ph, 350...540 V without filter												●	●	●	●
Blower, radial 3 ph, 350...540 V with filter												●	●	●	●
Temperature protection															
KTY	●	●	●	●	●	●	●	●	●	●	●				
KTY and TKO												●	●	●	●
approval															
UR	●	●	●	●	●	●	●	●	●	●	●	○	○	○	

○: optional

MCS synchronous servo motors product overview

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_N A	n_{max} (rpm)	J_{mot} (w/o brake) kg m² · 10⁻⁴	Motor data
MCS 06C41	4050	0.8	2.4	0.6	0.25	1.3	8000	0.14	Page 2-3
MCS 06C60	6000	0.8	2.4	0.5	0.31	2.4		0.14	
MCS 06F41	4050	1.5	4.4	1.2	0.51	1.5		0.22	
MCS 06F60	6000	1.5	4.4	0.9	0.57	2.5		0.22	
MCS 06I41	4050	2.0	6.2	1.5	0.64	1.6		0.30	
MCS 06I60	6000	2.0	6.2	1.2	0.75	2.9		0.30	
MCS 09F38	3750	4.2	15.0	3.1	1.2	2.5	7000	1.50	Page 2-17
MCS 09F60	6000	4.2	15.0	2.4	1.5	4.5		1.50	
MCS 09H41	4050	5.5	20.0	3.8	1.6	3.4		1.90	
MCS 09H60	6000	5.5	20.0	3.0	1.9	6.0		1.90	
MCS 12H15	1500	11.4	29.0	10.0	1.9	3.8	6000	7.3	Page 2-29
MCS 12H35	3525	11.4	29.0	7.5	2.8	5.7		7.3	
MCS 12L20	1950	15.0	56.0	13.5	2.8	5.9		10.6	
MCS 12L41	4050	15.0	56.0	11.0	4.7	10.2		10.6	
MCS 14D15	1500	11.0	29.0	9.2	1.4	4.5	6000	8.1	Page 2-41
MCS 14D36	3600	11.0	29.0	7.5	2.8	7.5		8.1	
MCS 14H15	1500	21.0	55.0	16.0	2.5	6.6		14.2	
MCS 14H32	3225	21.0	55.0	14.0	4.7	11.9		14.2	
MCS 14L15	1500	28.0	77.0	23.0	3.6	9.7		23.4	
MCS 14L32	3225	28.0	77.0	17.2	5.8	15.0		23.4	
MCS 14P14	1350	37.0	105.0	30.0	4.2	10.8		34.7	
MCS 14P32	3225	37.0	105.0	21.0	7.1	15.6		34.7	
MCS 19F14	1425	32.0	86.0	27.0	4.0	8.6	4000	65.0	Seat 2-55
MCS 19F30	3000	32.0	86.0	21.0	6.6	14.0		65.0	
MCS 19J14	1425	51.0	129.0	40.0	6.0	12.3		105.0	
MCS 19J30	3000	51.0	129.0	29.0	9.1	18.5		105.0	
MCS 19P14	1350	64.0	190.0	51.0	7.2	14.3		160.0	
MCS 19P30	3000	64.0	190.0	32.0	10.0	19.0		160.0	

MCS 14H

MCS 19F

MCA asynchronous servo motors product overview

Motor type	n_N [rpm]	M_0 [Nm]	M_{max} [2)] [Nm]	M_N [Nm]	P_N [kW]	I_N [A]	n_{max} [rpm]	cos φ	J [1)] [kg m² · 10⁻⁴]	m [1)] [kg]	motor data
Without fan											
MCA 10I40...S00	3950	2.3	10	2.0	0.8	2.4	8000	0.70	2.4	6.4	Page
MCA 13I41...S00	4050	4.6	32	4.0	1.7	4.4	8000	0.76	8.3	10.4	3-3
MCA 14L20... S00	2000	8.0	60	6.7	1.4	3.3	8000	0.75	19.2	15.1	Page
MCA 14L41...S00	4100	8.0	60	5.4	2.3	5.8	8000	0.75	19.2	15.1	3-21
MCA 17N23...S00	2300	12.8	100	10.8	2.6	5.5	8000	0.81	36.0	22.9	Page
MCA 17N41...S00	4110	12.8	100	9.5	4.1	10.2	8000	0.80	36.0	22.9	3-35
MCA 19S23...S00	2340	22.5	180	16.3	4.0	8.2	8000	0.80	72.0	44.7	Page
MCA 19S42...S00	4150	22.5	180	12.0	5.2	14.0	8000	0.78	72.0	44.7	3-49
MCA 21X25...S00	2490	39.0	300	24.6	6.4	13.5	8000	0.83	180.0	60.0	Page
MCA 21X42...S00	4160	39.0	300	17.0	7.4	19.8	8000	0.80	180.0	60.0	3-63
With blower											
MCA 13I34...F10	3410	7.0	32	6.3	2.2	6.0	8000	0.75	8.3	12.0	Page 3-3
MCA 14L16...F10	1635	13.5	60	12.0	2.1	4.8	8000	0.81	19.2	16.9	Page
MCA 14L35...F10	3455	13.5	60	10.8	3.9	9.1	8000	0.80	19.2	16.9	3-21
MCA 17N17...F10	1680	23.9	100	21.5	3.8	8.5	8000	0.80	36.0	25.5	Page
MCA 17N35...F10	3480	23.9	100	19.0	6.9	15.8	8000	0.80	36.0	25.5	3-35
MCA 19S17...F10	1700	40.0	180	36.3	6.4	13.9	8000	0.83	72.0	48.2	Page
MCA 19S35...F10	3510	40.0	180	36.0	13.2	28.7	8000	0.80	72.0	48.2	3-49
MCA 21X17...F10	1710	75.0	300	61.4	11.0	22.5	8000	0.85	180.0	63.5	Page
MCA 21X35...F10	3520	75.0	300	55.0	20.3	42.5	8000	0.80	180.0	63.5	3-63

MDFQA asynchronous servo motors product overview

Motor type	Circuit	n_N [rpm]	M_0 [Nm]	M_{max} [2)] [Nm]	M_N [Nm]	P_N [kW]	I_N [A]	n_{max} [rpm]	cos φ	J [1)] [kg m² · 10⁻⁴]	m [1)] [kg]	motor data
MDFQA 100-22	Y	1420	76	250	71	10.6	26.5	5000	0.84	180	65	
	Δ	2930	76	250	66	20.3	46.9		0.80			
MDFQA 112-22, 50	Y	760	156	500	145	11.5	27.2	5000	0.87	470	115	Page
	Δ	1425	156	500	135	20.1	43.7		0.86			4-3
MDFQA 112-22, 100	Y	1670	156	500	130	22.7	49.1		0.85			
	Δ	2935	156	500	125	38.4	81.9		0.83			
MDFQA 132-32, 36	Y	550	325	1100	296	17.0	45.2	4500	0.81	1310	170	
	Δ	1030	325	1100	288	31.1	77.4		0.77			
MDFQA 132-32, 76	Y	1200	325	1100	282	35.4	88.8		0.78			
	Δ	2235	325	1100	257	60.1	144.8		0.80			Page
MDFQA 160-32, 31	Y	498	480	1600	433	22.6	51.5	4500	0.87	2900	300	4-19
	Δ	890	480	1600	434	40.5	87.0		0.86			
MDFQA 160-32, 78	Y	1280	470	1600	410	55.0	115.5		0.89			
	Δ	2295	470	1600	395	95.0	195.5		0.88			

[1)] Without brake, with resolver.
[2)] Magnetically/mechanically permissible torque.

General data

	Synchronous servo motors MCS	Asynchronous servo motors MCA	Asynchronous servo motors MDFQA
Enclosure	IP54/IP65 (naturally ventilated only)		IP23
Thermal class	Utilisation to temperature class F (VDE 0530) Insulation system (enamel-insulated wire) to thermal class H		
UL conformance	UR recognised component File no. E 210321		UL version on request*)
Insulation resistance	Maximum voltage amplitude Û = 1.5 kV Maximum rate of voltage rise du/dt = 5 kV/µs		
Vibration level	N	N Frame size 10 and 13 R above size 14	N
Smooth running, run-out, concentricity	N	N Frame size 10 and 13 R above size 14	N
Mechanical tolerance	Diameter of shaft end d ø 11 to ø 38: k6, at ø 55: m6 Diameter of centring flange b1: J6		
Temperature monitoring	KTY 83 – 110 + 2x PTC 150° MCS06: 1 x KTY 83 – 110 **)	Continuous temperature sensor (KTY 83 – 110) (full protection not provided)	KTY combined with thermo-switch
Connection	1 connector each for: motor and brake, resolver and temperature sensor, blower (MCA above frame size 13) or terminal box		motor connection as terminal box, encoder connection with plug
Temperature range	–20 to +40 °C with no power reduction (without brake, unventilated) –10 to +40 °C with no power reduction (with brake) –15 to +40 °C with no power reduction (forced ventilated)		
Air humidity	up to 85 % no condensation		
Surface temperature	up to 140 °C	Naturally-ventilated motors up to 140 °C Forced ventilated motors up to 110 °C	up to 110 °C
Site altitude	up to 1000 m amsl with no power reduction, with power reduction up to 4000 m		
Demagnetising limit	>5 · I_N with natural ventilation	No demagnetisation possible	
Maximum torque	>4 · M_N	>5 · M_N	
Rated speed	1350 – 6000 rpm	1635 – 4160 rpm	550 – 2935 rpm
Phase angle sensor	Resolver/SinCos absolute value encoder	Resolver/Incremental encoder/SinCos absolute value encoder SinCos encoder	
Type	B5	B5 / B14	B5 / B35
Storage	Deep-groove ball bearing with high-temperature resistant grease, sealing disc/cover plate Locating bearing on the B-side	Locating bearing on the A-side	Locating bearing on the B-side
Shaft end	with/without keyway		
Brake	with/without permanent-magnet holding brake		with/without spring-applied brake
Fan	naturally ventilated only	Axial fan above frame size 13 possible	Radial-flow fan
Colour	Black, RAL 9005		

*) Optional: UR recognised component
File No. E 210321
(not: MDFQA 160).

**) No full protection.

Concentricity and axial run-out of the mounting flanges
Concentricity of the shaft ends

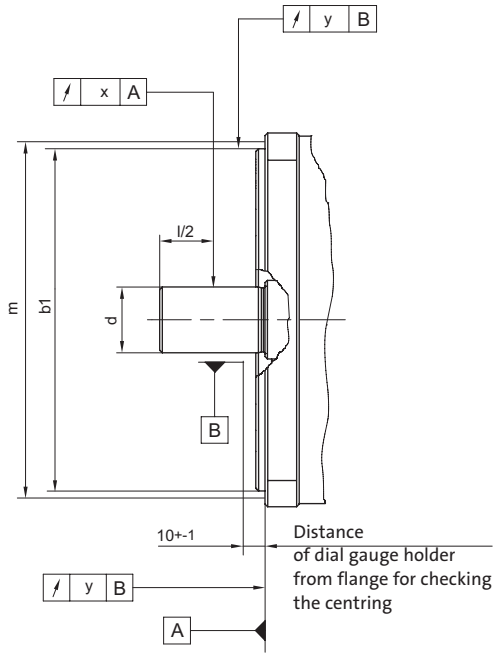
Motor type	Form	Centring diameter b1 [mm]	Measuring diameter m [mm]	Concentricity, run-out y [mm]		Shaft d [mm]	Smooth running limit value x [mm]	
				N	R		N	R
MCS 06	B5	60	65	**0.08**	0.04	11	**0.035**	0.018
MCS 09	B5	80	85	**0.08**	0.04	14	**0.035**	0.018
MCS 12	B5	110	115	**0.1**	0.05	19	**0.040**	0.021
MCS 14	B5	130	135	**0.1**	0.05	24	**0.040**	0.021
MCS 19	B5	180	185	**0.1**	0.05	28	**0.040**	0.021
MCA 10	B5 B14	80 70	113 98	**0.08** **0.08**	0.04 0.04	14 14	**0.035** **0.035**	0.018 0.018
MCA 13	B5, B14	110	149	**0.1**	0.05	19	**0.04**	0.021
MCA 14	B5 B14	130 110	188 149	0.1 0.1	**0.05** **0.05**	24 24	0.04 0.04	**0.021** **0.021**
MCA 17	B5 B14	130 110	188 149	0.1 0.1	**0.05** **0.05**	24 24	0.04 0.04	**0.021** **0.021**
MCA 19	B5 B14	180 110	239 149	0.1 0.1	**0.05** **0.05**	28 28	0.04 0.04	**0.021** **0.021**
MCA 21	B5 B5, A300 B14	180 230 110	239 289 149	0.1 0.1 0.1	**0.05** **0.05** **0.05**	38 38 38	0.05 0.05 0.05	**0.025** **0.025** **0.025**

- limit values for checking the smooth running of the shaft ends and the concentricity and run-out of the mounting flange according to DIN 42 955 and vibration level to DIN VDE 0530 Part 14
- recommended values shown in bold

Vibration level

Motor type	Maximum RMS value of vibration velocity [mm/s]	
	N	R
MCS 06	**1.8**	1.12
MCS 09	**1.8**	1.12
MCS 12	**1.8**	1.12
MCS 14	**1.8**	1.12
MCS 19	**1.8**	1.12
Mmax		10 13 1.8 1.12
MCA 14-21	1.8	**1.12**

- at n = 600...3600 rpm
- recommended values shown in bold

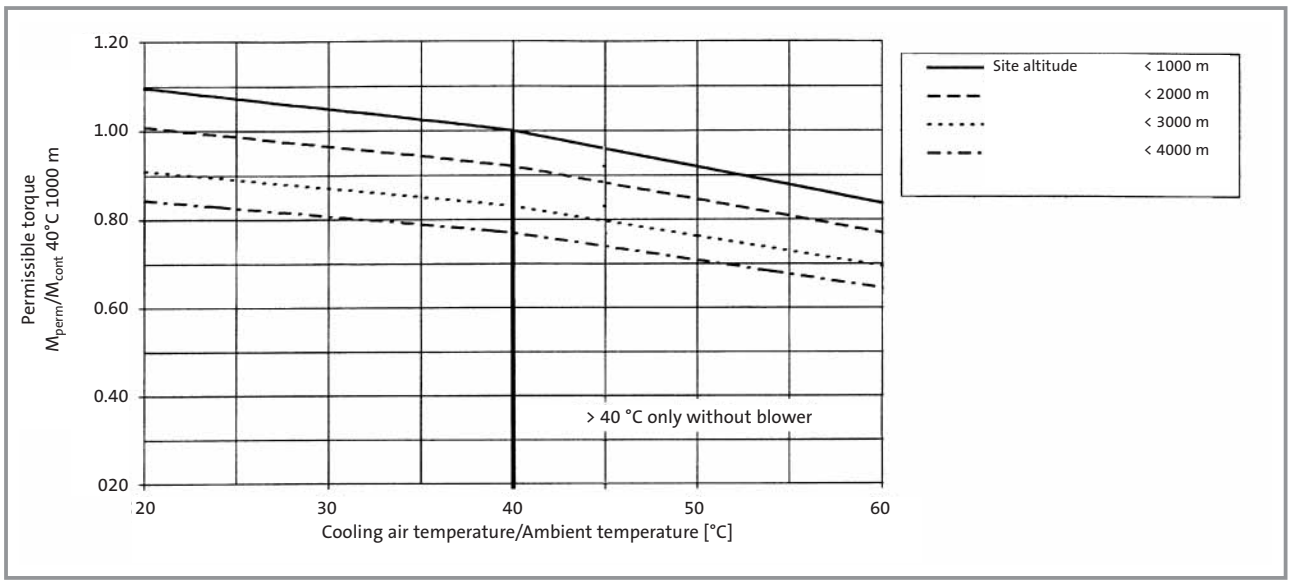


Influence of ambient temperature and installation height

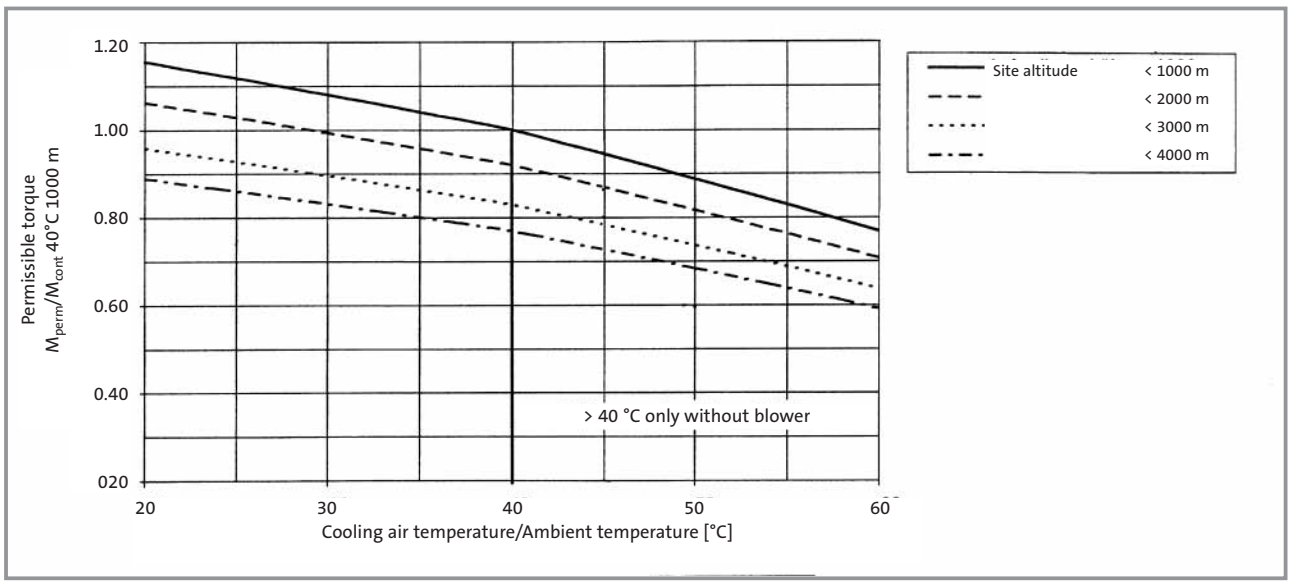
All values given in tables and diagrams for the servo motors are valid for a maximum ambient temperature of 40°C and an installation height up to 1000 m amsl.

If installation conditions differ, the correction factors below should be taken into account.

MCS synchronous servo motors



MCA and MDFQA asynchronous servo motors, on motors with blower MCA ... F 10 and MDFQA Maximum ambient temperature 40 °C



MCS synchronous servo motors have been developed in particular for dynamic drive tasks and therefore feature very high standstill and maximum torques. These optimised characteristics enable a smaller motor to be selected for many applications than if the motor was dimensioned in accordance with the rated data.

A brief overview of the most important data and relationships for dimensioning a servo motor appears below:

Gearbox ratio:

▶ for **optimum dynamics**

$$i \approx \sqrt{\frac{J_{load}}{J_{mot}}}$$

▶ for optimum utilisation in **continuous operation**

$$i \approx \frac{n_N}{n_{load}}$$

Maximum torque:

$$M_{max} = M_{accel} + \frac{1}{i}\,\frac{1}{\eta_{gearbox}}\,M_{load}$$

$$M_{accel} = 2 \cdot \pi\,\frac{\Delta n}{\Delta t}\left(J_{mot} + \frac{1}{i^2}\,J_{load}\right)$$

The thermal design of the motor takes the effective torque and the average speed into account. In the case of short load cycle steps and cycle times < 1 min, the following applies:

r.m.s. torque:

$$M_{eff} = \sqrt{\frac{1}{T}\sum_i M_i^2 \cdot t_i}$$

Average speed:

$$n_m = \frac{1}{T}\sum_i \left| n_i \cdot t_i \right|$$

If n_m, M_{rms} are located below the characteristic for continuous operation or the following relationship is true

$$M_{rms} \le M_0 + (M_n - M_0) \cdot \frac{n_m}{n_n}$$

and all working points M_i, n_i are below the torque limit line, then the thermal design of the motor is correct.

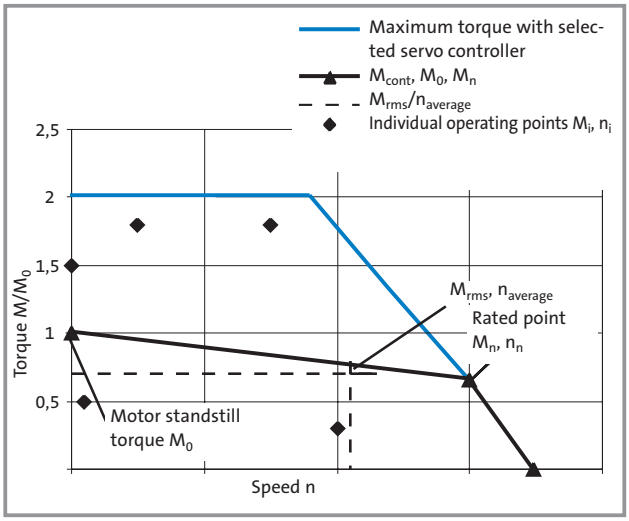
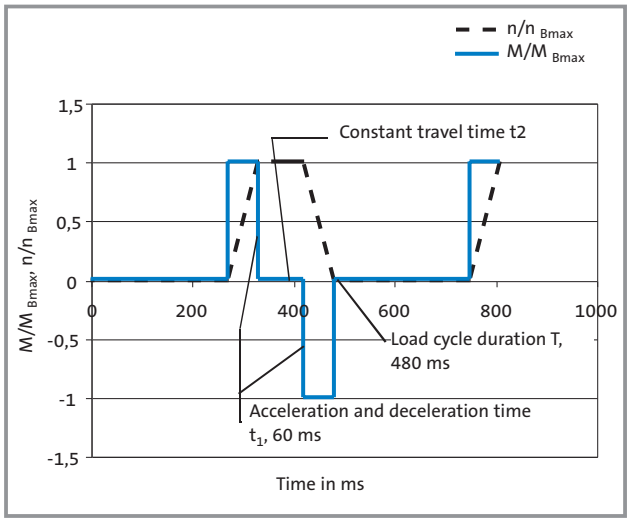


Illustration of correct thermal motor design: lines M_{rms} and $n_{average}$ intersect below the characteristic for continuous operation, and all working points M_i, n_i are below the torque limit line (dependent on motor and servo controller).

If the drive task involves a **cyclic motion sequence**, as shown on page 1-15, the following relationships for M_{eff} and n_m apply:

$$M_{rms} = \sqrt{\frac{2t_1}{T}\,M^2_{max}} \qquad n_m = \frac{t_1 + t_2}{T}\,n_{max}$$

To illustrate an example calculation for an MCS 19 servo motor connected to an EVS 9328 servo controller:



Motion diagram for example calculation

Example calculation
Values for the example illustrated in the diagram:

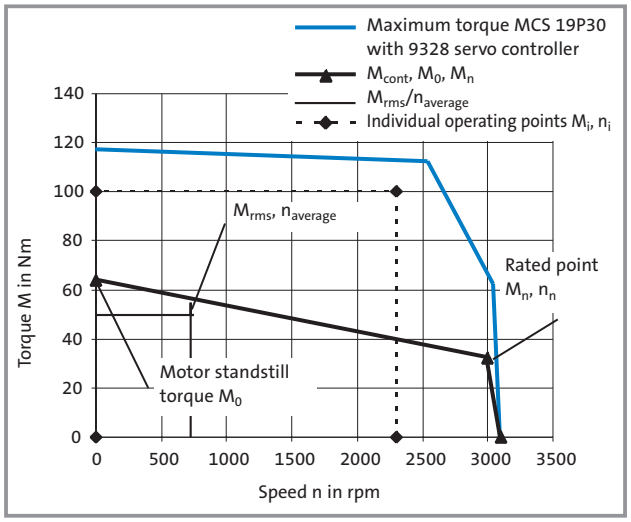
$t_1 = 60\ ms$ $t_2 = 90\ ms$ $T = 480\ ms$

$n_{Bmax} = 2300\ rpm$ $M_{Bmax} = 100\ Nm$

$$M_{rms} = \sqrt{\frac{2 \cdot 60\ ms}{480\ ms} \cdot M^2_{Bmax}} = 0.5 \cdot M_{Bmax} = 50\ NM$$

$$n_m = \frac{60 + 90}{480}\ n_{Bmax} = 0.3125 \cdot n_{Bmax} = 720\ rpm$$

Selected motor:
MCS 19P30 with data
$M_0 = 64\ Nm$ *and* $M_n = 32\ Nm$



The motor is suitable for the drive, although the rated torque (32 Nm) is less than $^1/_3$ of the drive torques required in the example:

1) The operating point calculated from the effective torque (50 Nm) and the average speed (720 rpm) is below the characteristic for continuous operation.
2) All working points are below the maximum torque characteristic of MCS 19P30 with the EVS 9328 servo controller
($I_{max\ controller} = 70.5$ A).

Technical data

MCS synchronous servo motors

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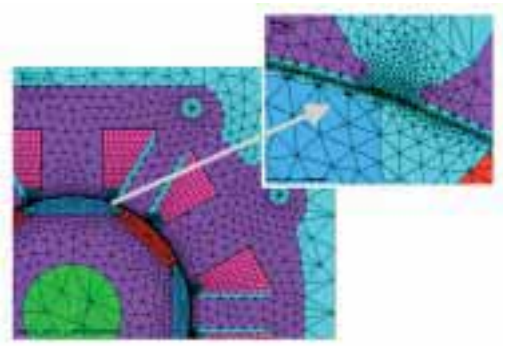
MCS synchronous servo motors

MCS synchronous servo motors are the ideal solution wherever maximum dynamics and maximum precision need to be combined with minimum dimensions.

The stator winding on the MCS motors has been created using a new production method based on the SEpT design*). When combined with high-quality neodymium iron boron magnets outstanding drive characteristics can be achieved. On the one hand this design ensures a significant increase in power density whilst at the same time reducing the moment of inertia and therefore achieves excellent dynamic characteristics. On the other hand, smooth running characteristics can be optimised and detent torques minimised. The robust design with large bearings and the high degree of protection also ensure high operational reliability and long service life even under harsh conditions.

SEpT stator winding for MCS servo motor



FEM calculation

Servo motor MCS 14

*) SePT: Single Element Pole Technology.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	η %	I_{max} A	J_{Motor} without brake kg m² · 10⁻⁴
MCS 06C41	4050	0.8	2.4	0.6	0.25	1.3	1.3	225	270	65	5.4	0.14
MCS 06C60	6000	0.8	2.4	0.5	0.31	2.5	2.4	135	400	70	10.8	0.14
MCS 06F41	4050	1.5	4.4	1.2	0.51	1.5	1.5	320	270	77	5.3	0.22
MCS 06F60	6000	1.5	4.4	0.9	0.57	2.9	2.5	180	400	81	10.5	0.22
MCS 06I41	4050	2.0	6.2	1.5	0.64	1.7	1.6	325	270	81	5.9	0.30
MCS 06I60	6000	2.0	6.2	2.2	0.75	3.4	2.9	190	400	84	11.8	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} mH	kt_0-factor at 150 °C Nm/A	Type connector-type	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 06C60	18.3	6.8	9.1	12.8	0.33		1.8	8000
MCS 06F41	60.1	21.9	29.5	63.5	1.05		2.2	8000
MCS 06F60	30.0	5.5	7.4	15.9	0.53		2.2	8000
MCS 06I41	73.4	18.8	25.4	60.2	1.21		2.9	8000
MCS 06I60	36.7	4.7	6.3	15.1	0.60		2.9	8000

The Operating Instructions for the MCS motors can be found in the download area of the Lenze Internet site at www.Lenze.de

MCS 06C

MCS 06F

MCS 06I

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz								
Type			**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]			2.0	4.0	8.0	12.7	17.0	20.0
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]			4.0	8.0	16.0	32.0	48.0	64.0
Motor type								
MCS 06C41	M_N	[Nm]	0.6					
	M_0	[Nm]	0.8					
	M_{max} n = 0 [4)]	[Nm]	1.2					
	M_{max}	[Nm]	1.9					
MCS 06C60	M_N	[Nm]	0.4	0.5				
	M_0	[Nm]	0.6	0.8				
	M_{max} n = 0 [4)]	[Nm]	0.6	1.2				
	M_{max}	[Nm]	1.0	1.9				
MCS 06F41	M_N	[Nm]	1.2					
	M_0	[Nm]	1.5					
	M_{max} n = 0 [4)]	[Nm]	2.0					
	M_{max}	[Nm]	3.5					
MCS 06F60	M_N	[Nm]	0.7	0.9				
	M_0	[Nm]	1.0	1.5				
	M_{max} n = 0 [4)]	[Nm]	1.0	2.0				
	M_{max}	[Nm]	1.8	3.5				
MCS 06I41	M_N	[Nm]	1.5	1.5				
	M_0	[Nm]	2.0	2.0				
	M_{max} n = 0 [4)]	[Nm]	2.6	5.0				
	M_{max}	[Nm]	4.4	6.2				
MCS 06I60	M_N	[Nm]	0.8	1.2	1.2			
	M_0	[Nm]	1.2	2.0	2.0			
	M_{max} n = 0 [4)]	[Nm]	1.3	2.6	4.9			
	M_{max}	[Nm]	2.2	4.4	6.2			

[1)] Caution: Limit I_{max} controller to I_{max} motor
[2)] Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
[4)] The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper 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	3.0	6.0	12.1	18.1	24.2
Maximum current > 5 Hz[1)2)3)] [A]			2.7	5.3	10.7	21.3	32.0	42.7
Motor type								
MCS 06C41	M_N	[Nm]	0.6	0.6				
	M_0	[Nm]	0.8	0.8				
	M_{max} n = 0[4)]	[Nm]	0.8	1.5				
	M_{max}	[Nm]	1.4	2.4				
MCS 06C60	M_N	[Nm]		0.5	0.5			
	M_0	[Nm]		0.8	0.8			
	M_{max} n = 0[4)]	[Nm]		0.8	1.5			
	M_{max}	[Nm]		1.3	2.4			
MCS 06F41	M_N	[Nm]	1.1	1.2				
	M_0	[Nm]	1.4	1.5				
	M_{max} n = 0[4)]	[Nm]	1.3	2.7				
	M_{max}	[Nm]	2.4	4.4				
MCS 06F60	M_N	[Nm]		0.9	0.9			
	M_0	[Nm]		1.4	1.5			
	M_{max} n = 0[4)]	[Nm]		1.3	2.7			
	M_{max}	[Nm]		2.4	4.4			
MCS 06I41	M_N	[Nm]	1.3	1.5				
	M_0	[Nm]	1.6	2.0				
	M_{max} n = 0[4)]	[Nm]	1.7	3.3				
	M_{max}	[Nm]	3.0	5.6				
MCS 06I60	M_N	[Nm]		1.1	1.2			
	M_0	[Nm]		1.6	2.0			
	M_{max} n = 0[4)]	[Nm]		1.7	3.3			
	M_{max}	[Nm]		3.0	5.7			

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: On the ECS automatic switching to 4 kHz not taken into account; when using automatic switching to 4 kHz, the maximum torques and currents apply at 4 kHz
4) The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz											
Controller type			**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**
Continuous current [A]			1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0
Maximum current 0 Hz [1) 2)] [A]			2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0
Maximum current > 5 Hz [1) 2)] [A]			2.3	3.8	5.9	10.5	19.5	35.2	48.0	70.5	88.5	133.5
Motor type												
MCS 06C41	M_N	[Nm]	0.6	0.6	0.6							
	M_0	[Nm]	0.8	0.8	0.8							
	M_{max} n = 0	[Nm]	1.2	1.8	2.4							
	M_{max}	[Nm]	1.2	1.8	2.4							
MCS 06C60	M_N	[Nm]		0.5	0.5	0.5						
	M_0	[Nm]		0.8	0.8	0.8						
	M_{max} n = 0	[Nm]		1.0	1.5	2.4						
	M_{max}	[Nm]		1.0	1.5	2.4						
MCS 06F41	M_N	[Nm]	1.2	1.2	1.2							
	M_0	[Nm]	1.5	1.5	1.5							
	M_{max} n = 0	[Nm]	2.0	3.3	4.4							
	M_{max}	[Nm]	2.0	3.3	4.4							
MCS 06F60	M_N	[Nm]		0.9	0.9	0.9						
	M_0	[Nm]		1.3	1.5	1.5						
	M_{max} n = 0	[Nm]		1.7	2.6	4.4						
	M_{max}	[Nm]		1.7	2.6	4.4						
MCS 06I41	M_N	[Nm]	1.4	1.5	1.5							
	M_0	[Nm]	1.8	2.0	2.0							
	M_{max} n = 0	[Nm]	2.6	4.2	6.2							
	M_{max}	[Nm]	2.6	4.2	6.2							
MCS 06I60	M_N	[Nm]		1.0	1.2	1.2						
	M_0	[Nm]		1.5	2.0	2.0						
	M_{max} n = 0	[Nm]		2.1	3.3	5.6						
	M_{max}	[Nm]		2.1	3.3	5.6						

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

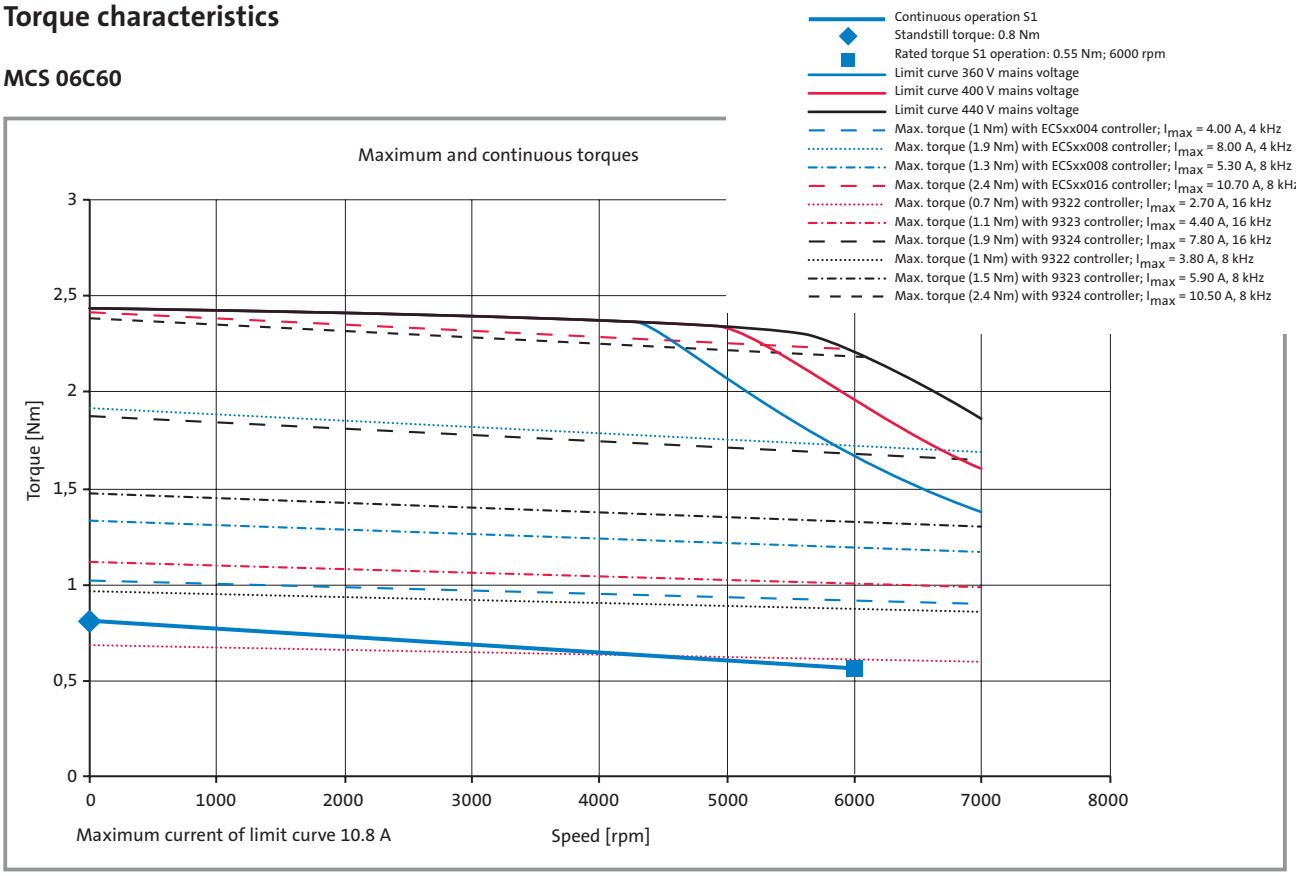
Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz											
Controller 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	38.0	58.0
Maximum current 0 Hz [1) 2)] [A]			1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0
Maximum current > 5 Hz [1) 2)] [A]			1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0
Motor type												
MCS 06C41	M_N	[Nm]	0.5	0.6 0.6								
	M_0	[Nm]	0.7	0.8	0.8							
	M_{max} n = 0	[Nm]	0.9	1.4	2.1							
	M_{max}	[Nm]	0.9	1.4	2.1							
MCS 06C60	M_N	[Nm]		0.4	0.5	0.5						
	M_0	[Nm]		0.6	0.8	0.8						
	M_{max} n = 0	[Nm]		0.7	1.1	1.9						
	M_{max}	[Nm]		0.7	1.1	1.9						
MCS 06F41	M_N	[Nm]	0.9	1.2	1.2							
	M_0	[Nm]	1.1	1.5	1.5							
	M_{max} n = 0	[Nm]	1.5	2.4	3.8							
	M_{max}	[Nm]	1.5	2.4	3.8							
MCS 06F60	M_N	[Nm]		0.6	0.9	0.9						
	M_0	[Nm]		0.9	1.5	1.5						
	M_{max} n = 0	[Nm]		1.2	2.0	3.4						
	M_{max}	[Nm]		1.2	2.0	3.4						
MCS 06I41	M_N	[Nm]	1.0	1.5	1.5	1.5						
	M_0	[Nm]	1.3	2.0	2.0	2.0						
	M_{max} n = 0	[Nm]	1.9	3.0	4.8	6.2						
	M_{max}	[Nm]	1.9	3.0	4.8	6.2						
MCS 06I60	M_N	[Nm]			1.2	1.2	1.2					
	M_0	[Nm]			1.7	2.0	2.0					
	M_{max} n = 0	[Nm]			2.4	4.3	6.2					
	M_{max}	[Nm]			2.4	4.3	6.2					

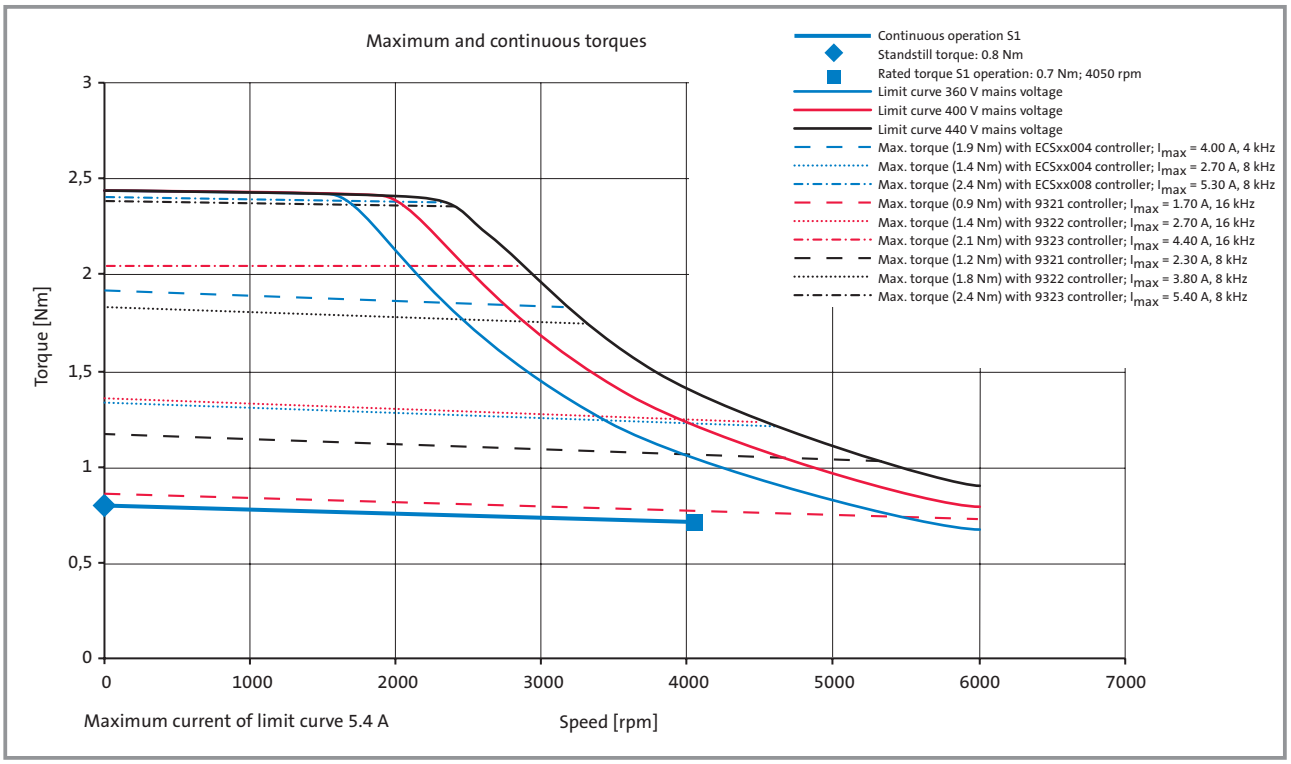
1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

Torque characteristics

MCS 06C60

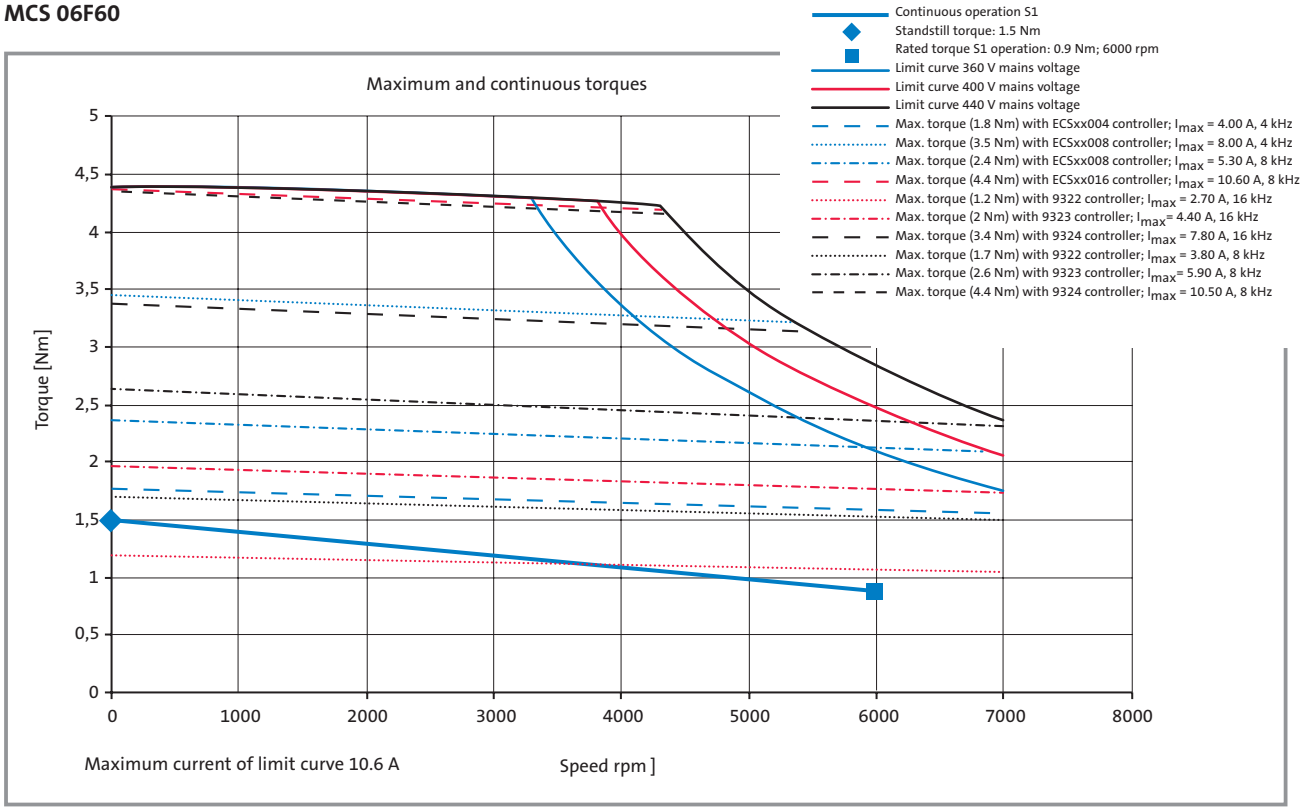


MCS 06C41

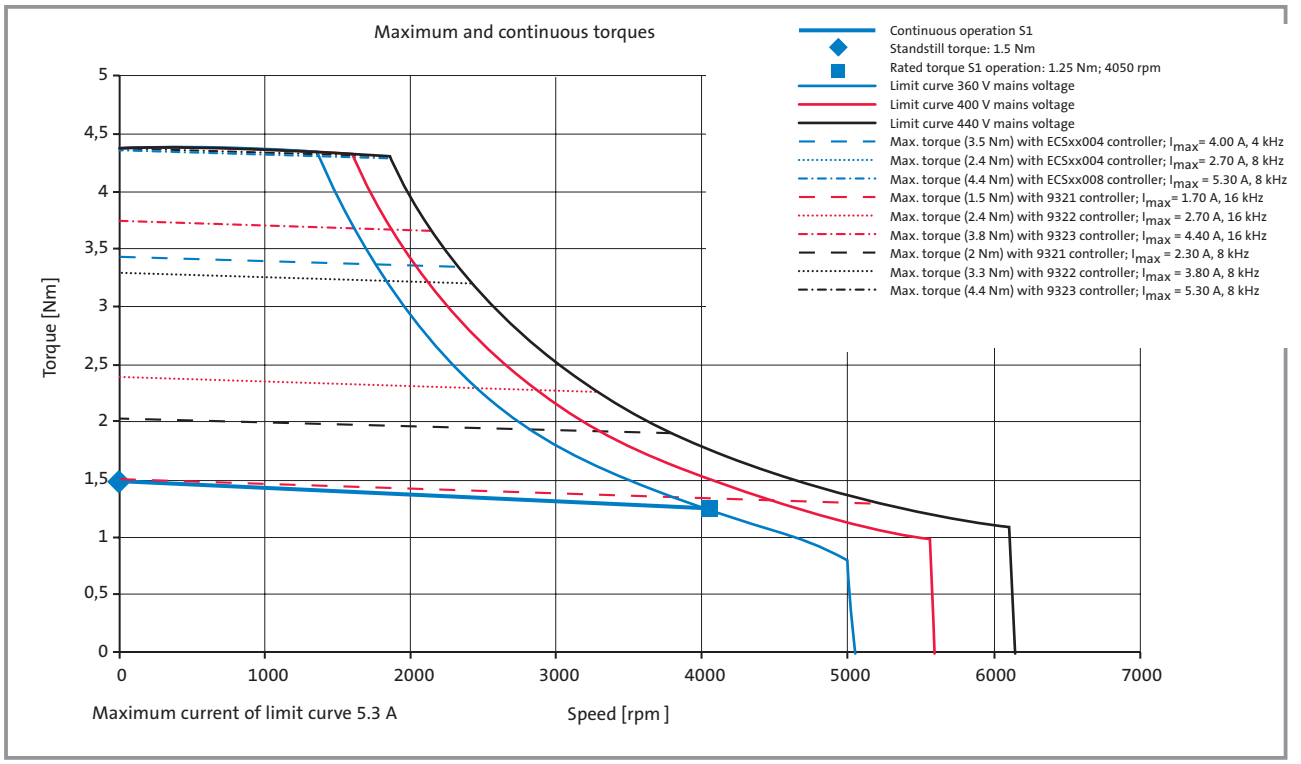


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 06F60



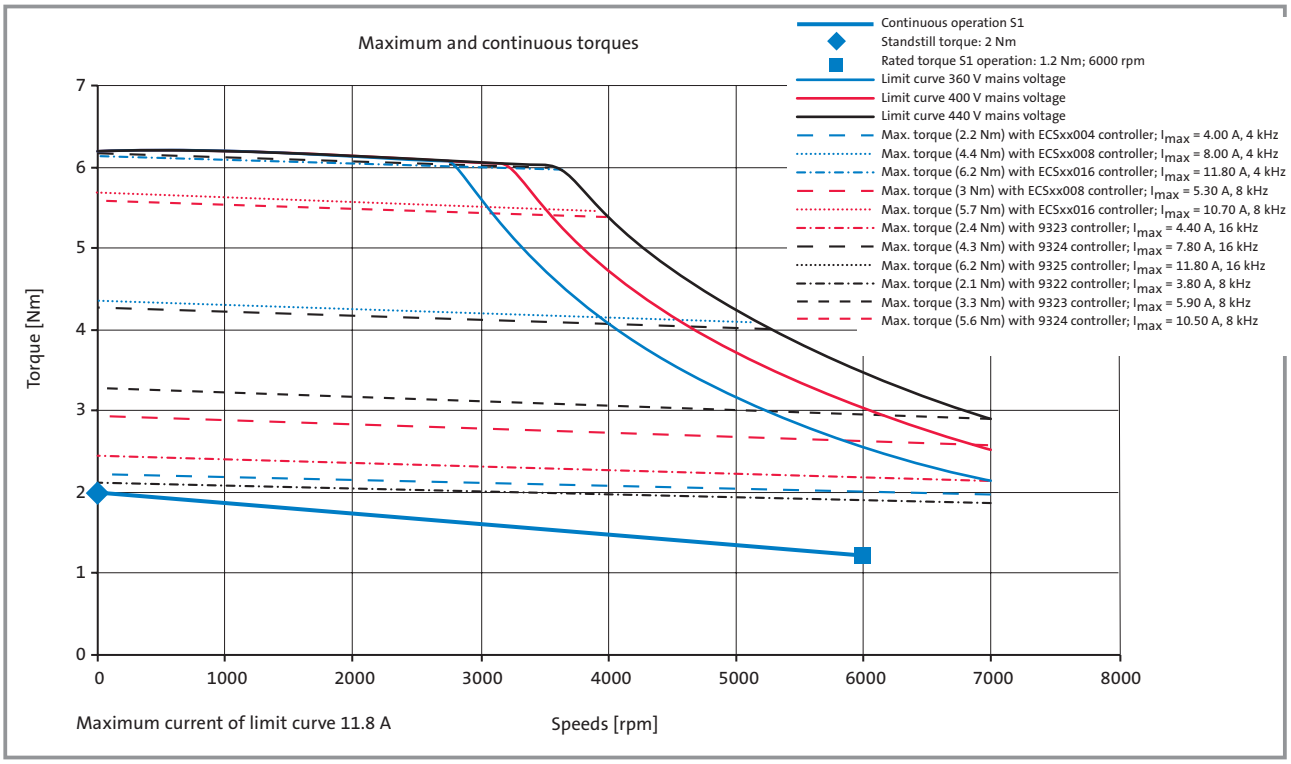
MCS 06F41



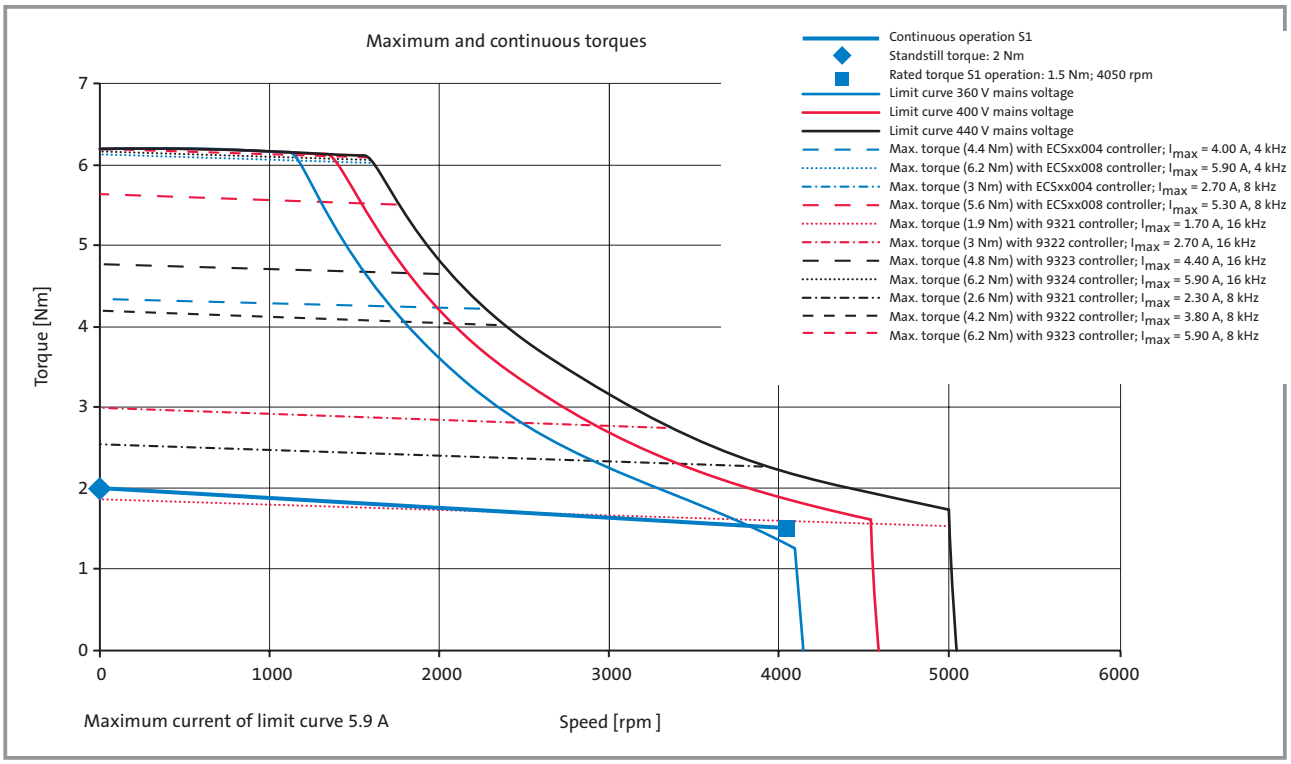
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Torque characteristics

MCS 06I60



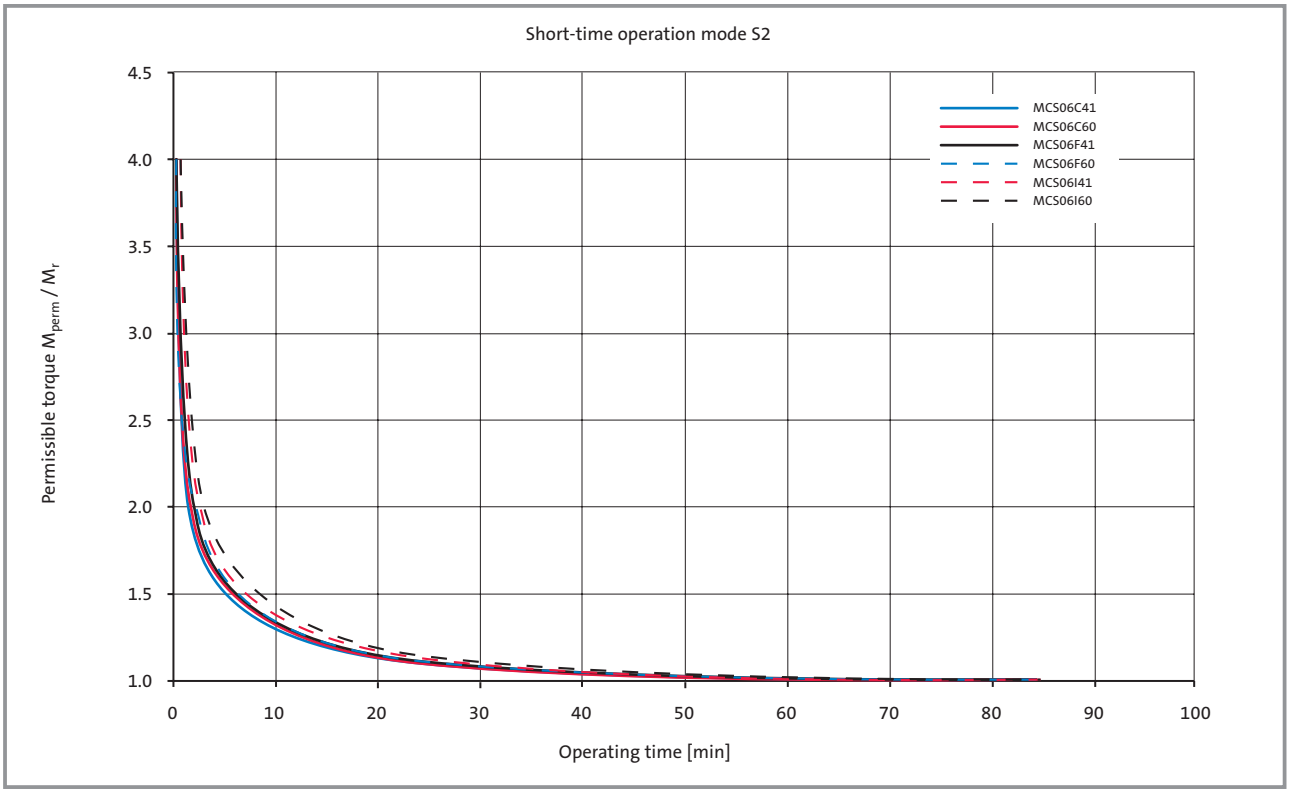
MCS 06I41

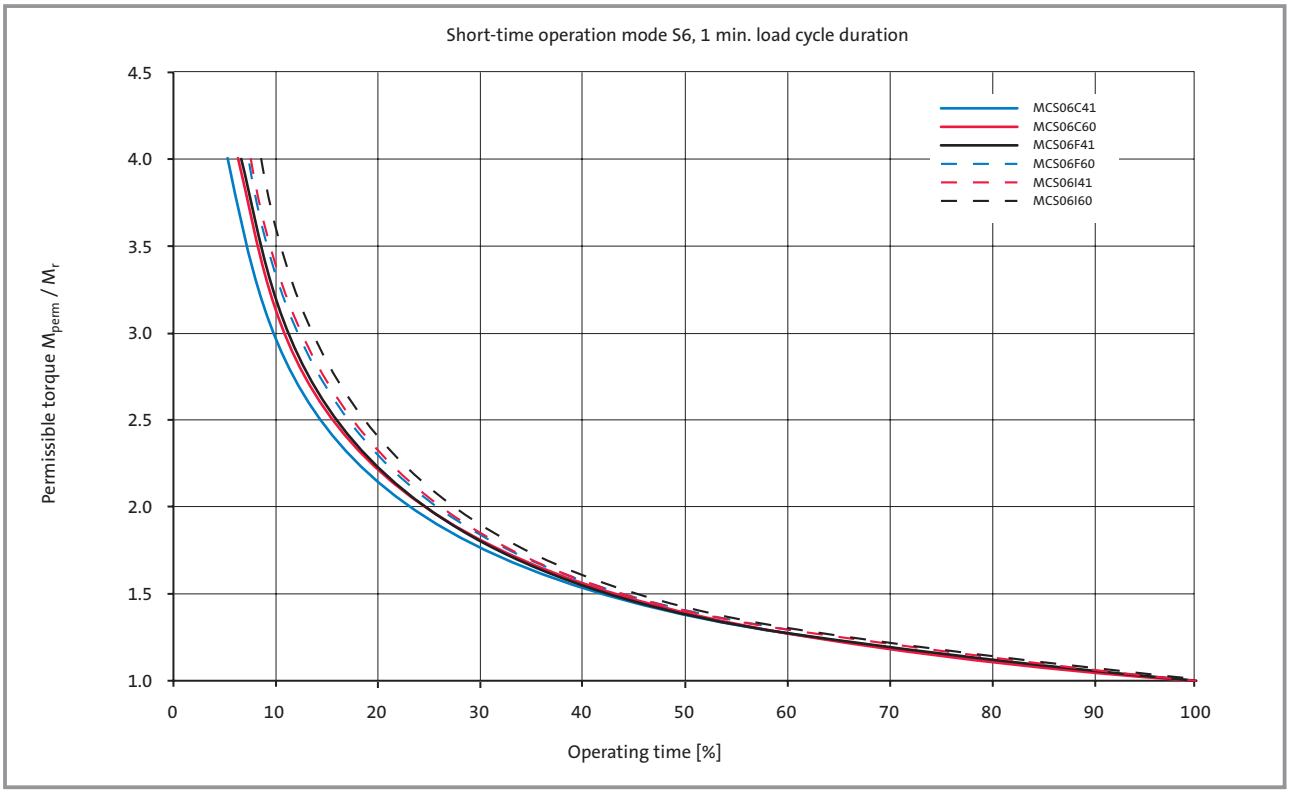


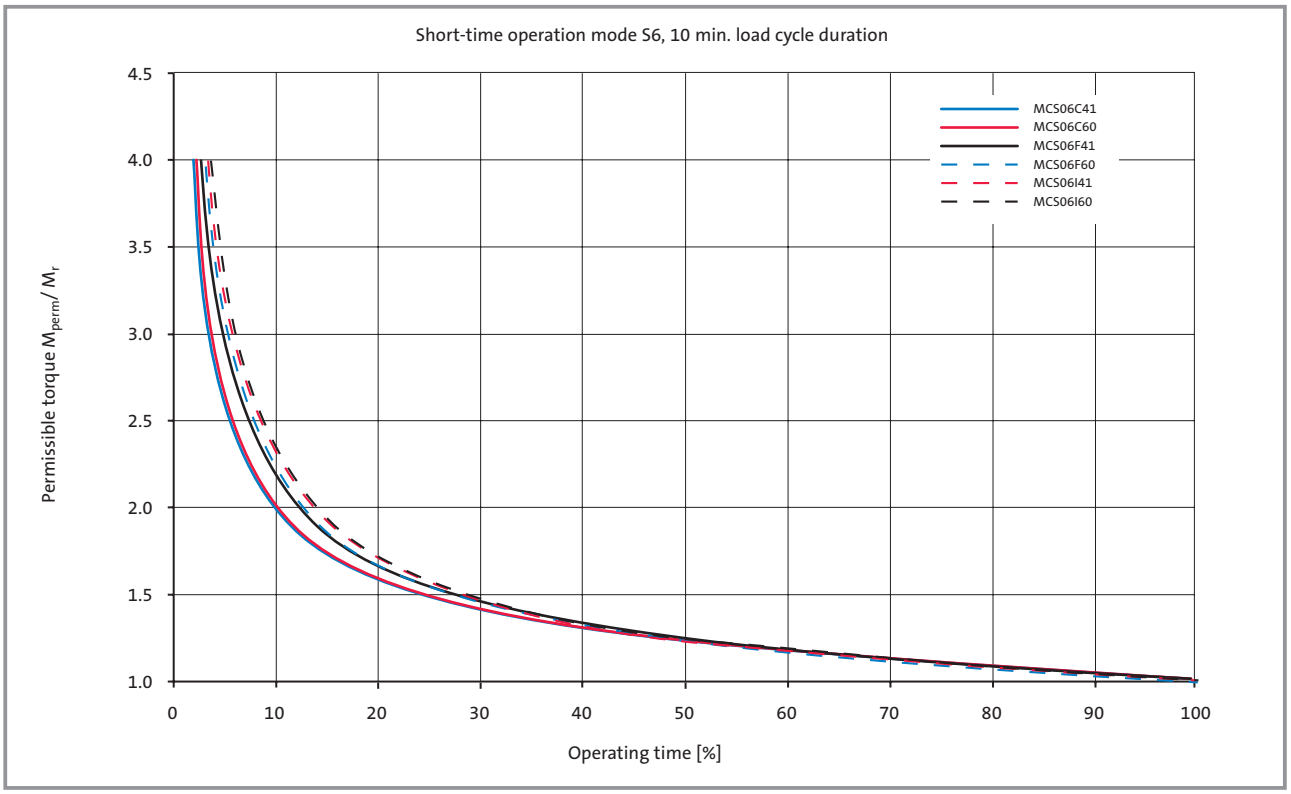
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Short-time operation characteristic

Lenze MCS servo motors are designed to be used in dynamic applications with high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.






Short-time operation mode S6, 10 min. load cycle duration
Permissible torque M_{perm}/ M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
MCS06C41
MCS06C60
MCS06F41
MCS06F60
MCS06I41
MCS06I60

Brake assignment

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

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCS 06C41, MCS 06C60
MCS 06F41, MCS 06F60
MCS 06I41, MCS 06I60

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B [3] +5 % – -10 % V	I_B [2] A	J_B kg m² · 10⁻⁴	Engagement time t_1 [1] ms	Disengagement time t_2 [1] ms	Maximum-switching rate per emergency stop with n = 3.000 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 valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
[2] The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
[3] Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{mot}
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 opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm .

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

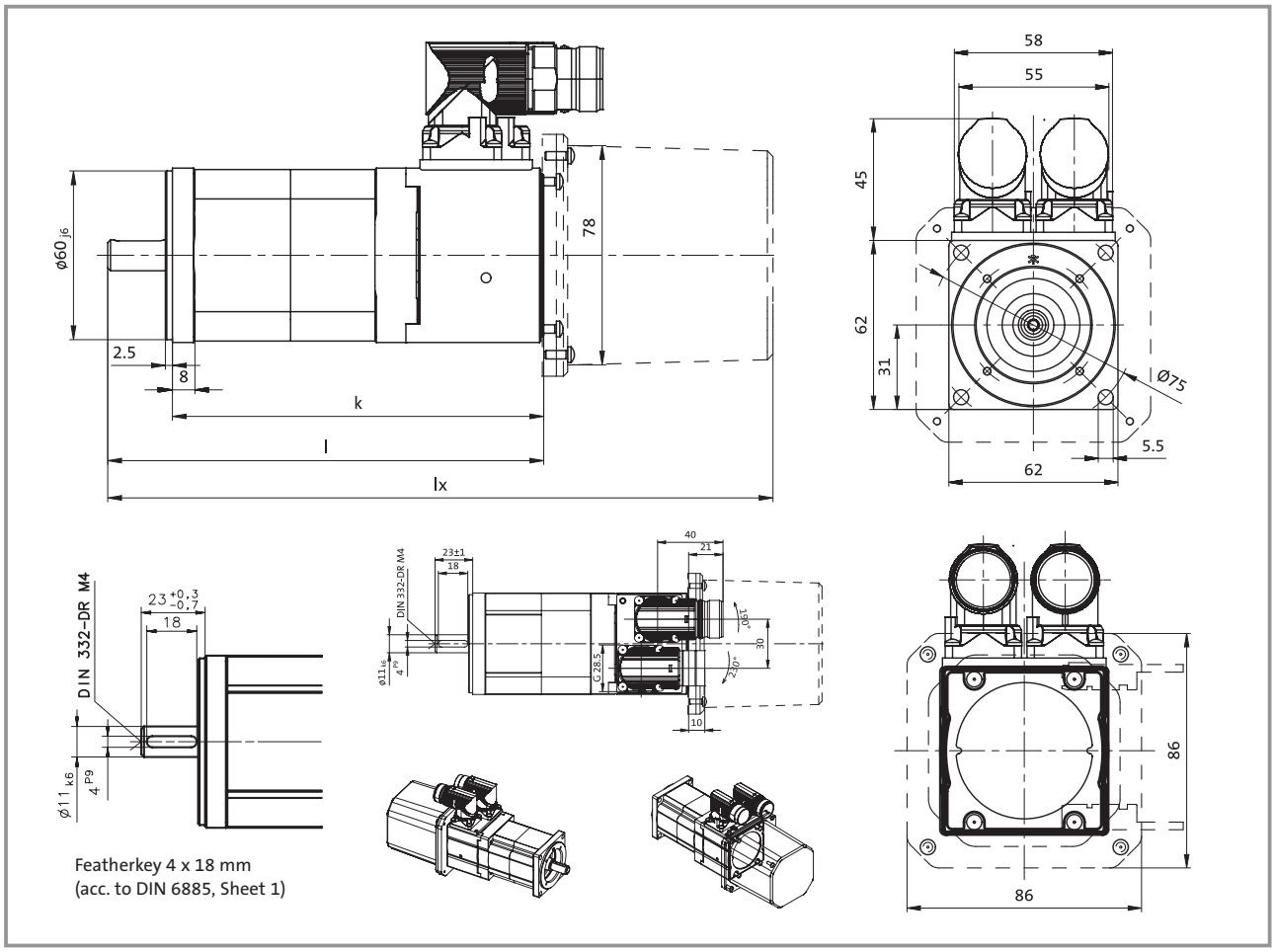
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

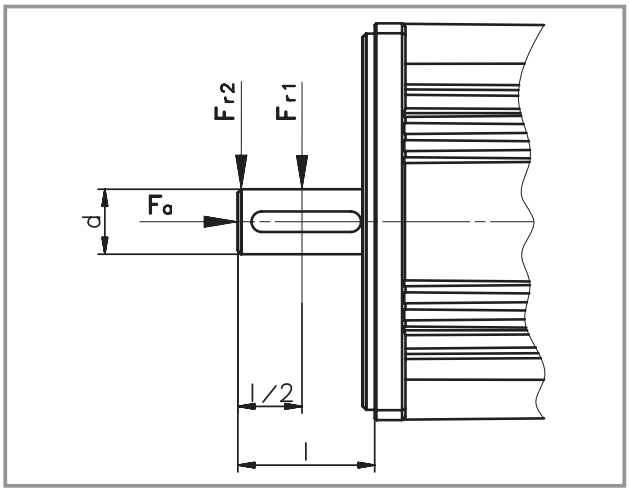


Motor type	Motor **without** holding brake			Motor **with** holding brake		
	k [mm]	l [mm]	lx [mm]	k [mm]	l [mm]	lx [mm]
MCS 06C	132	155	236.5	150.5	173.5	255
MCS 06F	162	185	266.5	180.5	203.5	285
MCS 06I	192	215	296.5	210.5	233.5	315

l Motor length with installation of a resolver as feedback
lx Motor length with installation of an absolute value encoder as feedback

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

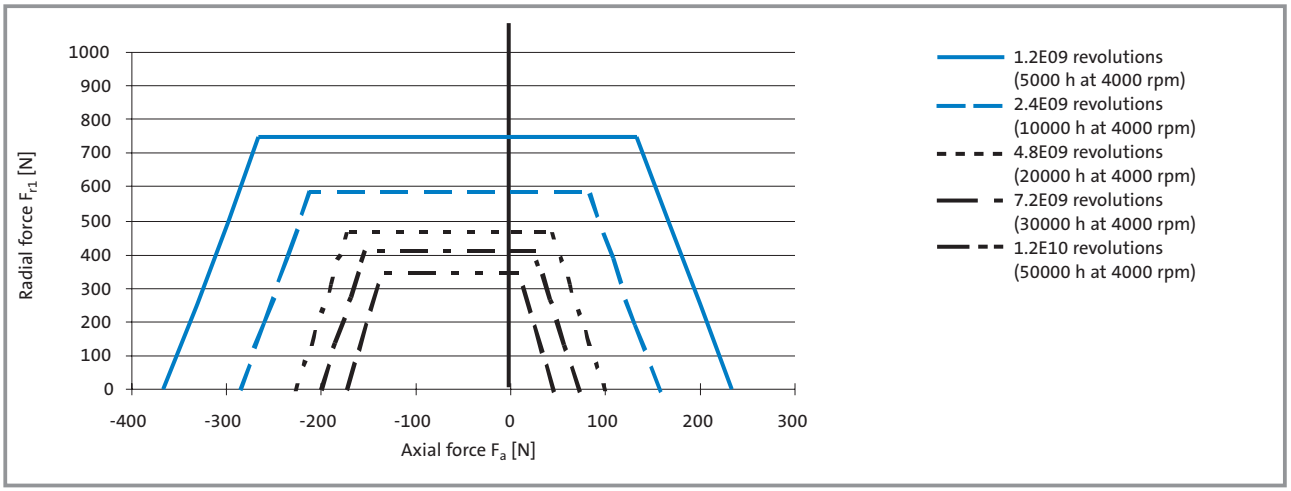
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

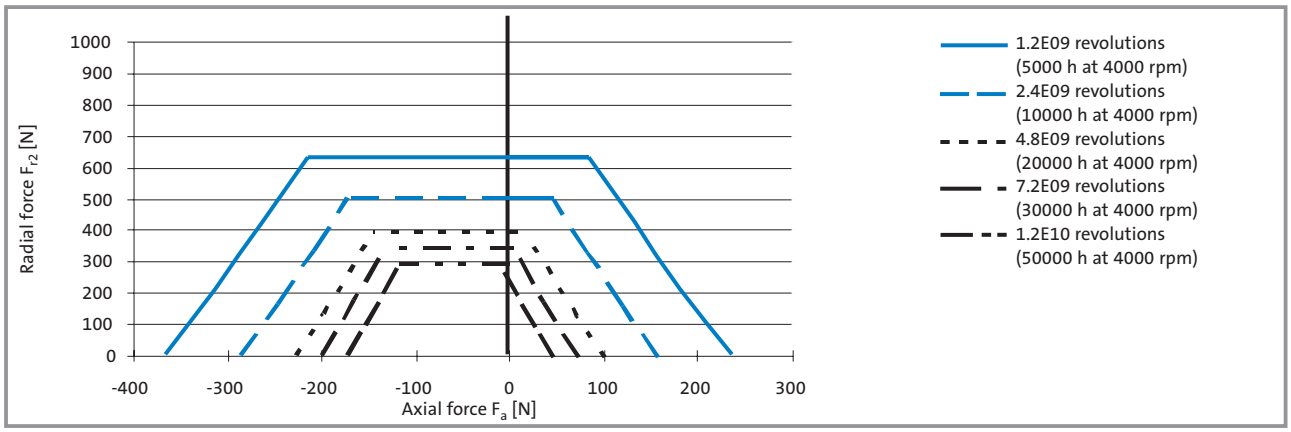
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The characteristics are valid for all MCS 06 frame sizes

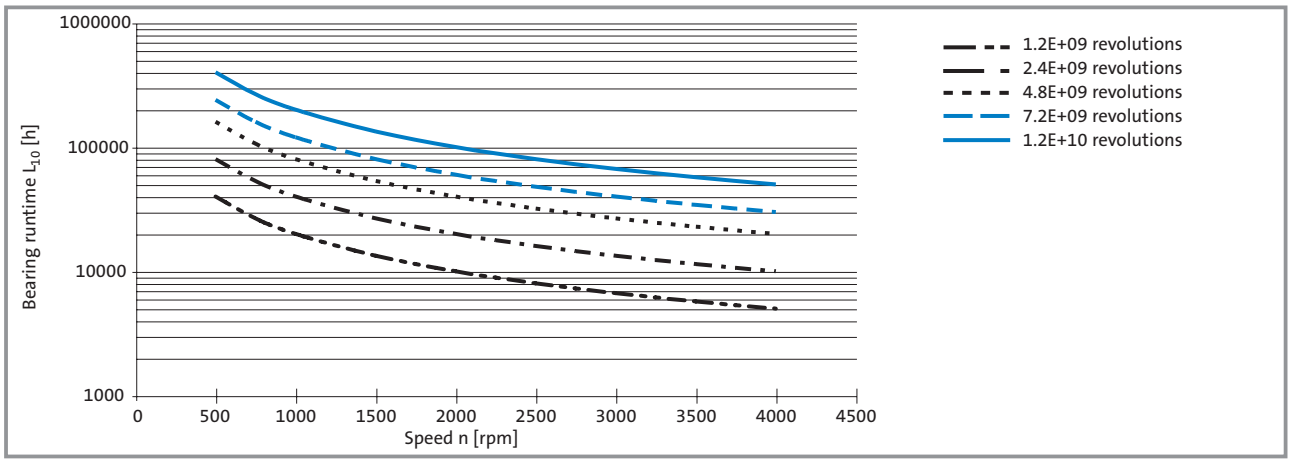
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



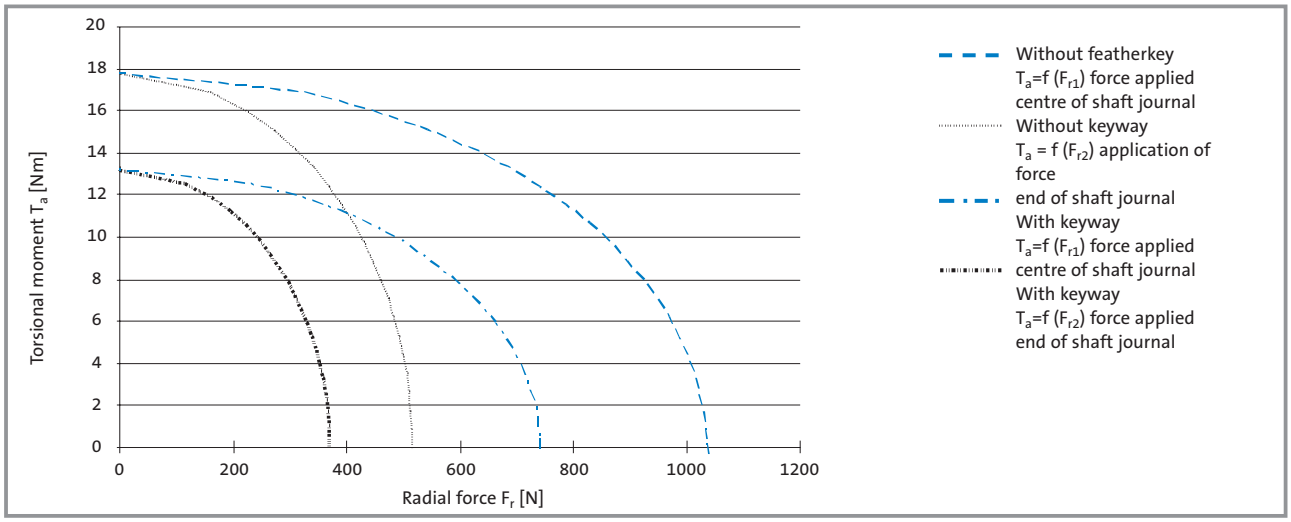
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	η %	I_{max} A	J_{Motor} without brake kg m² · 10⁻⁴
MCS 09F38	3750	4.2	15	3.1	1.2	3.0	2.5	330	250	90	15	1.50
MCS 09F60	6000	4.2	15	2.4	1.5	6.0	4.5	230	400	90	30	1.50
MCS 09H41	4050	5.5	20	3.8	1.6	4.3	3.4	300	270	91	20	1.90
MCS 09H60	6000	5.5	20	3.0	1.9	8.5	6.0	190	400	91	40	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} mH	kt_0-factor at 150 °C Nm/A	Type connector-type	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 09F60	39.9	1.3	1.8	6.2	0.70		5.2	7000
MCS 09H41	75.7	3.2	4.3	16.1	1.29		6.1	7000
MCS 09H60	37.8	0.8	1.1	4.0	0.64		6.1	7000

The Operating Instructions for the MCS motors can be found in the download area of the Lenze Internet site at www.Lenze.de

MCS 09F

MCS 09H

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz								
Type			**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]			2.0	4.0	8.0	12.7	17.0	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]			4.0	8.0	16.0	32.0	48.0	64.0
Motor type								
MCS 09F38	M_N	[Nm]	2.5	3.1	3.1			
	M_0	[Nm]	2.8	4.2	4.2			
	M_{max} n = 0[4)]	[Nm]	3.2	6.2	10.8			
	M_{max}	[Nm]	5.5	9.8	14.9			
MCS 09F60	M_N	[Nm]		2.1	2.4	2.4		
	M_0	[Nm]		2.8	4.2	4.2		
	M_{max} n = 0[4)]	[Nm]		3.2	6.1	10.8		
	M_{max}	[Nm]		5.5	9.8	14.9		
MCS 09F41	M_N	[Nm]		3.8	3.8			
	M_0	[Nm]		5.2	5.5			
	M_{max} n = 0[4)]	[Nm]		5.9	11.1			
	M_{max}	[Nm]		9.9	17.5			
MCS 09I60	M_N	[Nm]			3.0	3.0	3.0	
	M_0	[Nm]			5.2	5.5	5.5	
	M_{max} n = 0[4)]	[Nm]			5.9	11.1	15.5	
	M_{max}	[Nm]			10.0	17.5	20.5	

[1)] Caution: Limit I_{max} controller to I_{max} motor
[2)] Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
[4)] The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper 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	3.0	6.0	12.1	18.1	24.2
Maximum current > 5 Hz[1)2)3)] [A]		2.7	5.3	10.7	21.3	32.0	42.7
Motor type							
MCS 09F38	M_N [Nm]		3.1	3.1			
	M_0 [Nm]		3.8	4.2			
	M_{max} n = 0[4)] [Nm]		4.1	7.8			
	M_{max} [Nm]		7.0	12.2			
MCS 09F60	M_N [Nm]			2.4	2.4	2.4	
	M_0 [Nm]			3.7	4.2	4.2	
	M_{max} n = 0[4)] [Nm]			4.1	7.8	10.8	
	M_{max} [Nm]			7.1	12.1	14.9	
MCS 09H41	M_N [Nm]		3.0	3.8	3.8		
	M_0 [Nm]		3.5	5.5	5.5		
	M_{max} n = 0[4)] [Nm]		3.9	7.6	14.1		
	M_{max} [Nm]		6.8	12.7	20.5		
MCS 09H60	M_N [Nm]			2.7	3.0	3.0	3.0
	M_0 [Nm]			3.4	5.5	5.5	5.5
	M_{max} n = 0[4)] [Nm]			3.9	7.7	11.1	14.1
	M_{max} [Nm]			6.9	12.7	17.5	20.5

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: On the ECS automatic switching to 4 kHz not taken into account; when using automatic switching to 4 kHz, the maximum torques and currents apply at 4 kHz
4) The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz											
Controller type			**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**
Continuous current [A]			1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0
Maximum current 0 Hz [1) 2)] [A]			2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0
Maximum current > 5 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	35.25	48.0	70.5	88.5	133.5
Motor type												
MCS 09F38	M_N	[Nm]		3.1	3.1	3.1						
	M_0	[Nm]		3.5	4.2	4.2						
	M_{max} n = 0	[Nm]		5.2	7.7	12.0						
	M_{max}	[Nm]		5.2	7.7	12.0						
MCS 09F60	M_N	[Nm]				2.4	2.4					
	M_0	[Nm]				4.2	4.2					
	M_{max} n = 0	[Nm]				6.9	11.4					
	M_{max}	[Nm]				6.9	11.4					
MCS 09H41	M_N	[Nm]		2.8	3.8	3.8	3.8					
	M_0	[Nm]		3.2	5.0	5.5	5.5					
	M_{max} n = 0	[Nm]		4.9	7.5	12.5	20.1					
	M_{max}	[Nm]		4.9	7.5	12.5	20.1					
MCS 09H60	M_N	[Nm]				3.0	3.0	3.0				
	M_0	[Nm]				4.5	5.5	5.5				
	M_{max} n = 0	[Nm]				6.8	11.8	13.8				
	M_{max}	[Nm]				6.8	11.8	18.8				

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

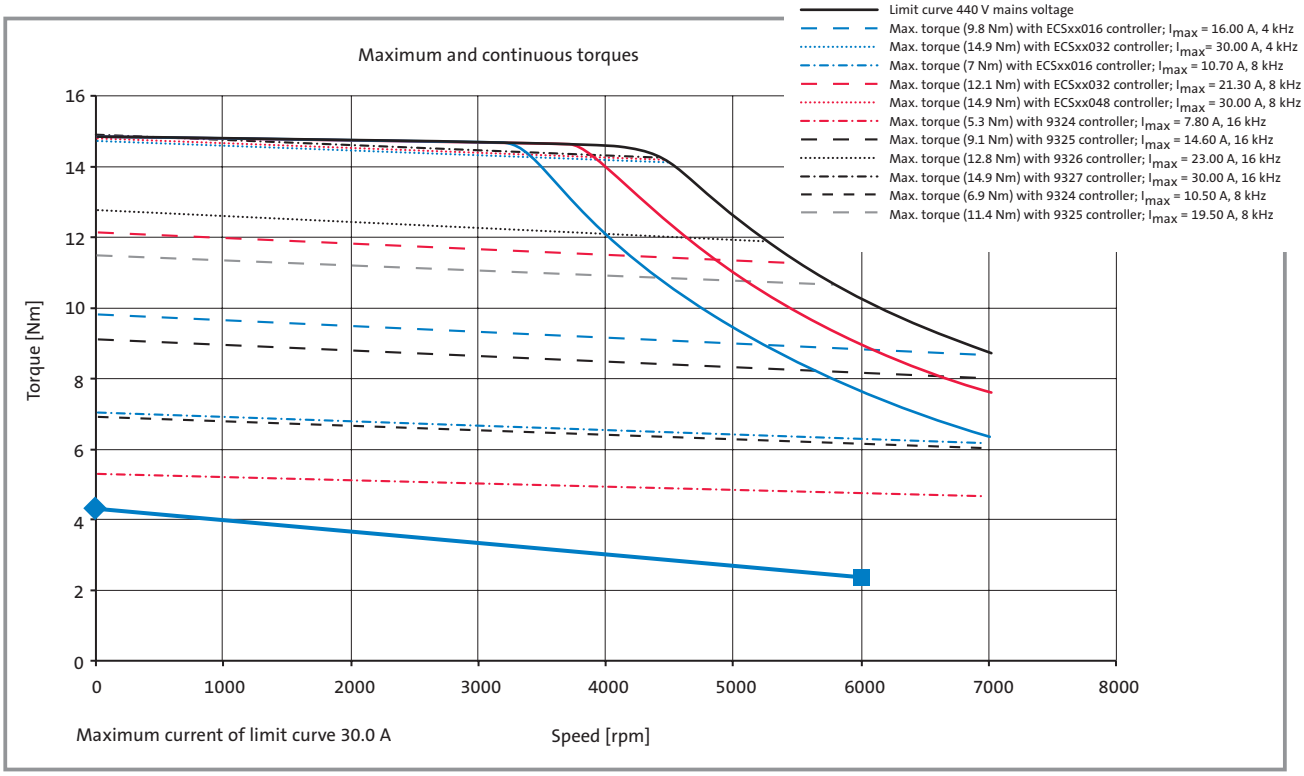
Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz											
Controller 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	38.0	58.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0
Maximum current > 5 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0
Motor type											
MCS 09F38	M_N [Nm]		2.2	3.1	3.1	3.1					
	M_0 [Nm]		2.5	4.1	4.2	4.2					
	M_{max} n = 0 [Nm]		3.7	5.9	9.6	14.7					
	M_{max} [Nm]		3.7	5.9	9.6	14.7					
MCS 09F60	M_N [Nm]				2.4	2.4	2.4				
	M_0 [Nm]				3.6	4.2	4.2				
	M_{max} n = 0 [Nm]				5.3	9.1	9.5				
	M_{max} [Nm]				5.3	9.1	12.8				
MCS 09H41	M_N [Nm]			3.2	3.8	3.8					
	M_0 [Nm]			3.7	5.5	5.5					
	M_{max} n = 0 [Nm]			5.7	9.7	16.3					
	M_{max} [Nm]			5.7	9.7	16.3					
MCS 09H60	M_N [Nm]				2.6	3.0	3.0	3.0			
	M_0 [Nm]				3.4	5.5	5.5	5.5			
	M_{max} n = 0 [Nm]				5.1	9.2	9.6	12.5			
	M_{max} [Nm]				5.1	9.2	13.6	17.2			

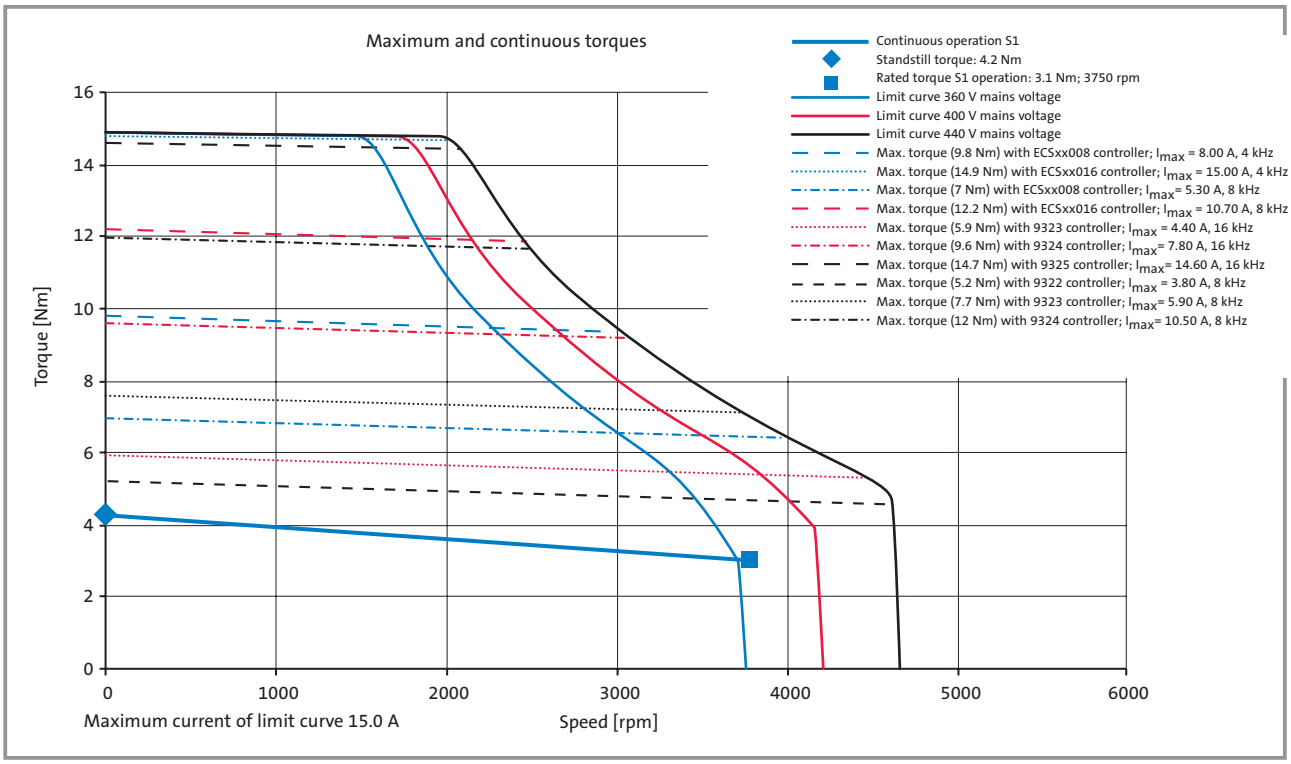
1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

Torque characteristics

MCS 09F60

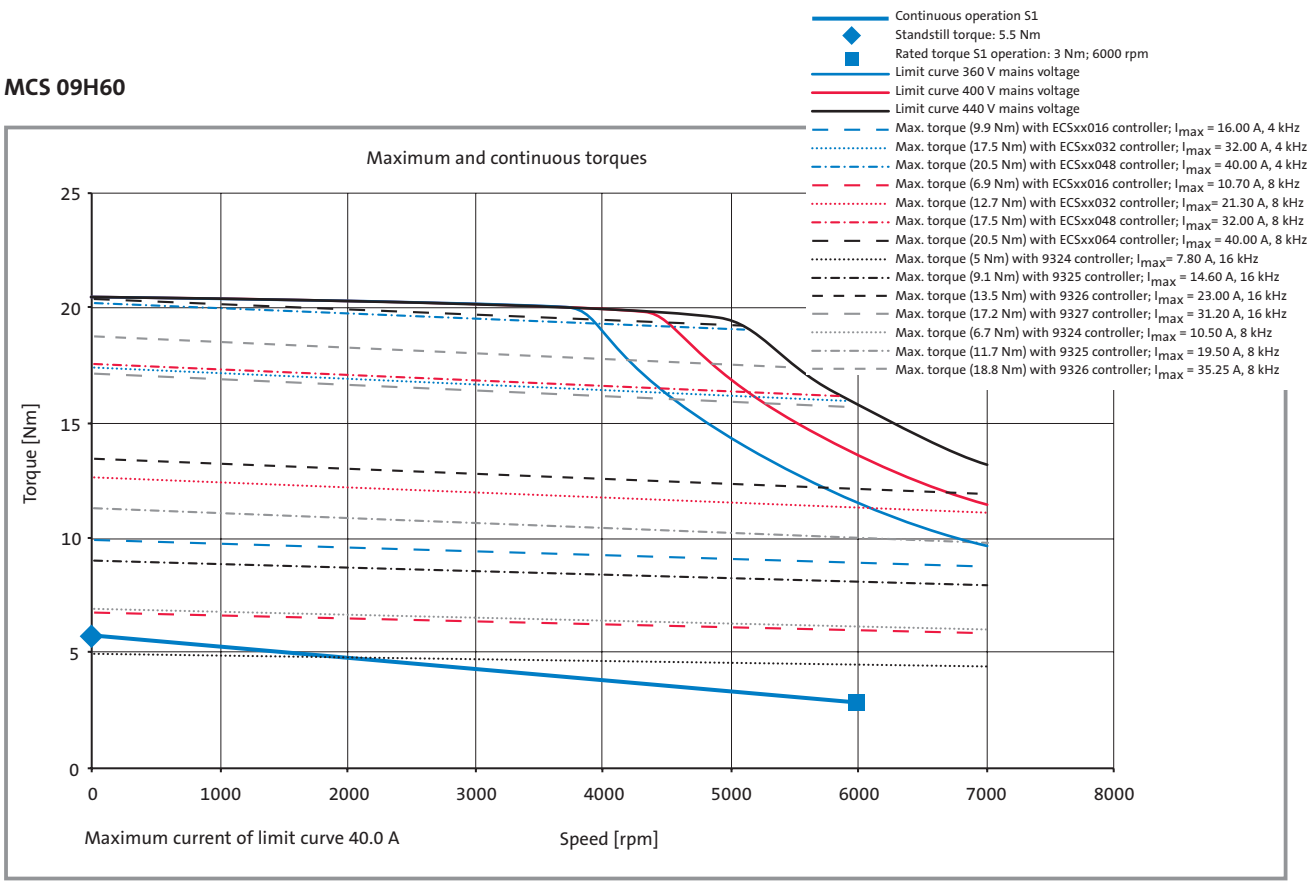


MCS 09F38

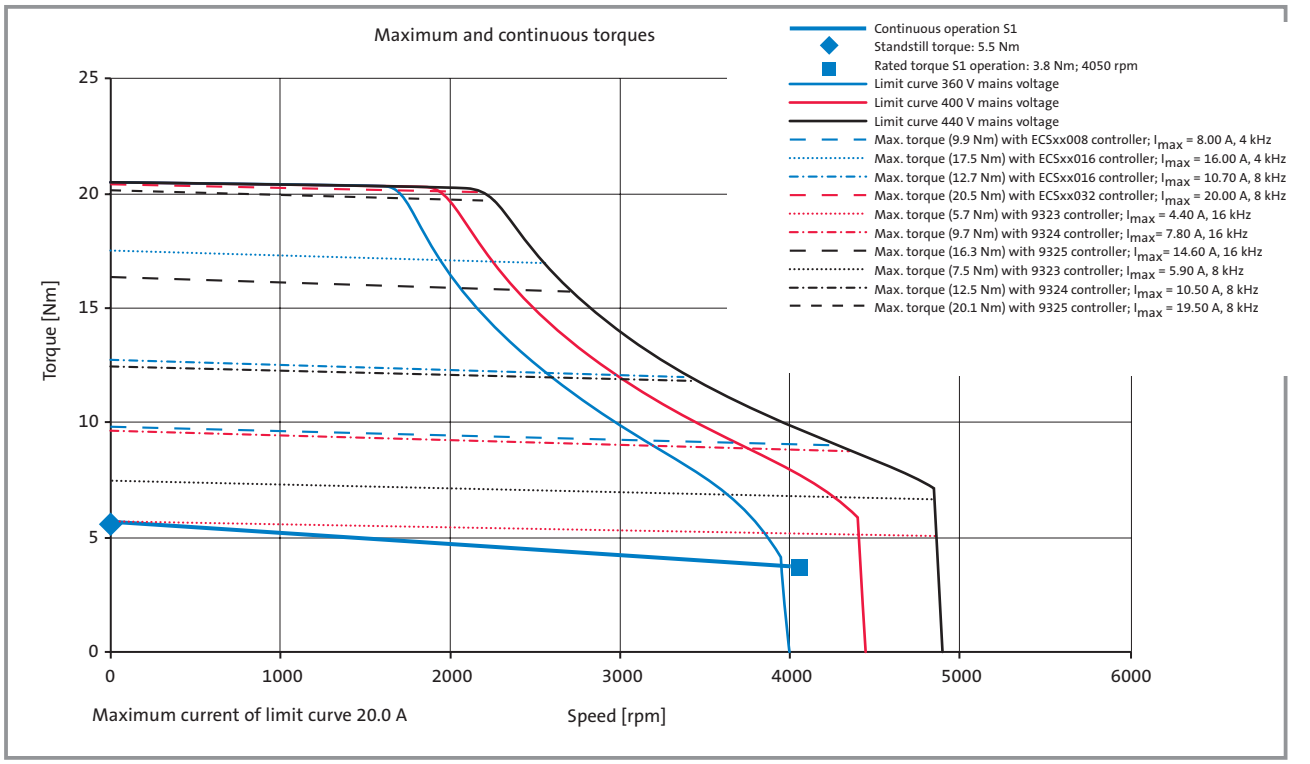


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 09H60



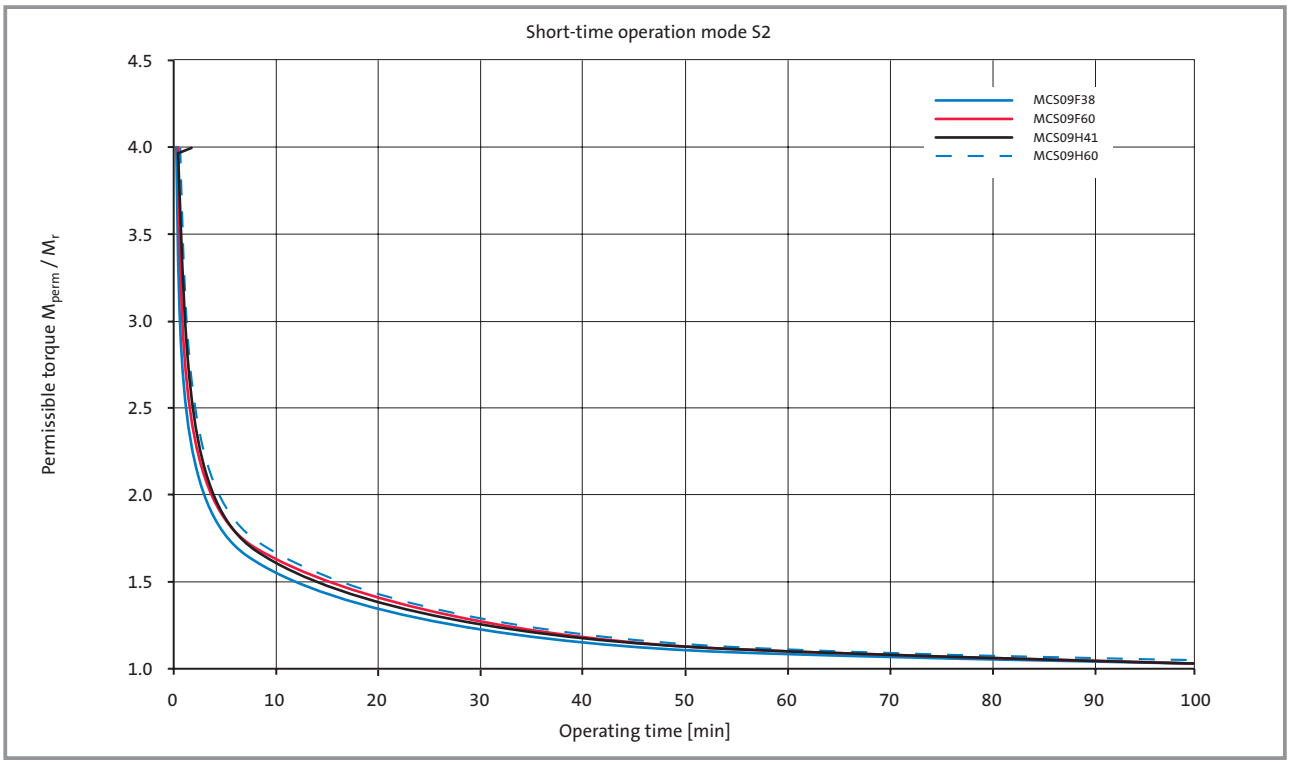
MCS 09H41

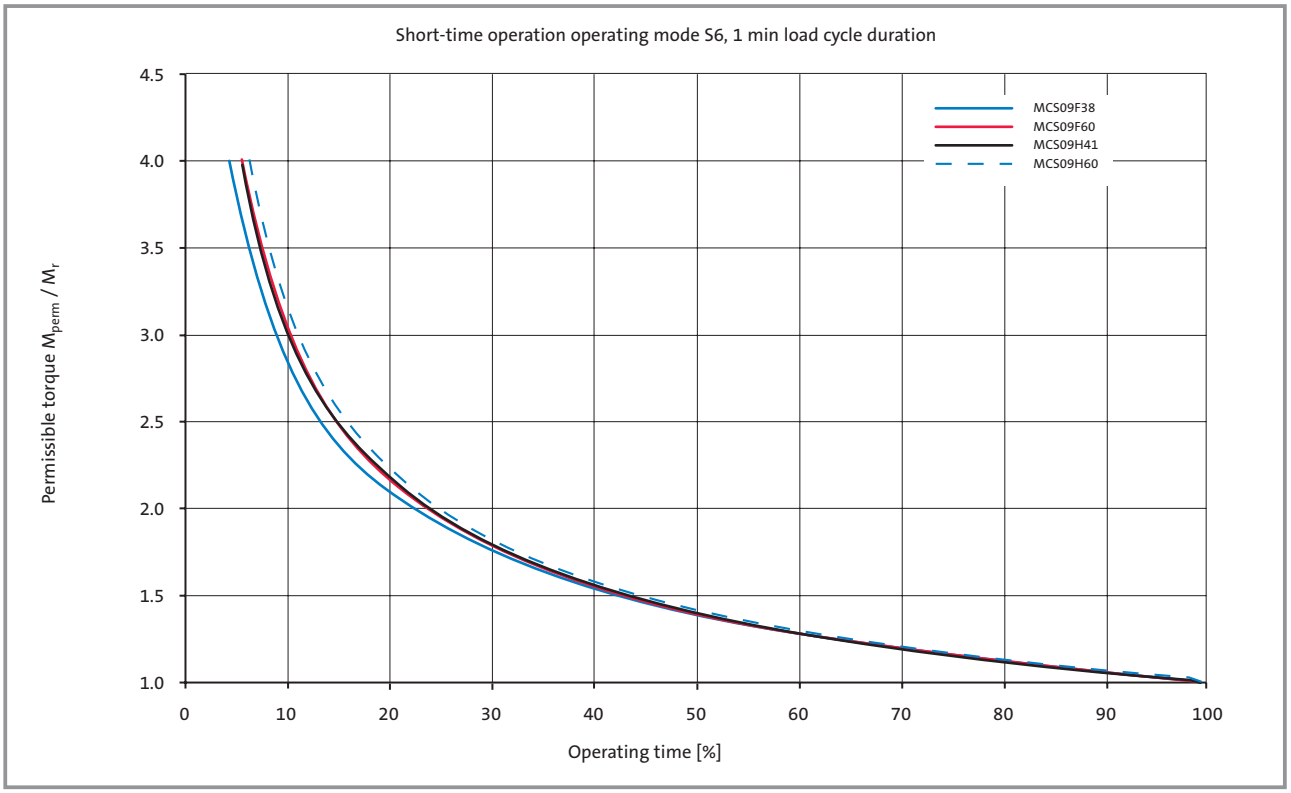


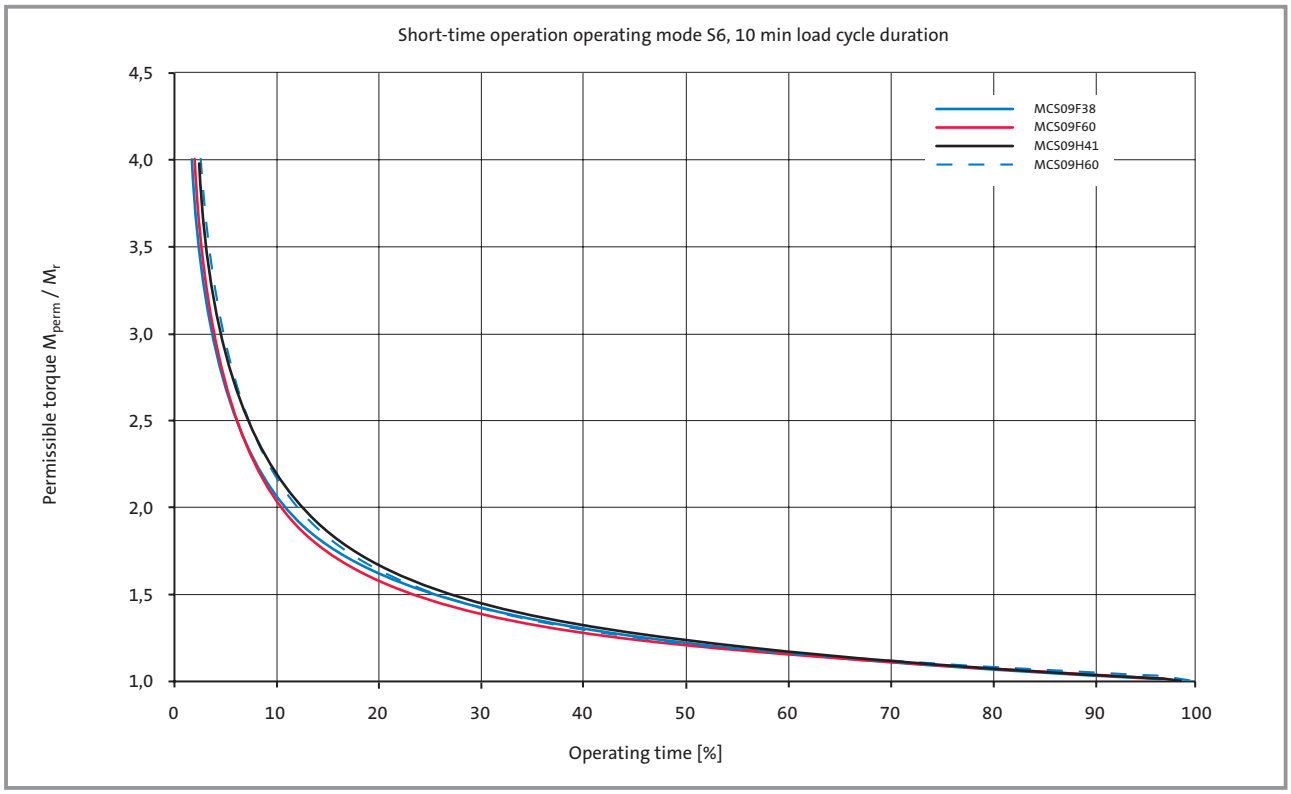
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Short-time operation characteristic

Lenze MCS synchronous servo motors are designed to be used in dynamic applications with high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.






Short-time operation operating mode S6, 10 min load cycle duration
Permissible torque M_{perm} / M_r
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
MCS09F38
MCS09F60
MCS09H41
MCS09H60

Brake assignment

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

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCS 09F
MCS 09H

Type	Size	Holding torque M_4 20 °C Nm	Holding-torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B [3] +5 % – -10 % V	I_B [2] A	J_B kg m² · 10⁻⁴	Engagement time t_1 [1] ms	Disengagement time t_2 [1] ms	Maximum-switching rate per emergency stop with n = 3.000 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 Reinforced brake

[1] Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.

[2] The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.

[3] Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{mot}
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 opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm. $^{-1}$

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e. g. oil leakage, will cause a loss of torque.

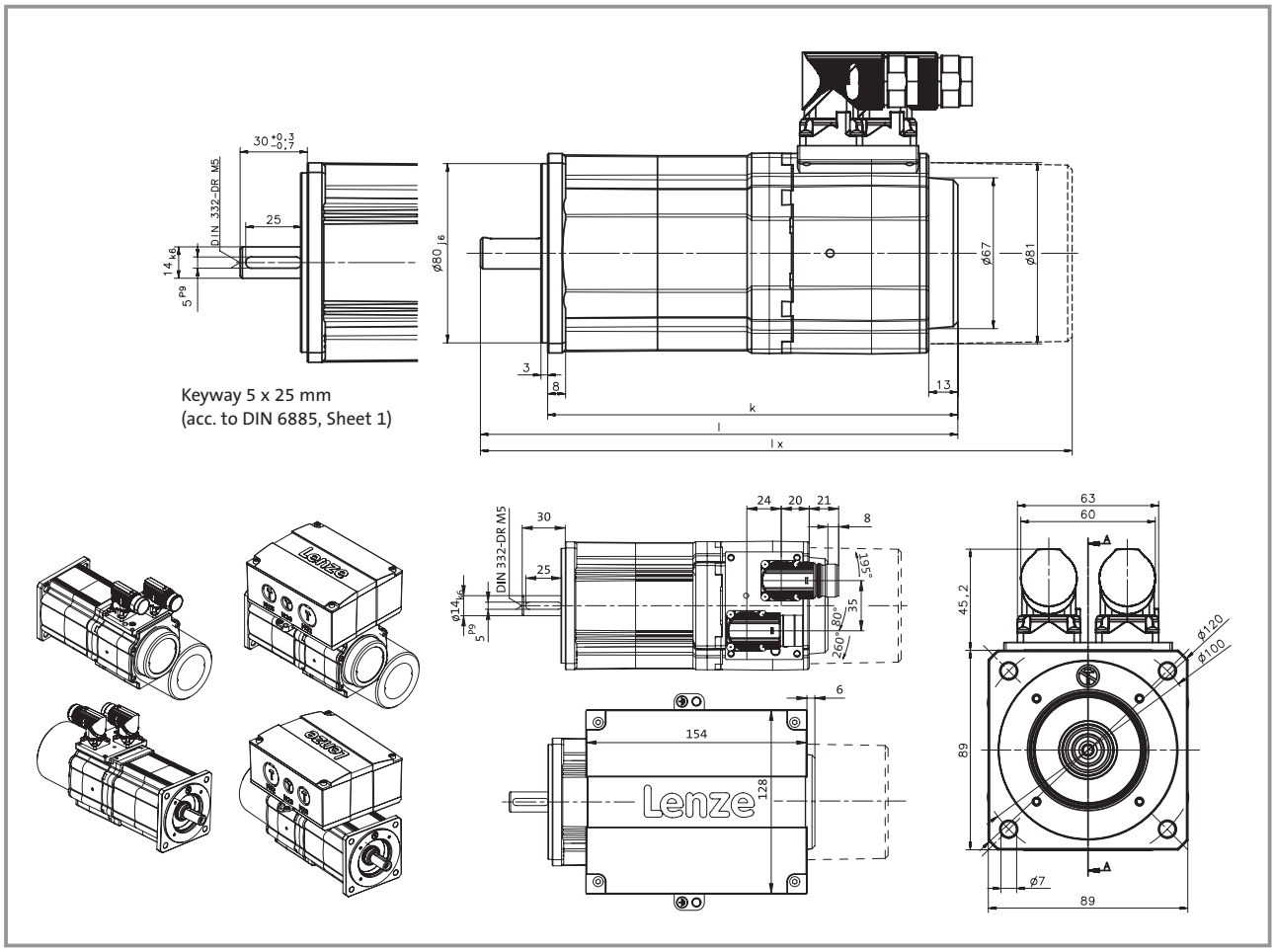
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

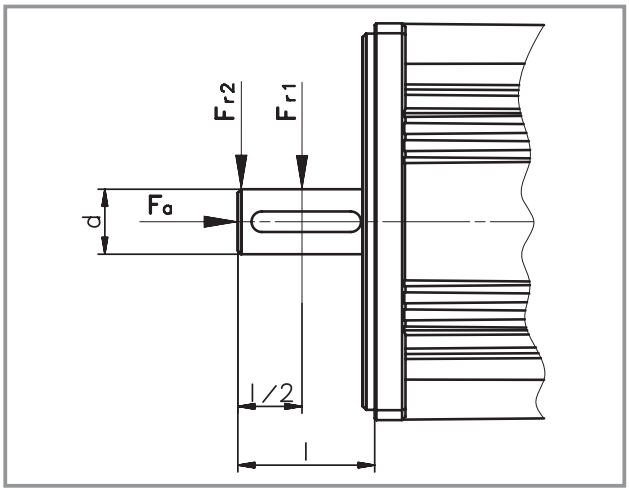


Motor type	Motor **without** holding brake			Motor **with** holding brake		
	k [mm]	l [mm]	lx [mm]	k [mm]	l [mm]	lx [mm]
MCS 09F	203	233	284	223	253	304
MCS 09H	223	253	304	243	273	324

l Motor length with installation of a resolver as feedback
lx Motor length with installation of an absolute value encoder as feedback

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

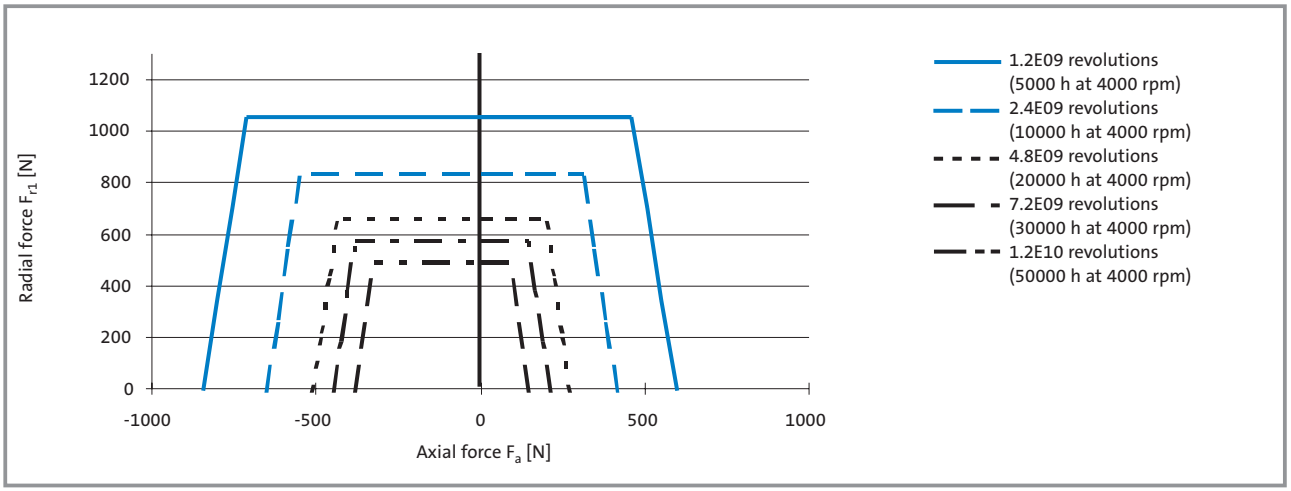
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

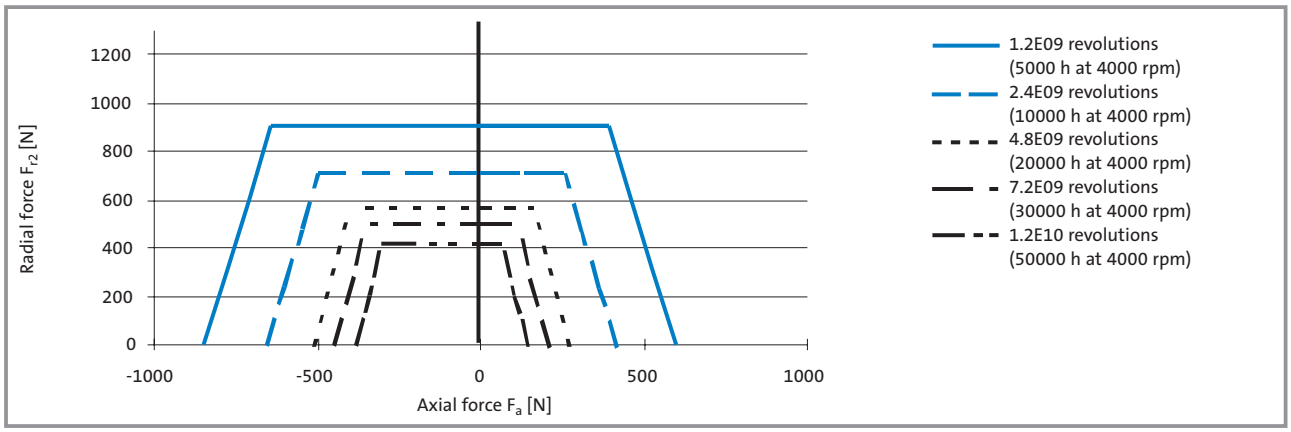
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The characteristics are valid for all MCS 09 frame sizes

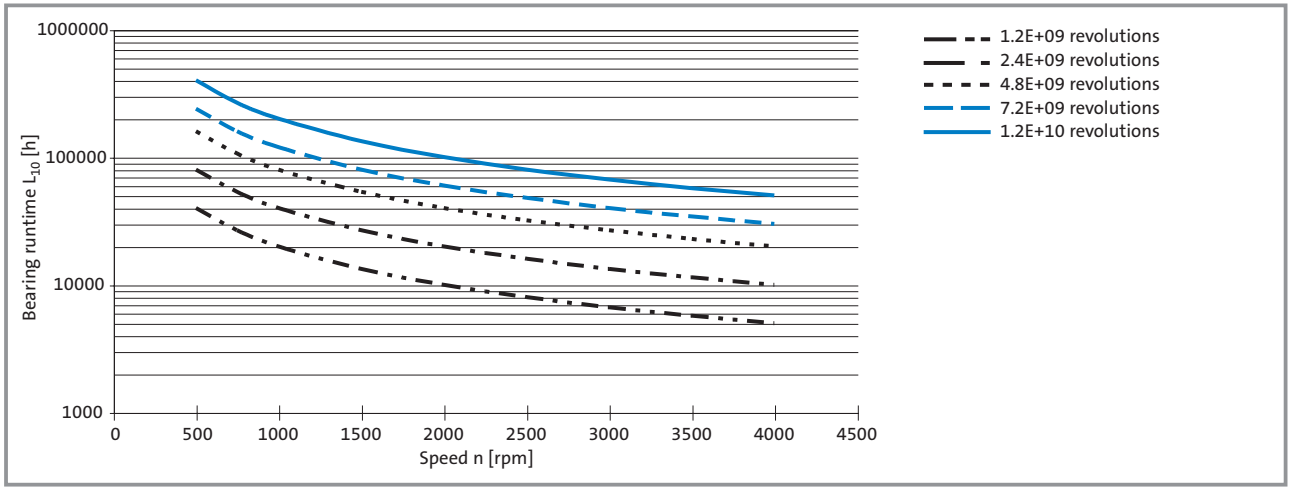
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



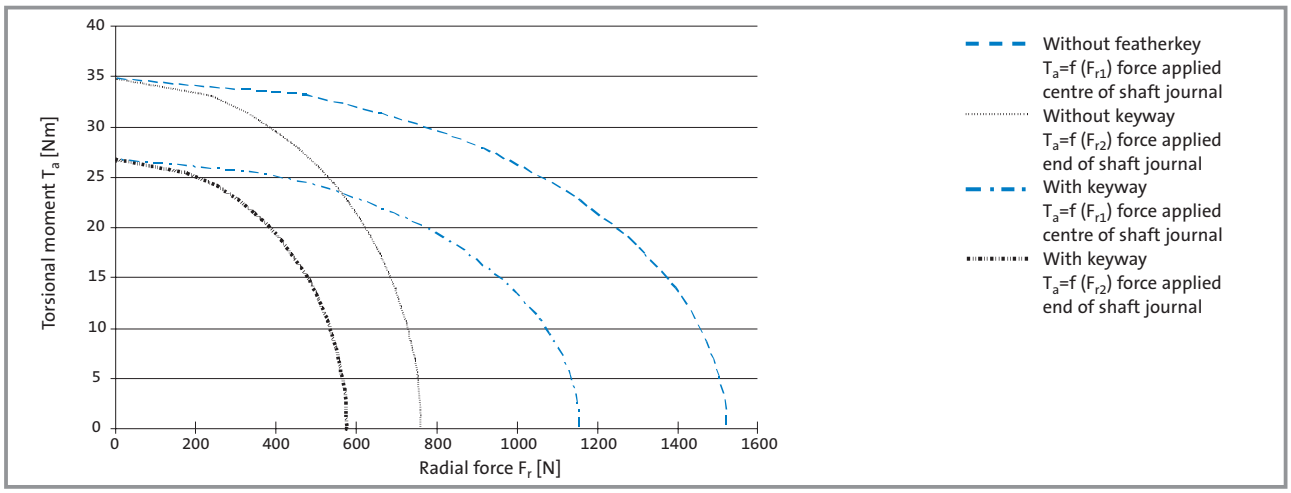
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	η %	I_{max} A	J_{Motor} without brake kg m² · 10⁻⁴
MCS 12H15	1500	11.4	29	10.0	1.6	4.1	3.8	300	100	88	12	7.3
MCS 12H35	3525	11.4	29	7.5	2.8	8.2	5.7	325	235	91	24	7.3
MCS 12L20	1950	15.0	56	13.5	2.8	6.2	5.9	330	130	90	28	10.6
MCS 12L41	4050	15.0	56	11.0	4.7	12.4	10.2	300	270	91	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} mH	kt_0-factor at 150 °C Nm/A	Type connector-type	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

The Operating Instructions for the MCS motors can be found in the download area of the Lenze Internet site at www.Lenze.de

MCS 12H

MCS 12L

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz								
Type			**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]			2.0	4.0	8.0	12.7	17.0	20.0
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]			4.0	8.0	16.0	32.0	48.0	64.0
Motor type								
MCS 12H15	M_N	[Nm]		10.0	10.0			
	M_0	[Nm]		11.2	11.4			
	M_{max} n = 0[4)]	[Nm]		11.9	22.6			
	M_{max}	[Nm]		20.1	29.0			
MCS 12H35	M_N	[Nm]		5.3	7.5	7.5		
	M_0	[Nm]		5.6	11.2	11.4		
	M_{max} n = 0[4)]	[Nm]		6.0	11.8	22.5		
	M_{max}	[Nm]		10.4	20.1	29.0		
MCS 12L20	M_N	[Nm]			13.5	13.5		
	M_0	[Nm]			15.0	15.0		
	M_{max} n = 0[4)]	[Nm]			21.4	39.4		
	M_{max}	[Nm]			35.5	56.4		
MCS 12L41	M_N	[Nm]			8.6	11.0	11.0	11.0
	M_0	[Nm]			9.7	15.0	15.0	15.0
	M_{max} n = 0[4)]	[Nm]			10.8	21.3	30.8	39.5
	M_{max}	[Nm]			19.0	35.5	49.6	56.4

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper 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	3.0	6.0	12.1	18.1	24.2
Maximum current > 5 Hz[1)2)3)] [A]		2.7	5.3	10.7	21.3	32.0	42.7
Motor type							
MCS 12H15	M_N [Nm]		7.1	10.0			
	M_0 [Nm]		7.5	11.4			
	M_{max} n = 0[4)] [Nm]		7.8	15.4			
	M_{max} [Nm]		13.7	26.2			
MCS 12H35	M_N [Nm]			7.0	7.5	7.5	
	M_0 [Nm]			7.4	11.4	11.4	
	M_{max} n = 0[4)] [Nm]			7.8	15.5	22.5	
	M_{max} [Nm]			13.8	26.1	29.0	
MCS 12L20	M_N [Nm]			12.1	13.5	13.5	
	M_0 [Nm]			12.8	15.0	15.0	
	M_{max} n = 0[4)] [Nm]			14.3	27.7	39.4	
	M_{max} [Nm]			24.8	45.1	56.4	
MCS 12L41	M_N [Nm]				9.2	11.0	11.0
	M_0 [Nm]				10.3	13.7	15.0
	M_{max} n = 0[4)] [Nm]				14.4	21.3	27.7
	M_{max} [Nm]				24.7	35.5	45.2

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: On the ECS automatic switching to 4 kHz not taken into account; when using automatic switching to 4 kHz, the maximum torques and currents apply at 4 kHz
4) The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e. g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz											
Controller type			**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**
Continuous current [A]			1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0
Maximum current 0 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0
Maximum current > 5 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	35.25	48.0	70.5	88.5	133.5
Motor type												
MCS 12H15	M_N	[Nm]			10.0	10.0						
	M_0	[Nm]			10.9	11.4						
	M_{max} n = 0	[Nm]			15.1	25.8						
	M_{max}	[Nm]			15.1	25.8						
MCS 12H35	M_N	[Nm]				7.5	7.5					
	M_0	[Nm]				9.8	11.4					
	M_{max} n = 0	[Nm]				13.6	24.1					
	M_{max}	[Nm]				13.6	24.1					
MCS 12L20	M_N	[Nm]				13.5	13.5					
	M_0	[Nm]				15.0	15.0					
	M_{max} n = 0	[Nm]				24.4	41.9					
	M_{max}	[Nm]				24.4	41.9					
MCS 12L41	M_N	[Nm]					11.0	11.0	11.0			
	M_0	[Nm]					15.0	15.0	15.0			
	M_{max} n = 0	[Nm]					22.8	27.0	35.5			
	M_{max}	[Nm]					22.8	38.5	49.6			

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

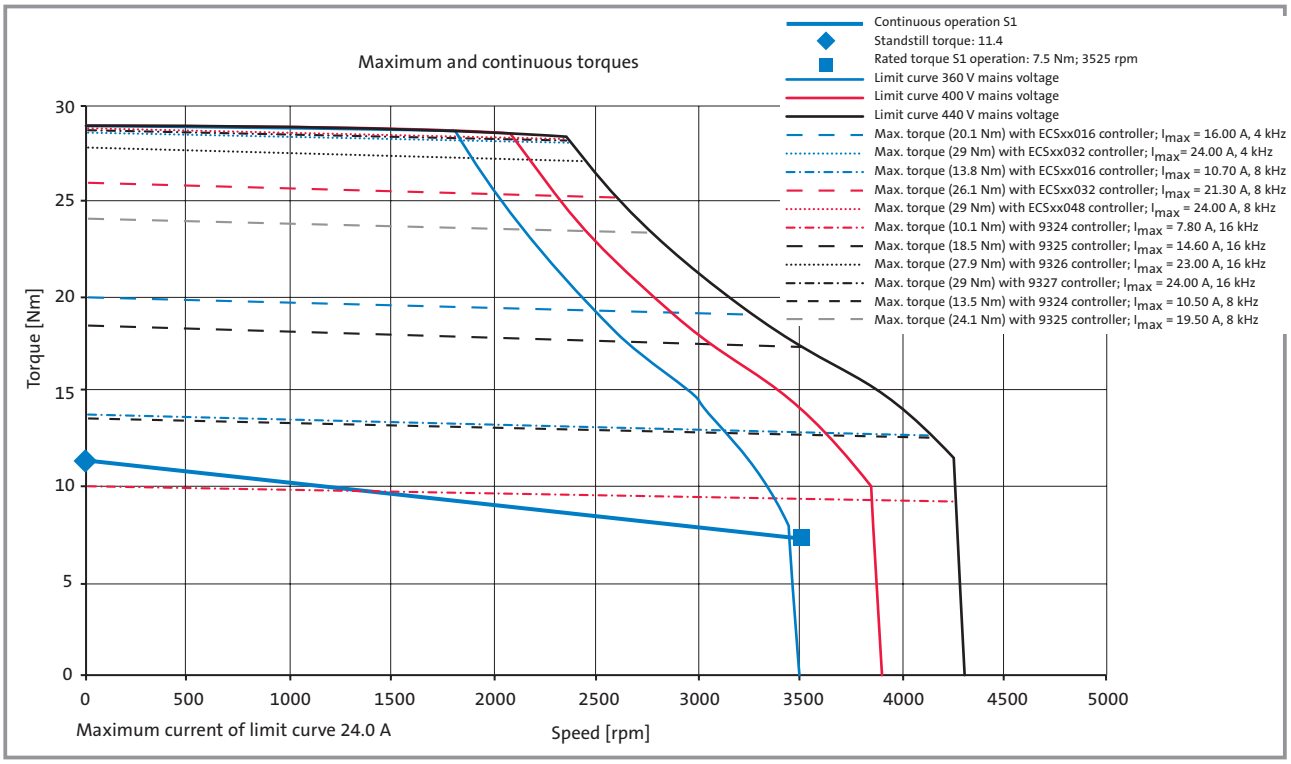
Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz											
Controller 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	38.0	58.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0
Maximum current > 5 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0
Motor type											
MCS 12H15	M_N [Nm]			7.6	10.0	10.0					
	M_0 [Nm]			8.1	11.4	11.4					
	M_{max} n = 0 [Nm]			11.4	19.6	29.0					
	M_{max} [Nm]			11.4	19.6	29.0					
MCS 12H35	M_N [Nm]				6.8	7.5	7.5				
	M_0 [Nm]				7.3	11.4	11.4				
	M_{max} n = 0 [Nm]				10.1	18.5	19.3				
	M_{max} [Nm]				10.1	18.5	27.9				
MCS 12L20	M_N [Nm]				11.9	13.5	13.5	13.5			
	M_0 [Nm]				12.6	15.0	15.0	15.0			
	M_{max} n = 0 [Nm]				18.5	32.8	34.1	44.2			
	M_{max} [Nm]				18.5	32.8	47.9	56.4			
MCS 12L41	M_N [Nm]					10.5	11.0	11.0	11.0		
	M_0 [Nm]					11.7	15.0	15.0	15.0		
	M_{max} n = 0 [Nm]					17.4	18.2	24.2	34.1		
	M_{max} [Nm]					17.4	26.5	34.7	47.8		

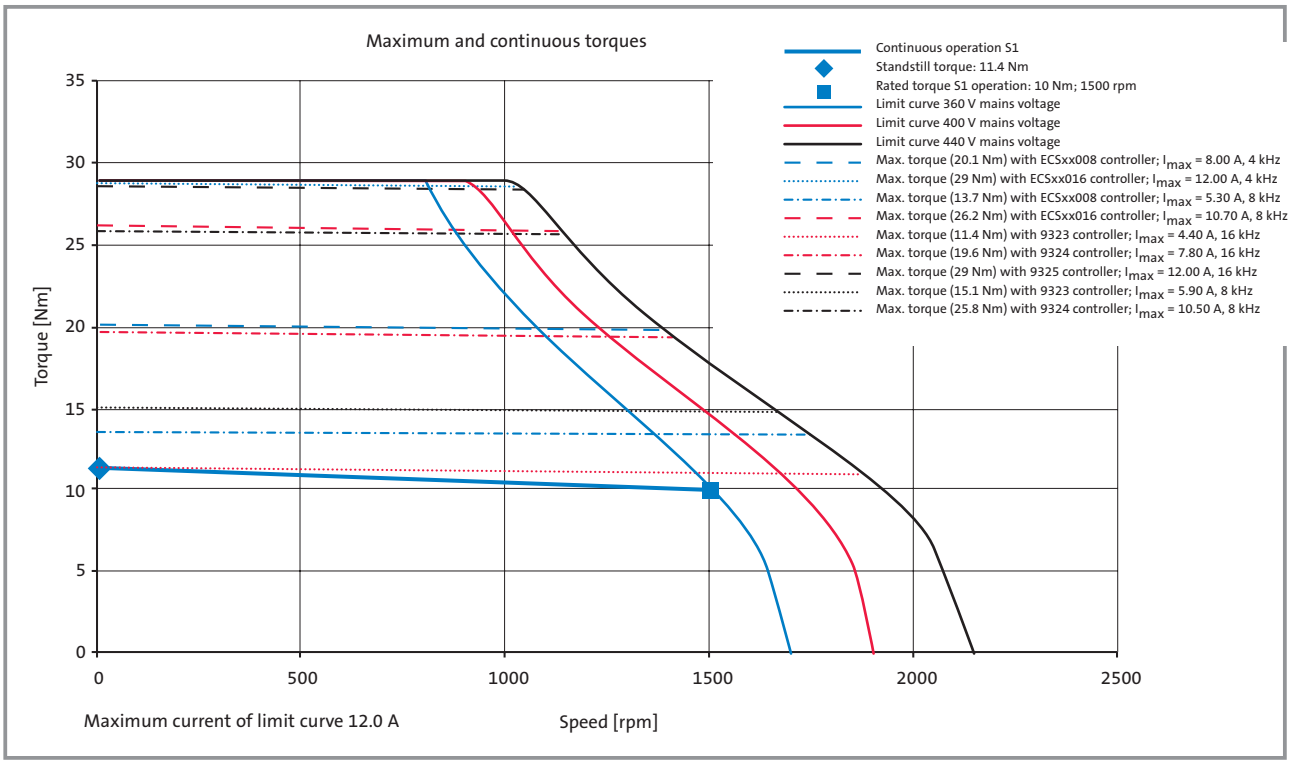
1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

Torque characteristics

MCS 12H35

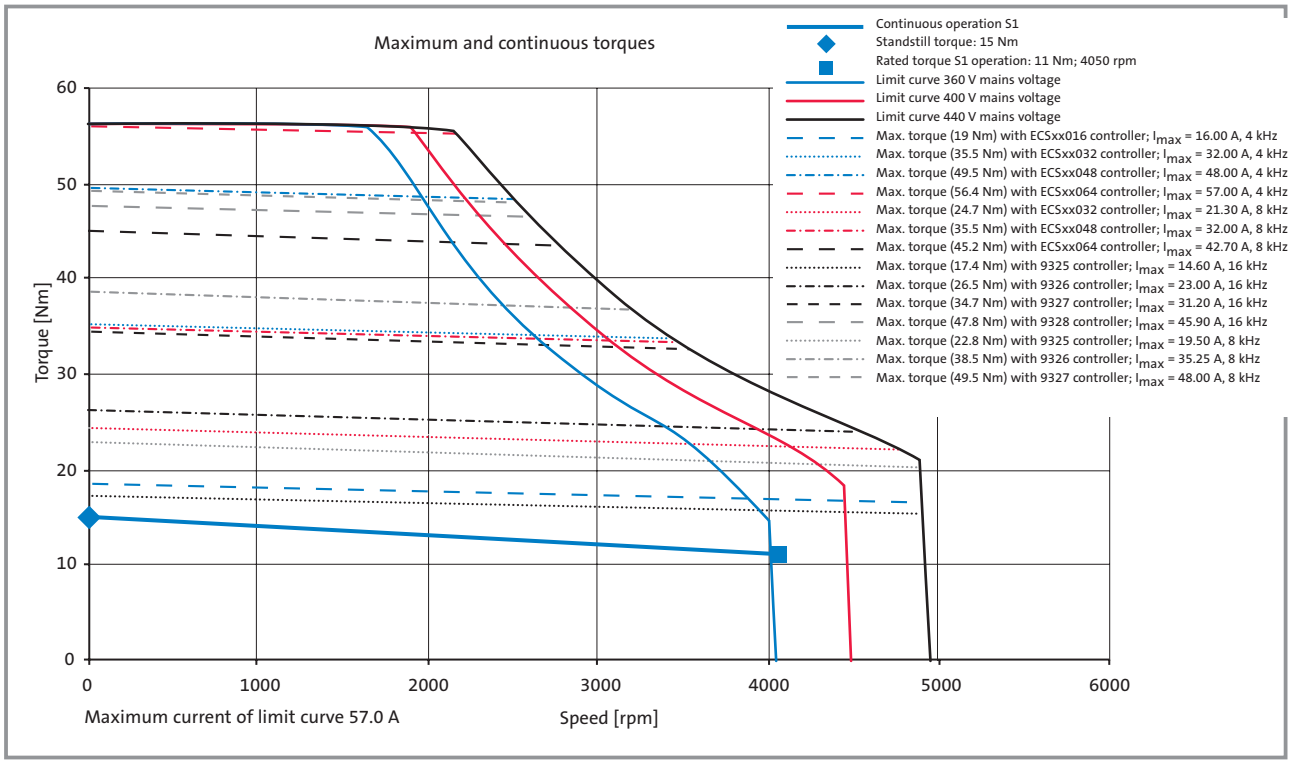


MCS 12H15

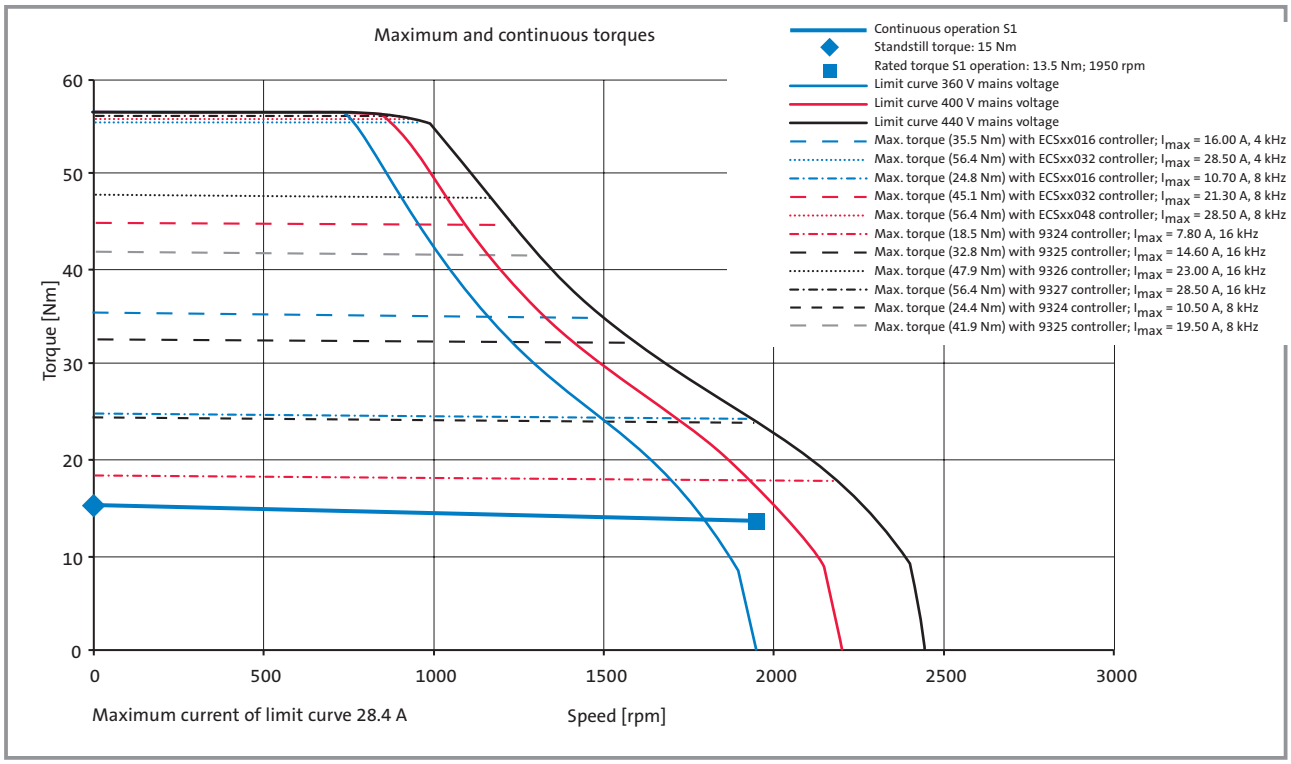


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 12L41



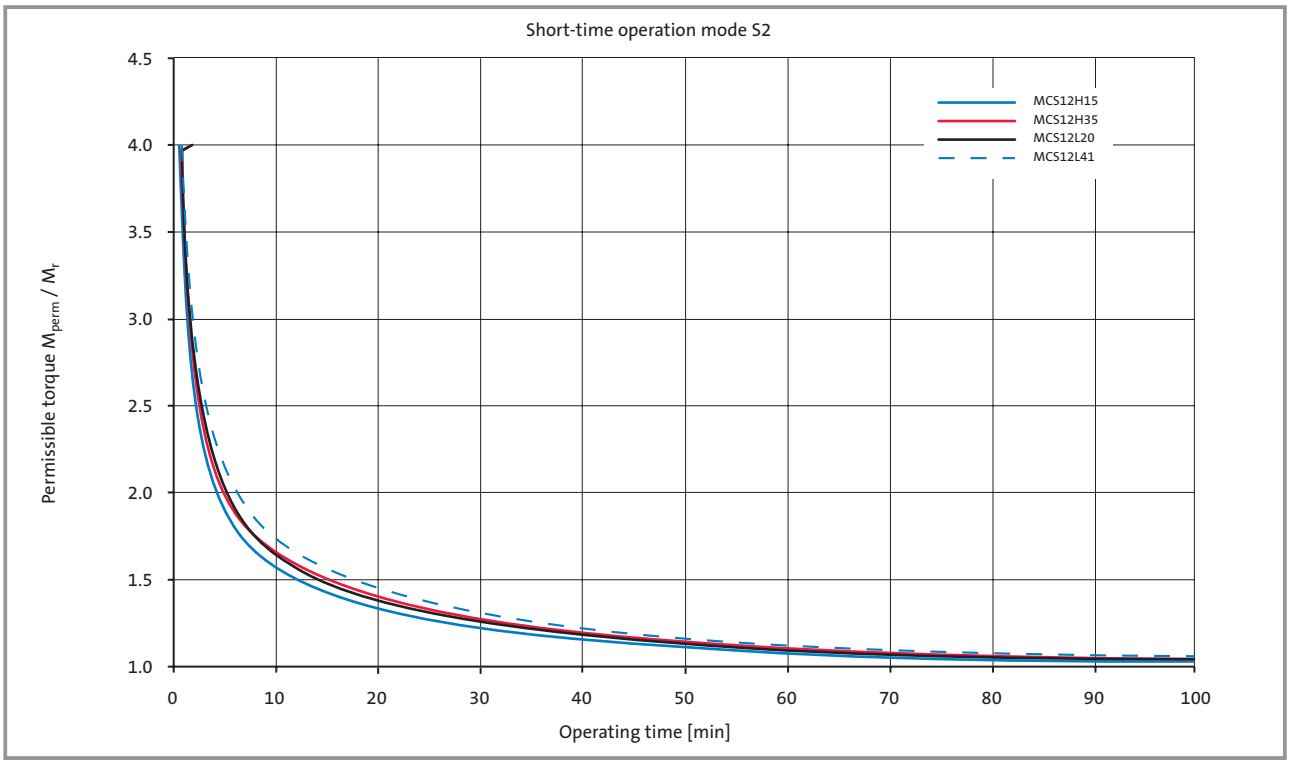
MCS 12L20

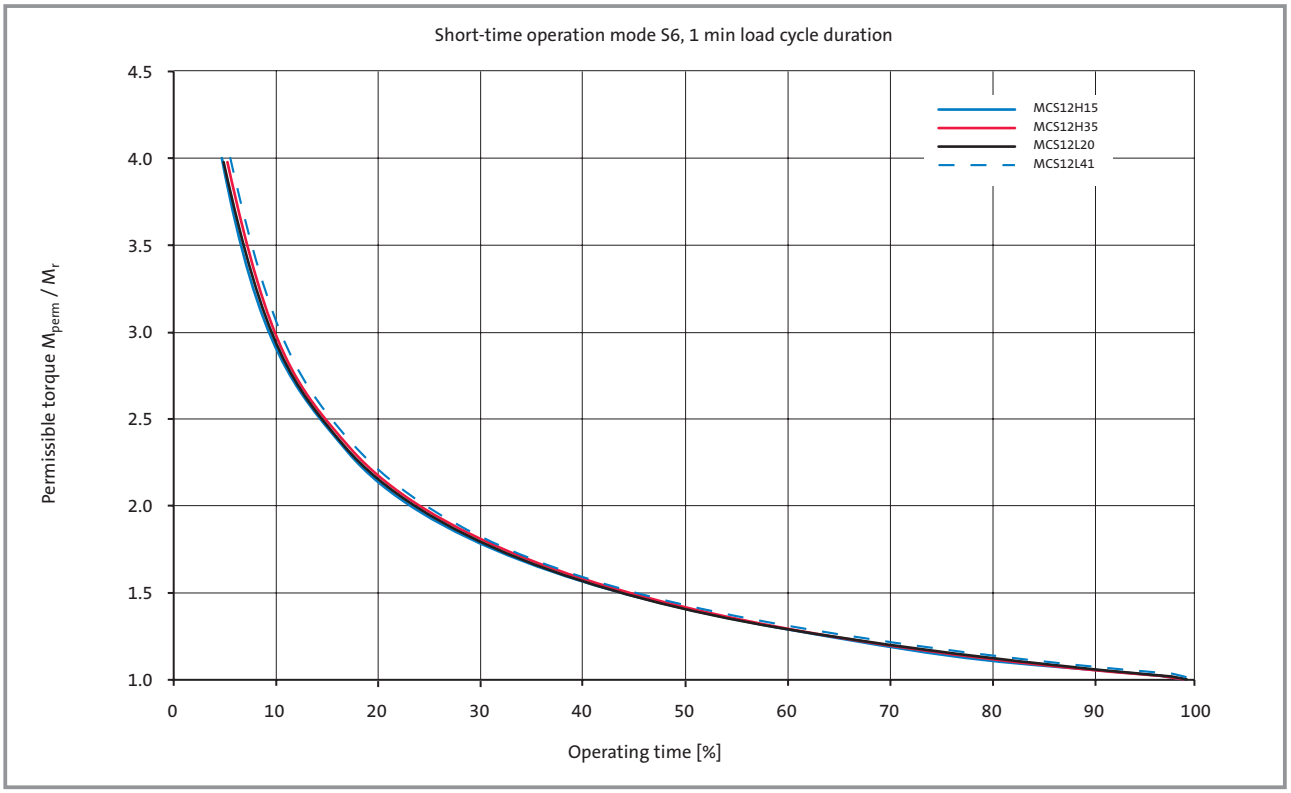


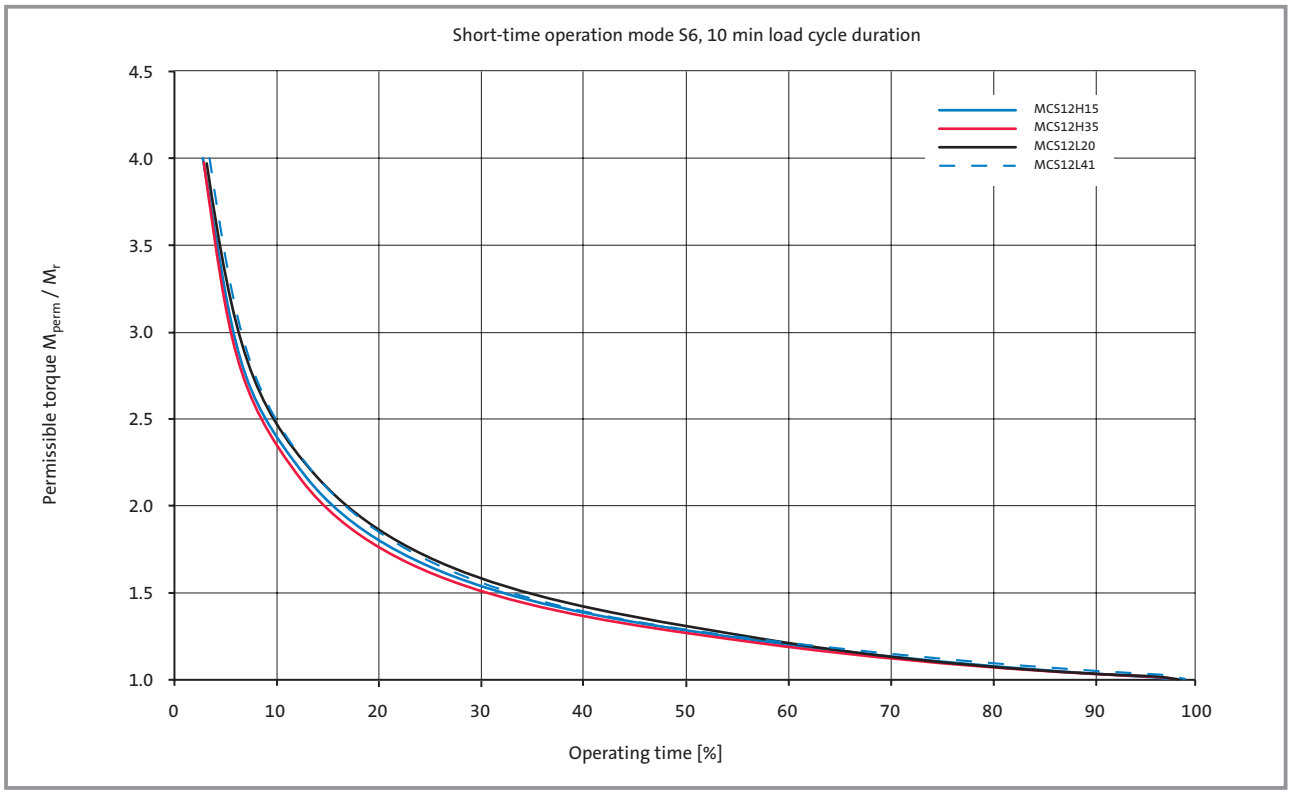
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Short-time operation characteristic

Lenze MCS synchronous servo motors are designed to be used in dynamic applications with high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.






Short-time operation mode S6, 10 min load cycle duration
Permissible torque M_{perm} / M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
MCS12H15
MCS12H35
MCS12L20
MCS12L41

Brake assignment

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

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCS 12H
MCS 12L

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B[3] +5 % – -10 % V	I_B[2] A	J_B kg m² · 10⁻⁴	Engagement time t_1[1] ms	Disengagement time t_2[1] ms	Maximum-switching rate per emergency stop with n = 3000 rpm J	Weight kg
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 Reinforced brake

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{mot}
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 opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm^{-1}.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e. g. oil leakage, will cause a loss of torque.

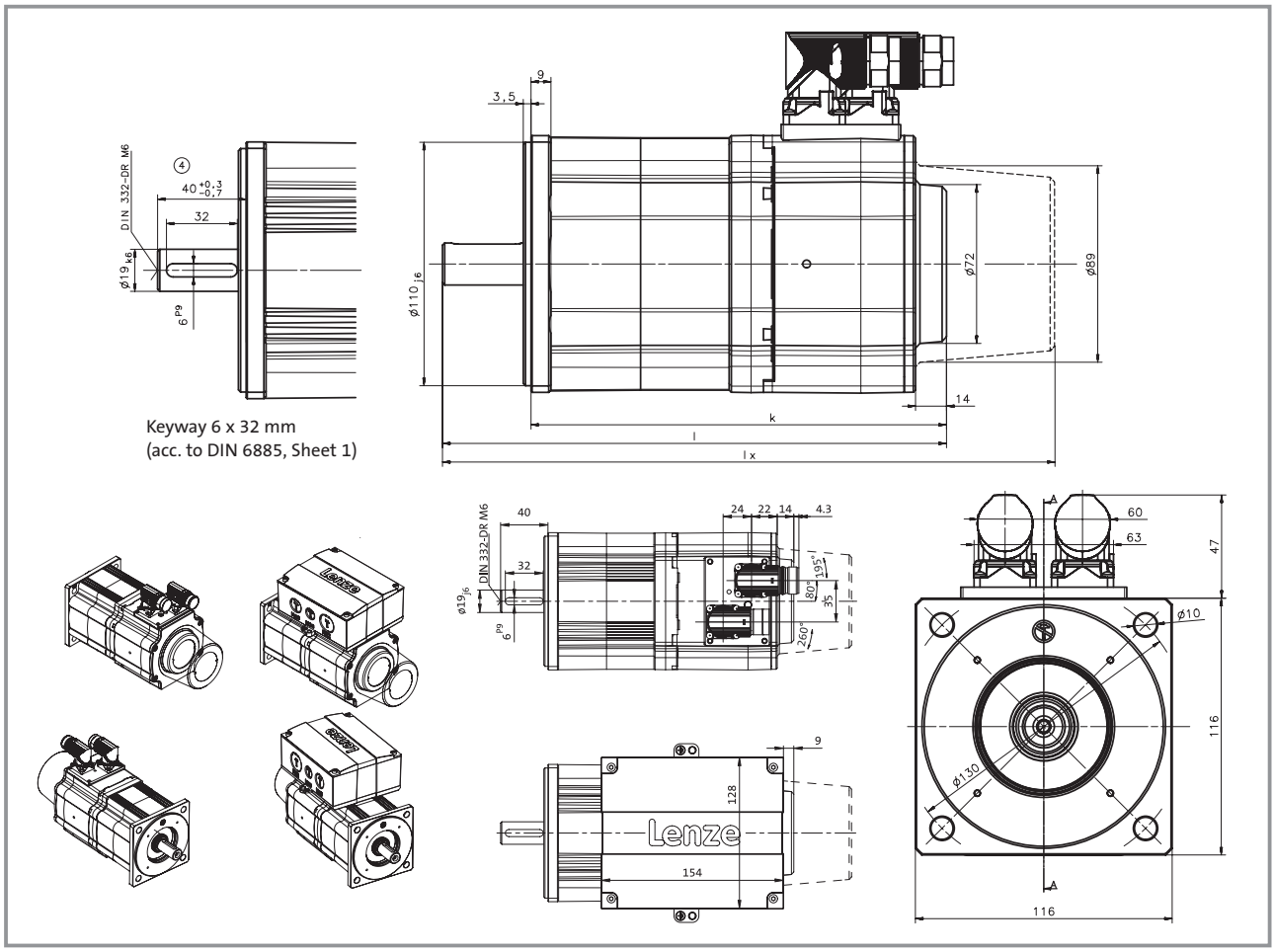
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

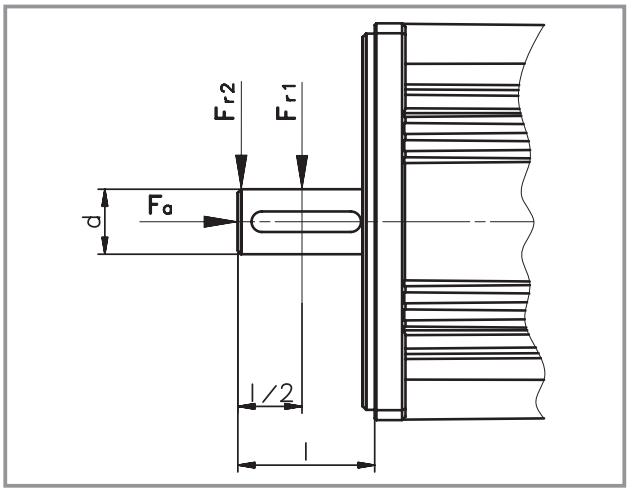


Motor type	Motor **without** holding brake			Motor **with** holding brake		
	k [mm]	l [mm]	lx [mm]	k [mm]	l [mm]	lx [mm]
MCS 12H	228	268	317	248	288	337
MCS 12L	268	308	357	288	328	377

l Motor length with installation of a resolver as feedback
lx Motor length with installation of an absolute value encoder as feedback

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

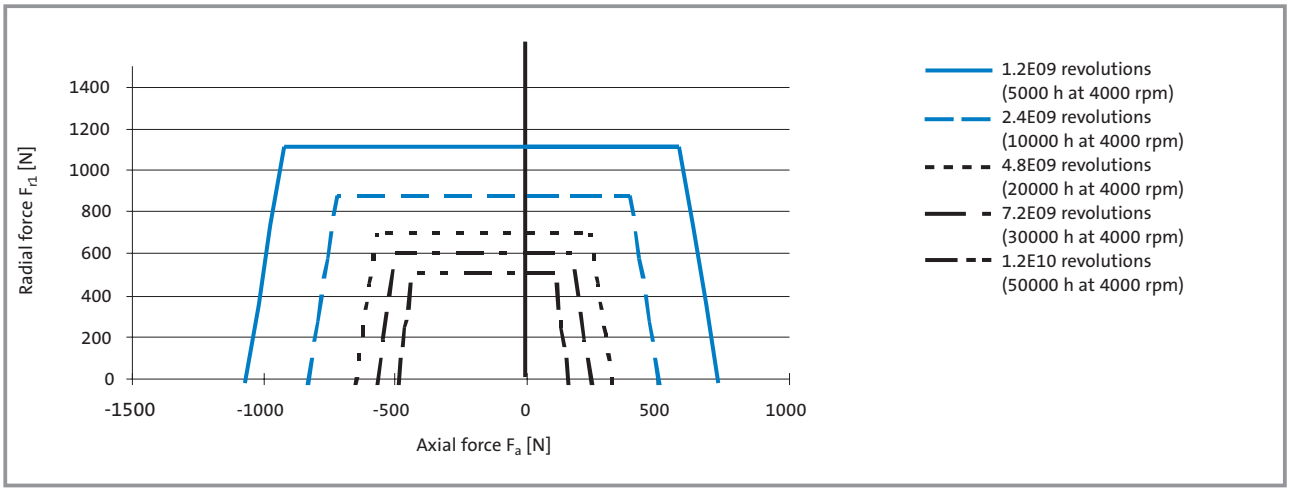
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

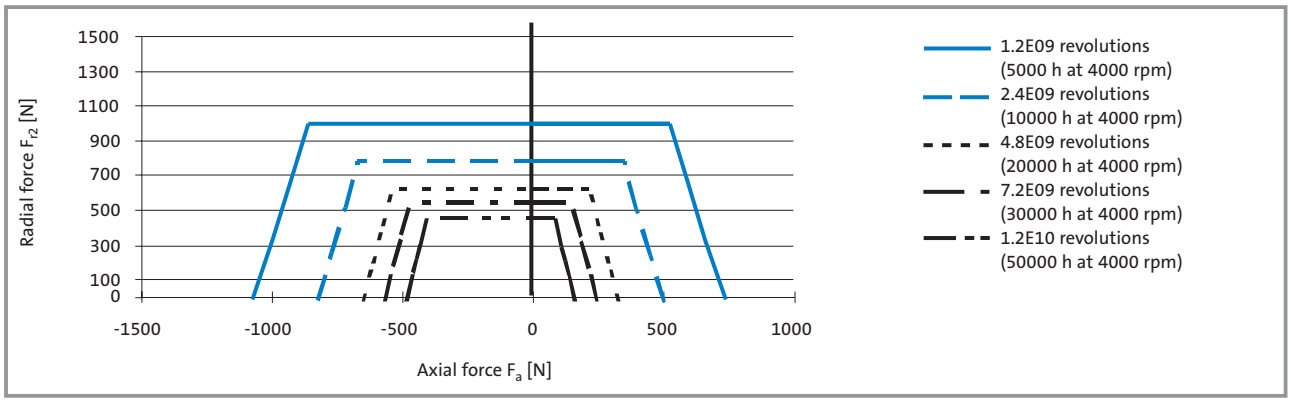
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The characteristics are valid for all MCS 12 frame sizes

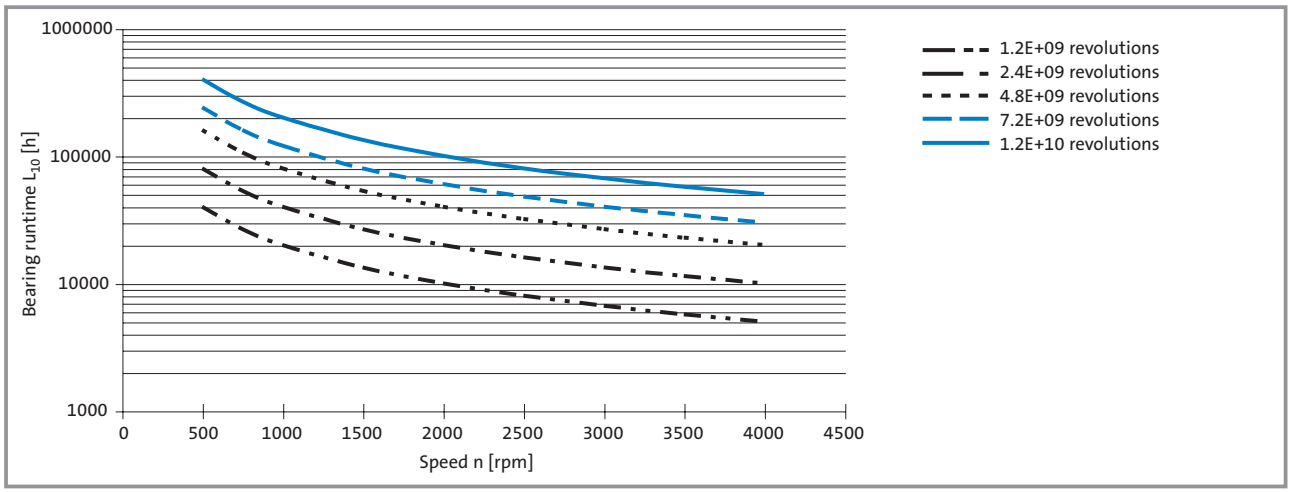
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



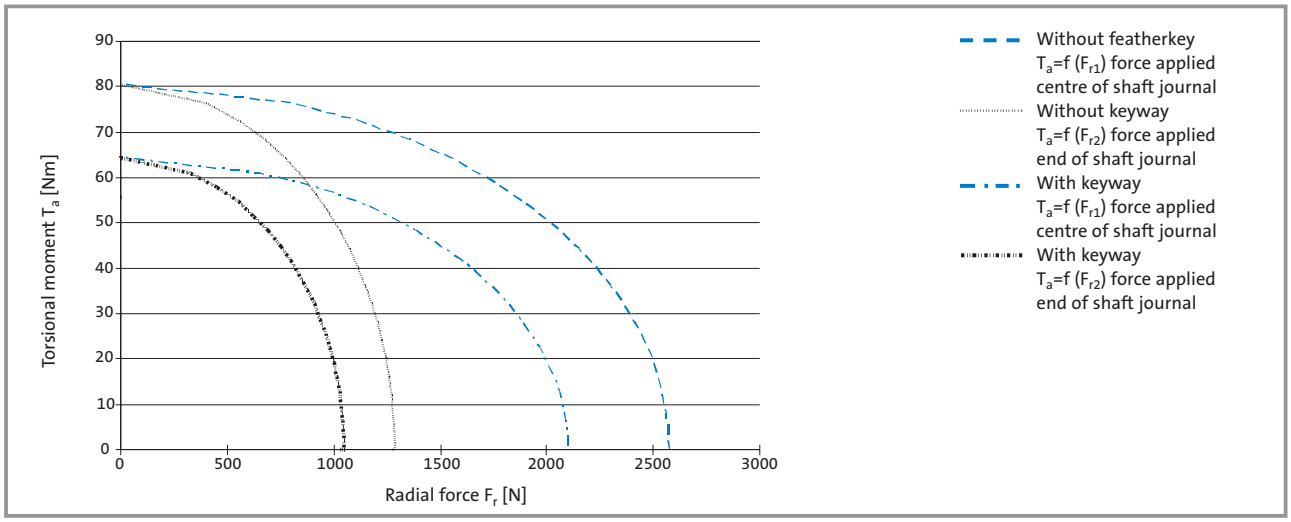
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

MCS 14D

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	η %	I_{max} A	J_{Motor} without brake kg m² · 10⁻⁴
MCS 14D15	1500	11	29	9.2	1.4	5.0	4.5	305	100	88	17	8.1
MCS 14D36	3600	11	29	7.5	2.8	10.0	7.5	295	240	92	33	8.1
MCS 14H15	1500	21	55	16.0	2.5	8.5	6.6	325	100	92	26	14.2
MCS 14H32	3225	21	55	14.0	4.7	16.9	11.9	295	215	93	52	14.2
MCS 14L15	1500	28	77	23.0	3.6	12.0	9.7	315	100	90	37	23.4
MCS 14L32	3225	28	77	17.2	5.8	24.0	15.0	275	215	93	75	23.4
MCS 14P14	1350	37	105	30.0	4.2	12.2	10.8	340	90	90	46	34.7
MCS 14P32	3225	37	105	21.0	7.1	24.3	15.6	315	215	93	92	34.7

Motor	kE_{LL}-factor at 150 °C V/1000 rpm	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	L_{phase} ⅄ mH	kt_0-factor at 150 °C Nm/A	Type connector-type	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		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		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	EWS0013	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	EWS0013	24.9	6000

The Operating Instructions for the MCS motors can be found in the download area of the Lenze Internet site at www.Lenze.de

MCS 14H

MCS 14L

MCS 14P

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz								
Type			**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]			2.0	4.0	8.0	12.7	17.0	20.0
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]			4.0	8.0	16.0	32.0	48.0	64.0
Motor type								
MCS 14D15	M_N	[Nm]		8.2	9.2			
	M_0	[Nm]		8.8	11.0			
	M_{max} n = 0[4)]	[Nm]		9.6	17.9			
	M_{max}	[Nm]		16.0	28.3			
MCS 14D36	M_N	[Nm]			7.5	7.5		
	M_0	[Nm]			8.8	11.0		
	M_{max} n = 0[4)]	[Nm]			9.5	17.8		
	M_{max}	[Nm]			16.0	28.3		
MCS 14H15	M_N	[Nm]			16.0	16.0		
	M_0	[Nm]			19.8	21.0		
	M_{max} n = 0[4)]	[Nm]			22.3	41.2		
	M_{max}	[Nm]			37.1	54.8		
MCS 14H32	M_N	[Nm]				14.0	14.0	14.0
	M_0	[Nm]				15.8	21.0	21.0
	M_{max} n = 0[4)]	[Nm]				22.2	32.1	41.3
	M_{max}	[Nm]				37.1	51.9	54.8
MCS 14L15	M_N	[Nm]			19.0	23.0	23.0	
	M_0	[Nm]			18.7	28.0	28.0	
	M_{max} n = 0[4)]	[Nm]			21.9	42.1	59.9	
	M_{max}	[Nm]			37.6	68.5	77.1	
MCS 14L32	M_N	[Nm]				14.6	17.2	17.2
	M_0	[Nm]				14.8	19.8	23.3
	M_{max} n = 0[4)]	[Nm]				21.8	32.4	42.2
	M_{max}	[Nm]				37.6	53.9	68.5
MCS 14P14	M_N	[Nm]				30.0	30.0	
	M_0	[Nm]				37.0	37.0	
	M_{max} n = 0[4)]	[Nm]				49.1	70.0	
	M_{max}	[Nm]				80.0	105.1	
MCS 14P32	M_N	[Nm]				17.1	21.0	21.0
	M_0	[Nm]				19.3	25.9	30.5
	M_{max} n = 0[4)]	[Nm]				25.4	37.9	49.3
	M_{max}	[Nm]				43.9	63.0	80.0

[1)] Caution: Limit I_{max} controller to I_{max} motor
[2)] Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
[4)] The reduction in torque must be taken into account in applications that have an active load (e. g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper 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	3.0	6.0	12.1	18.1	24.2
Maximum current > 5 Hz[1)2)3)] [A]		2.7	5.3	10.7	21.3	32.0	42.7
Motor type							
MCS 14D15	M_N [Nm]			9.2	9.2		
	M_0 [Nm]			11.0	11.0		
	M_{max} n = 0[4)] [Nm]			12.3	22.7		
	M_{max} [Nm]			20.5	29.0		
MCS 14D36	M_N [Nm]				7.5	7.5	7.5
	M_0 [Nm]				9.3	11.0	11.0
	M_{max} n = 0[4)] [Nm]				12.4	17.8	22.7
	M_{max} [Nm]				20.5	28.3	29.0
MCS 14H15	M_N [Nm]			12.8	16.0	16.0	
	M_0 [Nm]			13.1	21.0	21.0	
	M_{max} n = 0[4)] [Nm]			14.8	29.0	41.2	
	M_{max} [Nm]			25.9	47.2	54.8	
MCS 14H32	M_N [Nm]					13.3	14.0
	M_0 [Nm]					14.0	16.5
	M_{max} n = 0[4)] [Nm]					22.2	28.9
	M_{max} [Nm]					37.1	47.3
MCS 14L15	M_N [Nm]				20.2	23.0	23.0
	M_0 [Nm]				19.8	26.4	28.0
	M_{max} n = 0[4)] [Nm]				29.1	42.1	54.3
	M_{max} [Nm]				48.6	68.5	77.1
MCS 14L32	M_N [Nm]					13.0	15.3
	M_0 [Nm]					13.2	15.5
	M_{max} n = 0[4)] [Nm]					21.8	29.1
	M_{max} [Nm]					37.6	48.7
MCS 14P14	M_N [Nm]				23.6	30.0	30.0
	M_0 [Nm]				25.8	34.3	37.0
	M_{max} n = 0[4)] [Nm]				34.0	49.1	63.4
	M_{max} [Nm]				56.8	80.0	99.7
MCS 14P32	M_N [Nm]						17.9
	M_0 [Nm]						20.3
	M_{max} n = 0 [4)] [Nm]						34.0
	M_{max} [Nm]						56.9

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: On the ECS automatic switching to 4 kHz not taken into account; when using automatic switching to 4 kHz, the maximum torques and currents apply at 4 kHz
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz											
Controller type			**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**
Continuous current [A]			1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0
Maximum current 0 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0
Maximum current > 5 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	35.25	48.0	70.5	88.5	133.5
Motor type												
MCS 14D15	M_N	[Nm]			8.0	9.2	9.2					
	M_0	[Nm]			8.5	11.0	11.0					
	M_{max} n = 0	[Nm]			12.1	20.2	29.0					
	M_{max}	[Nm]			12.1	20.2	29.0					
MCS 14D36	M_N	[Nm]				7.0	7.5	7.5				
	M_0	[Nm]				7.7	11.0	11.0				
	M_{max} n = 0	[Nm]				10.9	19.0	22.2				
	M_{max}	[Nm]				10.9	19.0	29.0				
MCS 14H15	M_N	[Nm]				16.0	16.0					
	M_0	[Nm]				17.3	21.0					
	M_{max} n = 0	[Nm]				25.4	43.9					
	M_{max}	[Nm]				25.4	43.9					
MCS 14H32	M_N	[Nm]					14.0	14.0	14.0			
	M_0	[Nm]					16.2	21.0	21.0			
	M_{max} n = 0	[Nm]					23.8	28.2	37.1			
	M_{max}	[Nm]					23.8	40.3	51.9			
MCS 14L15	M_N	[Nm]					23.0	23.0				
	M_0	[Nm]					28.0	28.0				
	M_{max} n = 0	[Nm]					45.0	52.9				
	M_{max}	[Nm]					45.0	73.9				
MCS 14L32	M_N	[Nm]					14.9	17.2	17.2	17.2		
	M_0	[Nm]					15.2	27.4	28.0	28.0		
	M_{max} n = 0	[Nm]					23.5	28.3	37.6	52.9		
	M_{max}	[Nm]					23.5	41.1	53.9	73.9		
MCS 14P14	M_N	[Nm]					30.0	30.0	30.0			
	M_0	[Nm]					37.0	37.0	37.0			
	M_{max} n = 0	[Nm]					52.5	61.8	80.0			
	M_{max}	[Nm]					52.5	86.4	105.1			
MCS 14P32	M_N	[Nm]					17.5	21.0	21.0	21.0		
	M_0	[Nm]					19.8	35.8	37.0	37.0		
	M_{max} n = 0	[Nm]					27.4	33.0	43.9	61.8		
	M_{max}	[Nm]					27.4	48.0	63.0	86.4		

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply

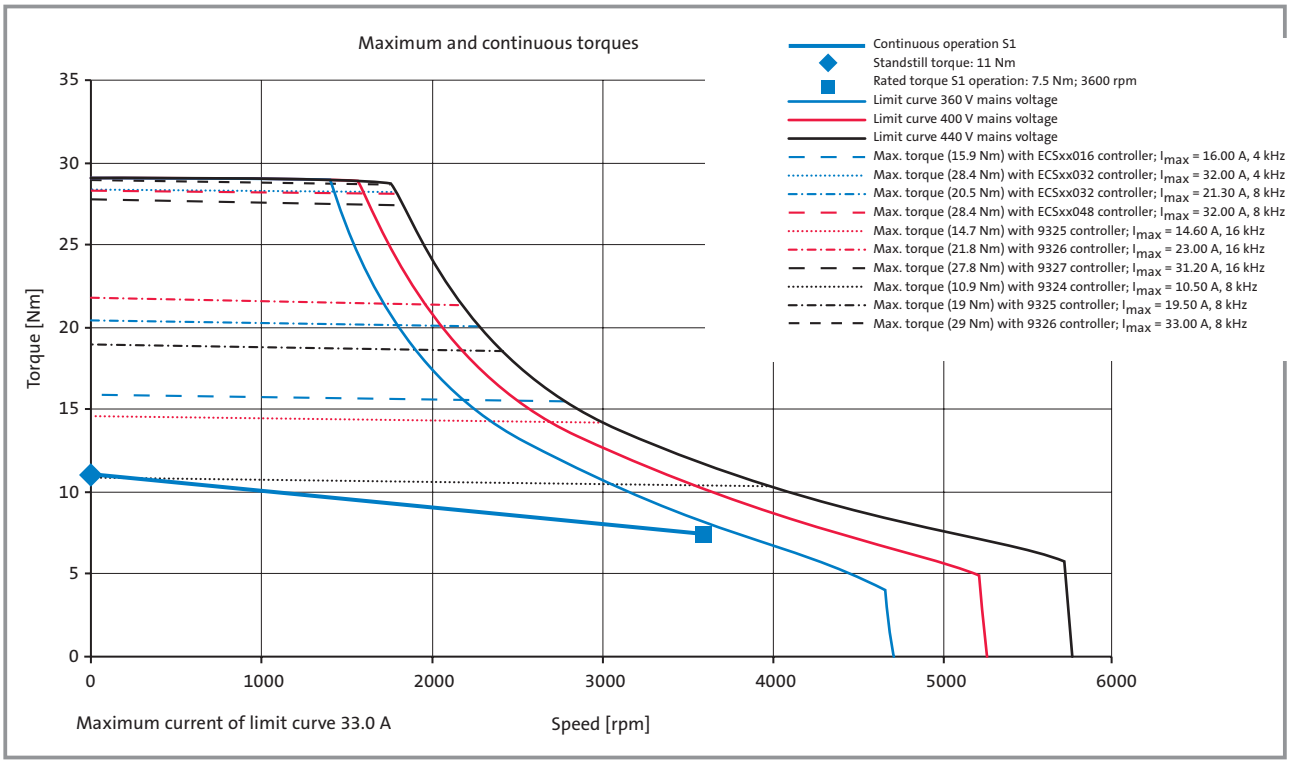
Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz											
Controller 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	38.0	58.0
Maximum current 0 Hz [1) 2)] [A]			1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0
Maximum current > 5 Hz [1) 2)] [A]			1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0
Motor type												
MCS 14D15	M_N	[Nm]				9.2	9.2	9.2				
	M_0	[Nm]				11.0	11.0	11.0				
	M_{max} n = 0	[Nm]				15.6	26.4	27.4				
	M_{max}	[Nm]				15.6	26.4	29.0				
MCS 14D36	M_N	[Nm]					7.5	7.5	7.5			
	M_0	[Nm]					10.6	11.0	11.0			
	M_{max} n = 0	[Nm]					14.7	15.3	20.0			
	M_{max}	[Nm]					14.7	21.8	27.8			
MCS 14H15	M_N	[Nm]				12.6	16.0	16.0	16.0			
	M_0	[Nm]				12.8	21.0	21.0	21.0			
	M_{max} n = 0	[Nm]				19.2	34.2	35.7	46.3			
	M_{max}	[Nm]				19.2	34.2	50.2	54.8			
MCS 14H32	M_N	[Nm]					11.4	14.0	14.0	14.0	14.0	
	M_0 [4)]	[Nm]					12.1	19.0	21.0	21.0	21.0	
	M_{max} n = 0	[Nm]					18.0	18.8	25.2	35.7	38.1	
	M_{max}	[Nm]					18.0	27.6	36.3	50.1	54.8	
MCS 14L15	M_N	[Nm]					23.0	23.0	23.0	23.0		
	M_0 [4)]	[Nm]					22.6	28.0	28.0	28.0		
	M_{max} n = 0	[Nm]					34.6	36.1	47.6	66.0		
	M_{max}	[Nm]					34.6	52.0	67.1	77.1		
MCS 14L32	M_N	[Nm]						17.2	17.2	17.2	17.2	
	M_0 [4)]	[Nm]						17.9	24.3	28.0	28.0	
	M_{max} n = 0	[Nm]						18.4	25.0	36.1	38.7	
	M_{max}	[Nm]						27.7	36.8	51.9	62.3	
MCS 14P14	M_N	[Nm]					26.9	30.0	30.0	30.0		
	M_0 [4)]	[Nm]					29.4	37.0	37.0	37.0		
	M_{max} n = 0	[Nm]					40.4	42.2	55.6	77.2		
	M_{max}	[Nm]					40.4	60.7	78.4	104.9		
MCS 14P32	M_N	[Nm]						20.6	21.0	21.0	21.0	
	M_0 [4)]	[Nm]						23.3	31.7	37.0	37.0	
	M_{max} n = 0	[Nm]						21.5	29.2	42.2	45.2	
	M_{max}	[Nm]						32.3	42.9	60.6	72.8	

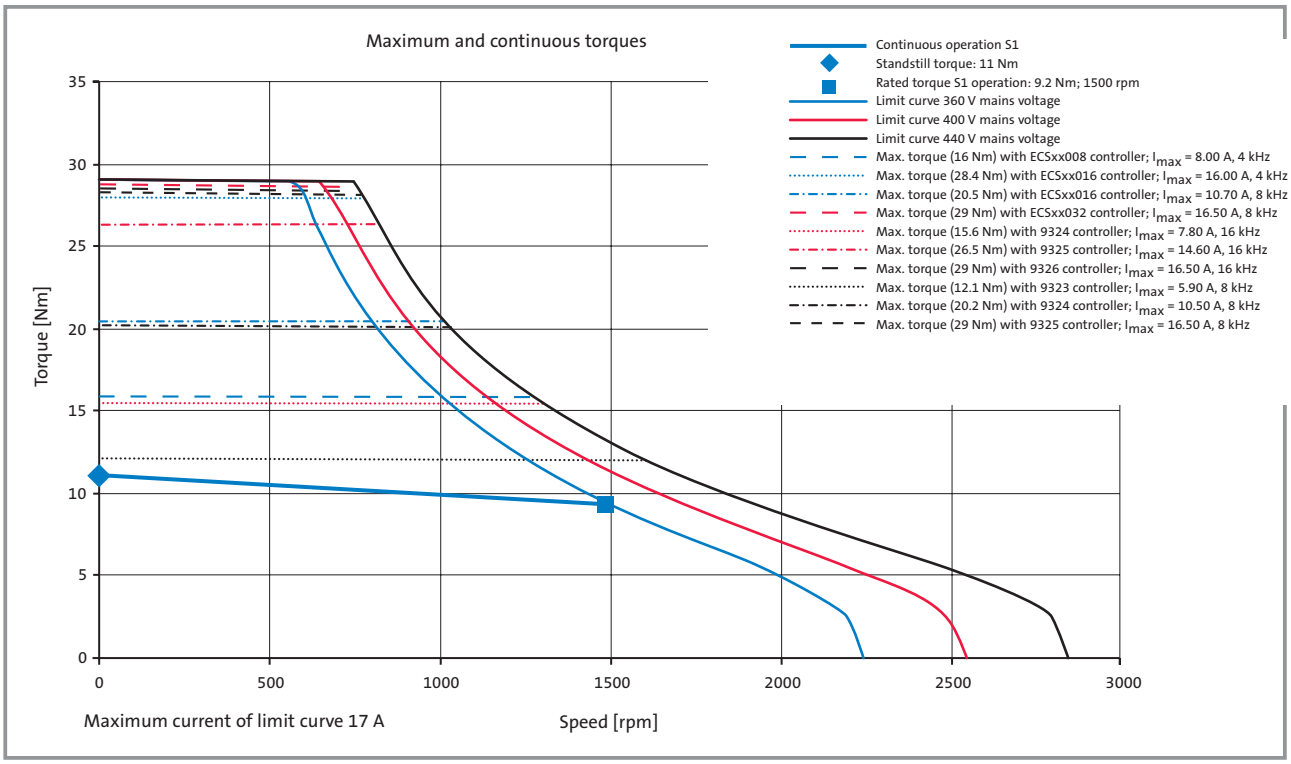
1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) On the 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

Torque characteristics

MCS 14D36

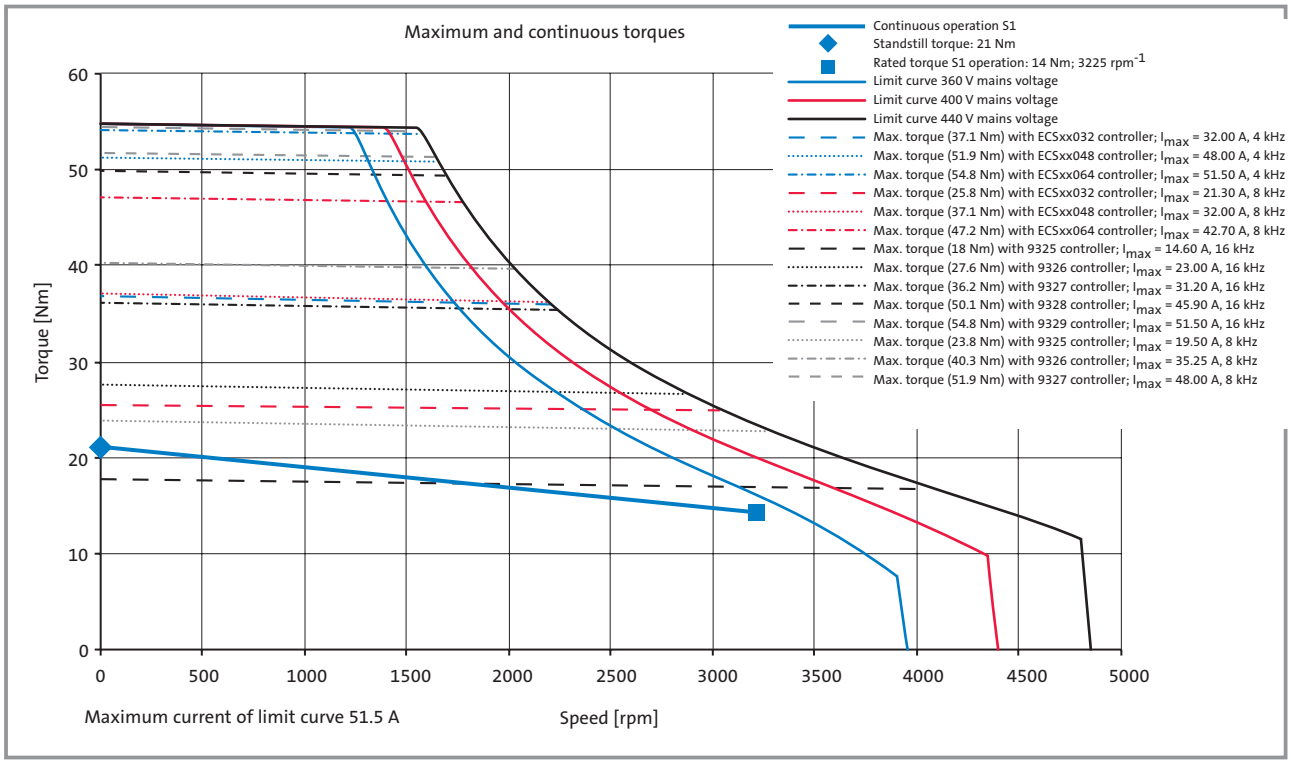


MCS 14D15

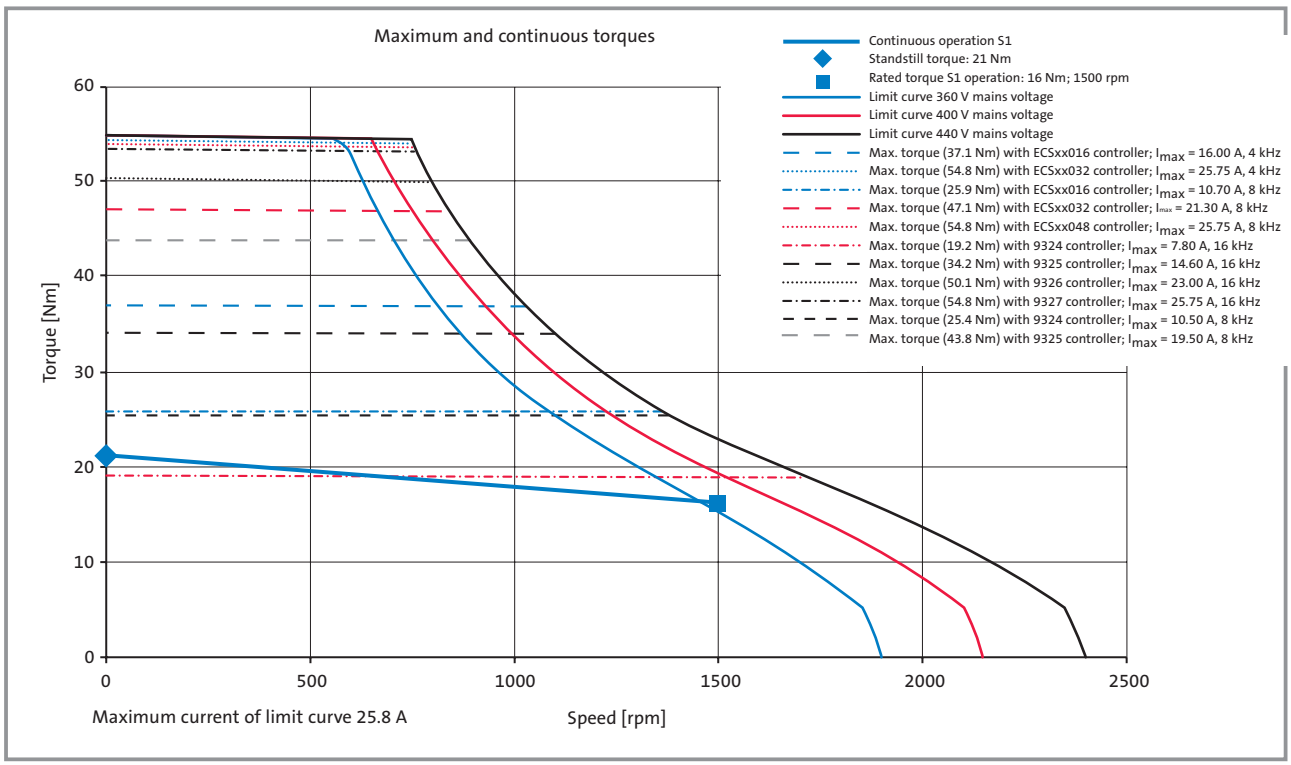


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 14H32



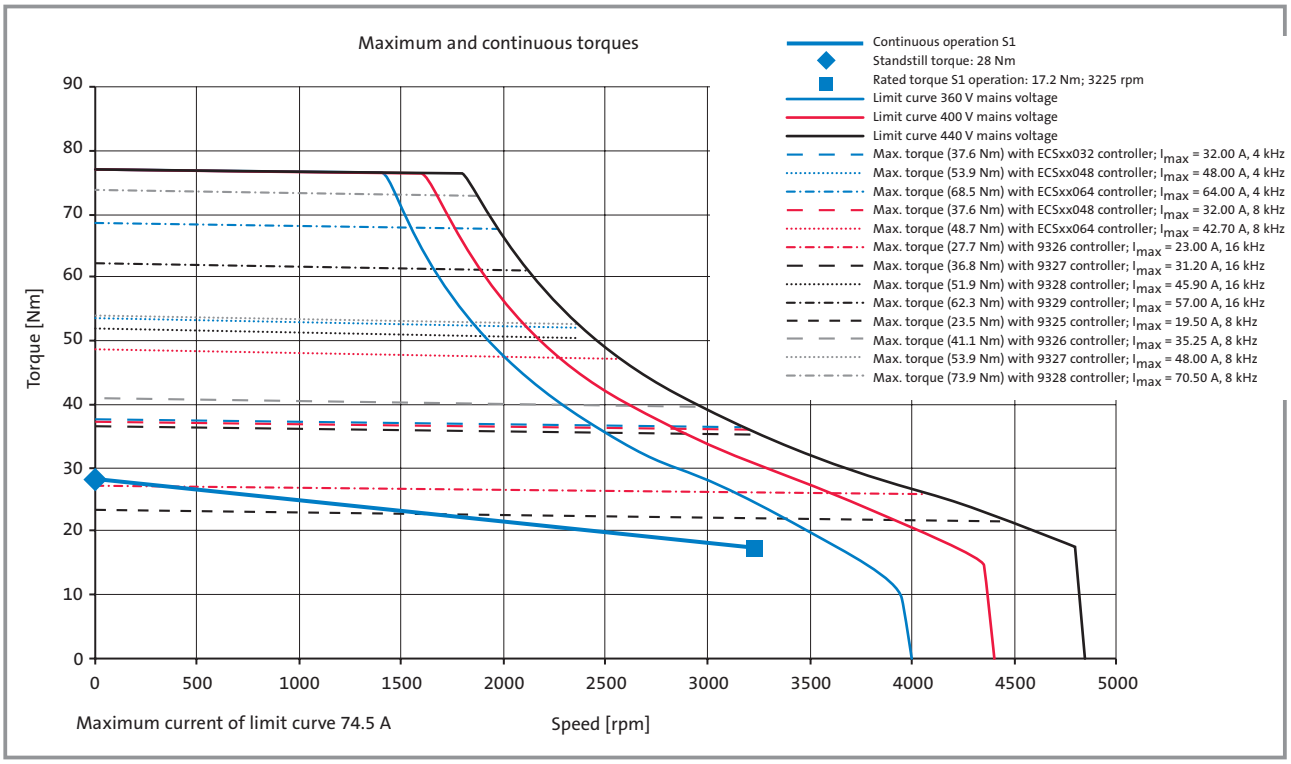
MCS 14H15



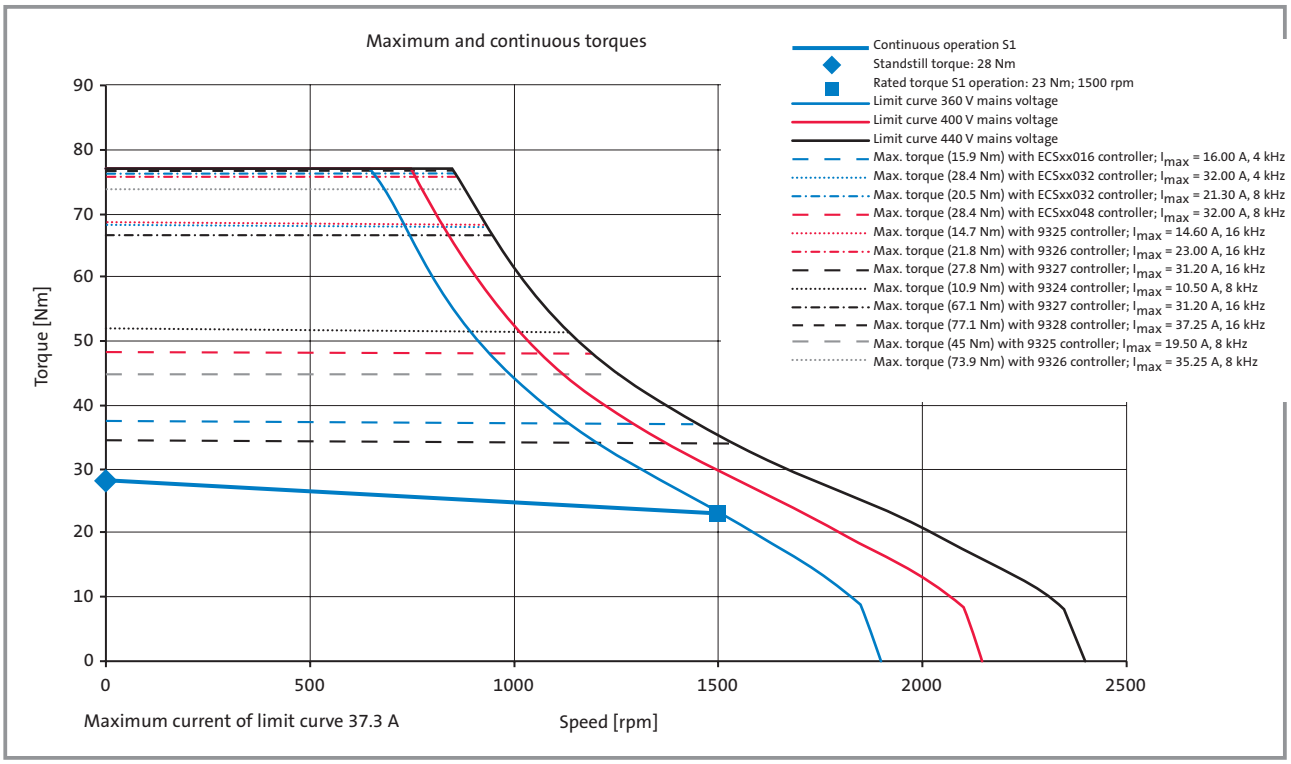
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Torque characteristics

MCS 14L32

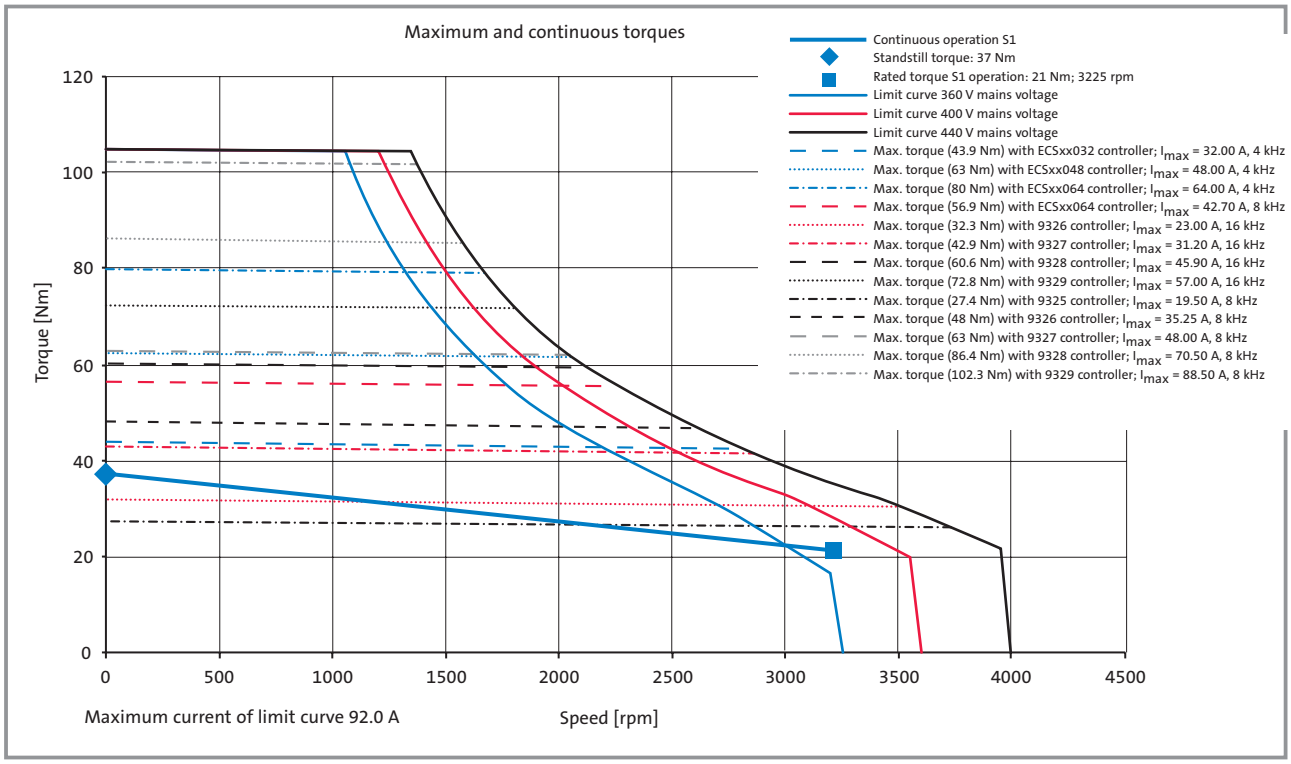


MCS 14L15

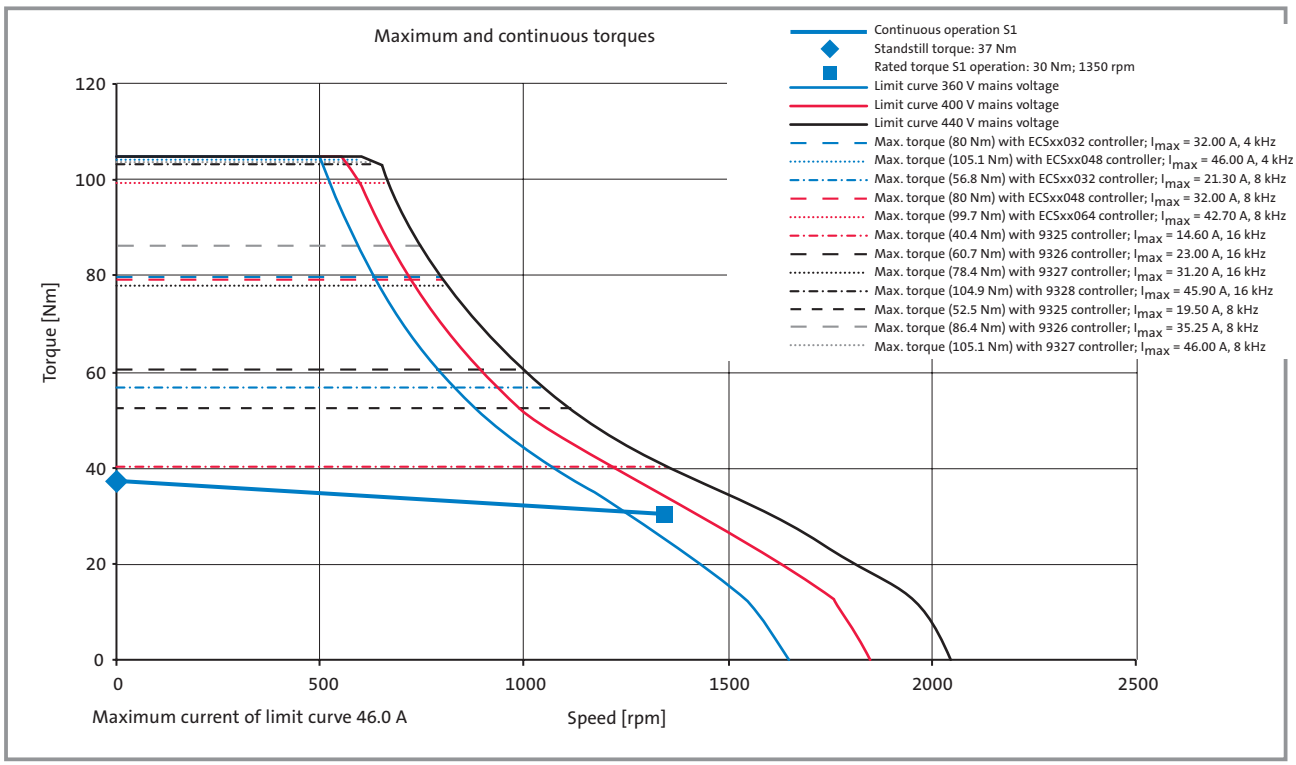


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 14P32



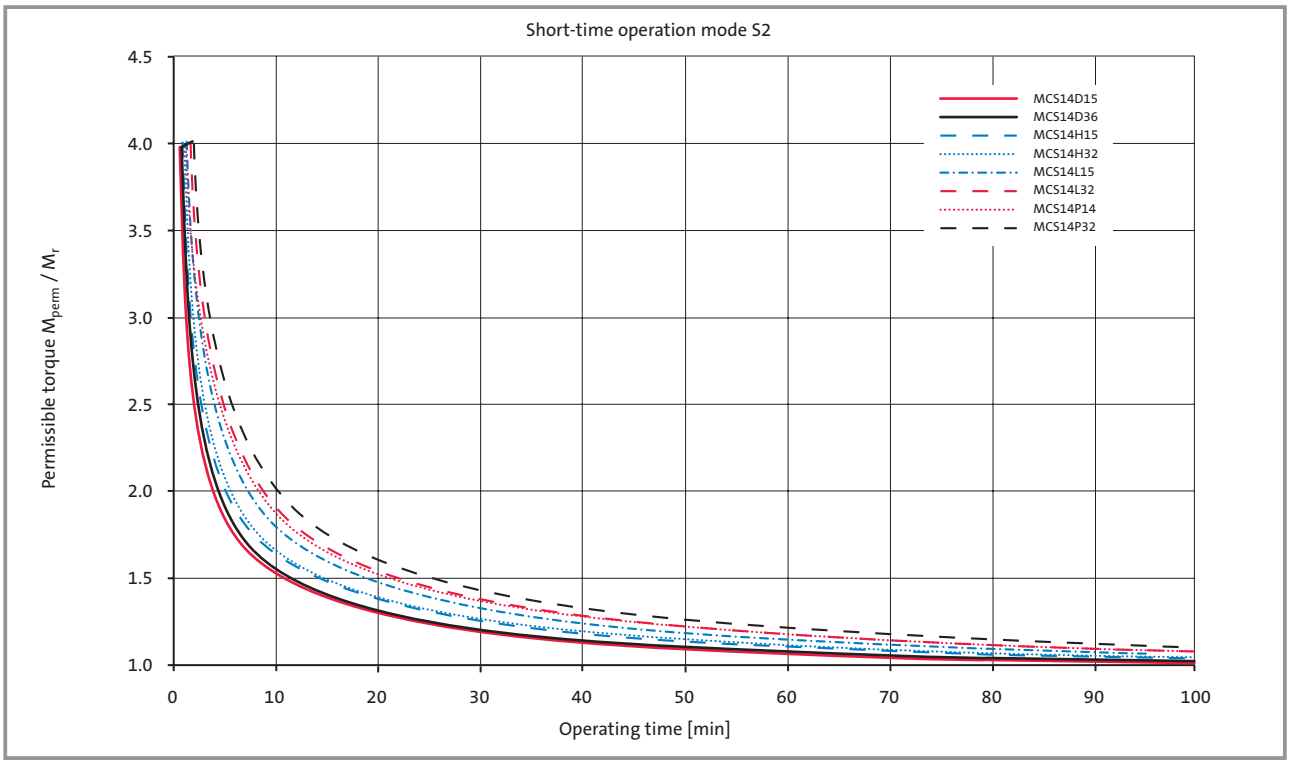
MCS 14P14

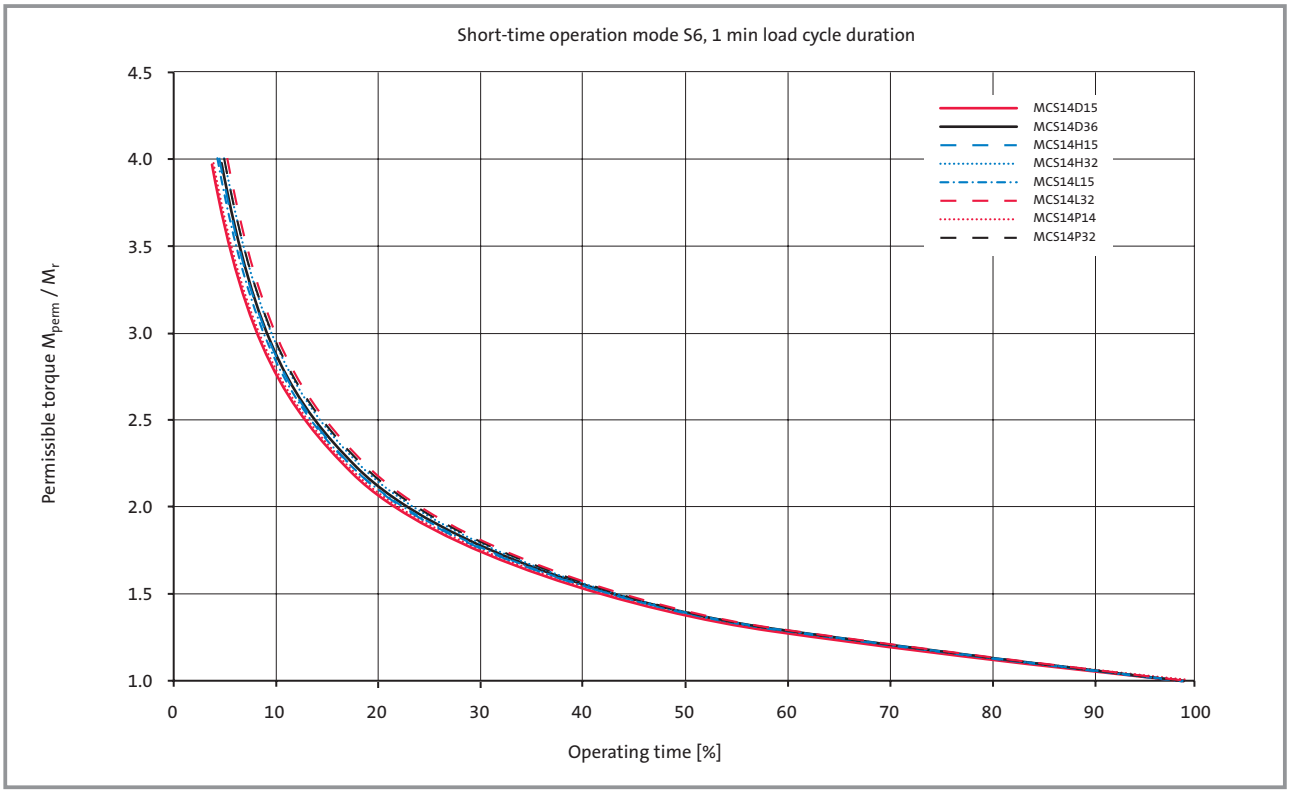


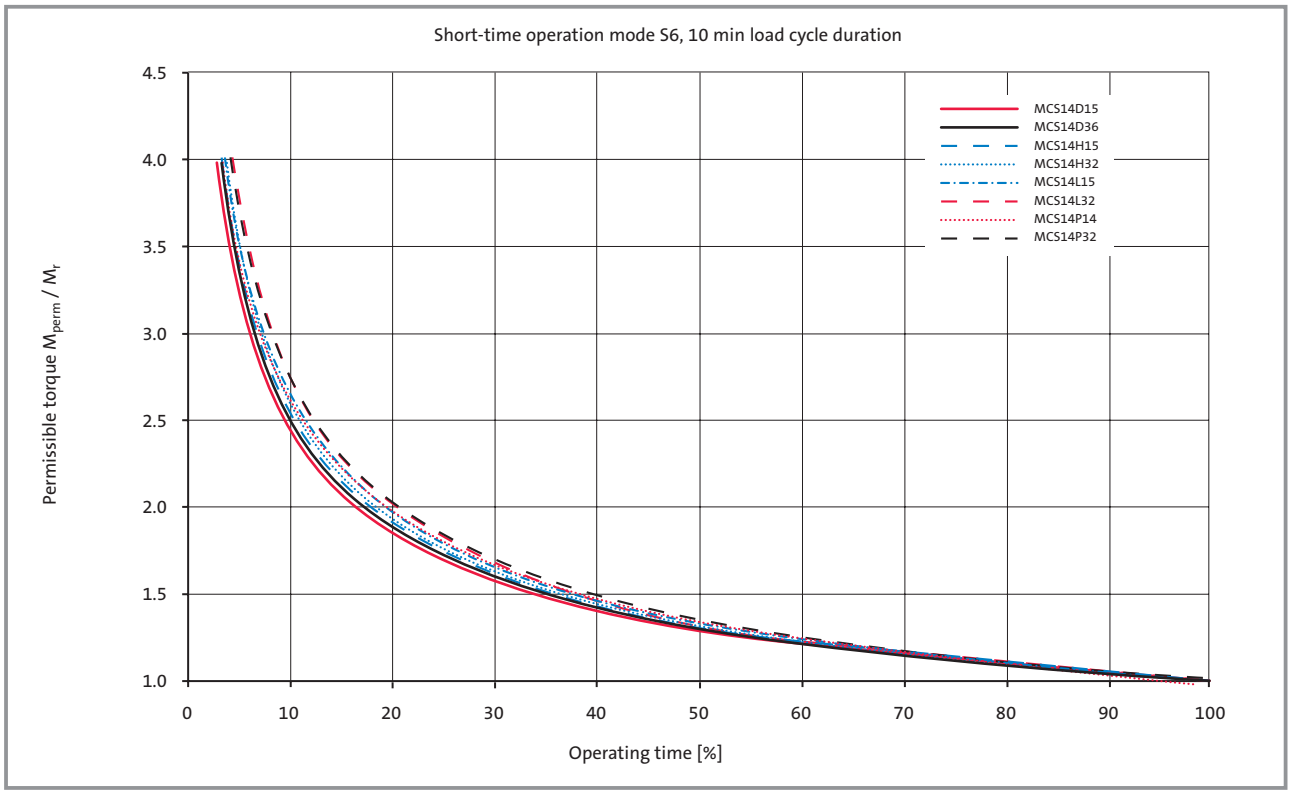
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Short-time operation characteristic

Lenze MCS synchronous servo motors are designed to be used in dynamic applications with high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.






Short-time operation mode S6, 10 min load cycle duration
Permissible torque M_{perm} / M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
MCS14D15
MCS14D36
MCS14H15
MCS14H32
MCS14L15
MCS14L32
MCS14P14
MCS14P32

Brake assignment

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

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

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

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B[3] +5 % – -10 % V	I_B[2] A	J_B kg m² · 10⁻⁴	Engagement time t_1[1] ms	Disengagement time t_2[1] ms	Maximum switching range per emergency stop with 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 Reinforced brake

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{mot}
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 opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

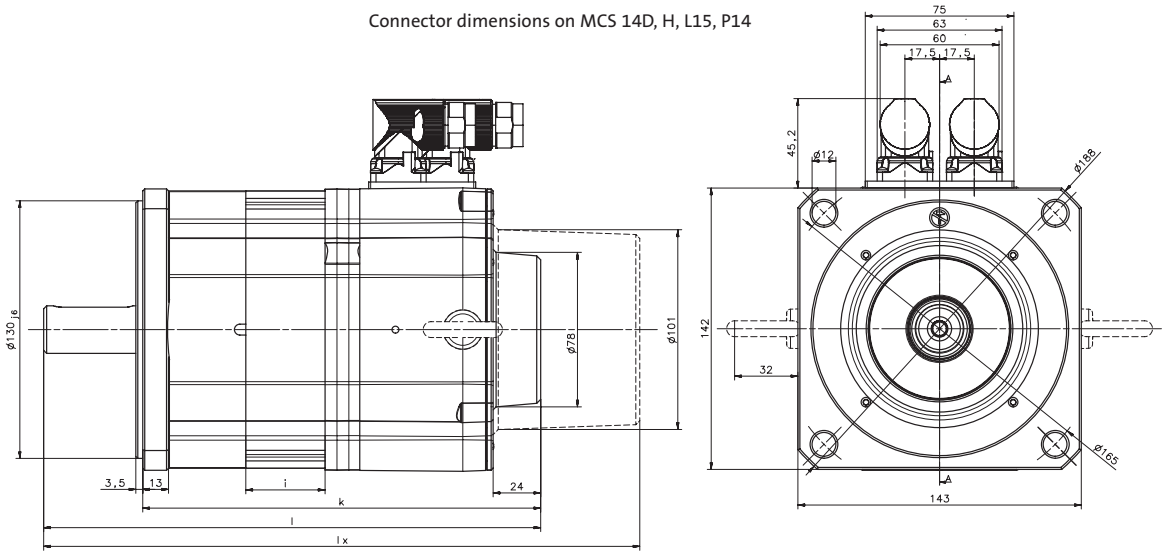
$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

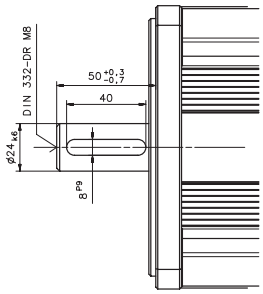
If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

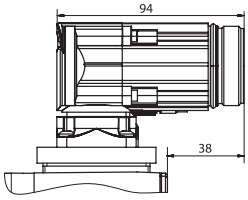
Mechanical dimensions

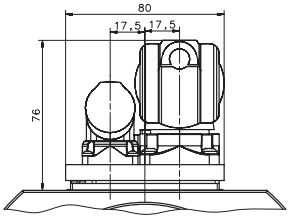
Connector dimensions on MCS 14D, H, L15, P14



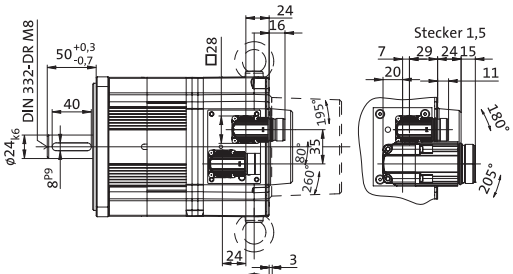


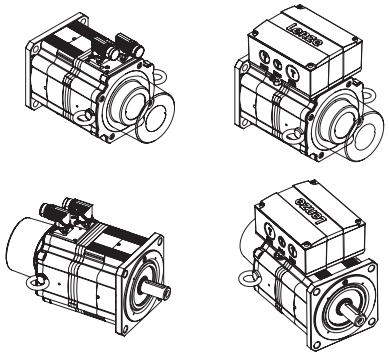
Keyway 8 x 40 mm
(acc. to DIN 6885, Sheet 1)

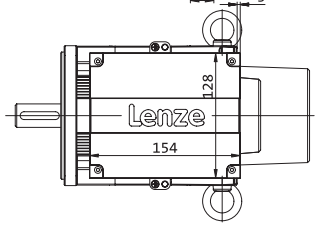




Connector dimensions on MCS 14L32, P32





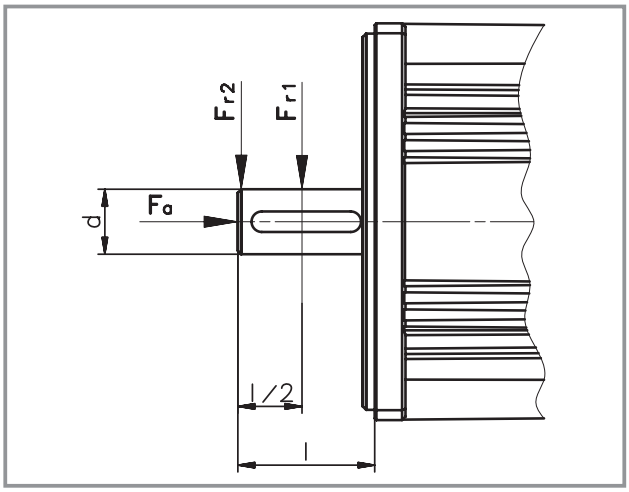


Motor type	Motor **without** holding brake				Motor **with** holding brake			
	i [mm]	k [mm]	l [mm]	lx [mm]	i [mm]	k [mm]	l [mm]	lx [mm]
MCS 14D	40	201	251	301	40	229	279	329
MCS 14H	80	241	291	341	80	269	319	369
MCS 14L	120	281	331	381	120	309	359	409
MCS 14P	160	321	371	421	160	349	399	449

l Motor length with installation of a resolver as feedback
lx Motor length with installation of an absolute value encoder as feedback
i Package length

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

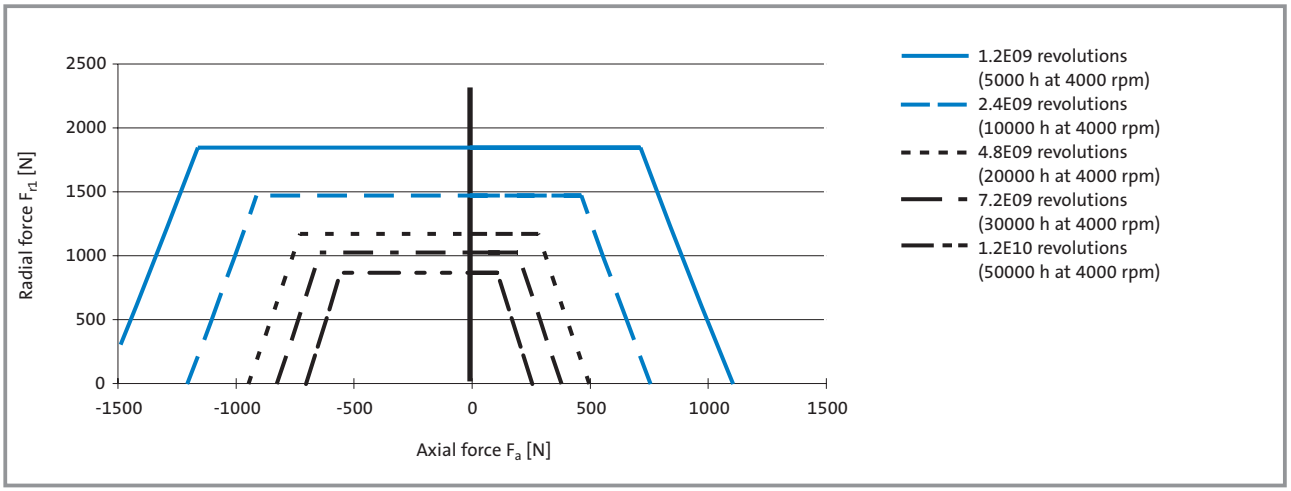
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

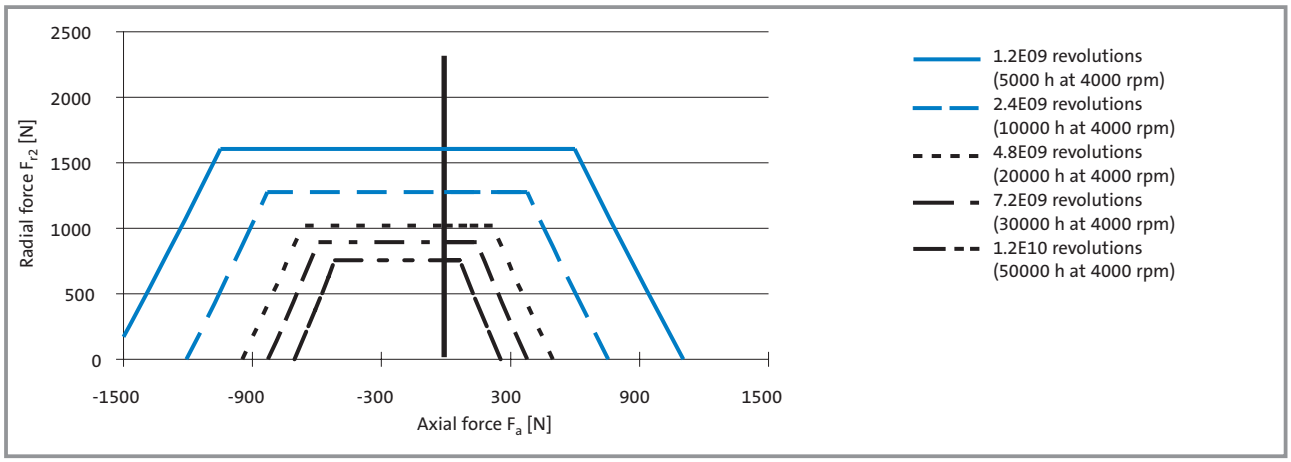
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The characteristics are valid for all MCS 14 frame sizes

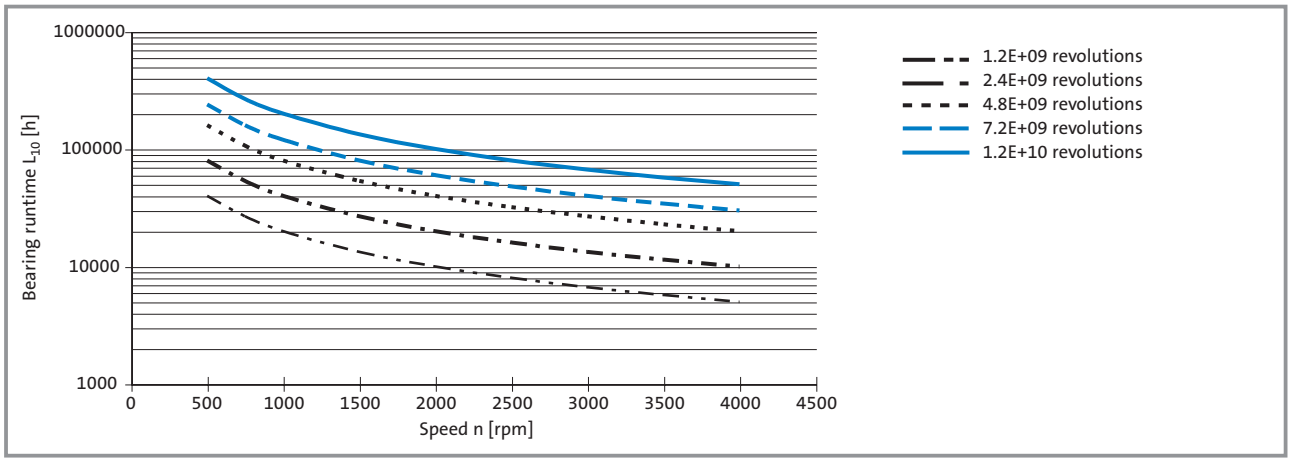
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



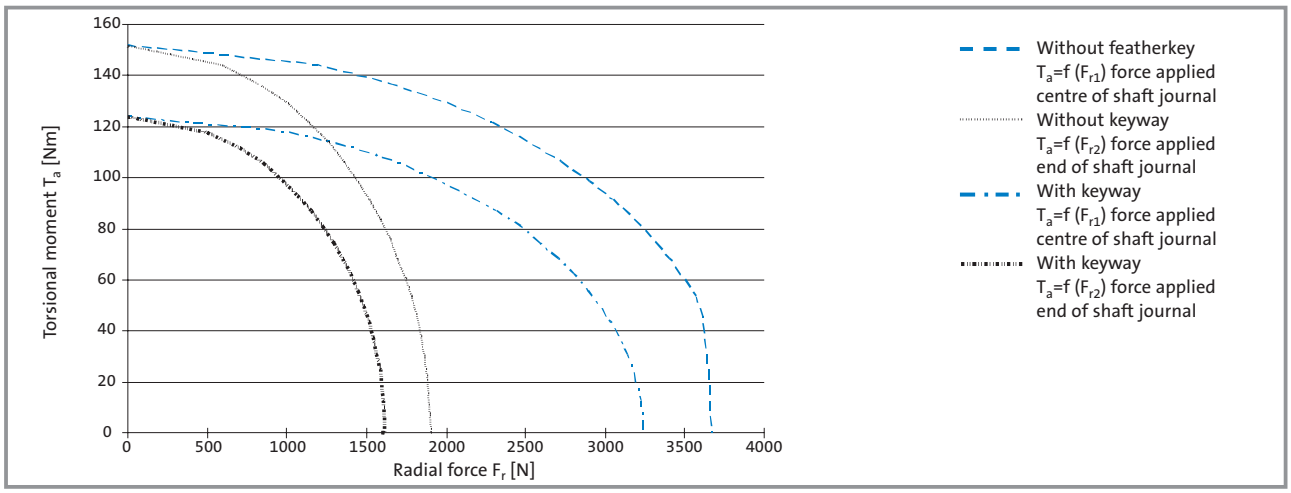
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	η %	I_{max} A	J_{Motor} without brake kg m² · 10⁻⁴
MCS 19F14	1425	32	86	27	4.0	9.9	8.6	335	95	92	31	65.0
MCS 19F30	3000	32	86	21	6.6	19.8	14.0	300	200	93	63	65.0
MCS 19J14	1425	51	129	40	6.0	15.2	12.3	330	95	92	45	105.0
MCS 19J30	3000	51	129	29	9.1	30.5	18.5	300	200	93	90	105.0
MCS 19P14	1350	64	190	51	7.2	17.5	14.3	330	90	92	60	160.0
MCS 19P30	3000	64	190	32	10.0	34.9	19.0	320	200	93	120	160.0

Motor	kE_{LL}-factor at 150 °C V/1000 rpm	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	L_{phase} mH	kt_0-factor at 150 °C Nm/A	Power connector type	Weight without brake kg	Maximum speed mech. 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	EWS0013	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	EWS0013	40	4000

The Operating Instructions for the MCS motors can be found in the download area of the Lenze Internet site at www.Lenze.de

MCS 19F

MCS 19J

MCS 19P

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz								
Type			**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]			2.0	4.0	8.0	12.7	17.0	20.0
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]			4.0	8.0	16.0	32.0	48.0	64.0
Motor type								
MCS 19F14	M_N	[Nm]			25.1	27.0		
	M_0	[Nm]			25.9	32.0		
	M_{max} n = 0[4)]	[Nm]			28.6	54.6		
	M_{max}	[Nm]			48.9	86.0		
MCS 19F30	M_N	[Nm]				19.1	21.0	21.0
	M_0	[Nm]				20.5	27.5	32.0
	M_{max} n = 0[4)]	[Nm]				27.2	40.5	53.0
	M_{max}	[Nm]				47.2	68.3	86.0
MCS 19J14	M_N	[Nm]				40.0	40.0	
	M_0	[Nm]				42.6	51.0	
	M_{max} n = 0[4)]	[Nm]				58.9	85.0	
	M_{max}	[Nm]				97.9	129.0	
MCS 19J30	M_N	[Nm]					26.6	29.0
	M_0	[Nm]					28.4	33.4
	M_{max} n = 0[4)]	[Nm]					42.6	56.9
	M_{max}	[Nm]					73.9	96.1
MCS 19P14	M_N	[Nm]				45.3	51.0	51.0
	M_0	[Nm]				46.4	62.2	64.0
	M_{max} n = 0[4)]	[Nm]				64.6	95.3	123.8
	M_{max}	[Nm]				110.5	157.9	190.0
MCS 19P30	M_N	[Nm]					28.6	32.0
	M_0	[Nm]					31.2	36.7
	M_{max} n = 0[4)]	[Nm]					45.8	61.1
	M_{max}	[Nm]					80.5	106.0

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper 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	3.0	6.0	12.1	18.1	24.2
Maximum current > 5 Hz[1)2)3)] [A]		2.7	5.3	10.7	21.3	32.0	42.7
Motor type							
MCS 19F14	M_N [Nm]				26.7	27.0	
	M_0 [Nm]				27.5	32.0	
	M_{max} n = 0[4)] [Nm]				37.9	54.6	
	M_{max} [Nm]				62.9	86.0	
MCS 19F30	M_N [Nm]					17.0	20.0
	M_0 [Nm]					18.3	21.5
	M_{max} n = 0[4)] [Nm]					27.2	36.3
	M_{max} [Nm]					47.2	61.5
MCS 19J14	M_N [Nm]					36.7	40.0
	M_0 [Nm]					37.9	44.6
	M_{max} n = 0[4)] [Nm]					58.9	76.7
	M_{max} [Nm]					97.9	124.2
MCS 19J30	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0[4)] [Nm]						
	M_{max} [Nm]						
MCS 19P14	M_N [Nm]					40.3	47.4
	M_0 [Nm]					41.3	48.6
	M_{max} n = 0[4)] [Nm]					64.6	85.5
	M_{max} [Nm]					110.5	142.8
MCS 19P30	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0[4)] [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply.
3) Caution: On the ECS automatic switching to 4 kHz not taken into account; when using automatic switching to 4 kHz, the maximum torques and currents apply at 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz											
Controller type			**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**
Continuous current [A]			1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0
Maximum current 0 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0
Maximum current > 5 Hz[1)2)] [A]			2.3	3.8	5.9	10.5	19.5	35.25	48.0	70.5	88.5	133.5
Motor type												
MCS 19F14	M_N	[Nm]				22.0	27.0	27.0				
	M_0	[Nm]				22.6	32.0	32.0				
	M_{max} n = 0	[Nm]				33.0	58.2	68.3				
	M_{max}	[Nm]				33.0	58.2	86.0				
MCS 19F30	M_N	[Nm]					19.5	21.0	21.0			
	M_0	[Nm]					21.0	32.0	32.0			
	M_{max} n = 0	[Nm]					29.3	35.3	47.2			
	M_{max}	[Nm]					29.3	51.6	68.3			
MCS 19J14	M_N	[Nm]					40.0	40.0	40.0			
	M_0	[Nm]					43.6	51.0	51.0			
	M_{max} n = 0	[Nm]					63.1	74.7	97.9			
	M_{max}	[Nm]					63.1	106.2	129.0			
MCS 19J30	M_N	[Nm]						29.0	29.0	29.0	29.0	
	M_0[4)]	[Nm]						39.3	51.0	51.0	51.0	
	M_{max} n = 0	[Nm]						36.8	50.2	72.5	79.6	
	M_{max}	[Nm]						55.3	73.9	104.7	127.7	
MCS 19P14	M_N	[Nm]					46.4	51.0	51.0			
	M_0[4)]	[Nm]					47.5	64.0	64.0			
	M_{max} n = 0	[Nm]					69.5	83.2	110.5			
	M_{max}	[Nm]					69.5	120.6	157.9			
MCS 19P30	M_N	[Nm]						32.0	32.0	32.0	32.0	
	M_0[4)]	[Nm]						43.1	58.7	64.0	64.0	
	M_{max} n = 0	[Nm]						39.6	53.9	78.8	86.9	
	M_{max}	[Nm]						59.4	80.5	116.1	143.7	

1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) On the 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz.

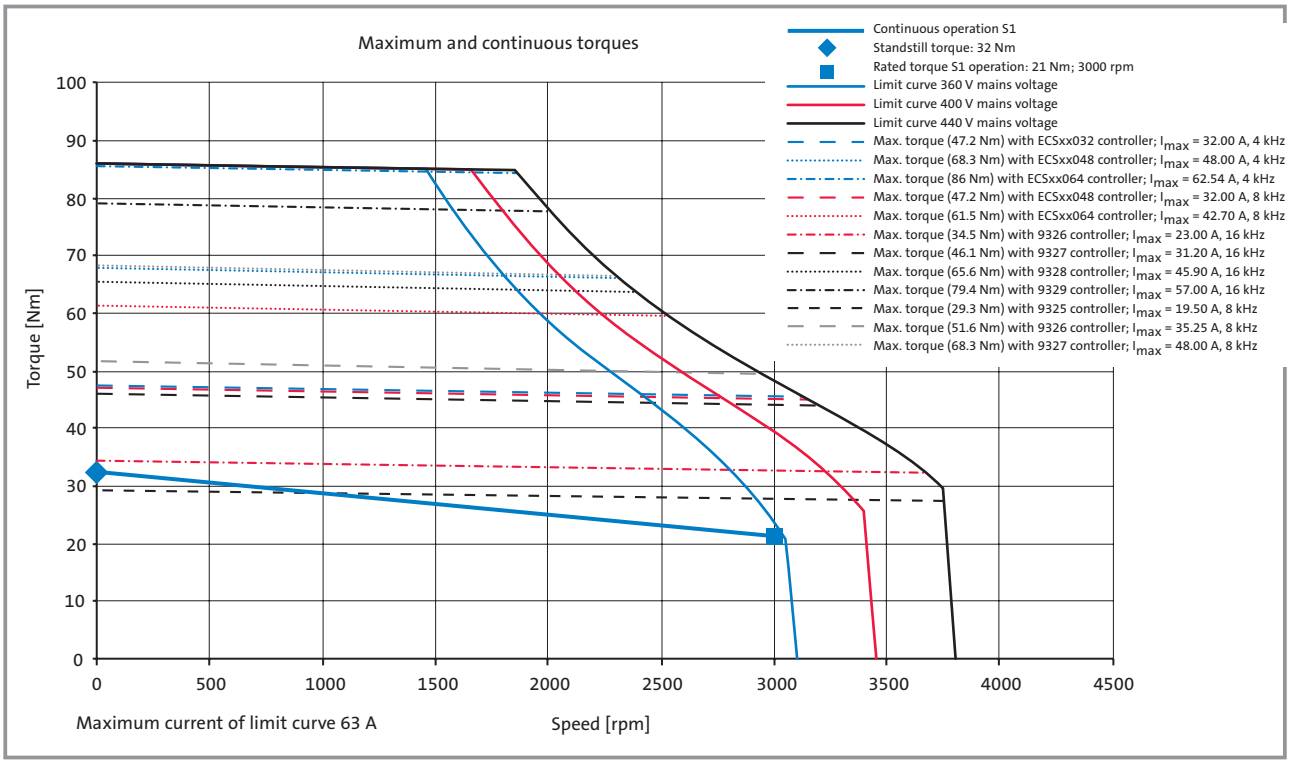
Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz											
Controller 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	38.0	58.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0
Maximum current > 5 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0
Motor type											
MCS 19F14	M_N [Nm]					27.0	27.0	27.0			
	M_0 [Nm]					31.4	32.0	32.0			
	M_{max} n = 0 [Nm]					45.0	47.0	61.6			
	M_{max} [Nm]					45.0	67.1	85.9			
MCS 19F30	M_N [Nm]						21.0	21.0	21.0	21.0	
	M_0 [4)] [Nm]						24.7	32.0	32.0	32.0	
	M_{max} n = 0 [Nm]						23.0	31.2	45.2	48.5	
	M_{max} [Nm]						34.5	46.1	65.6	79.4	
MCS 19J14	M_N [Nm]					31.5	40.0	40.0	40.0		
	M_0 [4)] [Nm]					32.5	51.0	51.0	51.0		
	M_{max} n = 0 [Nm]					47.5	49.8	66.9	94.2		
	M_{max} [Nm]					47.5	73.3	95.8	129.0		
MCS 19J30	M_N [Nm]						24.0	29.0	29.0	29.0	29.0
	M_0 [4)] [Nm]						25.6	34.8	51.0	51.0	51.0
	M_{max} n = 0 [Nm]						24.0	32.6	48.0	51.7	69.6
	M_{max} [Nm]						36.1	48.9	70.9	86.5	125.8
MCS 19P14	M_N [Nm]						51.0	51.0	51.0	51.0	
	M_0 [4)] [Nm]						56.0	64.0	64.0	64.0	
	M_{max} n = 0 [Nm]						54.6	74.2	106.1	113.6	
	M_{max} [Nm]						81.6	108.0	152.0	182.3	
MCS 19P30	M_N [Nm]						25.8	32.0	32.0	32.0	32.0
	M_0 [4)] [Nm]						28.1	38.1	56.1	64.0	64.0
	M_{max} n = 0 [Nm]						25.8	35.0	51.5	55.6	75.6
	M_{max} [Nm]						38.7	52.5	77.1	94.9	141.5

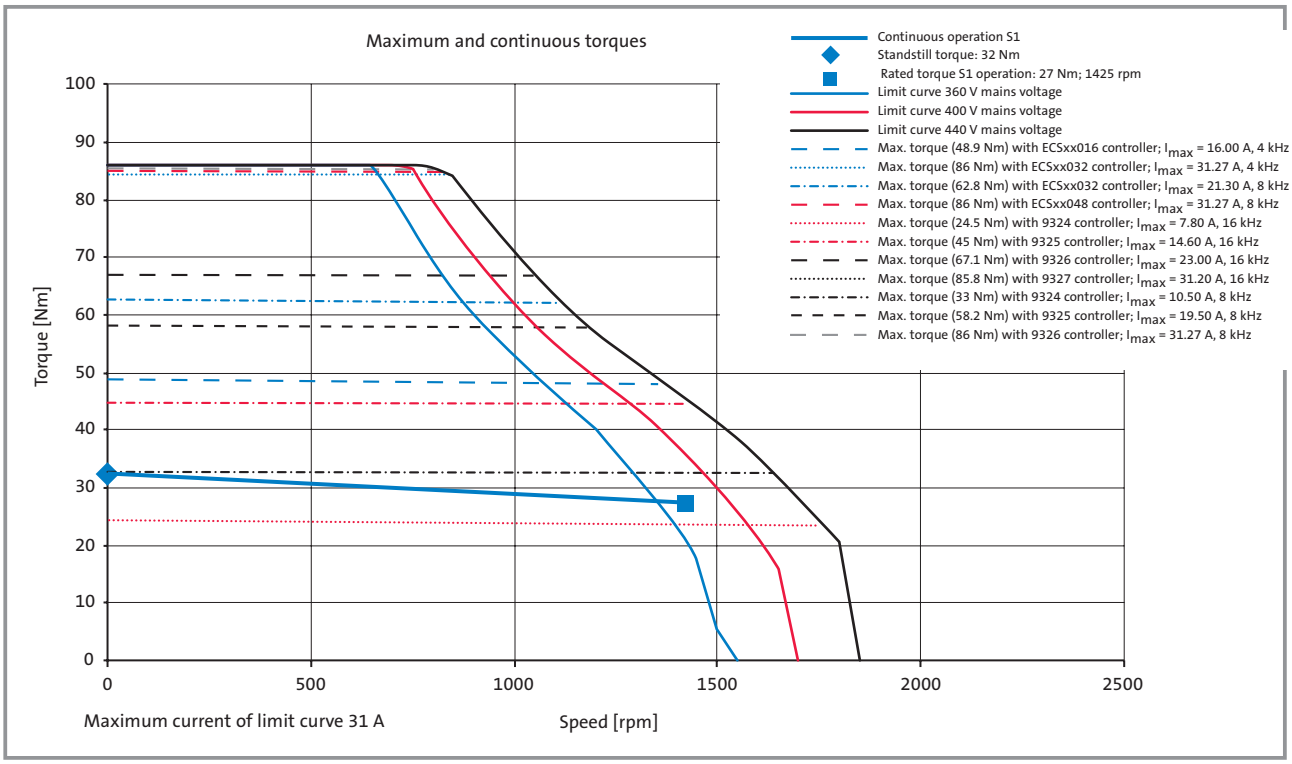
1) Caution: Limit I_{max} controller to I_{max} motor
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) On the 9329 and 9330 at frequencies > 5 Hz, derating below 5 Hz

Torque characteristics

MCS 19F30

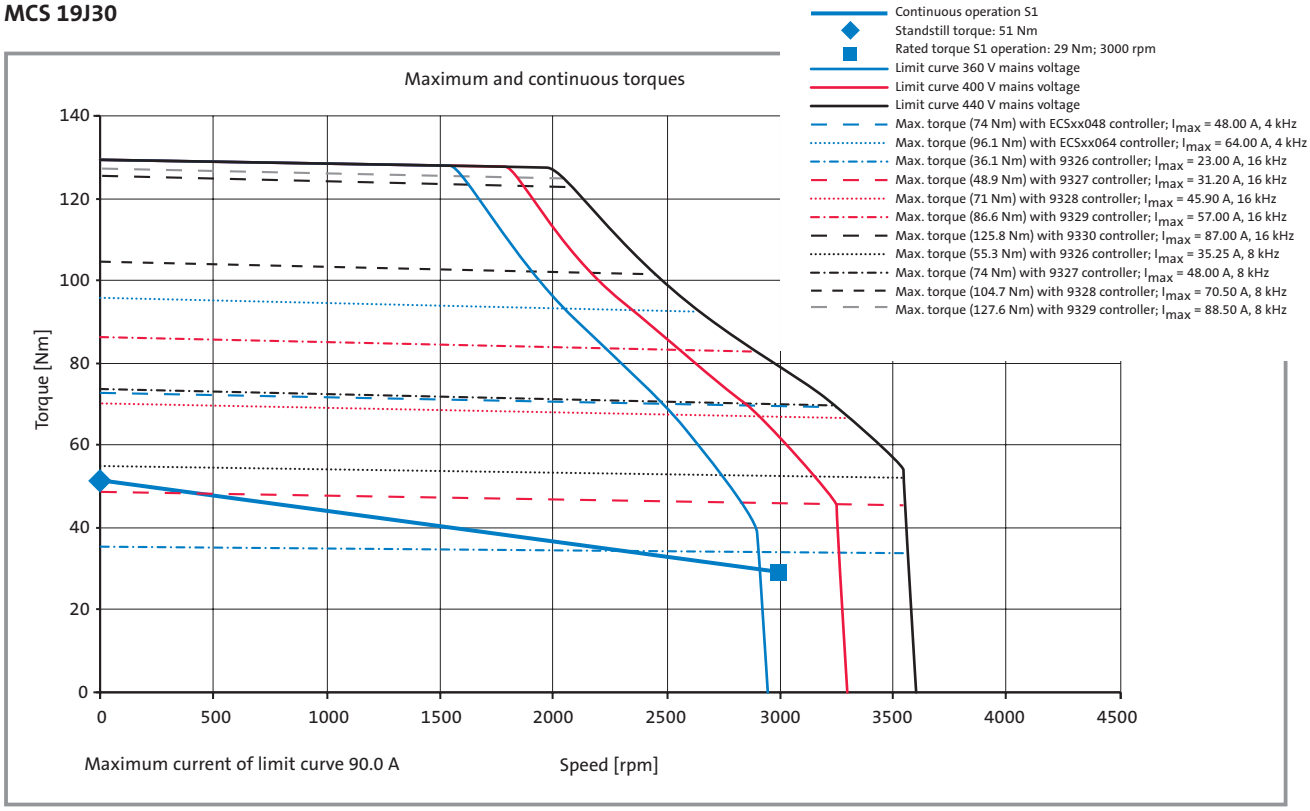


MCS 19F14

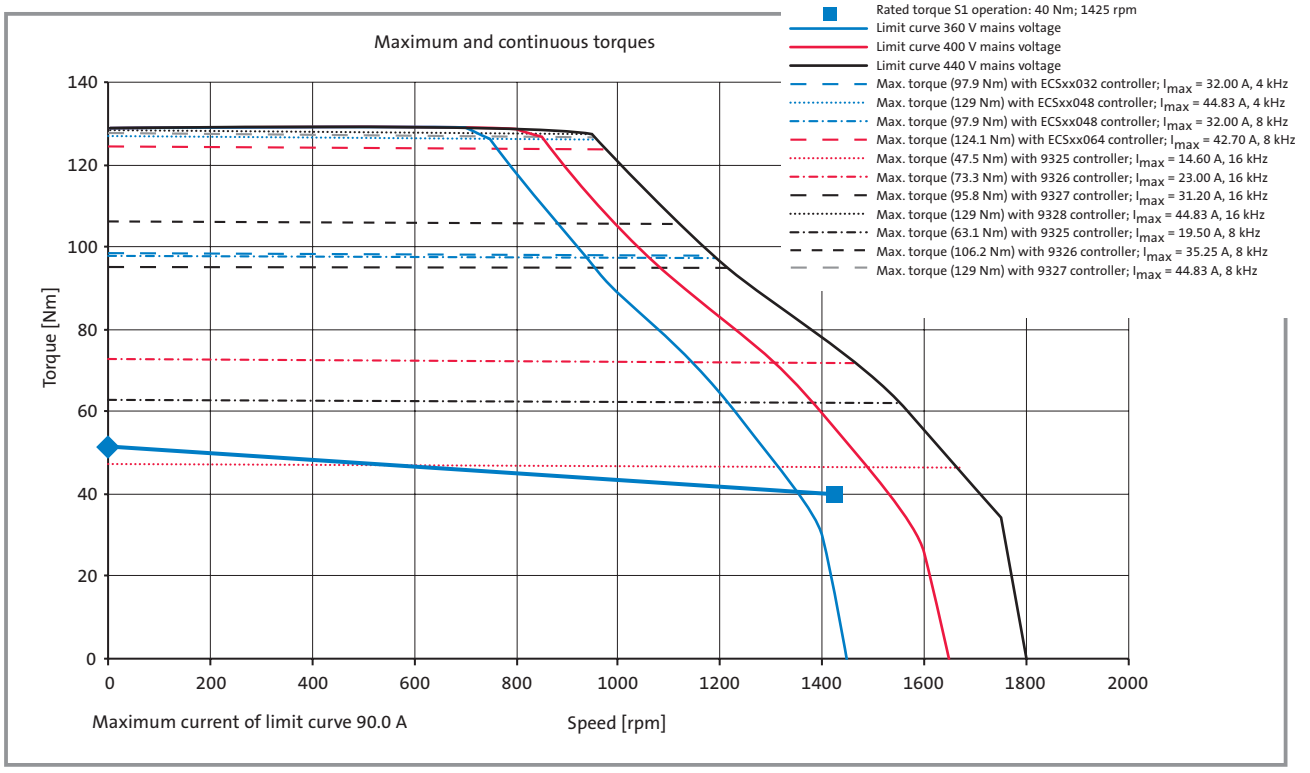


At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

MCS 19J30



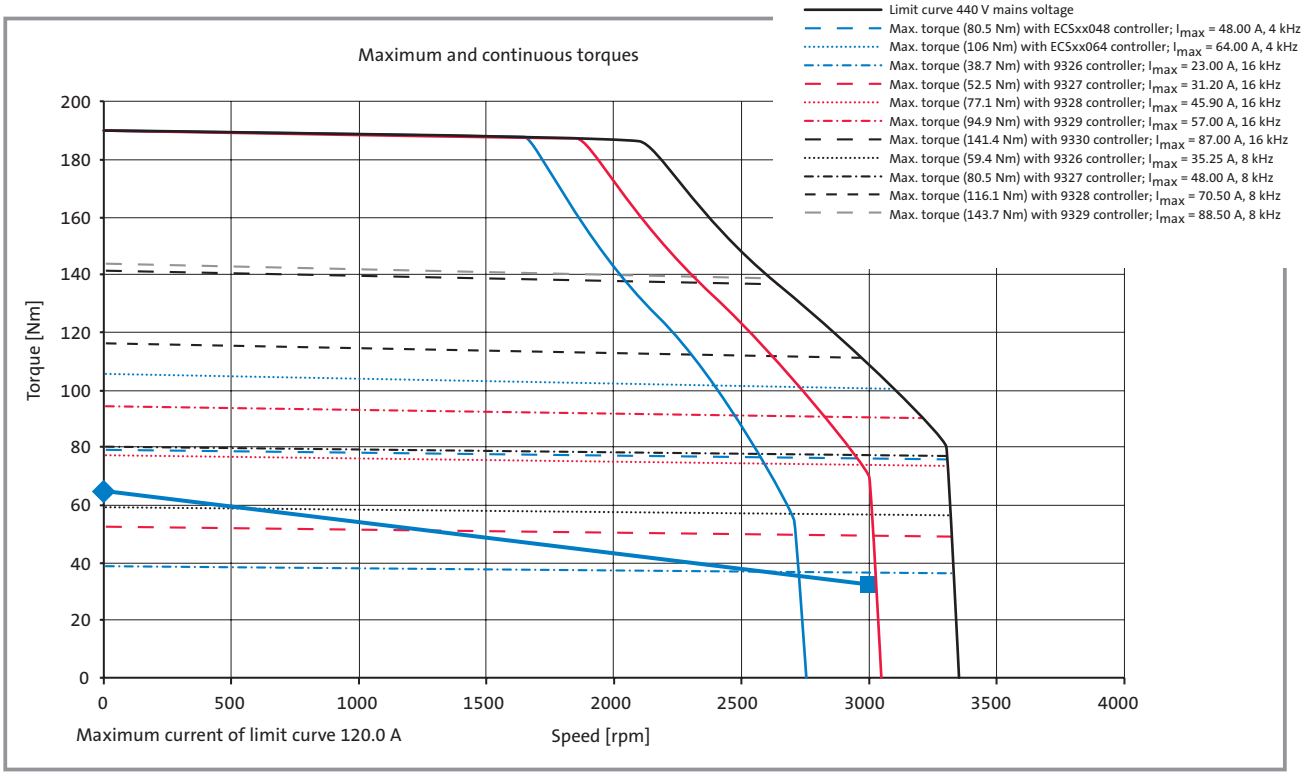
MCS 19J14



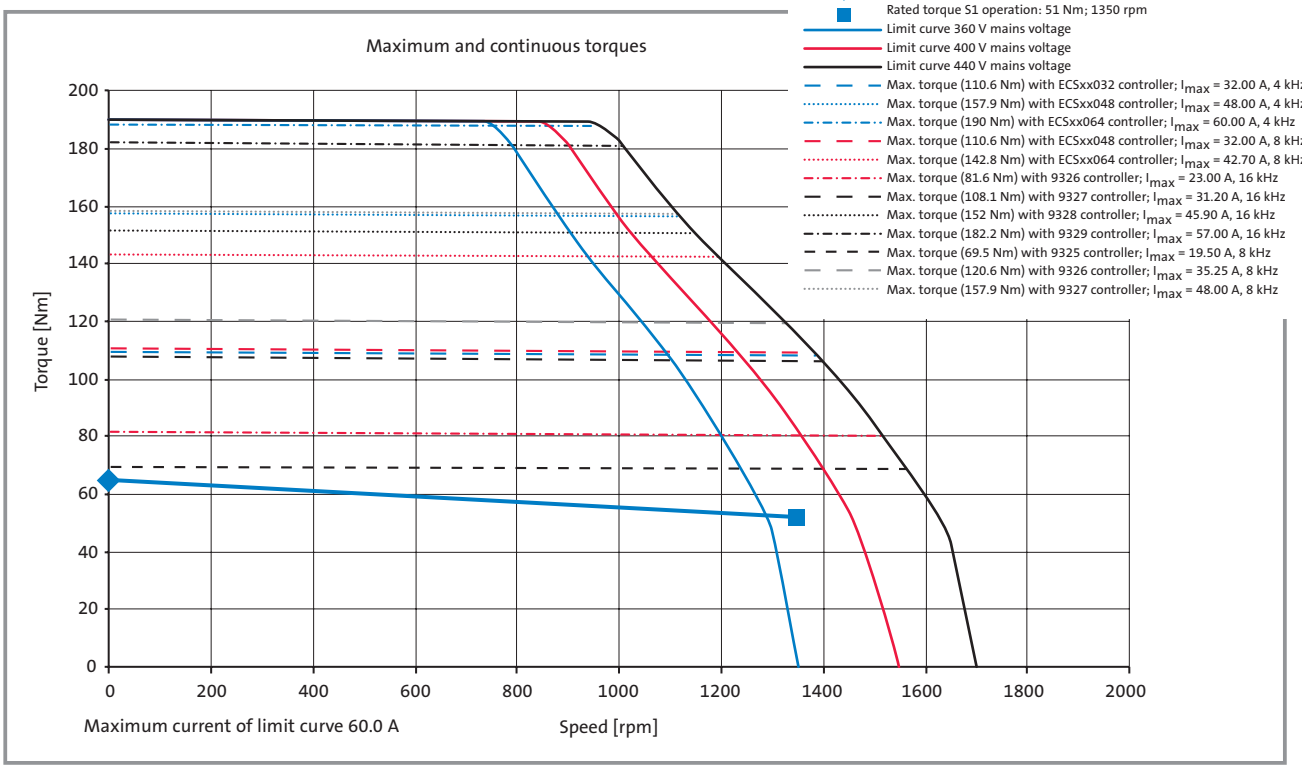
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Torque characteristics

MCS 19P30



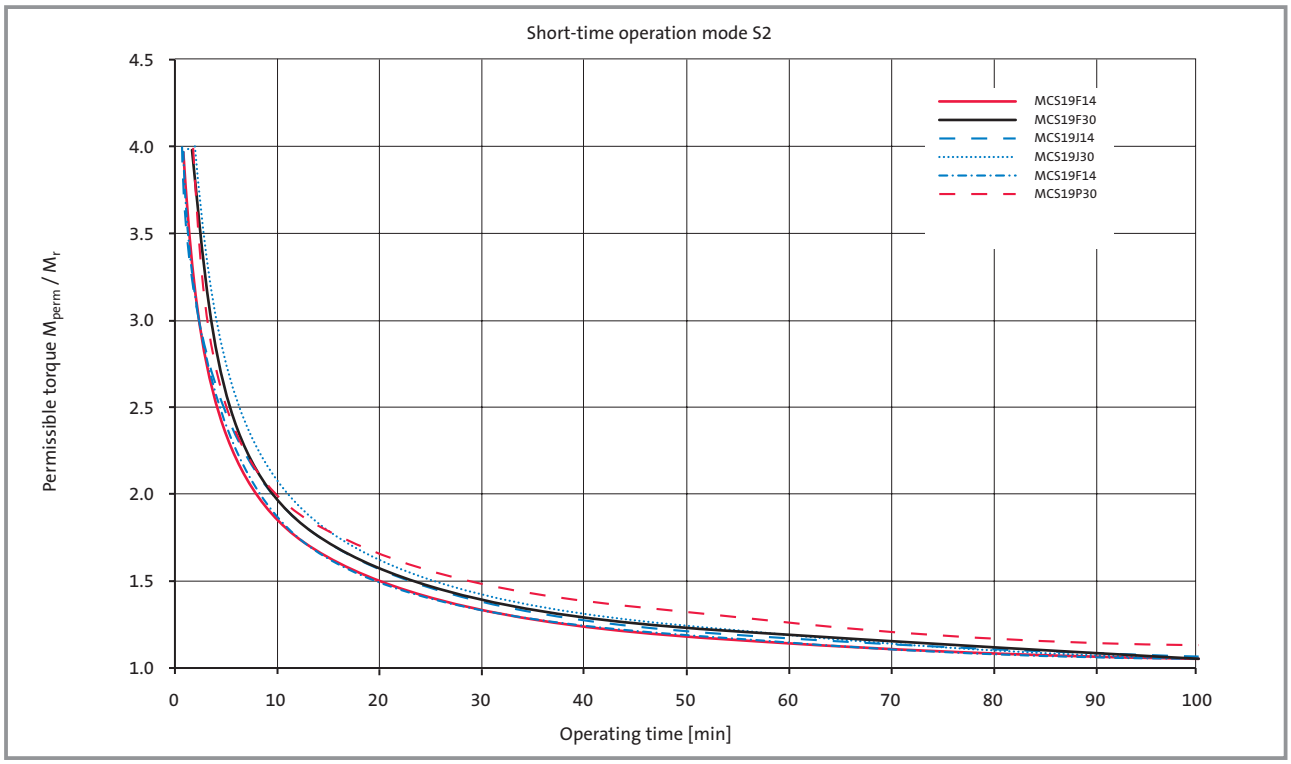
MCS 19P14

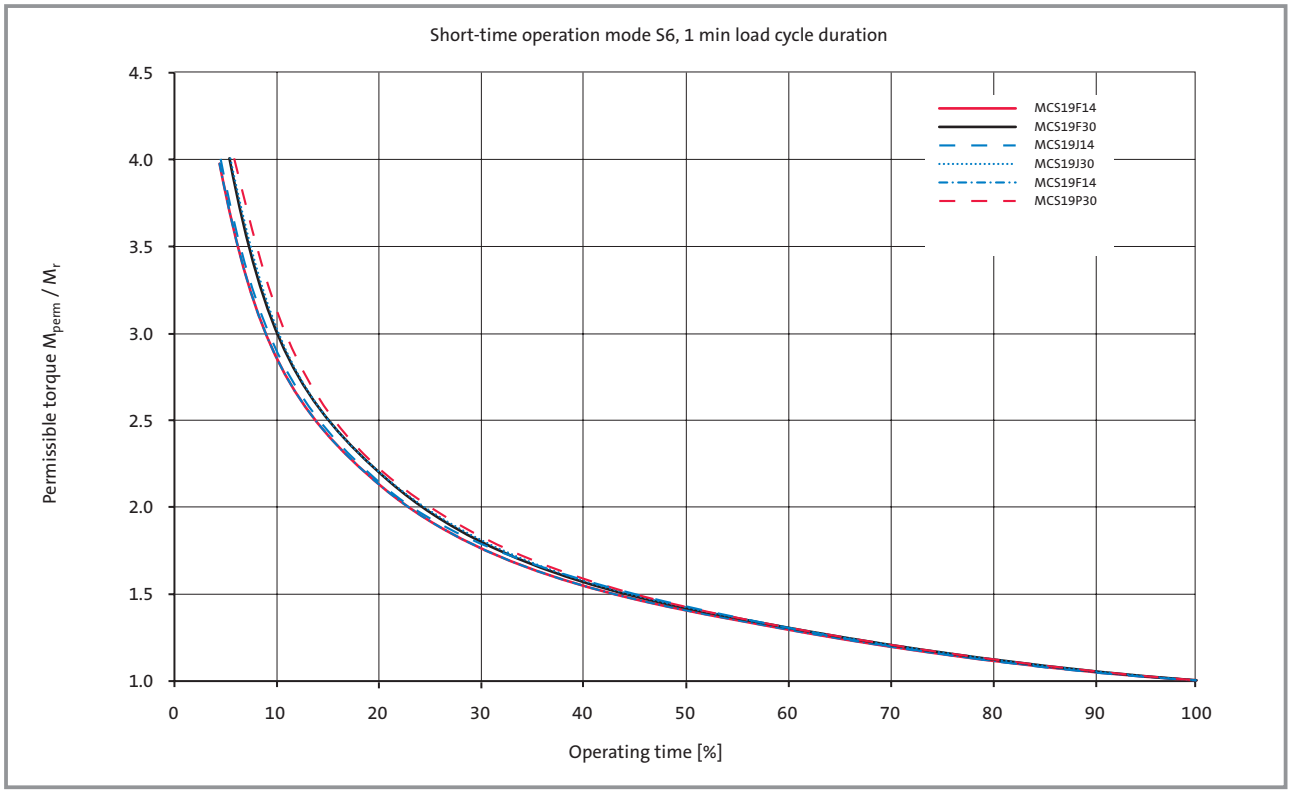


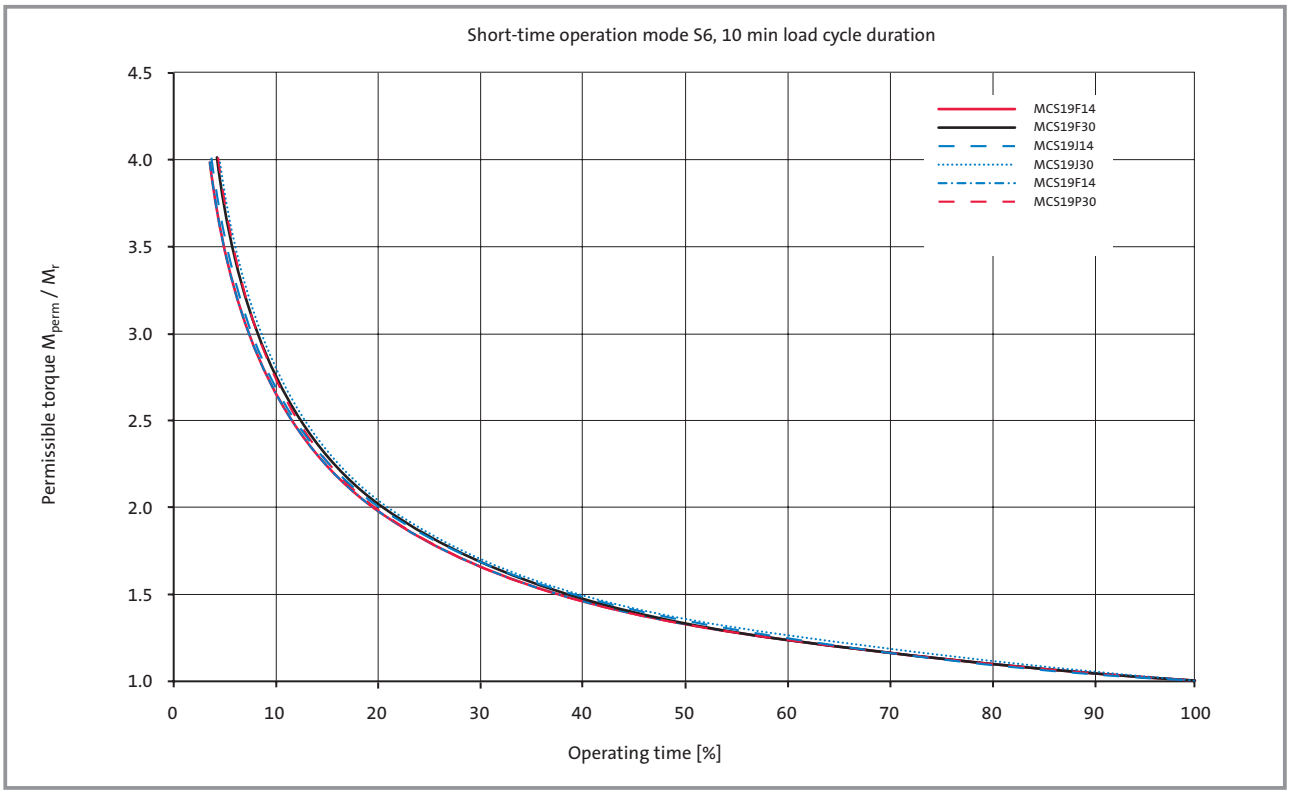
At speeds < 75 rpm servo controller derating may need to be taken into account. See "Servo controller assignment" tables.

Short-time operation characteristic

Lenze MCS synchronous servo motors are designed to be used in dynamic applications with high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.






Short-time operation mode S6, 10 min load cycle duration
Permissible torque M_{perm} / M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
MCS19F14
MCS19F30
MCS19J14
MCS19J30
MCS19F14
MCS19P30

Brake assignment

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

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

Brake assignment MCS 19

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

MCS 19F30, MCS 19F14

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B [3] +5 % – -10 % V	I_B [2] A	J_B kg m² · 10⁻⁴	Engagement time t_1 [1] ms	Disengagement time t_2 [1] ms	Maximum switching rate per emergency stop with n = 3.000 rpm J	Weight kg
P1	11H	37	32	15	24	0.93	12.4	96	113	2350	1.5

[1] Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.

[2] The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.

[3] Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{Motor} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{Motor}
MCS 19F	P1	77.4	5.2

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Brake assignment

MCS 19J30, MCS 19J14
MCS 19P30, MCS 19P14

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynamic torque M_{1m} 120 °C Nm	U_B [3] +5 % – -10 % V	I_B [2] A	J_B kg m² · 10⁻⁴	Engagement time t_1 [1] ms	Disengagement time t_2 [1] ms	Maximum switching rate per emergency stop with 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 valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.

[2] The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.

[3] Smoothed DC voltage, ripple < 1%.

Permissible moments of inertia

Motor	Brake type	J_{Motor} with brake kg m² · 10⁻⁴	Permissible J_{load} / J_{Motor}
MCS 19J	P2	135	2.2
MCS 19P	P2	190	1.2

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input. The following applies to Lenze system cables:

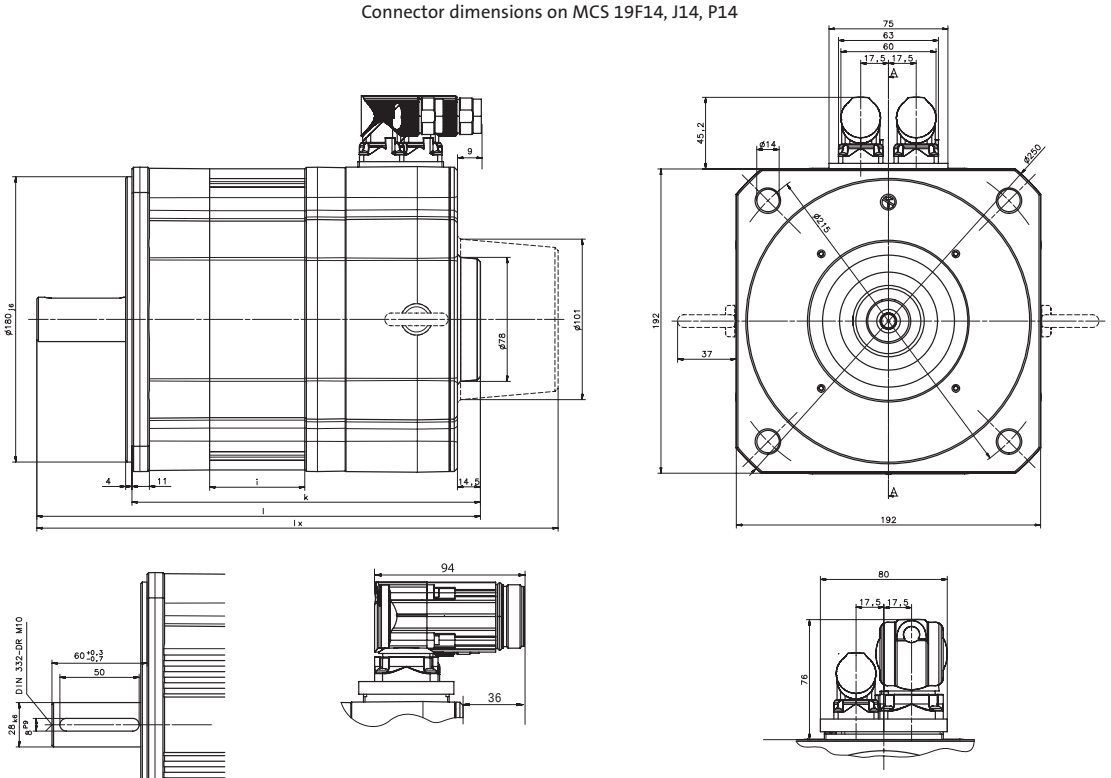
$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

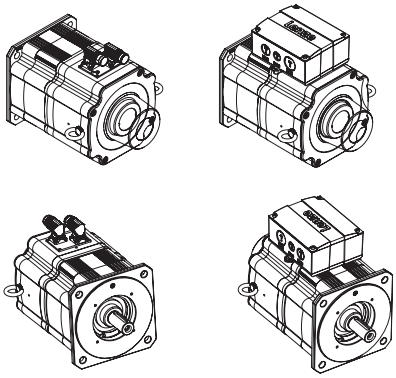
Mechanical dimensions

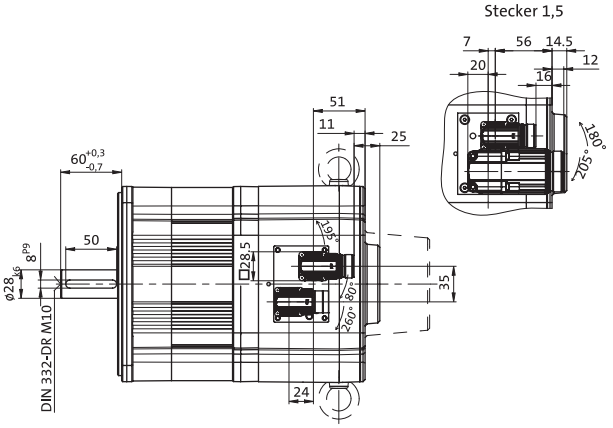
Connector dimensions on MCS 19F14, J14, P14



Keyway 8 x 50 mm
(acc. to DIN 6885, Sheet 1)

Connector dimensions on MCS 19J30, F30



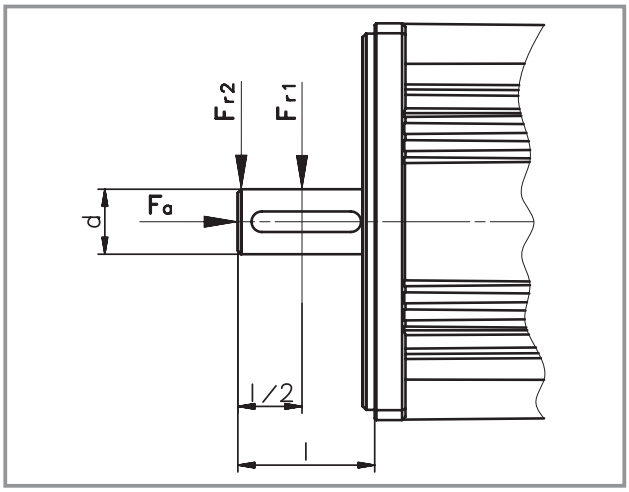


Motor type	Motor **without** holding brake				Motor **with** holding brake			
	i [mm]	k [mm]	l [mm]	lx [mm]	i [mm]	k [mm]	l [mm]	lx [mm]
MCS 19F	60	220	280	329	60	254	314	363
MCS 19J	100	260	320	369	100	304	364	413
MCS 19P	160	320	380	429	160	364	424	473

l Motor length with installation of a resolver as feedback
lx Motor length with installation of an absolute value encoder as feedback
i Package length

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

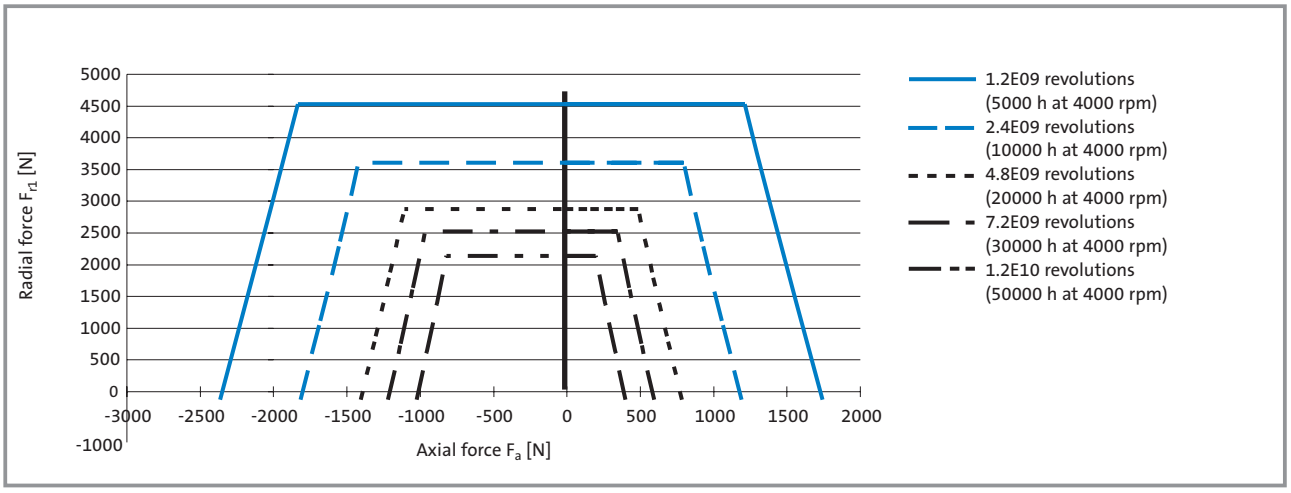
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

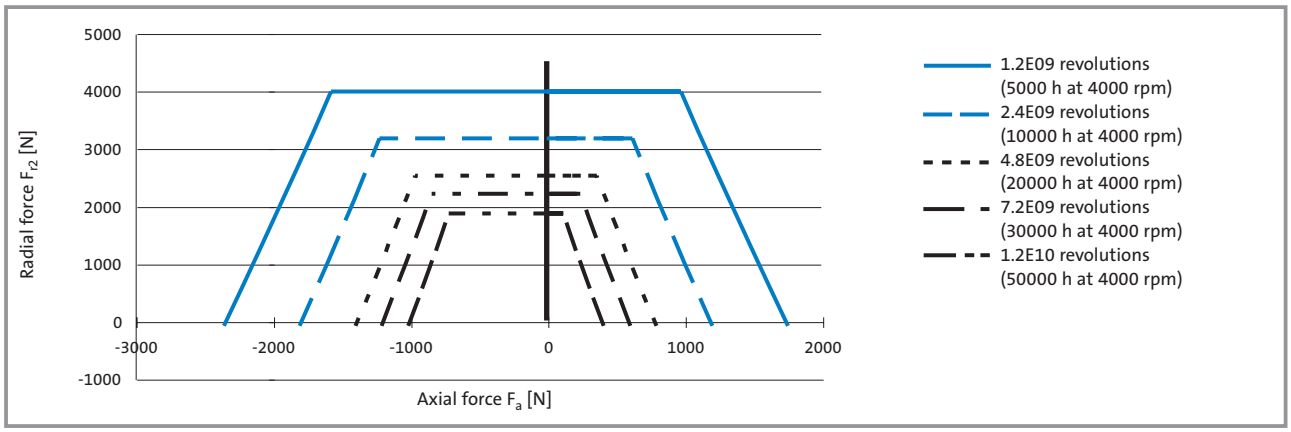
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The characteristics are valid for all MCS 19 frame sizes

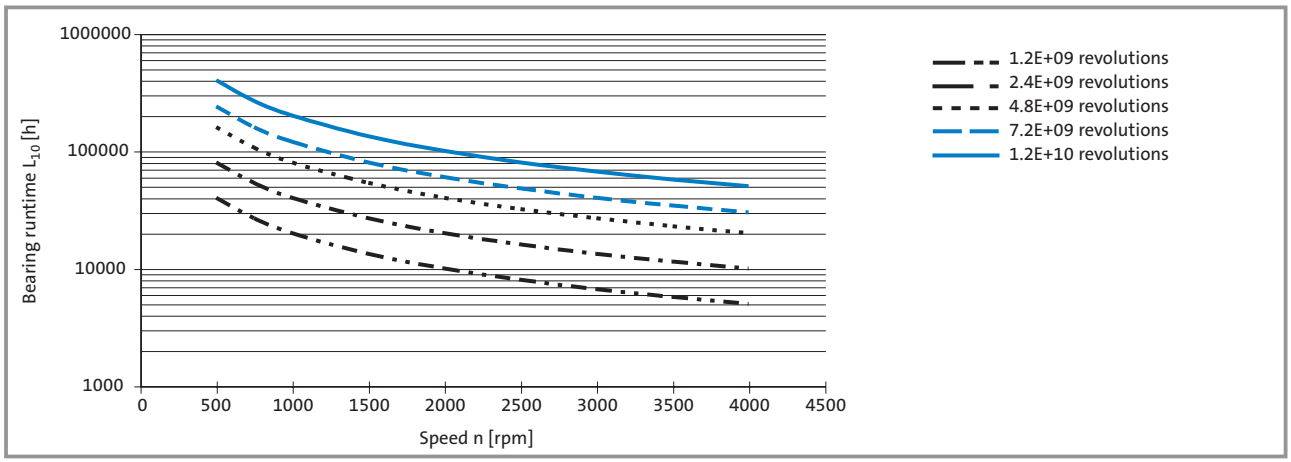
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



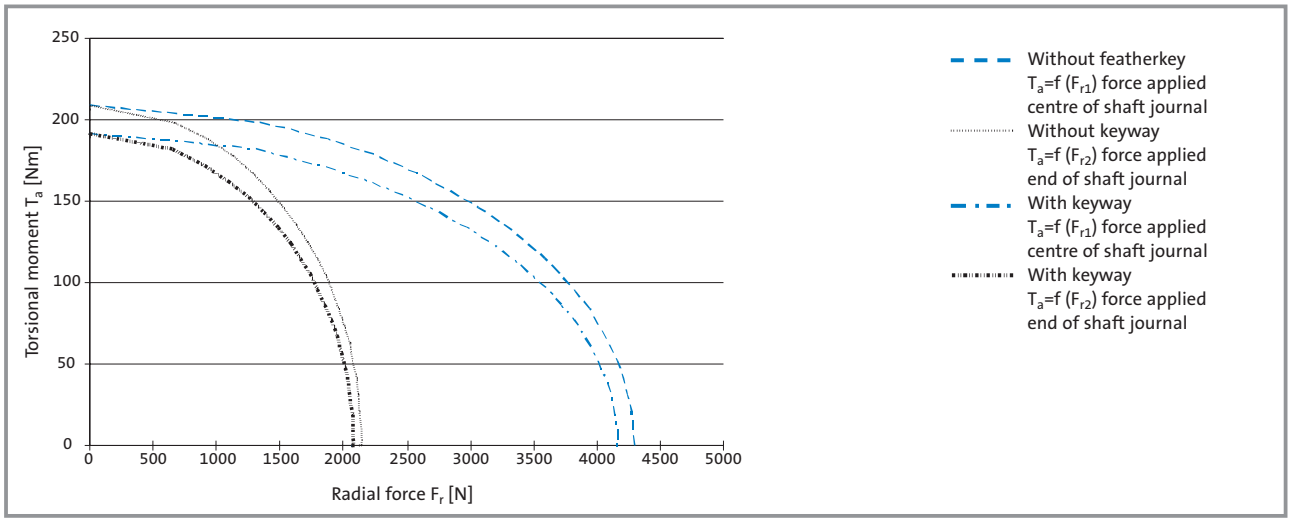
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

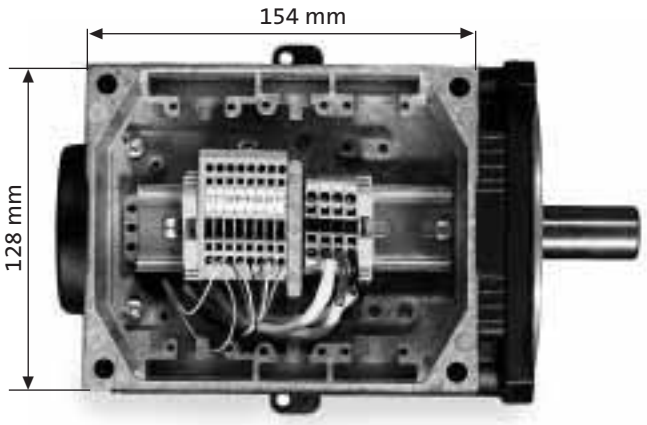
The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading

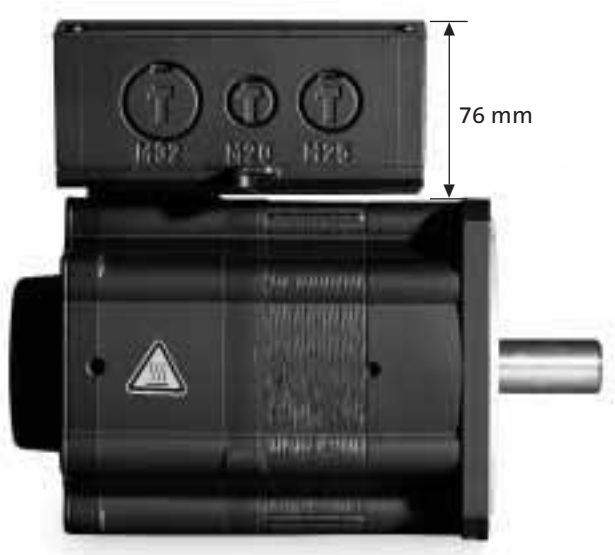


Relationship between radial force and torsional moment on the shaft.

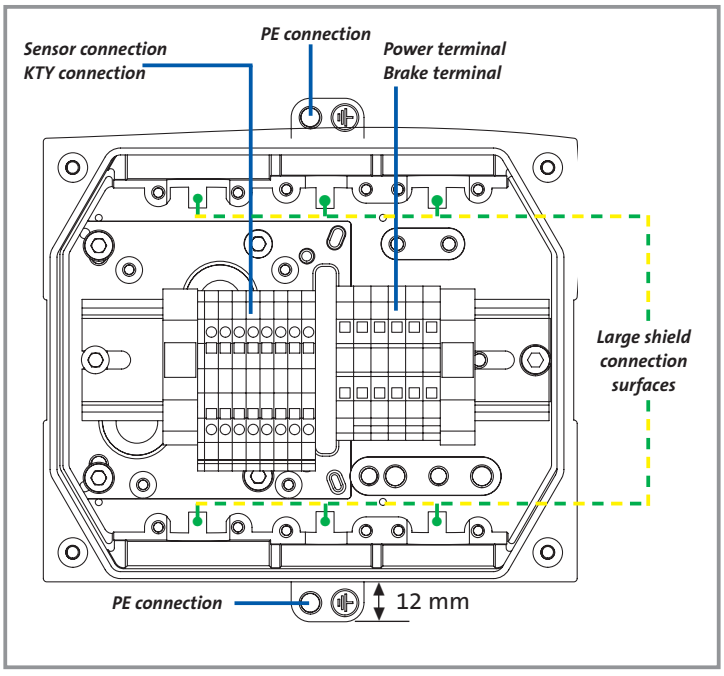
If an MCS servo motor is to be connected to an existing cable or plug connectors are not to be used for other reasons, the connection can also be made via a terminal box. In order to ensure the required long term vibration resistance of the cable connectors with sufficient contact pressure, tension spring terminals are used.
The terminal box features sufficient space for customer wiring and large shield contact surfaces for a safe EMC-compliant connection. The outgoing cable can be routed to the right or left-hand side according to requirements.



View from above of the MCS 14D with terminal box



Side view of the MCS 14D with terminal box



Internal view of terminal box

Openings for cable connectors:
- 2xM20, 2xM25, 2xM32
- Openings are cast-closed and can be knocked through the customer if required

Terminal assignment for power terminal

Terminal	Connections
U	Motor phase
V	Motor phase
W	Motor phase
PE	PE conductor
Y1	Brake
Y2	Brake

Permissible cable cross-sections for power connection terminals

Motor	2.5 mm²	4 mm²	10 mm²
MCS 09 (all frame sizes)	▲	▲*)	
MCS 12 (all frame 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

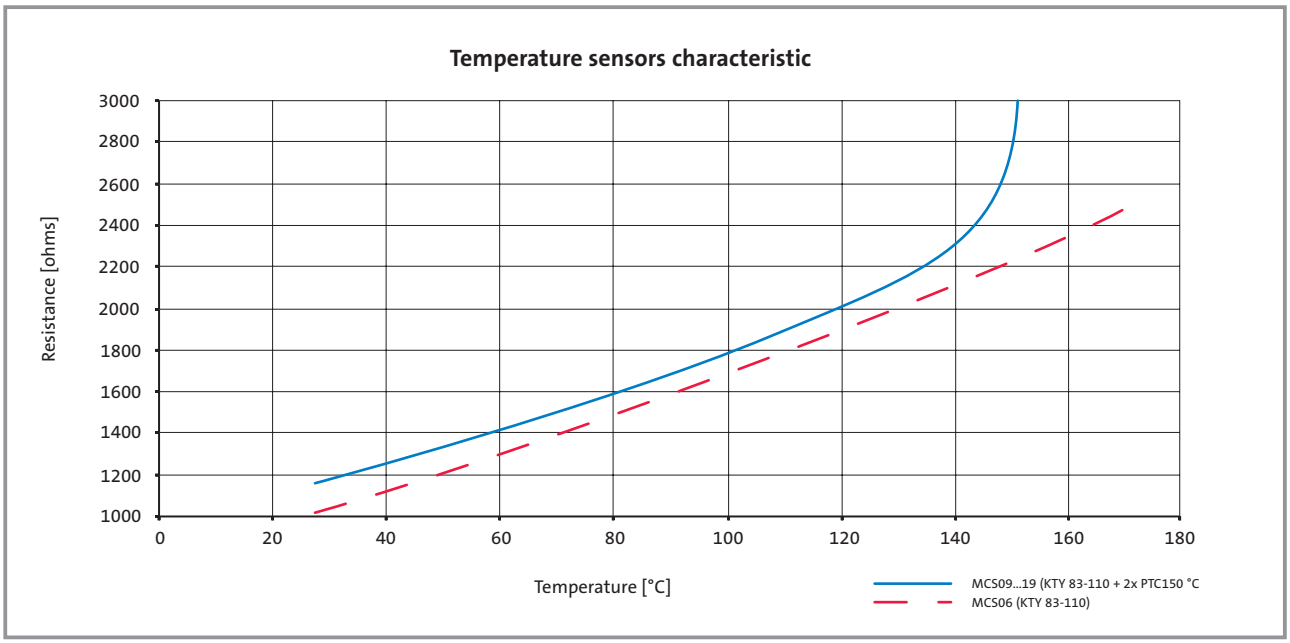
Terminal assignment feedback and temperature monitoring

Resolver			Absolute value encoder (SRX50)			Cross-section
Terminal	Connection	Wire colour	Terminal	Connection	Wire colour	mm²
S1	Thermostat	S1	Thermostat	0.14/0.21		
S2	Thermostat	S2	Thermostat	0.14/0.21		
T1	KTY thermal detector (+)		T1	KTY thermal detector (+)		0.14/0.21
T2	KTY thermal detector (-)		T2	KTY thermal detector (-)		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	VDC power supply	red	0.14/0.21
B2	-REF	yellow/white	B2	Earth 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	Data+ RS485	grey	0.14/0.21
–	–	–	B8	Data- RS485	green	0.14/0.21

The thermal sensors used in the MCS motors continually monitor the motor temperature. The temperature information is passed to the servo controller via the system cable of the feedback system. Due to the varying physical conditions, two different types of temperature monitoring mechanisms are used with the MCS motors (neither provide full motor protection).

MCS 06
In this motor, the winding temperature of a winding phase is monitored by a KTY 83-110 thermal sensor.

MCS 09-MCS 19
These motors are monitored by three thermal sensors connected in series (1x KTY 83-110 + 2x PTC 150 °C). This enables the normal operating temperature of the motor to be measured very accurately and also, in the event of an overtemperature in one of the winding phases, allows the controller to carry out the appropriate action.



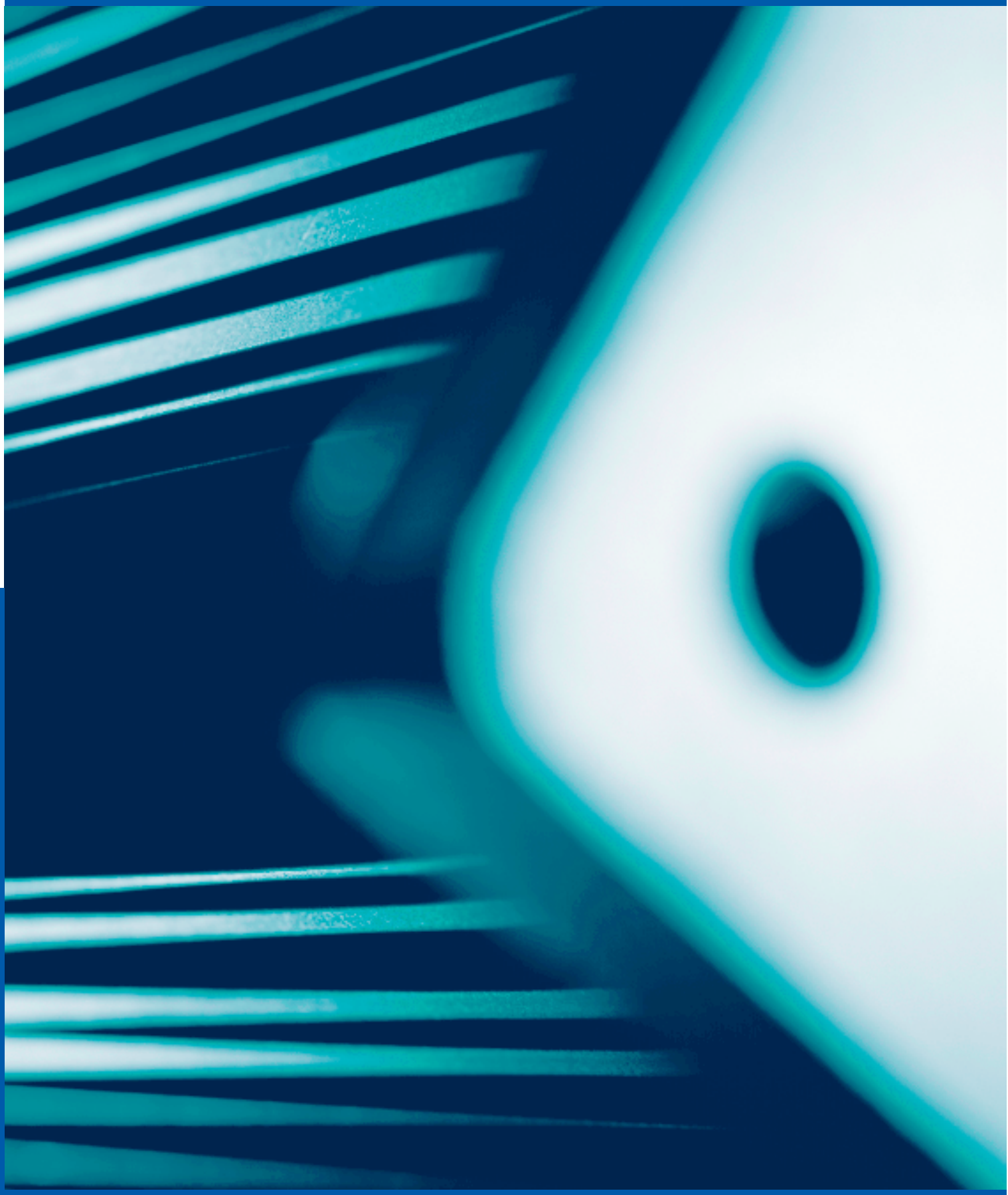
If the sensor is supplied with a measured current of 1 mA, the above relationship between the temperature and the resistance applies.

Note:
To ensure trouble-free operation, the thermal sensor must be connected to the servo controller with the correct polarity.

Details concerning

Phase angle sensors and tacho generators
Pin assignment
System cables
System connectors

for the MCS synchronous servo motors can be found in Chapter 5.



Technical data

MCA asynchronous servo motors

Asynchronous servo motors MCA 10/13

Rated data 3-3
Servo controller assignment 3-4
Torque characteristics 3-8
Brake assignment 3-12
Mechanical dimensions 3-13
Permissible shaft loads 3-16

Asynchronous servo motors MCA 14

Rated data 3-21
Servo controller assignment 3-22
Torque characteristics 3-26
Brake assignment 3-30
Mechanical dimensions 3-31
Permissible shaft loads 3-32

Asynchronous servo motors MCA 17

Rated data 3-35
Servo controller assignment 3-36
Torque characteristics 3-40
Brake assignment 3-44
Mechanical dimensions 3-45
Permissible shaft loads 3-46

Asynchronous servo motors MCA 19

Rated data 3-49
Servo controller assignment 3-50
Torque characteristics 3-54
Brake assignment 3-58
Mechanical dimensions 3-59
Permissible shaft loads 3-60

Asynchronous servo motors MCA 21

Rated data 3-63
Servo controller assignment 3-64
Torque characteristics 3-68
Brake assignment 3-72
Mechanical dimensions 3-73
Permissible shaft loads 3-74

Terminal box

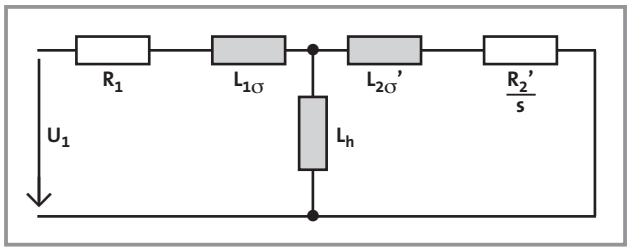
Terminal box 3-76

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	J_{mot} without brake kg m² · 10⁻⁴
natural ventilation											
MCA 10I40-...S00	3950	2.3	10	2.0	0.8	2.6	2.4	390	140	0.70	2.4
MCA 13I41-...S00	4050	4.6	32	4.0	1.7	4.6	4.4	390	140	0.76	8.3
forced ventilated											
MCA 13I34-...F10	3410	7.0	32	6.3	2.2	6.3	6.0	390	120	0.75	8.3

Motor	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Power connector type	Weight without brake kg	Maximum speed mech. rpm
natural ventilation											
MCA 10I40-...S00	70	9.40	12.7	4.7	9.8	167.8	8.20	10.0	EWS0001	6.4	8000
MCA 13I41-...S00	75	3.40	4.6	1.7	5.4	98.1	2.22	4.9	EWS0001	10.4	8000
forced ventilated											
MCA 13I34-...F10	72	3.40	4.6	1.7	4.9	81.9	2.23	4.4	EWS0001	12.0	8000

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram

MCA 10 asynchronous servo motor

MCA 13 asynchronous servo motor with fan and shaft end for mounting directly on Lenze G-motion gearboxes.

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		2.0	4.0	8.0	12.7	17.0	20.0
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 10I40-...S00	M_N [Nm]		2.0				
	M_0 [Nm]		2.3				
	M_{max} n = 0 [4)] [Nm]		5.6				
	M_{max} [Nm]		8.1				
MCA 13I41-...S00	M_N [Nm]		3.0	4.0			
	M_0 [Nm]		3.0	4.6			
	M_{max} n = 0 [4)] [Nm]		4.3	11.0			
	M_{max} [Nm]		9.4	18.2			
With blower							
MCA 13I34-...F10	M_N [Nm]			6.3			
	M_0 [Nm]			7.0			
	M_{max} n = 0 [4)] [Nm]			10.7			
	M_{max} [Nm]			20.8			

[1)] Caution: Limit $_{max}$ controller to I_{max} motor.
[2)] Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
[4)] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 8 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		1.35	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1, 3)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 10I40-...S00	M_N [Nm]		2.0				
	M_0 [Nm]		2.3				
	M_{max} n = 0 [4)] [Nm]		5.6				
	M_{max} [Nm]		8.1				
MCA 13I41-...S00	M_N [Nm]			4.0			
	M_0 [Nm]			4.6			
	M_{max} n = 0 [4)] [Nm]			11.0			
	M_{max} [Nm]			18.2			
With blower							
MCA 13I34-...F10	M_N [Nm]			4.8			
	M_0 [Nm]			4.8			
	M_{max} n = 0 [4)] [Nm]			10.7			
	M_{max} [Nm]			20.8			

1) Caution: Limit $_{max}$ controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: If $I_{max} > I_r$ controller in an ECS system, there is an automatic switchover to 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1) 2)] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [1)] [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 10I40-...S00	M_N [Nm]		2.0	2.0									
	M_0 [Nm]		2.2	2.3									
	M_{max} n = 0 [Nm]		4.4	7.3									
	M_{max} [Nm]		4.4	7.3									
MCA 13I41-...S00	M_N [Nm]				4.0	4.0							
	M_0 [Nm]				4.6	4.6							
	M_{max} n = 0 [Nm]				12.6	19.5							
	M_{max} [Nm]				12.6	19.5							
With blower													
MCA 13I34-...F10	M_N [Nm]				6.3	6.3							
	M_0 [Nm]				7.0	7.0							
	M_{max} n = 0 [Nm]				13.0	25.0							
	M_{max} [Nm]				13.0	25.0							

[1)] Caution: Limit I_{max} controller to I_{max} motor.
[2)] Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.

Servo controller assignment

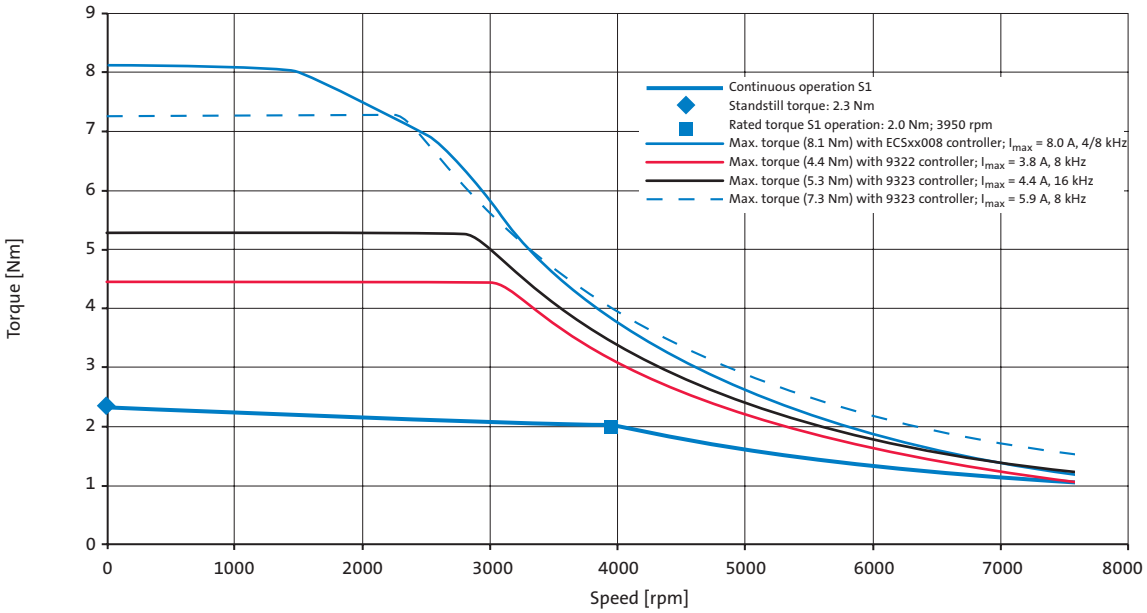
Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [1)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 10I40-...S00	M_N [Nm]			2.0									
	M_0 [Nm]			2.3									
	M_{max} n = 0 [Nm]			5.3									
	M_{max} [Nm]			5.3									
MCA 13I41-...S00	M_N [Nm]				4.0	4.0							
	M_0 [Nm]				4.6	4.6							
	M_{max} n = 0 [Nm]				9.2	17.3							
	M_{max} [Nm]				9.2	17.3							
With blower													
MCA 13I34-...F10	M_N [Nm]					6.3	6.3						
	M_0 [Nm]					7.0	7.0						
	M_{max} n = 0 [Nm]					19.0	19.8						
	M_{max} [Nm]					19.0	26.3						

[1)] Caution: Limit $_{max}$ controller to I_{max} motor.
[2)] Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.

Torque characteristics

MCA 10I40...S00

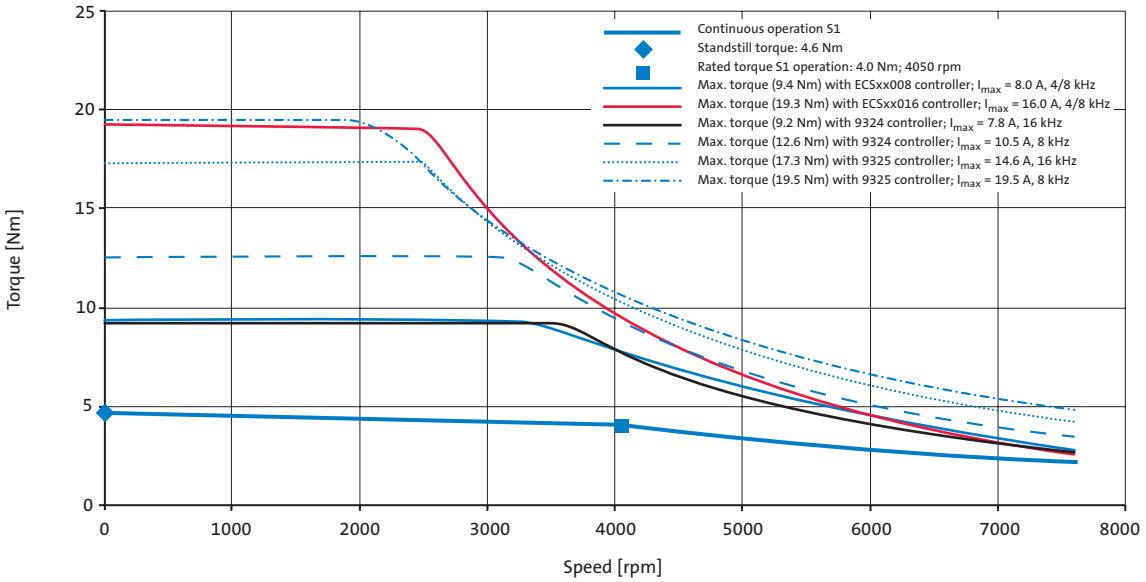


Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Torque characteristics

MCA 13I41...S00

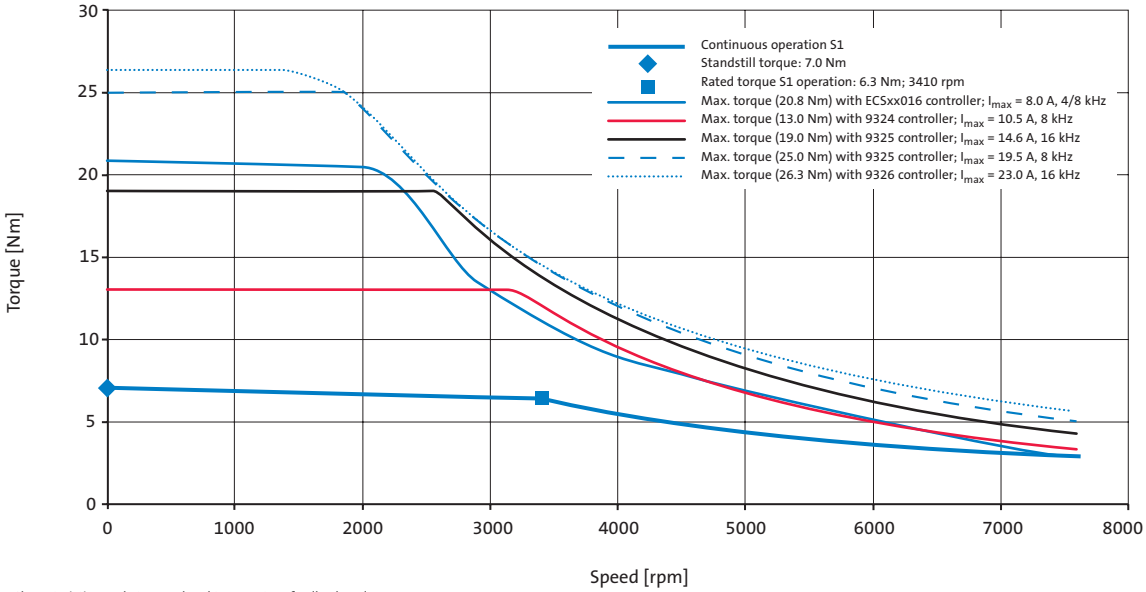
Maximum and continuous torques
MCA asynchronous servo motor 13I41 ... S00, 140 Hz, without fan



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS!

MCA 13I34...F10

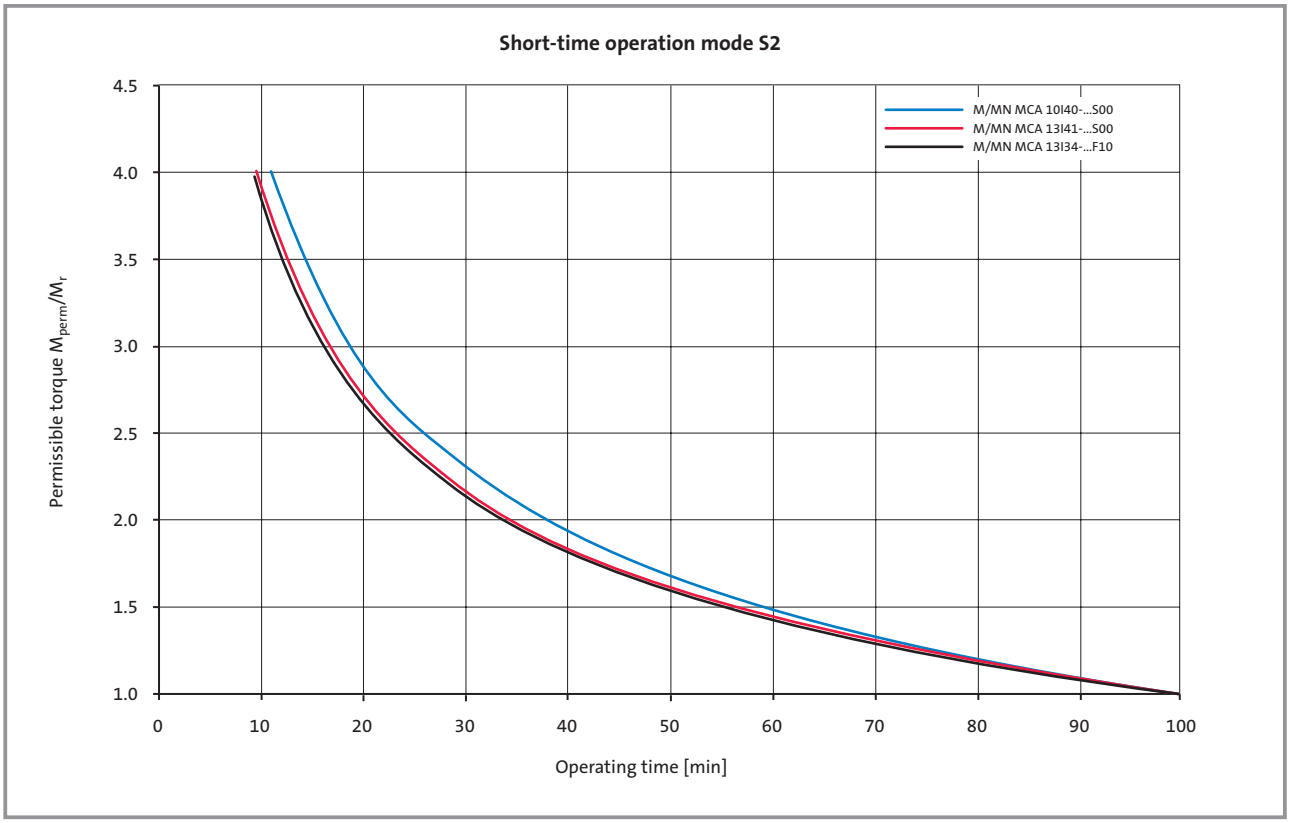
Maximum and continuous torques
MCA asynchronous servo motor 13I34 ... F10, 120 Hz, with blower

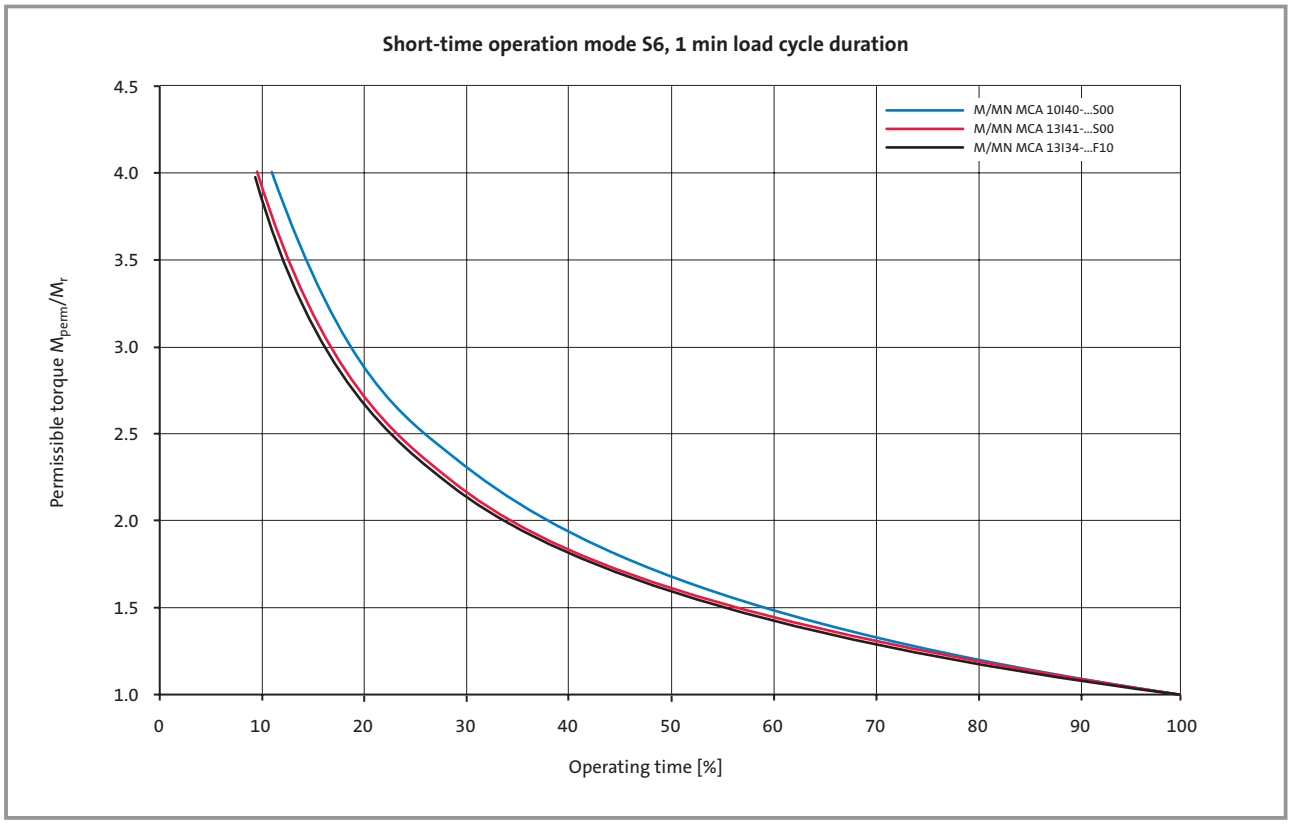


Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Short-time operation characteristic

Lenze MCA servo motors have high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.




Short-time operation mode S6, 1 min load cycle duration
M/MN MCA 10I40-...S00
M/MN MCA 13I41-...S00
M/MN MCA 13I34-...F10
Permissible torque M_{perm}/M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]


Short-time operation mode S6, 10 min load cycle duration
M/MN MCA 10I40-...S00
M/MN MCA 13I41-...S00
M/MN MCA 13I34-...F10
Permissible torque M_{perm}/M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]

Brake assignment

The MCA asynchronous servo motors can be fitted with integral permanent magnet holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCA 10
MCA 13

Type	MCA10 B5/B14	MCA13 B5/B14	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynam. M_{1m} 120 °C Nm	U_B +5 % – -10 %[3] V	I_{BR}[2] A	J_{BR} kg m² · 10⁻⁴	Engagement time t_1[1] ms	Diseng. time t_2[1] ms	Maximum switching rate emergency stop with n = 3000 rpm J	Weight kg
P1	●		06E	3.25	2.50	1.20	24	0.50	0.38	5	7	350	0.85
P5[4]	●		06E	3.25	2.50	1.20	205	0.06	0.38	5	7	350	0.85
P1		●	07H	12.0	11.0	5.50	24	0.67	1.06	20	29	400	0.83
P5[4]		●	07H	12.0	11.0	5.50	205	0.08	1.06	20	29	400	0.83

● Combination possible
Combination **not** possible

[1] Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
[2] The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
[3] Smoothed DC voltage, ripple 1%.
[4] UR not possible in the case of a brake with 205 V supply voltage.

Permissible moments of inertia

Motor	Brake	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load}/J_{mot}
MCA 10	P1	2.78	24.5
MCA 10	P5	2.78	24.5
MCA 13	P1	9.36	7.7
MCA 13	P5	9.36	7.7

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.
The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

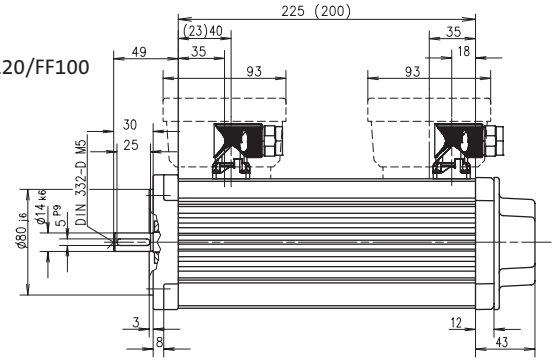
If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

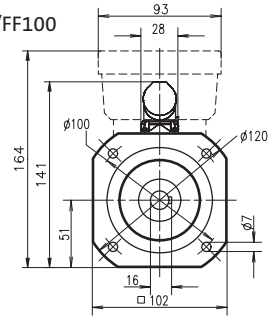
Mechanical dimensions

MCA 10

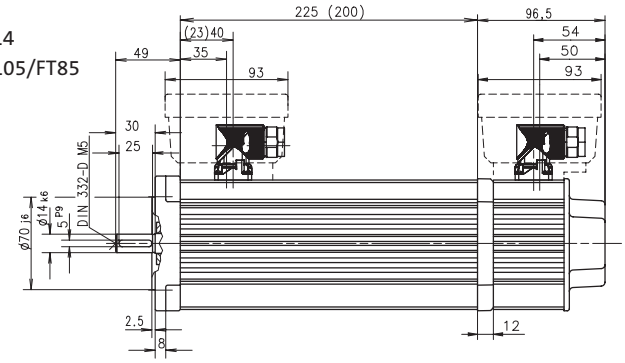
B5
A120/FF100



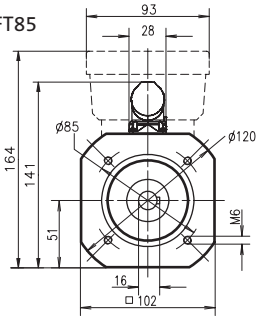
Encoder/ventilation
RS0 S00



B14
C105/FT85

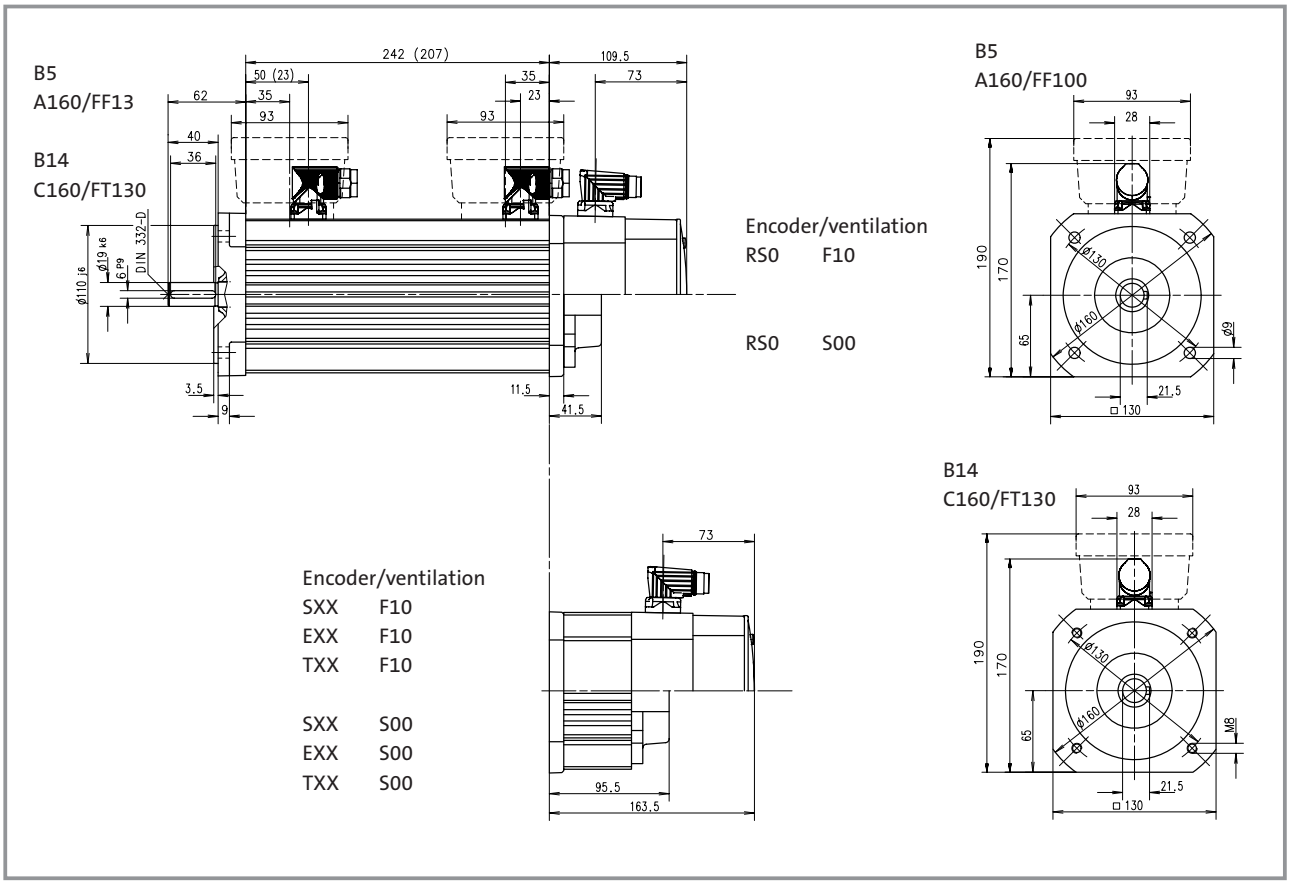


Encoder/ventilation
SXX S00
EXX S00
TXX S00



Mechanical dimensions

MCA 13

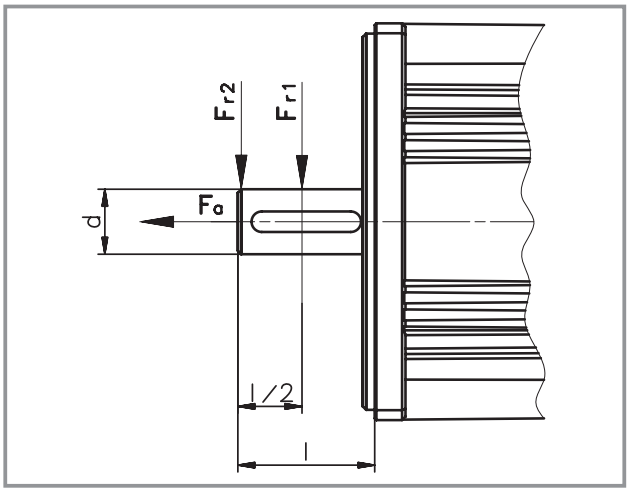


Blower data

U_N	f_N	I_N	P_N
[V]	[Hz]	[A]	[W]
210...240, 1 ph.	50/60	0.12	19

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

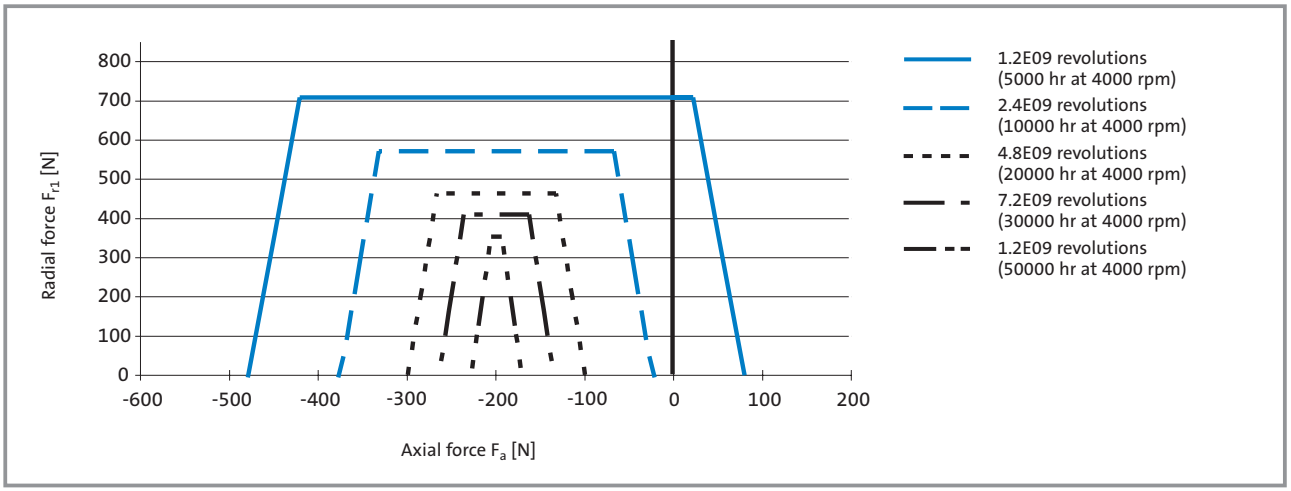
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

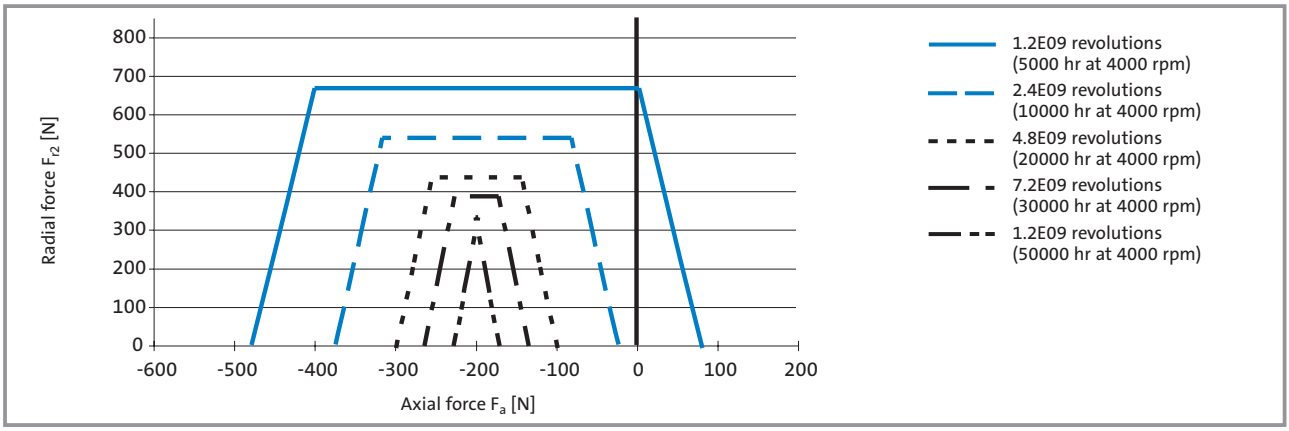
3

The curves apply to MCA 10

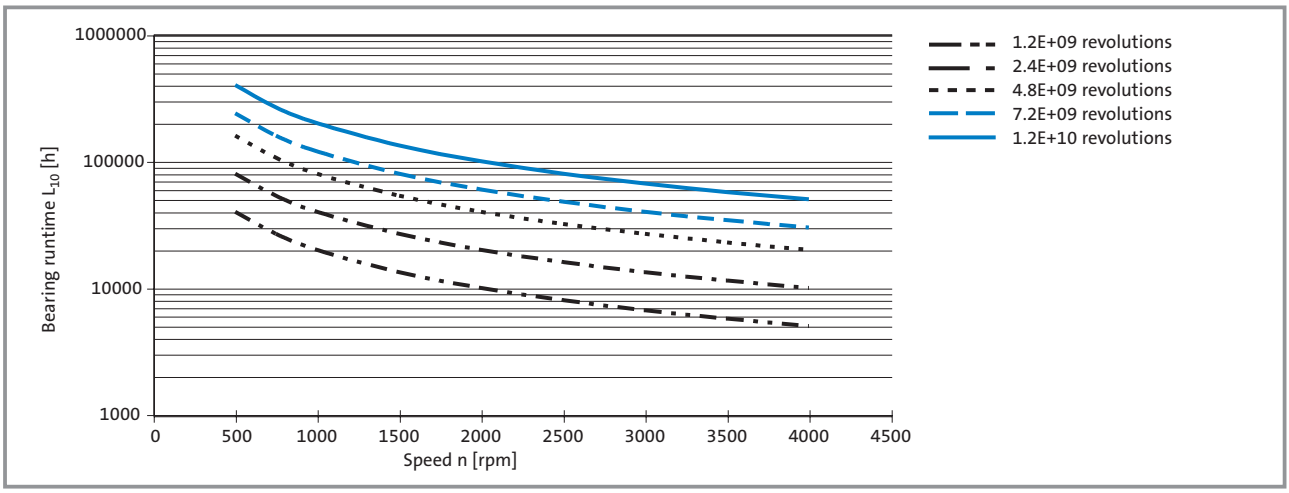
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



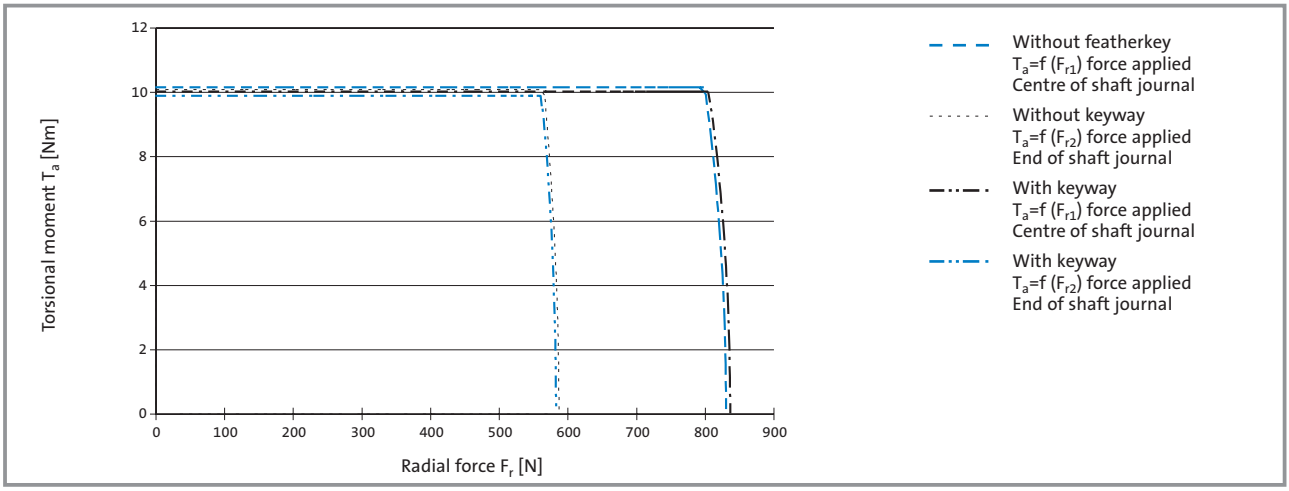
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

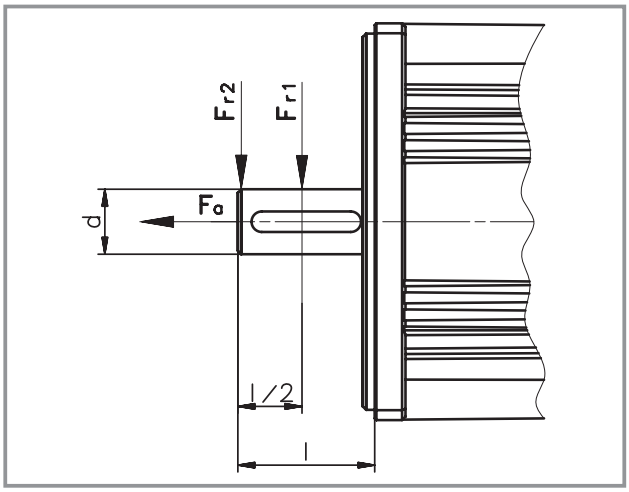
Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

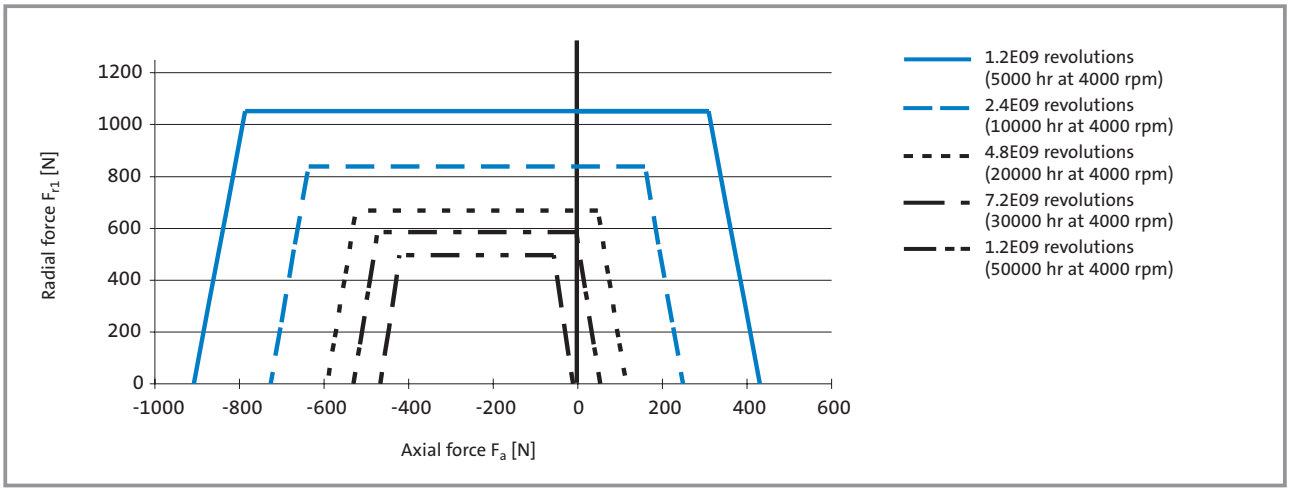
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

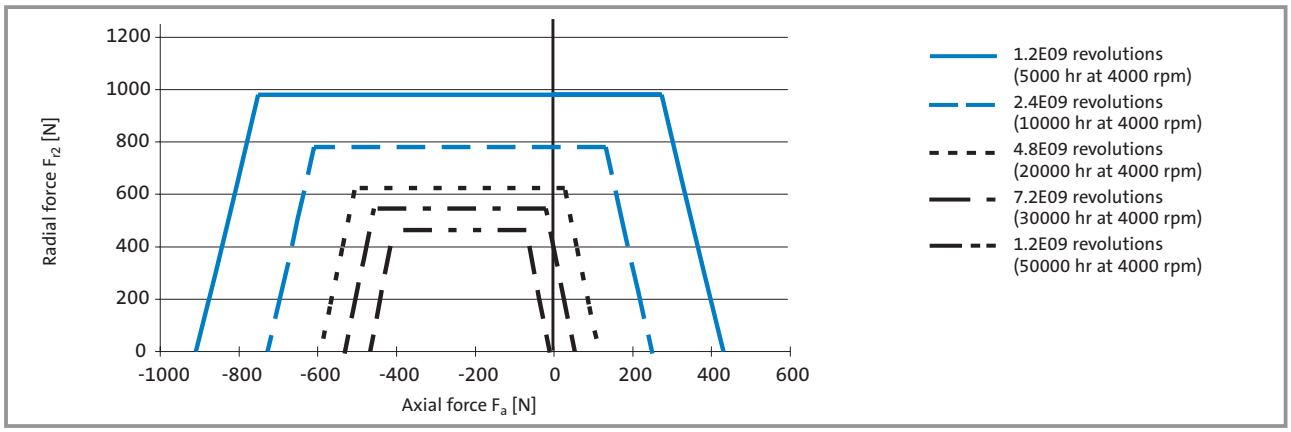
3

The curves apply to MCA 13

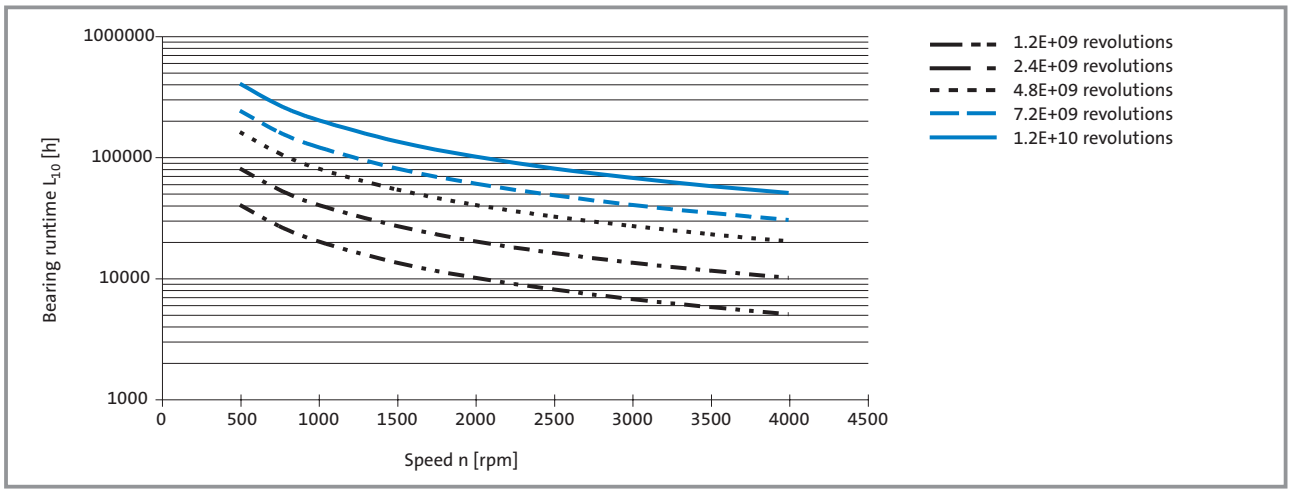
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



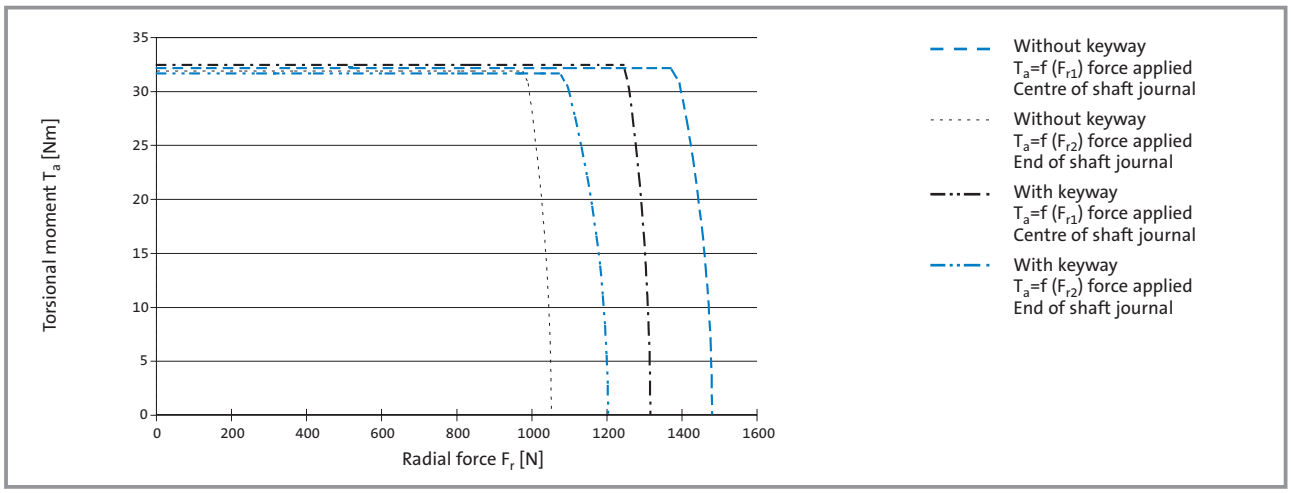
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



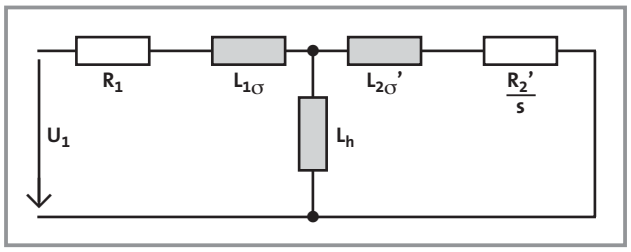
Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	J_{mot} without brake kg m² · 10⁻⁴
natural ventilation											
MCA 14L20-...S00	2000	8.0	60.0	6.7	1.4	3.9	3.3	390	70	0.75	19.2
MCA 14L41-...S00	4100	8.0	60.0	5.4	2.3	7.7	5.8	390	140	0.75	19.2
forced ventilated											
MCA 14L16-...F10	1635	13.5	60.0	12.0	2.1	5.3	4.8	390	60	0.81	19.2
MCA 14L35-...F10	3455	13.5	60.0	10.8	3.9	10.5	9.1	390	120	0.80	19.2

Motor	η %	R_{UV} @ 20 °C Ω	R_{UV} @ 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Power connector type	Weight without brake kg	Maximum speed mech. rpm
natural ventilation											
MCA 14L20-...S00	84	6.00	8.1	3.0	10.0	268.9	4.93	10.0	EWS0001	15.1	8000
MCA 14L41-...S00	78	1.50	2.0	0.8	2.5	66.6	1.23	2.5	EWS0001	15.1	8000
forced ventilated											
MCA 14L16-...F10	80	6.00	8.1	3.0	9.5	251.5	4.93	9.3	EWS0001	16.9	8000
MCA 14L35-...F10	79	1.50	2.0	0.8	2.4	56.8	1.23	2.3	EWS0001	16.9	8000

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram

MCA 14 asynchronous servo motor with blower and special flange and shaft end for mounting directly on Lenze G-motion gearboxes.

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		2.0	4.0	8.0	12.7	17	20.0
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 14L20-...S00	M_N [Nm]		6.7	6.7			
	M_0 [Nm]		8.0	8.0			
	M_{max} n = 0 [4)] [Nm]		10.7	25.3			
	M_{max} [Nm]		21.6	42.8			
MCA 14L41-...S00	M_N [Nm]			5.4	5.4		
	M_0 [Nm]			8.0	8.0		
	M_{max} n = 0 [4)] [Nm]			11.0	24.0		
	M_{max} [Nm]			20.7	29.1		
With blower							
MCA 14L16-...F10	M_N [Nm]		8.9	12.0			
	M_0 [Nm]		8.9	13.5			
	M_{max} n = 0 [4)] [Nm]		11.5	25.4			
	M_{max} [Nm]		21.6	46.7			
MCA 14L35-...F10	M_N [Nm]			8.3	10.8	10.8	
	M_0 [Nm]			8.3	13.5	13.5	
	M_{max} n = 0 [4)] [Nm]			11.0	27.0	41.0	
	M_{max} [Nm]			22.2	42.0	60.0	

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 8 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		1.35	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)3)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 14L20-...S00	M_N [Nm]		4.9	6.7			
	M_0 [Nm]		4.9	8.0			
	M_{max} n = 0 [4)] [Nm]		10.7	25.3			
	M_{max} [Nm]		21.6	42.8			
MCA 14L41-...S00	M_N [Nm]			4.4	5.4		
	M_0 [Nm]			4.4	8.0		
	M_{max} n = 0 [4)] [Nm]			11.0	24.0		
	M_{max} [Nm]			20.7	29.1		
With blower							
MCA 14L16-...F10	M_N [Nm]			12.0			
	M_0 [Nm]			13.5			
	M_{max} n = 0 [4)] [Nm]			25.4			
	M_{max} [Nm]			46.7			
MCA 13L35-...F10	M_N [Nm]				9.5	10.8	
	M_0 [Nm]				9.5	13.5	
	M_{max} n = 0 [4)] [Nm]				27.0	41.0	
	M_{max} [Nm]				42.0	60.0	

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: If I_{max} > I_r controller in an ECS system, there is an automatic switchover to 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1) 2)] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [1)] [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 14L20-...S00	M_N [Nm]		6.7		6.7								
	M_0 [Nm]			8.0	8.0								
	M_{max} n = 0 [Nm]			15.1	29.3								
	M_{max} [Nm]			15.1	29.3								
MCA 14L41-...S00	M_N [Nm]				5.4	5.4							
	M_0 [Nm]				7.0	8.0							
	M_{max} n = 0 [Nm]				13.2	26.0							
	M_{max} [Nm]				13.2	26.0							
With blower													
MCA 14L16-...F10	M_N [Nm]				12.0								
	M_0 [Nm]				13.5								
	M_{max} n = 0 [Nm]				29.6								
	M_{max} [Nm]				29.6								
MCA 14L35-...F10	M_N [Nm]					10.8	10.8						
	M_0 [Nm]					13.5	13.5						
	M_{max} n = 0 [Nm]					29.3	47.0						
	M_{max} [Nm]					29.3	53.8						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.

Servo controller assignment

Servo system assignment 93□□

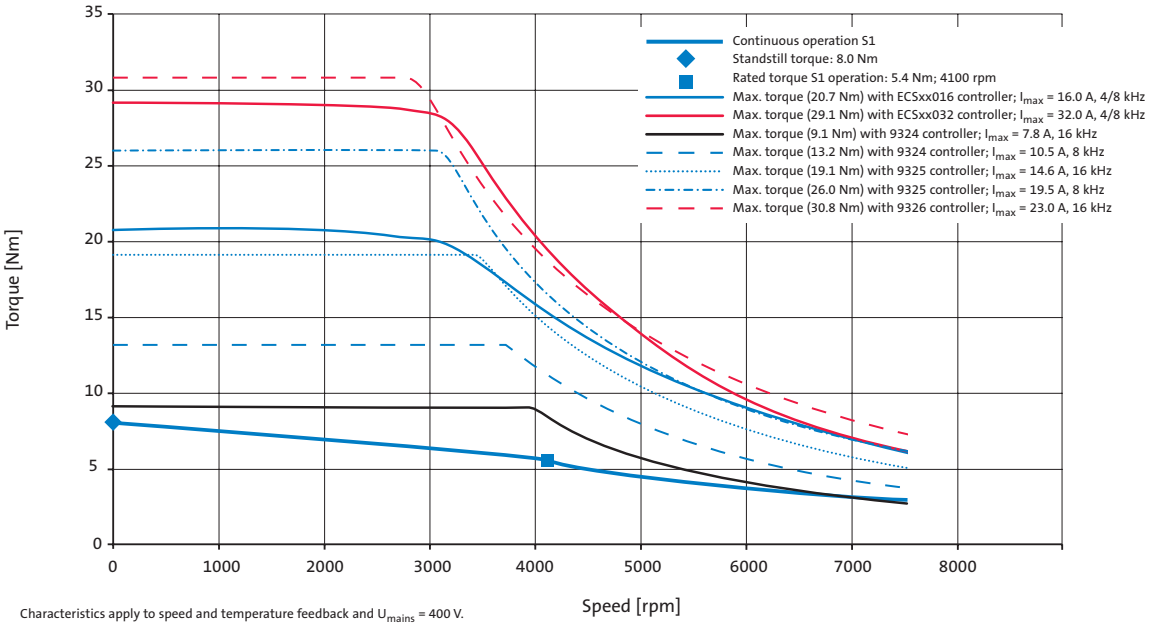
Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [1)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 14L20-...S00	M_N [Nm]				6.7								
	M_0 [Nm]				8.0								
	M_{max} n = 0 [Nm]				21.2								
	M_{max} [Nm]				21.2								
MCA 14L41-...S00	M_N [Nm]				4.5	5.4	5.4						
	M_0 [Nm]				4.5	8.0	8.0						
	M_{max} n = 0 [Nm]				9.1	19.1	20.0						
	M_{max} [Nm]				9.1	19.1	30.8						
With blower													
MCA 14L16-...F10	M_N [Nm]				12.0	12.0							
	M_0 [Nm]				13.4	13.5							
	M_{max} n = 0 [Nm]				21.5	41.6							
	M_{max} [Nm]				21.5	41.3							
MCA 14L35-...F10	M_N [Nm]					10.8	10.8	10.8					
	M_0 [Nm]					12.0	13.5	13.5					
	M_{max} n = 0 [Nm]					21.2	22.5	32.0					
	M_{max} [Nm]					21.2	34.9	47.7					

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.

Torque characteristics

MCA 14L41...S00

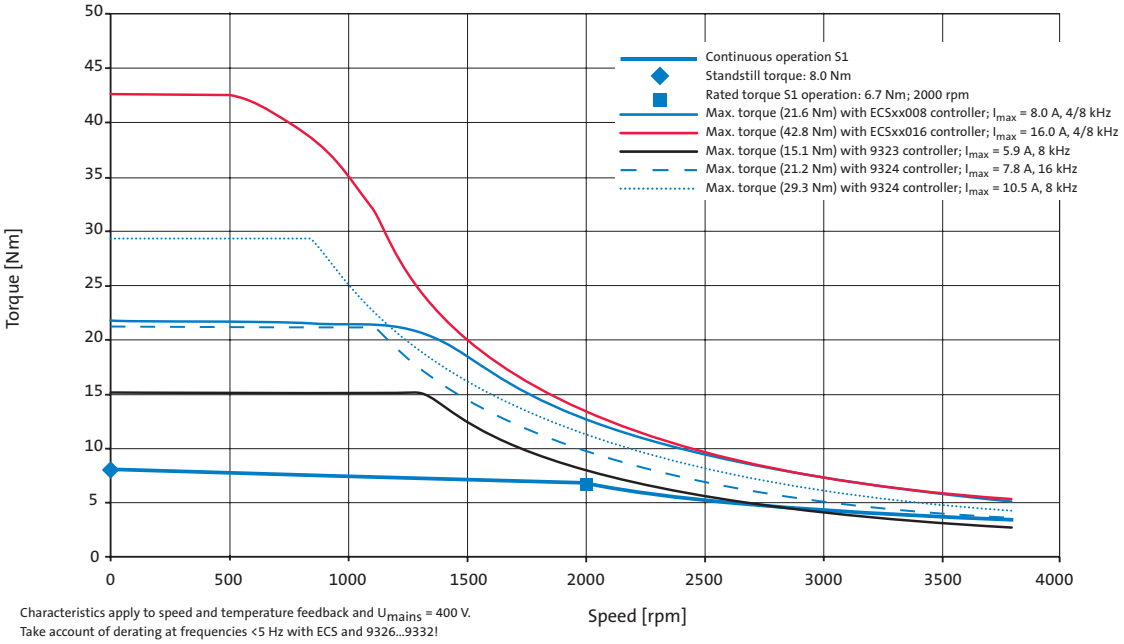
Maximum and continuous torques
Asynchronous servo motor MCA 14L41... S00, 140 Hz, without fan



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

MCA 14L20...S00

Maximum and continuous torques
Asynchronous servo motor MCA 14L20... S00, 70 Hz, without fan

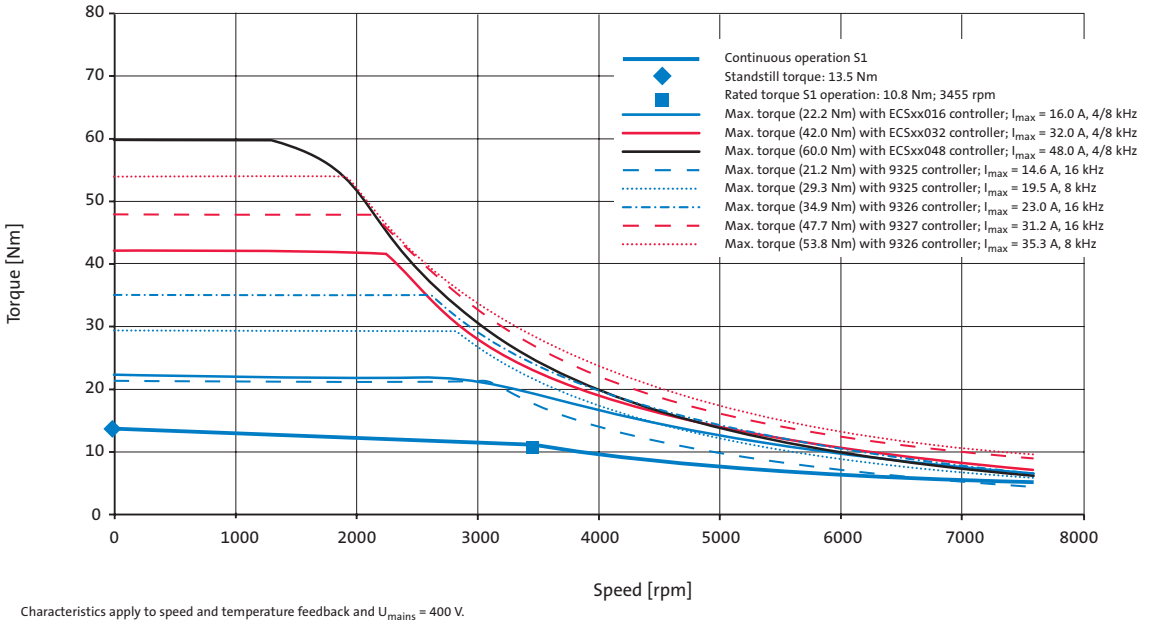


Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Torque characteristics

MCA 14L35...F10

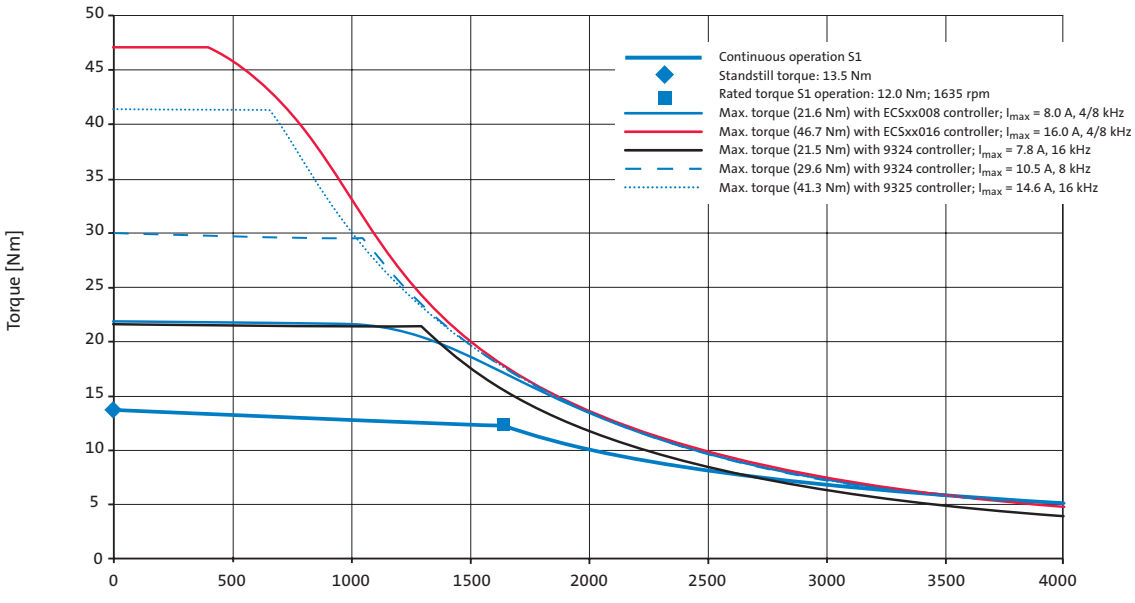
Maximum and continuous torques
Asynchronous servo motor MCA 14L35 ... F10, 120 Hz, with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

MCA 14L16...F10

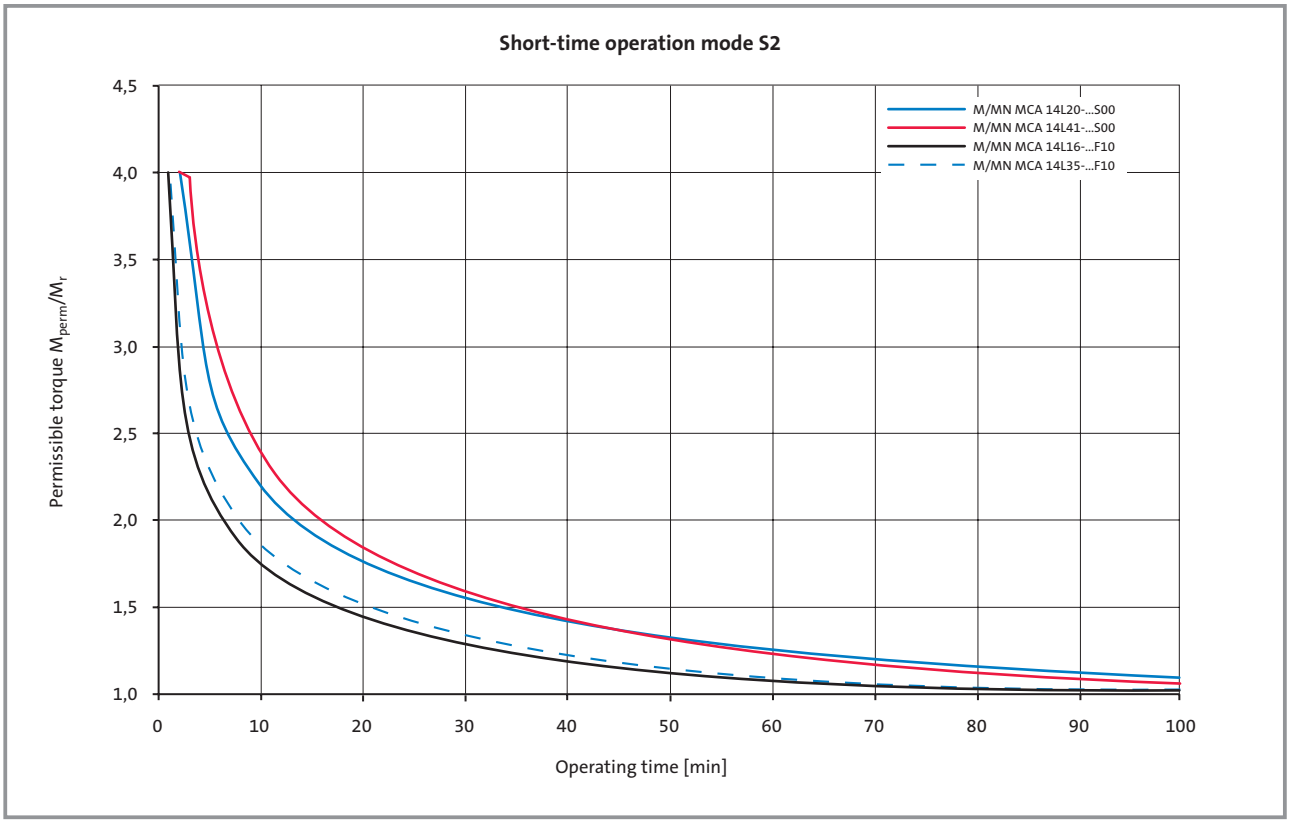
Maximum and continuous torques
Asynchronous servo motor MCA 14L16 ... F10, 60 Hz, with blower



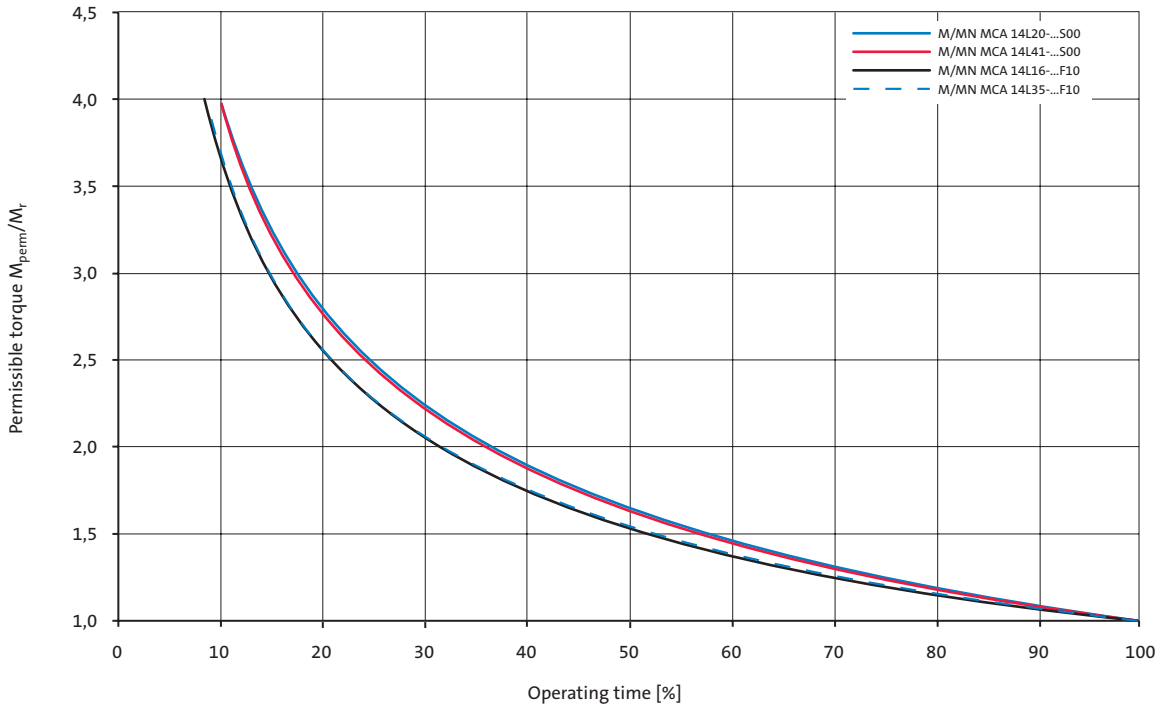
Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Short-time operation characteristic

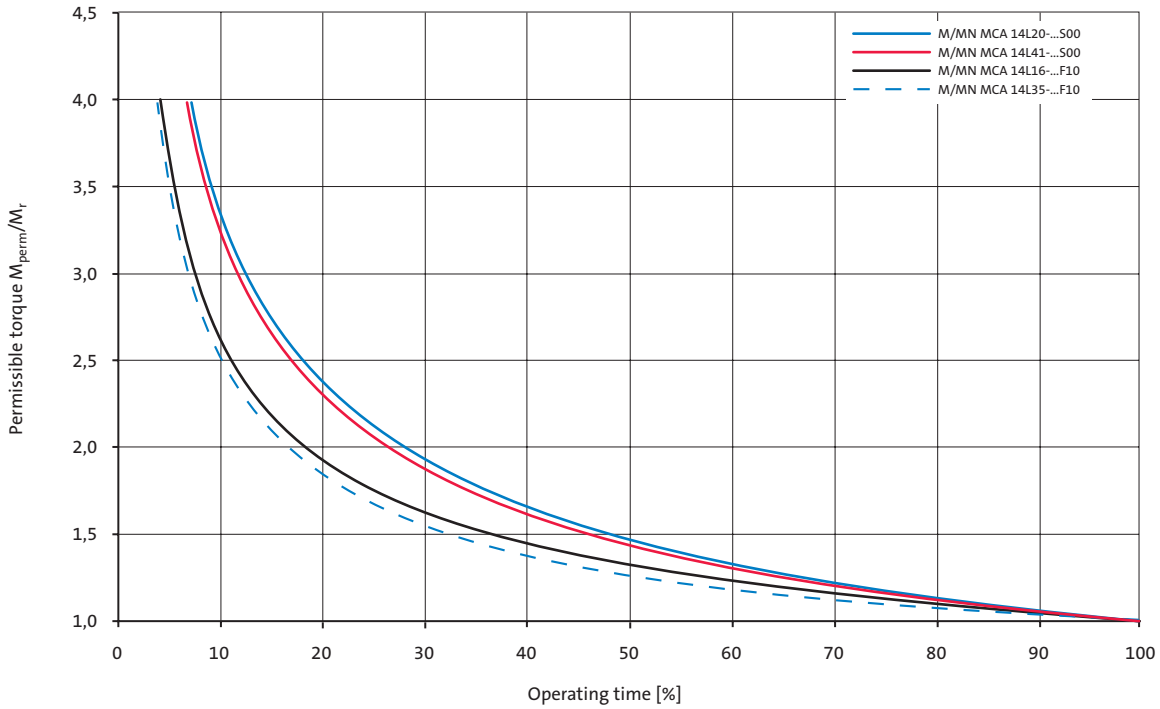
Lenze MCA servo motors have high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.



Short-time operation mode S6, 1 min load cycle duration



Short-time operation mode S6, 10 min load cycle duration



Brake assignment

The MCA asynchronous servo motors can be fitted with integral permanent magnet holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCA 14

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynam. M_{1m} 120 °C Nm	U_B +5 % – -10 %[3] V	I_{BR}[2] A	J_{BR} kg m² · 10⁻⁴	Engagement t_1[1] ms	Diseng. time t_2[1] ms	Maximum switching rate per emergency stop with n = 3000 rpm J	Weight kg
P1	09E	15.0	12.0	6.0	24	0.75	3.60	13	30	700	1.45
P5[4]	09E	15.0	12.0	6.0	205	0.09	3.60	13	30	700	1.45

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple 1%.
4) UR not possible in the case of a brake with 205 V supply voltage

3

Permissible moments of inertia

Motor	Brake	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load}/J_{mot}
MCA 14	P1	22.80	5.2
MCA 14	P5	22.80	5.2

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

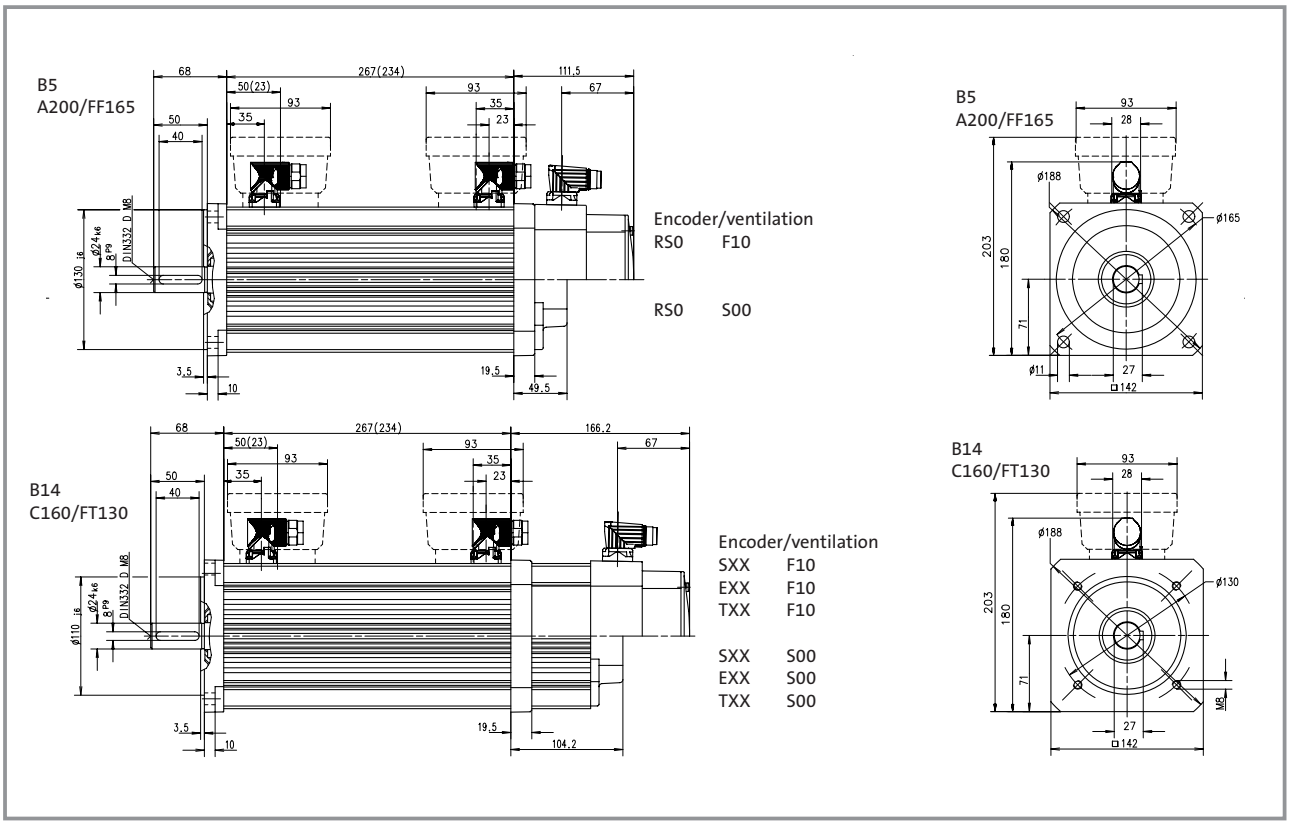
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.
The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release reand the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

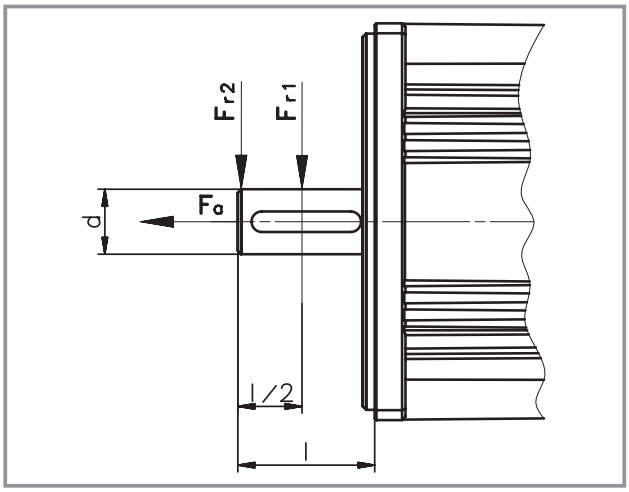


Fan data

U_N	f_N	I_N	P_N
[V]	[Hz]	[A]	[W]
210...240, 1 ph.	50/60	0.12	19

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

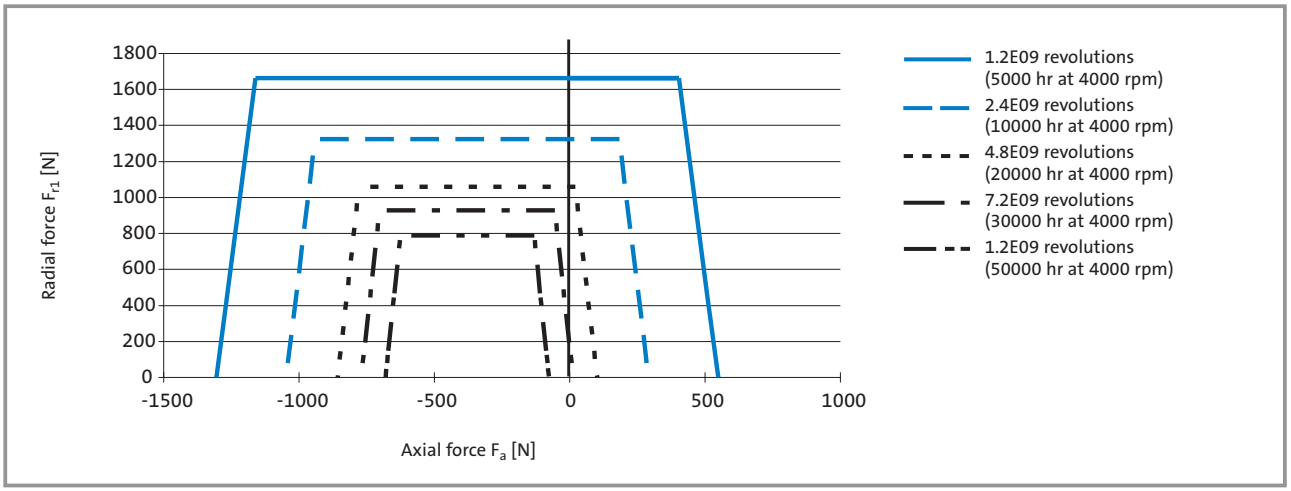
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

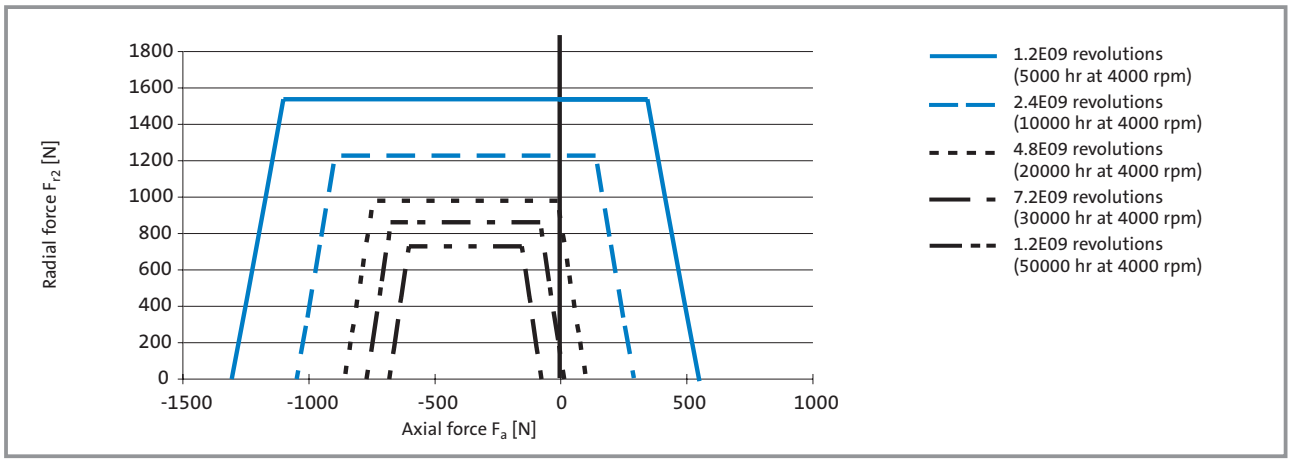
3

The curves apply to MCA 14

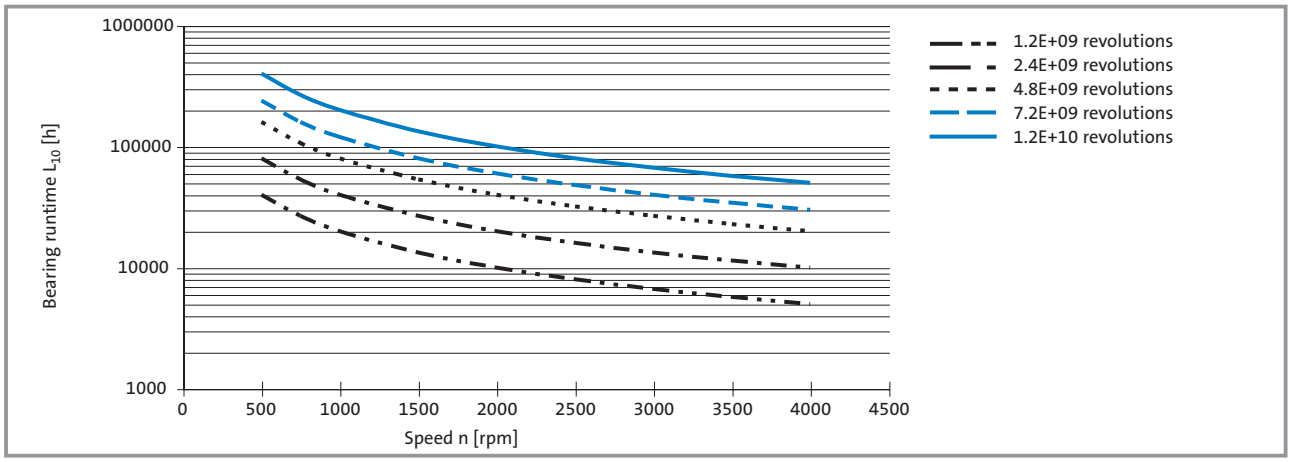
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



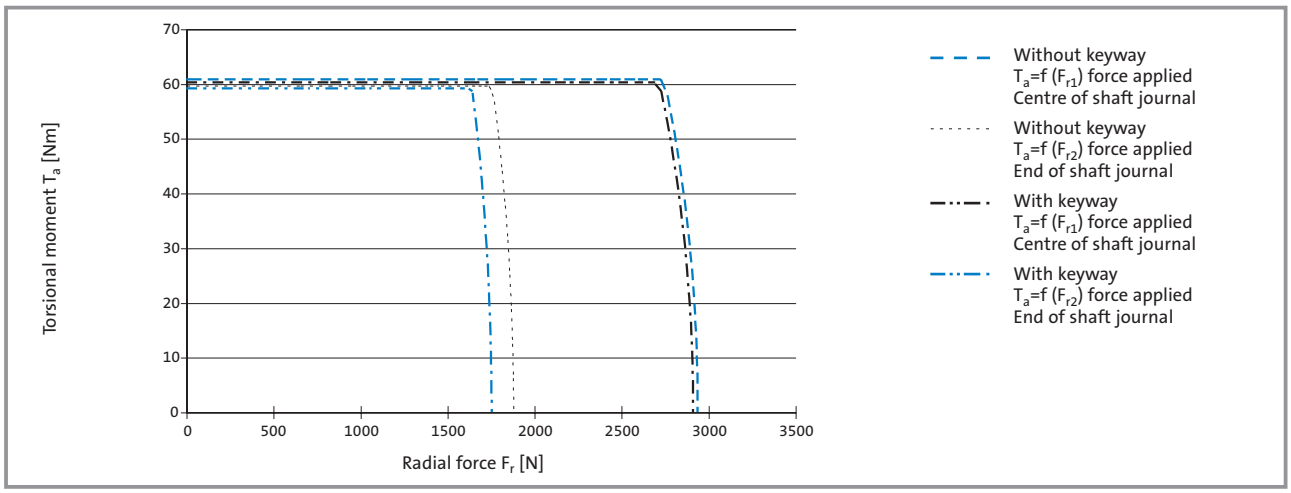
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



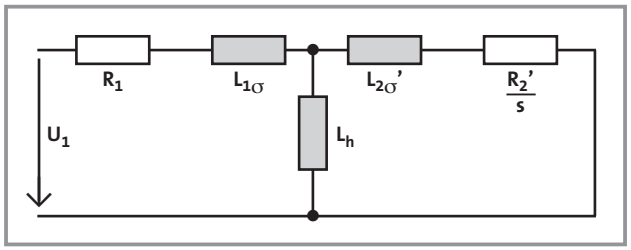
Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	J_{mot} without brake kg m² · 10⁻⁴
natural ventilation											
MCA 17N23-...S00	2300	12.8	100.0	10.8	2.6	6.0	5.5	390	80	0.81	36.0
MCA 17N41-...S00	4110	12.8	100.0	9.5	4.1	12.0	10.2	350	140	0.80	36.0
forced ventilated											
MCA 17N17-...F10	1680	23.9	100.0	21.5	3.8	9.1	8.5	390	60	0.80	36.0
MCA 17N35-...F10	3480	23.9	100.0	19.0	6.9	18.1	15.8	390	120	0.80	36.0

Motor	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Power connector type	Weight without brake kg	Maximum speed mech. rpm
natural ventilation											
MCA 17N23-...S00	86	3.04	4.1	1.5	6.2	176.3	2.16	6.8	EWS0001	22.9	8000
MCA 17N41-...S00	83	0.76	1.0	0.4	1.5	43.5	0.54	1.7	EWS0001	22.9	8000
forced ventilated											
MCA 17N17-...F10	83	3.04	4.1	1.5	5.6	142.6	2.16	6.0	EWS0001	25.5	8000
MCA 17N35-...F10	81	0.76	1.0	0.4	1.4	33.1	0.54	1.5	EWS0001	25.5	8000

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram

Asynchronous servo motor MCA 17

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		2.0	4.0	8.0	12.7	17.0	20.0
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 17N23-...S00	M_N [Nm]			10.8	10.8		
	M_0 [Nm]			12.8	12.8		
	M_{max} n = 0 [4)] [Nm]			20.5	43.5		
	M_{max} [Nm]			40.2	63.7		
MCA 17N41-...S00	M_N [Nm]			6.1	9.5	9.5	
	M_0 [Nm]			6.1	12.8	12.8	
	M_{max} n = 0 [4)] [Nm]			7.8	21.5	33.5	
	M_{max} [Nm]			17.4	29.6	57.7	
With blower							
MCA 17N17-...F10	M_N [Nm]			19.5	21.5		
	M_0 [Nm]			19.5	23.9		
	M_{max} n = 0 [4)] [Nm]			23.0	53.0		
	M_{max} [Nm]			44.8	80.0		
MCA 17N35-...F10	M_N [Nm]				12.7	19.0	
	M_0 [Nm]				12.7	23.0	
	M_{max} n = 0 [4)] [Nm]				23.0	37.5	
	M_{max} [Nm]				37.7	64.4	

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 8 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		1.35	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1) 3)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 17N23-...S00	M_N [Nm]			9.9	10.8		
	M_0 [Nm]		9.9		12.8		
	M_{max} n = 0 [4)] [Nm]			20.5	43.5		
	M_{max} [Nm]			40.2	63.7		
MCA 17N41-...S00	M_N [Nm]				7.0	9.5	
	M_0 [Nm]				7.0	11.3	
	M_{max} n = 0 [4)] [Nm]				21.5	33.5	
	M_{max} [Nm]				29.6	57.7	
With blower							
MCA 17N17-...F10	M_N [Nm]				21.5		
	M_0 [Nm]				21.5		
	M_{max} n = 0 [4)] [Nm]				53.0		
	M_{max} [Nm]				72.0		
MCA 17N35-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [4)] [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: If $I_{max} > I_r$ controller in an ECS system, there is an automatic switchover to 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1) 2)] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [1)] [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 17N23-...S00	M_N [Nm]				10.8	10.8							
	M_0 [Nm]				12.8	12.8							
	M_{max} n = 0 [4)] [Nm]				24.4	46.2							
	M_{max} [Nm]				24.4	46.2							
MCA 17N41-...S00	M_N [Nm]					9.5	9.5	9.5					
	M_0 [Nm]					12.8	12.8	12.8					
	M_{max} n = 0 [4)] [Nm]					23.4	37.0	54.0					
	M_{max} [Nm]					23.4	43.7	59.4					
With blower													
MCA 17N17-...F10	M_N [Nm]					21.5							
	M_0 [Nm]					23.9							
	M_{max} n = 0 [4)] [Nm]					57.2							
	M_{max} [Nm]					57.2							
MCA 17N35-...F10	M_N [Nm]						19.0	19.0	19.0				
	M_0 [Nm]						23.9	23.9	23.9				
	M_{max} n = 0 [4)] [Nm]						27.5	57.0	89.0				
	M_{max} [Nm]						50.7	69.2	100.2				

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

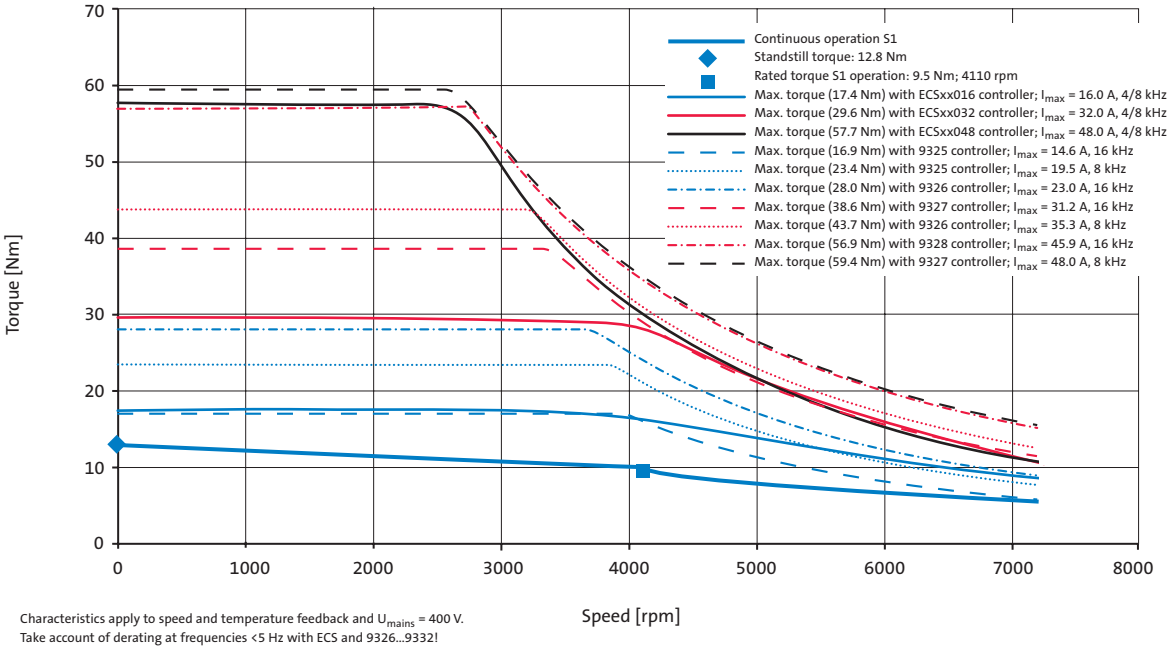
Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [1)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 17N23-...S00	M_N [Nm]				9.5	10.8	10.8						
	M_0 [3)] [Nm]				9.5	12.8	12.8						
	M_{max} n = 0 [4)] [Nm]				17.5	34.5	36.0						
	M_{max} [Nm]				17.5	34.5	50.0						
MCA 17N41-...S00	M_N [Nm]					8.5	9.5	9.5	9.5				
	M_0 [3)] [Nm]					8.5	12.8	12.8	12.8				
	M_{max} n = 0 [4)] [Nm]					16.9	17.5	25.0	38.0				
	M_{max} [Nm]					16.9	28.0	38.6	56.9				
With blower													
MCA 17N17-...F10	M_N [Nm]					21.5	21.5						
	M_0 [3)] [Nm]					23.9	23.9						
	M_{max} n = 0 [4)] [Nm]					42.0	44.5						
	M_{max} [Nm]					42.0	67.9						
MCA 17N35-...F10	M_N [Nm]						18.4	19.0	19.0	19.0			
	M_0 [3)] [Nm]						18.4	23.9	23.9	23.9			
	M_{max} n = 0 [4)] [Nm]						18.4	27.5	39.5	48.0			
	M_{max} [Nm]						32.2	44.6	66.1	81.7			

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
3) On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

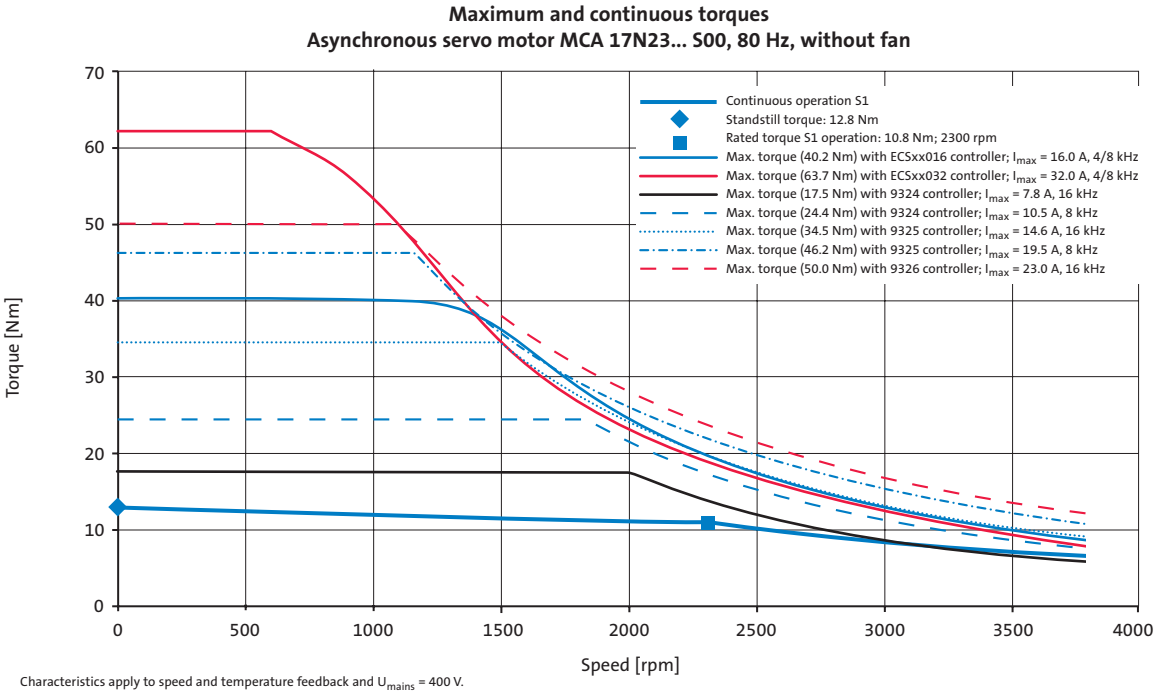
Torque characteristics

MCA 17N41...S00



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

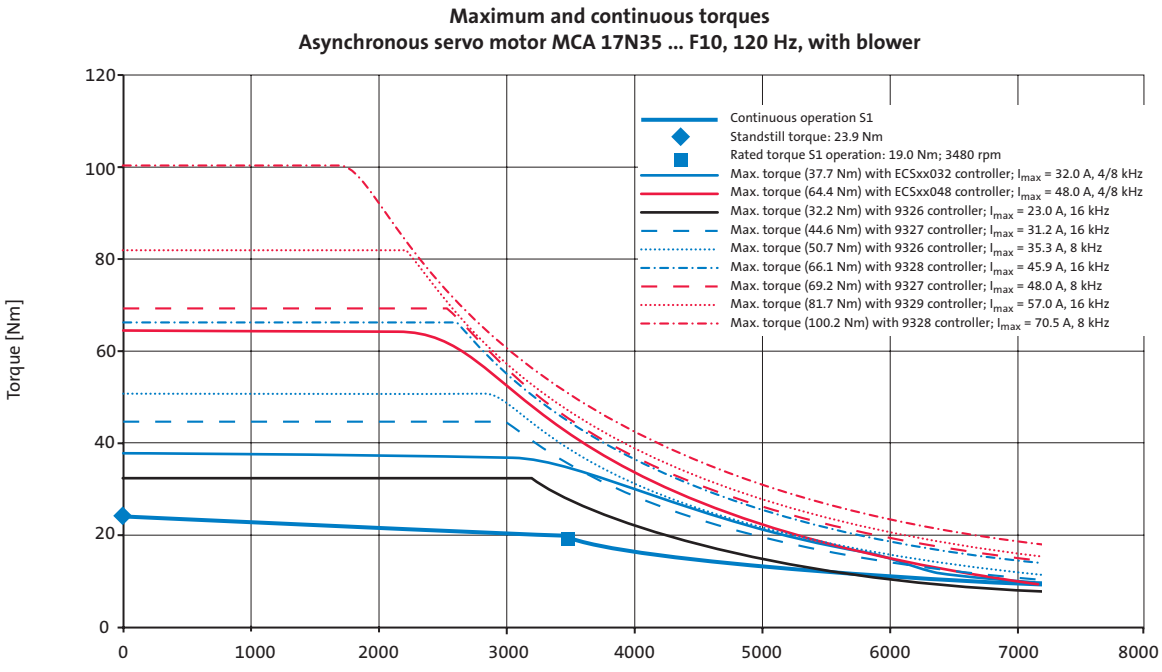
MCA 17N23...S00



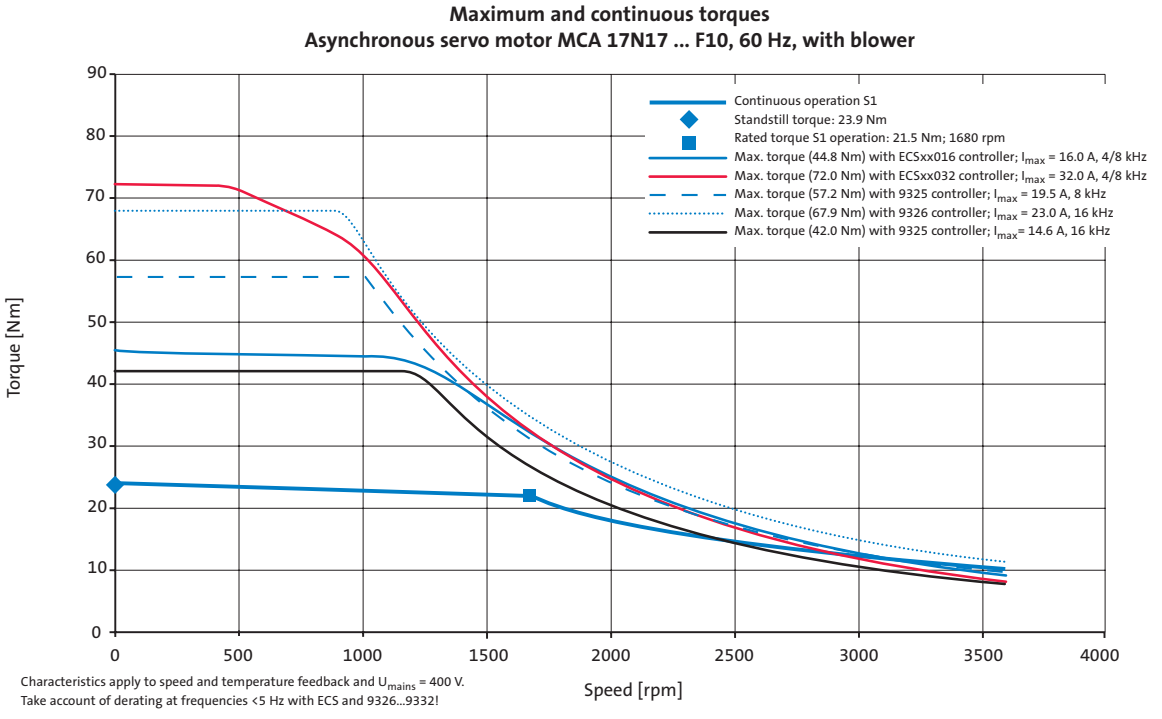
Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Torque characteristics

MCA 17N35...F10

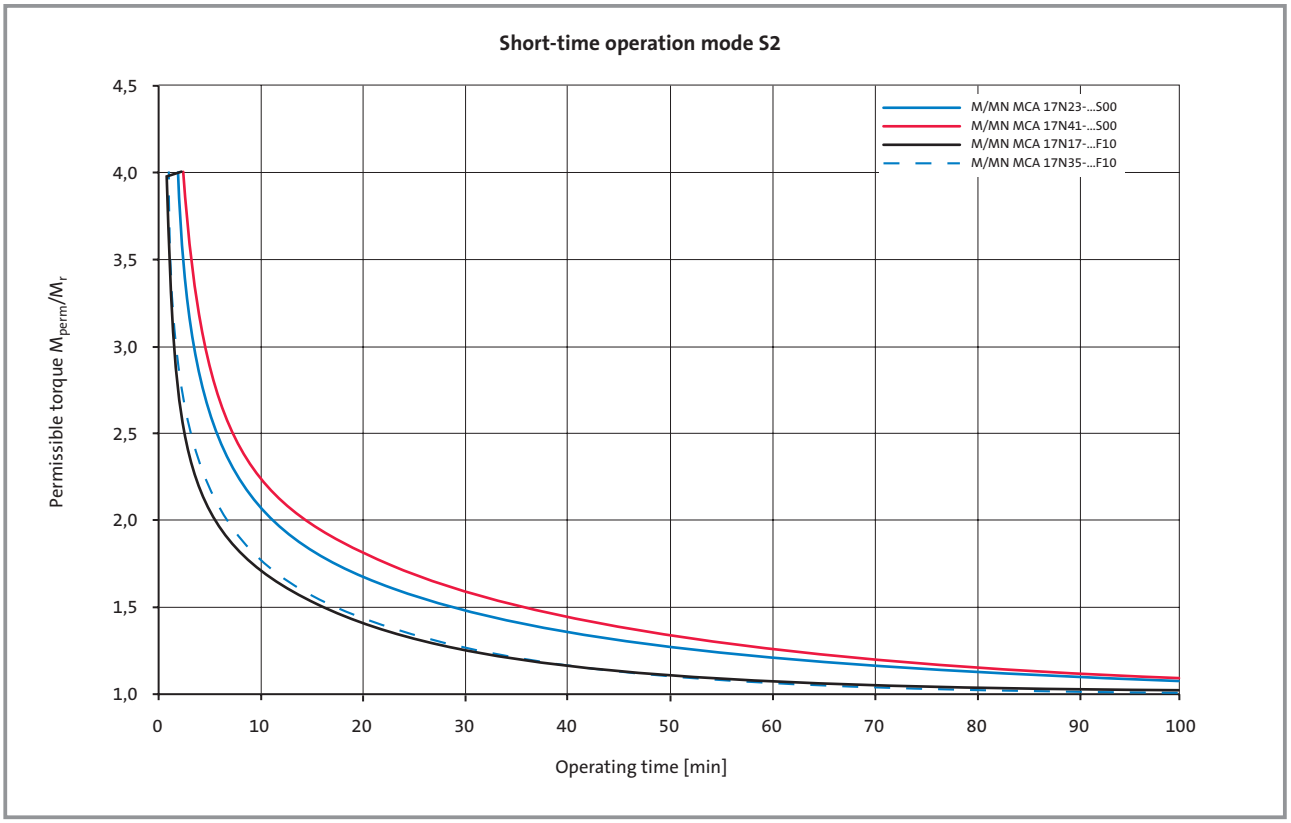


MCA 17N17...F10

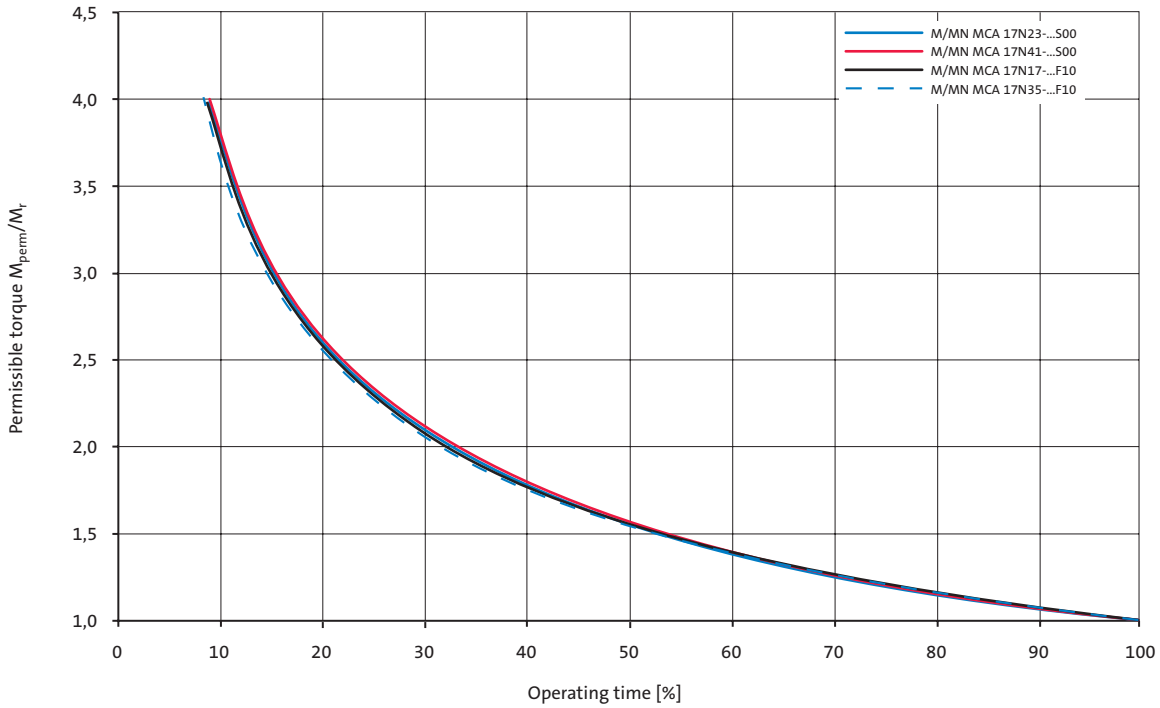


Short-time operation characteristic

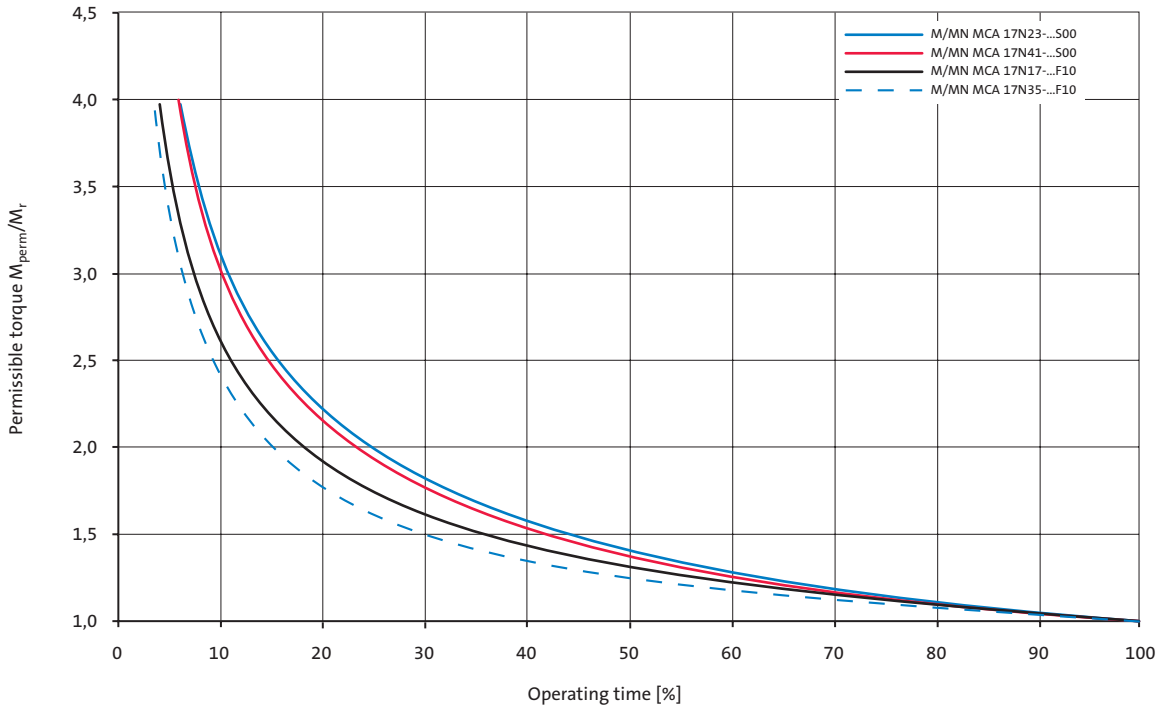
Lenze MCA servo motors have high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.



Short-time operation mode S6, 1 min load cycle duration



Short-time operation mode S6, 10 min load cycle duration



Brake assignment

The MCA asynchronous servo motors can be fitted with integral permanent magnet holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCA 17

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynam. M_{1m} 120 °C Nm	U_B +5 % – -10 %[3] V	I_{BR}[2] A	J_{BR} kg m² · 10⁻⁴	Engagement t_1[1] ms	Diseng. time t_2[1] ms	Maximum switching rate per emergency stop with n = 3000 rpm J	Weight kg
P1	09H	24.0	22.0	11.0	24	0.75	3.60	25	50	550	1.54
P5[4]	09H	24.0	22.0	11.0	205	0.09	3.60	25	50	550	1.54

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple 1%.
4) UR not possible in the case of a brake with 205 V supply voltage.

Permissible moments of inertia

Motor	Brake	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load}/J_{mot}
MCA 17	P1	39.60	5.1
MCA 17	P5	39.60	5.1

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

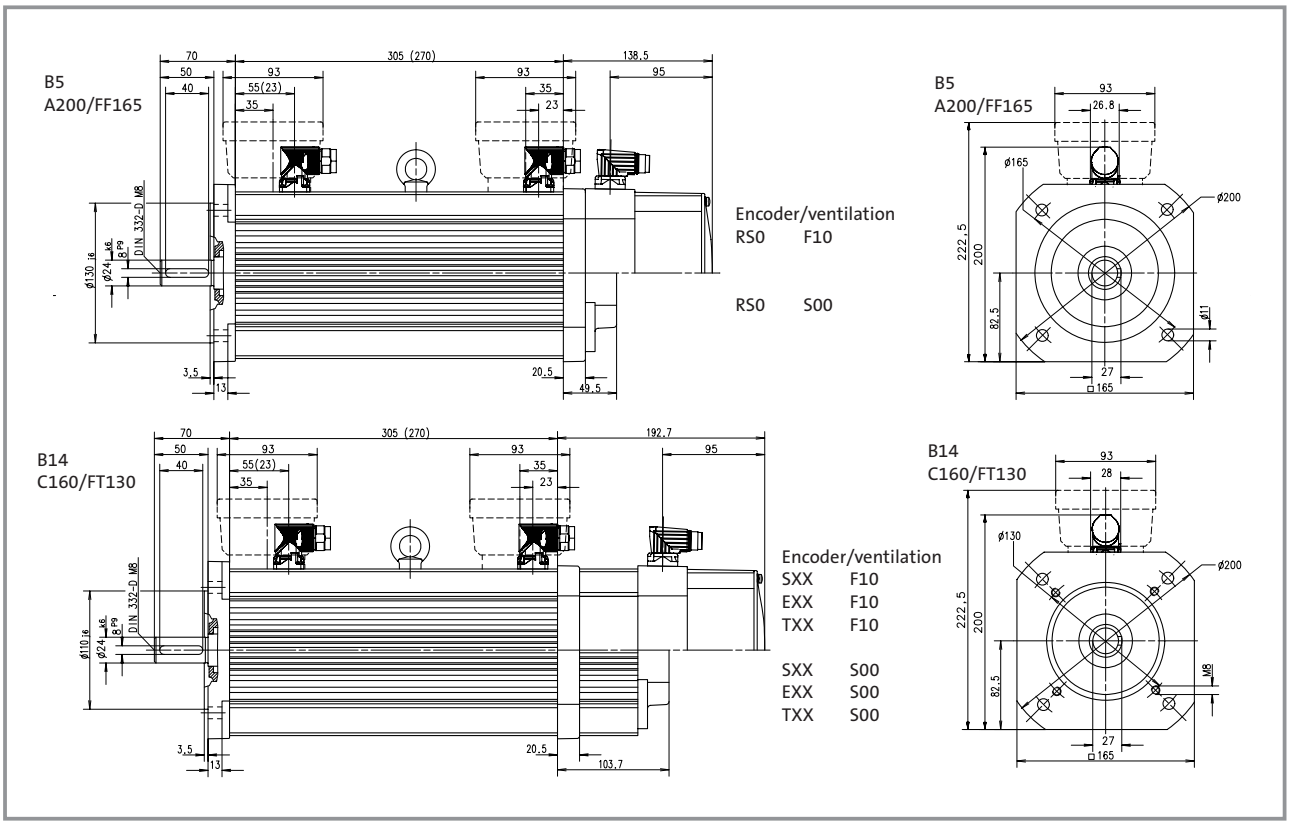
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.
The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

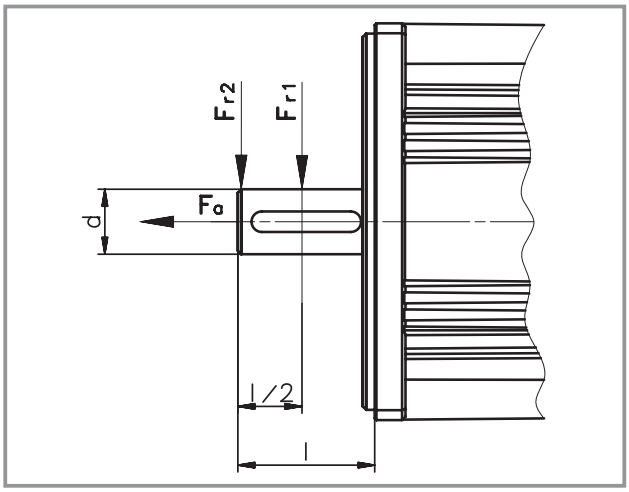


Blower data

U_N	f_N	I_N	P_N
[V]	[Hz]	[A]	[W]
210...240, 1 ph.	50/60	0.32	46

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

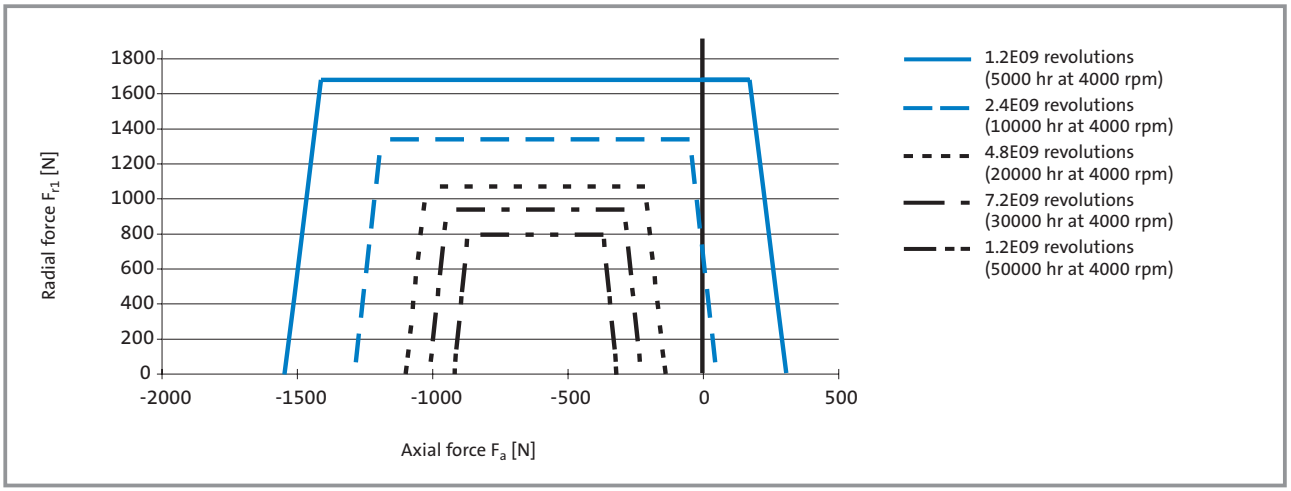
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

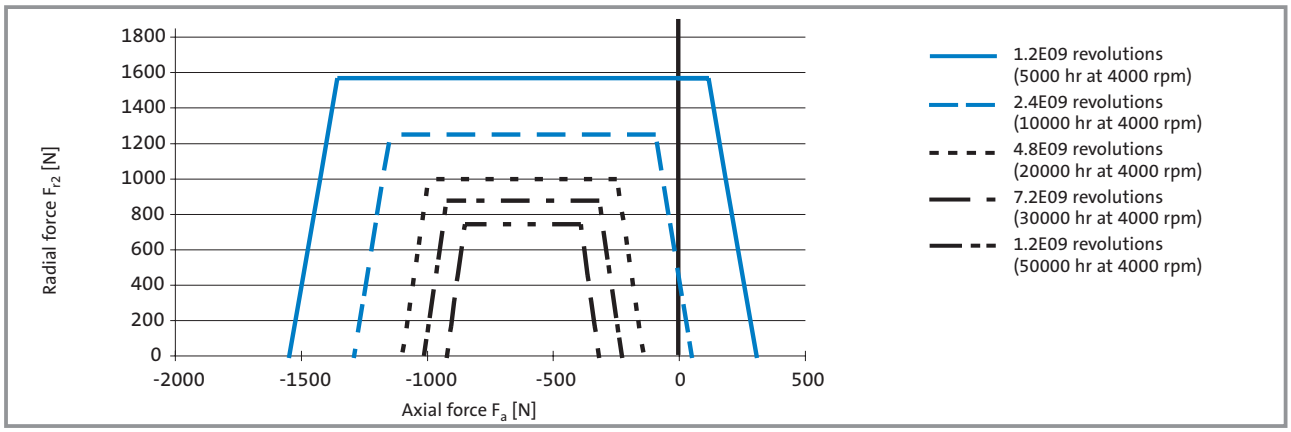
3

The curves apply to MCA 17

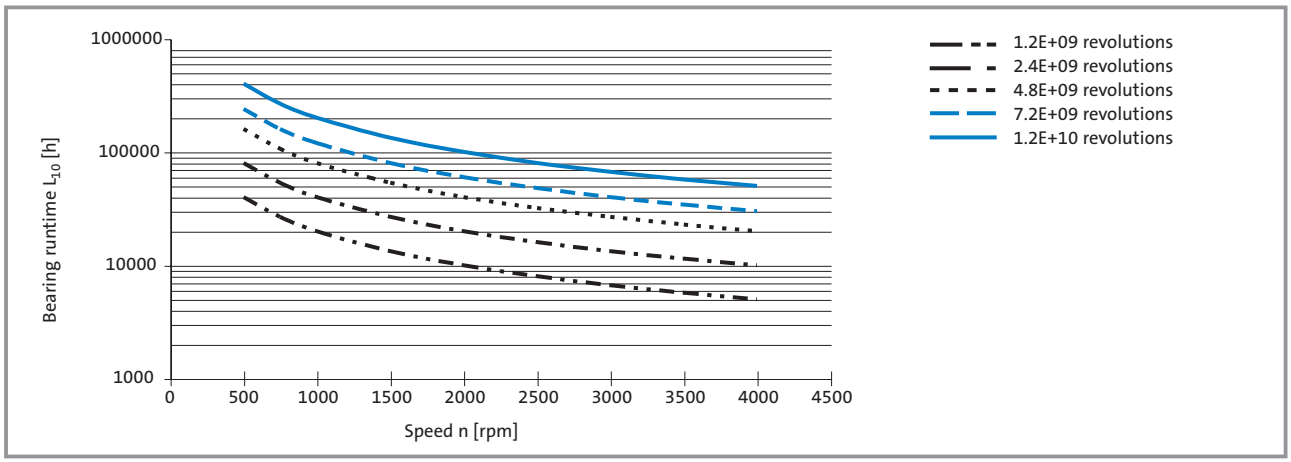
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



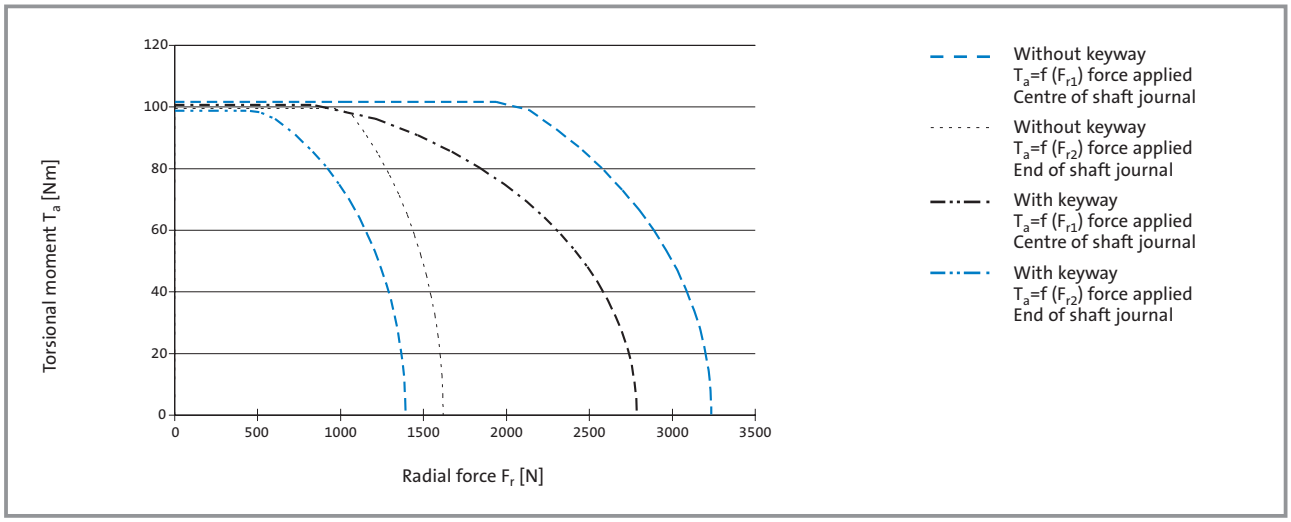
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



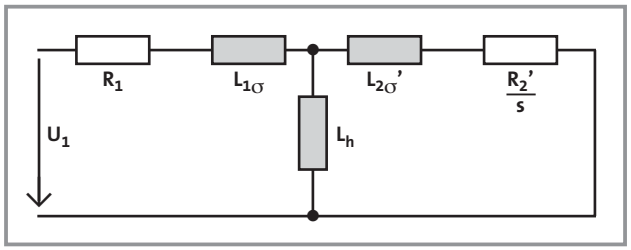
Relationship between radial force and torsional moment on the shaft.

Rated data

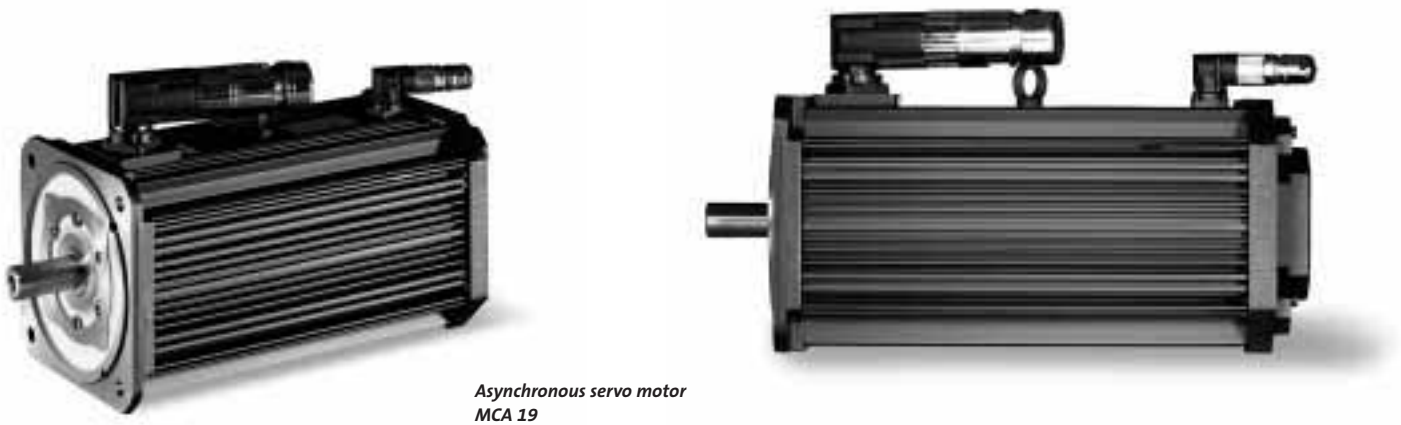
Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	J_{mot} without brake kg m² · 10⁻⁴
natural ventilation											
MCA 19S23-...S00	2340	22.5	180	16.3	4.0	9.9	8.2	390	80	0.80	72.0
MCA 19S42-...S00	4150	22.5	180	12.0	5.2	19.7	14.0	330	140	0.78	72.0
forced ventilated											
MCA 19S17-...F10	1700	40.0	180	36.3	6.4	15.4	13.9	390	60	0.83	72.0
MCA 19S35-...F10	3510	40.0	180	36.0	13.2	30.8	28.7	390	120	0.80	72.0

Motor	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Power connector type	Weight without brake kg	Maximum speed mech. rpm
natural ventilation											
MCA 19S23-...S00	90	1.38	1.9	0.7	3.2	101.5	0.97	3.9	EWS0012	44.7	8000
MCA 19S42-...S00	83	0.35	0.5	0.2	0.8	25.8	0.24	1.0	EWS0012/13	44.7	8000
forced ventilated											
MCA 19S17-...F10	82	1.38	1.9	0.7	2.6	56.1	0.97	3.1	EWS0012	48.2	8000
MCA 19S35-...F10	85	0.35	0.5	0.2	0.7	13.0	0.24	0.8	EWS0013	48.2	8000

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram



Asynchronous servo motor MCA 19

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		2.0	4.0	8.0	12.7	17.0	20.0
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 19S23-...S00	M_N [Nm]			15.1	16.3		
	M_0 [Nm]			15.1	22.5		
	M_{max} n = 0 [4)] [Nm]			18.7	43.5		
	M_{max} [Nm]			38.5	67.9		
MCA 19S42-...S00	M_N [Nm]				9.8	12.0	
	M_0 [Nm]				9.8	16.7	
	M_{max} n = 0 [4)] [Nm]				18.4	31.9	
	M_{max} [Nm]				29.9	58.2	
With blower							
MCA 19S17-...F10	M_N [Nm]				28.3	36.3	36.3
	M_0 [Nm]				28.3	40.0	40.0
	M_{max} n = 0 [4)] [Nm]				46.5	72.0	98.0
	M_{max} [Nm]				75.4	130.8	158.9
MCA 19S35-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [4)] [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 8 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		1.35	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)3)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 19S23-...S00	M_N [Nm]				16.3		
	M_0 [Nm]				17.0		
	M_{max} n = 0 [4)] [Nm]				43.5		
	M_{max} [Nm]				67.9		
MCA 19S42-...S00	M_N [Nm]					7.5	10.8
	M_0 [Nm]					7.5	11.0
	M_{max} n = 0 [4)] [Nm]					31.9	44.5
	M_{max} [Nm]					58.2	80.4
With blower							
MCA 19S17-...F10	M_N [Nm]						32.3
	M_0 [Nm]						32.3
	M_{max} n = 0 [4)] [Nm]						98.0
	M_{max} [Nm]						158.9
MCA 19S35-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [4)] [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: If $I_{max} > I_r$ controller in an ECS system, there is an automatic switchover to 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1) 2)] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [1)] [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 19S23-...S00	M_N [Nm]					16.3	16.3						
	M_0 [Nm]					22.5	22.5						
	M_{max} n = 0 [4)] [Nm]					47.2	78.0						
	M_{max} [Nm]					47.2	88.2						
MCA 19S42-...S00	M_N [Nm]					10.0	12.0	12.0					
	M_0 [Nm]					10.0	22.5	22.5					
	M_{max} n = 0 [4)] [Nm]					20.7	33.5	51.0					
	M_{max} [Nm]					20.7	43.3	60.7					
With blower													
MCA 19S17-...F10	M_N [Nm]					34.0	36.3	36.3					
	M_0 [Nm]					34.0	40.0	40.0					
	M_{max} n = 0 [4)] [Nm]					50.1	76.0	112.0					
	M_{max} [Nm]					50.1	95.9	130.8					
MCA 19S35-...F10	M_N [Nm]						21.0	36.0	36.0	36.0	36.0		
	M_0 [3)] [Nm]						21.0	39.0	40.0	40.0	40.0		
	M_{max} n = 0 [4)] [Nm]						21.0	39.0	73.0	80.0	161.5		
	M_{max} [Nm]						45.7	67.6	104.3	132.9	180.0		

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
3) On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

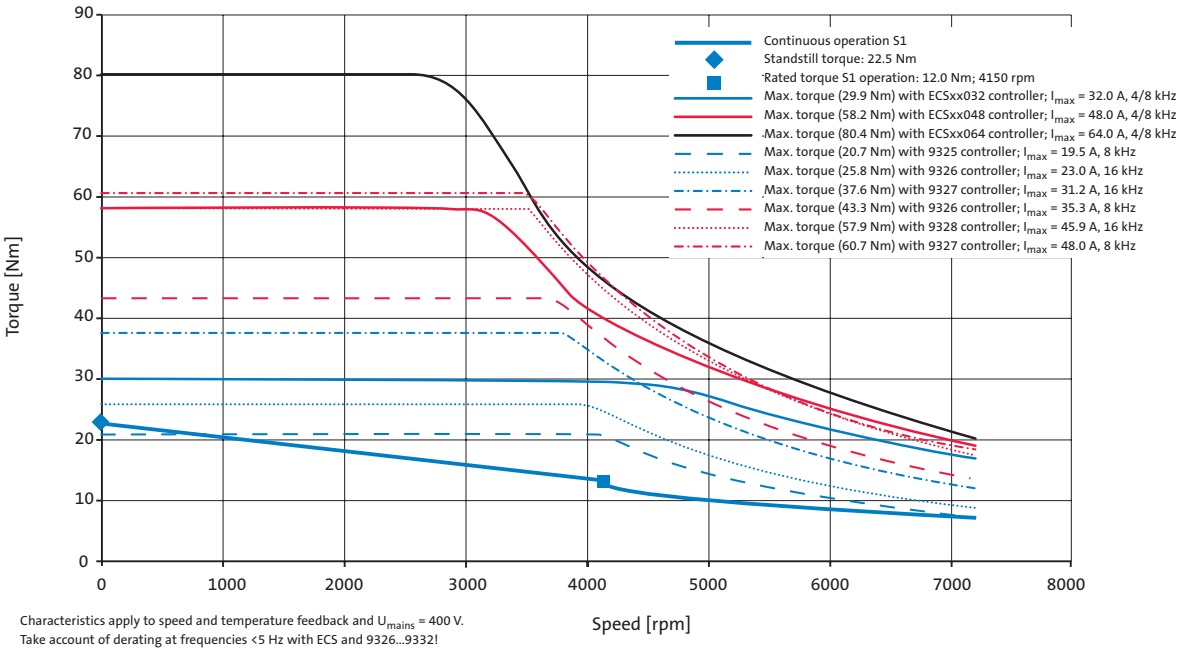
Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1] [2] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [1] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 19S23-...S00	M_N [Nm]					16.3	16.3	16.3					
	M_0 [Nm]					20.5	22.5	22.5					
	M_{max} n = 0 [4] [Nm]					33.8	35.5	50.5					
	M_{max} [Nm]					33.8	56.7	78.1					
MCA 19S42-...S00	M_N [Nm]						12.0	12.0	12.0				
	M_0 [3] [Nm]						14.4	22.5	22.5				
	M_{max} n = 0 [4] [Nm]						14.4	26.0	37.0				
	M_{max} [Nm]						25.8	37.6	57.9				
With blower													
MCA 19S17-...F10	M_N [Nm]						36.3	36.3	36.3	36.3			
	M_0 [3] [Nm]						40.0	40.0	40.0	40.0			
	M_{max} n = 0 [4] [Nm]						40.0	54.0	83.0	89.0			
	M_{max} [Nm]						60.5	84.3	125.2	150.7			
MCA 19S35-...F10	M_N [Nm]								36.0	36.0	36.0	36.0	
	M_0 [3] [Nm]								39.7	40.0	40.0	40.0	
	M_{max} n = 0 [4] [Nm]								39.7	43.0	63.0	105.0	
	M_{max} [Nm]								64.0	82.4	130.5	158.3	

[1] Caution: Limit I_{max} controller to I_{max} motor.
[2] Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
[3] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.
[4] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

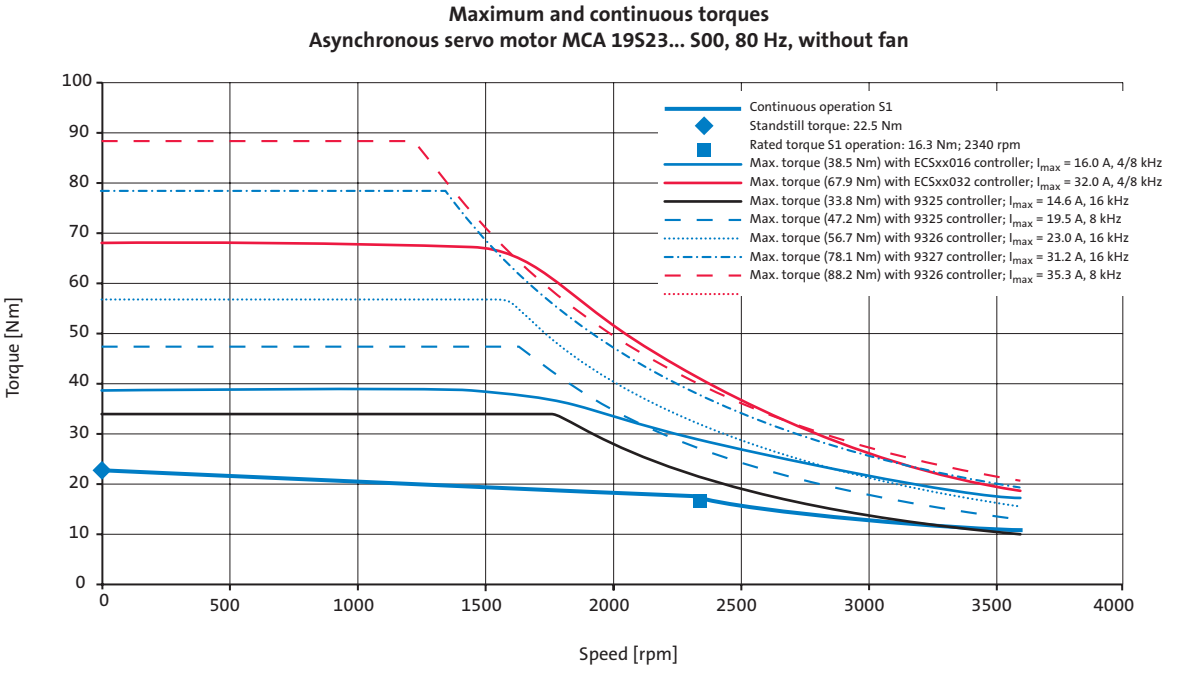
Torque characteristics

MCA 19S42...S00



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

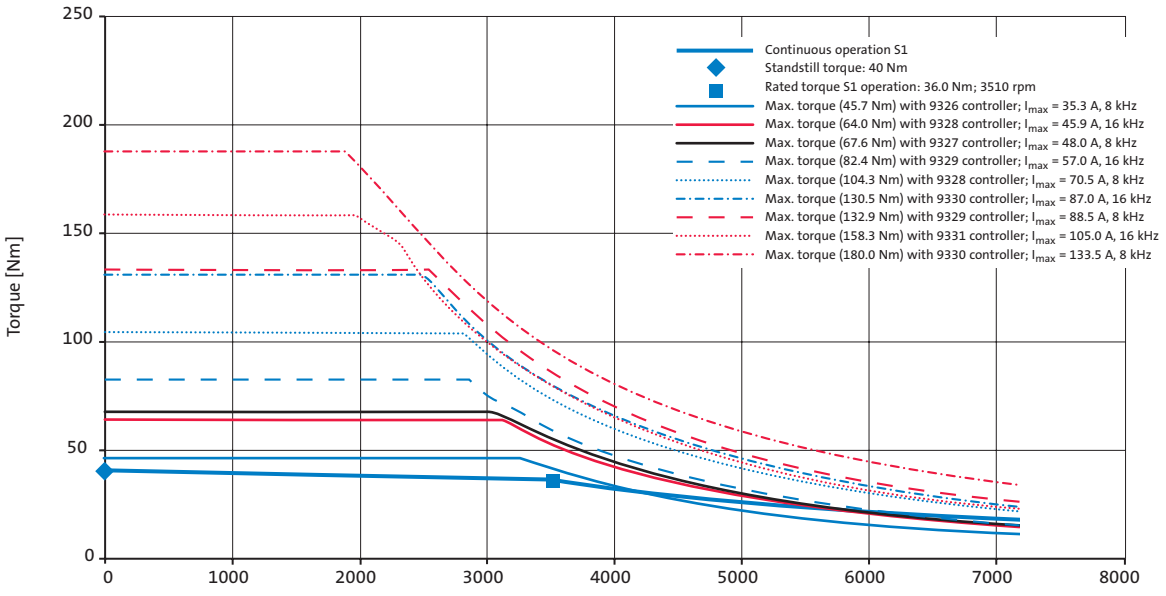
MCA 19S40...S00



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

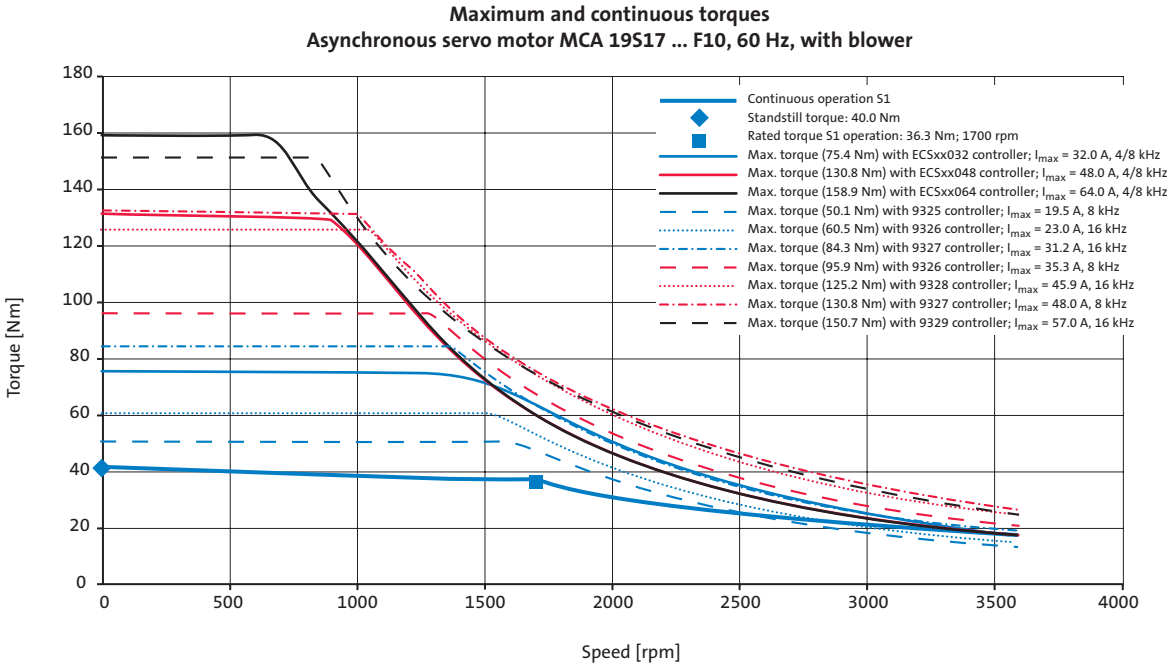
Torque characteristics

MCA 19S35...F10



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

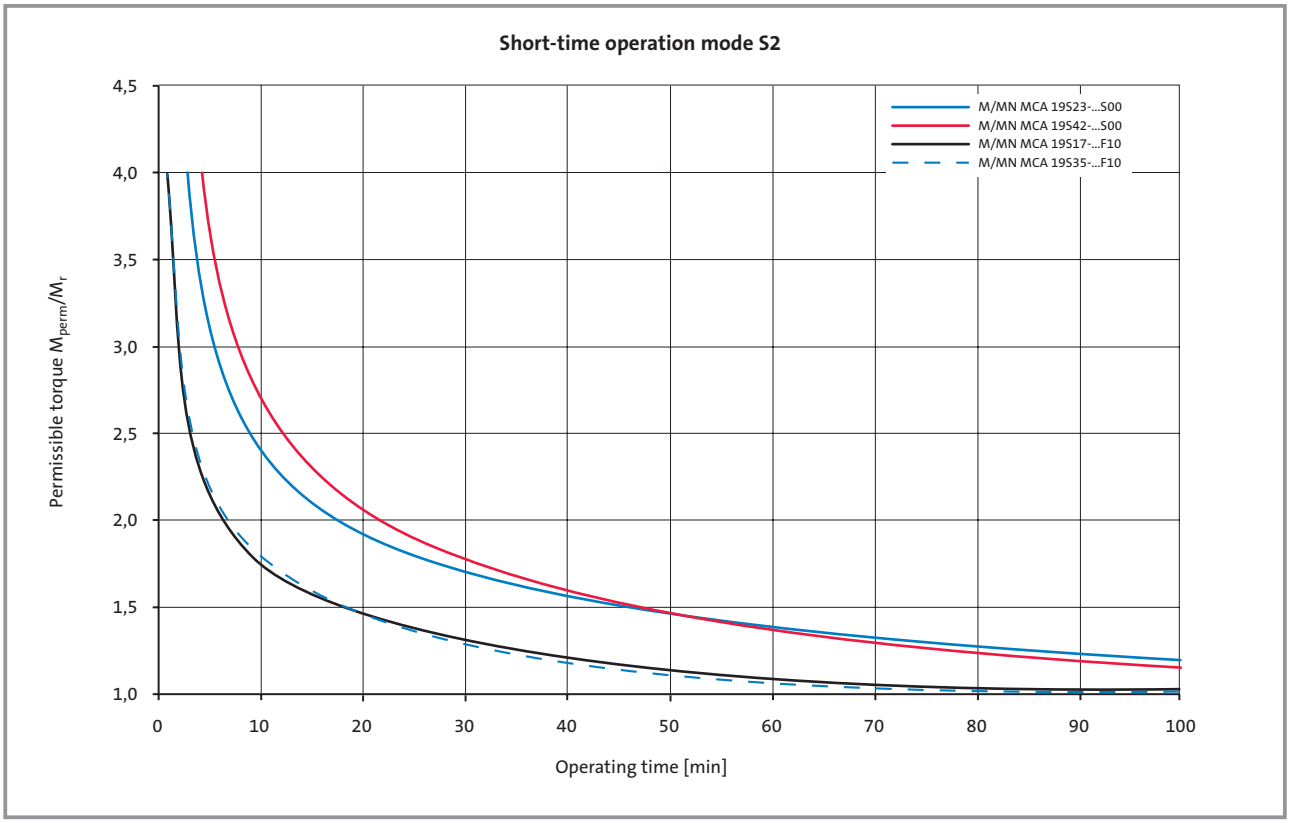
MCA 19S17...F10



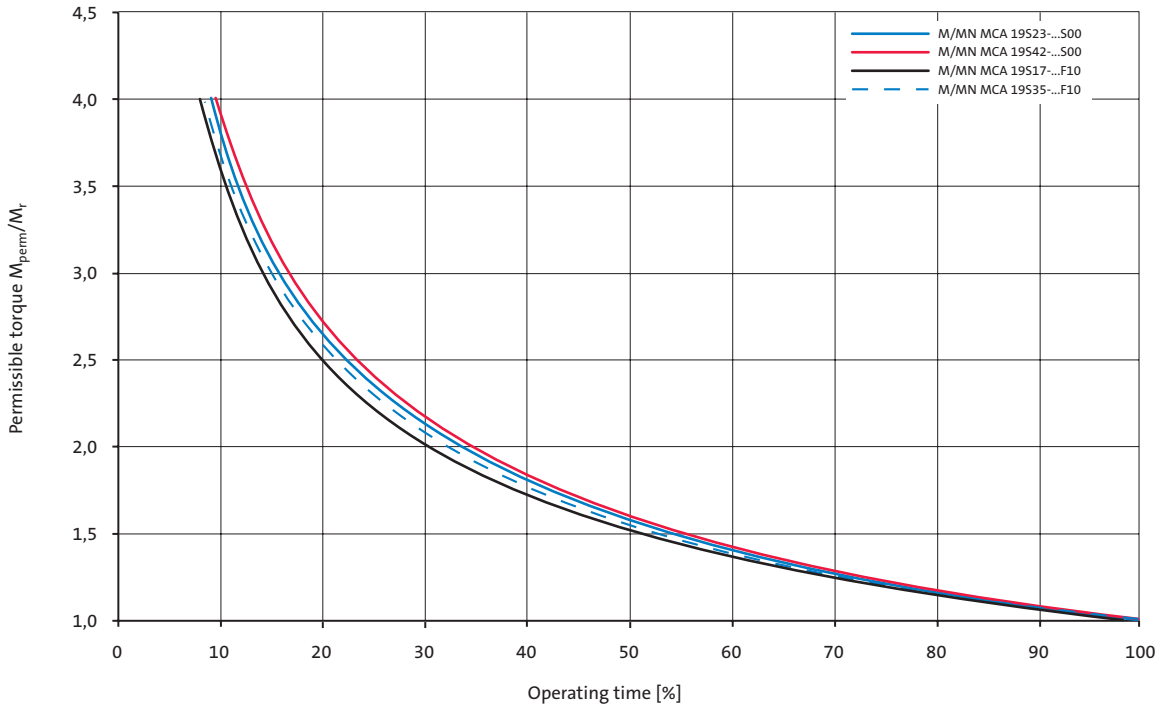
Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

Short-time operation characteristic

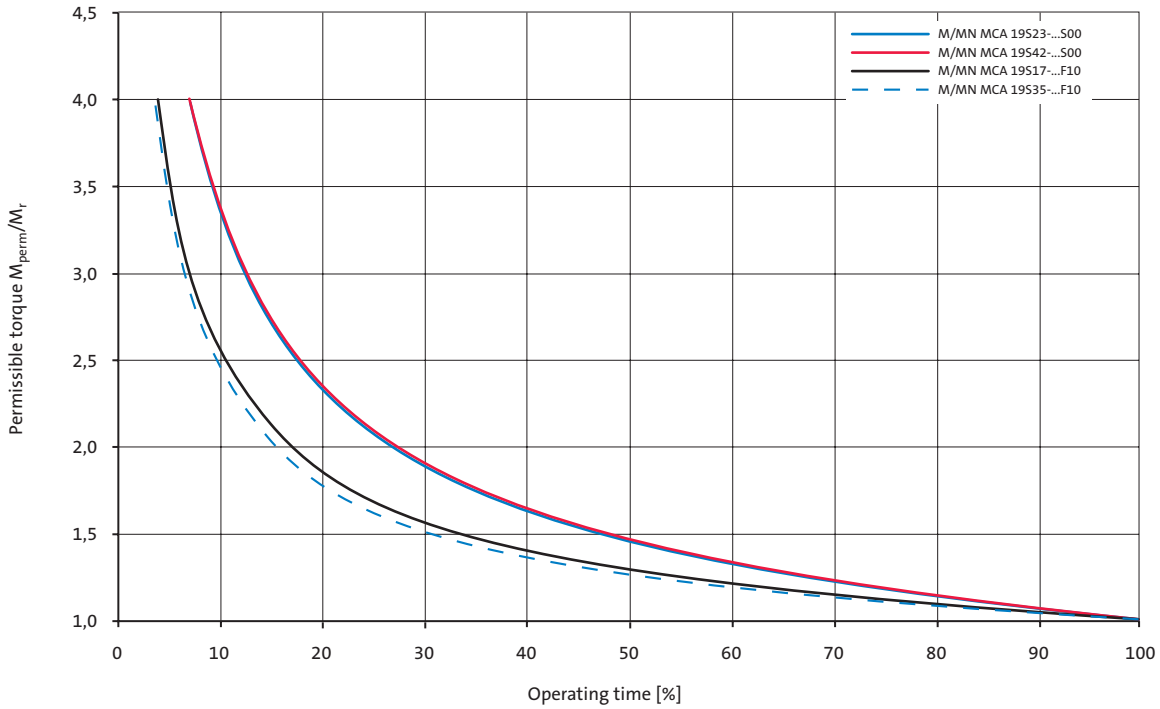
Lenze MCA servo motors have high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.



Short-time operation mode S6, 1 min load cycle duration



Short-time operation mode S6, 10 min load cycle duration



Brake assignment

The MCA asynchronous servo motors can be fitted with integral permanent magnet holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCA 19

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynam. M_{1m} 120 °C Nm	U_B +5 % – -10 %[3] V	I_{BR}[2] A	J_{BR} kg m² · 10⁻⁴	Engagement t_1[1] ms	Diseng. time t_2[1] ms	Maximum switching rate per emergency stop with n = 3000 rpm J	Weight kg
P1	11H	46.0	40.0	18.0	24	1.0	9.50	25	73	1.900	2.72
P5[4]	11H	46.0	40.0	18.0	205	0.12	9.50	25	73	1.900	2.72

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple 1%.
4) UR not possible in the case of a brake with 205 V supply voltage

Permissible moments of inertia

Motor	Brake	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load}/J_{mot}
MCA 19	P1	81.50	3.7
MCA 19	P5	81.50	3.7

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.
The following applies to Lenze system cables:

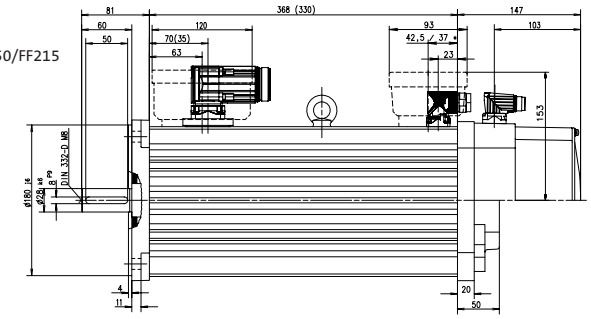
$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

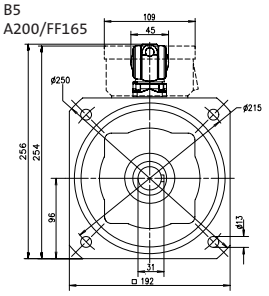
B5
A250/FF215



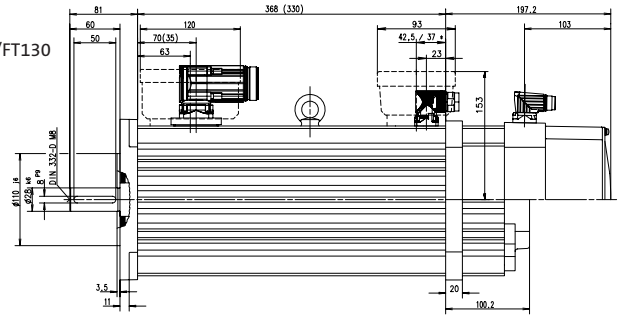
Encoder/ventilation
RS0 F10

RS0 S00

B5
A200/FF165



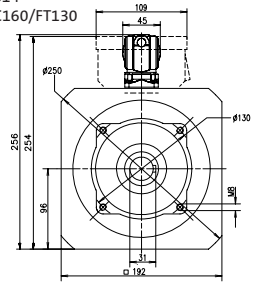
B14
C160/FT130



Encoder/ventilation
SXX F10
EXX F10
TXX F10

SXX S00
EXX S00
TXX S00

B14
C160/FT130

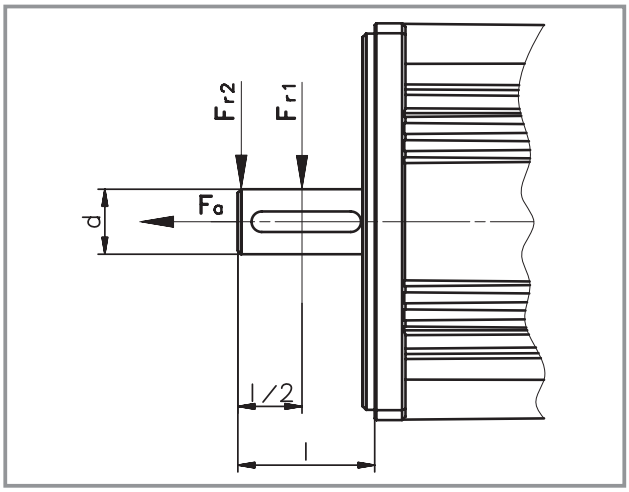


Blower data

U_N	f_N	I_N	P_N
[V]	[Hz]	[A]	[W]
210...240, 1 ph.	50/60	0.32	46

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

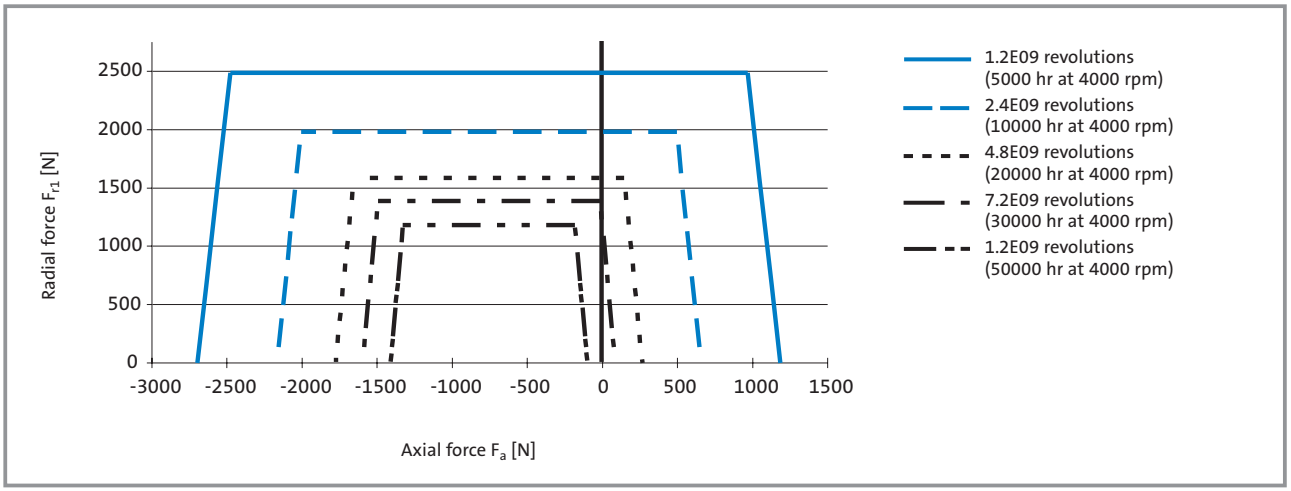
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

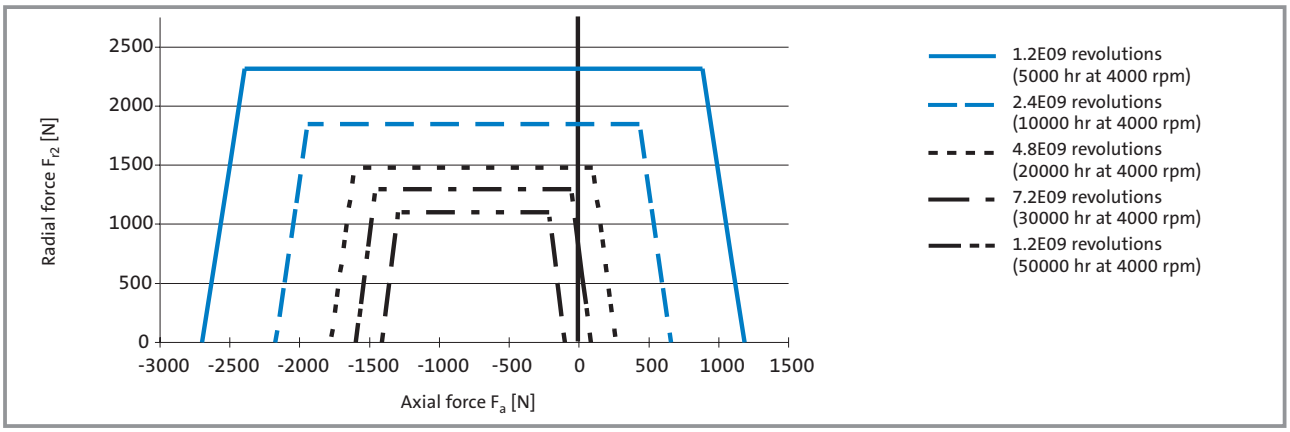
3

The curves apply to MCA 19

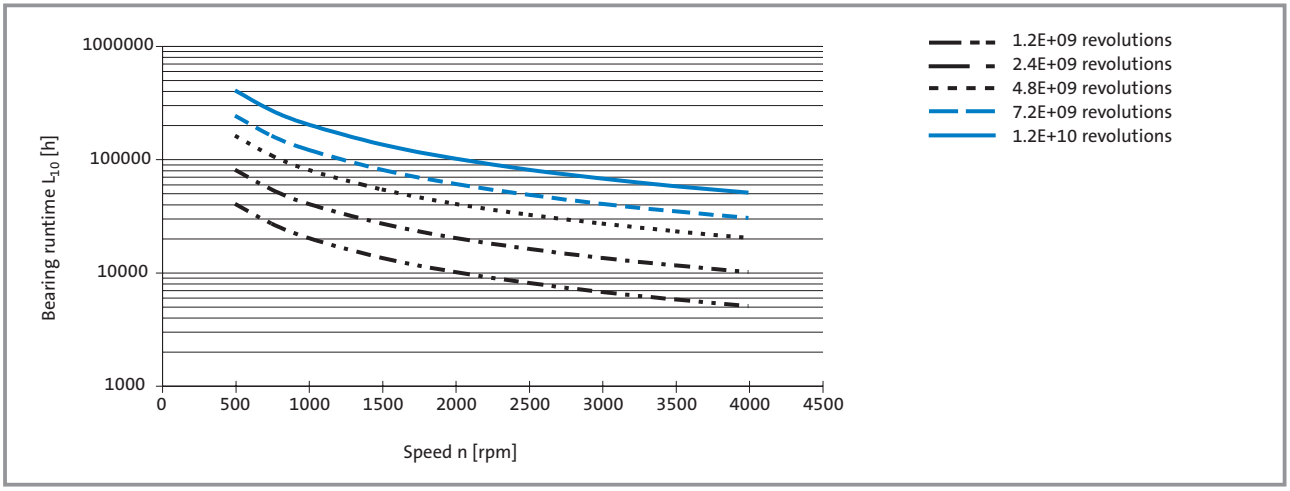
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



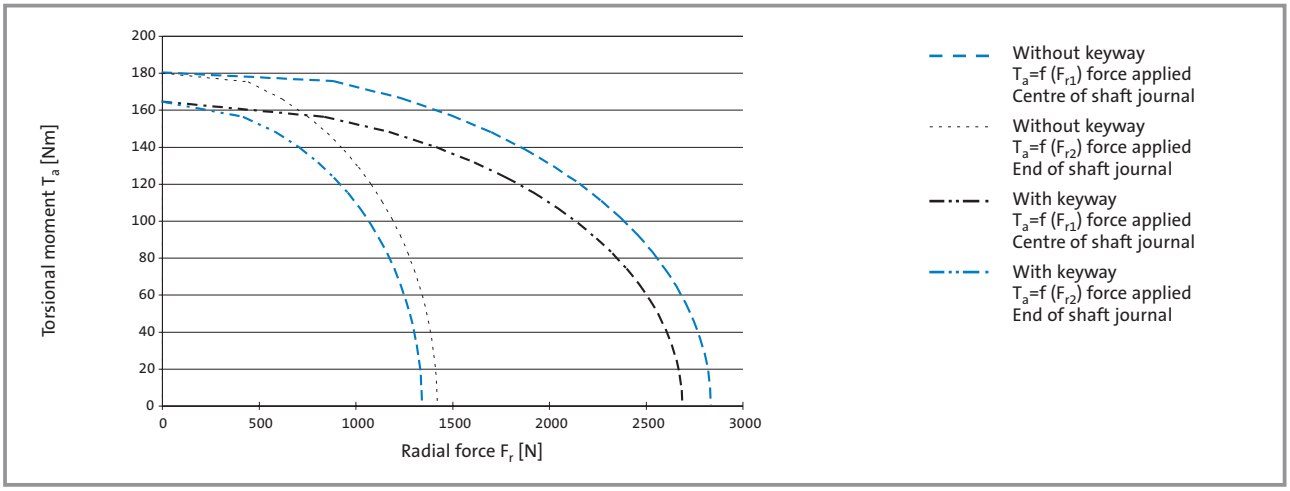
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



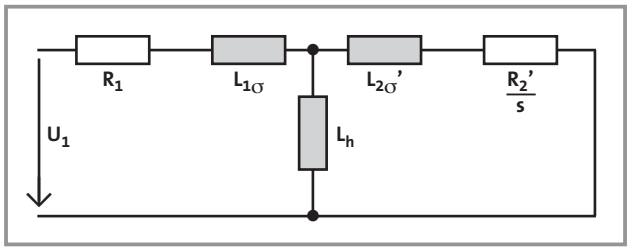
Relationship between radial force and torsional moment on the shaft.

Rated data

Motor	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	J_{mot} without brake kg m² · 10⁻⁴
natural ventilation											
MCA 21X25-...S00	2490	39.0	300	24.6	6.4	15.9	13.5	390	85	0.83	180.0
MCA 21X42-...S00	4160	39.0	300	17.0	7.4	31.8	19.8	320	140	0.80	180.0
forced ventilated											
MCA 21X17-...F10	1710	75.0	300	61.4	11.0	25.8	22.5	390	60	0.85	180.0
MCA 21X35-...F10	3520	75.0	300	55.0	20.3	49.5	42.5	390	120	0.80	180.0

Motor	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Power connector type	Weight without brake kg	Maximum speed mech. rpm
natural ventilation											
MCA 21X25-...S00	85	0.72	1.0	0.4	2.3	78.8	0.56	2.8	EWS0012/13	60.0	8000
MCA 21X42-...S00	84	0.18	0.2	0.1	0.6	19.5	0.14	0.7	EWS0012/13	60.0	8000
forced ventilated											
MCA 21X17-...F10	85	0.72	1.0	0.4	2.1	68.7	0.56	2.6	EWS0012/13	63.5	8000
MCA 21X35-...F10	88	0.18	0.2	0.1	0.5	16.6	0.14	0.6	EWS0012/13	63.5	8000

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram

MCA 21 asynchronous servo motor with terminal boxes for power, brake and encoder

Servo controller assignment

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 4 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		2.0	4.0	8.0	12.7	17.0	20.0
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 21X25-...S00	M_N [Nm]				21.0	24.6	
	M_0 [Nm]				21.0	39.0	
	M_{max} n = 0 [4)] [Nm]				41.0	64.5	
	M_{max} [Nm]				64.4	120.5	
MCA 21X42-...S00	M_N [Nm]					13.0	17.0
	M_0 [Nm]					13.0	17.0
	M_{max} n = 0 [4)] [Nm]					30.0	45.0
	M_{max} [Nm]					59.4	83.0
With blower							
MCA 21X17-...F10	M_N [Nm]						52.5
	M_0 [Nm]						52.5
	M_{max} n = 0 [4)] [Nm]						107.0
	M_{max} [Nm]						190.0
MCA 21X35-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [4)] [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Assignment of ECS servo system – axis modules

Rated and maximum torques at a chopper frequency of 8 kHz							
Type		**ECS□□004**	**ECS□□008**	**ECS□□016**	**ECS□□032**	**ECS□□048**	**ECS□□064**
Continuous current [A]		1.35	2.7	5.3	8.5	11.3	13.3
Maximum current 0 Hz [1) 2)] [A]		2.3	4.6	9.1	18.1	27.2	36.3
Maximum current > 5 Hz [1) 3)] [A]		4.0	8.0	16.0	32.0	48.0	64.0
Motor type							
Totally enclosed fan-cooled asynchronous servo motors							
Without fan							
MCA 21X25-...S00	M_N [Nm]					19.0	
	M_0 [Nm]					19.0	
	M_{max} n = 0 [4)] [Nm]					64.5	
	M_{max} [Nm]					120.5	
MCA 21X42-...S00	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [Nm]						
	M_{max} [Nm]						
With blower							
MCA 21X17-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [Nm]						
	M_{max} [Nm]						
MCA 21X35-...F10	M_N [Nm]						
	M_0 [Nm]						
	M_{max} n = 0 [Nm]						
	M_{max} [Nm]						

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Max. heatsink temperature 9300 = 80°C/ECS = 90°C and 400 V mains supply
3) Caution: If $I_{max} > I_r$ controller in an ECS system, there is an automatic switchover to 4 kHz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1) 2)] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [1)] [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 21X25-...S00	M_N [Nm]					23.7	24.6	24.6					
	M_0 [Nm]					23.7	39.0	39.0					
	M_{max} n = 0 [4)] [Nm]					46.2	66.0	84.0					
	M_{max} [Nm]					46.2	78.0	92.4					
MCA 21X42-...S00	M_N [Nm]						17.0	17.0	17.0	17.0			
	M_0 [3)] [Nm]						24.0	39.0	39.0	39.0			
	M_{max} n = 0 [4)] [Nm]						24.0	47.0	84.0	94.0			
	M_{max} [Nm]						43.9	63.3	96.8	123.0			
With blower													
MCA 21X17-...F10	M_N [Nm]						61.4	61.4	61.4	61.4			
	M_0 [3)] [Nm]						65.5	75.0	75.0	75.0			
	M_{max} n = 0 [4)] [Nm]						65.5	102.0	178.0	200.0			
	M_{max} [Nm]						104.1	143.3	210.7	257.3			
MCA 21X35-...F10	M_N [Nm]								55.0	55.0	55.0	55.0	
	M_0 [3)] [Nm]								68.0	75.0	75.0	75.0	
	M_{max} n = 0 [4)] [Nm]								68.0	88.0	156.0	219.0	
	M_{max} [Nm]								107.7	135.9	205.0	250.4	

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
3) On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

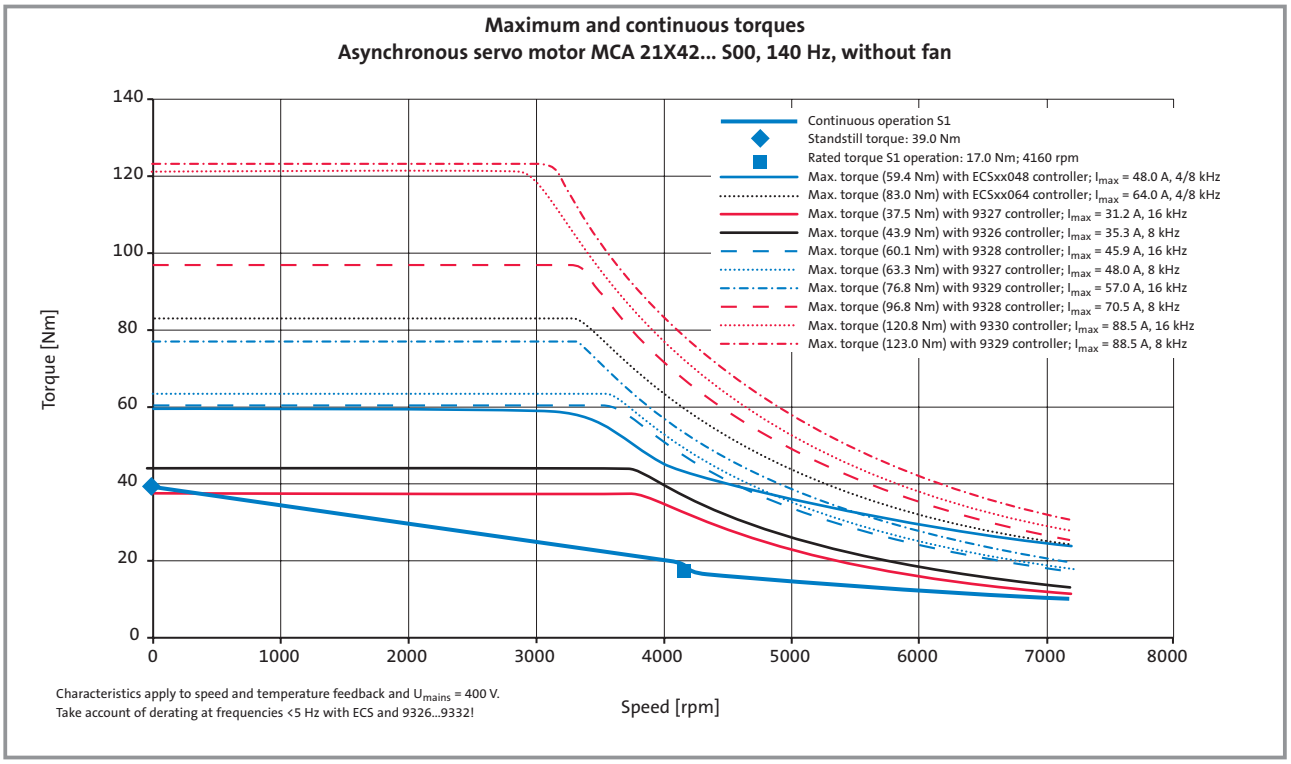
Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1) 2)] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [1)] [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Totally enclosed fan-cooled asynchronous servo motors													
Without fan													
MCA 21X25-...S00	M_N [Nm]						24.6	24.6	24.6	24.6			
	M_0 [Nm]						37.0	39.0	39.0	39.0			
	M_{max} n = 0 [4)] [Nm]						37.0	50.0	72.0	76.0			
	M_{max} [Nm]						55.8	71.4	90.3	97.5			
MCA 21X42-...S00	M_N [Nm]							17.0	17.0	17.0	17.0		
	M_0 [3)] [Nm]							18.0	36.0	39.0	39.0		
	M_{max} n = 0 [4)] [Nm]							18.0	36.0	40.0	59.0		
	M_{max} [Nm]							37.5	60.1	76.8	120.8		
With blower													
MCA 21X17-...F10	M_N [Nm]							52.0	61.4	61.4	61.4		
	M_0 [3)] [Nm]							52.0	75.0	75.0	75.0		
	M_{max} n = 0 [4)] [Nm]							52.0	89.0	96.0	134.0		
	M_{max} [Nm]							91.2	136.9	170.4	253.7		
MCA 21X35-...F10	M_N [Nm]										55.0	55.0	55.0
	M_0 [3)] [Nm]										75.0	75.0	75.0
	M_{max} n = 0 [4)] [Nm]										69.0	108.0	110.0
	M_{max} [Nm]										133.6	161.1	206.4

1) Caution: Limit I_{max} controller to I_{max} motor.
2) Caution: Values for heatsink temperature 9300 = 80 °C/ECS = 90 °C and 400 V mains supply; 9300: at heatsink temperatures < 80 °C the permissible maximum current increases at a chopper frequency of 8 kHz.
3) On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.
4) The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

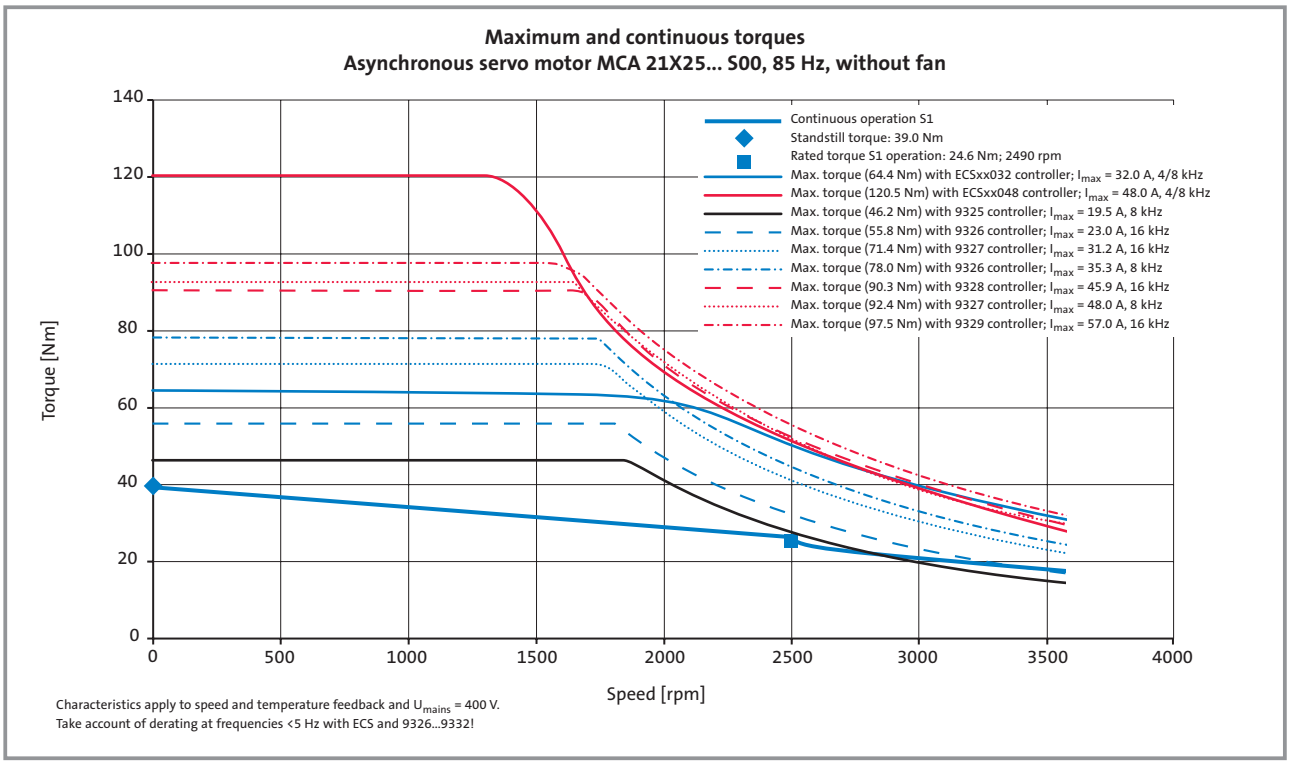
Torque characteristics

MCA 21X42...S00



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

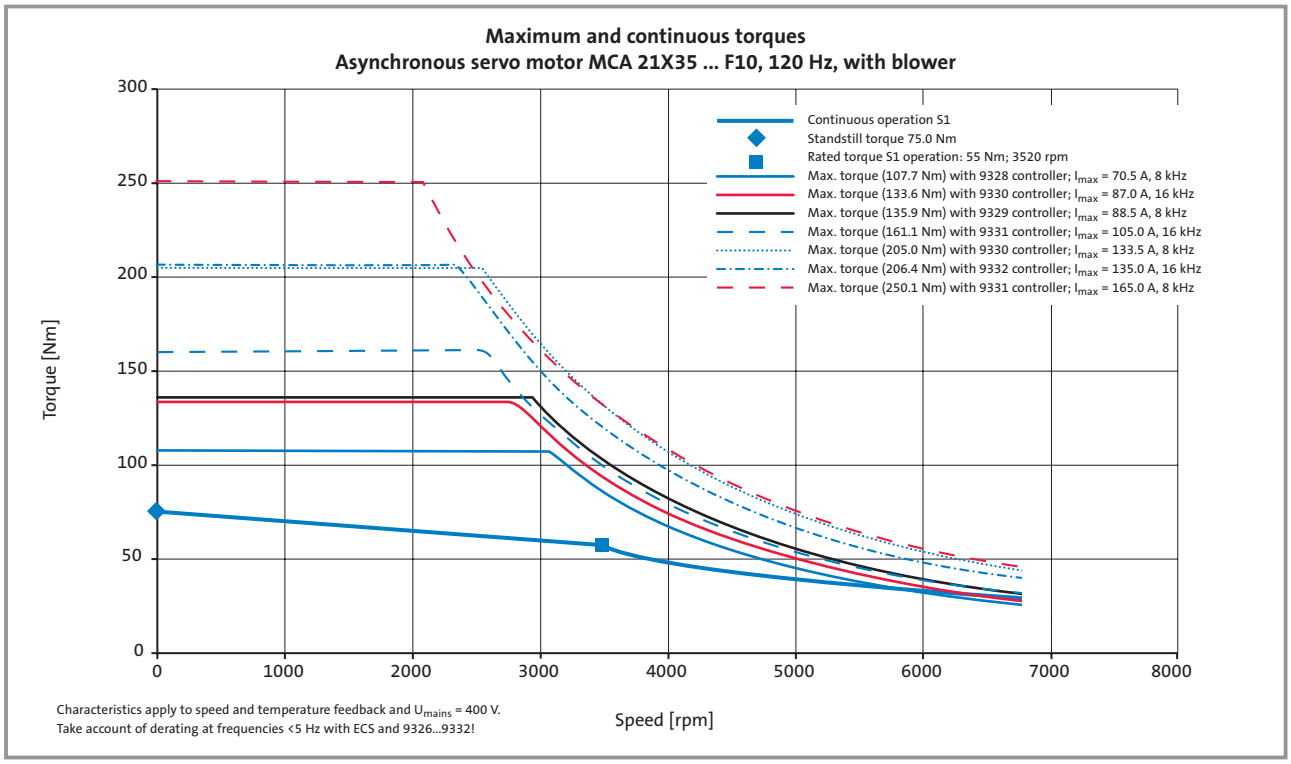
MCA 21X25...S00



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

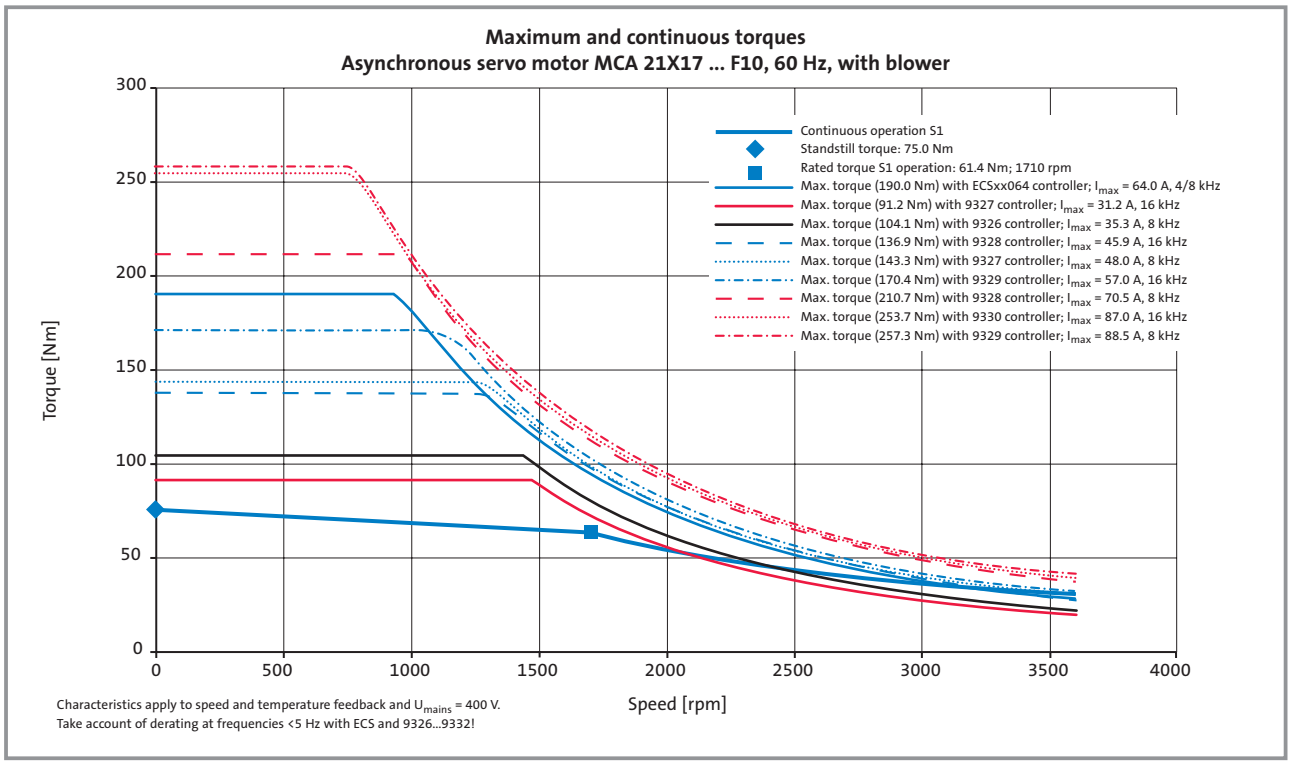
Torque characteristics

MCA 21X35...F10



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

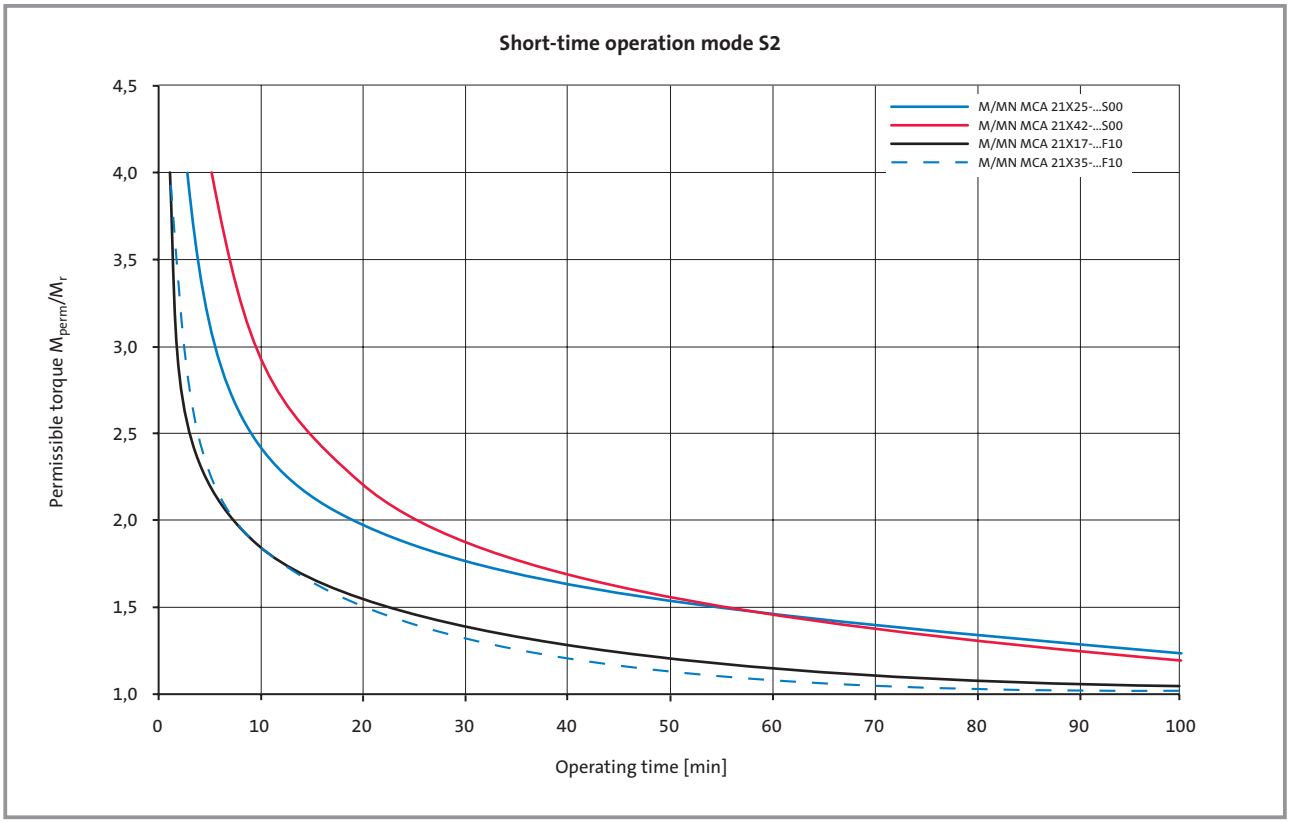
MCA 21X17...F10

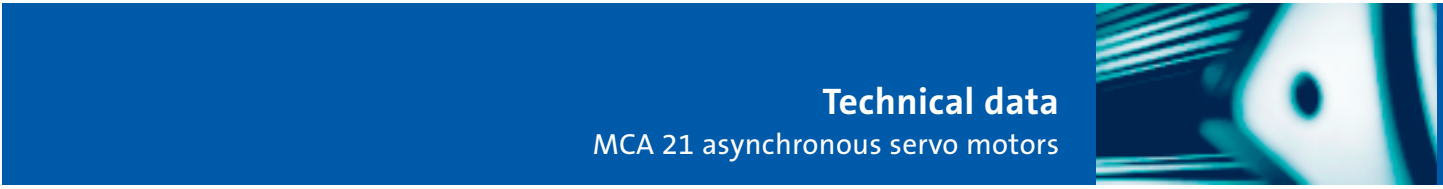


Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz with ECS and 9326...9332!

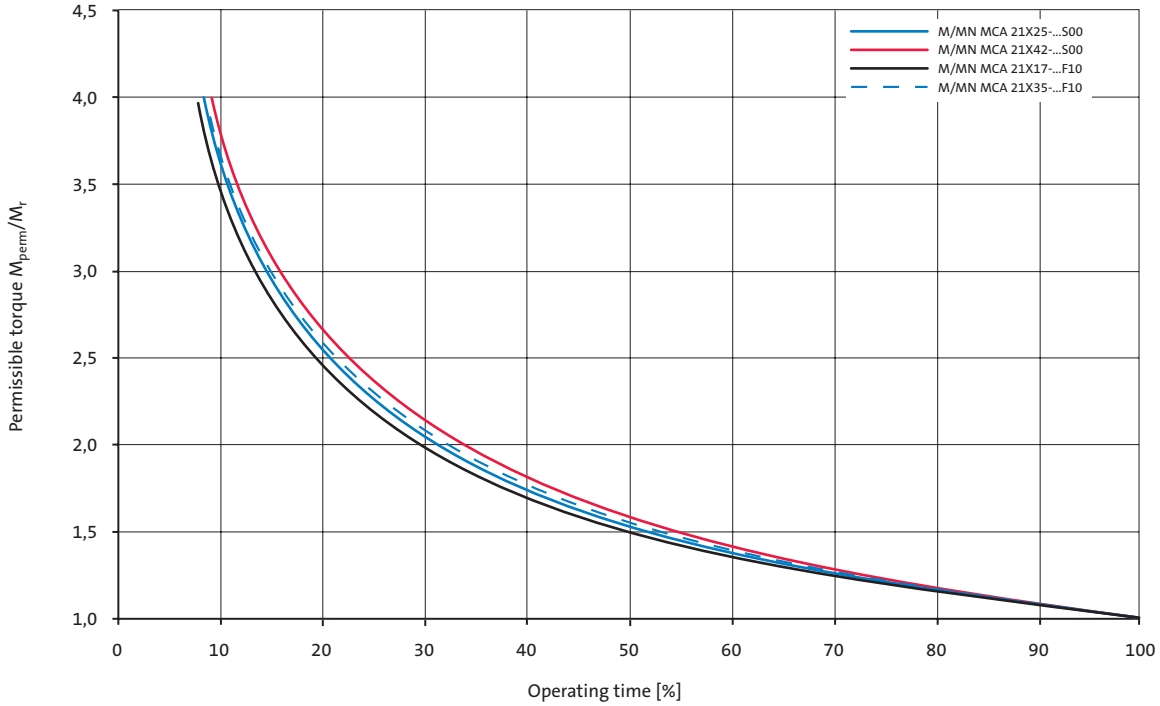
Short-time operation characteristic

Lenze MCA servo motors have high torque peaks. In order to make full use of this highly dynamic response as simply as possible, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.

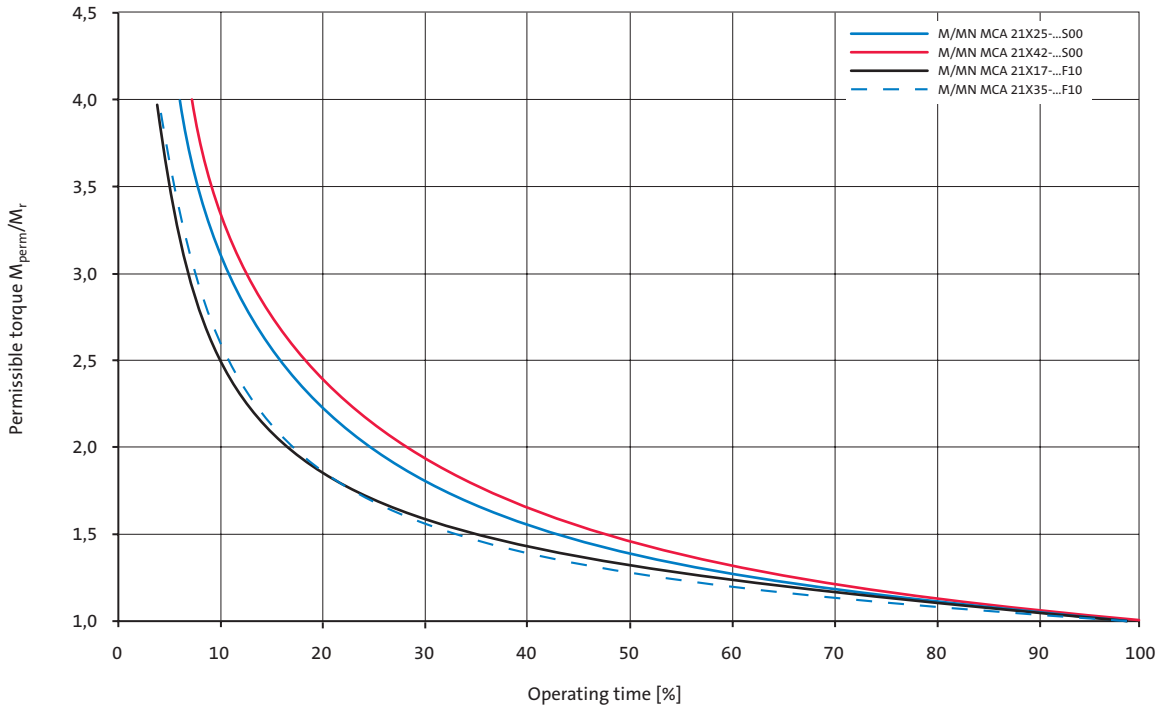




Short-time operation mode S6, 1 min load cycle duration



Short-time operation mode S6, 10 min load cycle duration



Brake assignment

The MCA asynchronous servo motors can be fitted with integral permanent magnet holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are used purely as holding brakes, there will be virtually no evidence of wear on the friction surfaces. As long as the permissible switching rate is not exceeded, at least 2000 emergency stop functions will be possible.

MCA 21

Type	Size	Holding torque M_4 20 °C Nm	Holding torque M_4 120 °C Nm	Average dynam. M_{1m} 120 °C Nm	U_B +5 % – -10 %[3] V	I_{BR}[2] A	J_{BR} kg m² · 10⁻⁴	Engagement t_1[1] ms	Diseng. time t_2[1] ms	Maximum switching rate per emergency stop with n = 3000 rpm J	Weight kg
P1	14H	88.0	80.0	35.0	24	1.46	31.80	53	97	2.800	4.98
P5[4]	14H	88.0	80.0	35.0	205	0.18	31.80	53	97	2.800	4.98

1) Engagement and disengagement times valid for rated voltage (± 0%) and protective circuit for brakes with varistor for DC-controlled switching. The times may increase without a protective circuit.
2) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.
3) Smoothed DC voltage, ripple 1%.
4) UR not possible in the case of a brake with 205 V supply voltage.

3

Permissible moments of inertia

Motor	Brake	J_{mot} with brake kg m² · 10⁻⁴	Permissible J_{load}/J_{mot}
MCA 21	P1	211.80	1.7
MCA 21	P5	211.80	1.7

If the permissible moments of inertia opposite are adhered to, the permissible maximum switching rate of the brake will not be exceeded and up to 2000 emergency stop functions will be possible at a speed of 3000 rpm.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

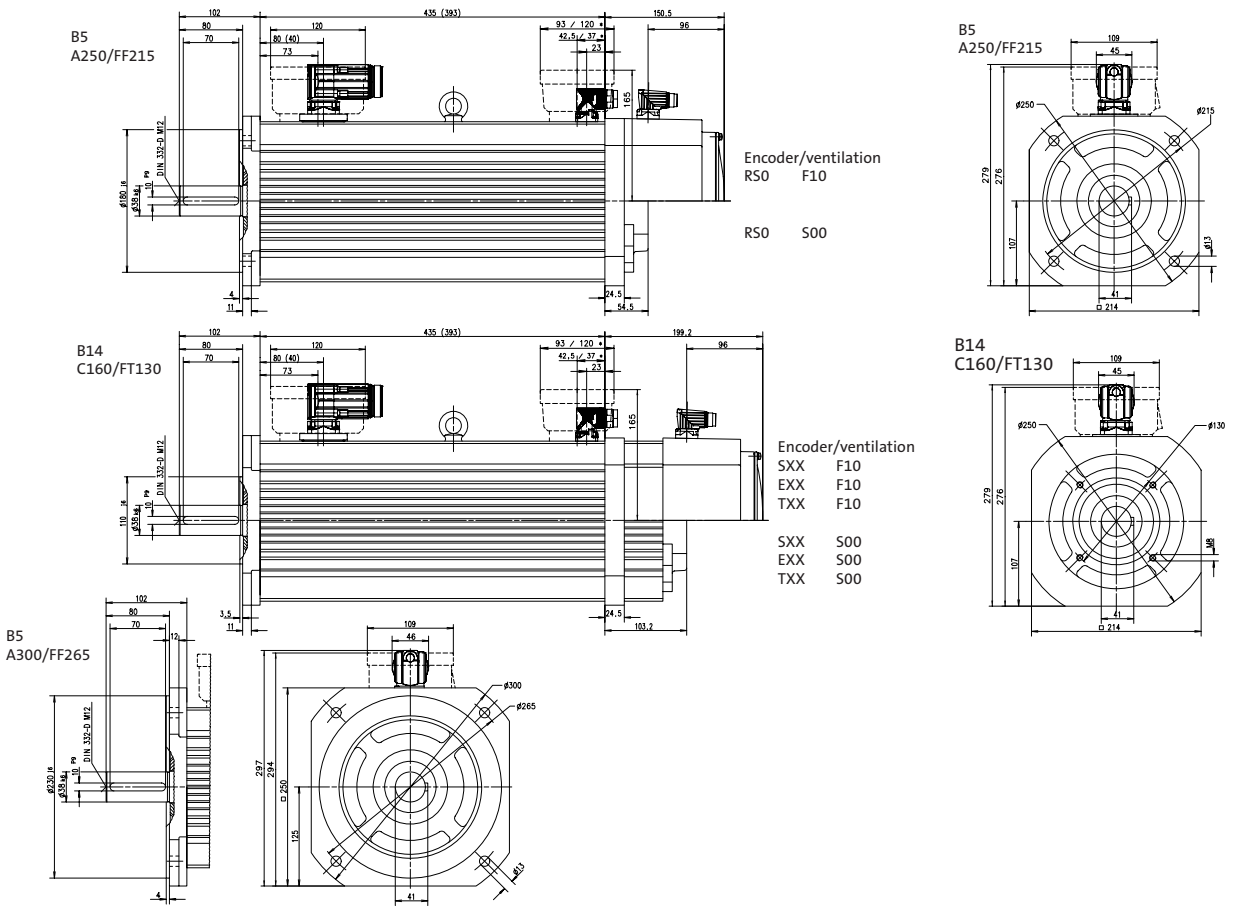
If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.
The following applies to Lenze system cables:

$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times I_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

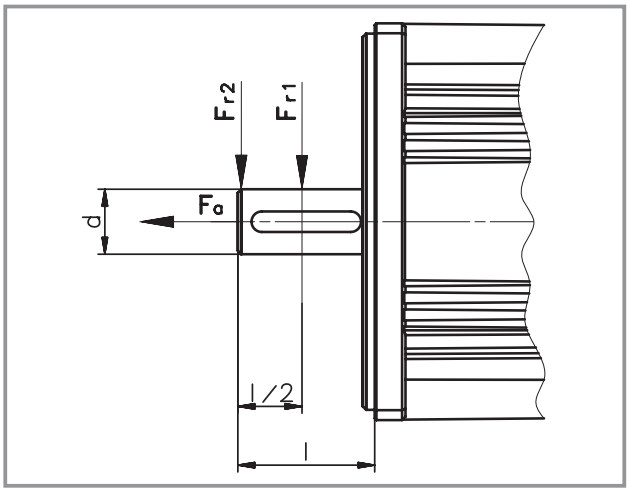


Blower data

U_N	f_N	I_N	P_N
[V]	[Hz]	[A]	[W]
210...240, 1 ph.	50/60	0.26	60

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

Service life is calculated as follows:

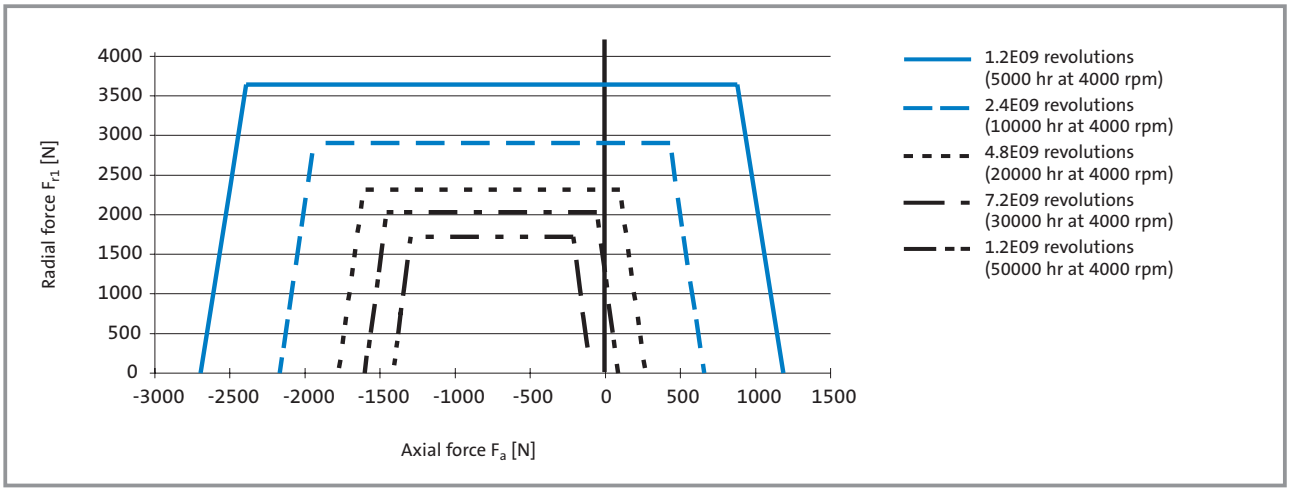
$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

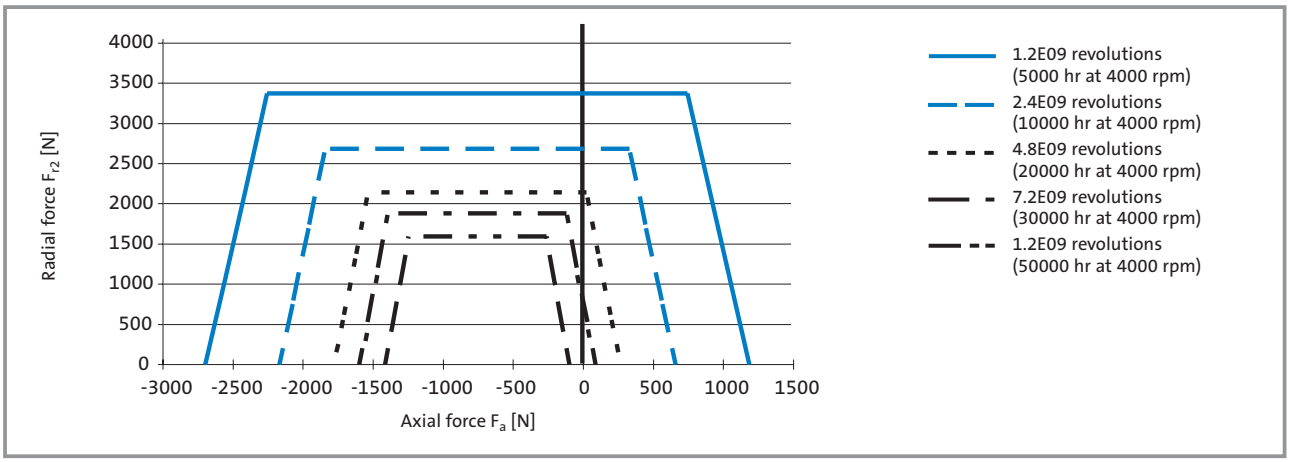
3

The curves apply to MCA 21

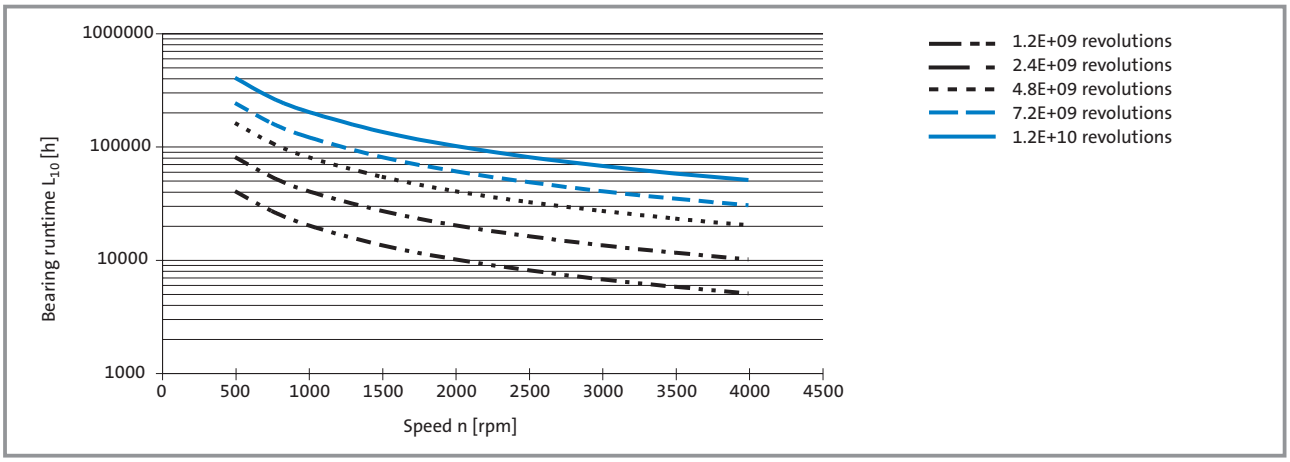
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



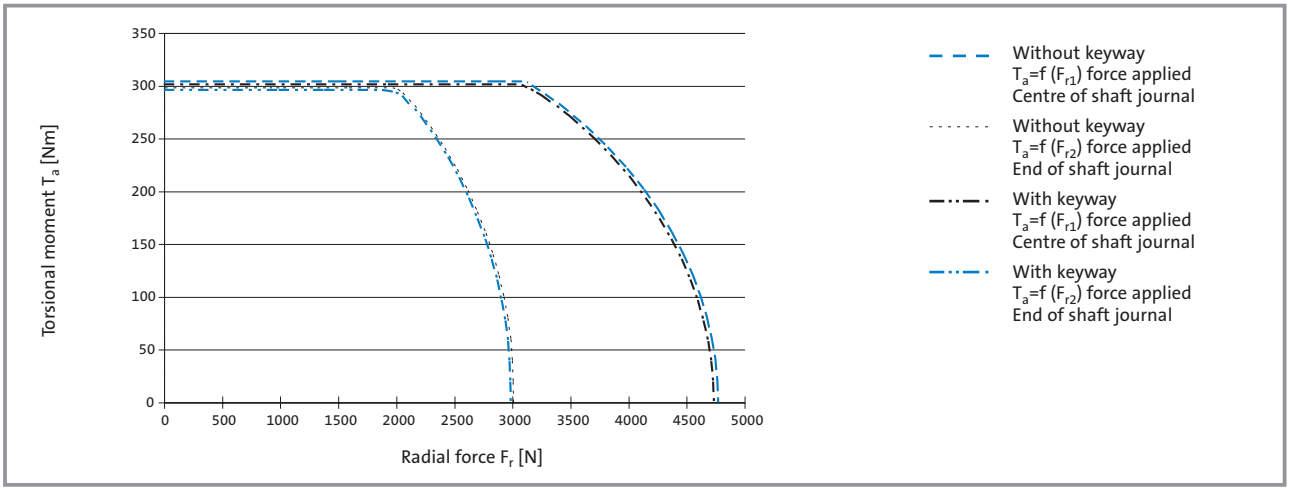
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Terminal box

If an MCA servo motor is to be connected to an existing cable or plug connectors are not to be used for other reasons, the connection can also be made via terminal box.

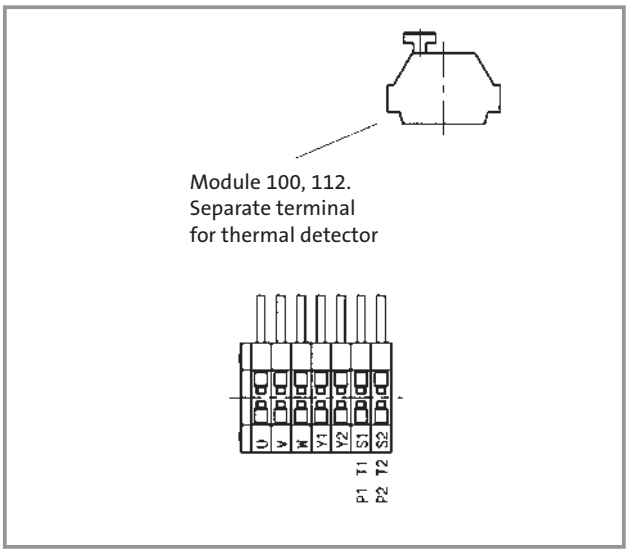
The motor can either be fitted with a terminal box for the power connection and motor holding brake or a second terminal box provided to connect the motor feedback and fan (if applicable).

Terminal box for power connection and motor holding brake

Terminals

	Pin no.	Terminal assignment
Brake U_B +	5	Y1
Brake U_B -	6	Y2
PE conductor	PE	PE
Motor phase	1	U
Motor phase	2	V
Motor phase	3	W

Terminal diagram



Cable glands

Motor type	Cable terminal box		Feedback
	Cable glands	Terminals	Cable glands
MCA 10	1x M20 x 1.5, 1x M16 x 1.5	0.08...2.5 mm²	1x M20 x 1.5, 1x M16 x 1.5
MCA 13	1x M20 x 1.5, 1x M16 x 1.5	0.08...2.5 mm²	1x M20 x 1.5, 1x M16 x 1.5
MCA 14	1x M20 x 1.5, 1x M16 x 1.5	0.08...2.5 mm²	1x M20 x 1.5, 1x M16 x 1.5
MCA 17	1x M20 x 1.5, 1x M16 x 1.5	0.08...2.5 mm²	1x M20 x 1.5, 1x M16 x 1.5
MCA 19	1x M32 x 1.5, 1x M25 x 1.5	0.02...10 mm²	1x M20 x 1.5, 1x M16 x 1.5
MCA 21	1x M32 x 1.5, 1x M25 x 1.5	0.02...10 mm²	1x M20 x 1.5, 1x M16 x 1.5

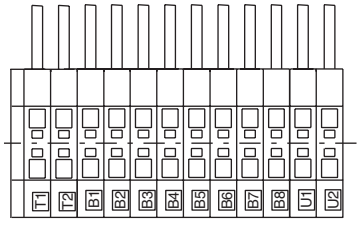
The following are required to ensure wiring is EMC-compliant:

- ▶ Shielded cables
- ▶ Metal EMC cable glands with shield connection

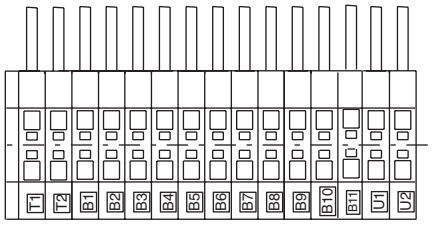
Terminal assignment – feedback and temperature monitoring

	Resolver		SinCos absolute value encoder		Incremental encoder			Cross-section
			SRx 50, SCx 70			ITD 21 / 22	CDD 50	
Terminal	Connection	Wire colour	Connection	Wire colour	Connection	Wire colour	Wire colour	mm²
T1/P1/S1	Thermal detector KTY +							0.14 / 0.21
T2/P1/S1	Thermal detector KTY -							0.14 / 0.21
B1	+ Ref	red/white	Supply VCC	red	Supply VCC	red	red	0.14 / 0.21
B2	- Ref	yellow/white	Ground GND	blue	Ground GND	blue	blue	0.14 / 0.21
B3	-	-	+ COS	pink	A	green	white	0.14 / 0.21
B4	+ COS	red	COS	black	- A	brown	brown	0.14 / 0.21
B5	- COS	black	+ SIN	white	B	grey	pink	0.14 / 0.21
B6	+ SIN	yellow	- SIN	brown	- B	black	black	0.14 / 0.21
B7	- SIN	blue	Data + RS 485	grey	N	pink	white/yellow	0.14 / 0.21
B8	-	-	Data - RS 485	green	- N	white	white/blue	0.14 / 0.21
B10	-	-	-	-	-	-	-	0.14 / 0.21
U1	Blower / L1							1.0 / 1.5
U2	Blower / N							1.0 / 1.5

Terminal diagram – resolver



Terminal diagram – SinCos/incremental encoder



Technical data

MDFQA asynchronous servo motors

Asynchronous servo motors MDFQA 100/112

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Asynchronous servo motors MDFQA 132/160

Rated data 4-19
Servo controller assignment 4-20
Torque characteristics 4-24
Brake assignment 4-30
Mechanical dimensions 4-31
Permissible shaft loads 4-34

Motor connection

Terminal box 4-38

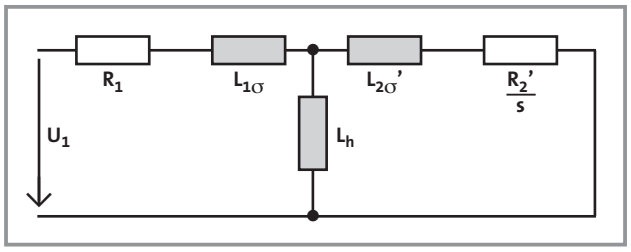
Rated data

Motor	Circuit	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	Moment of inertia motor w/o brake kg m² · 10⁻⁴
MDFQA 100-22, 50	Y	1420	76	250	71.3	10.6	27	26.5	360	50	0.84	180
MDFQA 100-22, 100	Y	2930	76	250	66.2	20.3	54	46.9	360	100	0.80	180
MDFQA 112-22, 50	Y	760	156	500	145	11.5	29.5	27.2	360	28	0.87	470
MDFQA 112-22, 50	Δ	1425	156	500	135	20.1	51.0	43.7	360	50	0.86	470
MDFQA 112-22, 100	Y	1670	156	500	130	22.7	59.0	49.1	360	58	0.85	470
MDFQA 112-22, 100	Δ	2935	156	500	125	38.4	102.0	81.9	360	100	0.83	470

Motor	Circuit	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Weight without brake kg	Maximum speed mech. rpm
MDFQA 100-22, 50	Y	76	0.691	0.933	0.346	1.90	59.8	0.560	2.40	65	5000*
MDFQA 100-22, 100	Y	87	0.173	0.234	0.260	0.48	14.3	0.140	0.60	65	5000*
MDFQA 112-22, 50	Y	78	1.070	1.445	0.535	3.81	118.4	0.750	5.09	115	5000
MDFQA 112-22, 50	Δ	86	0.357	0.482	0.536	3.89	116.0	0.750	5.18	115	5000
MDFQA 112-22, 100	Y	87	0.268	0.362	0.134	0.98	28.9	0.189	1.30	115	5000
MDFQA 112-22, 100	Δ	90	0.089	0.120	0.134	0.97	28.1	0.189	1.30	115	5000

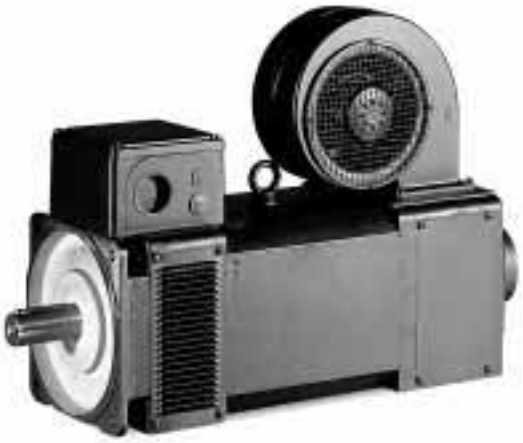
* Short term up to 8000 rpm.

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram

MDFQA 100 asynchronous servo motor with blower and holding brake



MDFQA 112 asynchronous servo motor with blower

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 8 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Asynchronous servo motors enclosed-ventilated													
MDFQA 100-22, 50 Y	MN [Nm]						61.0	71.3	71.3	71.3			
	M_0 [2] [Nm]						61.0	76.0	76.0	76.0			
	M_{max} n = 0 [4] [Nm]						61.0	93.0	153.0	168.0			
	M_{max} [Nm]						109.3	156.7	232.0	253.0			
MDFQA 100-22, 100 Y	MN [Nm]								66.2	66.2	66.2	66.2	
	M_0 [2] [Nm]								66.3	76.0	76.0	76.0	
	M_{max} n = 0 [4] [Nm]								66.3	72.0	129.0	190.0	
	M_{max} [Nm]								112.5	146.4	227.0	257.0	
MDFQA 112-22, 50 Y	MN [Nm]							145.0	145.0	145.0			
	M_0 [2] [Nm]							156.0	156.0	156.0			
	M_{max} n = 0 [4] [Nm]							166.0	242.0	267.0			
	M_{max} [Nm]							247.0	339.0	346.0			
MDFQA 112-22, 50 △	MN [Nm]								135.0	135.0	135.0		
	M_0 [2] [Nm]								146.0	156.0	156.0		
	M_{max} n = 0 [4] [Nm]								146.0	160.0	264.0		
	M_{max} [Nm]								230.1	292.9	341.8		
MDFQA 112-22, 100 Y	MN [Nm]								124.0	130.0	130.0	130.0	
	M_0 [2] [Nm]								124.0	156.0	156.0	156.0	
	M_{max} n = 0 [4] [Nm]								124.0	135.0	204.0	287.0	
	M_{max} [Nm]								180.5	228.0	342.0	378.0	
MDFQA 112-22, 100 △	MN [Nm]										125.0	125.0	125.0
	M_0 [2] [Nm]										135.5	156.0	156.0
	M_{max} n = 0 [4] [Nm]										122.0	171.0	200.0
	M_{max} [Nm]										216.0	273.0	355.0

[1] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.

[4] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo system assignment 93□□

Rated and maximum torques at a chopper frequency of 16 kHz													
Type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Asynchronous servo motors enclosed-ventilated													
MDFQA 100-22, 50 Y	MN [Nm]								71.3	71.3	71.3		
	M_0 [2] [Nm]								76.0	76.0	76.0		
	M_{max} n = 0 [4] [Nm]								87.0	95.0	146.0		
	M_{max} [Nm]								149.0	189.2	250.2		
MDFQA 100-22, 100 Y	MN [Nm]										66.2	66.2	66.2
	M_0 [2] [Nm]										76.0	76.0	76.0
	M_{max} n = 0 [4] [Nm]										62.0	110.0	115.0
	M_{max} [Nm]										143.6	175.2	227.2
MDFQA 112-22, 50 Y	MN [Nm]								145.0	145.0	145.0		
	M_0 [2] [Nm]								156.0	156.0	156.0		
	M_{max} n = 0 [4] [Nm]								154.0	167.0	232.0		
	M_{max} [Nm]								236.4	292.2	346.0		
MDFQA 112-22. 50 △	MN [Nm]										135.0	135.0	
	M_0 [2] [Nm]										156.0	156.0	
	M_{max} n = 0 [4] [Nm]										140.0	224.0	
	M_{max} [Nm]										288.5	314.3	
MDFQA 112-22, 100 Y	MN [Nm]										130.0	130.0	130.0
	M_0 [2] [Nm]										156.0	156.0	156.0
	M_{max} n = 0 [4] [Nm]										123.0	180.0	185.0
	M_{max} [Nm]										224.0	269.0	343.0
MDFQA 112-22. 100 △	MN [Nm]											102.0	125.0
	M_0 [2] [Nm]											102.0	138.0
	M_{max} n = 0 [4] [Nm]											102.0	110.0
	M_{max} [Nm]											159.4	217.0

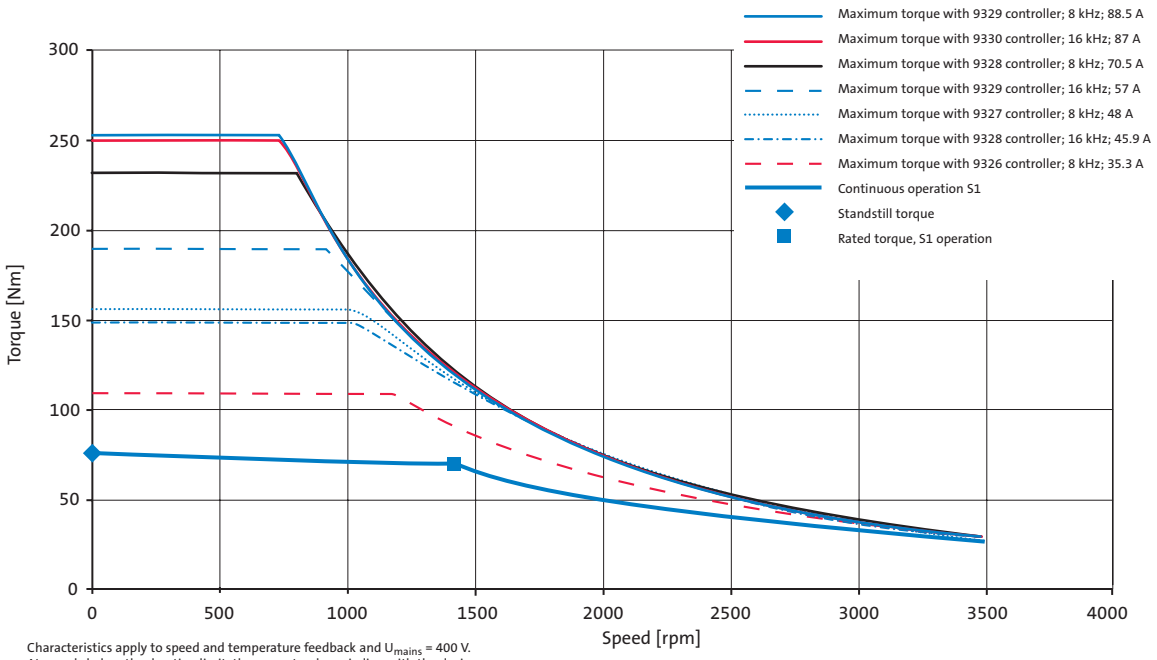
[1] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.

[4] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

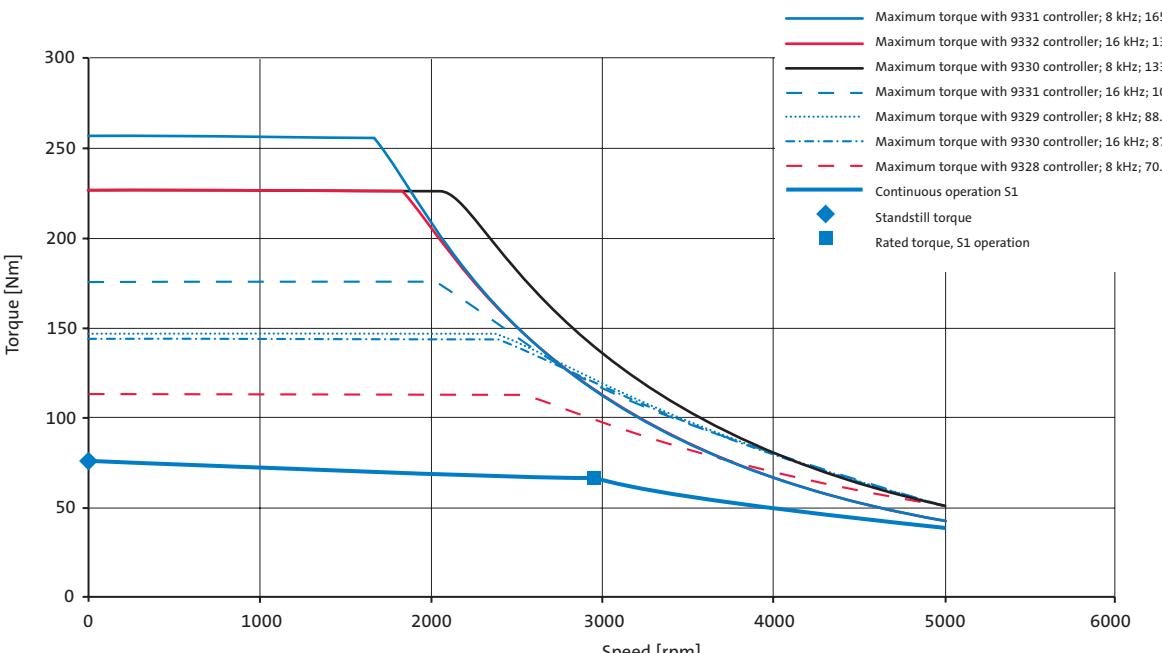
Torque characteristics

MDFQA 100-22, 50, Star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

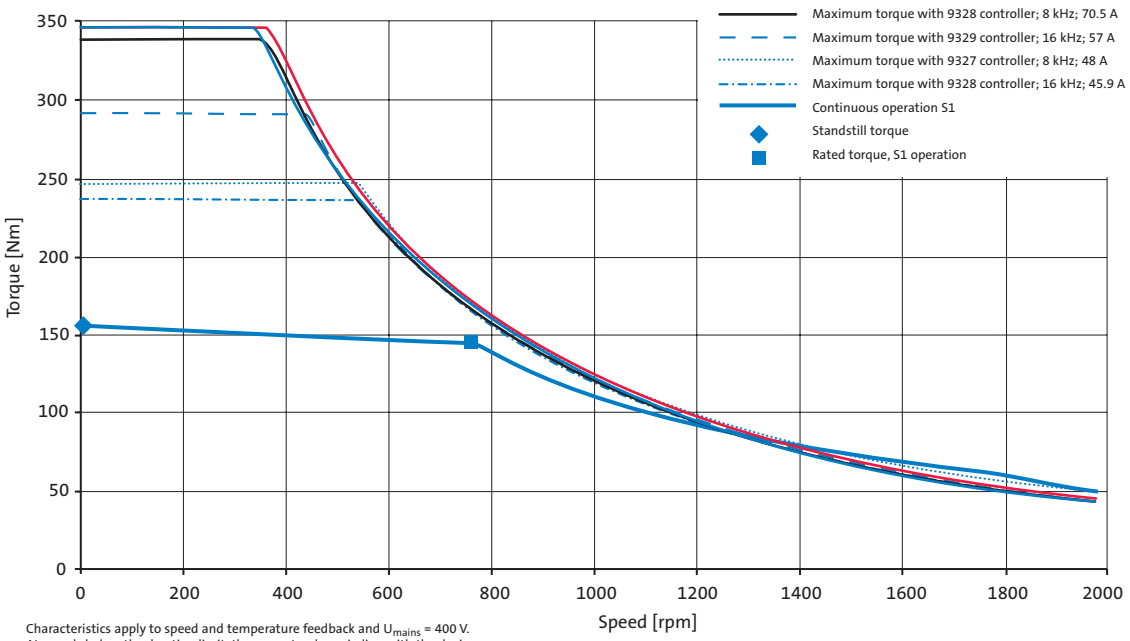
MDFQA 100-22, 100, Star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

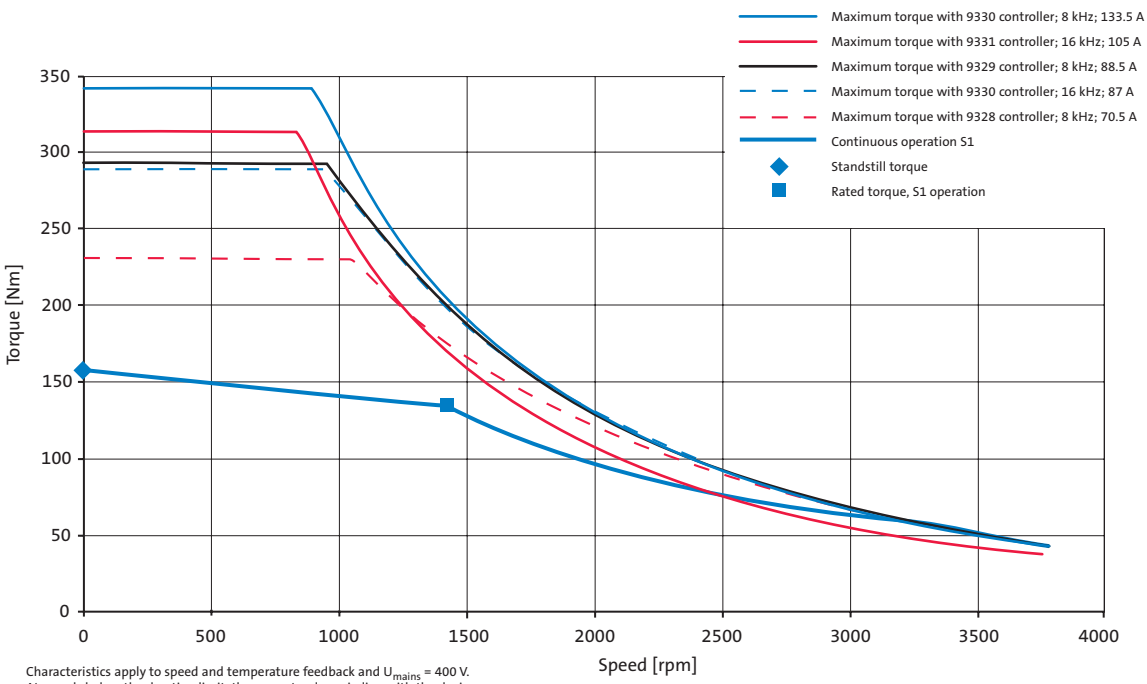
Torque characteristics

MDFQA 112-22, 50, Star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

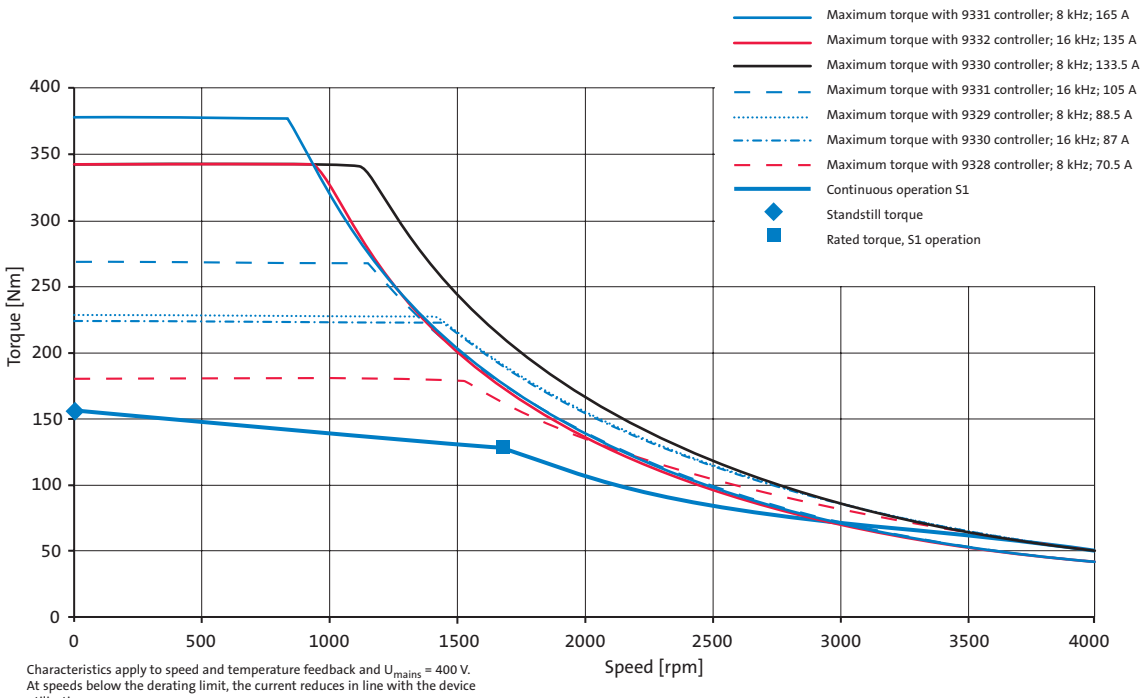
MDFQA 112-22, 50, Delta connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

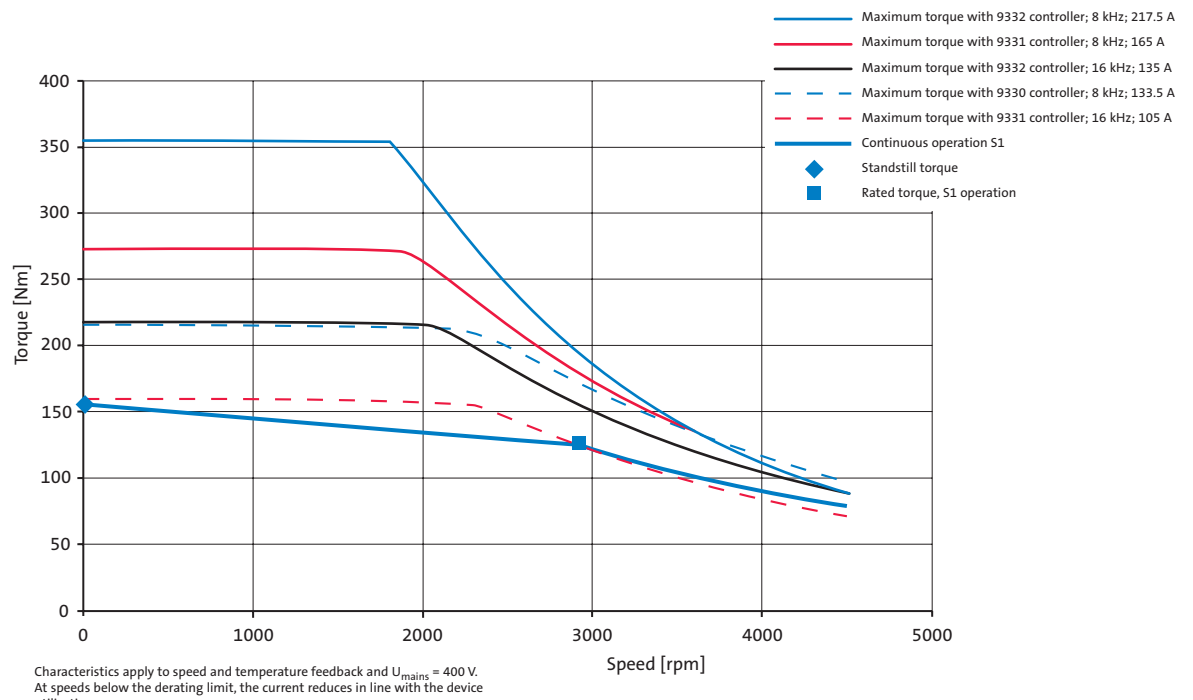
Torque characteristics

MDFQA 112-22, 100, Star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

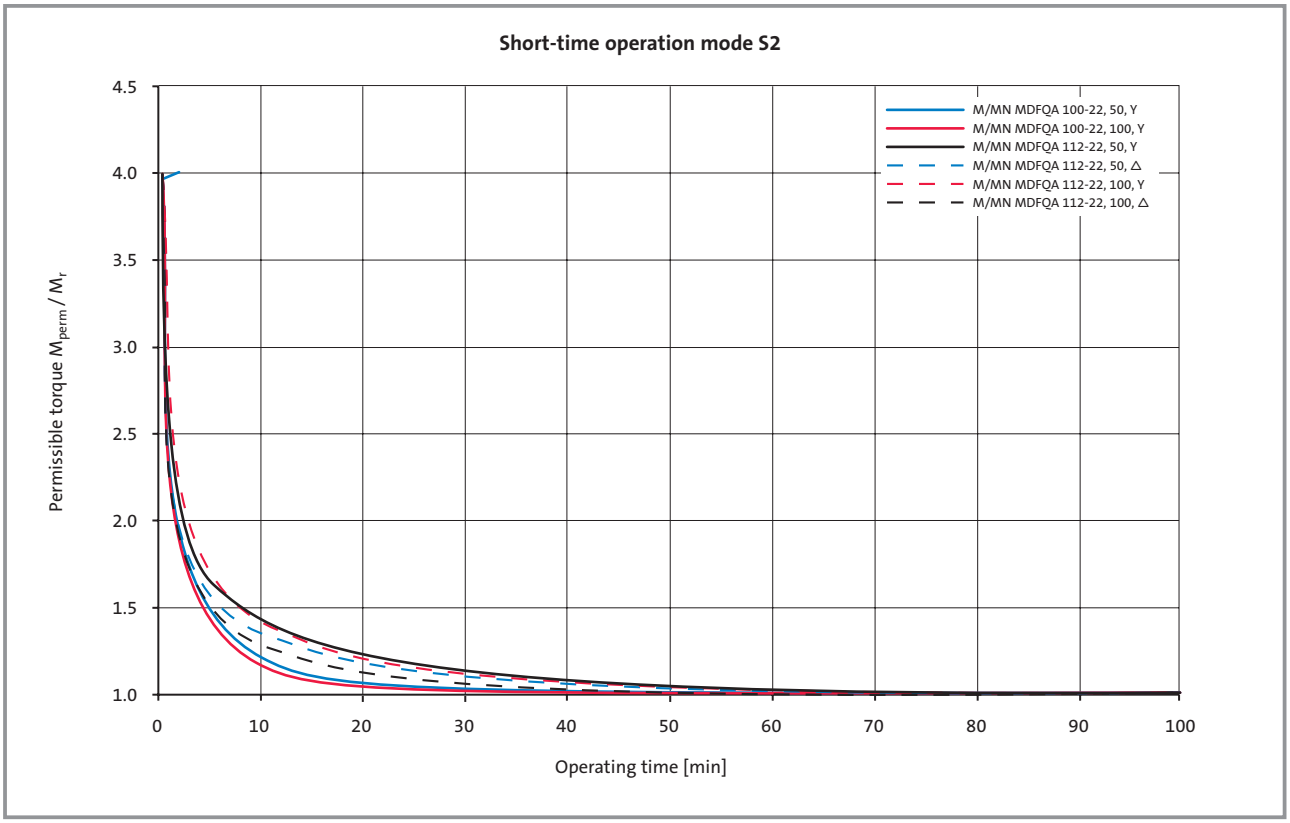
MDFQA 112-22, 100, Delta connection with blower



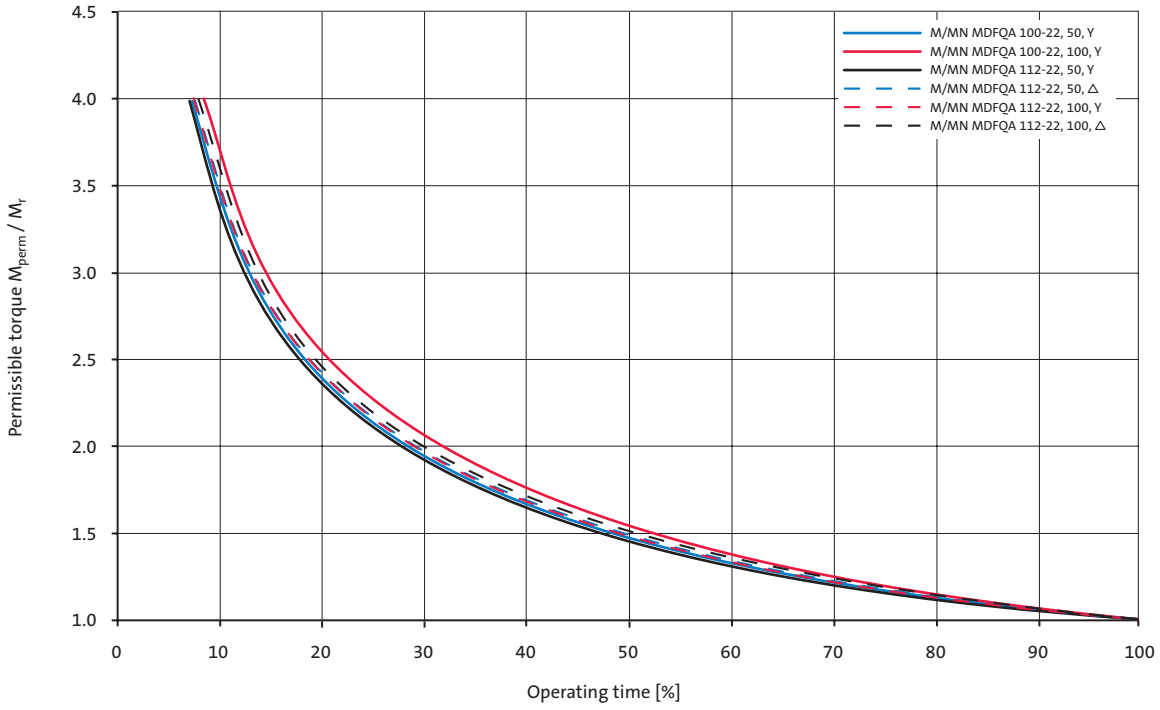
Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

Short-time operation characteristic

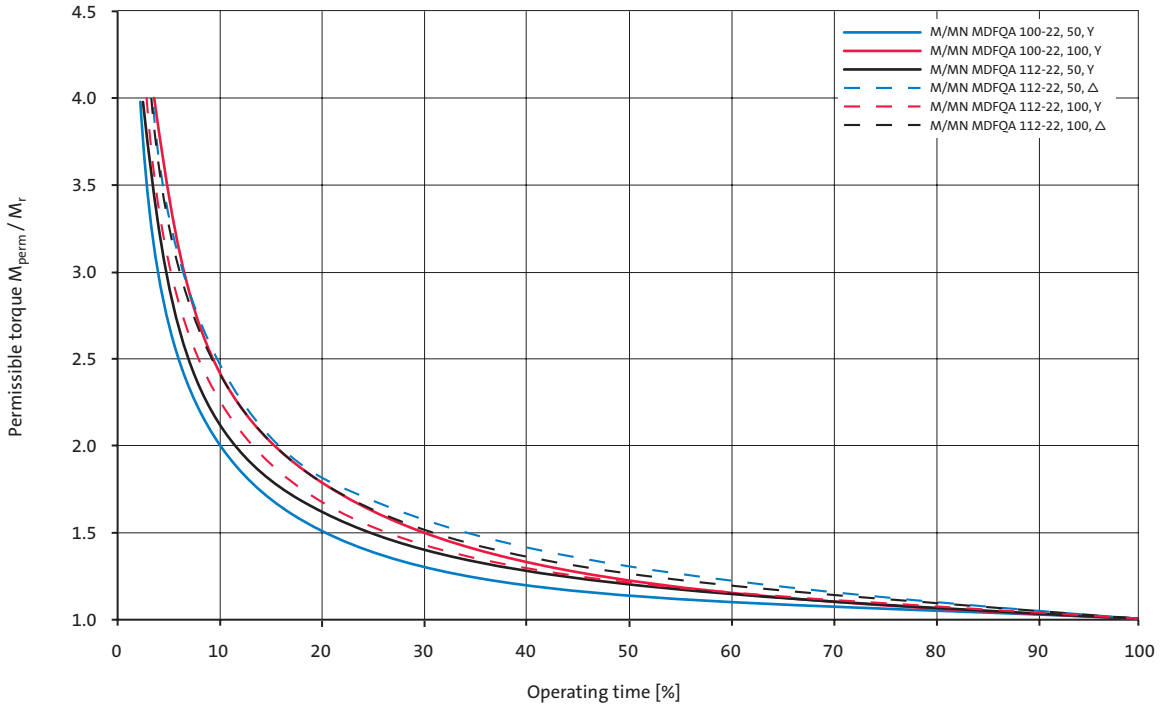
Lenze MDFQA servo motors can generate high torque peaks. In order to make full use of this highly dynamic response as simply as possible, without overloading the motor, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.



Short-time operation mode S6, 1 min load cycle duration



Short-time operation mode S6, 10 min load cycle duration



Brake assignment

MDFQA asynchronous servo motors can be fitted with integral spring-applied holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are being used as pure holding brakes, then there will be practically no wear on the friction surfaces.

Type	MDFQA 100	MDFQA 112	Size	Characteristic torque M_B [1] Nm	U_B +5 % – -10 % V	I_{Br} [4] A	J_{Br} kg m² · 10⁻⁴	Engagement time t_1 [2, 3] ms	Diseng. time t_2 [2, 3] ms	Max. switching rate per circuit at n = 3000 rpm Q_E kJ	Transition operating frequency $S_{hü}$ 1/h	Weight kg
F1	●		BFK460-16N	80	24	2.29	15.0	92	220	36	27	13.5
F2	●		BFK460-18N	150	24	3.54	29.0	125	270	60	20	20.0
F5	●		BFK460-16N	80	205	0.27	15.0	92	220	36	27	13.5
F6	●		BFK460-18N	150	205	0.41	29.0	125	270	60	20	20.0
F1		●	BFK460-18N	150	24	3.54	29.0	125	270	60	20	21.5
F2		●	BFK460-20N	260	24	4.17	73.0	265	340	80	19	31.0
F5		●	BFK460-18N	150	205	0.41	29.0	125	270	60	20	21.5
F6		●	BFK460-20N	260	205	0.49	73.0	265	340	80	19	31.0

1) Characteristic torques are with reference to the relative speed Δn = 100 rpm·

2) Engagement and disengagement times valid for rated voltage (±0 %) and protective circuit for brakes with spark suppressors.
The times may increase without a protective circuit. The operating times are mean values. The leakage depends on the type of rectifier, the air path and the coil current.

2) Engagement times with DC side switching, in the case of AC side switching t_1 increases by a factor of about 6.

4) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.

The following applies to Lenze system cables:

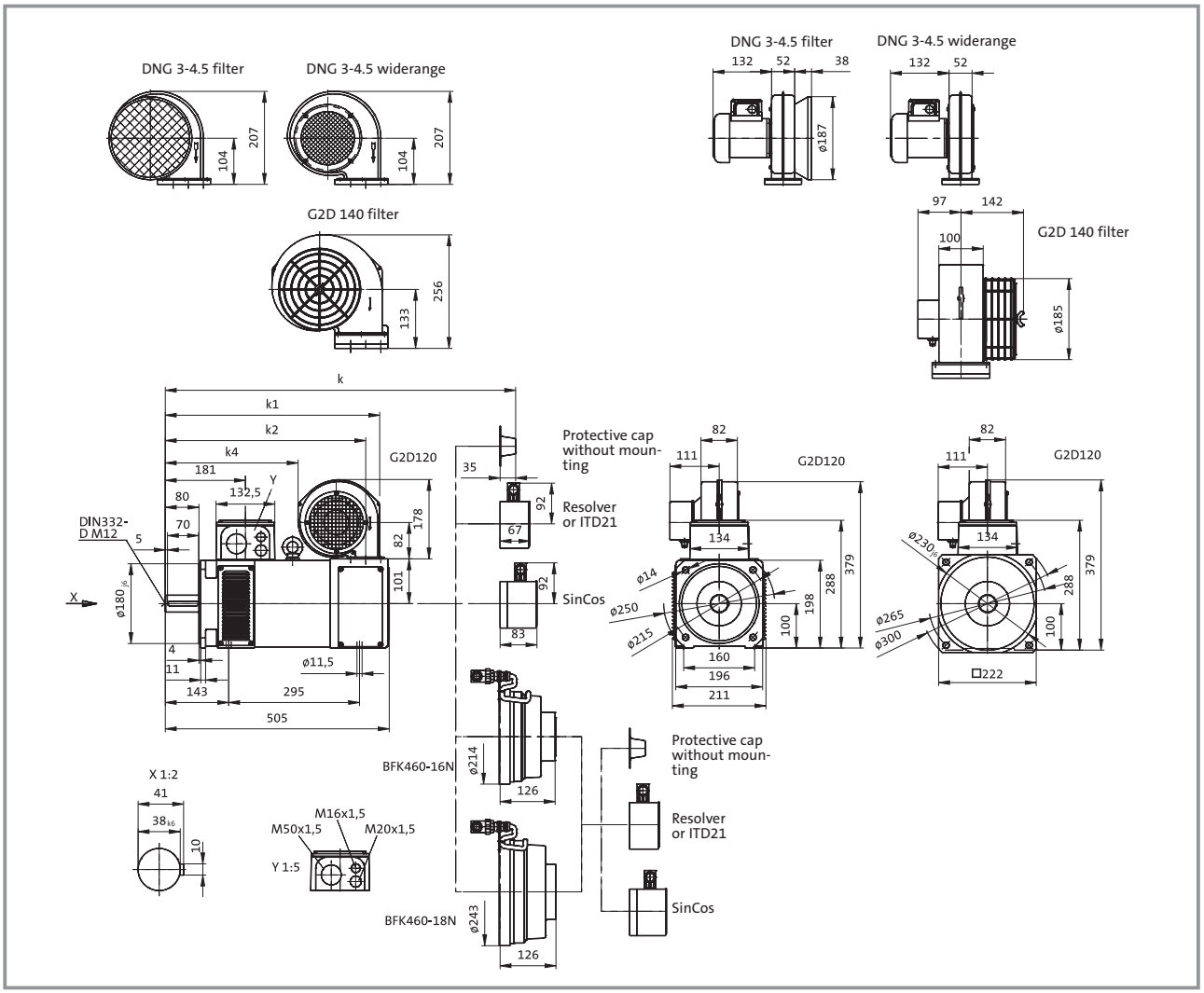
$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

MDFQA 100-22 B5 A300 / B35 A250



Fan type	k1	k2	k4
G2D120	484	452	300
G2D140 filter	489	452	241
DGN 3-4.5 widerange	486	452	275
DNG 3-4.5 filter	486	452	273

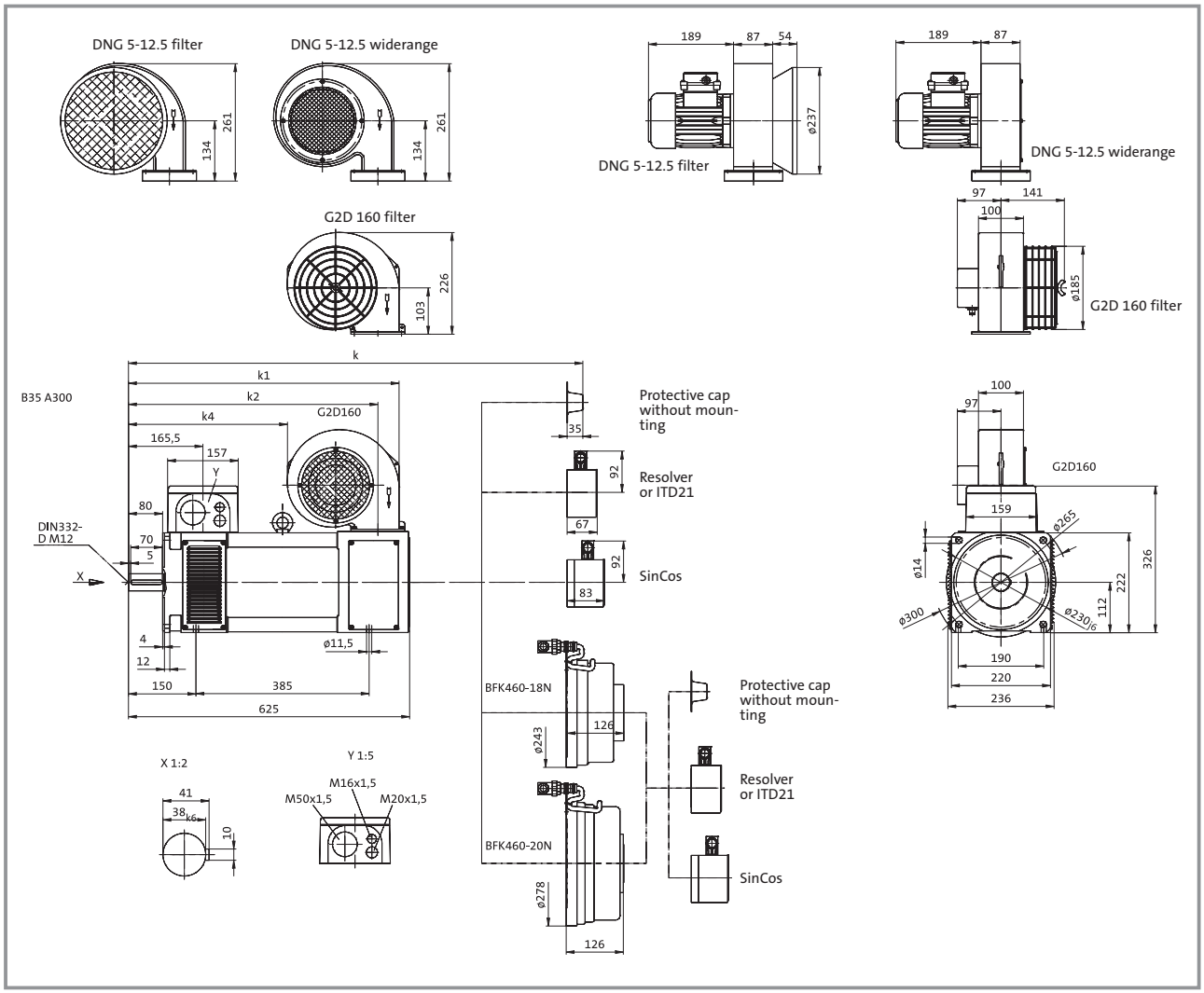
Accessories	Overall length k
None	484
Resolver or ITD21	572
SinCos	588
Brake	666
Brake with resolver or ITD21	698
Brake with SinCos	714

Blower data

Fan type	U_N	f_N	I_N	P_N
	[V]	[Hz]	[A]	[W]
120	380 ...460, 3 ph.	**50/60**	**0.11**	**60**
G2D 140 with or without filter	380 ... 460, 3 ph.	50/60	0.25	150
DNG 3-4.5 with or without filter with wide voltage range	350 ... 540, 3 ph.	50/60	0.25	100

Mechanical dimensions

MDFQA 112-22 B35 A300



Fan type	k1	k2	k4
G2D160	601.5	554.5	353.5
G2D160 filter	601.5	554.5	353.5
DGN 5-12.5 widerange	590	554.5	323
DNG 5-12.5 filter	590	554.5	312.5

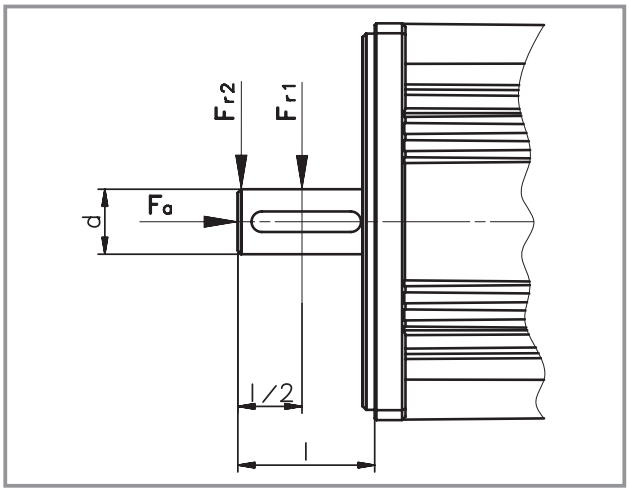
Accessories	Overall length k
None	660
Resolver or ITD21	692
SinCos	708
Brake	786
Brake with resolver or ITD21	818
Brake with SinCos	834

Blower data

Fan type	U_N	f_N	I_N	P_N
	[V]	[Hz]	[A]	[W]
G2D 160 with or without filter	380 ... 460, 3 ph.	50/60	0.5	320
DNG 5 -12.5 with or without filter with wide voltage range	350 ... 540, 3 ph.	50/60	0.75	390

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

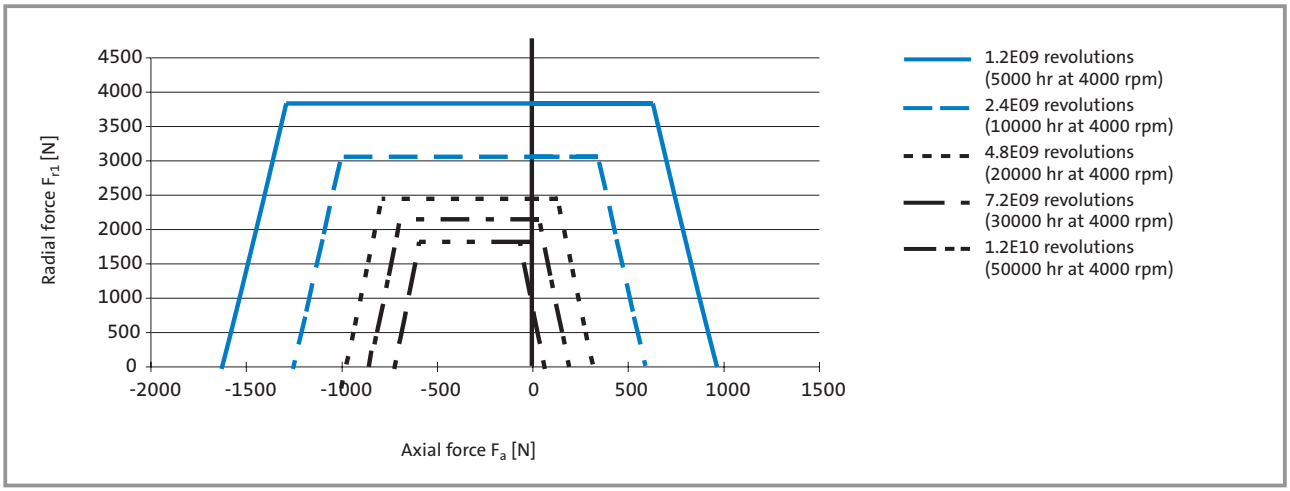
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

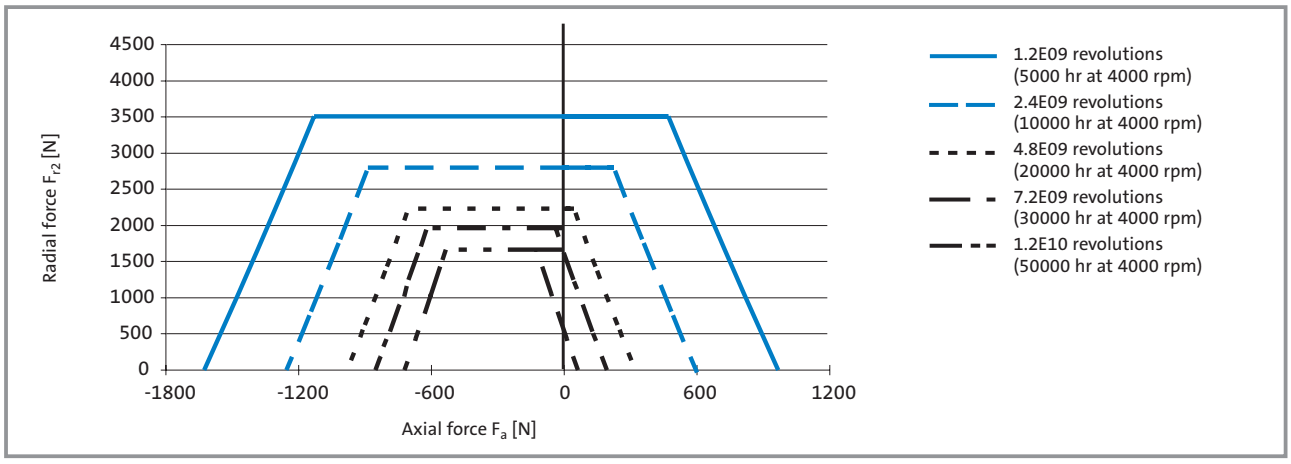
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The curves apply to all MDFQA 100 versions

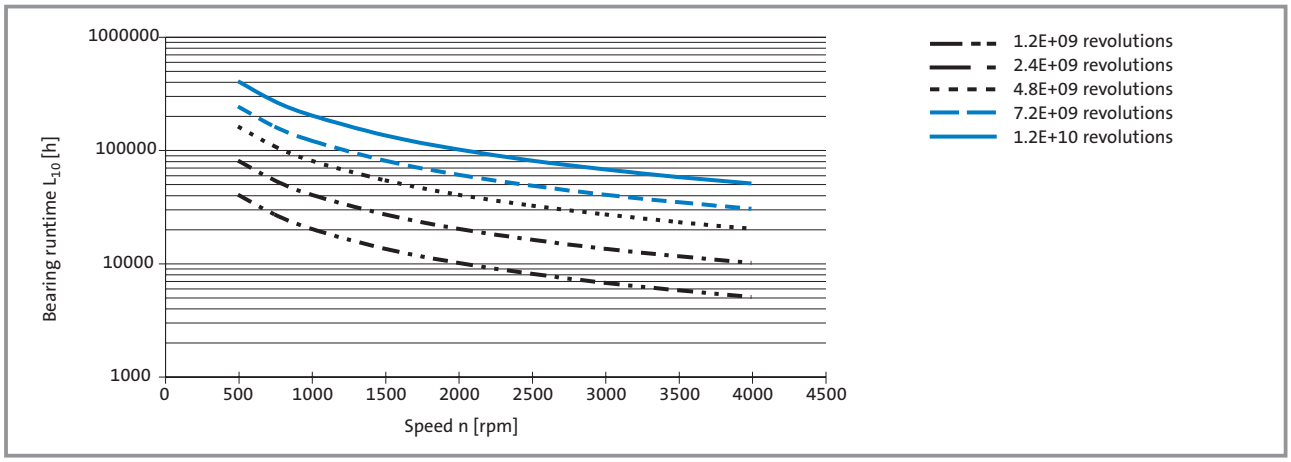
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



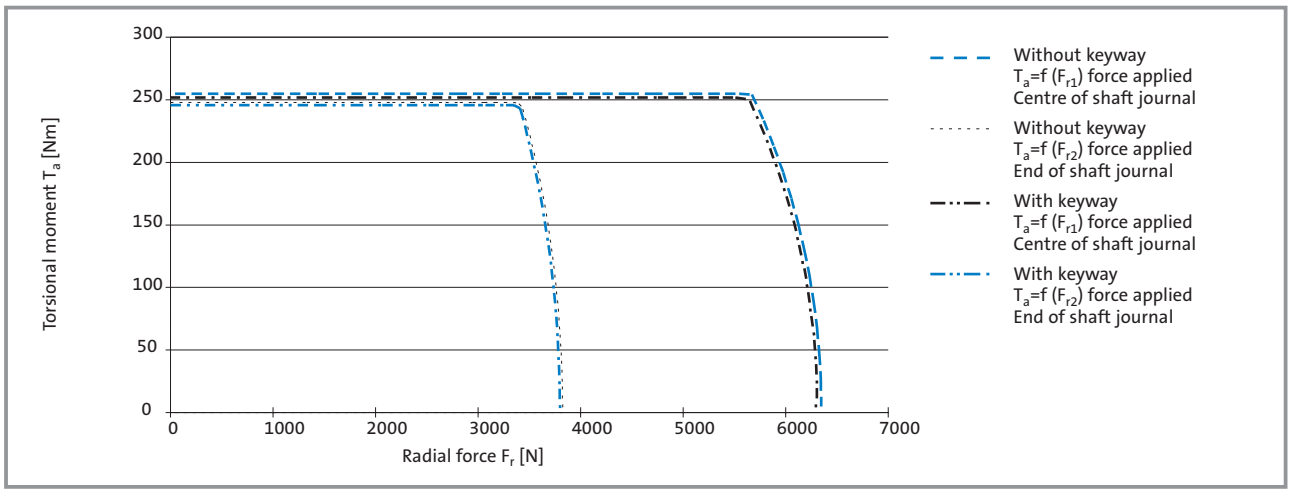
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

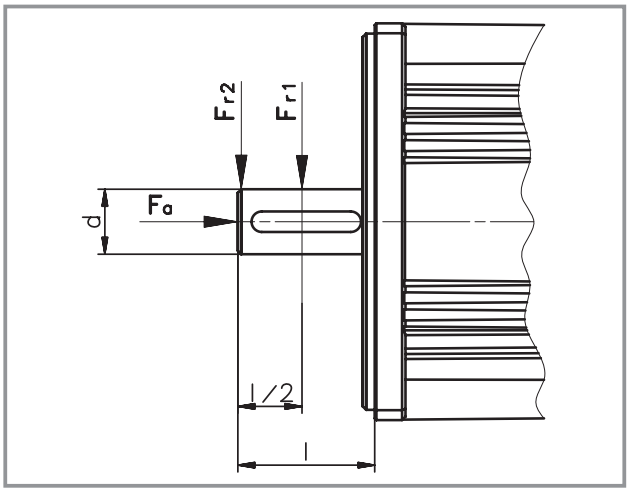
Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

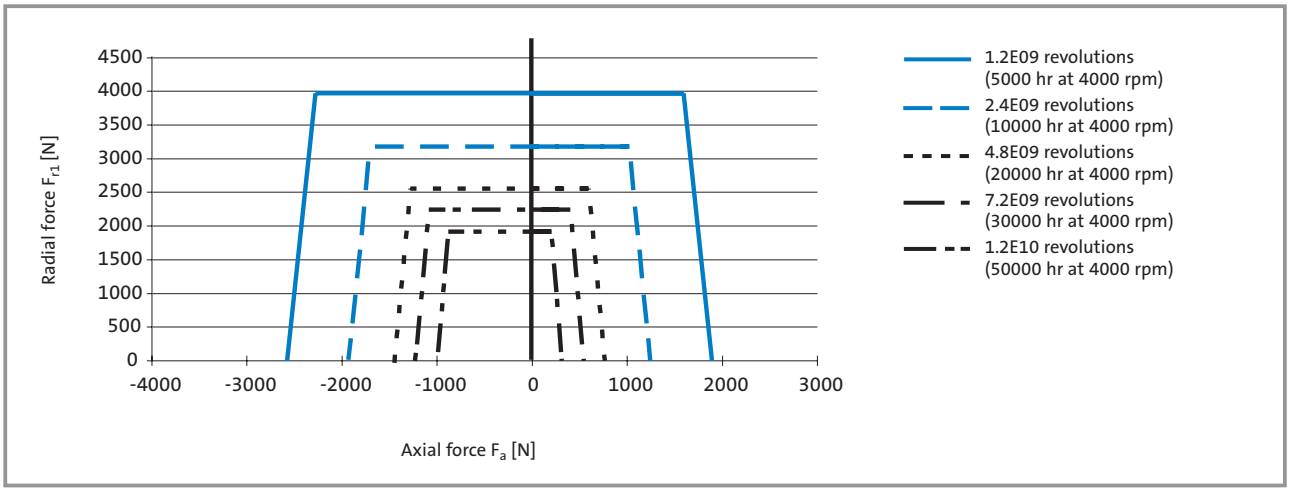
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

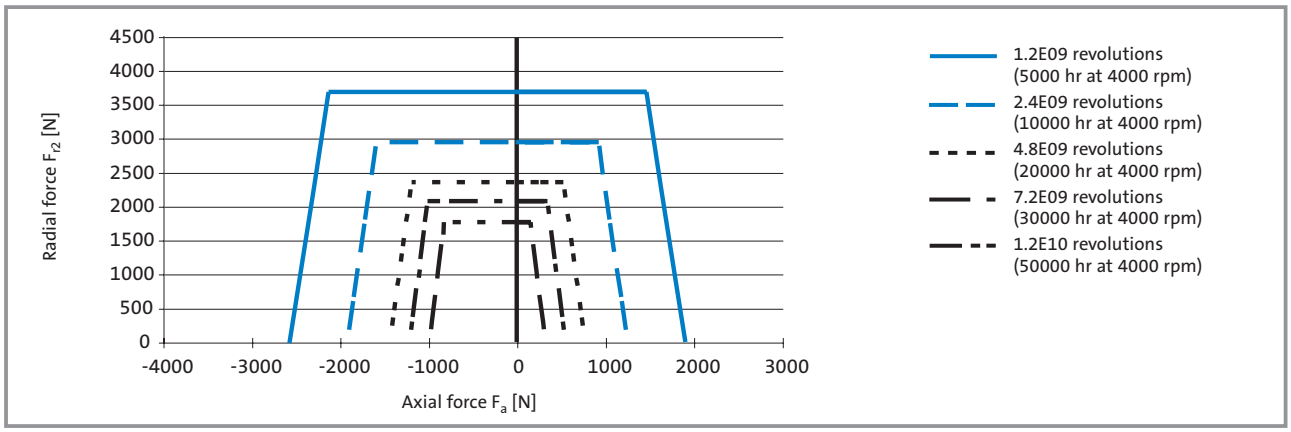
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The curves apply to all MDFQA 112 versions

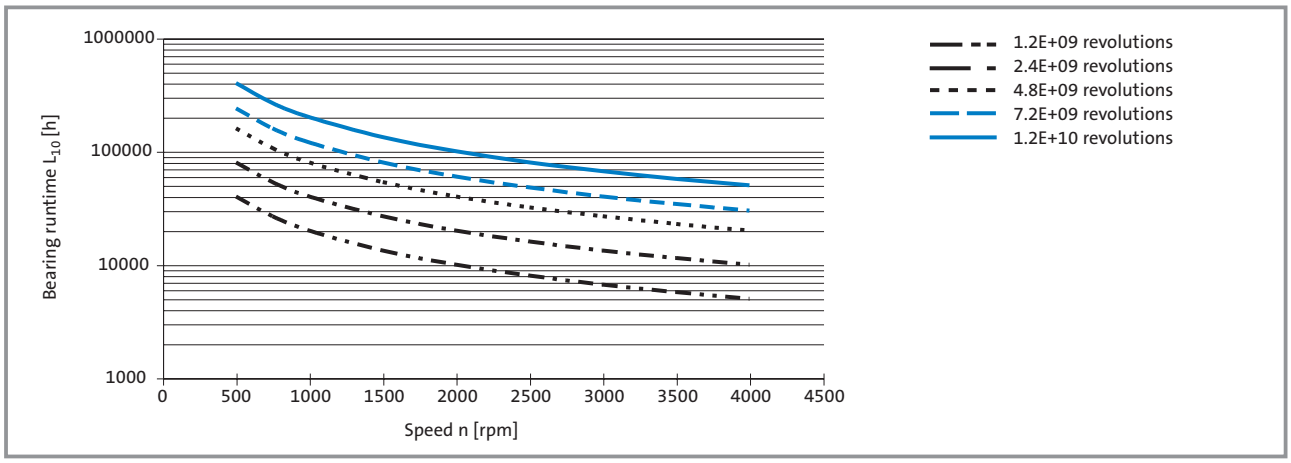
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



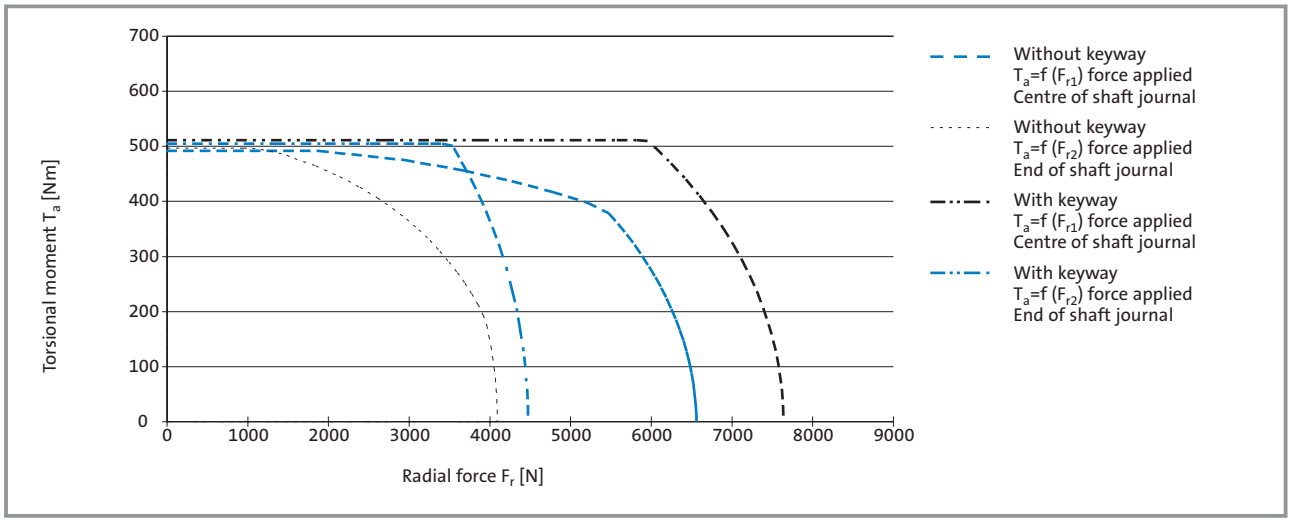
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

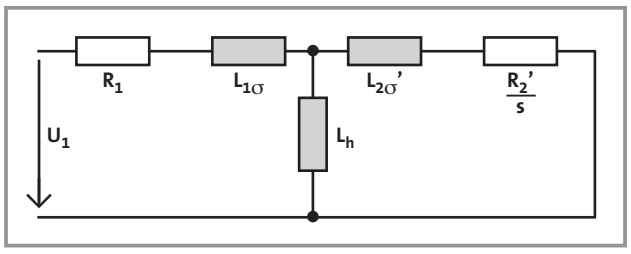
Rated data

Motor	Circuit	n_N rpm	M_0 Nm	M_{max} Nm	M_N Nm	P_N kW	I_0 A	I_N A	U_N V	f_N Hz	cos φ	Moment of inertia motor w/o brake kg m² · 10⁻⁴
MDFQA 132-32, 36	Y	550	325	1100	296	17.0	52.6	45.2	360	20	0.81	1310
MDFQA 132-32, 36	Δ	1030	325	1100	288	31.1	90.2	77.4	360	36	0.77	1310
MDFQA 132-32, 76	Y	1200	325	1100	282	35.4	109.0	88.8	360	42	0.78	1310
MDFQA 132-32, 76	Δ	2235	325	1100	257	60.1	196.5	144.8	340	76	0.80	1310
MDFQA 160-32, 31	Y	498	480	1400	433	22.6	56	51.5	360	18	0.87	2900
MDFQA 160-32, 31	Δ	890	480	1400	434	40.5	95	87.0	355	31	0.86	2900
MDFQA 160-32, 78	Y	1280	470	1400	410	55.0	130	115.5	340	44	0.89	2900
MDFQA 160-32, 78	Δ	2295	470	1400	395	95.0	230	195.5	340	78	0.88	2900

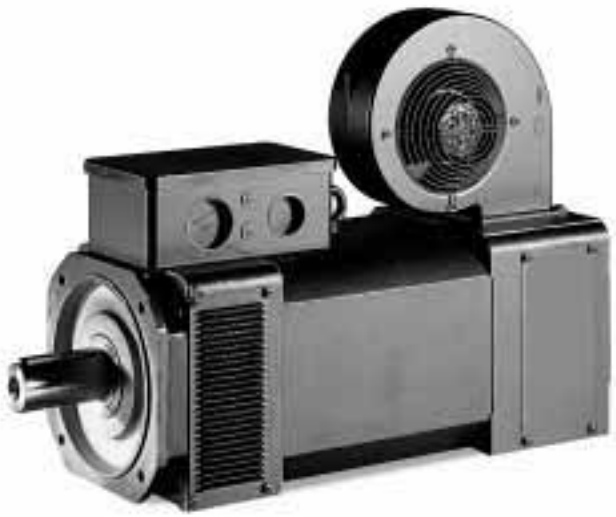
Motor	Circuit	η %	R_{UV} at 20 °C Ω	R_{UV} at 150 °C Ω	R_1 Ω	$L_{1\sigma}$ mH	L_h mH	R_2' Ω	$L_{2\sigma}'$ mH	Weight without brake kg	Maximum speed mech. rpm
MDFQA 132-32, 36	Y	74	0.620	0.837	0.310	2.69	78.4	0.394	4.97	170	4.500
MDFQA 132-32, 36	Δ	84	0.207	0.279	0.311	2.76	80.2	0.394	5.08	170	4.500
MDFQA 132-32, 76	Y	82	0.155	0.209	0.078	0.69	20.3	0.098	1.28	170	4.500
MDFQA 132-32, 76	Δ	88	0.052	0.070	0.078	0.74	24.3	0.098	1.35	170	4.500
MDFQA 160-32, 31	Y	81	0.446	0.602	0.223	2.65	73.8	0.202	2.23	300	6.500
MDFQA 160-32, 31	Δ	89	0.149	0.201	0.223	2.65	76.1	0.202	2.23	300	6.500
MDFQA 160-32, 78	Y	91	0.078	0.105	0.039	0.47	15.6	0.036	0.39	300	6.500
MDFQA 160-32, 78	Δ	93	0.026	0.035	0.039	0.48	16.2	0.036	0.38	300	6.500

* Short term up to 8000 rpm.

The figures in columns R_1, $L_{1\sigma}$, L_h, R_2' and $L_{2\sigma}'$ refer to a single-phase equivalent circuit diagram at 20 °C (Y-circuit).



Equivalent circuit diagram



MDFQA 132 asynchronous servo motor with blower, shaft with keyway

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 8 kHz													
Controller type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.5	2.5	3.9	7.0	13.0	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Maximum current 0 Hz [1] [A]		2.3	3.8	5.9	10.5	19.5	23.5	32.0	47.0	52.0	80.0	110.0	126.0
Maximum current > 5 Hz [A]		2.3	3.8	5.9	10.5	19.5	35.3	48.0	70.5	88.5	133.5	165.0	217.5
Motor type													
Asynchronous servo motors enclosed-ventilated													
MDFQA 132-32, 36 Y	M_N [Nm]								296.0	296.0	296.0		
	M_0 [2)] [Nm]								303.0	325.0	325.0		
	M_{max} n = 0 [4)] [Nm]								303.0	333.0	615.0		
	M_{max} [Nm]								482.0	612.0	751.0		
MDFQA 132-32, 36 △	M_N [Nm]										288.0	288.0	
	M_0 [2)] [Nm]										319.0	325.0	
	M_{max} n = 0 [4)] [Nm]										300.0	440.0	
	M_{max} [Nm]										552.0	671.0	
MDFQA 132-32, 76 Y	M_N [Nm]										282.0	282.0	282.0
	M_0 [2)] [Nm]										284.0	325.0	325.0
	M_{max} n = 0 [4)] [Nm]										258.0	327.0	397.0
	M_{max} [Nm]										424.0	512.0	663.0
MDFQA 132-32, 76 △	M_N [Nm]											203.0	257.0
	M_0 [2)] [Nm]											203.0	257.0
	M_{max} n = 0 [4)] [Nm]											203.0	220.0
	M_{max} [Nm]											344.0	458.0

[1)] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2)] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.

[4)] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Servo controller assignment

Servo controller 93□□ assignment

Rated and maximum torques at a chopper frequency of 16 kHz													
Controller type		**9321**	**9322**	**9323**	**9324**	**9325**	**9326**	**9327**	**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		1.1	1.8	2.9	5.2	9.7	15.3	20.8	30.6	38.0	58.0	70.0	90.0
Maximum current 0 Hz [1] [A]		1.7	2.7	4.4	7.8	14.6	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Maximum current > 5 Hz [A]		1.7	2.7	4.4	7.8	14.6	23.0	31.2	45.9	57.0	87.0	105.0	135.0
Motor type													
Asynchronous servo motors enclosed-ventilated													
MDFQA 132-32, 36 Y	M_N [Nm]										296.0	296.0	296.0
	M_0 [2] [Nm]										325.0	325.0	325.0
	M_{max} n = 0 [4] [Nm]										295.0	480.0	495.0
	M_{max} [Nm]										605.0	681.0	753.0
MDFQA 132-32, 36 △	M_N [Nm]											210.0	288.0
	M_0 [2] [Nm]											210.0	325.0
	M_{max} n = 0 [4] [Nm]											210.0	220.0
	M_{max} [Nm]											440.0	556.0
MDFQA 132-32, 76 Y	M_N [Nm]												282.0
	M_0 [2] [Nm]												285.0
	M_{max} n = 0 [4] [Nm]												215.0
	M_{max} [Nm]												428.0
MDFQA 132-32, 76 △	M_N [Nm]												
	M_0 [2] [Nm]												
	M_{max} n = 0 [4] [Nm]												
	M_{max} [Nm]												

[1] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.

[4] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Controller assignment

Servo controller 93□□

Rated and maximum torques at a chopper frequency of 8 kHz						
Controller type		**9328**	**9329**	**9330**	**9331**	**9332**
Continuous current [A]		47	59	89	110	145
Maximum current 0 Hz [1] [A]		47	52	80	110	126
Maximum current > 5 Hz [2] [A]		70.5	88.5	133.5	165	217.5
Motor type						
Asynchronous servo motors enclosed-ventilated						
MDFQA 160-32, 31 Y	M_N [Nm]	395.0	433.0	433.0		
	M_0 [3] [Nm]	395.0	435.0	480.0		
	M_{max} n = 0 [4] [Nm]	395.0	435.0	680.0		
	M_{max} [Nm]	615.0	795.0	1260.0		
MDFQA 160-32, 31 △	M_N [Nm]			434.0	434.0	434.0
	M_0 [3] [Nm]			435.0	480.0	480.0
	M_{max} n = 0 [4] [Nm]			385.0	585.0	731.0
	M_{max} [Nm]			668.0	850.0	1140.0
MDFQA 160-32, 78 Y	M_N [Nm]				365.0	410.0
	M_0 [3] [Nm]				365.0	470.0
	M_{max} n = 0 [4] [Nm]				365.0	455.0
	M_{max} [Nm]				630.0	850.0
MDFQA 160-32, 78 △	M_N [Nm]					
	M_0 [3] [Nm]					
	M_{max} n = 0 [4] [Nm]					
	M_{max} [Nm]					

[1] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2] Caution: Maximum device currents on the 9300 servo apply at frequencies > 5 Hz

[3] On the 9329, 9330, 9331 and 9332 at frequencies > 5 Hz, derating below 5 Hz.

[4] The reduction in torque must be taken into account in applications that have an active load (e.g. vertical motion drives, hoists, test benches, unwinders). In applications with passive loads (e.g. horizontal motion drives) the reduction can usually be ignored.

Controller assignment

Controller 93□□ Vector

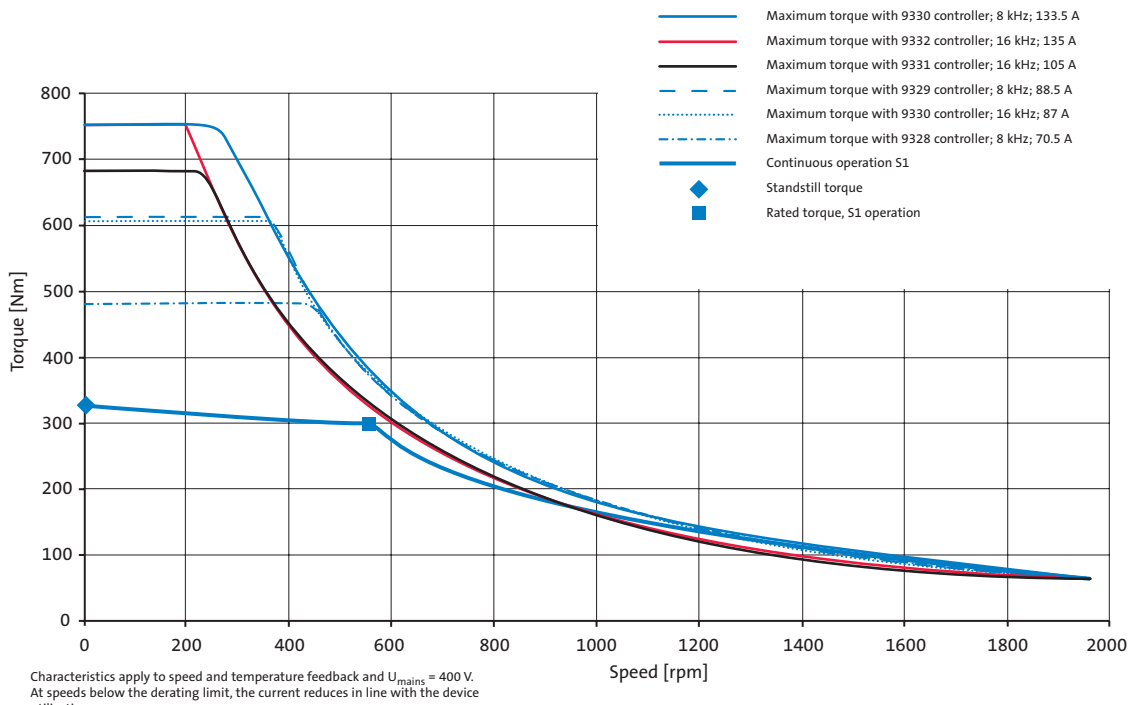
Rated and maximum torques at chopper frequency f_{chopp} = 8/2 kHz (9329...9333) and f_{chopp} = 4/2 kHz (9335...9337)										
Controller type		**9328**	**9329**	**9330**	**9331**	**9332**	**9333**	**9335**	**9336**	**9337**
Continuous current [A]		47	59	89	110	150	180	210	250	270
Maximum current 0 Hz [1] [A]		70.5	89	134	165	225	270	315	375	450
Maximum current > 5 Hz [2] [A]		70.5	89	134	165	225	270	315	375	450
Motor type										
Asynchronous servo motors enclosed-ventilated										
MDFQA 160-32, 31 Y	M_N [Nm]	433.0	433.0	433.0						
	M_0 [Nm]	480.0	480.0	480.0						
	M_{max} n = 0 [Nm]	550.0	740.0	1165.0						
	M_{max} [Nm]	550.0	740.0	1165.0						
MDFQA 160-32, 31 △	M_N [Nm]			434.0	434.0	434.0	434.0			
	M_0 [Nm]			434.0	480.0	480.0	480.0			
	M_{max} n = 0 [Nm]			625.0	815.0	910.0	1100.0			
	M_{max} [Nm]			625.0	815.0	910.0	1100.0			
MDFQA 160-32, 78 Y	M_N [Nm]				365.0	410.0	410.0	410.0		
	M_0 [Nm]				365.0	470.0	470.0	470.0		
	M_{max} n = 0 [Nm]				630.0	834.0	1045.0	1255.0		
	M_{max} [Nm]				630.0	834.0	1045.0	1255.0		
MDFQA 160-32, 78 △	M_N [Nm]						336.0	395.0	395.0	395.0
	M_0 [Nm]						336.0	430.0	470.0	470.0
	M_{max} n = 0 [Nm]						563.0	671.0	802.0	984.0
	M_{max} [Nm]						563.0	671.0	802.0	984.0

[1] Caution: Specified torques for max. heatsink temperature 9300 = 80 °C and 400 V mains supply; at heatsink temperatures < 80 °C the permissible maximum current increases on the 9300 and a chopper frequency of 8 kHz.

[2] Caution: Maximum device currents in the case of the 9300 Vector apply to power-optimised operation with automatic change-over to lower chopper frequencies; 9329...9333 change-over 8/2 kHz; 9335...9337 change-over 4/2 kHz.

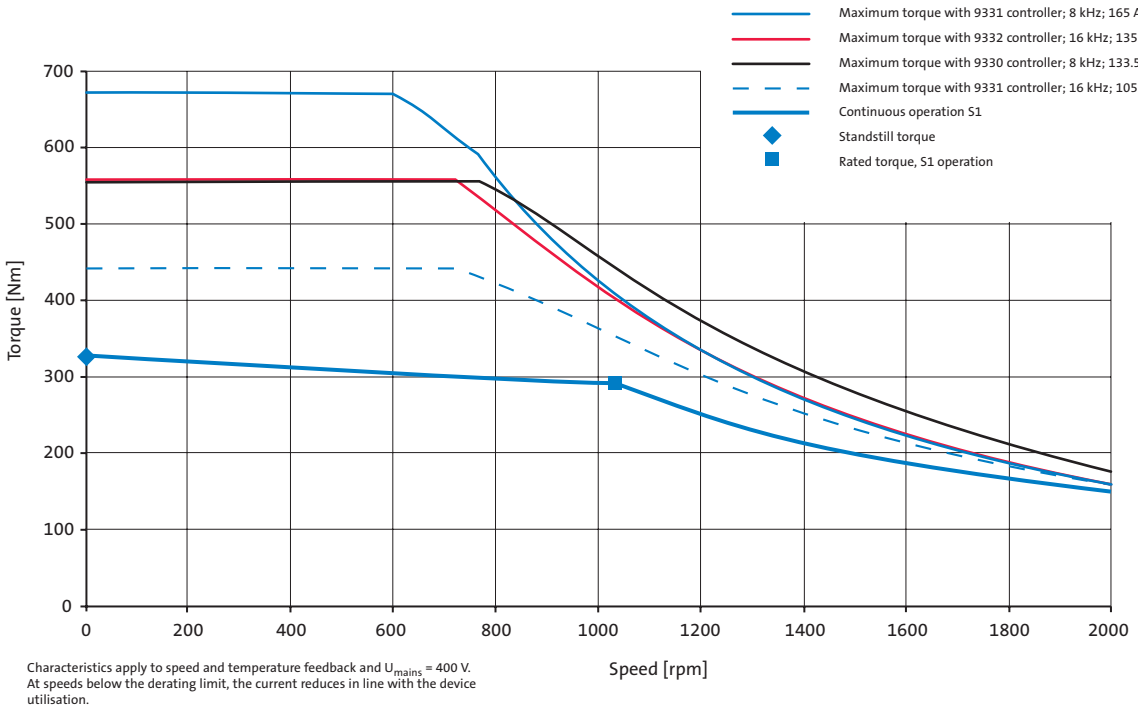
Torque characteristics

MDFQA 132-32, 36, star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

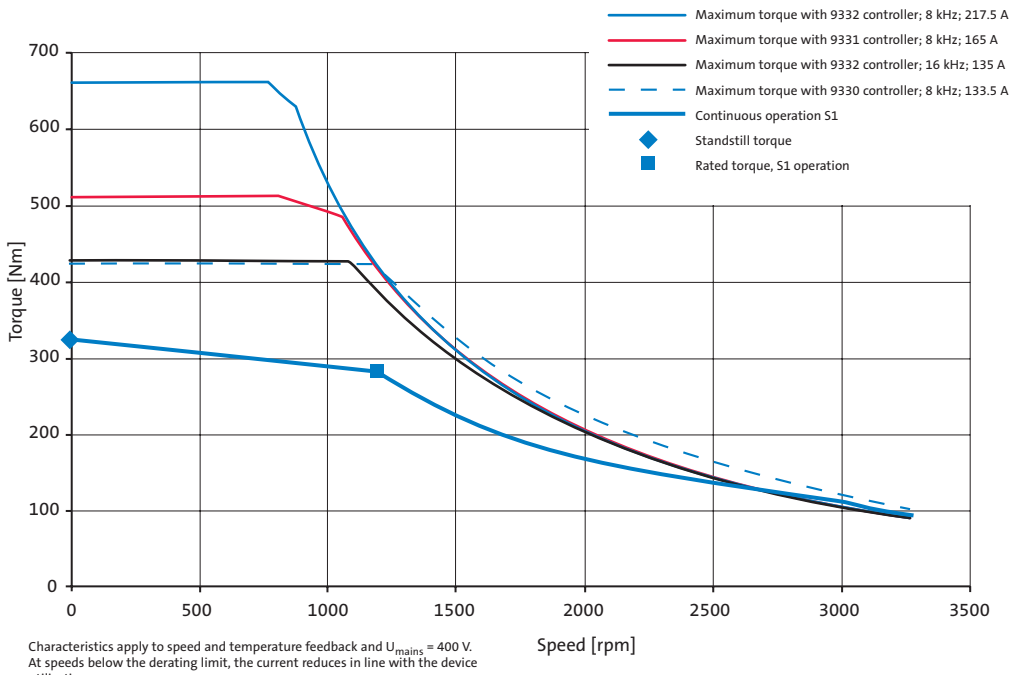
MDFQA 132-32, 36, delta connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

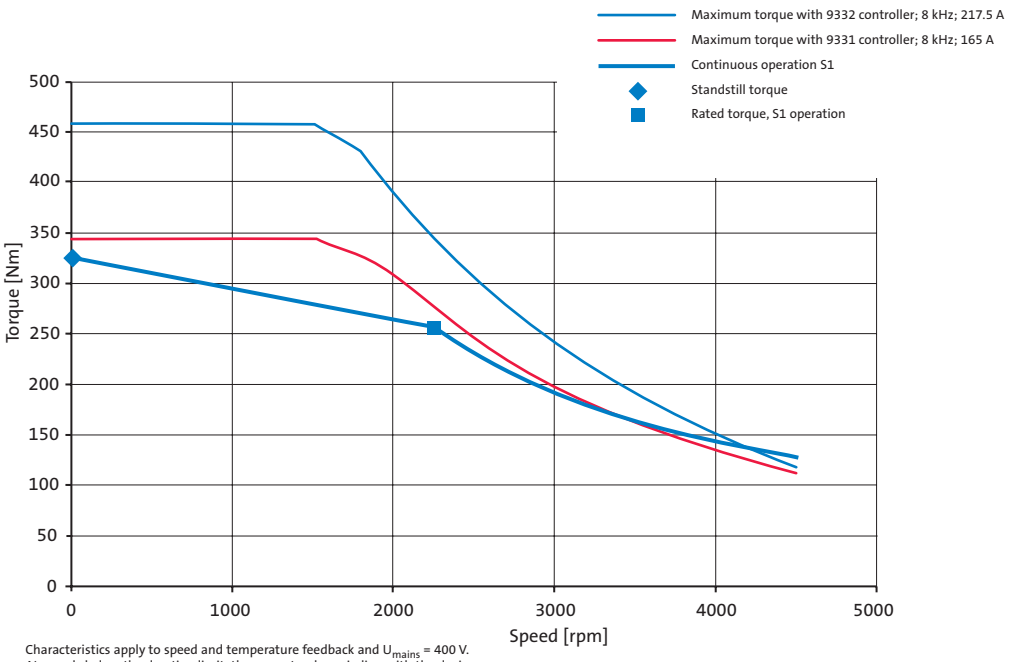
Torque characteristics

MDFQA 132-32, 76, star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

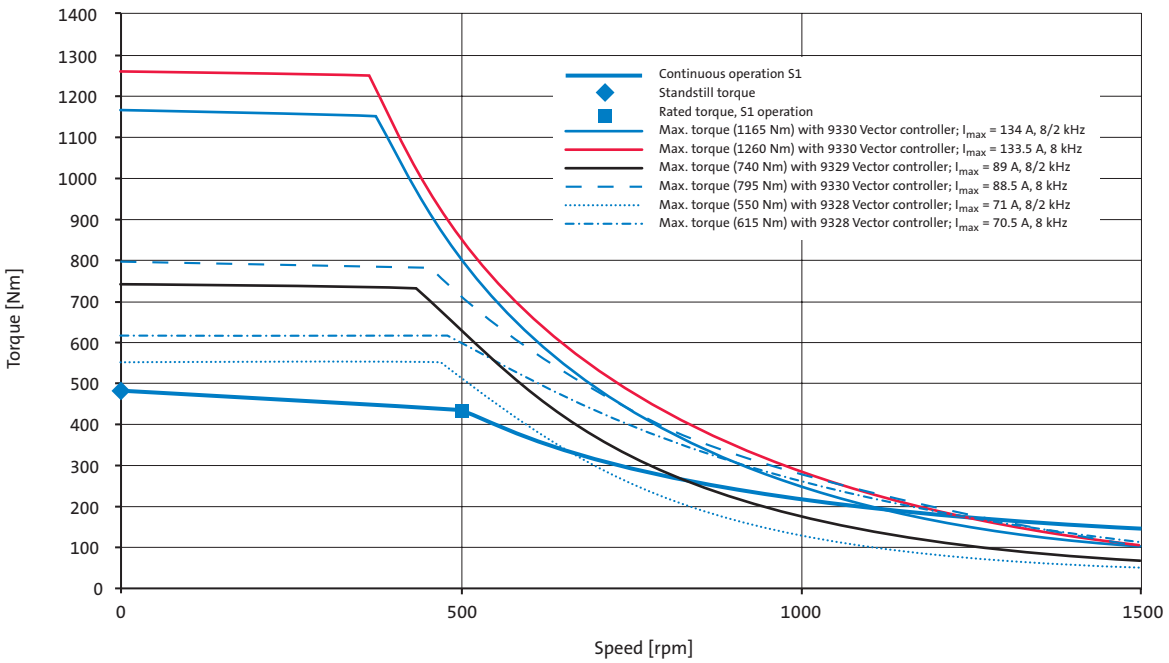
MDFQA 132-32, 76, delta connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
At speeds below the derating limit, the current reduces in line with the device utilisation.

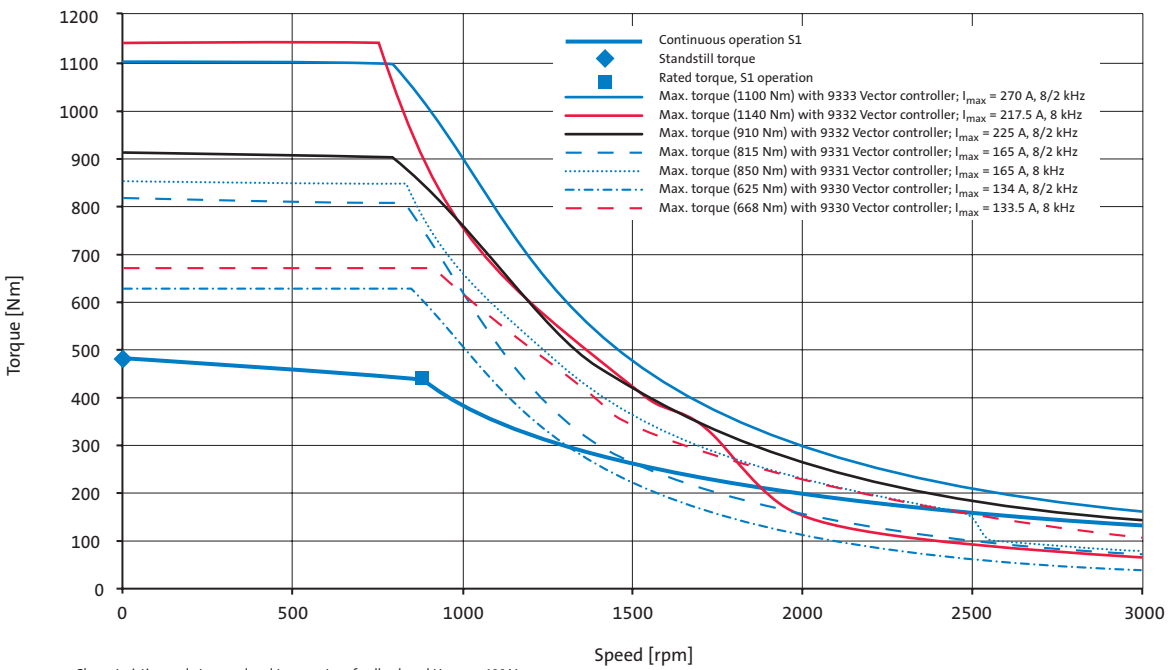
Torque characteristics

MDFQA 160-32, 31, star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz!

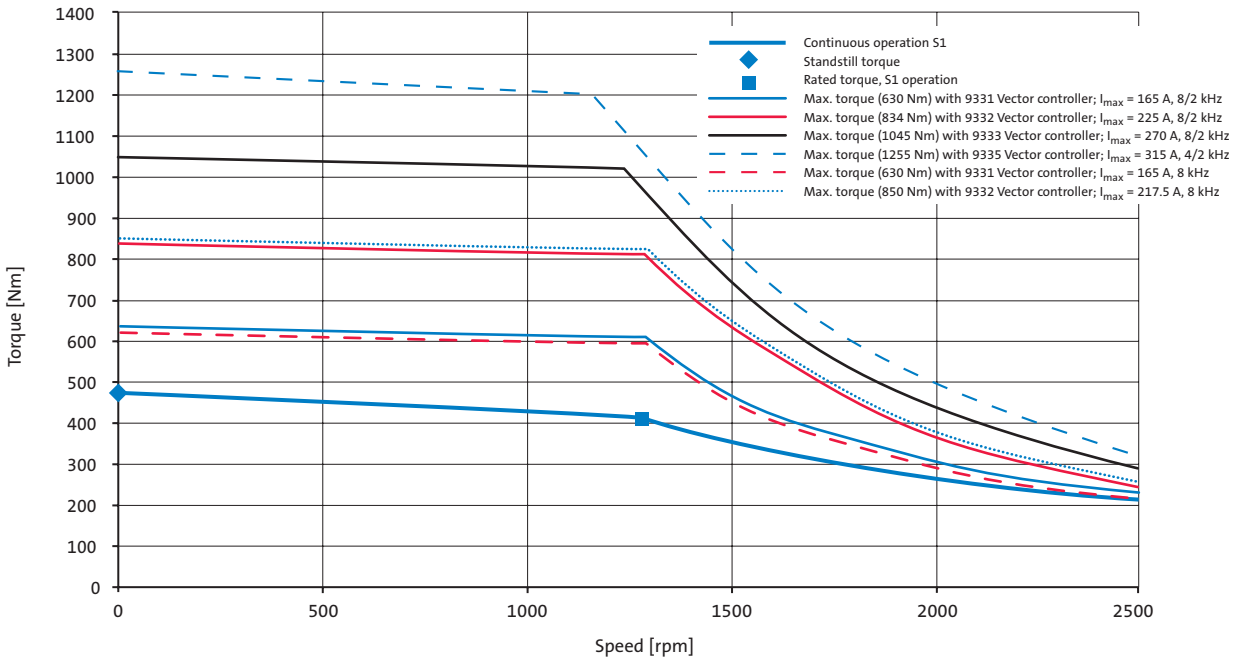
MDFQA 160-32, 31, delta connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz!

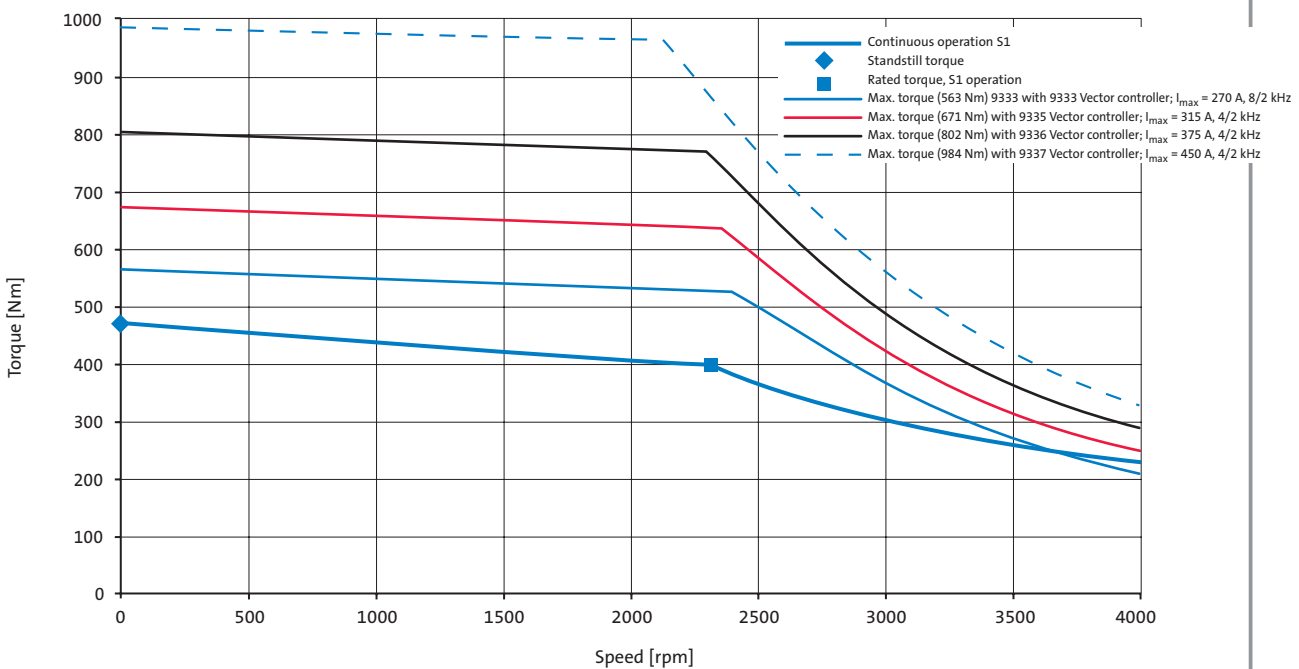
Torque characteristics

MDFQA 160-32, 78, star connection with blower



Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz!

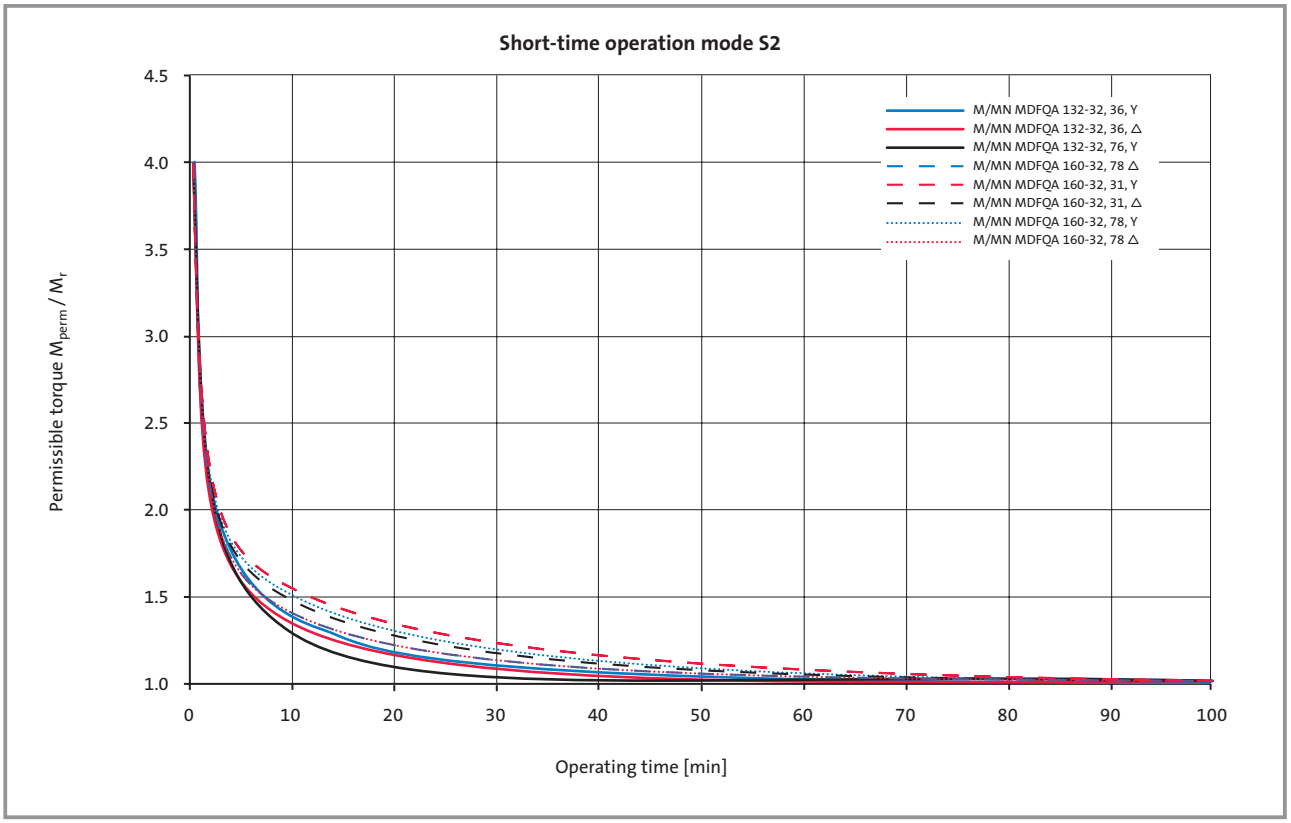
MDFQA 160-32, 78, delta connection with blower

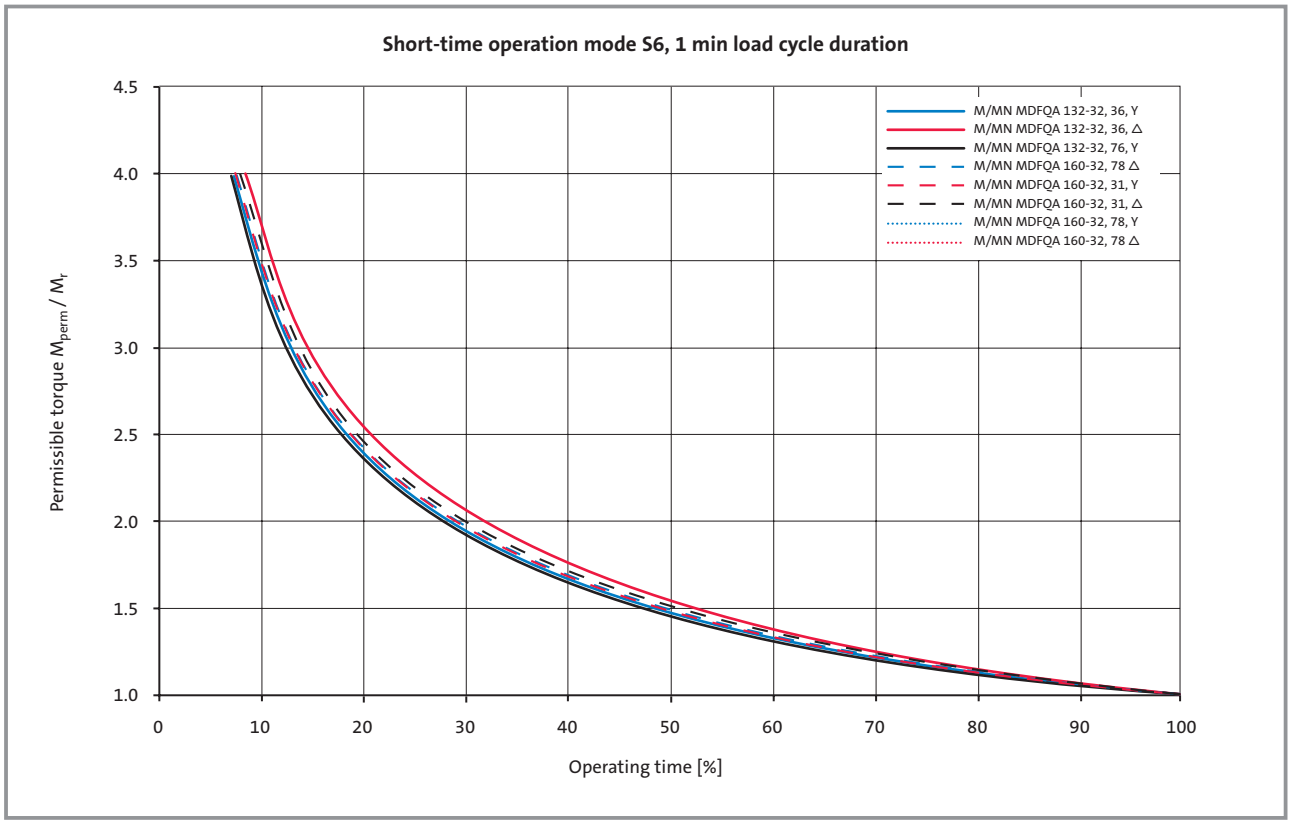


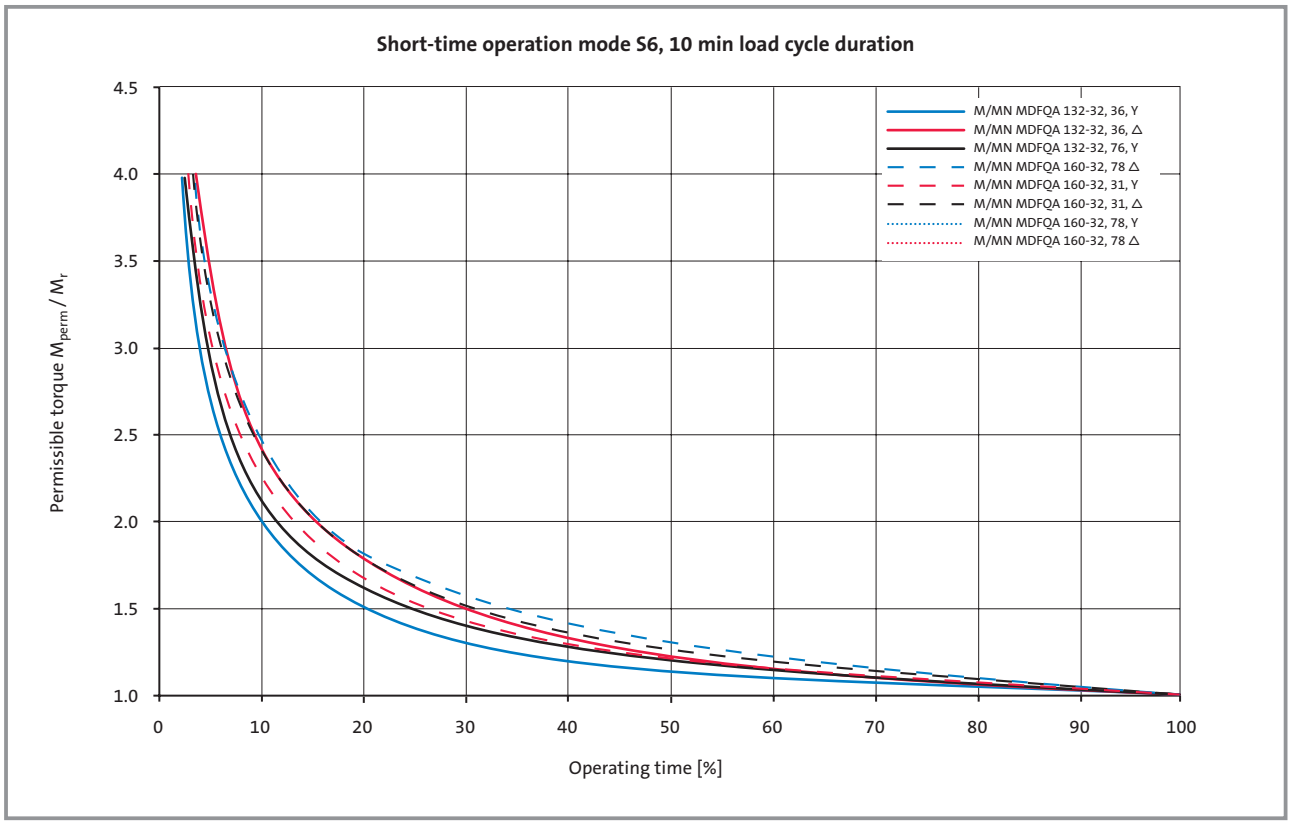
Characteristics apply to speed and temperature feedback and U_{mains} = 400 V.
Take account of derating at frequencies <5 Hz!

Short-time operation characteristic

Lenze MDFQA servo motors can generate high torque peaks. In order to make full use of this highly dynamic response as simply as possible, without overloading the motor, the following diagrams for operating modes S2 and S6 illustrate the permissible operating times against the torque peaks required.




Short-time operation mode S6, 1 min load cycle duration
Permissible torque M_{perm} / M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
M/MN MDFQA 132-32, 36, Y
M/MN MDFQA 132-32, 36, Δ
M/MN MDFQA 132-32, 76, Y
M/MN MDFQA 160-32, 78 Δ
M/MN MDFQA 160-32, 31, Y
M/MN MDFQA 160-32, 31, Δ
M/MN MDFQA 160-32, 78, Y
M/MN MDFQA 160-32, 78 Δ


Short-time operation mode S6, 10 min load cycle duration
Permissible torque M_{perm} / M_r
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
10
20
30
40
50
60
70
80
90
100
Operating time [%]
M/MN MDFQA 132-32, 36, Y
M/MN MDFQA 132-32, 36, Δ
M/MN MDFQA 132-32, 76, Y
M/MN MDFQA 160-32, 78 Δ
M/MN MDFQA 160-32, 31, Y
M/MN MDFQA 160-32, 31, Δ
M/MN MDFQA 160-32, 78, Y
M/MN MDFQA 160-32, 78 Δ

Brake assignment

MDFQA asynchronous servo motors can be fitted with integral spring-applied holding brakes. Voltages of 24 V DC and 205 V DC are available for this purpose.

The brakes are activated when the supply voltage is disconnected (closed-circuit current principle).

If the brakes are being used as pure holding brakes, then there will be practically no wear on the friction surfaces.

Type	MDFQA 132	MDFQA 160	Size	Characteristic torque M_B[1] Nm	U_B +5 % – -10 % V	I_{Br}[4] A	J_{Br} kg m² · 10⁻⁴	Engagement time t_1[2, 3] ms	Diseng. time t_2[2] ms	Max. switching rate per circuit at n = 1500 rpm Q_E kJ	Transition operating frequency $S_{hü}$ 1/h	Weight kg
F1	●		BFK460-20N	260	24	4.17	73.0	265	340	80	19	32.50
F2	●		BFK460-25N	400	24	4.58	200.0	370	390	120	15	46.00
F5	●		BFK460-20N	260	205	0.49	73.0	265	340	80	19	32.50
F6	●		BFK460-25N	400	205	0.54	200.0	370	390	120	15	46.00
F1		●	BFK458-20E	260	24	4.17	73.0	265	340	80	19	25.40
F2		●	BFK458-25E	400	24	4.58	200.0	370	390	120	15	37.20
F5		●	BFK458-20E	260	205	0.49	73.0	265	340	80	19	25.40
F6		●	BFK458-25E	400	205	0.54	200.0	370	390	120	15	37.20

1) Characteristic torques are with reference to the relative speed Δn = 100 rpm.

2) Engagement and disengagement times valid for rated voltage (±0 %) and protective circuit for brakes with spark suppressors.
The times may increase without a protective circuit. The operating times are mean values. The leakage depends on the type of rectifier, the air path and the coil current.

3) Engagement times with DC side switching, in the case of AC side switching t_1 increases by a factor of about 6.

4) For 24V DC brake: smoothed DC voltage, ripple 1 %.

4) The currents are maximum values for a cold brake (data for dimensioning the power supply). The values for a motor at operating temperature are considerably lower.

Caution:
The brakes used are not fail-safe brakes in the true sense because certain types of fault, e.g. oil leakage, will cause a loss of torque.

If long motor cables are being used, the ohmic voltage drop along the cable should be taken into account and compensated for by applying a higher voltage at the cable input.

The following applies to Lenze system cables:

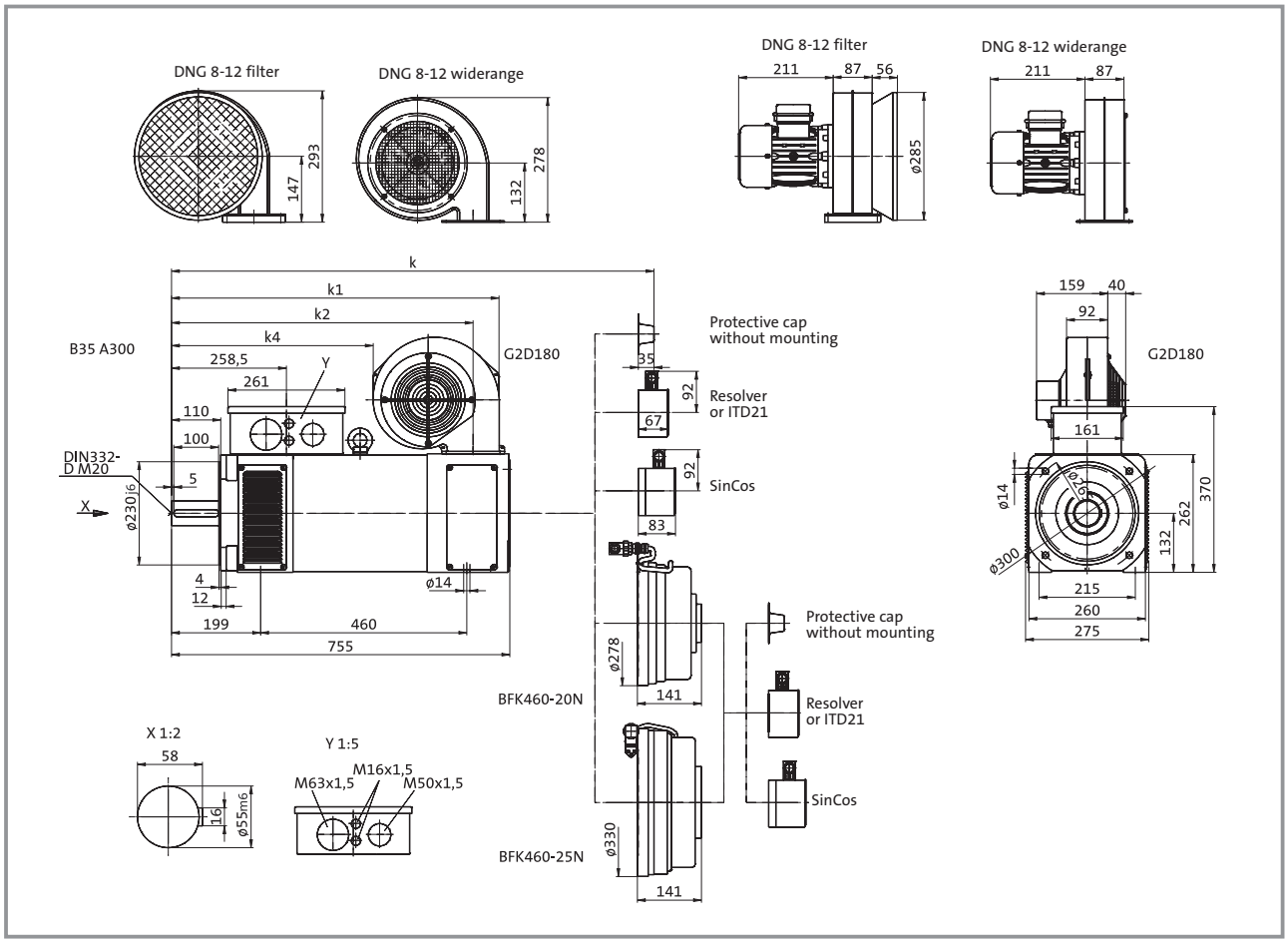
$$U^*[V] = U_B\,[V] + 0.08\left[\frac{V}{A \cdot m}\right] \times l_{cable}\,[m] \times I_B\,[A]$$

If an appropriate voltage is not supplied to the brake (incorrect dimension, incorrect polarity), the brake will fail to release and the continuing rotation of the motor could cause it to overheat, leading to irreparable damage.

DC voltage switching helps to minimise brake response times. A spark suppressor is required for interference suppression and to increase the service life of the relay contacts.

Mechanical dimensions

MDFQA 132-32 B35 A300



Fan type	k1	k2	k4
G2D180	730	673	450
G2D180 Filter	730	673	450
DGN 8-12 widerange	708	673	413
DNG 8-12 filter	708	673	406

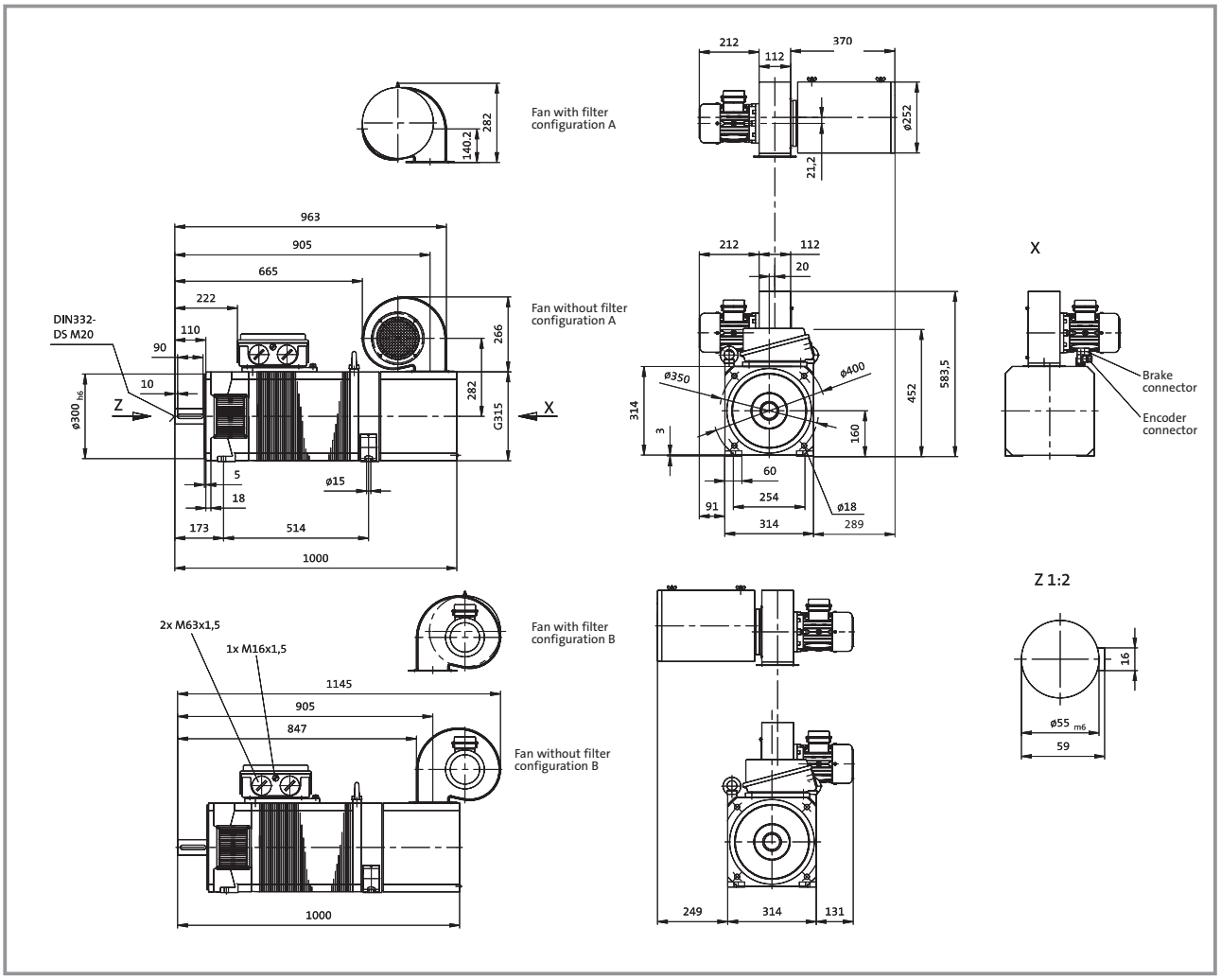
Accessories	Overall length k
none	790
Resolver or ITD21	822
SinCos	838
Brake	931
Brake with resolver or ITD21 963	
Brake with SinCos	979

Blower data

Fan type	U_N	f_N	I_N	P_N
	[V]	[Hz]	[A]	[W]
180	380 ...460, 3 ph.	**50/60**	**0.66**	**415**
DNG 8-12 with or without filter with wide voltage range	50 ... 60, 3 ph.	1.4/60	0.75	660

Mechanical dimensions

MDFQA 160-32 B35 A400



Fan type	Enclosure
DNG 6-35	IP23

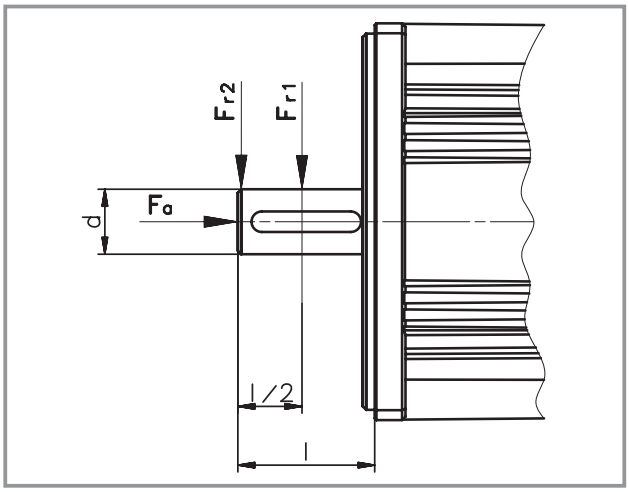
Accessories	
Brake	Encoder
BFK 458-20	Resolver ITD21 SinCos

Blower data

Fan type	U_N	f_N	I_N	P_N
	[V]	[Hz]	[A]	[W]
DNG 6-35 with or without filter with wide voltage range	50 ... 60, 3 ph.	1.4/60	0.75	650

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

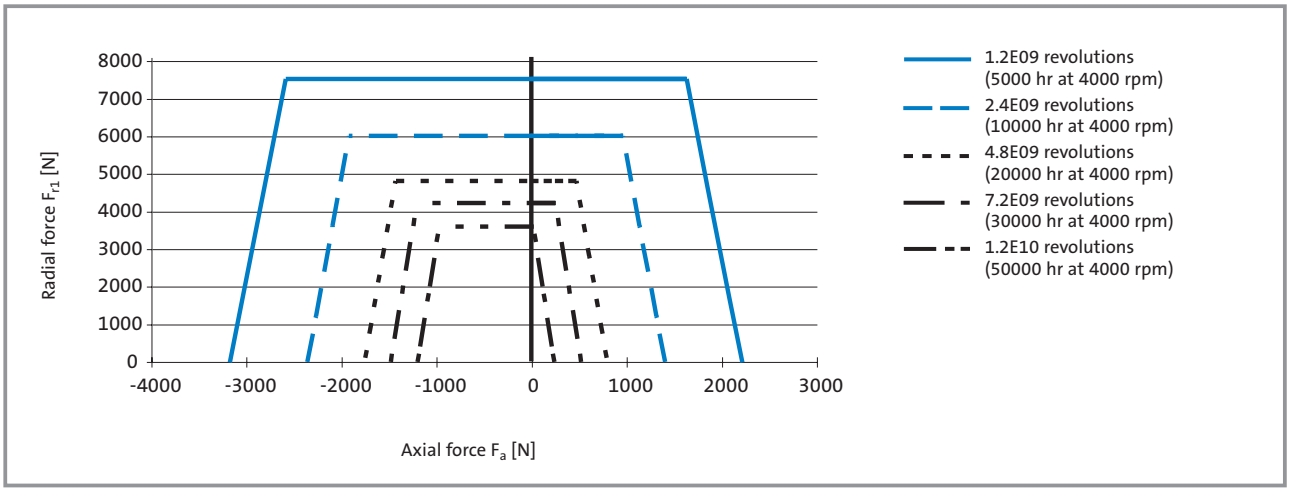
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

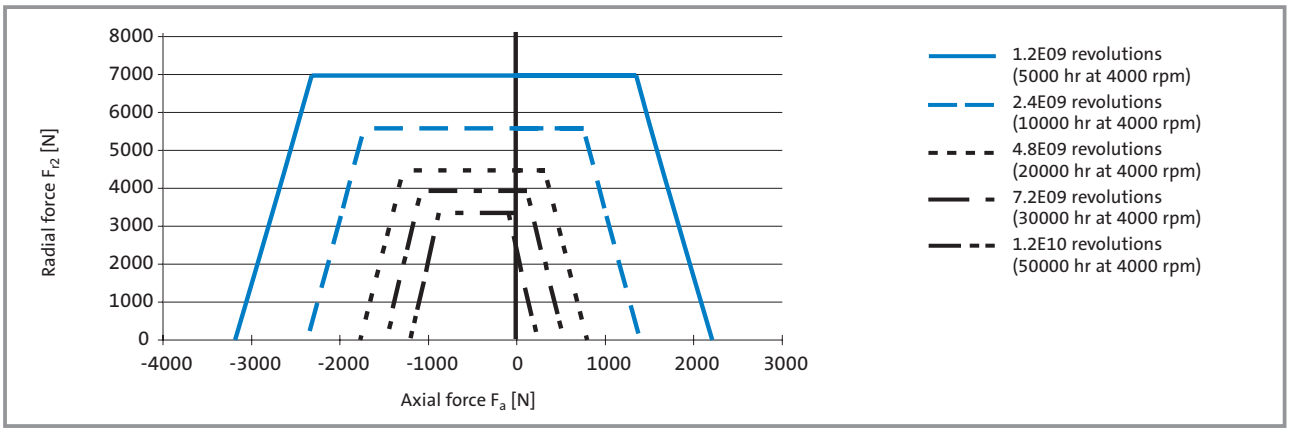
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The curves apply to all MDFQA 132 versions

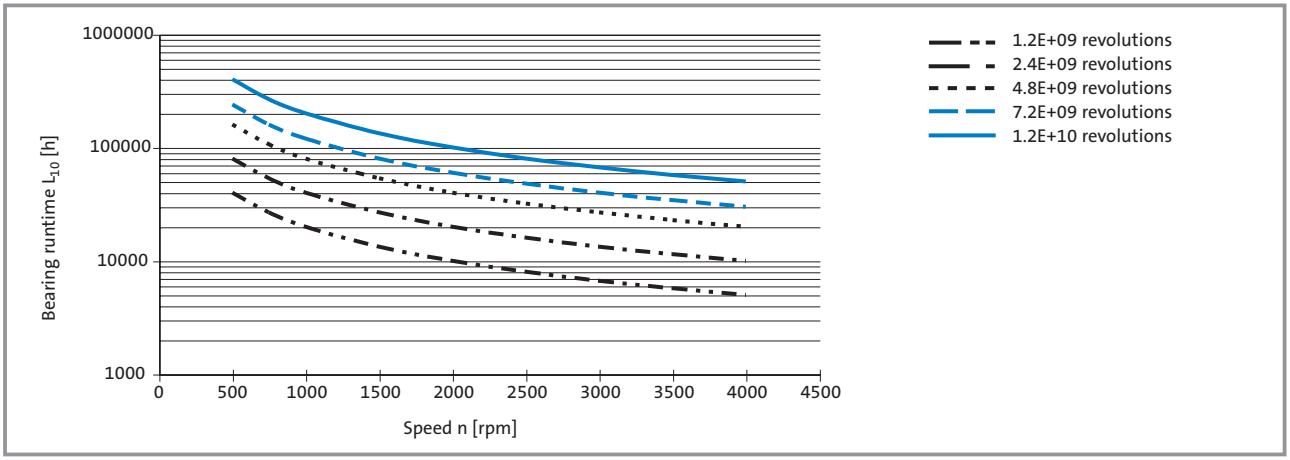
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



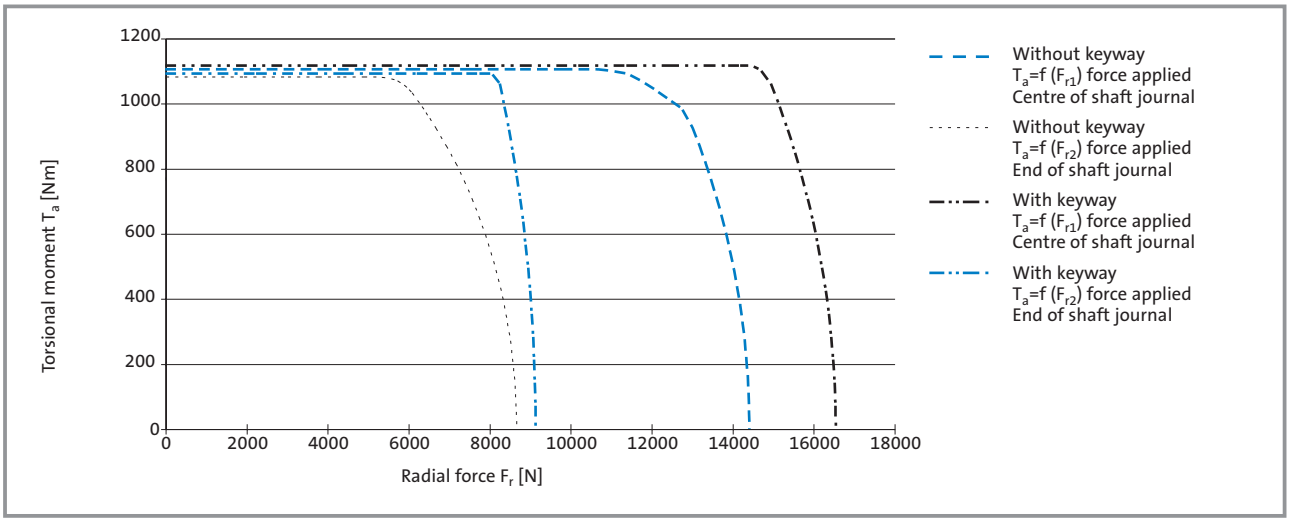
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

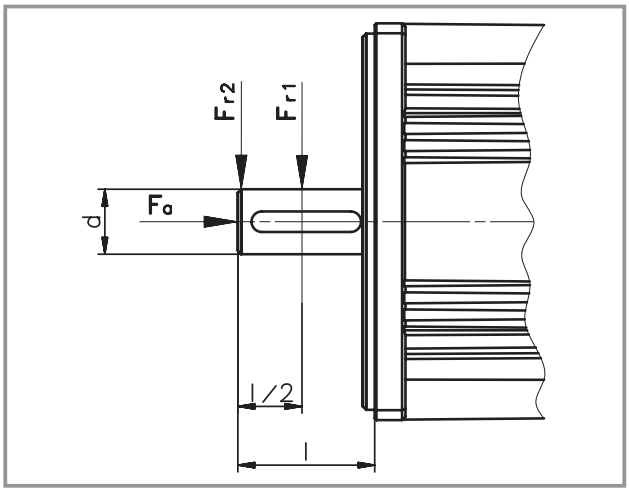
Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Permissible shaft loads

Forces on the motor shaft



The following diagrams provide a simple means of determining:

a) the service life of the roller bearings on the basis of the forces and torques calculated.

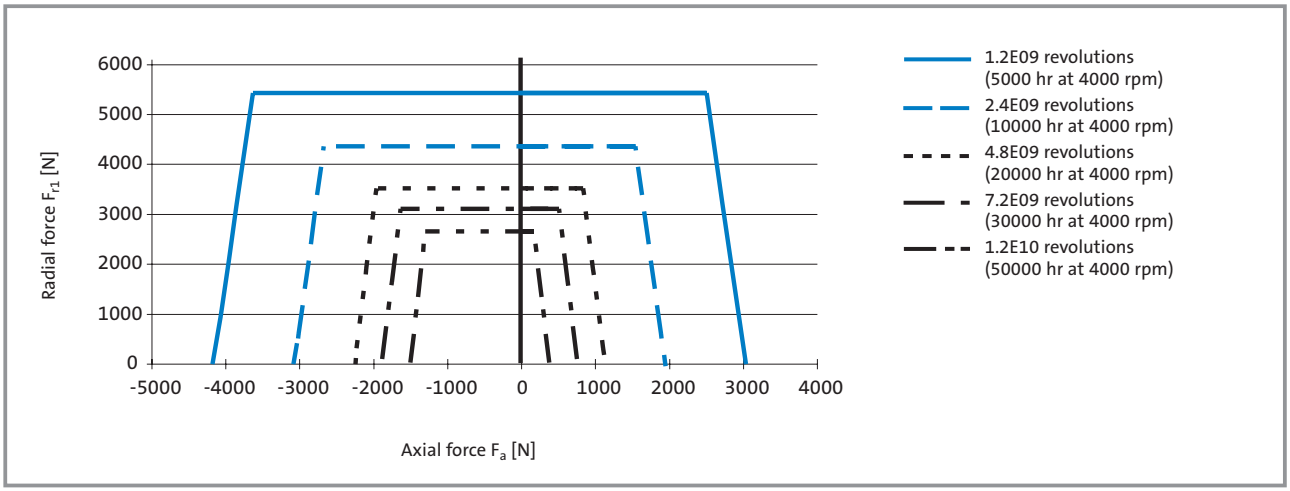
Service life is calculated as follows:

$$\frac{\text{Number of bearing revolutions}}{\text{n [rpm] x 60}} = \text{bearing service life [h]}$$

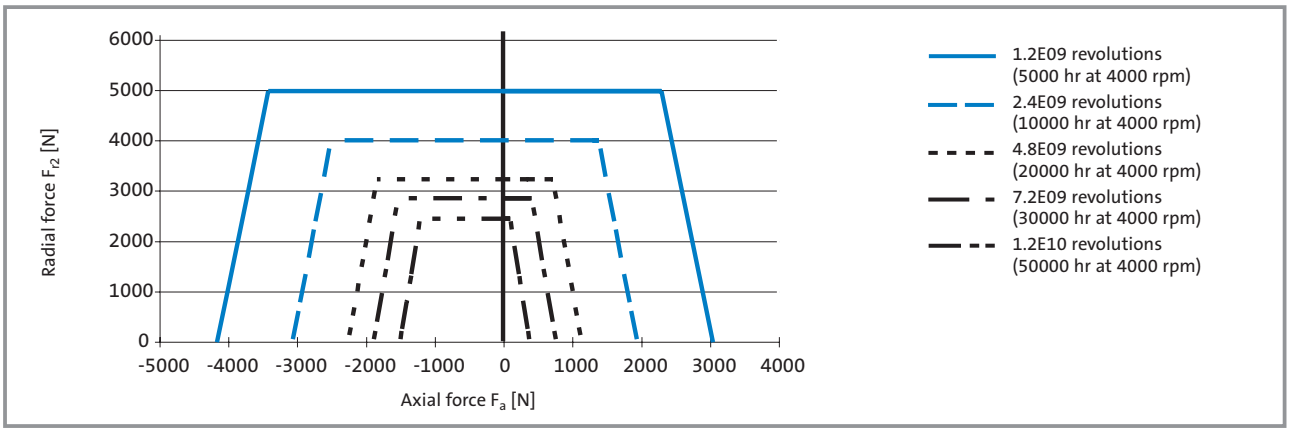
b) the maximum permissible radial force and the associated maximum permissible torsional moment on the motor shaft. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

The curves apply to all MDFQA 160 versions

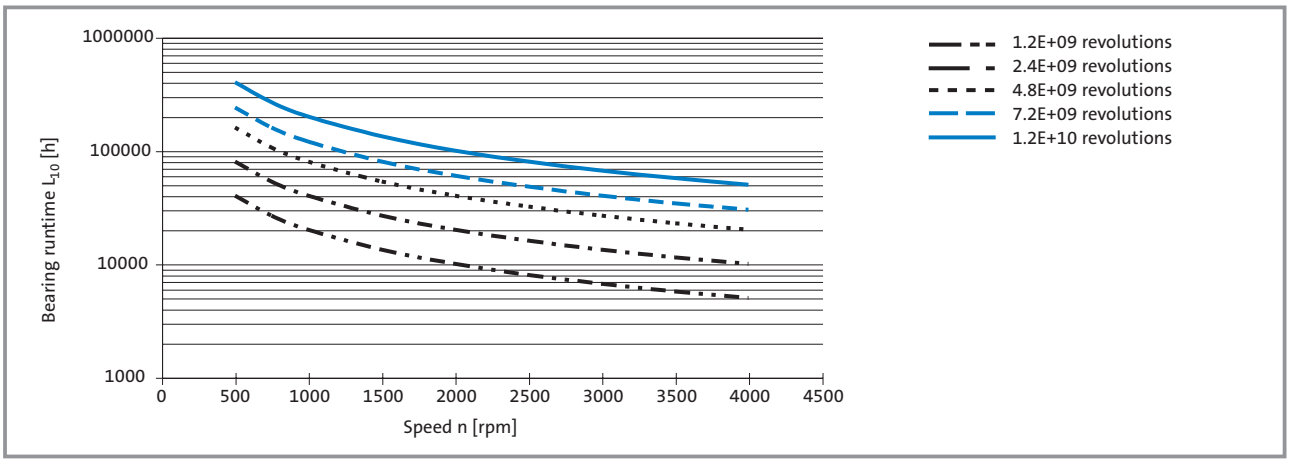
Permissible radial force F_{r1} and axial force F_a on shaft



Permissible radial force F_{r2} and axial force F_a on shaft



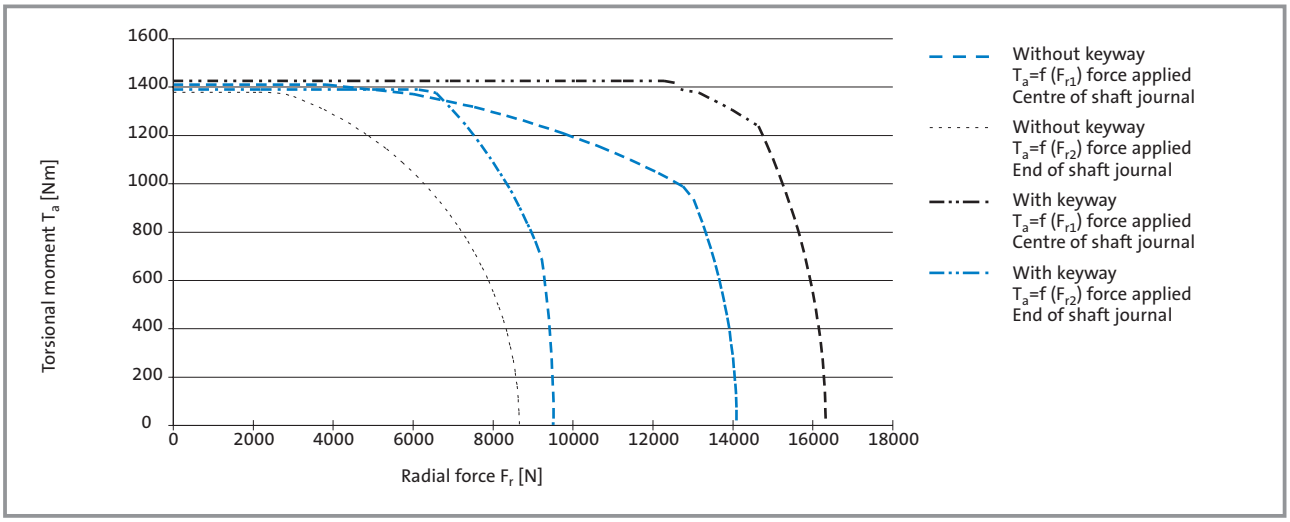
Bearing service life



Relationship between the number of total bearing revolutions, bearing service life and the average speed of the drive.

The bearing runtime L_{10} indicates that 90% of the bearings will still be intact at the end of this period.

Permissible shaft loading



Relationship between radial force and torsional moment on the shaft.

Motor connection

The power and fan connections on the MDFQA asynchronous servo motors are always made to separate terminal boxes.

If the motors have feedback and/or holding brakes, the encoder and/or the holding brake are connected using separate connectors.

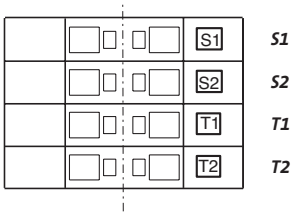
Terminal box for power connection

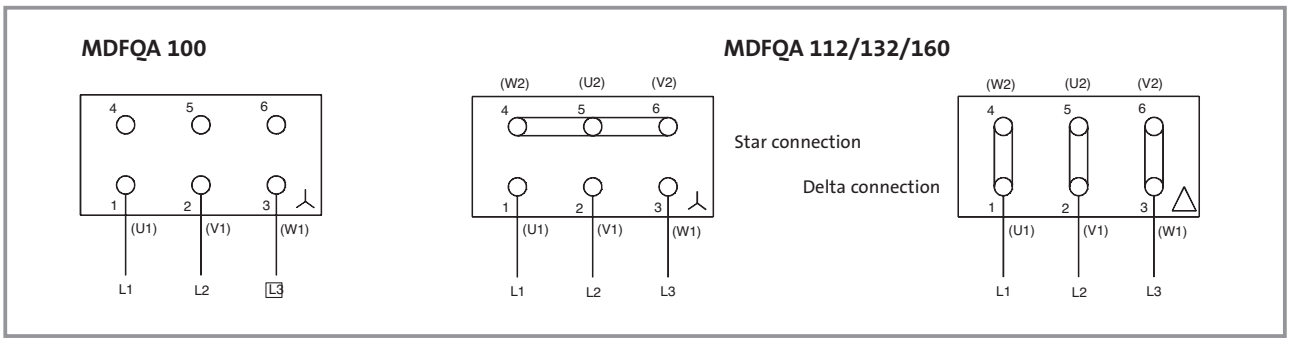
Terminals

	Terminal designation
Protective earth	PE
Motor phase	U
Motor phase	V
Motor phase	W
Thermostat, terminal T1 on 9300	S1
Thermostat, connection T2 on 9300	S2
Thermal detector*, KTY, connected via encoder	T1
Thermal detector*, KTY, connected via encoder	T2

*On motors with feedback, the thermal detector is connected to the encoder.

Terminal diagram





PG cable glands and terminal studs

Motor type	Power connection		Fan connection
MDFQ 100	1x M40 x 1.5 + 1x M20 x 1.5 + 1x M16 x 1.5	M6	1x M16 x 1.5
MDFQ 112	1x M50 x 1.5 + 1x M20 x 1.5 + 1x M16 x 1.5	M6	
MDFQ 132	1x M63 x 1.5 + 1x M50 x 1.5 + 2x M16 x 1.5	M12	
MDFQ 160	2x M63 x 1.5 + 1x M16 x 1.5	M12	M20 x 1.5

Options and accessories

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Phase-angle sensor and tacho generator

The following feedback systems for Lenze servo motors are available. All systems are adjusted for the various applications and required accuracy.

Incremental and SinCos absolute value encoder

Encoder type	TTL incremental		Incremental		SinCos absolute value encoder					
			SinCos							
Type	**ITD21**	**CDD50**	**ITD22**	**EQI1329**	**SRS50**	**SRM50**	**SCS70**	**SCM70**	**ECN1313**	**EQN1325**
Vibration characteristic	Good		Good	Good	Good	Good	Good	Good	Very good	Very good
Multi-turn				●		●		●		●
Design	Brushless hollow shaft incremental encoder	Brushless incremental encoder with conical shaft	Brushless hollow shaft rotary encoder	Brushless inductive sinewave encoder with conical shaft	Brushless sinewave encoder with conical shaft	Brushless sinewave encoder with conical shaft	Brushless hollow shaft sinwave encoder	Brushless hollow shaft sinwave encoder	Brushless sinewave encoder with conical shaft	Brushless sinewave encoder with conical shaft
Connection	Metal spring, hollow shaft	Rubber spring	Metal spring	Metal spring	Rubber spring	Rubber spring	Rubber spring	Rubber spring	Metal spring	Metal spring
Number of increments	2048 TTL		2048 Sin	32 Sin	1024 Sin	1024 Sin	512 Sin	512 Sin	2048 Sin	2048 Sin
Resolution (depends on device)	2.6 min		0.4 min	0.4 min	0.4 min	0.4 min	0.4 min	0.4 min	0.4 min	0.4 min
Accuracy (reference value)	± 2 min		± 0.8 min	± 5 min	± 0.8 min	± 0.8 min	± 0.8 min	± 0.8 min	± 0.6 min	± 0.6 min
Absolute revolutions	0		0	4096	1	4096	1	4096	1	4096
Interface	-	-	-	Endat	Hiperface	Hiperface	Hiperface	Hiperface	Endat	Endat
Maximum speed	8,000 min^{-1}	9,000 min^{-1}	8,000 min^{-1}	12,000 min^{-1}	12,000 min^{-1}	12,000 min^{-1}	12,000 min^{-1}	12,000 min^{-1}	15,000 min^{-1}	12,000 min^{-1}
Limiting frequency	300 kHz	300 kHz	180 kHz	6 kHz	200 kHz	200 kHz	100 kHz	100 kHz	200 kHz	200 kHz
Output signals	TTL 5V	TTL 5V	~ 1Vss	~ 1Vss	~ 1Vss	~ 1Vss	~ 1Vss	~ 1Vss	~ 1Vss	~ 1Vss
	5 V ± 5%	5 V ± 10%	5 V ± 10%	5 V ± 5%	7...12 V	7...12 V	7...12 V	7...12 V	5 V ± 5%	5 V ± 5%
Current consumption	150 mA	50 mA	100 mA	130 mA	80 mA	80 mA	100...130 mA	100...130 mA	150 mA	250 mA
Can be used with motor type **MCS**				94xx	93xx ECS	93xx ECS	94xx	94xx	94xx	94xx
Can be used with motor type **MCA**	93xx ECS	93xx ECS	93xx ECS	94xx	93xx ECS	93xx ECS	93xx ECS	93xx ECS	94xx	94xx
Can be used with motor type **MDFQA**	93xx ECS	93xx ECS	93xx ECS	94xx	93xx ECS	93xx ECS	93xx ECS	93xx ECS	94xx	94xx
Order code	T20	CDD	S20	EQI	SRS	SRM	SCS	SCM	ECN	EQN
Connector type	EWS0010	EWS0010	EWS0010	EWS0017	EWS0010	EWS0010	EWS0010	EWS0010	EWS0017	EWS0017

Resolver

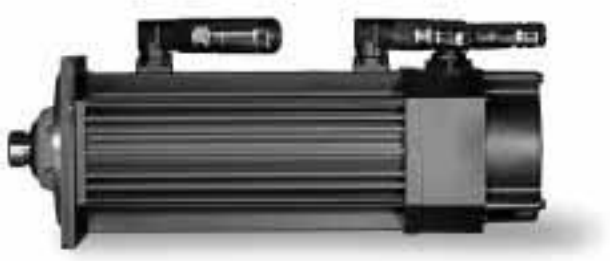
Stator-fed resolver with two 90° stator windings and one rotor winding with transformer winding.

Abbreviation	RS0
Resolution	0.8‘
Accuracy	±10‘
Absolute position control	1 revolution
Design	Brushless hollow shaft "pancake" resolver
Max. speed (continuous)	8000 rpm
Max. speed (short-time)	10000 rpm
Input voltage	10 V amplitude
Input frequency	4 kHz
Stator/rotor ratio	0.3 ± 5%
Rotor impedance Z_{ro}	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
Connector type	EWS0006

Blower

Motor type	Blower type	Perm. ambient - temperature	UN	fN	IN	PN
			[V]	[Hz]	[A]	[W]
MCA 13		< 75 °C	210...240, 1~	50/60	0.12	19
MCA 14		< 75 °C	210...240, 1~	50/60	0.12	19
MCA 17		< 55 °C	210...240, 1~	50/60	0.32	46
MCA 19		< 55 °C	210...240, 1~	50/60	0.32	46
MCA 21		< 70 °C	210...240, 1~	50/60	0.26	60
MDFQA 100	G2D 120		380...460, 3~	50/60	0.11	60
	G2D 140 with filter		380...460, 3~	50/60	0.25	150
	DNG 3-4.5 with or without filter with wide range mains		350...540, 3~	50/60	0.25	100
MDFQA 112	G2D 160 with or without filter		380...460, 3~	50/60	0.5	320
	DNG 5-12.5 with or without filter with wide range mains		350...540, 3~	50/60	0.75	390
MDFQA 132	G2D 180		380...460, 3~	50/60	0.66	415
	DNG 8-12 with or without filter with wide range mains		350...540, 3~	50/60	1.4	660
MDFQA 160	DNG 6-35 with or without filter with wide range mains		350...540, 3~	50/60	1.4	650

Installation:
the motors are suitable for all mounting positions but the protection type requirements are only met with horizontal installation (connector / terminal box position on top).



Asynchronous servo motor MCA 14 with built-on blower and shaft end for direct gearbox attachment.

Overview of system cables

An extensive selection of connecting cables for the power connection, the various encoder systems and the fan connection is available for all Lenze servo motors.

All cables are available for ixed installation or as trailing cables.

The length of all cable types can be freely selected in line with the application in steps of 0.1 m from 0.5 m upwards. Please note that certain cable lengths should not be exceeded depending on the controller and feedback system that is being used.

The cables can be assembled in line with your individual requirements in accordance with the following:

▶ Connection on motor – cable type – connection on controller

All cable types can be arranged as required. The following arrangements are therefore possible :

▶ Motor – Cable – Controller

▶ Motor – Cable 1 – Cable 2 – ... – Cable n – Controller

This applies for permanently installed cables and trailing cables. Both versions can also be combined as required.

All connectors are designed application-specific (power, fan, resolver, encoder) thus ensuring that the possibility of an incorrect connection can be practically excluded during assembly and when servicing.

Further detailed information relating to the required cable assembly can be found in the tables below.

Here, your cable can be freely assembled from the following components.

Connection on motor	Cable type	Connection on controller
Connector (socket) **or** free cable end for terminal box connection	Power cable with wire cross sections of 1 mm² to 16 mm² (motor), **as well as** encoder cables, optimised for the various feedback systems **and** fan cables	Connector (encoder cable) **as well as** free cable end (power) for connection on servo controller **or** connector (pin) for the connection of various cable types (e.g. trailing cable to permanently installed cable)

All cables* available for permanent installation or as trailing cable.

* Exception: the trailing cable for SinCos and incremental encoder (type 0019) can **only** be used as an intermediate cable.

Type code for system cables

a a a	b b b b	c	l l l l	m m m	r r r

Cable type

Motor cable	EYP
Encoder cable	EYF
Blower cable	EYL

Code for cable type

Please select from tables “Cable codes“
and “Assignment of motor cable/connector“

Utilisation type

Connecting cable	A
Extension	V
Cable without connector	Y

Cable length [dm]

Minimum length 0.5 m ≙ 5 dm

Examples:

Length [m]	“l l l l“
0.7 m	0007
14.5m	0145

Connection on motor please select from tables pages 5-10 to 5-13

Connection on controller please select from tables pages 5-10 to 5-13

Example:

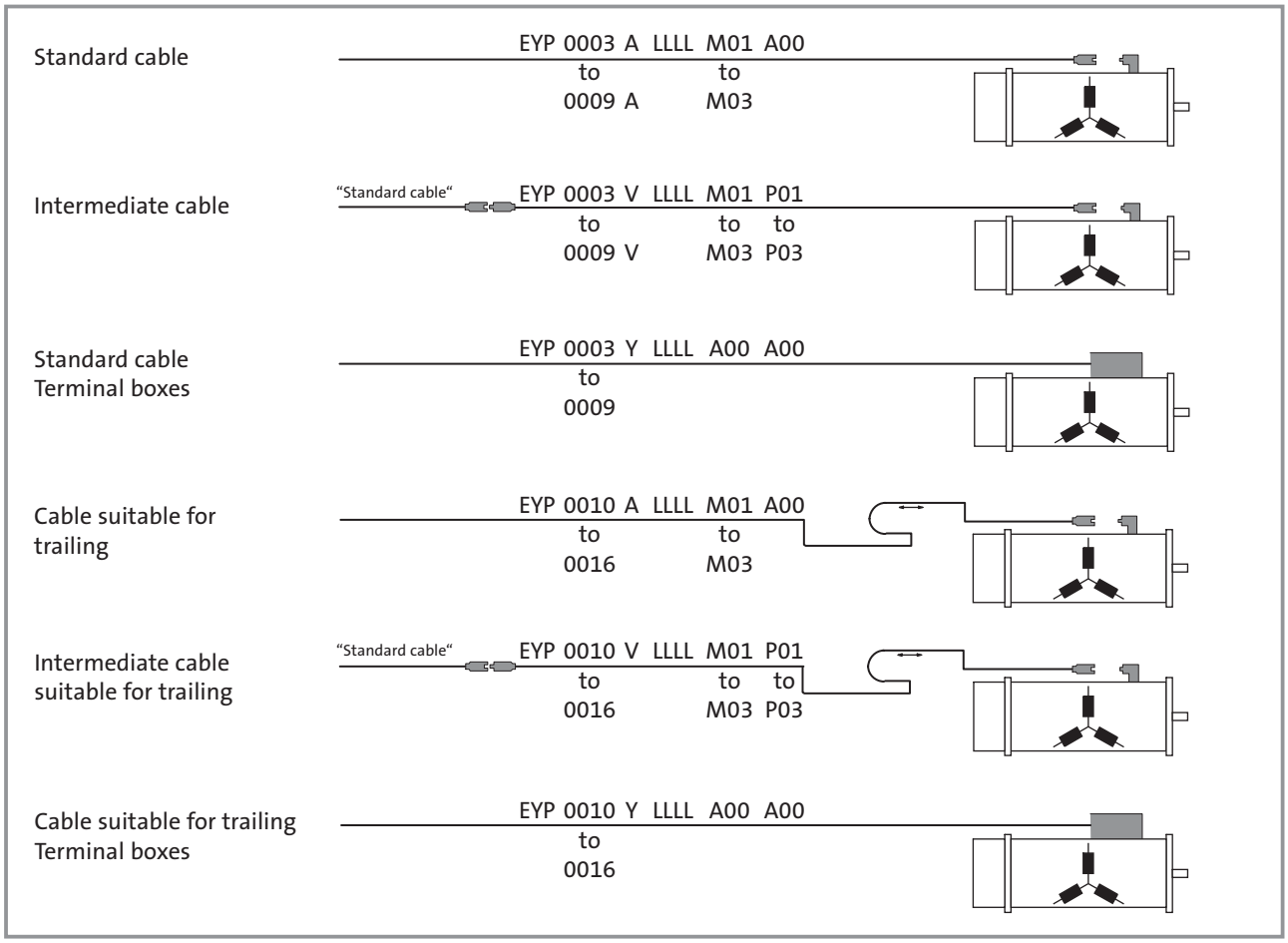
- Connecting cable for motor, 4x 2.5 mm², Length 17.6 m,
  fixed installation, for connection to servo controller,
  plug-in connection on motor
  Order no.: EYP 0005 A 0176 M02 A00

- A resolver should be connected to a servo controller.
  Depending on the system, it may be necessary to use a
  trailing cable for the connection on the motor side,
  otherwise the cable can be permanently installed.
  Connectors are provided on the controller and on the
  motor.
  Length of trailing cable: 12.5 m,
  Length for permanent installation: 15.9 m

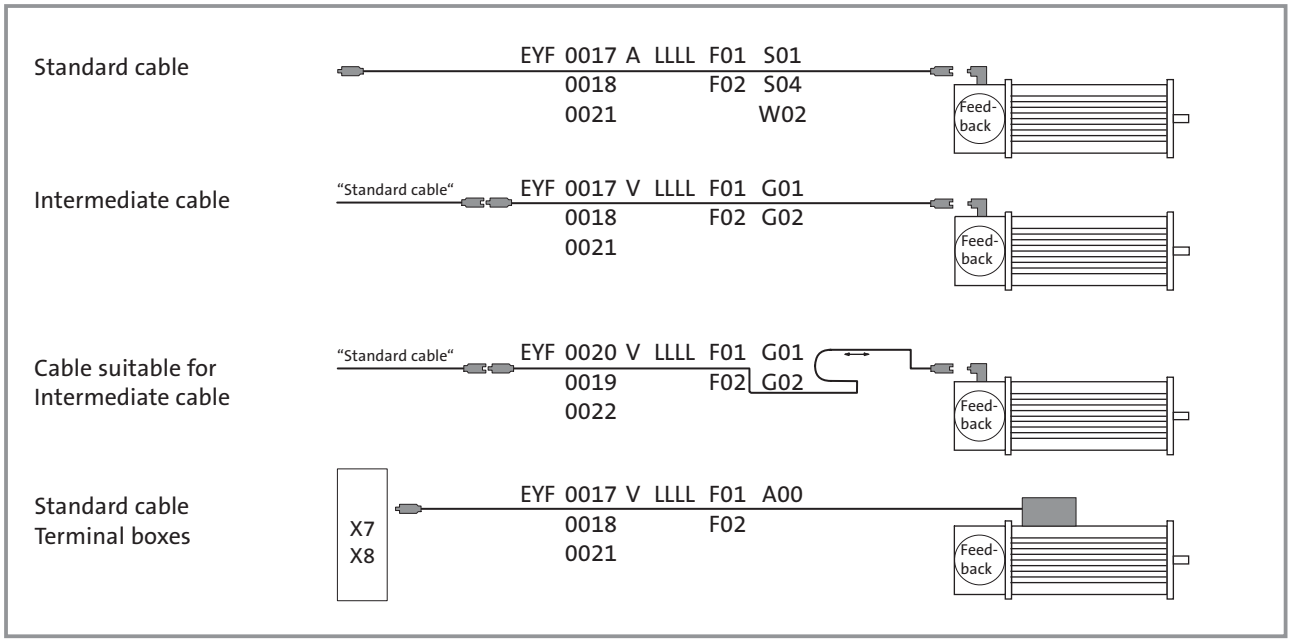
  Hence, there are two different cables:
  trailing cable:
  order no .: EYF 0020 V 0125 F01 G01
  permanently installed:
  order no.: EYF 0017 A 0159 F01 S01

Motor cable

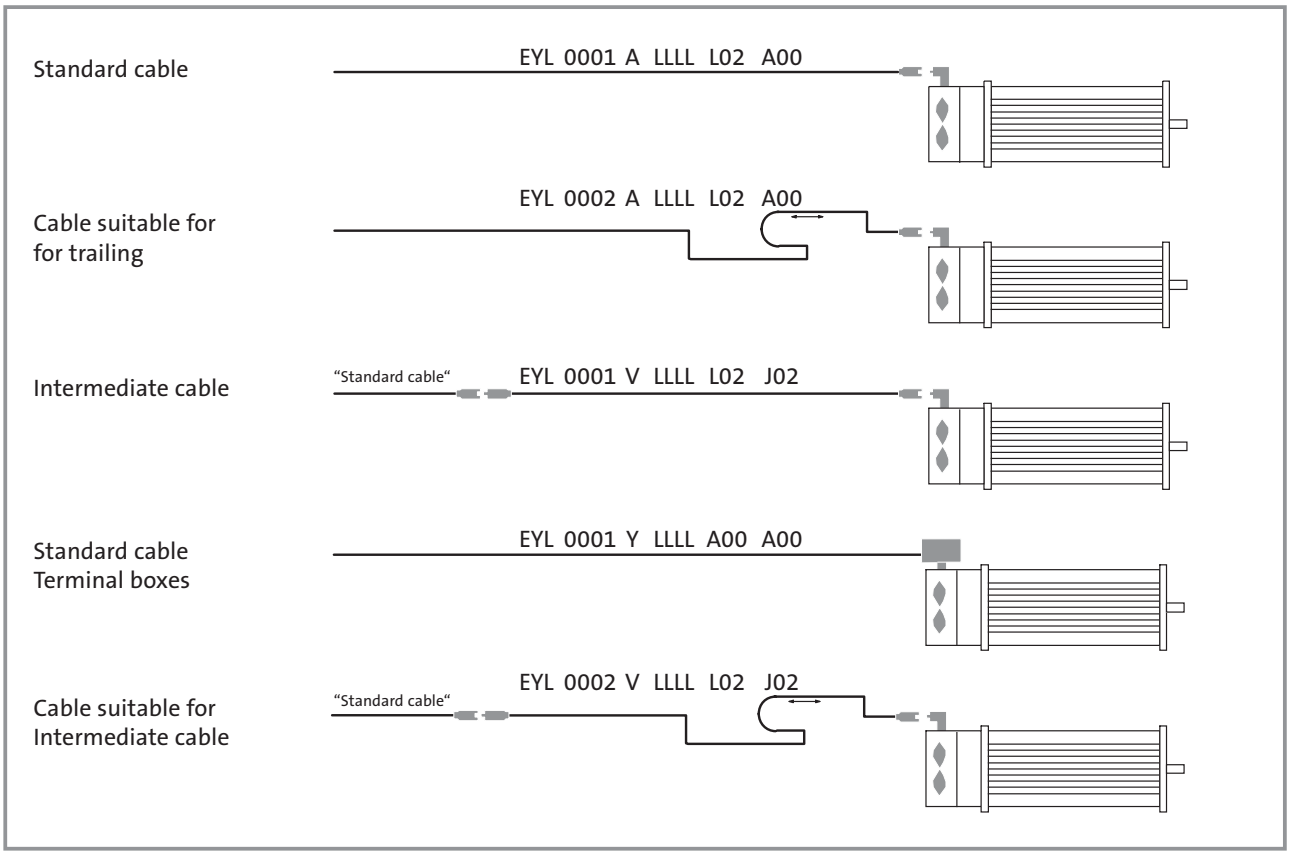
Overview of connecting cables for motor



Resolver and encoder cable



Blower cable



Code for cable type bbbb

Cable type For connection	Code bbbb	Structure* (...) = shield	Diam-eter [mm]	Sheath RAL (colour)	Sheath Material	UL File no.	CSA	Core-structure	suitable for trail-ing cables	Bending radius fixed installation	Bending radius Trailing cable
Blower	0001	5x1.0	7.8	7031 (grey)	PVC [1]	E172204	yes	flexible	no	7.5xd	--
	0002	5x1.0	9.1	9005 (black)	PUR [2]				yes	5xd	7.5xd
Motor and holding brake	0003	(4x1.0+(2x0.5))	11.4	7031 (grey)	PVC [1]	E172204	yes	flexible	no	7.5xd	--
	0004	(4x1.5+(2x0.5))	12.3								
	0005	(4x2.5+(2x0.5))	13.6								
	0006	(4x4.0+(2x1.0))	16.2								
	0007	(4x6.0+(2x1.0))	17.6								
	0008	(4x10.0+(2x1.0))	24.1								
	0009	(4x16.0+(2x1.0))	24.3								
	0010	(4x1.0+(2x0.5))	11.7	2003 (orange)	PUR [2]				yes	5xd	7.5xd
	0011	(4x1.5+(2x0.5))	12.8								10xd
	0012	(4x2.5+(2x0.5))	14.2								
	0013	(4x4.0+(2x1.0))	15.6								
	0014	(4x6.0+(2x1.0))	17.8								
	0015	(4x10.0+(2x1.0))	19.7								
	0016	(4x16.0+(2x1.0))	24.3								
Resolver	0017	3(2x0.14)+(3x0.14)	9.4	9005 (black)	PVC [1]	E47543	yes	flexible	no	7.5xd	--
	0020	3(2x0.14)+(3x0.14)	10.3	6018 (green)	PUR [2]				yes	5xd	7.5xd
Encoder with Hiperface interface or incremental encoder	0018	4(2x0.14)+(2x1.0)	11.4	9005 (black)	PVC [1]	E47543	yes	flexible	no	7.5xd	--
	0019	4(2x0.14)+2(1.0)	11.7	6018 (green)	PUR [2]				yes	5xd	10xd
Encoder with EnDat-Interface	0021	3(2x0.14)+(4x0.14) +2(2x0.5)	12,0	9005 (black)	PVC [1]	E47543	yes	flexible	no	7.5xd	--
	0022	3(2x0.14)+(4x0.14) +2(2x0.5)	12.2	6018 (green)	PUR [2]				yes	5xd	10xd

[1] PVC cables are silicone-free.
[2] PUR cables are silicone and halogen-free.

***Examples for column structure.**

3(2x0.14)+(2x0.5)	3 core pairs 2x0.14 each with shield, 1 core pair 2x0.5 in shield
(4x1.0+(2x0.5))	1 core pair 2x0.5 in shield, all cores in common shield

Assignment of motor – cable / connector

MCS synchronous servo motors						
Motor type	**Connection on motor "mmm"**		**Permissible cable types** [4] **"bbbb"**		**Connection on controller "r r r"**	
	Plug-in connection	Terminal box		**Core cross section** [mm²] (cf: trailing cable)	Plug-in connection for extension	Terminal
MCS 06C41...S00 MCS 06C60...S00 MCS 06F41...S00 MCS 06F60...S00 MCS 06I41...S00 MCS 06I60...S00	M01	not possible	0003 0004 0005	4x 1.0 mm² 4x 1.5 mm² 4x 2.5 mm²	P01	A00
MCS 09F38...S00 MCS 09F60...S00 MCS 09H41...S00 MCS 09H60...S00		A00	0010 0011 0012	4x 1.0 mm² (s) 4x 1.5 mm² (s) 4x 2.5 mm² (s)		
MCS 12H15...S00 MCS 12H35...S00 MCS 12L20...S00						
MCS 12L41...S00	M01	A00	0004 0005 0011 0012	4x 1.5 mm² 4x 2.5 mm² 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 14D15...S00 MCS 14D36...S00 MCS 14H15...S00	M01	A00	0003 0004 0005 0010 0011 0012	4x 1.0 mm² 4x 1.5 mm² 4x 2.5 mm² 4x 1.0 mm² (s) 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 14H32...S00 [1]	M01	A00	0005 0012	4x 2.5 mm² 4x 2.5 mm² (s)	P01	A00
MCS 14L15...S00	M01	A00	0004 0005 0011 0012	4x 1.5 mm² 4x 2.5 mm² 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 14L32...S00 [2]	M02	A00	0006 0013	4x 4.0 mm² 4x 4.0 mm² (s)	P02	A00
	M03		0007 0014	4x 6.0 mm² 4x 6.0 mm² (s)	P03	
MCS 14P14...S00	M01	A00	0004 0005 0011 0012	4x 1.5 mm² 4x 2.5 mm² 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 14P32...S00 [2]	M02	A00	0006 0013	4x 4.0 mm² 4x 4.0 mm² (s)	P02	A00
	M03		0007 0014	4x 6.0 mm² 4x 6.0 mm² (s)	P03	

[1] When connecting via a terminal box, core cross section 4.0 mm² is also possible, cable types 0006, 0013 (trailing cable).
[2] When using a plug-in connection core cross section 10.0 mm² is also possible, cable types 0008, 0015 (trailing cable).
[3] When using a plug-in connection core cross section 16.0 mm² is also possible, cable types 0009, 0016 (trailing cable).
[4] The motor cable assignments have been dimensioned according to the current capacities specified in IEC 60204-1, laying system C, for continuous operation conditions with motor standstill current (I_0) at an ambient air temperature of 40°C for PVC-insulated cables. Should conditions differ (laying system, ambient conditions, cable type, motor load), it is the responsibility of the user to install a cable set which is appropriate for the prevailing conditions and the applicable standards and legislation.

Assignment of motor – cable / connector

MCS synchronous servo motors

Motor type	Connection on motor "mmm"		Permissible cable types [4] "bbbb"		Connection on controller "r r r"	
	Plug-in connection	Terminal box		Core cross section [mm²] (cf. trailing cable)	Plug-in connection for extension	Terminal box
MCS 19F14...S00	M01	A00	0003 0004 0005 0010 0011 0012	4x 1.0 mm² 4x 1.5 mm² 4x 2.5 mm² 4x 1.0 mm² (s) 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 19F30...S00 [2]	M02	A00	0012 0006 0013	4x 2.5 mm² (s) 4x 4.0 mm² 4x 4.0 mm² (s)	P02	A00
	M03		0007 0014	4x 6.0 mm² 4x 6.0 mm² (s)	P03	
MCS 19J14...S00	M01	A00	0004 0005 0011 0012	4x 1.5 mm² 4x 2.5 mm² 4x 1.5 mm² (s) 4x 2.5 mm² (s)	P01	A00
MCS 19J30...S00 [3]	M03	A00	0007 0008 0013 0014 0015	4x 6.0 mm² 4x 10.0 mm² 4x 4.0 mm² (s) 4x 6.0 mm² (s) 4x 10.0 mm² (s)	P03	A00
MCS 19P14...S00 [1]	M01	A00	0005 0012	4x 2.5mm² 4x 2.5mm² (s)	P01	A00
MCS 19P30...S00 [3]	M03	A00	0008 0014 0015	4x 10.0mm² 4x 6.0mm² (s) 4x 10.0mm² (s)	P03	A00

[1] When connecting via a terminal box, core cross section 4.0 mm² is also possible, cable types 0006, 0013 (trailing cable).
[2] When using a plug-in connection core cross section 10.0 mm² is also possible, cable types 0008, 0015 (trailing cable).
[3] When using a plug-in connection core cross section 16.0 mm² is also possible, cable types 0009, 0016 (trailing cable).
[4] The motor cable assignments have been dimensioned according to the current capacities specified in IEC 60204-1, laying system C, for continuous operation conditions with motor standstill current (I_0) at an ambient air temperature of 40°C for PVC-insulated cables. Should conditions differ (laying system, ambient conditions, cable type, motor load), it is the responsibility of the user to install a cable set which is appropriate for the prevailing conditions and the applicable standards and legislation.

Assignment of motor – cable / connector

Asynchronous servo motors MCA						
Motor type	**Connection on motor "mmm"**		**Permissible cable types** [4] **"bbbb"**		**Connection on controller "r r r"**	
	Plug-in connection	Terminal box		**Core cross section** [mm²] (cf: trailing cable)	Plug-in connection for extension	Terminal
Motors with natural ventilation						
MCA 10I40...S00 [1] MCA 13I40...S00 [1] MCA 14L20...S00 [1] MCA 14L41...S00 [1] MCA 17N23...S00 [1]	M01	A00	0003 0004 0010 0011	4x 1.0 mm² 4x 1.5 mm² 4x 1.0 mm² (s) 4x 1.5 mm² (s)	P01	A00
MCA 17N41...S00 [1]	M01	A00	0004 0011	4x 1.5 mm² 4x 1.5 mm² (s)	P01	A00
MCA 19S23...S00 [2]	M02	A00	0005 0012	4x 2.5 mm² 4x 2.5 mm² (s)	P02	A00
MCA 19S42...S00	M02	A00	0006 0012 0013	4x 4.0 mm² 4x 2.5 mm² (s) 4x 4.0 mm² (s)	P02	A00
	M03		0007 0014	4x 6.0 mm² 4x 6.0 mm² (s)	P03	
MCA 21X25...S00	M02	A00	0005 0006 0012 0013	4x 2.5 mm² 4x 4.0 mm² 4x 2.5 mm² (s) 4x 4.0 mm² (s)	P02	A00
	M03	A00	0007 0014	4x 6.0 mm² 4x 6.0 mm² (s)	P03	A00
MCA 21X42...S00	M02	A00	0013	4x 4.0 mm² (s)	P02	A00
	M03	A00	0007 0014 0015	4x 6.0 mm² 4x 6.0 mm² (s) 4x 10.0 mm² (s)	P03	A00
		not possible	0008 0009 0016	4x 10.0 mm² 4x 16.0 mm² 4x 16.0 mm² (s)		
Motors with forced ventilation						
MCA 13I34...F10 [1] MCA 14L16...F10 [1] MCA 14L35...F10 [1] MCA 17N17...F10 [1]	M01	A00	0003 0004 0010 0011	4x 1.0 mm² 4x 1.5 mm² 4x 1.0 mm² (s) 4x 1.5 mm² (s)	P01	A00
MCA 17N35...F10	M01	not possible	0005 0012	4x 2.5 mm² 4x 2.5 mm² (s)	P01	A00
MCA 19S17...F10 [3]	M02	A00	0005 0012	4x 2.5 mm² 4x 2.5 mm² (s)	P02	A00
MCA 19S35...F10	M03	A00	0007 0014 0015	4x 6.0 mm² 4x 6.0 mm² (s) 4x 10.0 mm² (s)	P03	A00
		not possible	0009 0016	4x 16.0 mm² 4x 16.0 mm² (s)		
MCA 21X17...F10 MCA 21X35...F10	M02	A00	0013	4x 4.0 mm² (s)	P02	A00
	M03	A00	0007 0014 0015	4x 6.0 mm² 4x 6.0 mm² (s) 4x 10.0 mm² (s)	P03	A00
	M02	not possible	0008 0009 0016	4x 10.0 mm² 4x 16.0 mm² (s) 4x 16.0 mm² (s)		

[1] When connecting via a terminal box, core cross section 4.0 mm² is also possible, cable types 0006, 0013 (trailing cable).
[2] When using a plug-in connection core cross section 10.0 mm² is also possible, cable types 0008, 0015 (trailing cable).
[3] When using a plug-in connection core cross section 16.0 mm² is also possible, cable types 0009, 0016 (trailing cable).
[4] The motor power assignments were designed to correspond with the permissible current loads in accordance with IEC 60204-1, installation method C, for continuous operation with motor standstill current (I_0) with an ambient air temperature of 40 °C for PVC insulated cable. In the case of deviating conditions (installation method, ambient conditions, cable design, motor load), the responsibility for installing a connecting cable that corresponds with the actual conditions and the applicable standards and regulations lies with the user.

Assignment of encoder – cable / connector

encoder		Connection on motor or interm. cable on motor side	Cable		Connection with interm. cable on controller side	Connection on controller
			Install. method	Type		
Type	Order code	"mmm"		"bbbb"	"r r r"	"r r r"
Resolver	RS0	F01	permanent trailing cable	0017 0020	G01	S01 S04
TTL incremental encoder ITD21	T20	F02	permanent trailing cable	0018 0019	G02	W02 -- 1)
TTL incremental encoder CDD50	CDD					
SinCos absolute value encoder ITD22	ITD					
SinCos absolute value encoder SRS50 (Hiperface)	SRS					
SinCos absolute value encoder SRM50 (Hiperface)	SRM					
SinCos absolute value encoder SCS70 (Hiperface)	SCS					
SinCos absolute value encoder SCM70 (Hiperface)	SCM					

1) When using trailing cable connection should always be made with intermediate cable

Assignment of blower cables for forced ventilated motors – cable / connector

Motor type	Connection on motor "mmm"		Cable		Connection in control cabinet "r r r"	
	Plug-in connection	Terminal box	Laying system	"bbbb"	Plug-in connection	Terminal
all motors MCA ...F10	L02	A00	permanent trailing cable	0001 0002	J02	A00
all motors MDFQA	L02 1)	A00	permanent trailing cable	0001 0002	J02	A00

1) Plug-in connection only possible for intermediate cable, connection to motor only via terminal box.

System connectors

For applications in which Lenze system cables cannot be used but motors with plug connectors are to be used, Lenze can provide appropriate connectors for the assembly of cable sets by the customer.

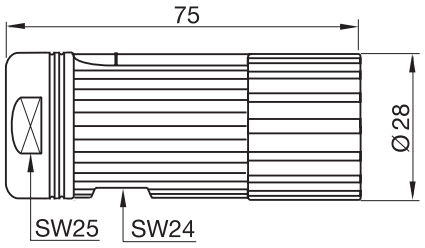
Various connectors with pin or socket contacts that correspond with the power requirements of the motor and the connection type (power, fan, encoder) are available.

Details relating to the assignment of the connector type to the frame sizes can be found in the table to the right. Details relating to the connection assignments can follow.

Motor type	Motor connection		Encoder connection		Blower connection	
	Connector Socket (for motor connection)	Connector Pin (for extension etc.)	Connector Socket (for encoder connection)	Connector Pin (for extension etc.)	Connector Socket (for blower connection)	Connector Pin (for extension etc.)
Synchronous motors with natural ventilation						
MCS 06C40...S00 MCS 06C60...S00 MCS 06F40...S00 MCS 06F60...S00 MCS 06I40...S00 MCS 06I60...S00 MCS 09F38...S00 MCS 09F60...S00 MCS 09H40...S00 MCS 09H60...S00 MCS 12H15...S00 MCS 12H35...S00 MCS 12L20...S00 MCS 12L40...S00 MCS 14D15...S00 MCS 14D36...S00 MCS 14H15...S00 MCS 14H32...S00 MCS 14L15...S00	EWS0001	EWS0016	Resolver EWS0006 SinCos encoder Hiperface EWS0010	Resolver EWS0007 SinCos encoder Hiperface EWS0011	No blower connection required	No blower connection required
MCS 14L32...S00	EWS0012 EWS0013	EWS0014 EWS0015	EnDat EWS0017	EnDat EWS0018		
MCS 14P14...S00	EWS0001	EWS0016				
MCS 14P32...S00	EWS0012 EWS0013	EWS0014 EWS0015				
MCS 19F14...S00	EWS0001	EWS0016				
MCS 19F30...S00	EWS0012 EWS0013	EWS0014 EWS0015				
MCS 19J14...S00	EWS0001	EWS0016				
MCS 19J30...S00	EWS0013	EWS0015				
MCS 19P14...S00	EWS0001	EWS0016				
MCS 19P30...S00	EWS0013	EWS0015				
Asynchronous motors with natural ventilation						
MCA 10I40...S00 MCA 13I40...S00 MCA 14L20...S00 MCA 14L41...S00 MCA 17N23...S00 MCA 17N41...S00	EWS0001	EWS0016				
MCA 19S23...S00	EWS0012	EWS0014	Resolver	Resolver		
MCA 19S42...S00 MCA 21X25...S00 MCA 21X42...S00	EWS0012 EWS0013	EWS0014 EWS0015	EWS0006	EWS0007		
Asynchronous motor with forced ventilation			Incremental encoder and SinCos encoder Hiperface EWS0010	Incremental encoder and SinCos encoder Hiperface EWS0011		
MCA 13I34...F10 MCA 14L16...F10 MCA 14L35...F10 MCA 17N17...F10 MCA 17N35...F10	EWS0001	EWS0016			EWS0021	EWS0022
MCA 19S17...F10	EWS0012	EWS0014	Incremental encoder and SinCos encoder EnDat EWS0017	Incremental encoder and SinCos encoder EnDat EWS0018		
MCA 19S35...F10	EWS0013	EWS0015				
MCA 21X17...F10 MCA 21X35...F10	EWS0012 EWS0013	EWS0014 EWS0015				
MDFQA all frame sizes	Power connection only via terminal box				Blower connection only via terminal box	

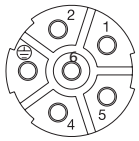
Connector for power terminal

Main dimensions
Connector EWS0001



***SW** = Width across flats*

Pin diagram EWS0001
View from connector side



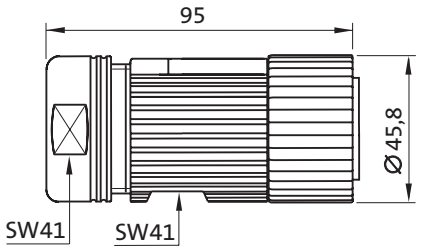
	Pin no.	Terminal assignment
Holding brake +UB	1	Y1/BD1
Holding brake -UB	2	Y2/BD2
Earth PE	⊥	⊥
Motor phase U	4	U
Motor phase V	5	V
Motor phase W	6	W

Contact assignment EWS0001

Order number: **EWS0001**

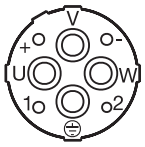
Power connector EWS0001

Main dimensions
Connector EWS0012, EWS0013



***SW** = Width across flats*

View of poles EWS0012, EWS0013
View from connector side



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

Contact assignment EWS0012, EWS0013

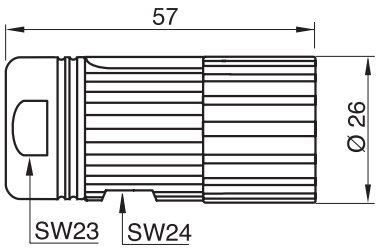
Order number: **EWS0012** (for 2.5-4 mm²)
EWS0013 (for 6-16 mm²)

Power connector EWS0012, EWS0013

Connectors for feedback systems

Resolver

Main dimensions
Connector



***SW** = Width across flats*

View of poles EWS0006
View from connector side

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

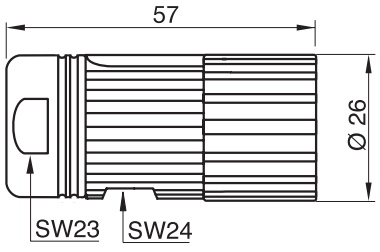
Contact assignment EWS0006

Order number: **EWS0006**

Connector for resolver EWS0006

SinCos absolute value encoder

Main dimensions
Connector



***SW** = Width across flats*

View of poles EWS0010
View from connector side

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

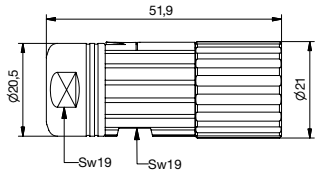
Contact assignment EWS0010

Order number: **EWS0010**

Connector for SinCos encoder and incremental encoder EWS0010

Connector for blower connection

Main dimensions
Connector EWS0021



***SW** = Width across flats*

View of poles EWS0021
View from connector side

Pin no.	Terminal designation	Meaning
1	L1	Connection for blower
2	N	
3		
4	Y1 (+)	
5	Y2 (-)	
⏚	PE	PE conductor

Order number: **EWS0021**

Power connector EWS0021

Replacement contacts

If contacts are damaged when crimping the connector, replacement contacts are available for all connector types.

Pack size: 10 pins per pack

Connector			Replacement contact	
			large	small
Order no.	Brief description	Code	Order no.	Order no.
EWS0001	Connector 6-pole 630 V 1 – 2.5 mm² socket	M01	EWZ0054	
EWS0006	Connector 12-pole 125 V Socket	F01	EWZ0053	
EWS0010	Connector 12-pole 125 V 20DEC socket	F02	EWZ0053	
EWS0012	Connector 8-pole 630 V 2.5 – 4 mm² socket	M02	EWZ0055	EWZ0054
EWS0013	Connector 8-pole 630 V 6 – 16 mm² socket	M03	EWZ0056	
EWS0017	Connector 17-pole 125 V Socket	F03	EWZ0053	
EWS0021	Connector 7-pole 630 V 1 mm² 5 assigned socket	L02	EWZ0053	


Lenze

Services | Synchronous servo motors

Services 6-2

Related documentation 6-3

Product codes 6-4

Fax order form 6-6

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For us, service is more than just supporting the use of our drives. The Lenze system approach begins with your enquiry. Next you get technical information and advice from a network of sales outlets staffed by knowledgeable engineers. If you want, we follow up with training, commissioning, maintenance and repair. Our service is always at your disposal.

With passion
The Lenze team does not just offer the necessary manpower and technical know-how – we are passionate and meticulous about what we do. We will only be happy once you are entirely satisfied with our work. Our team of professionals provides assistance over the telephone or on site, ensures the express delivery of spare parts and carries out repairs with incredible urgency. We're fast and reliable.

Someone to talk to
Expert advice is available for all your technical queries via our helpline. In cases of urgent need, call 008000 24 hours (008000 24 46877), Lenze's worldwide expert helpline – 24 hours a day, 365 days a year. For more direct assistance, you can of course contact your local Lenze service support centre. We can tell you where it is – or you can find out for yourself by visiting us on the Internet at www.Lenze.com.

Around the world
Our products are available for speedy delivery worldwide. Lenze companies, Lenze factories and sales agencies are based in major industrial countries around the world. Contact them through our website **www.Lenze.com**, which also gives you 24-hour access to technical instructions and product manuals. Local support, on site if you need it, is available.

Technical documentation

The technical documentation provides more detailed information about our products:

- Mounting Instructions in three languages are supplied with our products.
- Our System Manuals for controllers, our Communication Manuals for bus systems and our Operating Instructions for electromechanical products and accessories provide the information required for planning, designing and developing machines and systems. System Manuals and Communication Manuals are supplied in loose-leaf format. Operating Instructions are bound.
- Our User's Manuals for our controllers are designed for the operators and users of machines and systems. The information in User's Manuals has been put together so that it can be integrated directly into the machine or system documentation.

All our technical documentation is available free of charge in PDF format

- Via Internet download from "www.lenze.de", "Downloads" area
- On the "Lenze Library" CD

System Manuals and Communication Manuals can also be supplied in ring binder format for a nominal fee.

Technical documentation at a glance

Documentation	Contents	Target group	Available languages
Mounting Instructions	Safety instructions, handling and installation	Installation personnel	In three languages: German, English, French
System manual **Communication manual** **Operating instructions**	Extensive and comprehensive information for design, construction, development and programming	Planning engineers, design engineers and developers of machines and systems	Single-language version: German, English or French
User's manual	Safety instructions, handling, troubleshooting and fault elimination	Operators and users of machines and systems	Single-language version German, English or French. Other languages will shortly be available on request

MC□ □□ □ □□ - □□□ □□ -

Motor principle	□	
Synchronous motor	S	
Asynchronous motor	A	
Square dimensions, motor length and winding	□□ □ □□	
Square dimensions		
Square dimension 62 mm 1)	06	
Square dimension 89 mm 1)	09	
Square dimension 102 mm 2)	10	
Square dimension 116 mm 1)	12	
Square dimension 130 mm 2)	13	
Square dimension 142 mm	14	
Square dimension 165 mm 2)	17	
Square dimension 192 mm	19	
Square dimension 214 mm 2)	21	
Overall length: length of coil module as letter		
30 mm 1)	C	
40 mm 1)	D	
60 mm 1)	F	
80 mm 1)	H	
90 mm	I	
100 mm 1)	J	
120 mm	L	
140 mm 2)	N	
160 mm 1)	P	
190 mm 2)	S	
240 mm 2)	X	
Rated speed in 100 rpm		
Example: 1500 rpm	15	
Speed encoder/angle sensor		□□□
Resolver p = 1		RS0
Single-turn absolute value encoder SRS 50 with SinCos signals, Hiperface		SRS
Multi-turn absolute value encoder SRM 50 with SinCos signals, Hiperface		SRM
Single-turn absolute value encoder SCS 70 with SinCos signals, Hiperface		SCS
Multi-turn absolute value encoder SCM 70 with SinCos signals, Hiperface		SCM
Single-turn absolute value encoder ECN 1313 with SinCos signals, EnDat		ECN
Multi-turn absolute value encoder EQN 1325 with SinCos signals, EnDat		EQN
Incremental encoder ITD 21 2) TTL, 2048		T20
Incremental encoder CDD 50 2) TTL, 2048		CDD
Incremental encoder ITD 22 2) SinCos, 2048		S20
Incremental encoder EQI 1329 2) SinCos, 32		EQI
Brake		□□
No brake		B0
PM brake 24 V DC		P1
PM brake 24 V DC, higher torque 1)		P2
PM brake 205 V DC 2) 3)		P5

□ □□ □ - □□ □ □□□ □ - □ □ □ □

Temperature protection, electronic nameplate, nameplate, colour, specification

Temperature protection
R — KTY sensor

Nameplate
0 — international nameplate
2 — second nameplate, supplied loose

Colour black
S — black
X — other colours

Load flywheel

N — Without
J — With additional mass inertia

Cooling/Ventilation

S00 — Natural ventilation/without fan
F10 — Blower axial, 1 ph. 230 V [2]

Enclosure

5 — IP54 without shaft sealing ring (except for direct mounting on the gearbox)
6 — IP65 with shaft sealing ring

Electrical connection

ST — Separate circular connector for power/brake, encoder/temperature, fan
KK — Terminal box for power/brake, encoder/temperature, fan
KS — Terminal box for power/brake, fan 2) Plug connectors for encoder, temperature

Design and shaft

Standard design

A — Standard flange form A / FF with through holes, parallel shaft without keyway: A
B — Standard flange form A / FF with through holes, parallel shaft with keyway: B

11 — Shaft 11 x 23 (MCS06)
14 — Shaft 14 x 30 (MCS 09, MCA 10)
19 — Shaft 19 x 40 (MCS 12, MCA 13)
24 — Shaft 24 x 50 (MCS 14, MCA 14, MCA 17)
28 — Shaft 28 x 60 (MCS19, MCA 19)
38 — Shaft 38 x 80 (MCA 21)

N — Concentricity/vibration level – normal
R — Concentricity/vibration level – reduced

[1] motor type MCS only.
[2] motor type MCA only.
[3] no UL-certification.

Examples:

Synchronous motor 14 Nm, 3000 rpm, resolver, PM standard brake, B5, standard shaft without keyway, connector, IP54, no blower, no load flywheel

MCS 14H30-RS0P1-A24N-ST5S0-R0S0

Synchronous motor 30 Nm, 4000 rpm, SRM multi-turn encoder, no brake, B5, standard shaft with keyway, connector, IP65, no blower, no load flywheel, with 2nd nameplate MCS

14P40-SRMB0-B24N-ST6S0-R2S0

To the Lenze sales office

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☐ **Order**

☐ **Quotation**

Fax no. _____

From

_____
Company

_____
Street/PO Box

_____
Postcode/City

_____
Date Signature

Customer no.

_____
Order no.

_____
Name

_____
Department

_____
Tel. no.

Delivery address (if different)

_____
Street

_____
Postcode City

Invoice to (if different)

_____
Street/PO Box

_____
Postcode/City

Requested delivery date _____

Despatch information _____

_____

_____

Customer no.

Order no. _____

MCS synchronous servo motors

☐ **MCS 06C41** 0.6 Nm/0.25 kW 4050 rpm	☐ **MCS 06F41** 1.2 Nm/0.51 kW 4050 rpm	☐ **MCS 06I41** 1.5 Nm/0.64 kW 4050 rpm	
☐ **MCS 06C60** 0.5 Nm/0.31 kW 6000 rpm	☐ **MCS 06F60** 0.9 Nm/0.57 kW 6000 rpm	☐ **MCS 06I60** 1.2 Nm/0.75 kW 6000 rpm	
☐ **MCS 09F38** 3.1 Nm/1.2 kW 3750 rpm	☐ **MCS 09H41** 3.8 Nm/1.6 kW 4050 rpm	☐ **MCS 12H15** 10.0 Nm/1.6 kW 1500 rpm	☐ **MCS 12L20** 14.0 Nm/4.9 kW 1950 rpm
☐ **MCS 09F60** 2.4 Nm/1.5 kW 6000 rpm	☐ **MCS 09H60** 3.0 Nm/1.9 kW 6000 rpm	☐ **MCS 12H35** 8.0 Nm/3.0 kW 3525 rpm	☐ **MCS 12L41** 11.5 kW/4.9 Nm 4050 rpm
☐ **MCS 14D15** 9.2 Nm/1.45 kW 1500 rpm	☐ **MCS 14H15** 16.0 Nm/2.5 kW 1500 rpm	☐ **MCS 14L15** 23.0 Nm/3.6 kW 1500 rpm	☐ **MCS 14P14** 30.0 Nm/4.2 kW 1350 rpm
☐ **MCS 14D36** 7.5 Nm/2.8 kW 3600 rpm	☐ **MCS 14H32** 14.0 Nm/4.7 kW 3225 rpm	☐ **MCS 14L32** 17.2 Nm/5.8 kW 3225 rpm	☐ **MCS 14P32** 21.0 Nm/7.1 kW 3225 rpm
☐ **MCS 19F14** 27.0 Nm / kW 1425 rpm	☐ **MCS 19J14** 40.0 Nm / 6.0 kW 14250 rpm	☐ **MCS 19P14** 51.0 Nm / 7.2 kW 1350 rpm	
☐ **MCS 19F30** 21.0 Nm/6.6 kW 3000 rpm	☐ **MCS 19J30** 29.0 Nm/9.1 kW 3000 rpm	☐ **MCS 19P30** 32.0 Nm/10.0 kW 3000 rpm	

Encoder

☐ **Resolver**

☐ **SinCos encoder** Single-turn SRS 50	☐ **SinCos encoder** Multi-turn SRM 50	(SinCos encoder SCS70/SCM70 for 93□□ on request)

Brake

☐ **no brake**	☐ **with PM brake** 24 V DC	☐ **with PM brake, reinforced** 24 V DC (not on MCS 06, MCS 19)

Flange and shaft

☐ **B5 standard flange form A/FF** Shaft without featherkey	☐ **B5 standard flange form A/FF** Shaft with featherkey

Electrical connection

☐ **Separate plug connectors for** power/brake encoder/temperature	☐ **Terminal box for** power/brake/encoder/temperature (not on MCS 06)

Enclosure

☐ **IP54 without shaft sealing ring**	☐ **IP65 with shaft sealing ring**

Thermal protection

☒ **KTY sensor**

Nameplate

☐ **international nameplate**	☐ **second nameplate,** supplied loose

Customer no.

Order no. _____

MCA asynchronous servo motors

without fan		with fan	
☐ **MCA 10I40...S00** 2.0 Nm / 0.8 kW 3950 rpm			
☐ **MCA 13I41...S00** 4.0 Nm / 1.7 kW 4050 rpm		☐ **MCA 13I34...F10** 6.3 Nm / 2.2 kW 3410 rpm	
☐ **MCA 14L20...S00** 6.7 Nm / 1.4 kW 2000 rpm	☐ **MCA 14L21...S00** 5.4 Nm / 2.3 kW 4100 rpm	☐ **MCA 14L16...F10** 12.0 Nm / 2.1 kW 1635 rpm	☐ **MCA 14L35...F10** 10.8 Nm / 3.9 kW 34550 rpm
☐ **MCA 17N23...S00** 10.8 Nm / 2.6 kW 6000 rpm	☐ **MCA 17N41...S00** 9.5 Nm / 4.1 kW 4110 rpm	☐ **MCA 17N17...F10** 21.5 Nm / 3.8 kW 1680 rpm	☐ **MCA 17N35...F10** 19.0 kW / 6.9 Nm 3480 rpm
☐ **MCA 19S23...S00** 16.3 Nm / 4.0 kW 2340 rpm	☐ **MCA 19S42...S00** 12.0 Nm / 5.2 kW 4150 rpm	☐ **MCA 19S17...F10** 36.3 Nm / 6.4 kW 1700 rpm	☐ **MCA 19S35...F10** 36.0 Nm / 13.2 kW 3510 rpm
☐ **MCA 21X25...S00** 24.6 Nm / 6.4 kW 2490 rpm	☐ **MCA 21X42...S00** 17.0 Nm / 7.4 kW 4160 rpm	☐ **MCA 21X17...F10** 61.4 Nm / 11.0 kW 1710 rpm	☐ **MCA 21X35...F10** 55.0 Nm / 20.3 kW 3520 rpm

Encoder

☐ **Resolver**			
☐ **SinCos encoder** Single-turn SRS 50	☐ **SinCos encoder** Multi-turn SRM 50	**SinCos encoder** Single-turn SCS 70	**SinCos encoder** Multi-turn SCM 70
☐ **Incremental encoder** TTL, 2048 ITD21	☐ **Incremental encoder** TTL, 2048 CDD 50	☐ **Incremental encoder** SinCos, 2048 ITD22	

Brake

☐ **no brake**	☐ **with PM brake** 24 V DC	☐ **with PM brake, reinforced** 24 V DC

Flange and shaft

☐ **Standard flange B5** Form A / FF Shaft without featherkey	☐ **Standard flange B5** Form A / FF Shaft with featherkey	☐ **Standard flange B14** Form A / FF Shaft without featherkey	☐ **Standard flange B14** Form A / FF Shaft with featherkey

Electrical connection

☐ **Separate circular connector for** power/brake encoder/temperature	☐ **Terminal box for**	☐ **Terminal box** power/brake encoder/temperature	for power/brake/fan **Circular connector** for encoder/temperature

Enclosure

☐ **IP54 without shaft sealing ring**	☐ **IP65 with shaft sealing ring**

Thermal protection

☒ **KTY sensor**

Nameplate

☐ **international nameplate**	☐ **second nameplate,** separate

Customer no.

Order no. _____

Page __ of __

MDFQA asynchronous servo motors

☐ **MDFQAxx 100-22**
10.6/20.3 kW
1420/2930 rpm
360 V, 50 Hz

☐ **MDFQAxx 112-22, 50**
20.1/11.5 kW
1425/760 rpm
360 V, 50/28 Hz

☐ **MDFQAxx 112-22, 100**
38.4/22.7 kW
2935/1670 rpm
360 V, 100/58 Hz

☐ **MDFQAxx 132-32, 36**
31.1/17.0 kW
1030/550 rpm
360 V, 36/20 Hz

☐ **MDFQAxx 132-32, 76**
60.1/35.4 kW
2235/1200 rpm
340/360 V, 76/42 Hz

☐ **MDFQAxx 160-32, 31**
40.5/22.6 kW
890/498 rpm
355/360 V, 31/18 Hz

☐ **MDFQAxx 160-32, 78**
95.0/55.0 kW
2295/1280 rpm
340/340 V, 78/44 Hz

Operating mode ☒ **S1 continuous operation**

Design
☐ **B3/B5** Combined flange designs: ☐ **B6/B5** MDFQA100 = A250 ☐ **B7/B5** MDFQA112 = A300 ☐ **B8/B5** MDFQA132 = A300 ☐ **V1/V5** ☐ **V3/V6**
☐ **B5** Single flange designs: ☐ **V1** MDFQA100 = A300 ☐ **V3** MDFQA132 = A400 Forms B5, V1, V3 not possible with frame size 112.

A-side ☐ **with keyway** ☐ **without keyway**

B-side ☐ **motor for encoder mounting** ☐ **motor for brake and encoder mounting**

Temperature monitoring ☒ **Tk NC contact + KTY cont. sensor**

Enclosure ☒ **IP23s**

Terminal box position ☒ **-2- (top)** in relation to form B3 *view of motor output

Brakes ☐ **no brake** ☐ 14.450___
☐ 24 V DC ☐ 205 V DC ☐ 230 V AC incl. rectifier

Encoder ☐ no encoder ☐ **Resolver** ☐ ITD21 TTL 4096 pulses ☐ ITD21 TTL 2048 pulses ☐ SinCos encoder Single-turn ☐ SinCos encoder Multi-turn

Fitting only (all motors can be equipped as standard with A4 tachos (with hollow shaft)).

Blower with:

	380 ... 460 V		**350 ... 540 V**	
	without filter	with filter	without filter	with filter
Frame size 100	☐ G2D120	☐ G2D140	☐ DNG 3-4.5	☐ DNG 3-4.5
Frame size 112	☐ G2D160	☐ G2D160	☐ DNG 5-12.5	☐ DNG 5-12.5
Frame size 132/160	☐ G2D180		☐ DNG 8-12	☐ DNG 8-12

Blower position ☐ **-2- top** ☐ **-1- right** ☐ **-3- left** ☐ **-4- bottom (only with direct mounting on gearbox)** ☐ **without blower**
Worm position ☐ front ☐ back

Gearbox mounting
☐ **no gearbox** ☐ with old gearbox ☐ KKL-1- (right) ☐ KKL-2- (top) ☐ KKL-3- (left) ☐ KKL-4- (bottom)
☐ with GnG gearbox ☐ KKL-5- (right) ☐ KKL-2- (top) ☐ KKL-3- (left) ☐ KKL-4- (bottom)

Colour ☐ **RAL9005 black** ☐ RAL6011 copper green ☐ RAL2000 orange ☐ primed signal grey ☐ RAL9018 papyrus white

☐ 2nd nameplate supplied in terminal box

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