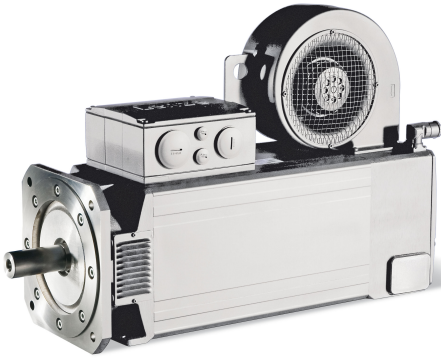




Servo motors

MQA asynchronous servo motor

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About this document

Document description

This document addresses to all persons who want to carry out any configurations with the products described.

The data and information compiled in this document serve to support you in the dimensioning and selection processes and in carrying out the electrical and mechanical installation. You will receive information regarding product extensions and accessories.

- The document includes safety instructions which must be observed.
- All persons working on and with the drives must have the documentation at hand during work and observe the information and notes relevant for it.
- The documentation must always be complete and in a perfectly readable state.

Further documents

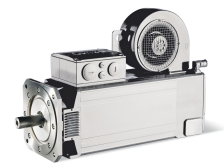


Information and tools with regard to the Lenze products can be found on the Internet:

www.Lenze.com → Downloads

About this document

Notations and conventions



Notations and conventions

This document uses the following conventions to distinguish different types of information:

Numbers			
	Decimal separator	Point	In general, the decimal point is used. Example: 1 234.56
Warning			
	UL warning	UL	Are used in English and French.
	UR warning	UR	
Text			
	Programs	» «	Software Example: »Engineer«, »EASY Starter«
Icons			
	Page reference		Reference to another page with additional information Example:  16 = see page 16
	Documentation reference		Reference to another documentation with additional information Example:  EDKxxx = see documentation EDKxxx

Layout of the safety instructions

DANGER!

Indicates an extremely hazardous situation. Failure to comply with this instruction will result in severe irreparable injury and even death.

WARNING!

Indicates an extremely hazardous situation. Failure to comply with this instruction may result in severe irreparable injury and even death.

CAUTION!

Indicates a hazardous situation. Failure to comply with this instruction may result in slight to medium injury.

NOTICE

Indicates a material hazard. Failure to comply with this instruction may result in material damage.



Product information

Product description

The MQA asynchronous servo motor for precisely controlled motion.

The naturally ventilated MQA asynchronous servo motor is suitable for applications that require a high dynamic performance, high construction-related operational reliability and precisely controlled motion.

In connection with the i700 and i950 servo inverters, Servo Drives 9400, and Inverter Drives 8400 TopLine, high-performance drive solutions in the torque range from 66 to 1100 Nm can be obtained.

Customer benefit

- Optimum controllability and high dynamic performance thanks to low moments of inertia
- Optimal smooth running characteristics for exact work results
- Wide speed setting range
- Field weakening operation usable
- Robust resolvers are included as a standard, and incremental encoders or absolute value encoders ensure a high precision



Fig. 1: Asynchronous servo motor MQA22P08-

Identification of the products

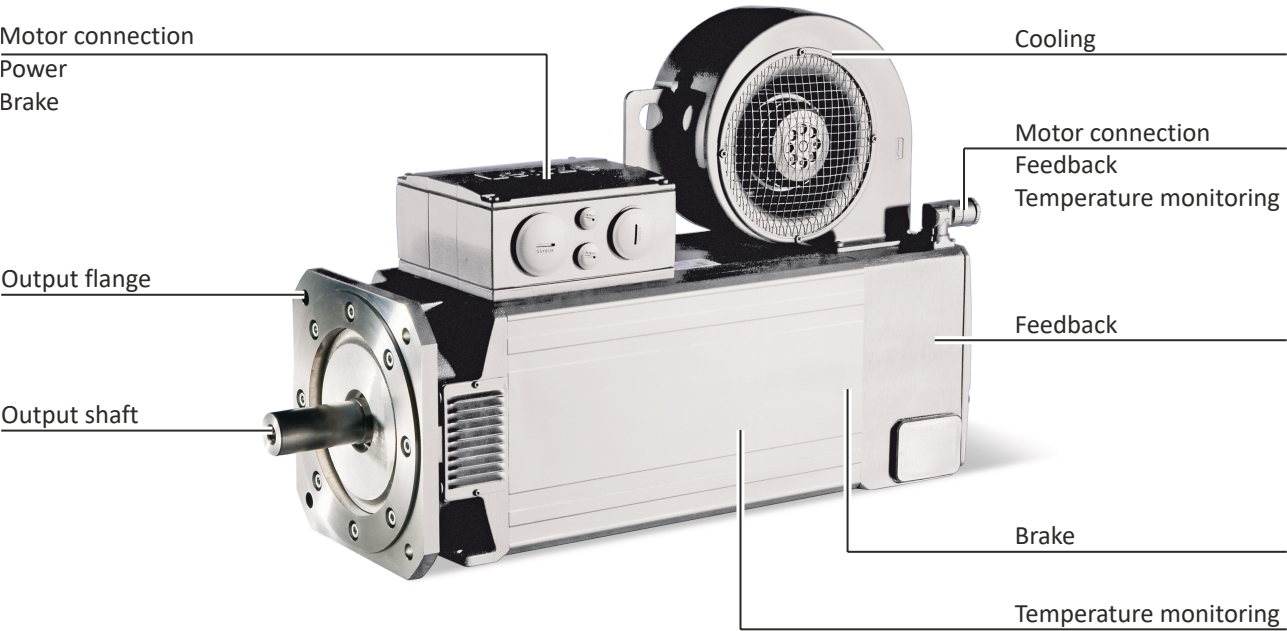
Product name: MQA asynchronous servo motor

		Motor				
Example		MQA	20	L	14	H
Meaning	Variant					
Product family		MQA				
Size			20 22 26			
Overall length				L ... T		
Rated speed	rpm x 100				05 ... 29	
Inverter mains connection	3 x 400 V					H



Features

The following figure provides an overview of the elements and connections on the product.
Their position, size and appearance may vary.



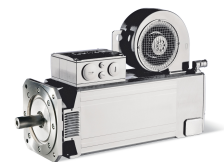


The modular system



Values printed in bold are standard designs. Values that are not printed in bold are potential extensions, some of them including a surcharge.

Motor		MQA20	MQA22	MQA26
Technical data				
Rated power	kW	10.6 ... 20.3	11.5 ... 38.4	17.0 ... 60.2
Rated torque	Nm	66.2 ... 71.3	125 ... 145	257 ... 296
Max. torque	Nm	250	500	1100
Rated speed	rpm	1420 ... 2930	760 ... 2935	550 ... 2235
Color		Primed RAL9005 matt jet black RAL color		
Surface and corrosion protection		OKS-G Different types of OKS		
Output shaft				
Solid shaft with featherkey	mm	38 x 80	38 x 80	55 x 110
Solid shaft without keyway	mm	38 x 80	38 x 80	55 x 110
Shaft material		Steel		
Shaft sealing ring material		FKM		
Shaft seal		Standard Oil-proof Dust-proof		
A-side end shield		Not oil-proof Oil-proof		
Design		With flange (B3/B35)		
Output flange	mm	FF215 FF265	FF265	FF265 FF350
Cooling		Forced ventilated IP23s		
Dust filter		Without With		
Motor connection				
Power + brake + blower		ICN connector Terminal box	Terminal box	
Encoder + temperature monitoring		ICN connector		
Spring-applied holding brake		Without With		
Standard braking torque	Nm	80.0	130	260
Increased braking torque	Nm	130	260	-
DC brake voltage	V	24		
AC brake voltage	V	230 (not for cURus an ICN connector)		
Feedback				
Without functional safety		Resolver Absolute value encoder Incremental encoder		
With functional safety		Resolver Incremental encoder		
Temperature monitoring		PT1000 temperature sensor TCO thermal contact (not for ICN connector and spring-applied brake)		



Information on project planning

Safety instructions

Basic safety instructions

Disregarding the following basic safety instructions and safety information may lead to severe personal injury and damage to property!

- Only use the product as directed.
- Never commission the product in the event of visible damage.
- Never modify the product technically.
- Never commission the product before assembly has been completed.
- Never operate the product without the required covers.
- Connect/disconnect all pluggable connections only in deenergized condition!
- Only remove the product from the installation in the deenergized state.
- The product can – depending on their degree of protection – have live, movable or rotating parts during or after operation. Surfaces can be hot.
- Observe all specifications of the corresponding documentation supplied. This is the condition for safe and trouble-free operation and the achievement of the specified product features.
- The procedural notes and circuit details given in the associated documentation are suggestions and their transferability to the respective application has to be checked. The manufacturer of the product does not take responsibility for the suitability of the process and circuit proposals.
- All work with and on the product may only be carried out by qualified personnel. IEC 60364 and CENELEC HD 384 define the qualifications of these persons:
 - They are familiar with installing, mounting, commissioning, and operating the product.
 - They have the corresponding qualifications for their work.
 - They know and can apply all regulations for the prevention of accidents, directives, and laws applicable at the place of use.

Application as directed

- The product is a professional equipment intended for use by trades, specific professions or industry and not for sale to the general public. IEC 60050 [IEV 161-05-05]
- To prevent personal injury and damage to property, higher-level safety and protection systems must be used!
- All transport locks must be removed.
- Mounted eye bolts on the motor are not suitable for transporting geared motors.
- The product may only be operated under the specified operating conditions and in the specified mounting positions.
- The product may only be operated on the inverter.
- Built-in brakes must not be used as safety brakes.
- The product must not be operated in private areas, in potentially explosive atmospheres and in areas with harmful gases, oils, acids and radiation.



Residual hazards

Even if notes given are taken into consideration and protective measures are implemented, the occurrence of residual risks cannot be fully prevented.

The user must take the residual hazards mentioned into consideration in the risk assessment for his/her machine/system.

If the above is disregarded, this can lead to severe injuries to persons and damage to property!

Product

Observe the warning labels on the product!



Dangerous electrical voltage:

Before working on the product, make sure there is no voltage applied to the power terminals! After mains disconnection, the power terminals will still carry the hazardous electrical voltage for the time given next to the symbol!



Electrostatic sensitive devices:

Before working on the product, the staff must ensure to be free of electrostatic charge!



High leakage current:

Carry out fixed installation and PE connection in compliance with:
EN 61800-5-1 / EN 60204-1



Hot surface:

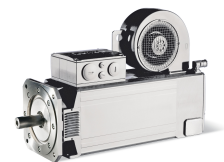
Use personal protective equipment or wait until the device has cooled down!

Protection of persons

- The power terminals may carry voltage in the switched-off state or when the motor is stopped.
 - Before working, check whether all power terminals are deenergized.
- Voltages may occur on the drive components (e.g. capacitive, caused by inverter supply).
 - Careful earthing in the marked positions of the components must be carried out.
- There is a risk of burns from hot surfaces.
 - Provide protection against accidental contact.
 - Use personal protective equipment or wait until the device has cooled down.
 - Prevent contact with flammable substances.
- There is a risk of injury due to rotating parts.
 - Before working on the drive system, ensure that the motor is at a standstill.
- There is a risk of accidental start-up or electric shock.

Motor protection

- Installed temperature sensors are no full protection for the machine.
 - If necessary, limit the maximum current. Parameterize the inverter so that it will be switched off after some seconds of operation with $I > I_{rated}$, especially if there is a risk of blocking.
 - Integrated overload protection does not prevent overloading under all conditions.
- The fuses are no motor protection.
 - Use a current-dependent motor protection switch.
 - Use the built-in temperature sensors.
- Too high torques cause a fraction of the motor shaft.
 - Do not exceed the maximum torques according to the technical data on the nameplate.
- Lateral forces on the motor shaft are possible.
 - Align the shafts of motor and driven machine exactly to each other.



Drive dimensioning

In order to carry out an accurate drive dimensioning process, you can use our configuring software, the »Drive Solution Designer«.

With the »Drive Solution Designer«, you can design the drive both quickly and to a high quality. The software contains profound and proven expertise with regard to drive applications and mechatronic drive components.

Please get in touch with your Lenze representative.

The dimensioning is suitable for:

- kinematic profiles
- operating modes S1, S2, S3, S6 [66](#)
- simple linear speed profiles, not for S-curves or similar

The following 3 elements are taken into consideration in the dimensioning process:

Drive function

On the basis of the values required for the process that are specified, a drive is selected, for which all operating points are within the speed-torque characteristic curve of the motor.

As a result, a motor with a suitable speed and an inverter with a sufficient maximum current are selected. Further limits (maximum speed, installation height...) are specified in tables.

Mechanical strength

On the basis of the occurring forces and torques, a drive is selected that has a sufficient mechanical strength (endurance strength for the periodically occurring torques and fatigue strength for the sporadically occurring torques).

Thermal dimensioning

For the inverter, the thermal dimensioning process is carried out on the basis of the continuous inverter current or on the basis of the continuous torque from the motor-inverter combination, which can be reached.

The motor is thermally dimensioned on the basis of the mean speed and the effective torque.

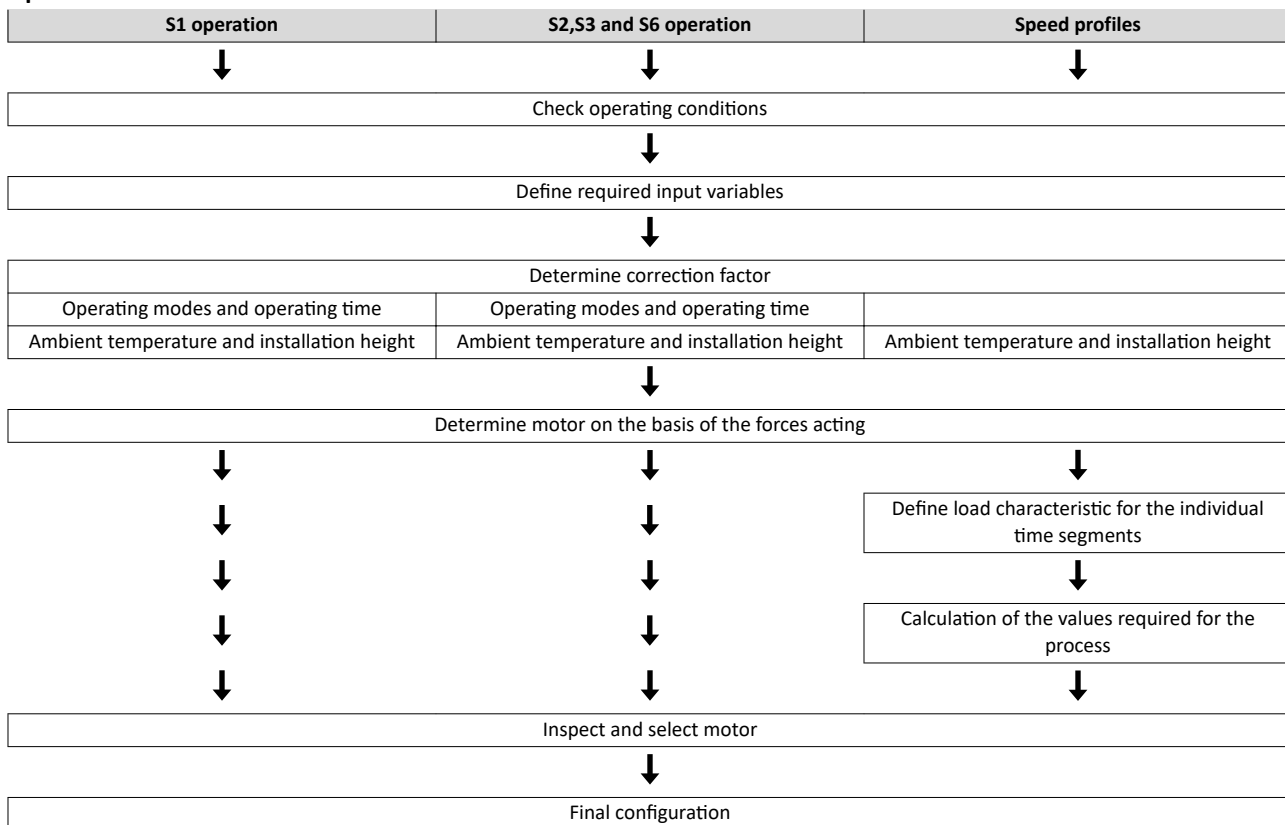
The mean speed of the drive should not exceed the values specified.



If dimensioning processes are complex or reach limit loads, please refer to your Lenze representative.



Operation chart



Check operating conditions

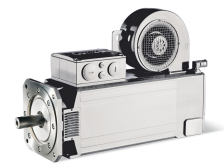
Check
Approvals Conformities Supply voltage Degree of protection Ambient temperature Surface protection

► [Standards and operating conditions](#) 21

► [Surface and corrosion protection](#) 17

Define required input variables

Necessary input variables	Note	Symbol	Unit
Mean speed utilisation	Relating to the load speed n_L		%
Ambient temperature		T_U	°C
Site altitude Amsl		H	m
Radial force		F_{rad}	N
Axial force		F_{ax}	N
Transmission element at the output	Gear wheels, sprockets ...		
Effective diameter of the transmission element		d_w	mm
Load torque	Only with S1, S2, S3, and S6 operating modes	M_L	Nm
Load speed	Only with S1, S2, S3, and S6 operating modes	n_L	rpm
Short-time maximum torque	Emergency off, quick stop, occasional high starting duty	$M_{L,max}$	Nm
Runtime with maximum torque		t_L	%



Determine correction factor

Operating modes S1, S2, S3, S6, and operating time							
Operating mode S1		Operating mode S2		Operating mode S3		Operating mode S6	
ED	k_L	ED	k_L	ED	k_L	ED	k_L
%		min		%		%	
100	1.0	10	1.4 - 1.5	15	1.4 - 1.5	15	1.5 - 1.6
		30	1.15 - 1.2	25	1.3 - 1.4	25	1.4 - 1.5
		60	1.07 - 1.1	40	1.15 - 1.2	40	1.3 - 1.4
		90	1.0 - 1.05	60	1.05 - 1.1	60	1.15 - 1.2

► Operating modes of the motor [66](#)

Ambient temperature and installation height				
Ambient temperature		Installation height amsl		
		≤ 1000 m	≤ 2000 m	≤ 3000 m
		Correction factor		
T_U		k_H	k_H	k_H
≤ 20 °C		1.15	1.06	0.97
30 °C		1.07	0.99	0.90
40 °C		1.00	0.92	0.83
50 °C		0.92	0.85	0.76
60 °C		0.83	0.77	0.70

Determine product on the basis of the forces

Transmission element			Gear wheels	Sprockets	Toothed belt pulleys (depending on the preloading)	Narrow V-belt (depending on the preloading)
Additional radial force factor	f_z		≥ 17 teeth = 1.0	≥ 20 teeth = 1.0	With belt tightener= 2.0 - 2.5	1.5 - 2.0
			< 17 teeth = 1.15	< 20 teeth = 1.25	Without belt tightener= 2.5 - 3.0	
				< 13 teeth = 1.4		
			Calculation		Check	
Radial force	F_{rad}	N	$F_{rad} = 2000 \times \frac{M_{L,max} \times f_z}{dw}$		$F_{rad} \leq F_{rad,max}$	
Axial force	F_{ax}	N			$F_{ax} \leq F_{ax,max}$	

dw Effective diameter of transmission element

► Radial forces and axial forces [23](#)

Operating mode S1

Check and select servo motor/inverter combination			
	Check	Selection	Unit
Output torque	$M_{rated} \geq M_L / (k_L \times k_H)$	M_{rated}	Nm
Output speed	$n_{rated} \geq n_L$	n_{rated}	rpm

► Rated data [25](#)



Operating modes S2, S3, and S6

Check and select servo motor/inverter combination			
	Check	Selection	Unit
Output torque	$M_{rated} \geq M_L / (k_L \times k_H)$	M_{rated}	Nm
Output speed (recommendation)	$n_{rated} \geq n_L$	n_{rated}	rpm
Max. output torque.	$M_{max} \geq M_L$	M_{max}	Nm
Max. output speed	$n_{max} \geq n_L$	n_{max}	rpm
All operating points (●)		n_L	
below the maximum torque characteristic of the servo motor/inverter combination here, $M_{L,max}$ must be considered		M_L	
Thermally effective operating point (○)		n_L	
below the S1 torque characteristic of the servo motor		$M_L / (k_L \times k_H)$	

► [Rated data](#) 25

► [Torque characteristics](#) 32

Speed profiles

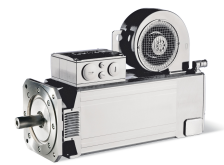
Temporal load characteristic for the individual time segments z							
Total time	Individual time segments	Load speed	Load speed variation	Steady-state load torque	Torque	Acceleration torque	Moment of inertia
t	Δt_z	$n_{L,z}$	$\Delta n_{L,z}$	$M_{L,z}$	M_z	$M_{s,z}$	J_L
s	s	rpm	rpm	Nm	Nm	Nm	kgcm ²

	Calculation	Symbol	Unit
Load cycle duration	$T = \sum \Delta t_z$	T	s

Calculation of the values required for the process			
	Calculation	Symbol	Unit
Torque per time segment	$M_z = M_{L,z} + J_L \frac{2\pi \times \Delta n_{L,z}}{60 \times \Delta t_z}$	M_z	Nm
Maximum torque of the profile	$M_{p,max} = \max(M_z)$	$M_{p,max}$	Nm
Effective torque	$M_{eff} = \sqrt{\frac{1}{T} \sum_z M_z^2 \times \Delta t_z}, T \leq 1 \text{ min}$	M_{eff}	Nm
Mean speed	$n_m = \overline{n_{L,z}} = \frac{1}{T} \sum_z n_{L,z} \times \Delta t_z$	n_m	rpm
Maximum load speed	$n_{L,max} = \max(n_{L,z})$	$n_{L,max}$	rpm

Information on project planning

Drive dimensioning



Check and select servo motor/inverter combination			
	Check	Preselection	Unit
Output torque	$M_{\text{rated}} > M_{\text{eff}} / k_H$	M_{rated}	Nm
Output speed	$n_{\text{rated}} \geq n_m$	n_{rated}	rpm
Load-matching factor			
for an optimum dynamic performance/ control properties	Requirement $k_j = 0.5 \dots 10$ Optimum $k_j = 1$	$k_j = J_L / (J_M + J_B)$	
Checking the motor torques			
Acceleration torque	$M_{S,z} = M_z + (J_M + J_B) \times \frac{2\pi \times \Delta n_{L,z}}{60 \times \Delta t_z}$	$M_{S,z}$	Nm
Effective torque	$M_{S,\text{eff}} = \sqrt{\frac{1}{T} \sum_z M_{S,z}^2 \times \Delta t_z}$	$M_{S,\text{eff}}$	
All operating points (●)		$n_{L,z}$	
below the maximum torque characteristic of the servo motor/ inverter combination here, $M_{L,\text{max}}$ must be considered		$M_{S,z}$	
Thermally effective operating point (○)		n_m	
below the S1 torque characteristic of the servo motor		$M_{S,\text{eff}} / k_H$	

► [Rated data](#) 25

► [Torque characteristics](#) 32



Final configuration

	Check
Connection dimensions	Output shaft Output flange
Product extensions	Motor connection (connector/terminal box) Brake Feedback Blower

More information about the final configuration:

► [The modular system](#) 9

► [Product extensions](#) 48

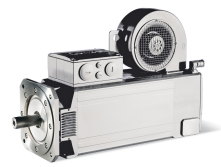
Surface and corrosion protection

Depending on the ambient conditions, the surface and corrosion protection system (called OKS) offers solutions for optimum protection.

Various surface coatings ensure that the motors operate reliably at high air humidity, in outdoor installation or in the presence of atmospheric impurities. Any color from the "RAL Classic" collection can be chosen for the top coat.

Surface and corrosion protection	Applications	Type
OKS-G (primed)	Dependent on subsequent top coat applied	Standard
OKS-S (small)	- Standard applications - Internal installation in heated buildings - Air humidity up to 90 %	Optional
OKS-M (medium)	- Internal installation in non-heated buildings - Covered, protected external installation - Air humidity up to 95 %	
OKS-L (large)	- External installation - Air humidity above 95 % - Chemical industrial plants - Food industry	

Surface and corrosion protection	Corrosivity category	Surface coating	Colour	Coating thickness
	DIN EN ISO 12944-2	Design		
OKS-G (primed)		2K PUR priming coat	RAL 9005 matt jet black	60 ... 90 µm
OKS-S (small)	Comparable to C1	2K-PUR top coat	According to RAL Classic	80 ... 120 µm
OKS-M (medium)	Comparable to C2	2K PUR priming coat		110 ... 160 µm
OKS-L (large)	Comparable to C3	2K-PUR top coat		140 ... 200 µm



Mechanical installation

Important notes

- Install the product according to the information in the chapter "Standards and operating conditions".
 - ▶ [Standards and operating conditions](#)  21
- The technical data and the data regarding the supply conditions can be found on the nameplate and in this documentation.
- Ambient media – especially chemically aggressive ones – may damage shaft sealing rings, lacquers and plastics.
- Lenze offers special surface and corrosion protection in this case.

NOTICE

Bearing damage caused by unbalance!

Shafts with keyway are balanced with a half featherkey!

▶ Balance transmission elements with a half featherkey!

Transport

- Ensure appropriate handling.
- Make sure that all component parts are securely mounted. Secure or remove loose component parts.
- Only use safely fixed transport aids (e.g., eye bolts or support plates).
- Do not damage any components during transport.
- Avoid electrostatic discharges on electronic components and contacts.
- Avoid impacts.
- Check the carrying capacity of the hoists and load handling devices. The weights can be found in the shipping documents.
- Secure the load against tipping and falling down.
- Standing beneath suspended loads is prohibited.

Installation

- The mounting surfaces must be plane, torsionally rigid and free from vibrations.
- The mounting areas must be suited to absorb the forces and torques generated during operation.
- Ensure an unhindered ventilation.
- For versions with a fan, keep a minimum distance of 10 % from the outside diameter of the fan cover in intake direction.



Electrical installation

Important notes

DANGER!

Risk of injury and risk of burns from dangerous voltage

Power terminals may also carry voltage in the switched-off state or when the motor is stopped and may cause life-threatening cardiac arrhythmia and serious burns.

- ▶ Disconnect the product from the mains.
- ▶ Check that the power terminals are deenergized before starting work.

- When working on energized products, comply with the applicable national accident prevention regulations.
- The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection).
- The manufacturer of the system or machine is responsible for adherence to the limits required in connection with EMC legislation.

Operation on an external inverter

A max. pulse voltage amplitude of $U_{pk} = 1560 \text{ V}$ at the motor terminals must not be exceeded. Here, the minimum pulse rise time must be $t_R = 0.1 \text{ } \mu\text{s}$.

If it cannot be ruled out that the permissible voltage peaks will be exceeded or that the minimum pulse rise time will not be reached, the following measures must be initiated:

- Reduction of the DC-bus voltage (threshold for brake chopper voltage)
- Use of filters, chokes
- Use of special motor cables

Preparation



The notes for the electrical connection can be found in the enclosed mounting instructions.

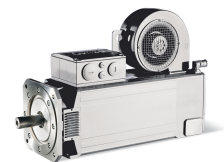
EMC-compliant wiring



The EMC-compliant wiring is described in detail in the documentation of the Lenze inverters.

Technical data

Notes regarding the given data



Technical data

Notes regarding the given data

The power values, torques and speeds specified in the configuration are rounded values and apply to:

- ambient temperature $T_U = 40\text{ °C}$ for motors (in compliance with EN 60034)
- Site altitude $\leq 1000\text{ m}$ above mean sea level

The selection tables specify the inverter/ motor combination with the achievable torques.

The rated data applies to the S1 operating mode S1 (in accordance with EN 60034-1) and the operation on a servo inverter with a switching frequency of at least 4 kHz.

NOTICE

In case of other operating conditions, the achievable values can differ for those mentioned.

► In case of extreme operating conditions, please get in touch with your Lenze representative.



Standards and operating conditions

Conformities and approvals

More information and certificates of approval can be found under

[MQA asynchronous servo motors \(Lenze.com\)](https://www.lenze.com)

Europe					
Country	Conformity/ approval	Law/standard	Description	Special feature	Product representation
European Union	CE	2006/42/EC	Machinery Directive	Only for safety-relevant components	CE mark
		2014/35/EU	Low-Voltage Directive		
		2014/30/EU	EMC Directive		
		2011/65/EU	RoHS		
				-	
Great Britain	UKCA	S.I. 2008/1597	The Supply of Machinery (Safety) Regulations 2008	Only for safety-relevant components	UKCA mark
		S.I. 2016/1091	The Electromagnetic Compatibility Regulations 2016	-	
		S.I. 2016/1101	The Electrical Equipment (Safety) Regulations 2016		
		S.I. 2012/3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012		

America					
Country	Conformity/ approval	Law/standard	Description	Special feature	Product representation
Canada	CSA	CSA 22.1 No. 100	CSA Standard for Motors and Generators	-	cURus mark
USA	UL	UL 1004-1	UL Standard for Rotating Electrical Machines		

Asia					
Country	Conformity/ approval	Law/standard	Description	Special feature	Product representation
China	-	GB/T 26572	Requirements on concentration limits for certain restricted substances in electrical and electronic products	-	EFUP mark

Protection of persons and device protection

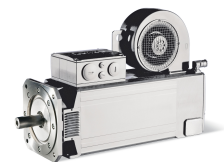
Degree of protection			
-	EN IEC 60529, EN IEC 60034-5	IP23S	
Temperature class			
-	EN IEC 60034-1	F (155 °C)	Insulation system
Permissible voltage			
-	IEC 60034-18-41	IVIC C	At 500 V
	IEC/TS 60034-25:2007	Limit curve A	Of the pulse voltage

EMC data

Noise emission		
-	EN IEC 60034-1	A final overall assessment of the drive system is indispensable
Noise immunity		
-	EN IEC 60034-1	A final overall assessment of the drive system is indispensable

Technical data

Standards and operating conditions
Environmental conditions



Environmental conditions

Climate			
Storage	EN 60721-3-1:1997	1K3 (-20 ... +40 °C)	>3 months
		1K3 (-20 ... +60 °C)	<3 months
Transport	EN 60721-3-2:1997	2K3 (-20 ... +70 °C)	
Operation	EN 60721-3-3:1995 + A2:1997	3K3 (-10 ... +40 °C)	Operation with brake
		3K3 (-15 ...+40 °C)	Operation, without brake
Site altitude			
0 ... 1000 m amsl	-	Without current derating	
1000 ... 4000 m amsl		Reduce the power by 5 %/1000 m	
Air humidity			
-	-	Average relative humidity 85 %	Without condensation
Vibration resistance			
Operation	EN 60721-3-3:1995 + A2:1997	3M6	
Vibration severity			
-	EN IEC 60034-14	A	
Vibration velocity			
Free suspension	-	1.6 mm/s	
Radial runout, axial runout, concentricity			
-	EN 50347 / IEC 60072-1	Normal Class	

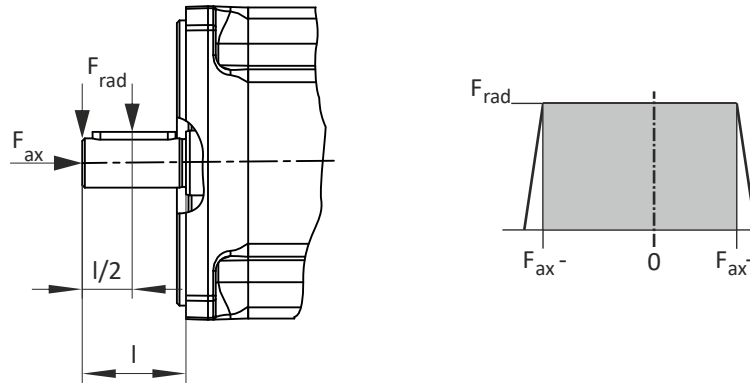


Radial forces and axial forces



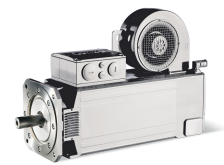
The values of the bearing service life L_{10h} refer to an average motor speed of 3000 rpm. Depending on the ambient temperatures, they are also limited by the grease lifetime.

Application of forces



Application of force at $l/2$

Motor			MQA 20	MQA 22	MQA 26
Bearing service life 5000					
Radial force	F_{rad}	rated	3400	3600	6950
Min. axial force	$F_{ax,-}$	rated	-1330	-2370	-2500
Max. axial force	$F_{Fax,+}$	rated	690	1700	1580
Bearing service life 10000					
Radial force	F_{rad}	rated	2500	2800	5400
Min. axial force	$F_{ax,-}$	rated	-1020	-1740	-1800
Max. axial force	$F_{Fax,+}$	rated	380	1090	880
Bearing service life 20000					
Radial force	F_{rad}	rated	1950	2200	4300
Min. axial force	$F_{ax,-}$	rated	-780	-1280	-1300
Max. axial force	$F_{Fax,+}$	rated	140	640	380
Bearing service life 30000					
Radial force	F_{rad}	rated	1700	1900	3700
Min. axial force	$F_{ax,-}$	rated	-690	-1080	-1090
Max. axial force	$F_{Fax,+}$	rated	40	440	160
Bearing service life 50000					
Radial force	F_{rad}	rated	-	1600	-
Min. axial force	$F_{ax,-}$	rated	-	-880	-
Max. axial force	$F_{Fax,+}$	rated	-	240	-



Application of force at I

Motor			MQA 20	MQA 22	MQA 26
Bearing service life 5000					
Radial force	F_{rad}	rated	3150	3500	6400
Min. axial force	$F_{ax,-}$	rated	-1170	-2240	-2080
Max. axial force	$F_{Fax,+}$	rated	530	1600	1150
Bearing service life 10000					
Radial force	F_{rad}	rated	2300	2600	5000
Min. axial force	$F_{ax,-}$	rated	-920	-1640	-1600
Max. axial force	$F_{Fax,+}$	rated	280	1100	680
Bearing service life 20000					
Radial force	F_{rad}	rated	1800	2050	4000
Min. axial force	$F_{ax,-}$	rated	-710	-1200	-1160
Max. axial force	$F_{Fax,+}$	rated	70	560	230
Bearing service life 30000					
Radial force	F_{rad}	rated	1400	1800	3400
Min. axial force	$F_{ax,-}$	rated	-650	-1020	-1090
Max. axial force	$F_{Fax,+}$	rated	0	380	50
Bearing service life 50000					
Radial force	F_{rad}	rated	-	1450	-
Min. axial force	$F_{ax,-}$	rated	-	-850	-
Max. axial force	$F_{Fax,+}$	rated	-	200	-



Technical data

Rated data

Inverter mains connection 400 V, Forced ventilated motors

Rated data

Inverter mains connection 400 V, Forced ventilated motors

Motor			MQA 20L29H	MQA 20L14H	MQA 22P29H	MQA 22P17H	MQA 22P14H	MQA 22P08H
Degree of protection			IP23	IP23	IP23	IP23	IP23	IP23
Standstill torque	M_0	Nm	76.0	76.0	156	156	156	156
Rated torque	M_{rated}	Nm	66.2	71.3	125	130	135	145
Max. torque	M_{max}	Nm	250	250	500	500	500	500
Rated speed	n_{rated}	rpm	2930	1420	2935	1670	1425	760
Max. speed	n_{max}	rpm	6500	6500	6500	6500	6500	6500
Rated power	P_{rated}	kW	20.3	10.6	38.4	22.7	20.1	11.5
Standstill current	I_0	A	54.0	27.0	102	59.0	51.0	29.5
Rated current	I_{rated}	A	46.9	26.5	86.0	50.3	45.6	27.6
Max. current	I_{max}	A	188	106	344	201	182	110
Rated voltage	V_{rated}	V	360	360	360	360	360	360
Rated frequency	f_{rated}	Hz	100	50	100	58	50	28
Moment of inertia	J	kgcm ²	171	171	487	487	487	487
Efficiency	η		0.900	0.800	0.900	0.880	0.860	0.770
Stator terminal resistance	$R_{UV\ 20}$ °C	Ω	0.183	0.731	0.089	0.268	0.357	1.072
Stator terminal resistance	$R_{UV\ 150}$ °C	Ω	0.276	1.102	0.134	0.404	0.538	1.616
Mutual inductance	L_H	mH	13.68	57	23.2	23.86	93.3	92.8
Stator leakage inductance	$L_{1\sigma}$	mH	0.493	1.979	0.892	0.895	3.568	3.53
Rotor leakage inductance	$L_{2\sigma}$	mH	0.524	2.103	1.203	1.206	4.813	4.762
Stator resistance	$R_{1,\ 20}$	Ω	0.0915	0.365	0.134	0.134	0.536	0.536
Rotor resistance	$R_{2,\ 20}$	Ω	0.09	0.361	0.12	0.12	0.477	0.477
Weight	m	kg	63.0	63.0	102	102	102	102

Technical data

Rated data

Inverter mains connection 400 V, Forced ventilated motors



Motor			MQA 26T22H	MQA 26T12H	MQA 26T10H	MQA 26T05H
Degree of protection			IP23	IP23	IP23	IP23
Standstill torque	M_0	Nm	325	325	325	325
Rated torque	M_{rated}	Nm	257	282	288	296
Max. torque	M_{max}	Nm	1100	1100	1100	1100
Rated speed	n_{rated}	rpm	2235	1200	1030	550
Max. speed	n_{max}	rpm	5500	5500	5500	5500
Rated power	P_{rated}	kW	60.2	35.4	31.1	17
Standstill current	I_0	A	171	109	85.5	48.5
Rated current	I_{rated}	A	138	88.8	76.2	44.5
Max. current	I_{max}	A	552	355	305	178
Rated voltage	V_{rated}	V	340	360	360	360
Rated frequency	f_{rated}	Hz	76	42	36	20
Moment of inertia	J	kgcm ²	1340	1340	1340	1340
Efficiency	η		0.920	0.820	0.870	0.810
Stator terminal resistance	$R_{UV\ 20}$ °C	Ω	0.05	0.15	0.196	0.589
Stator terminal resistance	$R_{UV\ 150}$ °C	Ω	0.075	0.226	0.295	0.888
Mutual inductance	L_H	mH	18.38	16.8	69.23	69.96
Stator leakage inductance	$L_{1\sigma}$	mH	0.78	0.65	2.91	2.873
Rotor leakage inductance	$L_{2\sigma}$	mH	1.3	0.69	5.09	5.049
Stator resistance	$R_{1,\ 20}$	Ω	0.075	0.075	0.294	0.294
Rotor resistance	$R_{2',\ 20}$	Ω	0.0621	0.1	0.25	0.25
Weight	m	kg	193	193	193	193



Selection tables

Notes on the selection tables

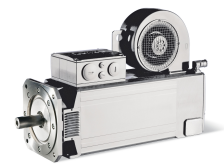
The selection tables represent the combinations of servo motors and servo inverters. The serve as a rough overview.

In the case of the servo inverters, the overload capacity depending on the switching frequency in the default setting is taken into consideration. For more information, please refer to the inverter documentation.

Graphical representation of the operating points		Explanation	Notes
	M_0	Standstill torque	
	$M_{0,max}$	Max. standstill torque	With an active load observe (e. g. vertical drive axes, hoists, test benches, unwinders).
	M_{rated}	Rated torque	
	n_{rated}	Rated speed	
	M_{max}	Max. torque	Can usually be used with a passive load (e. g. horizontal drive axes).
	n_{eto}	Transition speed	
	n_k	Derating speed	Due to a derating of the inverter output current to the derating speed, for some inverters the achievable max. standstill torque is smaller than the max. speed when the value of 5 Hz is not reached.

Derating speed

Motor	Derating speed
	n_k
	rpm
MQA20	150
MQA22	
MQA26	



i950 cabinet servo inverter



The following data apply to a mains voltage 3x 400 V and a switching frequency 8 kHz of the inverter.

When operating the motors with a lower switching frequency, please contact your responsible Lenze representative!

When operating the motor at 4 kHz, it only produces 95 % of its rated torque at increased noise emission.

MQA20 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 20L14H	I95AE311F	64.2	61.6	134	134
	I95AE315F	76.0	71.3	185	185
	I95AE322F			274	274
	I95AE330F			309	309
MQA 20L29H	I95AE322F	63.8	66.2	147	147
	I95AE330F	76.0		194	194
	I95AE345F			285	285
	I95AE355F			301	301

MQA22 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 22P08H	I95AE311F	118	119	263	263
	I95AE315F	156	145	363	363
	I95AE322F			537	537
	I95AE330F			630	630
MQA 22P14H	I95AE322F	142	135	301	301
	I95AE330F	156		394	394
	I95AE345F			579	579
	I95AE355F			592	592
MQA 22P17H	I95AE322F	118	119	263	263
	I95AE330F	156	130	345	345
	I95AE345F			508	508
	I95AE355F			574	574
MQA 22P29H	I95AE345F	132	125	285	285
	I95AE355F	156		356	356
	I95AE375F			489	489
	I95AE390F			562	562

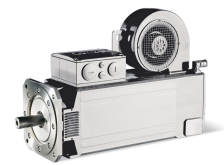


Technical data

Selection tables

MQA26 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 26T05H	I95AE322F	313	296	692	692
	I95AE330F	325		908	908
	I95AE345F			1335	1335
MQA 26T10H	I95AE330F	205	210	502	502
	I95AE345F	325	288	751	751
	I95AE355F			935	935
	I95AE375F			1283	1283
	I95AE390F			1305	1305
MQA 26T12H	I95AE345F	253	282	625	625
	I95AE355F	325		780	780
	I95AE375F			1073	1073
	I95AE390F			1273	1273
MQA 26T22H	I95AE375F	277	257	622	622
	I95AE390F	325		752	752
	I95AE411F			891	891



9400 HighLine servo drives



The data apply to a mains voltage of 3x 400 V and a switching frequency of 8 kHz of the inverter.

If the motors are operated at a lower switching frequency, please get in touch with your Lenze representative!

When operating at 4 kHz, the motor generates just 95 % of its rated torque with increased noise emissions.

MQA20 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M_0	M_{rated}	$M_{0, max}$	M_{max}
		Nm	Nm	Nm	Nm
MQA 20L14H	E94AXXE0174	32.5	32.5	154	154
	E94AXXE0244	66.0	66.0	190	190
MQA 20L29H	E94AXXE0324	28.0	28.0	116	116
	E94AXXE0474	51.6	51.6	148	148
	E94AXXE0594			193	193

MQA22 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 22P08H	E94AXXE0244	116	116	313	313
	E94AXXE0324	156	145	402	402
MQA 22P14H	E94AXXE0594	118	118	372	372
MQA 22P17H		99.0	99.0	325	325
	E94AXXE0864	156	130	463	463
MQA 22P29H	E94AXXE1044	109	109	335	335
	E94BxxE1454	156	125	416	416
	E94BxxE1724			486	486

MQA26 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 26T05H	E94AXXE0474	268	268	665	665
	E94AXXE0594			826	826
	E94AXXE0864	325	296	1100	1100
MQA 26T10H		270	270	713	713
	E94AXXE1044	298	288	855	855
	E94BxxE1454	325		1044	1044
MQA 26T12H	E94AXXE1044	219	219	609	609
	E94BxxE1454	291	282	739	739
	E94BxxE1724	325		840	840
	E94BxxE2024			950	950
MQA 26T22H		242	242	711	711
	E94BxxE2454	290	257	843	843
	E94BxxE2924	325		1001	1001
	E94BxxE3664			1100	1100



8400 TopLine inverter drives



The data apply to a mains voltage of 3x 400 V and a switching frequency of 8 kHz of the inverter.

If the motors are operated at a lower switching frequency, please get in touch with your Lenze representative!

When operating at 4 kHz, the motor generates just 95 % of its rated torque with increased noise emissions.

MQA20 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M_0	M_{rated}	$M_{0, max}$	M_{max}
		Nm	Nm	Nm	Nm
MQA 20L14H	E84AVTCX1534	76.0	71.3	202	202
	E84AVTCX1834			249	249
	E84AVTCX2234			250	250
	E84AVTCX3034				
MQA 20L29H	E84AVTCX2234		66.2	141	141
	E84AVTCX3034			184	184
	E84AVTCX3734			225	226
	E84AVTCX4534			250	250

MQA22 Forced-ventilated

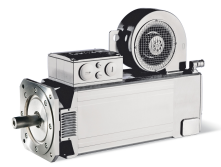
Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M₀	M_{rated}	M_{0, max}	M_{max}
		Nm	Nm	Nm	Nm
MQA 22P14H	E84AVTCX2234	156	135	267	267
	E84AVTCX3034			344	344
	E84AVTCX3734			418	420
	E84AVTCX4534			500	500
MQA 22P17H	E84AVTCX3034		130	300	300
	E84AVTCX3734			365	368
	E84AVTCX4534			447	450
MQA 22P29H				125	263

MQA26 Forced-ventilated

Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M ₀	M _{rated}	M _{0, max}	M _{max}
		Nm	Nm	Nm	Nm
MQA 26T05H	E84AVTCX2234	325	295	567	568
	E84AVTCX3034			744	745
	E84AVTCX3734			902	905
	E84AVTCX4534			1080	1080
MQA 26T10H			288	638	642

Technical data

Torque characteristics



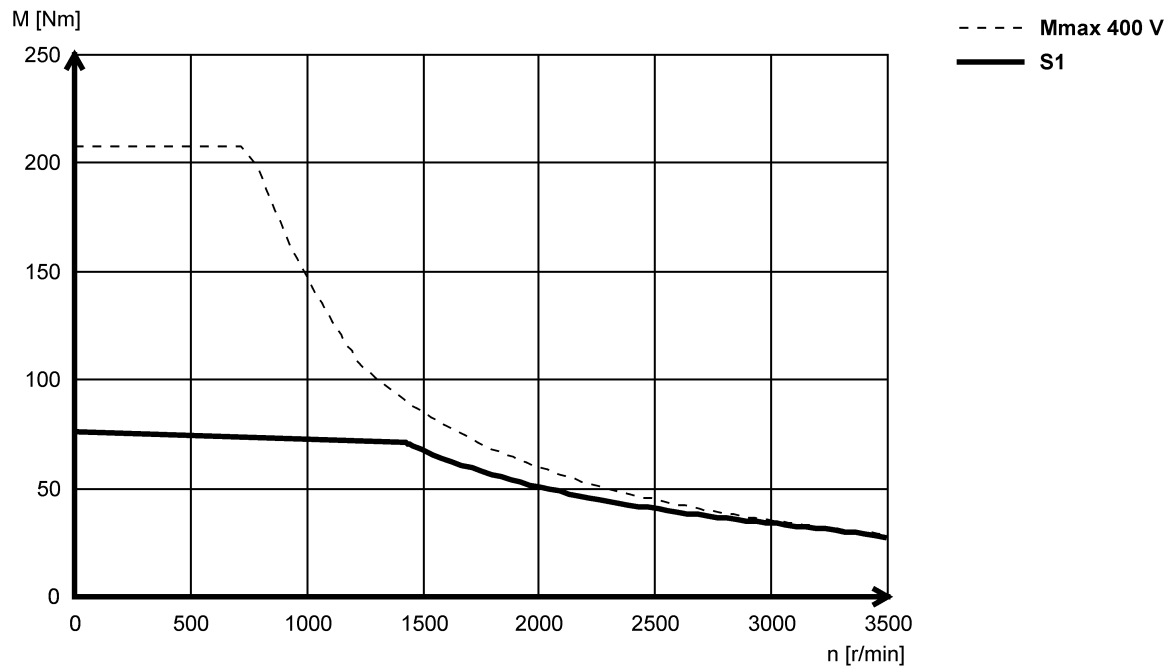
The torque/speed characteristic for your motor/inverter combination can be found on the Internet:

<http://www.lenze.com> → Product Finder → M-n characteristics

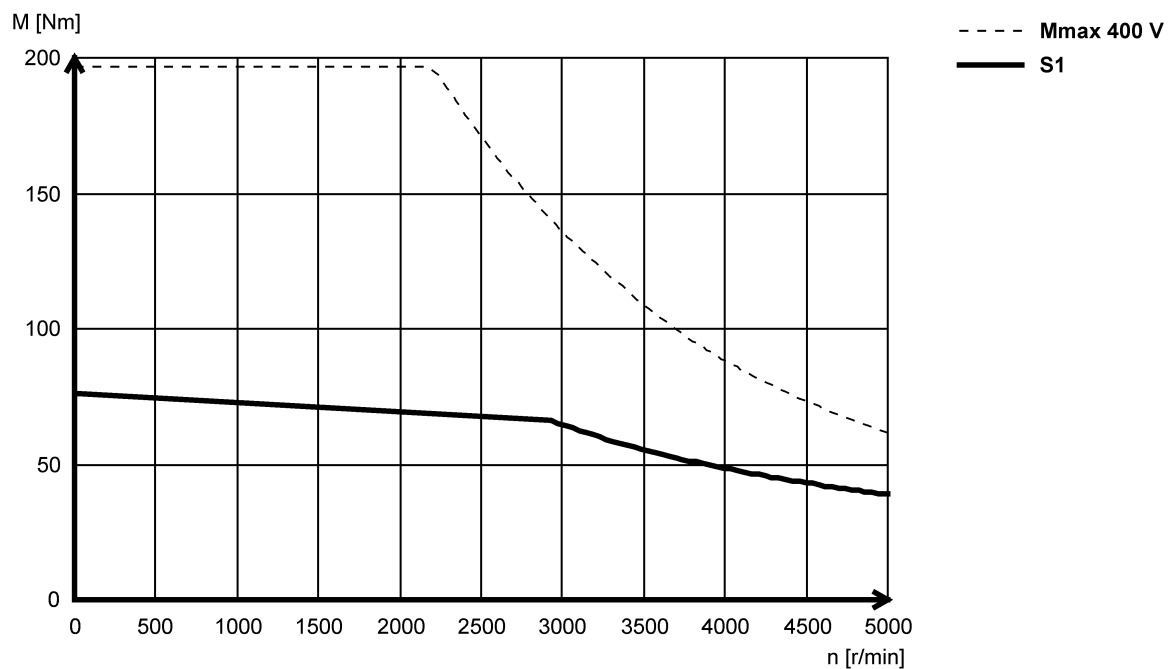


The following data apply to a mains voltage 3 x 400 V of the inverter.

MQA20L14H (forced ventilated)

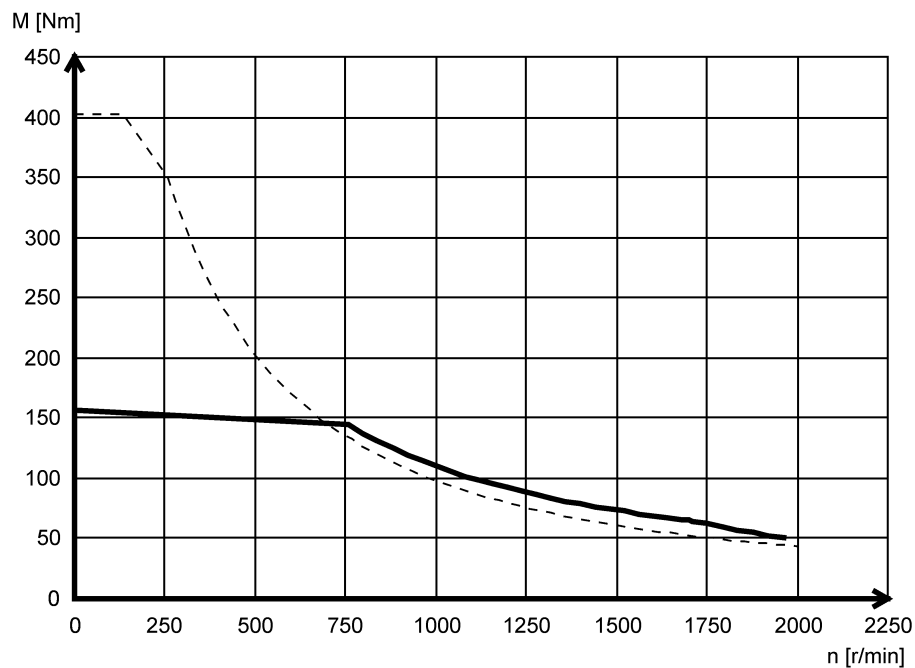


MQA20L29H (forced ventilated)

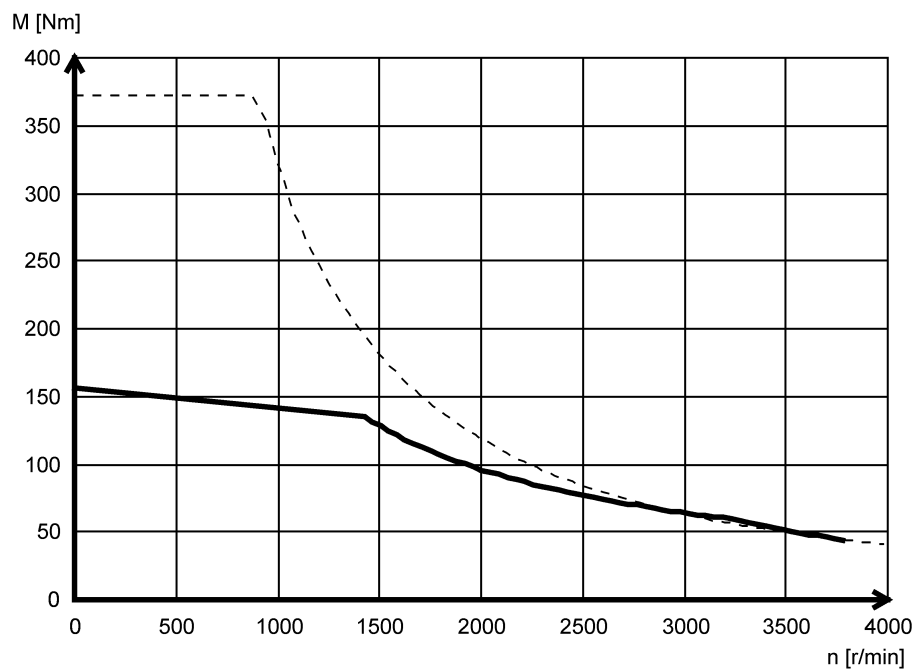




MQA22P08H (forced ventilated)

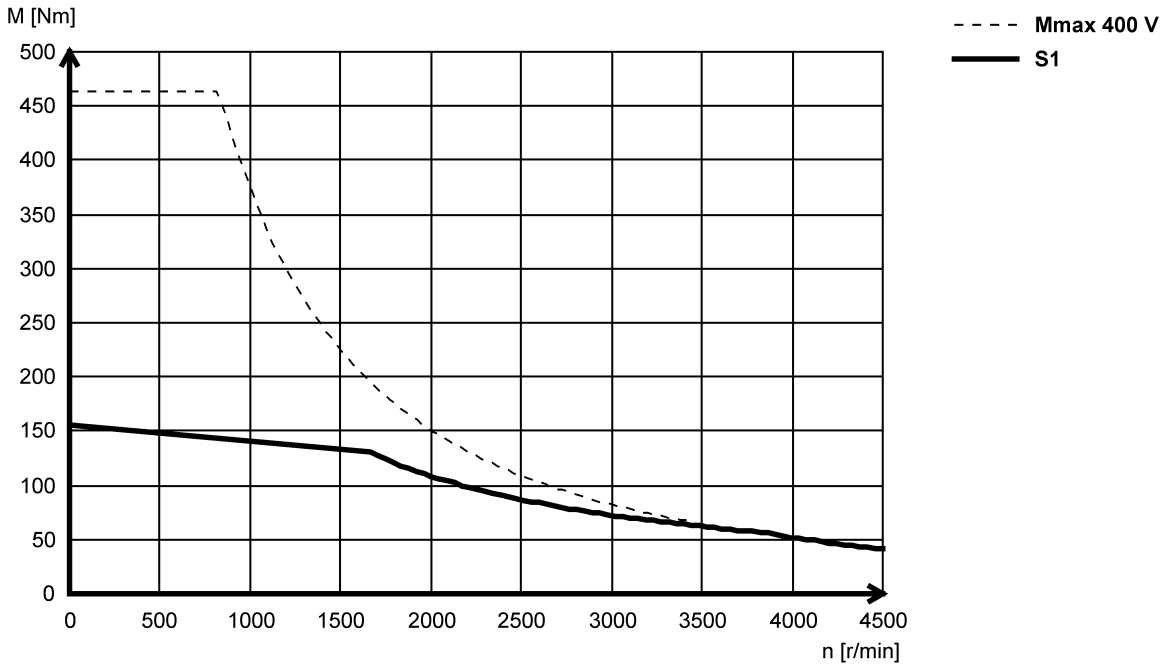


MQA22P14H (forced ventilated)

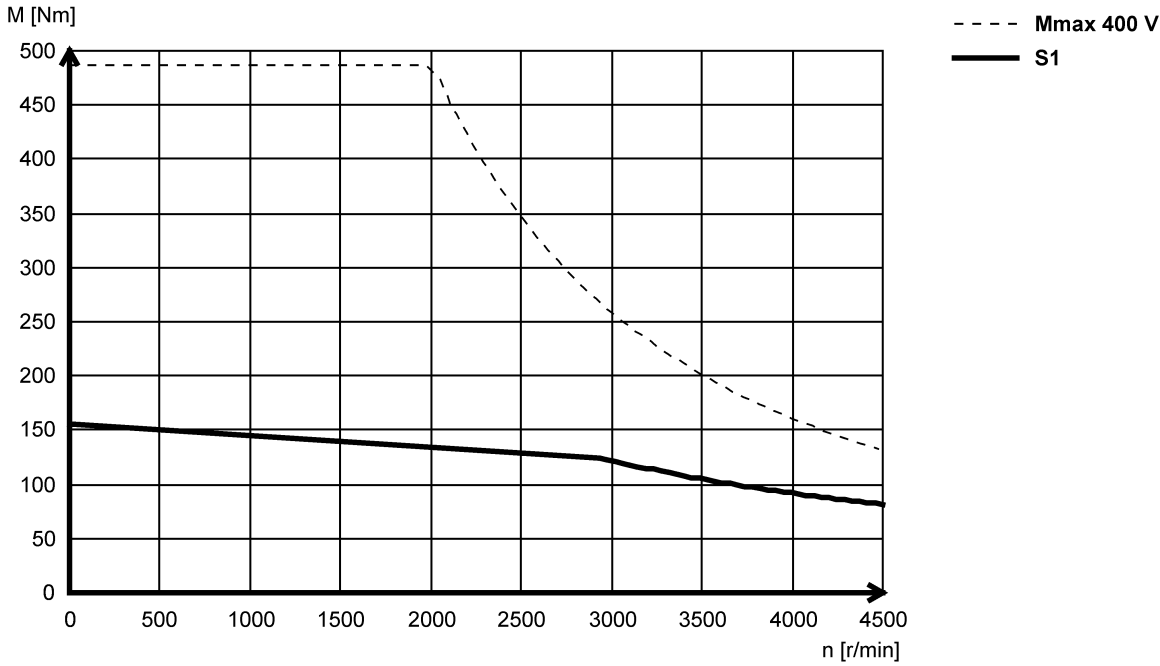




MQA22P17H (forced ventilated)

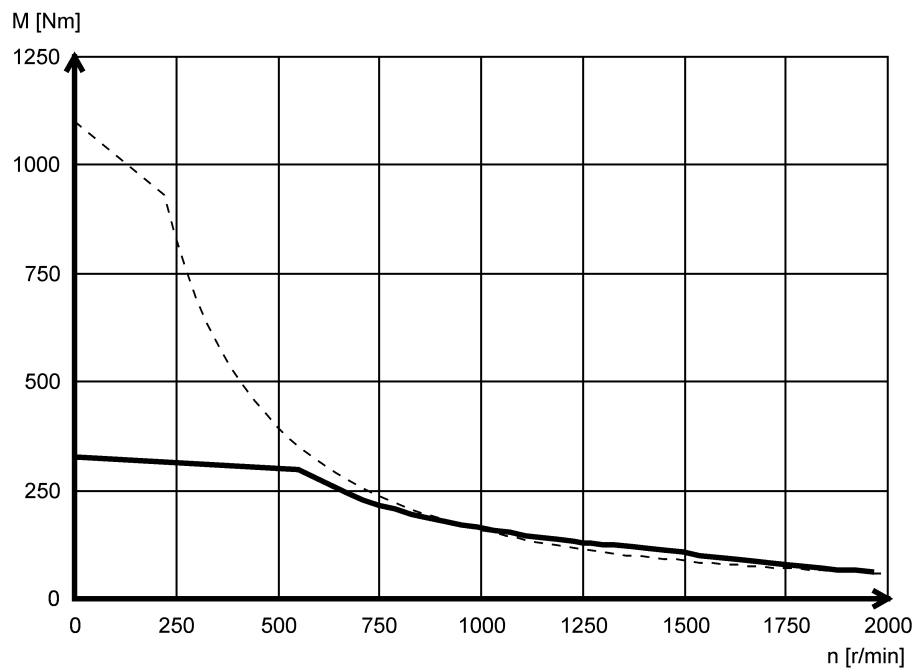


MQA22P29H (forced ventilated)

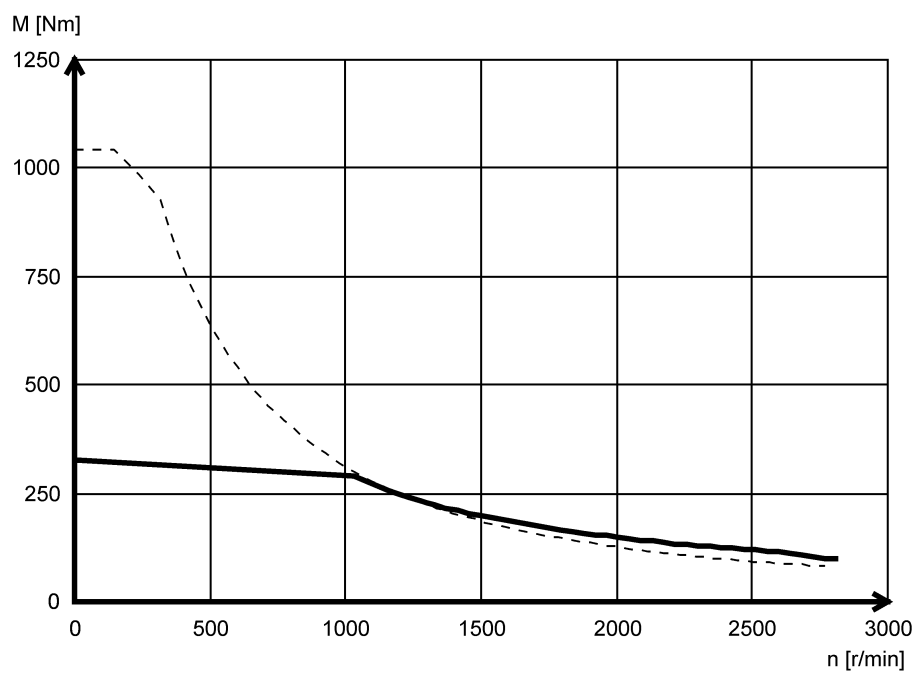




MQA26T05H (forced ventilated)

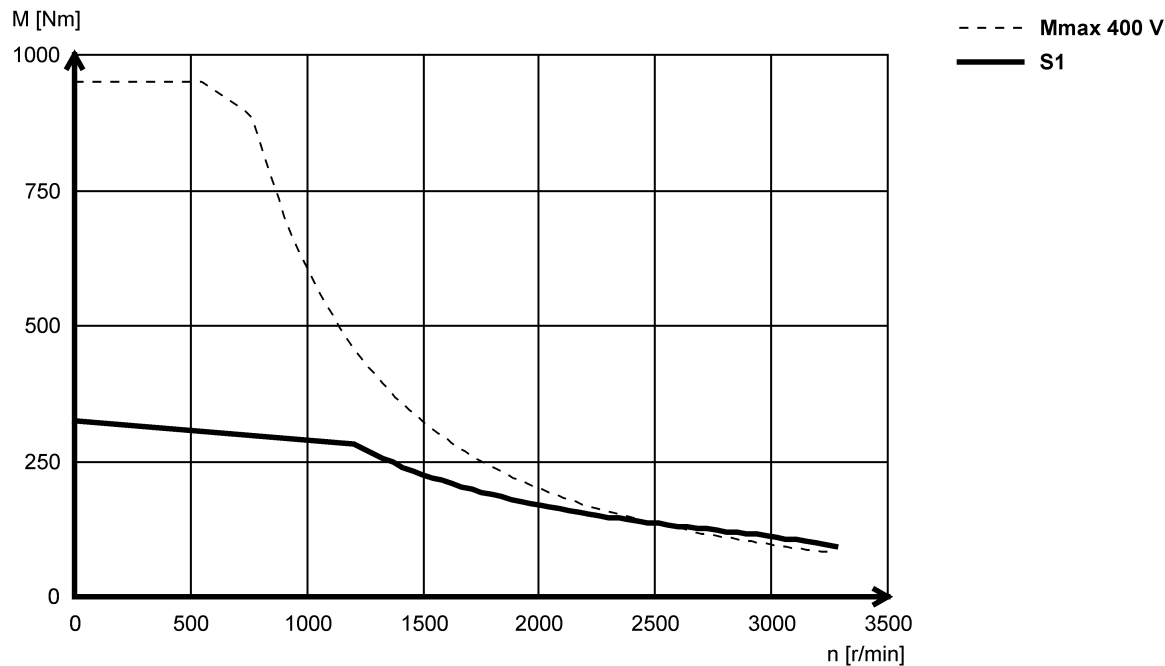


MQA26T10H (forced ventilated)

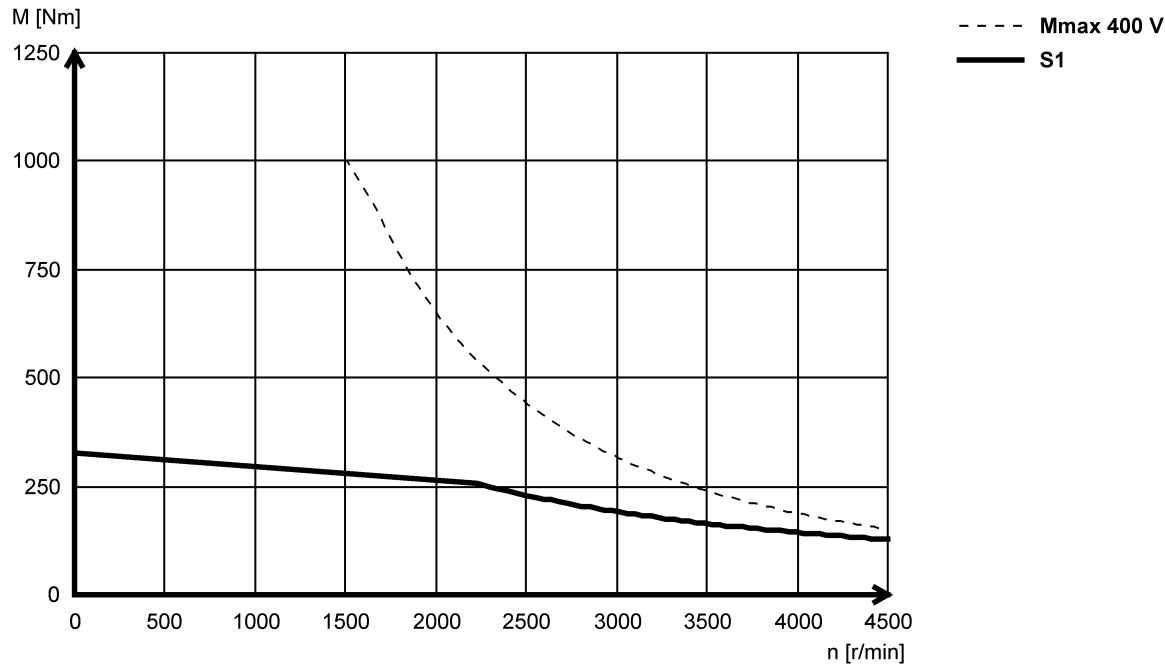




MQA26T12H (forced ventilated)



MQA26T22H (forced ventilated)





Dimensions

Notes on the basic dimensions

Table content	Explanation	
Total length without brake	L	Total length of the drive with resolver
Total length with brake	L	Total length of the drive with resolver
Motor/connection distance	AD	Distance from center of motor to end of connector/terminal box

Technical data

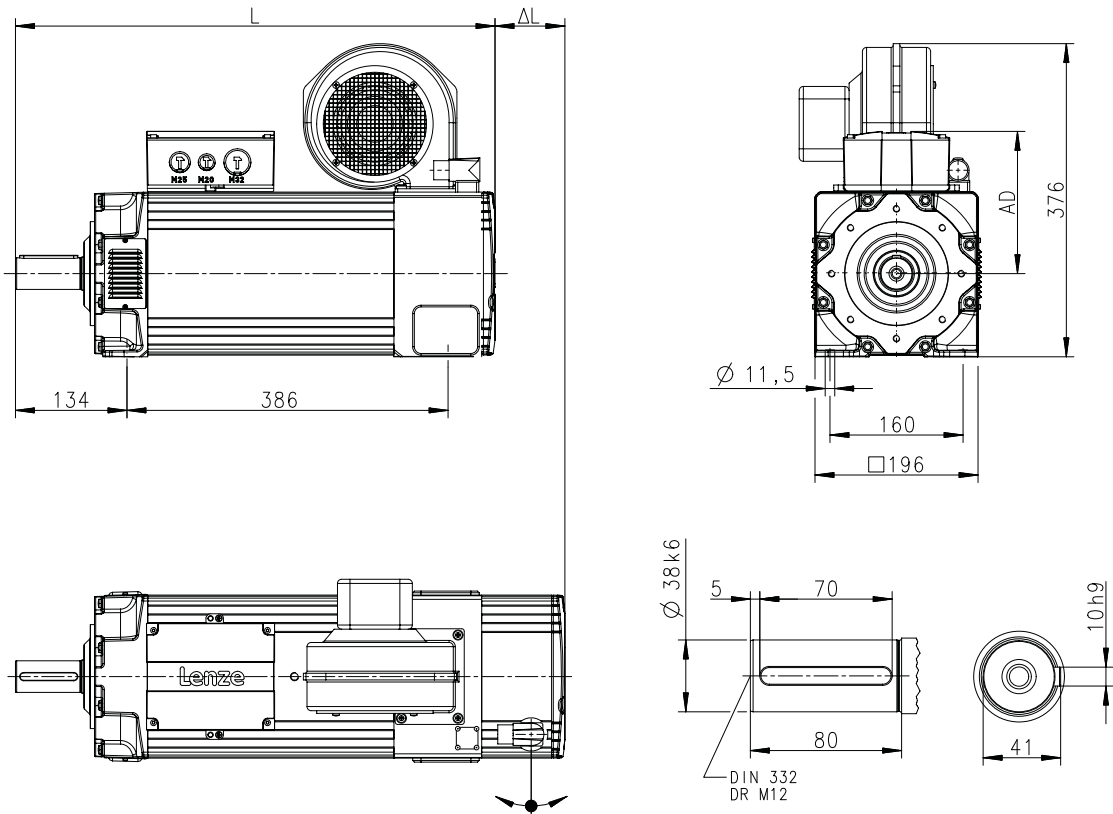
Dimensions
Basic dimensions



Basic dimensions

MQA20, forced ventilated

Design B3



8800714-00

Motor			MQA 20L14H	MQA 20L29H
Total length without brake	L	mm	577	
Motor/connection distance	AD	mm	171	

ΔL ▶ [Additional lengths](#) 46

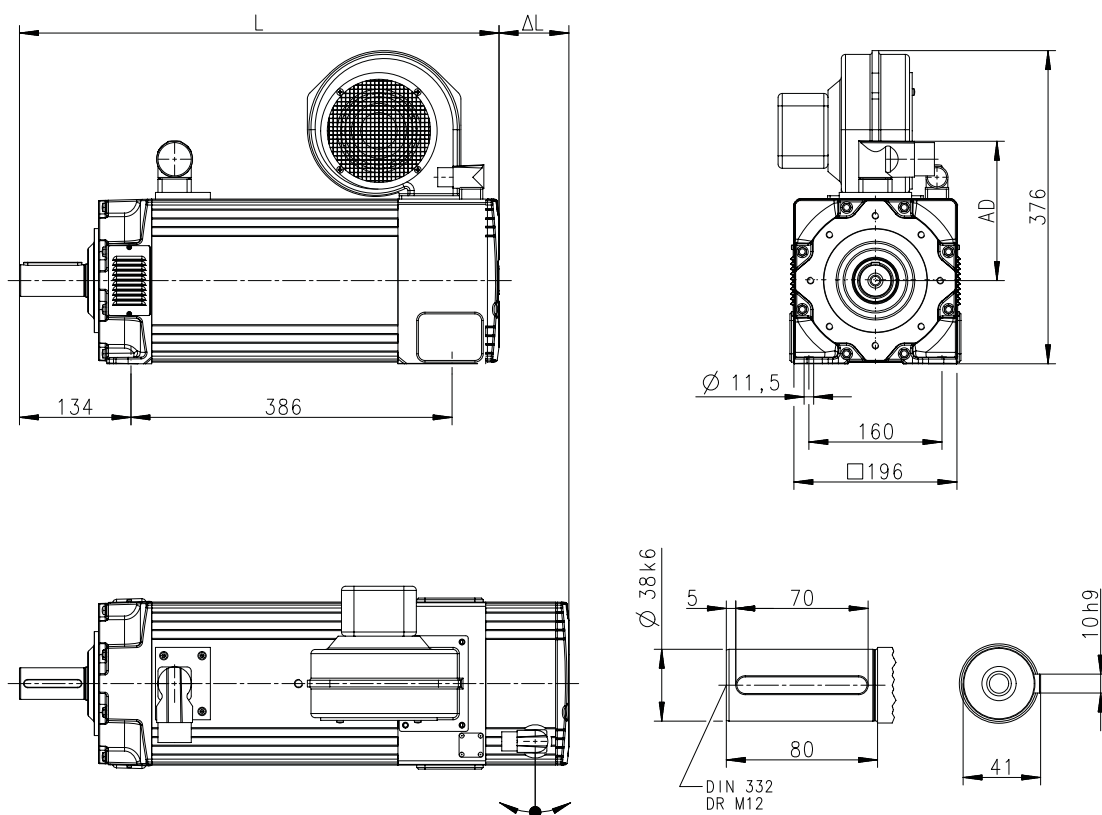


Technical data

Dimensions
Basic dimensions

MQA20, forced ventilated

Design B3



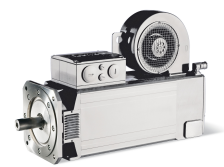
8800712-00

Motor			MQA 20L14H	MQA 20L29H
Total length without brake	L	mm	577	
Motor/connection distance	AD	mm	171	

ΔL ▶ Additional lengths [46](#)

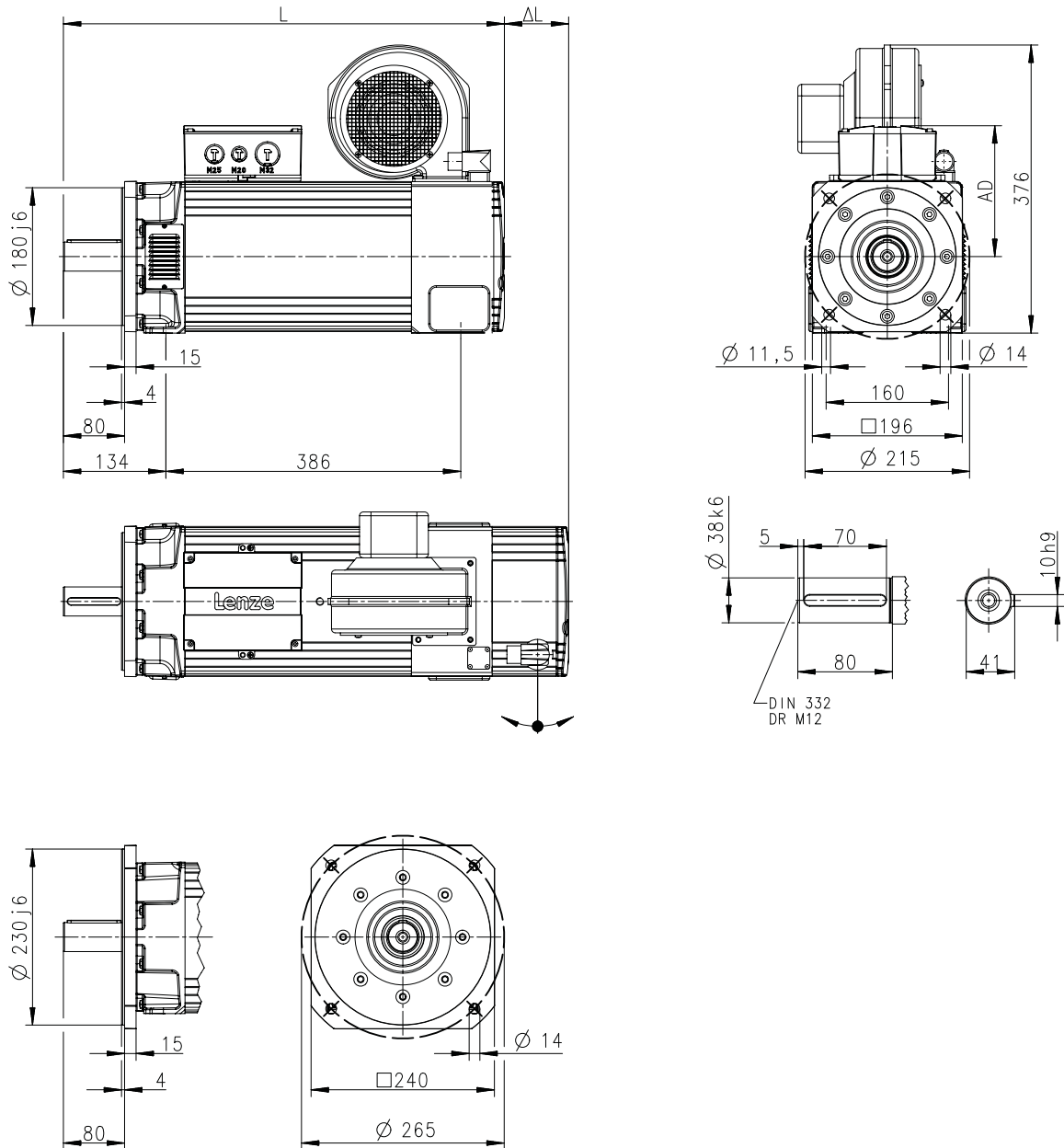
Technical data

Dimensions
Basic dimensions



MQA20, forced ventilated

Design B35-FF215/265



8800669-00

Motor			MQA 20L14H	MQA 20L29H
Total length without brake	L	mm	577	
Motor/connection distance	AD	mm	171	

Δ L ▶ Additional lengths 46

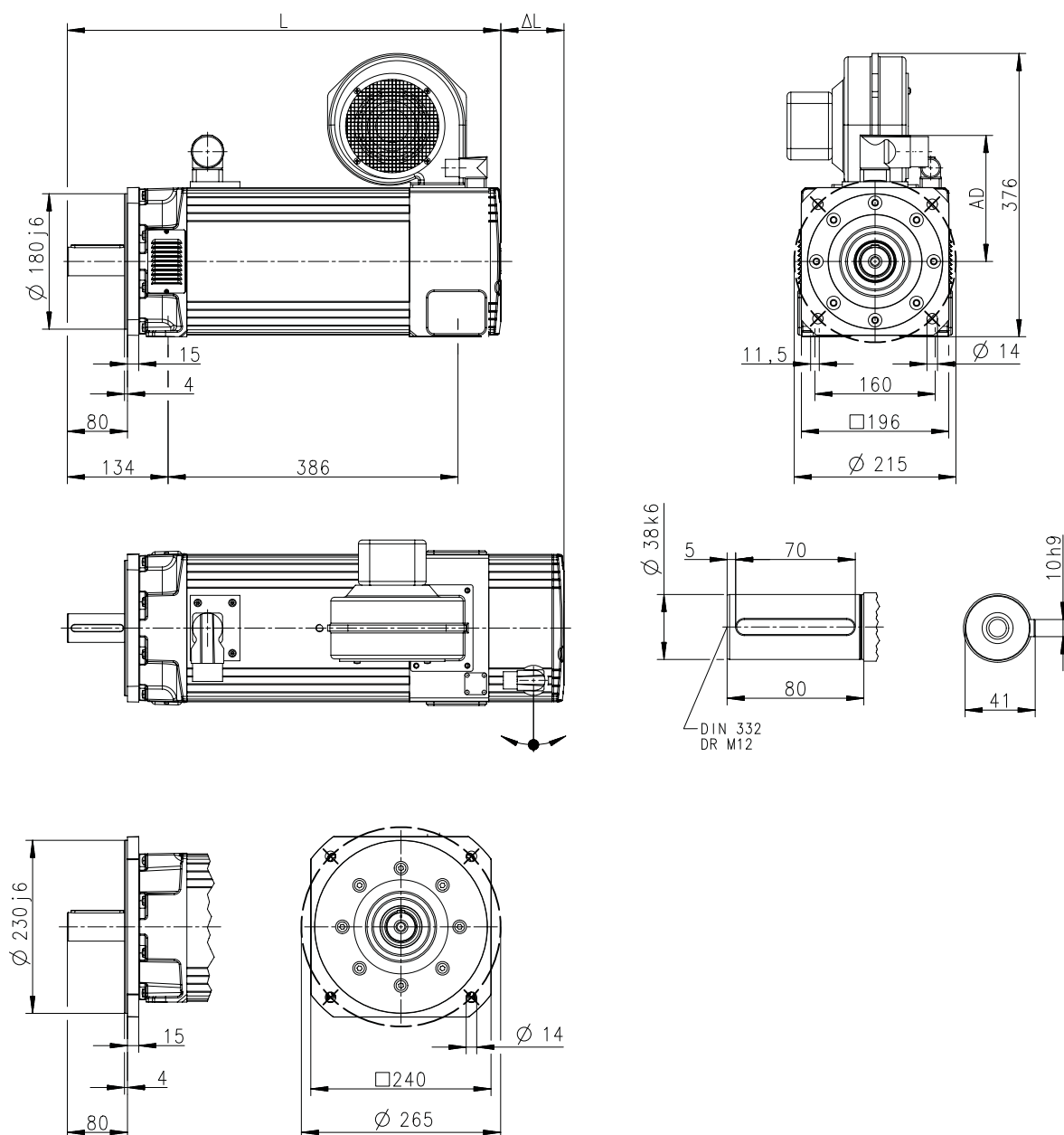


Technical data

Dimensions
Basic dimensions

MQA20, forced ventilated

Design B35-FF215/265



8800711-00

Motor			MQA 20L14H	MQA 20L29H
Total length without brake	L	mm	577	
Motor/connection distance	AD	mm	171	

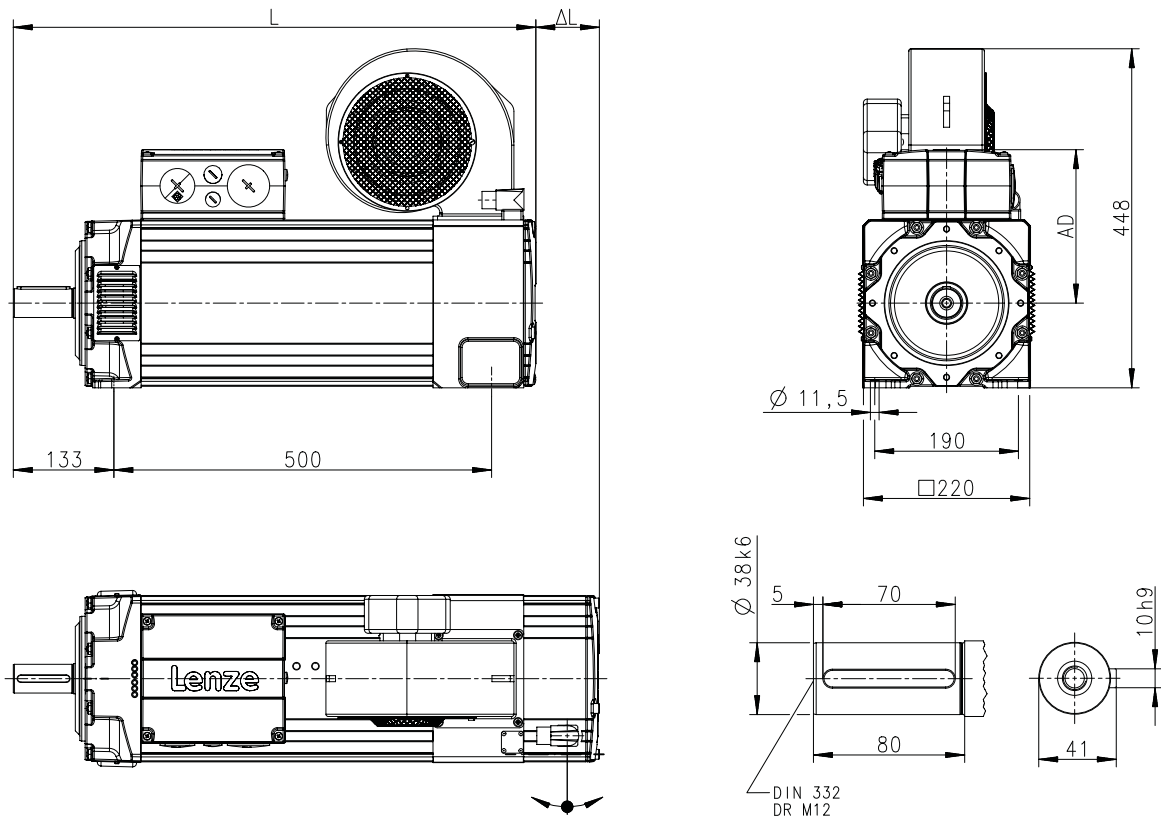
ΔL ▶ Additional lengths 46

Technical data

Dimensions
Basic dimensions



MQA22, forced ventilated
Design B3



8800716-00

Motor			MQA 22P08H	MQA 22P14H	MQA 22P17H	MQA 22P29H
Total length without brake	L	mm	691			
Motor/connection distance	AD	mm	203			

Δ L ▶ Additional lengths 46

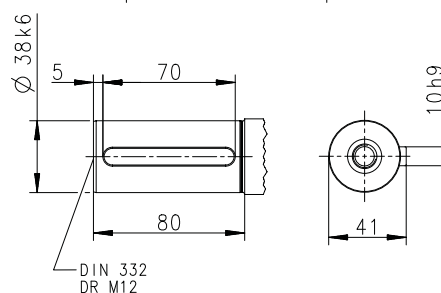
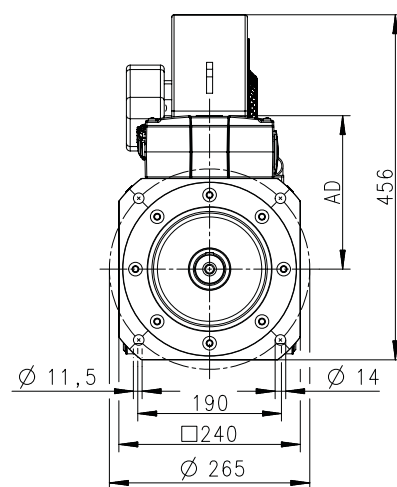
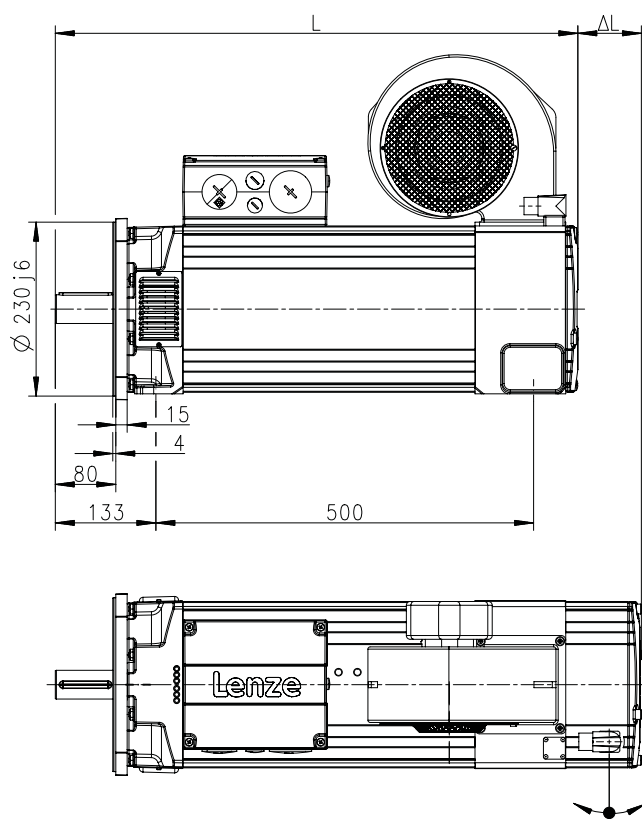


Technical data

Dimensions
Basic dimensions

MQA22, forced ventilated

Design B35-FF265



8800715-00

Motor			MQA 22P08H	MQA 22P14H	MQA 22P17H	MQA 22P29H
Total length without brake	L	mm	691			
Motor/connection distance	AD	mm	203			

ΔL ▶ Additional lengths [46](#)

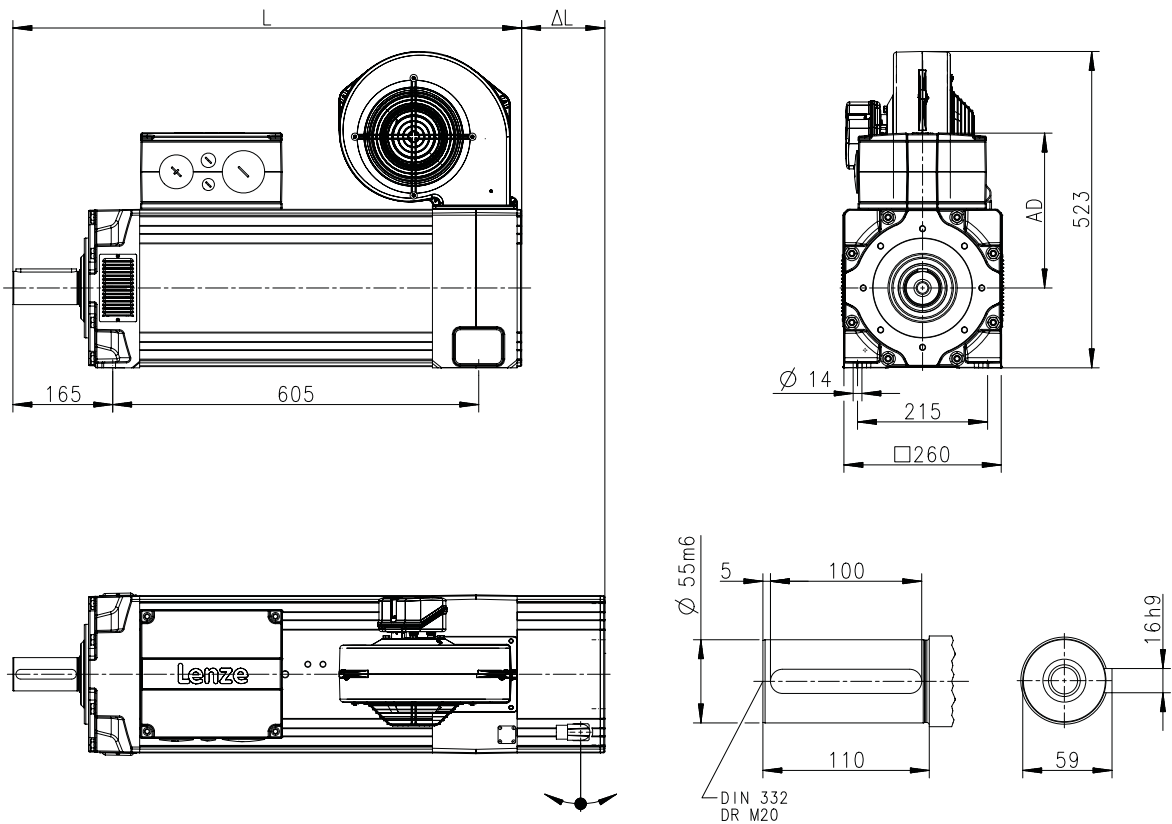
Technical data

Dimensions
Basic dimensions



MQA26, forced ventilated

Design B3



8800718-00

Motor			MQA 26T05H	MQA 26T10H	MQA 26T12H	MQA 26T22H
Total length without brake	L	mm	841			
Motor/connection distance	AD	mm	256			

ΔL ▶ Additional lengths 46

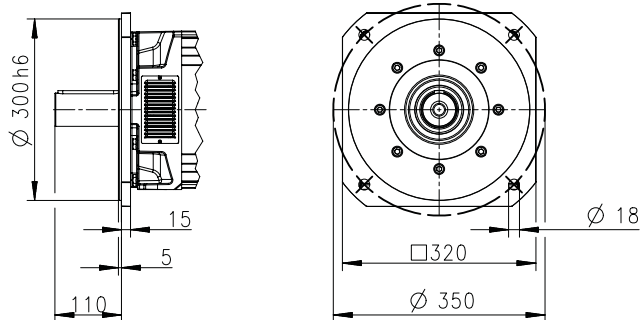
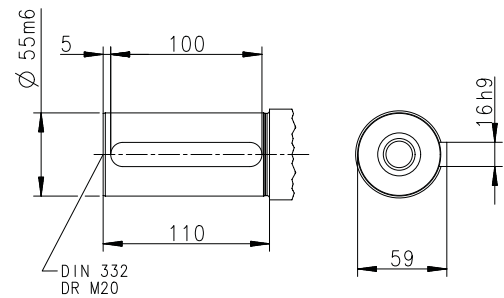
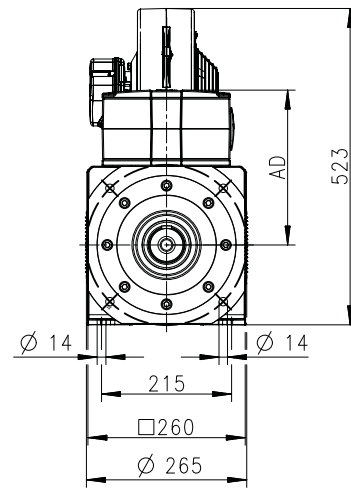
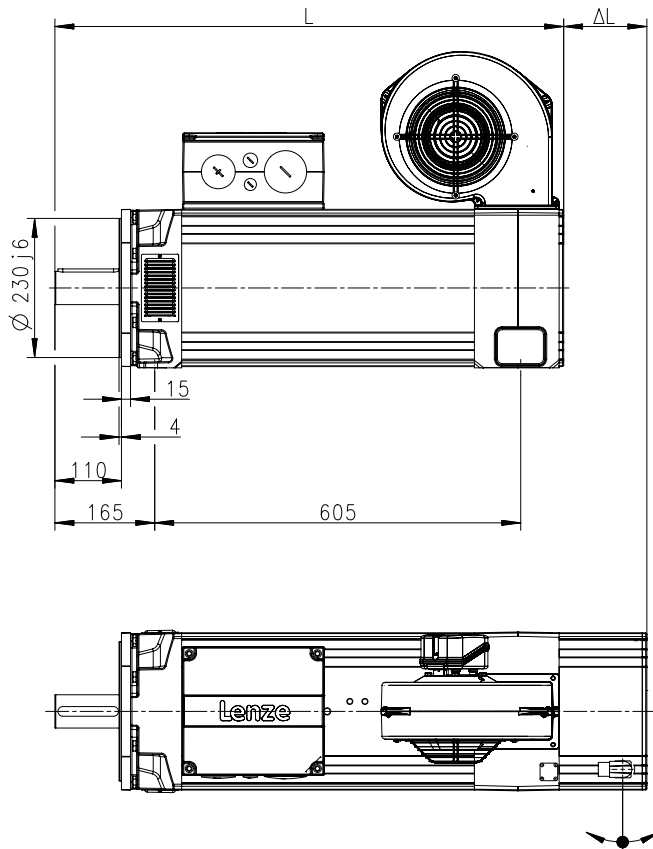


Technical data

Dimensions
Basic dimensions

MQA26, forced ventilated

Design B35-FF350



8800717-00

Motor			MQA 26T05H	MQA 26T10H	MQA 26T12H	MQA 26T22H
Total length without brake	L	mm	841			
Motor/connection distance	AD	mm	256			

Δ L ▶ Additional lengths 46

Technical data

Dimensions
Additional lengths



Additional lengths



The motor code indicates the short designation of the brake and feedback.
Detailed information can be found for

► [Product codes](#) 64

► [Brakes](#) 54

► [Feedback](#) 58

MQA20

Motor			MQA20L14H	MQA20L29H
Cooling type			Forced	Forced
Feedback (without brake B0)				
R□0	Δ L	mm	0	
S□□ / T□□ / E□□	Δ L	mm	0	
Brake (F1/FG) and feedback				
R□0	Δ L	mm	84	
S□□ / T□□ / E□□	Δ L	mm	127	
Brake (F2/FH) and feedback				
R□0	Δ L	mm	152	
S□□ / T□□ / E□□	Δ L	mm	152	

MQA22

Motor			MQA22P08H	MQA22P14H	MQA22P17H	MQA22P29H
Cooling type			Forced	Forced	Forced	Forced
Feedback (without brake B0)						
R□0	Δ L	mm	0			
S□□ / T□□ / E□□	Δ L	mm	0			
Brake (F1/FG) and feedback						
R□0	Δ L	mm	82			
S□□ / T□□ / E□□	Δ L	mm	125			
Brake (F2/FH) and feedback						
R□0	Δ L	mm	157			
S□□ / T□□ / E□□	Δ L	mm	157			

MQA26

Motor			MQA26T05H	MQA26T10H	MQA26T12H	MQA26T22H
Cooling type			Forced	Forced	Forced	Forced
Feedback (without brake B0)						
R□0	Δ L	mm	0			
S□□ / T□□ / E□□	Δ L	mm	0			
Brake (F1/FG) and feedback						
R□0	Δ L	mm	138			
S□□ / T□□ / E□□	Δ L	mm	176			
Brake (F2/FH) and feedback						
R□0	Δ L	mm	176			
S□□ / T□□ / E□□	Δ L	mm	176			



Technical data

Weights
Basic weights

Weights

Basic weights



The basic weights are listed in the rated data.

► [Rated data](#) 25

Observe ► [Additional weights](#) 47!

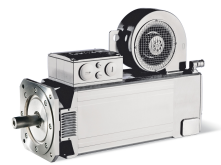
Additional weights

Motors

Motor			MQA20	MQA22	MQA26
Spring-applied holding brake					
Standard braking torque	m	kg	13.0	20.5	30.7
Increased braking torque	m	kg	15.4	26	-

Product extensions

Motor connection
Connection via terminal box



Product extensions

Motor connection

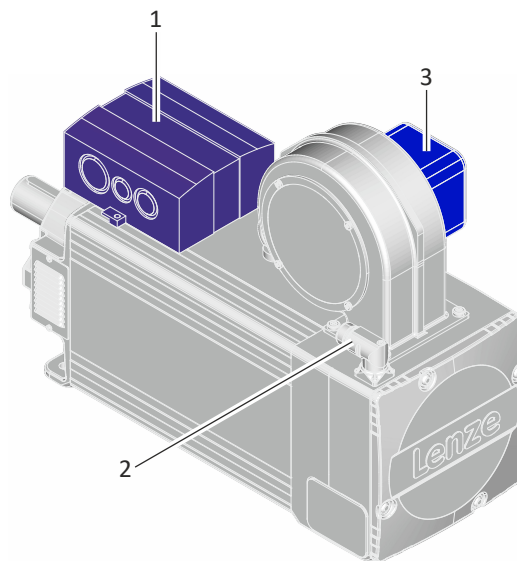
Connection via terminal box

If a 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.

The connection for feedback and temperature monitoring is generally via the ICN connector and the electric fan is connected via a terminal box.

The terminals are designed as tension spring terminals to ensure here the long-term vibration resistance of the cable contacts with adequate contact pressure required.

Position of the connections



Position	Meaning
1	Power connection Brake connection PE connection
2	Feedback connection Connection of temperature monitoring
3	Blower connection



Product extensions

Motor connection
Connection via terminal box

Cable glands



The cut-outs for the cable glands are closed with sealing plugs.

The cable glands are arranged on both sides with MQA20.

The cable glands are arranged on one side with MQA22 and MQA26. If required, the terminal box can be rotated by 180 ° after loosening the screws in the terminal box.

Motor		MQA20	MQA22	MQA26
Screwed connections		2x M20 x 1.5 2x M25 x 1.5 2x M32 x 1.5	1x M40 x 1.5 1x M50 x 1.5 1x M20 x 1.5 1x M16 x 1.5	1x M50 x 1.5 1x M63 x 1.5 1x M20 x 1.5 1x M16 x 1.5
Cable cross-section	mm ²	2.5 ... 16	10 ... 35	-
Terminal design		Spring-loaded terminal	Screw terminal	Threaded bolt
Stripping length	mm	18 ... 20	18	-
Threaded bolt		-	-	M12
Tightening torque	Nm	-	3.2	15.5

Terminal box, power

Contact	Name	Meaning
U1	L1	Motor winding phase
V1	L2	
W1	L3	
PE	PE	PE conductor

Terminal box, DC brake

Contact	Name	Meaning
BD1	+	Brake +
BD2	-	Brake -

Terminal box, AC brake

Contact	Name	Meaning
~	L1	Mains
	N	
+	+	Holding brake (factory-wired)
-	-	
Schalter		Switching contact - DC switching

Terminal box with temperature monitoring R

Contact	Name	Meaning
R1	+	Temperature sensor +
R2	-	Temperature sensor -

Terminal box, 1-phase separate fan

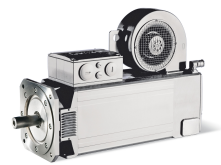
Contact	Name	Meaning
PE	PE	PE conductor
U1	L1	Mains
U2	N	

Terminal box, 3-phase separate fan

Contact	Name	Meaning
PE	PE	PE conductor
U1	L1	Mains connection
V1	L2	
W1	L3	

Product extensions

Motor connection
Connection via ICN connector



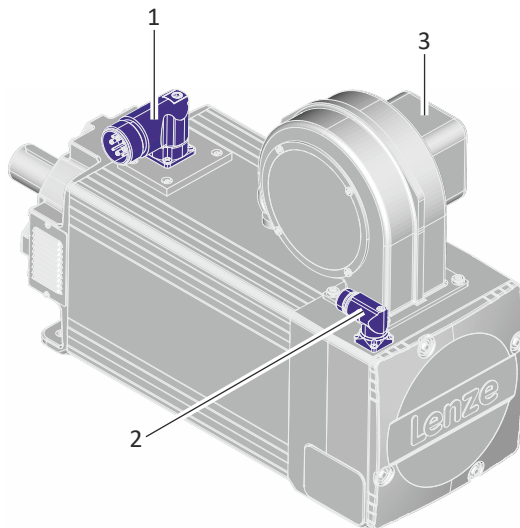
Connection via ICN connector

The connectors can be rotated by 270 ° and are provided with a bayonet catch. Since the catch of the connector is also compatible with conventional box nuts, existing mating connectors with a screw plug can continue to be used without any problems.



In order to provide for a quick and error-free connection of Lenze motors to Lenze inverters, we recommend using prefabricated Lenze system cables.

Position of the connections



Position	Meaning
1	Power connection Brake connection PE connection
2	Feedback connection Connection of temperature monitoring
3	Blower connection



Product extensions

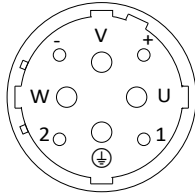
Motor connection
Connection via ICN connector

Power and brake connection

Valid for MQA20

ICN-M40 connector assignment

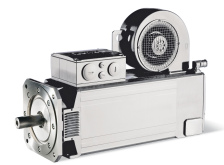
8-pole



ICN M40 8-pole		
Contact	Name	Meaning
+	BD1	Holding brake +
-	BD2	Holding brake -
PE	PE	PE conductor
U	U	Power phase U
V	V	Power phase V
W	W	Power phase W
1		Not assigned
2		Not assigned

Product extensions

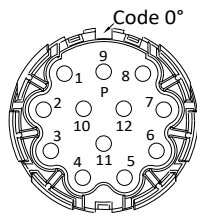
Motor connection
Connection via ICN connector



Feedback and temperature monitoring connection

ICN-M23 connector assignment

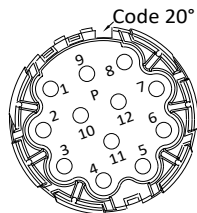
Resolver



ICN M23 for resolvers		
Contact	Name	Meaning
1	+Ref	Transformer windings
2	-Ref	Transformer windings
3	+VCC ETS	Supply: Electronic nameplate (Only for motors and inverters that support this function)
4	+COS	Cosine stator windings
5	-COS	Cosine stator windings
6	+SIN	Sine stator windings
7	-SIN	Sine stator windings
8		Not assigned
9		Not assigned
10	Schirm	Encoder housing shield
11	+	Temperature monitoring: PT1000
12	-	Temperature monitoring: PT1000

ICN-M23 connector assignment

Incremental and SinCos absolute value encoder Hiperface©



ICN M23 for incremental and SinCos absolute value encoder Hiperface		
Contact	Name	Meaning
1	B	Track B / +SIN
2	A ⁻	Track A inverse /-COS
3	A	Track A / + COS
4	+UB	Supply +
5	GND	Mass
6	Z ⁻	Zero track inverse /-RS485
7	Z	Zero track / + RS485
8		Not assigned
9	B ⁻	Track B inverse/-SIN
10	Schirm	Encoder housing shield
11	+	Temperature monitoring: PT1000
12	-	Temperature monitoring: PT1000

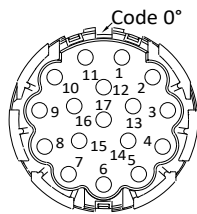


Product extensions

Motor connection
Connection via ICN connector

ICN-M23 connector assignment

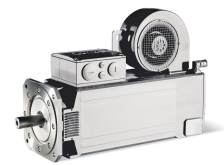
SinCos absolute value encoder with EnDat interface



ICN M23 SinCos absolute value encoder with EnDat		
Contact	Name	Meaning
1	UP Sensor	Up Sensor
2		Not assigned
3		Not assigned
4	0 V Sensor	0 V sensor
5	+	PT1000/KTY temperature sensor
6	-	PT1000/KTY temperature sensor
7	+UB	Supply +
8	Takt	EnDat interface cycle
9	Takt-	Inverse EnDat interface cycle
10	GND	Mass
11	Schirm	Encoder housing shield
12	B	Track B
13	B-	Track B inverse/-SIN
14	Daten	EnDat interface data
15	A	Track A
16	A-	Track A inverse /-COS
17	Daten-	Data inverse EnDat interface

Product extensions

Brakes
Connection via ICN connector



Brakes

⚠ CAUTION!

They may not be used as safety elements (particularly with hoist axes) without additional measures being implemented.

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

- ▶ The brakes must only be used as holding brakes for holding the axes at a standstill or in the deenergised state.
- ▶ The brake must not be used as a service brake.

⚠ CAUTION!

If no suitable voltage (incorrect value, incorrect polarity) is applied to the brake, the brake will be applied and can be overheated and destroyed by the motor continuing to rotate.

Motor supply cables

If long motor supply cables are used, pay attention to the ohmic voltage drop along the cable and compensate for it with a higher voltage at the input end of the cable.

The following applies to Lenze system cables:

$U[V] = U_B[V] + 0.08 \frac{[V]}{[A] \times [m]} \times I_{Lg}[m] \times I_B[A]$	U	V	Resulting supply voltage
	U_B	V	Rated voltage of the brake
	I_{Lg}	m	Cable length
	I_B	A	Rated current of the brake

NOTICE

- ▶ The brakes become active when the supply voltage has been switched off (closed-circuit principle).
- ▶ When using the brakes purely as holding brakes, virtually no wear occurs on the friction surfaces.
- ▶ The friction surfaces must always be free from oil and grease because even small amounts of grease or oil will considerably reduce the braking torque.

NOTICE

In case of travel axes, the compliance of the permissible ratio of mass inertia load/brake motor (J_L/J_{MB}) ensures that the permissible maximum switching energy of the brake will not be exceeded and at least the values given for the emergency stop functions from the given speed (see rated data) are applied.

For hoist axes, the load torque resulting from the weight acts additionally. In this case, the specifications for (J_L/J_{MB}) do not apply.



To simplify matters, the friction energy per switching cycle can be calculated using the formula below and must not exceed the limit value for emergency stops, which depends on the switching rate:

$Q = \frac{1}{2} \times J_{\text{ges}} \times \left(2\pi \times \frac{\Delta n}{60} \right)^2 \times \frac{M_N}{M_N - M_L}$	Q	J	Friction energy
	J_{total}	kgm ²	Total mass inertia (motor + load)
	Δn	rpm	Differential speed
	M_N	Nm	Rated torque of the brake
	M_L	nM	Load torque



The shortest operating times of the brakes are achieved by DC switching of the voltage and an external suppressor circuit (varistor or spark suppressor).

Without suppressor circuit, the operating times may increase. A varistor/ spark suppressor limits the breaking voltage peaks. It must be ensured that the power limit of the suppressor circuit is not exceeded. This limit depends on the brake current, brake voltage, disengagement time and the switching operations per time unit.

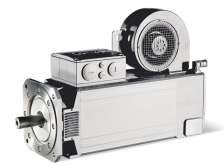
Furthermore the suppressor circuit is necessary for interference suppression and for increasing the service life of the relay contacts (external, is not integrated into the motor).



It is not possible to readjust the brake.

Product extensions

Brakes
Spring-applied brakes



Spring-applied brakes

Rated data



Engagement and disengagement times apply to rated voltage ($\pm 0\%$) and suppressor circuit of the brakes with a varistor with DC switching. Without a suppressor circuit, the times may be longer.

The currents are the maximum values when the brake is cold (value used for dimensioning the current supply). The values for a motor at operating temperature are considerably lower.

With 24 V DC brake: smoothed DC voltage, ripple $\leq 1\%$.

With 230 V AC brake: connection to an integrated rectifier (no cURus possible).

Maximum switching energy for each emergency stop with $n = 3000$ rpm for at least 300, and a maximum of 4 emergency stops per hour.

Supply voltage DC 24 V

Motor			MQA20L		MQA22P		MQA26T
Motor code			F1	F2	F1	F2	F1
Supply voltage range	V_{in}	V	21.6 ... 26.4				
Supply voltage	V_{rated}	V	24				
Bemessungsdrehmoment							
At 20 °C	M_{rated}	Nm	90	150	300		
At 120 °C	M_{rated}	Nm	80	130	260		
Rated current	I_{rated}	A	3.13	2.58	3.75		
Engagement time t_1	t_1	ms	70		50	175	
Disengagement time t_2	t_2	ms	220	240	260	320	
Friction energy	Q_E	kJ	18	31	23	39	51
Weight	m	kg	13	15.4	20.5	26	30.7
Massenträgheitsmoment							
Brake	J	kgcm ²	6.88	14.1	18.1	36.3	70.4
Brake motor	J_{MB}	kgcm ²	177	185	505	523	1405
Load/brake motor ratio	J_L/J_{MB}		19.6	33	8.2	14.1	12.7

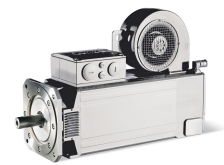


Product extensions

Brakes
Spring-applied brakes

Supply voltage AC 230 V

Motor			MQA20L		MQA22P		MQA26T
Motor code			FG	FH	FG	FH	FG
Supply voltage range	V_{in}	V	207 ... 253				
Supply voltage	V_{rated}	V	230				
Bemessungsdrehmoment							
At 20 °C	M_{rated}	Nm	90	150	300		
At 120 °C	M_{rated}	Nm	80	130	260		
Rated current	I_{rated}	A	0.37	0.3	0.44		0.37
Engagement time t1	t_1	ms	70		130		175
Disengagement time t2	t_2	ms	220	240	260	310	360
Friction energy	Q_E	kJ	18	31	23	39	51
Weight	m	kg	13	15.4	20.5	26	30.7
Massenträgheitsmoment							
Brake	J	kgcm ²	6.88	14.1	18.1	36.3	70.4
Brake motor	J_{MB}	kgcm ²	177	185	505	523	1405
Load/brake motor ratio	J_L/J_{MB}		19.6	33	8.2	14.1	12.7



Feedback

For speed control with a servo inverter, the servo motor can be equipped with the following feedback systems:

Inverter	Feedback without functional safety		
	Resolver	Absolute value encoder	Incremental encoder
i950 servo inverter	RS0	AM1024-8V-H AS1024-8V-H	-
i700 servo inverter	RS0	AM1024-8V-H AS1024-8V-H	-
8400 TopLine inverter drives	RS0	AM1024-8V-H AS1024-8V-H	IG2048-5V-S IG2048-5V-T IG4096-5V-T
9400 HighLine servo drives	RS0	AM32-5V-E AM1024-8V-H AM2048-5V-E AS1024-8V-H AS2048-5V-E	IG2048-5V-S IG2048-5V-T IG4096-5V-T

Inverter	Feedback with functional safety		
	Resolver	Absolute value encoder	Incremental encoder
i950 servo inverter	RV03	-	-
9400 HighLine servo drives	RV03	-	IG1024-5V-V3

Feedbacks in the environment of functional safety

Motors can perform speed-dependent safety functions for safe speed and/or safe relative position monitoring in a drive system by Lenze inverters or Controllers. In case of inverters, these functions are implemented by integrable safety modules and in case of Controllers by the additionally required Safety Controller.

When planning systems/installations of this kind, always observe the following:

- When using just one single feedback system in the environment of these safety applications, the applicable safety engineering standard EN 61800-5-2 (adjustable speed electrical power drive systems - Part: 5-2: Safety requirements - Functional) stipulates special requirements for the connection between feedback system and motor shaft.
- This is due to the fact that two-channel safety systems at this point in the mechanical system are actually designed as single-channel systems. If this mechanical connection is designed with considerable overdimensioning, the standard permits exclusion of the fault "encoder-shaft breakage" or "encoder-shaft slip". As such, the permissible angular acceleration limit values must not be exceeded for the individual drive solutions.

You can find the limit values in the corresponding feedback data of the individual motor ranges.

Speed-dependent safety functions

Examples of speed-dependent safety functions:

- Safe stop 1 (SS1)
- Safe operational stop (SOS)
- Safely limited speed (SLS)
- Safe maximum speed (SMS)
- Safe direction (SDI)
- Operation mode selector (OMS) with confirmation (ES)
- Safe speed monitor (SSM)
- Safely limited increment (SLI)



Resolver

The stator-supplied, 2-pole resolver with two stator windings shifted by 90 degrees and a rotor winding with a transformer winding can record both the speed and the rotor position, just like a single-turn absolute value encoder. The rotor position can be determined within one mechanical motor revolution after a voltage failure.

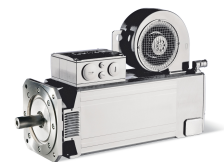
Feedback type			Resolver	
Feedback			RS0	RV03
Speed-dependent safety functions			No	Yes
Design			Mounting	
Resolution - angle		'	0.8	0.8
Min. accuracy		'	-10	-10
Max. accuracy		'	10	10
Absolute positioning			1 revolution	1 revolution
Max. speed	$n_{\max}$	rpm	8000	8000
Max. DC input voltage	$V_{\text{in,max}}$	V	10	10
Max. input frequency	$f_{\text{in,max}}$	kHz	4	4
Ratio stator/rotor			0.3	0.3
Min ratio tolerance		%	-5	-5
Max ratio tolerance		%	5	5
Rotor impedance	Z_{ro}	Ω	51+j90	51+j90
Stator impedance	Z_{so}	Ω	102+j150	102+j150
Impedance	Z_{rs}	Ω	44+j76	44+j76
Min. insulation resistance at DC 500 V	R_{min}	M Ω	10	10
Number of pole pairs			1	1
Max. angle error Min		'	-10	-10
Max. angle error Max		'	10	10

Speed-dependent safety functions

Feedback			RV03
Motor code			RV03
Max. permissible angular acceleration	α	rad/s ²	22000
Functional safety			
IEC 61508			SIL3
EN 13849-1			Up to Performance Level e

Product extensions

Feedback
Incremental encoder



Incremental encoder

Incremental encoders can be used for speed measurement. Homing is required in order to enable positioning later.

Feedback type			SinCos-Inkremental		TTL-Inkremental	
Feedback			IG1024-5V-V3	IG2048-5V-S	IG2048-5V-T	IG4096-5V-T
Speed-dependent safety functions			Yes	No	No	No
Design			Mounting			
Pulses			1024	2048	2048	4096
Output signals			SinCos 1 Vss	SinCos 1 Vss	TTL	TTL
Interfaces			SinCos		A, B; N; Ai, Bi; Ni	
Absolute revolution			0	0	0	0
Min. accuracy		'	-0.8	-0.8	-2	-2
Max. accuracy		'	0.8	0.8	2	2
Min. DC input voltage	$V_{in,min}$	V	4.75	4.5	4.75	4.75
Max. DC input voltage	$V_{in,max}$	V	5.25	5.5	5.25	5.25
Max. current consumption	I_{max}	A	0.07	0.1	0.15	0.15
Limit frequency	f_{max}	kHz	200	180	300	300

Speed-dependent safety functions

Feedback type			SinCos incremental	
Feedback			IG1024-5V-V3	
Motor code			S1S	
Max. permissible angular acceleration	α	rad/s ²	73000	
Functional safety				
IEC 61508			SIL3	
EN 13849-1			Up to Performance Level e	



Product extensions

Feedback
Absolute value encoder

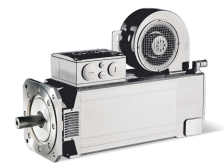
Absolute value encoder

Absolute value encoders can detect the speed, the rotor position, and the machine position with a very high resolution. They are used for the positioning of dynamic applications and do not require homing.

Feedback type			SinCos absolute value encoder			
Feedback			AM1024-8V-H	AM2048-5V-E	AS1024-8V-H	AS2048-5V-E
Speed-dependent safety functions			No	No	No	No
Design			Mounting	Mounting	Mounting	Mounting
Encoder type			Multi-turn	Multi-turn	Single-turn	Single-turn
Resolution		bit	-	-	-	-
Pulses			1024	2048	1024	2048
Output signals			SinCos 1 Vss	SinCos 1 Vss	SinCos 1 Vss	SinCos 1 Vss
Interfaces			Hiperface	EnDat	Hiperface	EnDat
Absolute revolution			4096	4096	1	1
Resolution - angle			0.4	0.4	0.4	0.4
Min. accuracy		'	-0.8	-0.6	-0.8	-0.6
Max. accuracy		'	0.8	0.6	0.8	0.6
Fehlergrenze Positionswert						
System accuracy			-	-	-	-
Integral nonlinearity			-	-	-	-
Min. DC input voltage	$V_{in,min}$	V	7	4.75	7	4.75
Max. DC input voltage	$V_{in,max}$	V	12	5.25	12	5.25
Max. current consumption	I_{max}	A	0.08	0.25	0.08	0.15
Limit frequency	f_{max}	kHz	200	200	200	200

Product extensions

Blower



Blower

The motors are cooled as a standard by means of a separate radial fan.

The separate fans are optionally available with a dust filter.

Rated data 50 Hz

Motor series			MQA	
Size			20	22
Degree of protection			IP23	
Number of phases			1	1
Rated voltage	V_{rated}	V	230	230
Rated power	P_{rated}	kW	0.09	0.24
Rated current	I_{rated}	A	0.39	1.05

Motor series			MQA		
Size			20	22	26
Degree of protection			IP23		
Number of phases			3	3	3
Rated voltage	V_{rated}	V	400	400	400
Rated power	P_{rated}	kW	0.067	0.23	0.43
Rated current	I_{rated}	A	0.13	0.37	0.68

Rated data 60 Hz

Motor series			MQA	
Size			20	22
Degree of protection			IP23	
Number of phases			1	1
Rated voltage	V_{rated}	V	230	230
Rated power	P_{rated}	kW	0.12	0.24
Rated current	I_{rated}	A	0.49	1.08

Motor series			MQA		
Size			20	22	26
Degree of protection			IP23		
Number of phases			3	3	3
Rated voltage	V_{rated}	V	400	400	400
Rated power	P_{rated}	kW	0.1	0.37	0.6
Rated current	I_{rated}	A	0.16	0.48	0.79



Product extensions

Temperature monitoring
Thermal detectors PT1000

Temperature monitoring

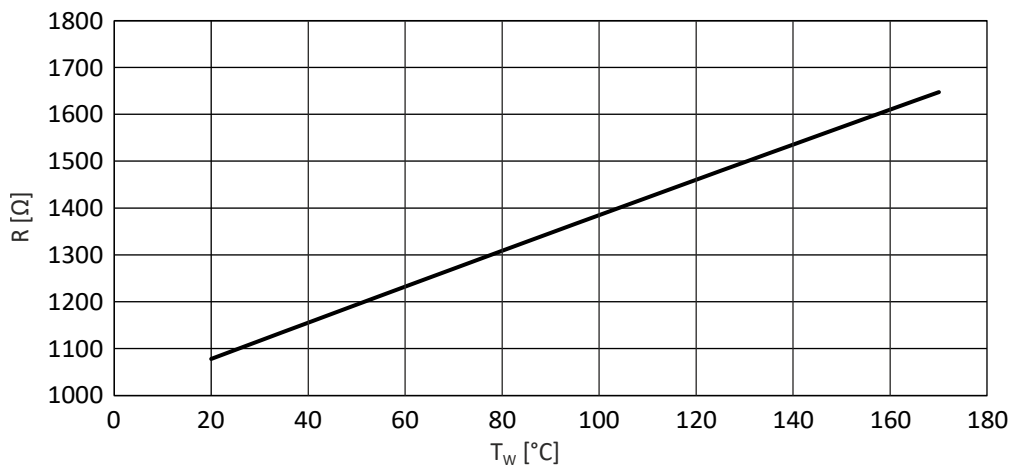
Thermal detectors PT1000

The thermal detector used continuously monitors the motor temperature. The temperature information is transferred to the inverter using the system cable of the feedback system. **This is not a full motor protection!**

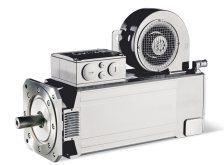
This makes it possible to determine the motor temperature in the permissible operating range with great accuracy.



When supplying the thermal sensors with a measurement current of 1 mA, the connection between the temperature and the resistance measured applies.



R Resistance
 T_w Winding temperature



Product codes

Product code of MQA asynchronous servo motor

Example		M	Q	A	20	L	14	-	RS0	B0
Meaning	Variant	Product code								
Product family	Motor	M								
Type	Compact servo motors		Q							
Variant	Asynchronous			A						
Motor frame size	Square dimension 200 mm				20					
	Square dimension 220 mm				22					
	Square dimension 260 mm				26					
Overall length						L P T				
Rated speed	rpm x 100						05 ... 29			
Inverter mains connection	3 x 400 V							H		
Feedback	SinCos absolute value encoder, single-turn, EnDat AS2048-5V-E									ECN
	SinCos absolute value encoder, multi-turn, EnDat AM32-5V-E									EQI
	SinCos absolute value encoder, multi-turn, EnDat AM2048-5V-E									EQN
	Resolver									RS0
	Safety resolver RV03									RV0
	SinCos safety incremental encoder, single-turn IG1024-5V-V3									S1S
	SinCos incremental encoder, single-turn IG2048-5V-S									S20
	SinCos absolute value encoder, multi-turn, Hiperface® AM1024-8V-H									SRM
	SinCos absolute value encoder, single-turn, Hiperface® AS1024-8V-H									SRS
	TTL incremental encoder IG2048-5V-T									T20
	TTL incremental encoder IG4096-5V-T									T40
Brake	Without brake									B0
	Spring-applied brake DC 24 V									F1
	Spring-applied brake DC 24 V, reinforced									F2
	Spring-applied brake AC 230 V									FG
	Spring-applied brake AC 230 V, reinforced									FH



Environmental notes and recycling

Lenze has been certified to the worldwide environmental management standard for many years (DIN EN ISO 14001). As part of our environmental policy and the associated climate responsibility, please note the following information on hazardous ingredients and the recycling of Lenze products and their packaging:



Lenze products are partly subject to the EU Directive on the restriction of certain hazardous substances in electrical and electronic equipment 2011/65/EU: RoHS Directive [UKCA: S.I. 2012/3032 - The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012] . This is documented accordingly in the EU declaration of conformity and with the CE mark.



The crossed-out wheeled bin symbol is located on the equipment. This information indicates that used electrical and electronic products must not be disposed of with normal household waste.

The EU Directive 2012/19/EU: Directive on waste electrical and electronic equipment (WEEE) [UKCA: S.I. 2013/3113 - The Waste Electrical and Electronic Equipment Regulations 2013] , which has been transposed into national law by the respective EU member states, applies to the disposal of equipment. As a customer, you have the option of disposing of the electrical and electronic equipment that you have purchased from us and that is subject to WEEE via the Lenze branch in your country.

Lenze addresses in Europe: <https://www.lenze.com/en-de/company/global-presence>

Some Lenze products contain batteries/rechargeable batteries in accordance with EU Directive 2006/66/EC: Battery Directive [UKCA: S.I. 2009/890 - The Waste Batteries and Accumulators Regulations 2009] . Any batteries/rechargeable batteries included are designed to last the life of the product and do not need to be replaced or otherwise removed by the end user.



Lenze products are usually sold with cardboard or plastic packaging. This packaging complies with EU Directive 94/62/EC: Directive on packaging and packaging waste [UKCA: S.I. 1997/648 - The Producer Responsibility Obligations (Packaging Waste) Regulations 1997] . The required disposal route is indicated by material-specific labels with the "recycling triangle". Example: "21 - other cardboard"

REACH

Lenze products are subject to REGULATION (EC) No 1907/2006: REACH Regulation [UKCA: S.I. 2008/2852 - The REACH Enforcement Regulations 2008] . When used as intended, exposure of substances to humans, animals and the environment is excluded.

Lenze products are industrial electrical and electronic products and are disposed of professionally. Both the mechanical and electrical components such as electric motors, gearboxes or inverters contain valuable raw materials that can be recycled and reused. Proper recycling and thus maintaining the highest possible level of recyclability is therefore important and sensible from an economic and ecological point of view.

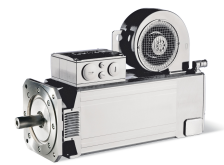
- Coordinate professional disposal with your waste disposal company.
- Separate mechanical and electrical components, packaging, hazardous waste (e.g. gear oils) and batteries/rechargeable batteries wherever possible.
- Dispose of the separated waste in an environmentally sound and proper manner (no household waste or municipal bulky waste).

What?	Material	Disposal instructions
Pallets	Wood	Return to manufacturers, freight forwarders or reusable materials collection system
Packaging material	Paper, cardboard, pasteboard, plastics	Collect and dispose of separately
Products		
Electronic devices	Metal, plastics, circuit boards, heatsinks	As electronic waste give to professional disposer for recycling
Gearbox	Oil	Drain oil and dispose of separately
	Casting, steel, aluminium	Dispose as metal scrap
Motors	Casting, copper, rotors, magnets, potting compound	As engine scrap give to professional disposer for recycling
Dry-cell batteries/rechargeable batteries		As used batteries give to professional disposer for recycling



Further information on Lenze's environmental and climate responsibility and on the topic of energy efficiency can be found on the Internet:

www.Lenze.com → search word: "Sustainability"



Appendix

Good to know

Operating modes of the motor

Operating modes S1 ... S10 as specified by EN 60034-1 describe the basic stress of an electrical machine.

In continuous operation a motor reaches its permissible temperature limit if it outputs the rated power dimensioned for continuous operation. However, if the motor is only subjected to load for a short time, the power output by the motor may be greater without the motor reaching its permissible temperature limit. This behaviour is referred to as overload capacity.

Depending on the duration of the load and the resulting temperature rise, the required motor can be selected reduced by the overload capacity.

The most important operating modes

Continuous operation S1	Short-time operation S2
Operation with a constant load until the motor reaches the thermal steady state. The motor may be actuated continuously with its rated power.	Operation with constant load; however, the motor does not reach the thermal steady state. During the following standstill, the motor winding cools down to the ambient temperature again. The increase in power depends on the load duration.



Intermittent operation S3	Non-intermittent periodic operation S6
Sequence of identical duty cycles comprising operation with a constant load and subsequent standstill. Start-up and braking processes do not have an impact on the winding temperature. The steady-state is not reached. The guide values apply to a cycle duration of 10 minutes. The power increase depends on the cycle duration and on the load period/downtime ratio.	Sequence of identical duty cycles comprising operation with a constant load and subsequent no-load operation. The motor cools down during the no-load phase. Start-up and braking processes do not have an impact on the winding temperature. The steady-state is not reached. The guide values apply to a cycle duration of 10 minutes. The power increase depends on the cycle duration and on the load period/idle time ratio.
P Power t Time t_L Idle time θ Temperature	P_v Power loss t_B Load period t_S Cycle duration

Enclosures

The protection class indicates the suitability of a product for specific ambient conditions with regard to humidity as well as the protection against contact and the ingress of foreign particles. The protection classes are classified in the EN 60034-5/ EN IEC 60529.

The first code number after the code letters IP indicates the protection against the ingress of foreign particles and dust. The second code number refers to the protection against the ingress of humidity.

Code number 1	Degree of protection	Code number 2	Degree of protection
0	No protection	0	No protection
1	Protection against the ingress of foreign particles $d > 50$ mm. No protection in case of deliberate access.	1	Protection against vertically dripping water (dripping water).
2	Protection against medium-sized foreign particles, $d > 12$ mm, keeping away fingers or the like.	2	Protection against diagonally falling water (dripping water), 15° compared to normal service position.
3	Protection against small foreign particles $d > 2.5$ mm. Keeping away tools, wires or the like.	3	Protection against spraying water, up to 60° from vertical.
4	Protection against granular foreign particles, $d > 1$ mm, keeping away tools, wire or the like.	4	Protection against spraying water from all directions.
5	Protection against dust deposits (dust-protected), complete protection against contact.	5	Protection against water jets from all directions.
6	Protection against the ingress of dust (dust-proof), complete protection against contact.	6	Protection against choppy seas or heavy water jets (flood protection).

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