m850 synchronous servo motor

Contents

Contents

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

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 m850 servo motor for medium dynamics in a compact design.

The compact synchronous servo motor for applications in positioning, robotics and packaging technology as well as for handling systems.

In combination with the servo inverters i750, i950, 9400 and 8400 TopLine powerful drive solutions are possible in the torque range from 0.12 to 200 Nm.

Customer benefit

- Compact design
- Easy controllability by an advantageous ratio of the mass inertia of the load and that of the motor.
- Optimal smooth running characteristics for exact work results
- Suitable for use in the food industry thanks to a smooth housing surface
- Simplicity thanks to robust resolvers as standard and multi-turn SinCos encoders for high precision
- Digital absolute value encoder for One Cable Technology (OCT)
- Easy to install and service thanks to bayonet lock connectors with rotatable connector boxes

m850-S140/S3240 synchronous servo motor

Synchronous servo motor m850-S120/L3960 with One Cable Technology (OCT) in connection with digital absolute value encoder

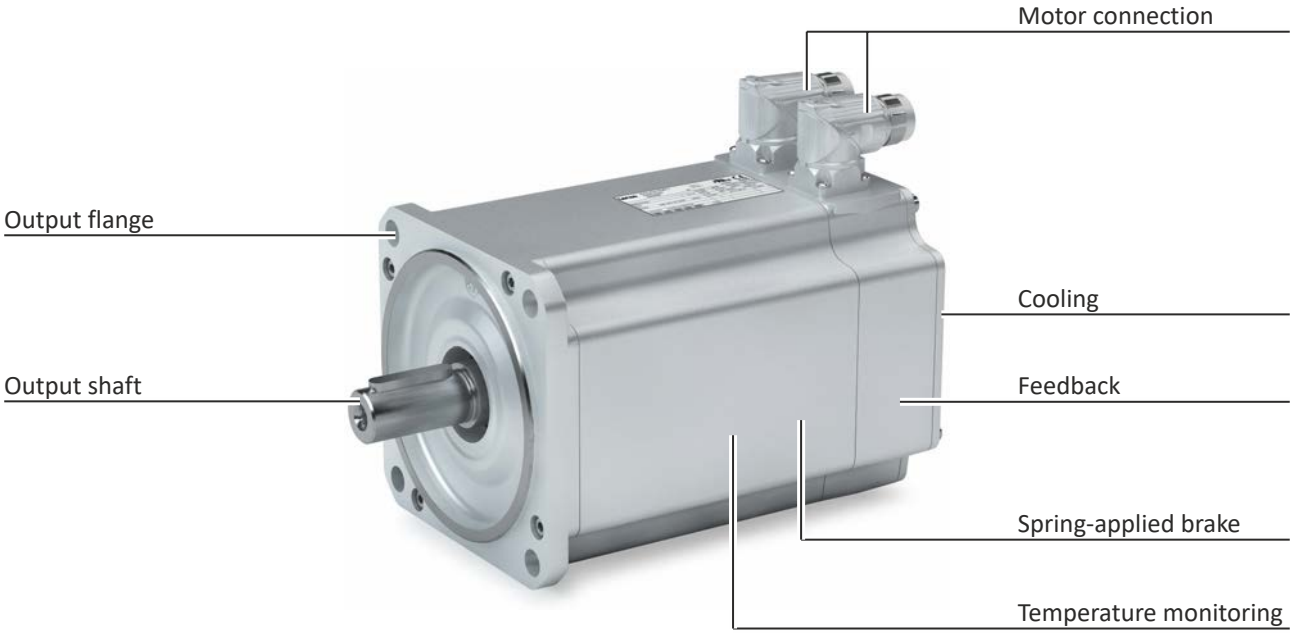
Identification of the products

Product name m850 synchronous servo motor

Product series		Design	Flange height		Overall length	Rated speed	Motor
			mm			rpm	
m850	-	S (synchronous)	40	/	S (short)	9000	m850-S40/S9000
					L (long)	9000	m850-S40/L9000
			60		S (short)	6000	m850-S60/S6000
					L (long)	6000	m850-S60/L6000
			80		S (short)	5500	m850-S80/S5500
					L (long)	5500	m850-S80/L5500
			120		S (short)	3960	m850-S120/S3960
					M (medium)	3960	m850-S120/M3960
					L (long)	3960	m850-S120/L3960
			140		S (short)	3240	m850-S140/S3240
					M (medium)	3240	m850-S140/M3240
					L (long)	3240	m850-S140/L3240
			190		S (short)	3000	m850-S190/S3000
					M (medium)	3000	m850-S190/M3000
					L (long)	2520	m850-S190/L2520

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		**m850-S40/ S9000**	**m850-S40/ L9000**	**m850-S60/ S6000**	**m850-S60/ L6000**	**m850-S80/ S5500**	**m850-S80/ L5500**
Technical data							
Rated power	kW	0.11	0.2	0.325	0.55	1	1.2
Rated torque	Nm	0.12	0.21	0.5	0.9	1.7	2.1
Max. torque	Nm	0.7	1.4	2.6	5.8	10.5	13.4
Rated speed	rpm	9000	9000	6000	6000	5500	5500
Color		Unpainted					
Surface and corrosion protection		**Without**					
Output shaft							
Solid shaft without keyway	mm	8 x 20	8 x 20	14 x 30	14 x 30	19 x 35	19 x 35
Solid shaft with featherkey	mm	8 x 20	8 x 20	14 x 30	14 x 30	19 x 35	19 x 35
Shaft material		Steel					
Output flange	mm	FF45	FF45	FF70	FF70	FF90	FF90
Cooling		Self-cooled IP65/IP21					
Motor connection		Connector					
Permanent magnet holding brake							
Characteristic torque	Nm	0.2		2		4.5	
DC brake voltage	V	24					
Feedback							
Without functional safety				**Resolver**			
				Absolute value encoder			
		Digital absolute value encoder for One Cable Technology (OCT)		Digital absolute value encoder for One Cable Technology (OCT)			
With functional safety				Resolver			
				Absolute value encoder			
				Digital absolute value encoder for One Cable Technology (OCT)			
Temperature monitoring		PT1000 temperature sensor					

Motor		m850-S120/S3960	m850-S120/M3960	m850-S120/L3960
Technical data				
Rated power	kW	2.0	3.1	3.7
Rated torque	Nm	4.8	7.4	9.0
Max. torque	Nm	14.5	29.0	44.0
Rated speed	rpm	3960	3960	3960
Color		Unpainted		
Surface and corrosion protection		**Without** Different types of OKS		
Output shaft				
Solid shaft without keyway	mm	19 x 40		
Solid shaft with featherkey	mm	19 x 40		
Shaft material		Steel		
Shaft sealing ring material		FKM		
Shaft seal		**Standard** Dust-tight		
Output flange	mm	FF130		
Cooling		**Self-cooled IP54** Self-cooled IP65		
Motor connection		Connector		
Spring-applied holding brake		**Without** With		
Characteristic torque	Nm	18		
DC brake voltage	V	24		
Feedback				
Without functional safety		**Resolver** Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
With functional safety		Resolver Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
Temperature monitoring		PT1000 thermal sensor + 2 PTC thermistors		

Motor		**m850-S140/S3240**	**m850-S140/M3240**	**m850-S140/L3240**
Technical data				
Rated power	kW	2.9	4.8	5.9
Rated torque	Nm	8.5	14.0	17.4
Max. torque	Nm	26.0	53.5	80.0
Rated speed	rpm	3240	3240	3240
Color		Unpainted		
Surface and corrosion protection		**Without** Different types of OKS		
Output shaft				
Solid shaft without keyway	mm	24 x 50		
Solid shaft with featherkey	mm	24 x 50		
Shaft material		Steel		
Shaft sealing ring material		FKM		
Shaft seal		**Standard** Dust-tight		
Output flange	mm	FF165		
Cooling		**Self-cooled IP54** Self-cooled IP65		
Motor connection		Connector		
Spring-applied holding brake		**Without** With		
Characteristic torque	Nm	32		
DC brake voltage	V	24		
Feedback				
Without functional safety		**Resolver** Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
With functional safety		Resolver Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
Temperature monitoring		PT1000 thermal sensor + 2 PTC thermistors		

Motor		m850-S190/S3000	m850-S190/M3000	m850-S190/L2520
Technical data				
Rated power	kW	5.0	7.5	9.2
Rated torque	Nm	16	24	35
Max. torque	Nm	71.0	120	200
Rated speed	rpm	3000	3000	2520
Color		Unpainted		
Surface and corrosion protection		**Without** Different types of OKS		
Output shaft				
Solid shaft without keyway	mm	28 x 60		
Solid shaft with featherkey	mm	28 x 60		
Shaft material		Steel		
Shaft sealing ring material		FKM		
Shaft seal		**Standard** Dust-tight		
Output flange	mm	FF215		
Cooling		**Self-cooled IP54** Self-cooled IP65		
Motor connection		Connector		
Spring-applied holding brake		**Without** With		
Characteristic torque	Nm	100		
DC brake voltage	V	24		
Feedback				
Without functional safety		**Resolver** Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
With functional safety		Resolver Absolute value encoder Digital absolute value encoder for One Cable Technology (OCT)		
Temperature monitoring		PT1000 thermal sensor + 2 PTC thermistors		

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 the specifications of the corresponding documentation. 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 »EASY System Designer«.

With the «EASY System 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 📖 76
- 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

S1 operation	S2,S3 and S6 operation	Speed profiles
↓	↓	↓
Check operating conditions		
↓		
Define required input variables		
↓		
Determine correction factor		
Operating modes and operating time	Operating modes and operating time	
Ambient temperature and installation height	Ambient temperature and installation height	Ambient temperature and installation height
↓		
Determine motor on the basis of the forces acting		
↓	↓	↓
↓	↓	Define load characteristic for the individual time segments
↓	↓	↓
↓	↓	Calculation of the values required for the process
↓	↓	↓
Inspect and select motor		
↓		
Final configuration		

Check operating conditions

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

▸ Standards and operating conditions 🕮 29

▸ Surface and corrosion protection 🕮 22

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 🕮 76

Ambient temperature and installation height		
Ambient temperature	Installation height amsl	
	≤ 1000 m	≤ 2000 m
	Correction factor	
T_U	k_H	k_H
≤ 20 °C	1.10	1.04
30 °C	1.05	1.00
40 °C	1.00	0.95
50 °C	0.80	0.76
60 °C	0.60	0.57

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 < 17 teeth = 1.15	≥ 20 teeth = 1.0 < 20 teeth = 1.25 < 13 teeth = 1.4	With belt tightener= 2.0 - 2.5 Without belt tightener= 2.5 - 3.0	1.5 - 2.0
			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

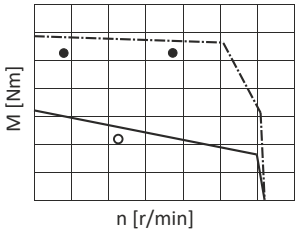
▸ Radial forces and axial forces 🕮 31

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 🕮 33

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 M_L	
below the maximum torque characteristic of the servo motor/ inverter combination here, $M_{L,max}$ must be considered			
Thermally effective operating point (○)		n_L $M_L / (k_L \times k_H)$	
below the S1 torque characteristic of the servo motor			

▸ Rated data 🕮 33

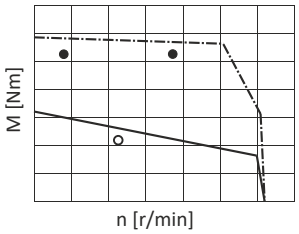
▸ Torque characteristics 🕮 43

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**	**kgcm²**

	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	$M_{eff} = \sqrt{\frac{1}{T} \sum_z M_z^2 \times \Delta t_z}$, $T \leq 1min$	M_{eff}	Nm
Mean speed	$n_m = \lvert \overline{n_{L,z}} \rvert = \frac{1}{T} \sum_z \lvert n_{L,z} \rvert \times \Delta t_z$	n_m	rpm
Maximum load speed	$n_{L,max} = \max (n_{L,z})$	$n_{L,max}$	rpm

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

▸ Rated data 🕮 33

▸ Torque characteristics 🕮 43

Final configuration

	Check
Connection dimensions	Output shaft Output flange
Product extensions	Brake Feedback

More information about the final configuration:

▸ The modular system 📖 11

▸ Product extensions 📖 58

Surface and corrosion protection

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

Various surface coatings ensure reliable functioning even at high air humidity, in outdoor installations, or in the presence of atmospheric contamination. Any color from the "RAL Classic" collection can be chosen for the top coat.

For indoor installation in buildings and if no special corrosion protection is required, the products are also available unpainted (without surface and corrosion protection system).

Surface and corrosion protection (called OKS)	Applications	Type
without OKS (unpainted)	• Indoor installation, no special corrosion protection necessary • Painting by customer	Standard
OKS-G (primed)	• Dependent on subsequent top coat applied	Optional
OKS-S (small)	• Standard applications • Internal installation in heated buildings • Air humidity up to 90 %	
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	Color	Coating thickness
	DIN EN ISO 12944-2	Design		
Without OKS(uncoated)				
OKS-G (primed)		• 2K PUR priming coat		30 ... 40 µm
OKS-S (small)	Comparable to C1	• 2K-PUR top coat	• Standard: RAL 7012 • Optional: According to RAL Classic possible	50 ... 70 µm
OKS-M (medium)	Comparable to C2	• 2K PUR priming coat • 2K-PUR top coat		80 ... 110 µm
OKS-L (large)	Comparable to C3			110 ... 150 µm

Mechanical installation

Important notes

- Install the product according to the information in the chapter "Standards and operating conditions".

  ▸ Standards and operating conditions 📖 29
- 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

Mounting surfaces

- 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 V at the motor terminals must not be exceeded. Here, the minimum pulse rise time must be t_R = 0.1 µs.

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

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

- ambient temperature T_U = 40 °C for motors (in compliance with EN 60034)
- Site altitude ≤ 1000 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.

Cooling effect of mounting flange

Mounting on a thermally conducting / insulating plate or machine chassis has an influence on heating up the motor, particularly when using naturally ventilated motors.

The motor rating data specified in the catalogue applies when mounting on a steel plate with free convection with the following dimensions:

Motor	Width	Height
	mm	mm
m850-S40	150	200
m850-S60	150	200
m850-S80	300	300
m850-S120 ... S190	450	450

Standards and operating conditions

Conformities and approvals

More information and certificates of approval can be found under

m850 synchronous servo motors (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
		2011/65/EU	RoHS	-	
		2014/30/EU	EMC Directive		
		2014/35/EU	Low-Voltage Directive		
Great Britain	UKCA	S.I. 2008/1597	The Supply of Machinery (Safety) Regulations 2008	Only for safety-relevant components	UKCA mark
		S.I. 2012/3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	-	
		S.I. 2016/1091	The Electromagnetic Compatibility Regulations 2016		
		S.I. 2016/1101	The Electrical Equipment (Safety) Regulations 2016		

America					
Country	**Conformity/ approval**	**Law/standard**	**Description**	**Special feature**	**Product representation**
Canada	CSA	CSA 22.1 No. 100	CSA Standard for Motors and Generators	S120, S140, S190	cULus mark
				S40 ,S60, S80	cURus mark
USA	UL	UL 1004-1	UL Standard for Rotating Electrical Machines	S120, S140, S190	cULus mark
				S40 ,S60, S80	cURus mark

Asia					
Country	**Conformity/ approval**	**Law/standard**	**Description**	**Special feature**	**Product representation**
China	-	GB 30253	Minimum allowable values of energy efficiency and energy efficiency grades for permanent magnet synchronous motors	-	CEL mark
		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	EN IEC 60529,EN IEC 60034-5	IP54	Specification applies to the ready-to-use mounted state for S120, S140, S190
		IP65	
		IP65/IP21 IP65 (except AS side, here IP21)	Specification applies to the ready-to-use mounted state for S40, S60, S80

Insulation resistance			
Overvoltage category II	EN IEC 60664-1	II	0 … 1000 m amsl, S40, S60, S80 Use a surge protection device for a high level of protection against overvoltage.
Overvoltage category III		III	0 … 2000 m amsl, S120, S140, S190

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

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, without brake
		3K3 (-20 ...+40 °C)	

Site altitude			
0 … 1000 m amsl	-	S120, S140, S190	Without current derating
		S40, S60, S80	
1000 ... 2000 m. amsl		S120, S140, S190	Reduce rated output current by 5 %/1000 m

Air humidity			
-	-	Average relative humidity 85 %	Without condensation

Vibration resistance			
Operation	EN 60721-3-3:1995 + A2:1997	3M5	Only in operation with feedback AM20-8V-D or AM20-8V-D2 for S120, S140, S190
		3M6	S120, S140, S190

Vibration severity			
EN	EN IEC 60034-14	A	S120, S140, S190

Vibration velocity			
Free suspension	-	1.6 mm/s	S120, S140, S190

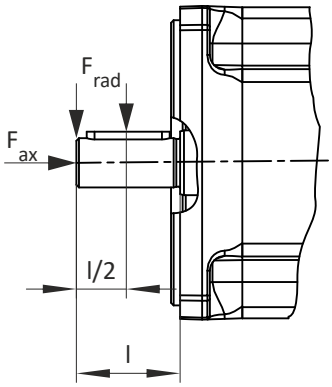
Smooth running, axial runout, concentricity			
DIN	DIN 49255	Class N	S40, S60, S80
EN	EN 50347 / IEC 60072-1	Normal Class	S120, S140, S190

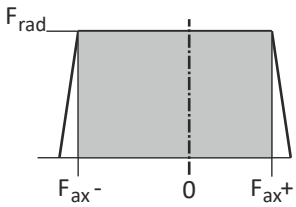
Radial forces and axial forces

The values of the bearing service life L_{10h} refer to the rated motor speed specified.
Depending on the ambient temperatures, they are additionally limited by the grease lifetime.

▸ Rated data 📖 33

Application of forces





Application of force at l/2

Motor			m850-S40		m850-S60		m850-S80	
Bearing service life 20000								
Radial force	F_{rad}	N	115	105	220	200	280	270
Max. axial force	$F_{Fax,+}$	N	23	21	44	40	56	54

Motor			m850-S120	m850-S140	m850-S190
Bearing service life 5000					
Radial force	F_{rad}	N	940	1210	2600
Min. axial force	$F_{ax,-}$	N	-870	-1100	-1440
Max. axial force	$F_{Fax,+}$	N	530	700	960
Bearing service life 10000					
Radial force	F_{rad}	N	740	960	2050
Min. axial force	$F_{ax,-}$	N	-670	-860	-1120
Max. axial force	$F_{Fax,+}$	N	330	450	640
Bearing service life 20000					
Radial force	F_{rad}	N	600	790	1620
Min. axial force	$F_{ax,-}$	N	-540	-690	-920
Max. axial force	$F_{Fax,+}$	N	200	290	440
Bearing service life 30000					
Radial force	F_{rad}	N	480	660	1440
Min. axial force	$F_{ax,-}$	N	-490	-660	-800
Max. axial force	$F_{Fax,+}$	N	150	260	320

Application of force at l

Motor			m850-S120	m850-S140	m850-S190
Bearing service life 5000					
Radial force	F_{rad}	N	820	1030	2170
Min. axial force	$F_{ax,-}$	N	-800	-1080	-1290
Max. axial force	$F_{Fax,+}$	N	460	680	810
Bearing service life 10000					
Radial force	F_{rad}	N	650	820	1710
Min. axial force	$F_{ax,-}$	N	-640	-830	-1030
Max. axial force	$F_{Fax,+}$	N	300	420	550
Bearing service life 20000					
Radial force	F_{rad}	N	530	670	1350
Min. axial force	$F_{ax,-}$	N	-520	-670	-820
Max. axial force	$F_{Fax,+}$	N	180	270	340
Bearing service life 30000					
Radial force	F_{rad}	N	420	550	1210
Min. axial force	$F_{ax,-}$	N	-470	-630	-720
Max. axial force	$F_{Fax,+}$	N	130	230	240

Rated data

Inverter mains connection 400 V, Self-ventilated motors

Motor			m850-S40/ S9000	m850-S40/ L9000	m850-S60/ S6000	m850-S60/ L6000	m850-S80/ S5500	m850-S80/ L5500
Standstill torque	M_0	Nm	0.180	0.350	0.700	1.50	2.80	3.50
Rated torque	M_{rated}	Nm	0.120	0.210	0.500	0.900	1.70	2.10
Max. torque	M_{max}	Nm	0.72	1.4	2.6	5.8	10.5	13.4
Rated speed	n_{rated}	rpm	9000	9000	6000	6000	5500	5500
Max. speed	n_{max}	rpm	10000	10000	10000	10000	10000	10000
Rated power	P_{rated}	kW	0.11	0.2	0.325	0.55	1	1.2
Standstill current	I_0	A	0.800	1.60	0.900	1.90	3.50	4.20
Rated current	I_{rated}	A	0.700	1.20	0.700	1.20	2.30	2.80
Max. current	I_{max}	A	3.20	6.40	6.40	13.2	13.2	15.6
Rated voltage	V_{rated}	V	149	134	310	318	282	292
Rated frequency	f_{rated}	Hz	300	300	300	300	275	275
Moment of inertia	J	kgcm²	0.03	0.054	0.22	0.413	1.40	1.93
Efficiency	η		0.64	0.73	0.84	0.85	0.87	0.88
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.23	0.22	0.78	0.79	0.8	0.83
Voltage constant	$KE_{LL\ 150\ °C}$	V/ (1000/ min)	12.32	11.98	45.25	43.62	45.59	47.82
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	25.6	8.6	26.4	9.8	4.6	2.8
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	38.579	12.96	39.785	14.769	6.932	4.22
Stator inductance	L	mH	4.87	2.3	16.14	8.48	4.74	3.74
Weight	m	kg	0.5	0.7	1.45	2	3.2	3.85

Motor			m850-S120/ S3960	m850-S120/ M3960	m850-S120/ L3960	m850-S140/ S3240	m850-S140/ M3240	m850-S140/ L3240
Standstill torque	M_0	Nm	6.50	11.0	15.0	11.0	21.0	28.0
Rated torque	M_{rated}	Nm	4.80	7.40	9.00	8.50	14.0	17.4
Max. torque	M_{max}	Nm	14.5	29.0	44.0	26.0	53.5	80.0
Rated speed	n_{rated}	rpm	3960	3960	3960	3240	3240	3240
Max. speed	n_{max}	rpm	6000	6000	6000	6000	6000	6000
Rated power	P_{rated}	kW	2	3.1	3.7	2.9	4.8	5.9
Standstill current	I_0	A	5.50	8.80	12.1	7.40	14.0	18.0
Rated current	I_{rated}	A	4.30	6.40	7.80	6.30	10.0	12.2
Max. current	I_{max}	A	15.0	28.0	42.0	23.0	45.5	66.0
Rated voltage	V_{rated}	V	330	330	320	340	330	330
Rated frequency	f_{rated}	Hz	330	330	330	270	270	270
Moment of inertia	J	kgcm²	6.50	12.4	18.2	15.7	30.1	44.6
Efficiency	η		0.902	0.914	0.914	0.879	0.915	0.926
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.18	1.25	1.24	1.49	1.50	1.56
Voltage constant	$KE_{LL\ 150\ °C}$	V/ (1000/ min)	68.99	73.1	72.93	86.81	88.36	90.67
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	2.24	1.02	0.63	1.436	0.562	0.366
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	3.376	1.537	0.949	2.164	0.847	0.552
Stator inductance	L	mH	11.5	6.73	4.58	9.90	5.22	3.76
Weight	m	kg	6.5	9.25	12.0	9.50	14.5	19.5

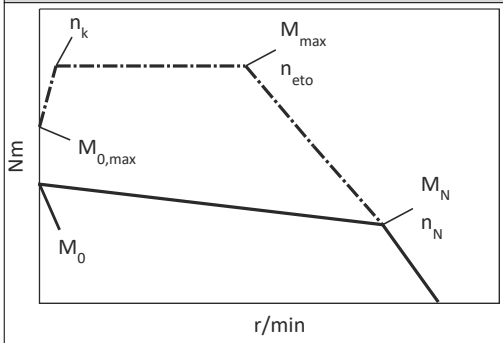
Motor			**m850-S190/S3000**	**m850-S190/M3000**	**m850-S190/L2520**
Standstill torque	M_0	Nm	27.0	46.0	67.0
Rated torque	M_{rated}	Nm	16.0	24.0	35.0
Max. torque	M_{max}	Nm	71.0	120	200
Rated speed	n_{rated}	rpm	3000	3000	2520
Max. speed	n_{max}	rpm	4500	4500	4500
Rated power	P_{rated}	kW	5	7.5	9.2
Standstill current	I_0	A	16.0	26.8	30.8
Rated current	I_{rated}	A	10.3	15.4	17.7
Max. current	I_{max}	A	64.0	87.0	112
Rated voltage	V_{rated}	V	340	330	345
Rated frequency	f_{rated}	Hz	250	250	210
Moment of inertia	J	kgcm²	60.8	117	193
Efficiency	η		0.905	0.919	0.929
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.69	1.72	2.18
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	99.24	101.13	124.86
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.452	0.196	0.16
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.681	0.295	0.241
Stator inductance	L	mH	5.46	2.90	2.76
Weight	m	kg	19.8	28.5	41.0

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	With a zero speed rpm, the standstill torque and standstill current are to be reduced by 30 % after 2 % seconds. For applications that require a longer holding of the standstill torque, it is recommended to hold the drive via the holding brake and, for instance, reducing the current by inverter disable.
	$M_{0,max}$	Max. standstill torque	With an active load observe (e. g. vertical drive axes, hoists, test benches, unwinders).
	M_N	Rated torque	
	n_N	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
m850-S40	150
m850-S60	100
m850-S80	
m850-S120	60
m850-S140	
m850-S190	

i950 cabinet servo inverter

The following data apply to a mains voltage 3x 400 V and a switching frequency 4 kHz of the inverter

m850-120 Self-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
m850-S120/S3960	i950-C2.2/400-3	6.5	4.8	11.8	11.8
	i950-C4.0/400-3			14.5	14.5
	i950-C0.55/400-3	2.1	2.0	4.4	4.4
	i950-C0.75/400-3	2.8	2.7	5.7	5.7
m850-S120/M3960	i950-C4.0/400-3	11.0	7.4	21.6	21.6
	i950-C2.2/400-3	7.0	6.5	13.7	13.7
	i950-C7.5/400-3	11.0	7.4	29.0	29.0
m850-S120/L3960	i950-C2.2/400-3	6.9	6.5	13.9	13.9
	i950-C4.0/400-3	11.8	9.0	22.7	22.7
	i950-C7.5/400-3	15.0		36.5	36.5
	i950-C11/400-3			44.0	44.0

m850-140 Self-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
m850-S140/S3240	i950-C7.5/400-3	11.0	8.5	26.0	26.0
	i950-C2.2/400-3	8.3	7.6	15.7	15.7
	i950-C4.0/400-3	11.0	8.5	23.2	23.2
m850-S140/M3240		14.3	13.3	27.5	27.5
	i950-C11/400-3	21.0	14.0	53.5	53.5
	i950-C7.5/400-3			43.1	43.1
	i950-C2.2/400-3	8.4	7.8	17.1	17.1
m850-S140/L3240		8.7	8.0	18.0	18.0
	i950-C22/400-3	28.0	17.4	80.0	80.0
	i950-C4.0/400-3	14.8	13.5	29.4	29.4
	i950-C7.5/400-3	25.7	17.4	47.8	47.8
	i950-C11/400-3	28.0		63.3	63.3
	i950-C15/400-3			78.5	78.5

m850-190 Self-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
m850-S190/S3000	i950-C7.5/400-3	27.0	16.0	48.9	48.9
	i950-C4.0/400-3	16.0	14.8	31.4	31.4
	i950-C11/400-3	27.0	16.0	61.7	61.7
	i950-C15/400-3			71.0	71.0
	i950-C2.2/400-3	9.4	8.7	19.5	19.5
m850-S190/M3000	i950-C22/400-3	46.0	24.0	120	120
	i950-C7.5/400-3	28.3		55.5	55.5
	i950-C11/400-3	40.3		75.4	75.4
	i950-C15/400-3	46.0		96.5	96.5
	i950-C4.0/400-3	16.3	14.8	33.4	33.4
m850-S190/L2520	i950-C11/400-3	51.1	35.0	98.6	98.6
	i950-C22/400-3	67.0		176	176
	i950-C4.0/400-3	20.7	18.8	42.4	42.4
	i950-C7.5/400-3	35.9	32.6	71.4	71.4
	i950-C15/400-3	67.0	35.0	129	129
	i950-C30/400-3			200	200

9400 HighLine servo drives

The following data apply to a mains voltage 3x 400 V and a switching frequency 4 kHz of the inverter.

m850-120 Self-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
m850-S120/S3960	E94AXXE0044	5.9	4.8	14.5	14.5
	E94AXXE0074	6.5			
m850-S120/M3960		11.0	7.4	23.4	23.4
	E94AXXE0094			29.0	29.0
m850-S120/L3960	E94AXXE0074	10.9	9.0	24.8	24.8
	E94AXXE0094	14.5		31.9	31.9
	E94AXXE0134	15.0		41.6	41.6
	E94AXXE0174			44.0	44.0

m850-140 Self-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
m850-S140/S3240	E94AXXE0074	11.0	8.5	24.7	24.7
	E94AXXE0094			26.0	26.0
m850-S140/M3240	E94AXXE0074	13.2	12.3	30.0	30.0
	E94AXXE0094	17.6	14.0	38.0	38.0
	E94AXXE0134	21.0		48.5	48.5
	E94AXXE0174			53.5	53.5
m850-S140/L3240	E94AXXE0094	18.2	16.7	41.6	41.6
	E94AXXE0134	25.4	17.4	54.8	54.8
	E94AXXE0174	28.0		65.8	65.8
	E94AXXE0244			74.3	74.3
	E94AXXE0324			80.0	80.0

m850-190 Self-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
m850-S190/S3000	E94AXXE0074	14.9	13.7	34.2	34.2
	E94AXXE0094	19.7	16.0	43.2	43.2
	E94AXXE0134	27.0		55.0	55.0
	E94AXXE0174			63.6	63.6
	E94AXXE0244				
	E94AXXE0324			71.0	71.0
m850-S190/M3000	E94AXXE0134	28.0	24.0	64.3	64.3
	E94AXXE0174	35.4		78.7	78.7
	E94AXXE0244	46.0		90.4	90.4
	E94AXXE0324			110	110
	E94AXXE0474			120	120
m850-S190/L2520	E94AXXE0134	35.5	32.2	83.3	83.3
	E94AXXE0174	44.8	35.0	103	103
	E94AXXE0244	64.0		120	120
	E94AXXE0324	67.0		150	150
	E94AXXE0474			176	176
	E94AXXE0594			200	200

8400 TopLine inverter drives

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

m850-120 Self-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
m850-S120/S3960	E84AVTCX1524	4.4	4.6	6.9	8.8
	E84AVTCX2224	4.8	6.5	9.4	11.8
	E84AVTCX3024			11.6	14.2
	E84AVTCX4024			14.1	14.5
	E84AVTCX5524			14.5	
m850-S120/M3960	E84AVTCX2224	6.5	7.0	10.5	13.7
	E84AVTCX3024	7.4	9.1	13.5	17.3
	E84AVTCX4024		11.0	17.0	21.6
	E84AVTCX5524			22.0	27.5
	E84AVTCX7524			26.6	29.0
	E84AVTCX1134			29.0	
m850-S120/L3960	E84AVTCX3024	8.4	9.0	13.6	17.9
	E84AVTCX4024	9.0	11.8	17.5	22.7
	E84AVTCX5524		15.0	23.2	29.9
	E84AVTCX7524			28.7	36.5
	E84AVTCX1134			38.5	44.0
	E84AVTCX1534			44.0	

m850-140 Self-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
m850-S140/S3240	E84AVTCX1524	7.6	8.3	12.3	15.7
	E84AVTCX3024	8.5	10.9	15.4	19.3
	E84AVTCX4024		11.0	19.0	23.2
	E84AVTCX5524			23.6	26.0
	E84AVTCX7524			26.0	
m850-S140/M3240	E84AVTCX4024	13.3	14.3	21.4	27.5
	E84AVTCX5524	14.0	19.5	28.1	35.8
	E84AVTCX7524		21.0	34.4	43.0
	E84AVTCX1134			45.2	53.5
	E84AVTCX1534			53.5	
m850-S140/L3240	E84AVTCX5524	17.4	20.2	30.1	39.0
	E84AVTCX7524		25.7	37.4	47.8
	E84AVTCX1134		28.0	50.5	63.4
	E84AVTCX1534			64.4	78.5
	E84AVTCX1834			74.0	80.0
	E84AVTCX2234			80.0	

m850-190 Self-ventilated

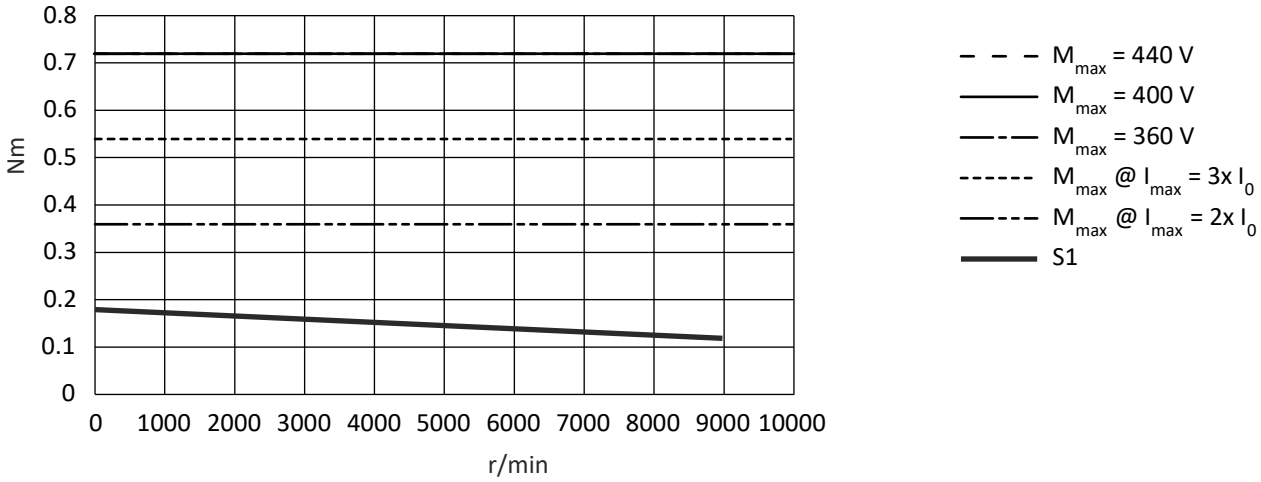
Motor	Inverter	Standstill torque	Rated torque	Max. standstill torque	Max. torque
		M_0	M_{rated}	$M_{0, max}$	M_{max}
		Nm	Nm	Nm	Nm
m850-S190/S3000	E84AVTCX4024	14.8	16.0	24.1	31.4
	E84AVTCX5524	16.0	21.9	32.1	40.7
	E84AVTCX7524		27.0	39.2	48.9
	E84AVTCX1134			51.4	61.8
	E84AVTCX1534			62.5	71.0
	E84AVTCX1834			68.8	
	E84AVTCX2234			71.0	
m850-S190/M3000	E84AVTCX5524	20.3	22.3	33.5	44.6
	E84AVTCX7524	24.0	28.3	42.6	55.5
	E84AVTCX1134		40.3	58.9	75.4
	E84AVTCX1534		46.0	76.7	96.5
	E84AVTCX1834			90.0	112
	E84AVTCX2234			104	120
	E84AVTCX3034			120	
m850-S190/L2520	E84AVTCX7524	32.6	35.9	53.9	71.4
	E84AVTCX1134	35.0	51.1	76.0	98.6
	E84AVTCX1534		67.0	101	129
	E84AVTCX1834			120	152
	E84AVTCX2234			140	169
	E84AVTCX3034			168	200
	E84AVTCX3734			195	
	E84AVTCX4534			200	

Torque characteristics

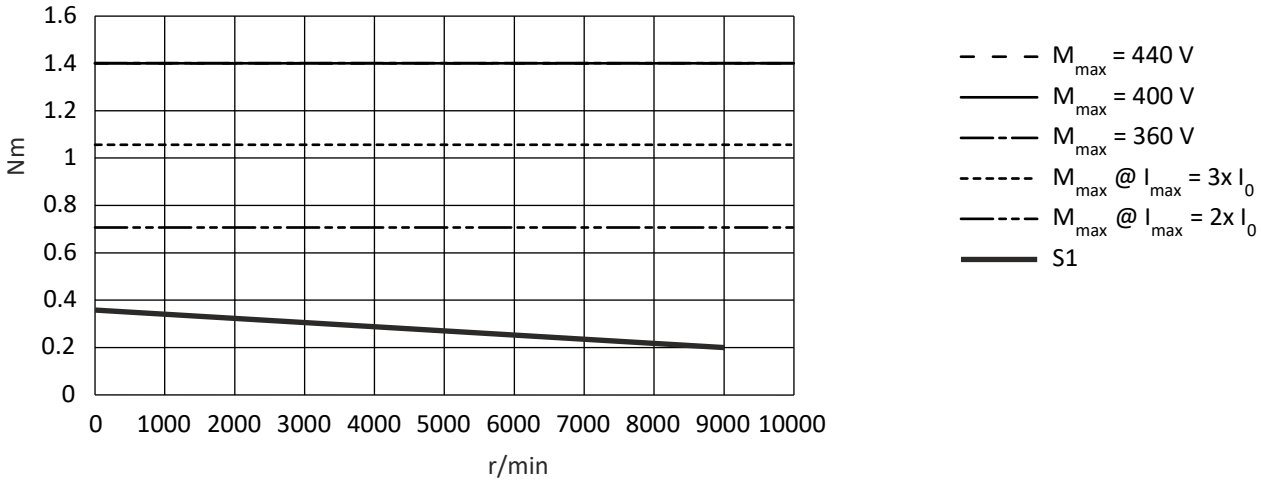
The torque/speed characteristic for your motor/inverter combination can be found on the Internet:
http://www.lenze.com → Product Finder → M-n characteristics

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

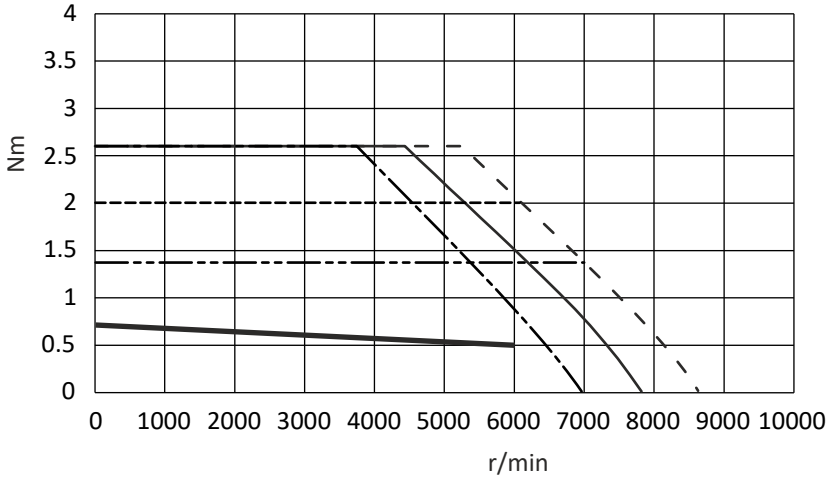
m850-S40/S9000



m850-S40/L9000

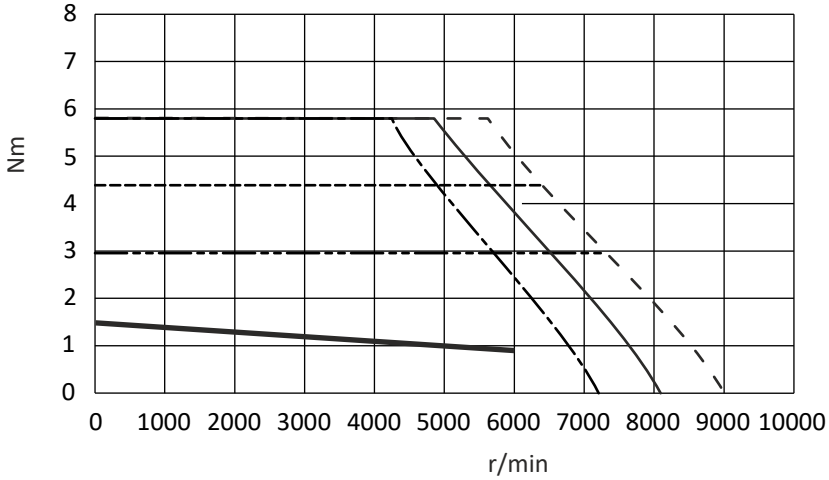


m850-S60/S6000



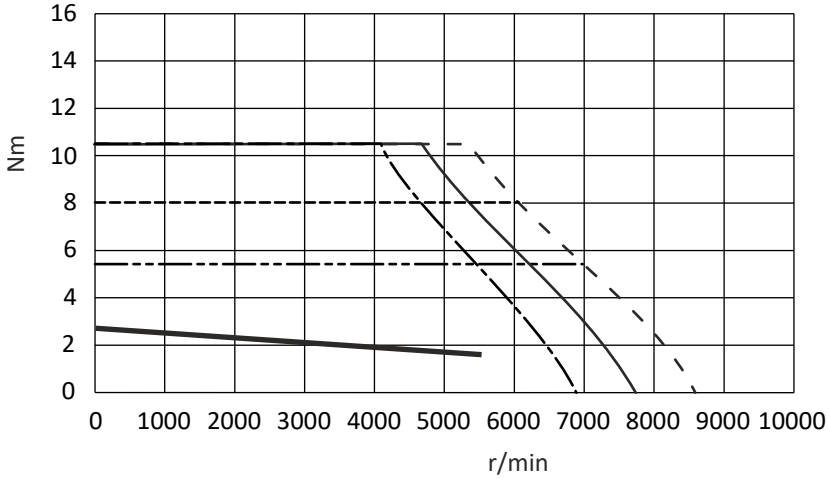
- M_{max} = 440 V
- M_{max} = 400 V
- M_{max} = 360 V
- M_{max} @ I_{max} = 3x I_0
- M_{max} @ I_{max} = 2x I_0
- S1

m850-S60/L6000



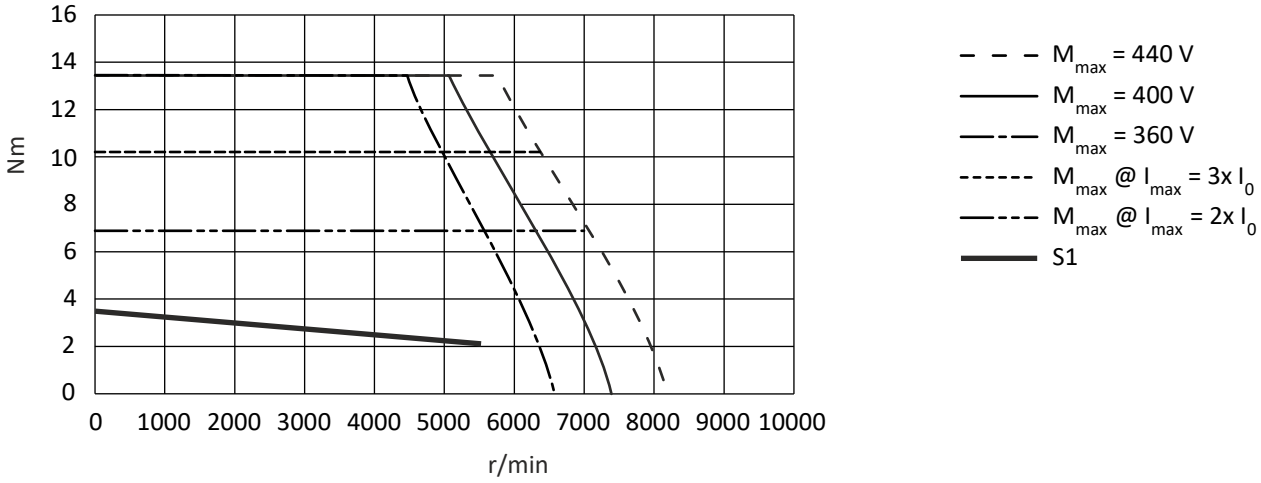
- M_{max} = 440 V
- M_{max} = 400 V
- M_{max} = 360 V
- M_{max} @ I_{max} = 3x I_0
- M_{max} @ I_{max} = 2x I_0
- S1

m850-S80/S5500

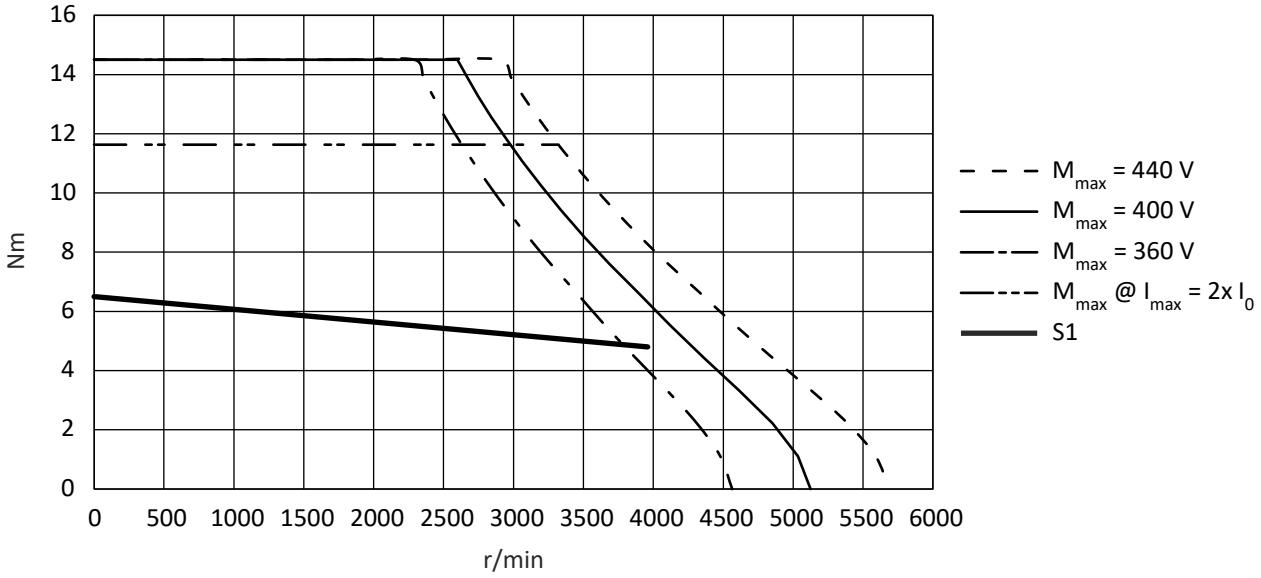


- M_{max} = 440 V
- M_{max} = 400 V
- M_{max} = 360 V
- M_{max} @ I_{max} = 3x I_0
- M_{max} @ I_{max} = 2x I_0
- S1

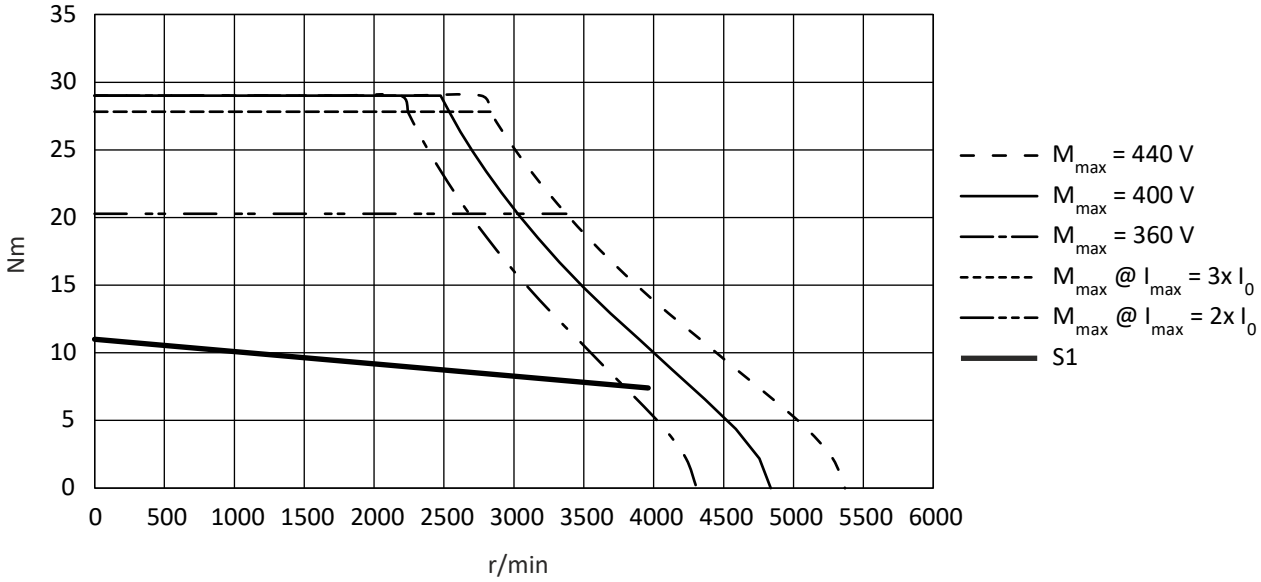
m850-S80/L5500



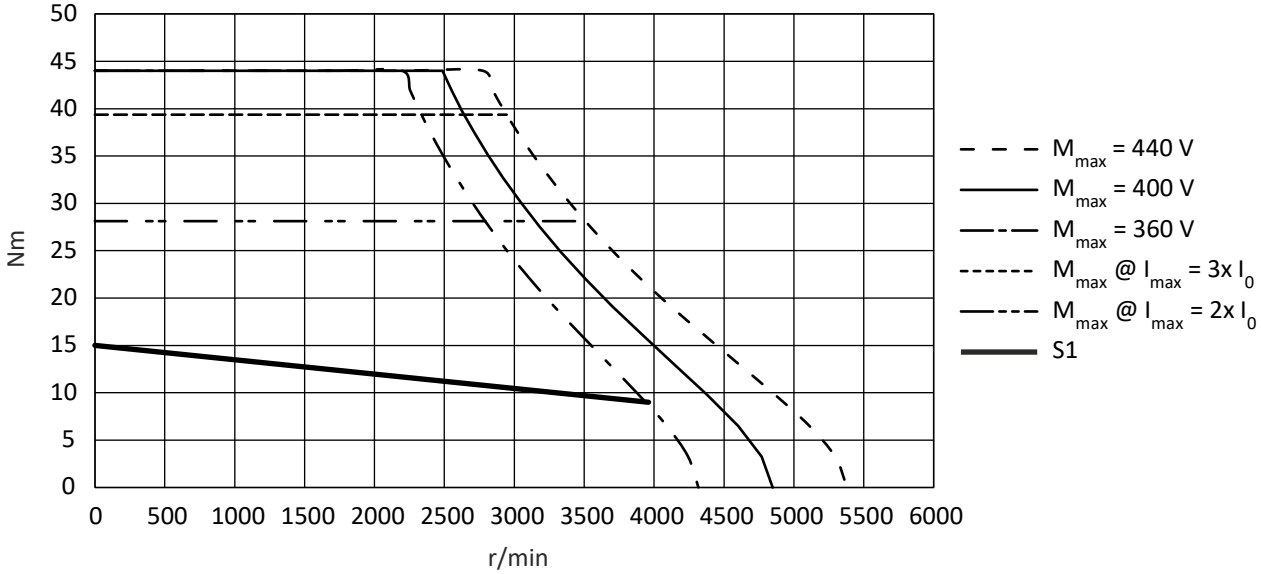
m850-S120/S3960



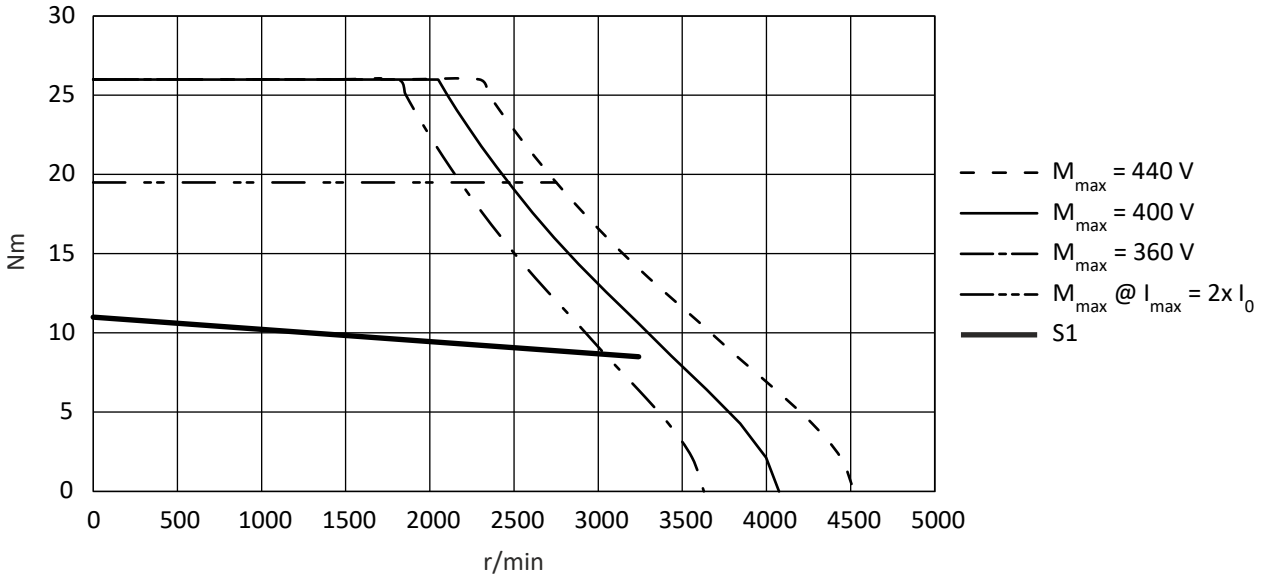
m850-S120/M3960



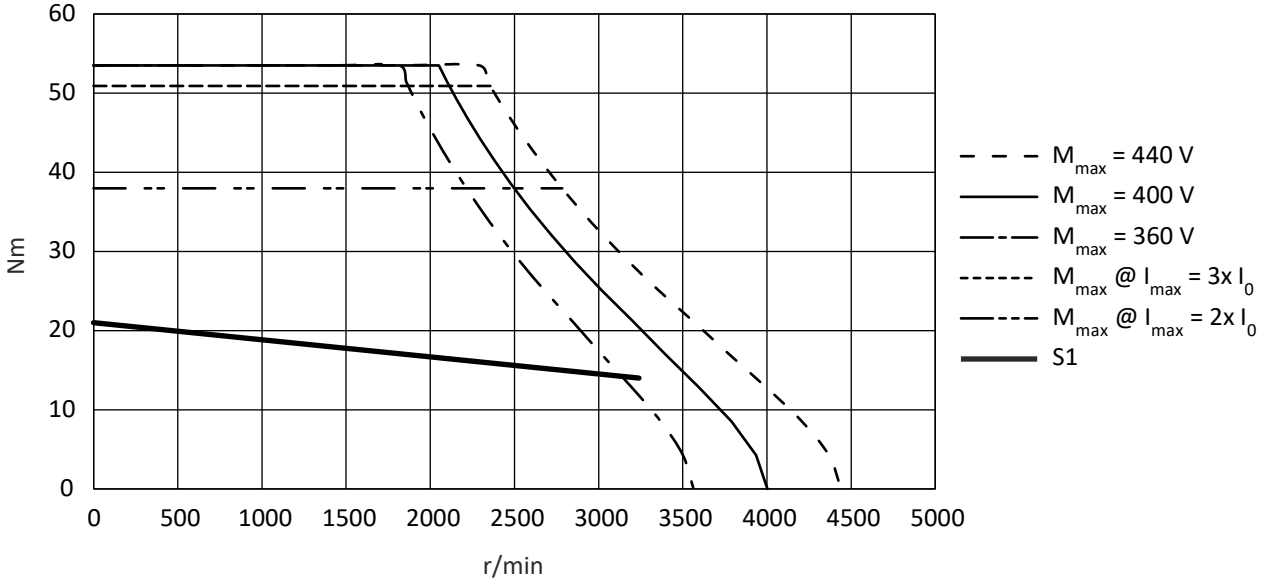
m850-S120/L3960



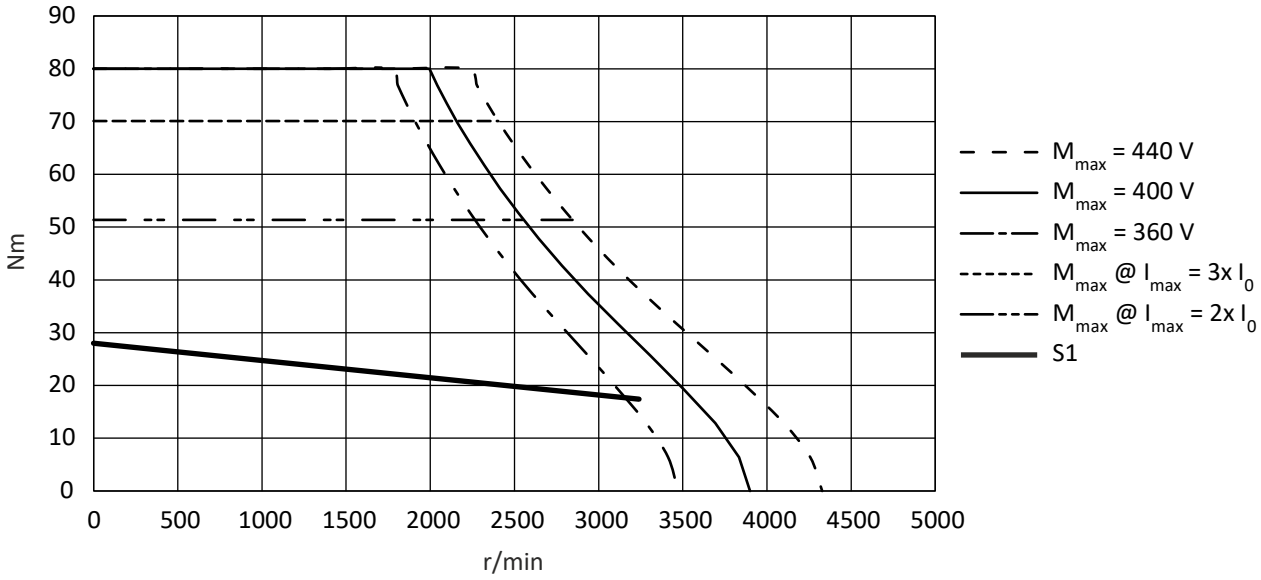
m850-S140/S3240



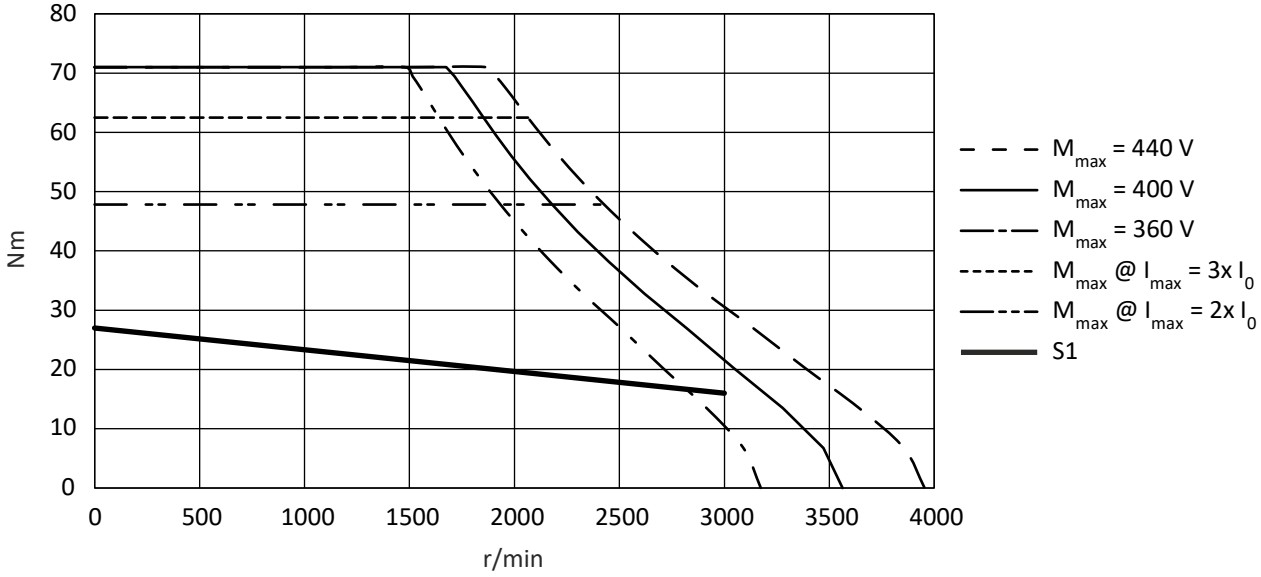
m850-S140/M3240



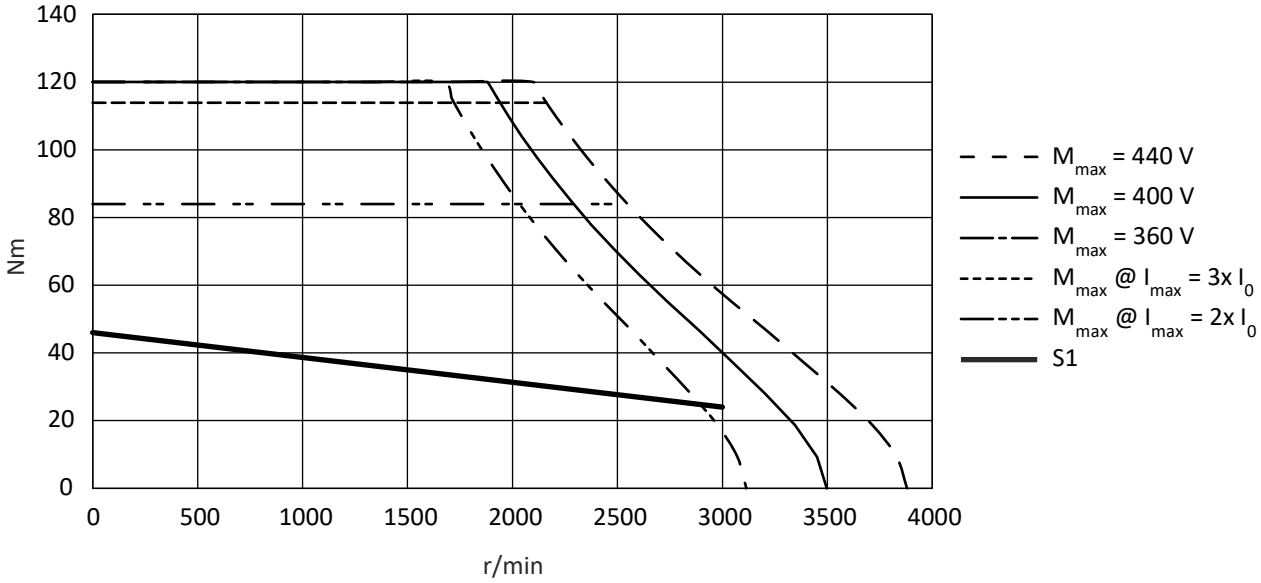
m850-S140/L3240



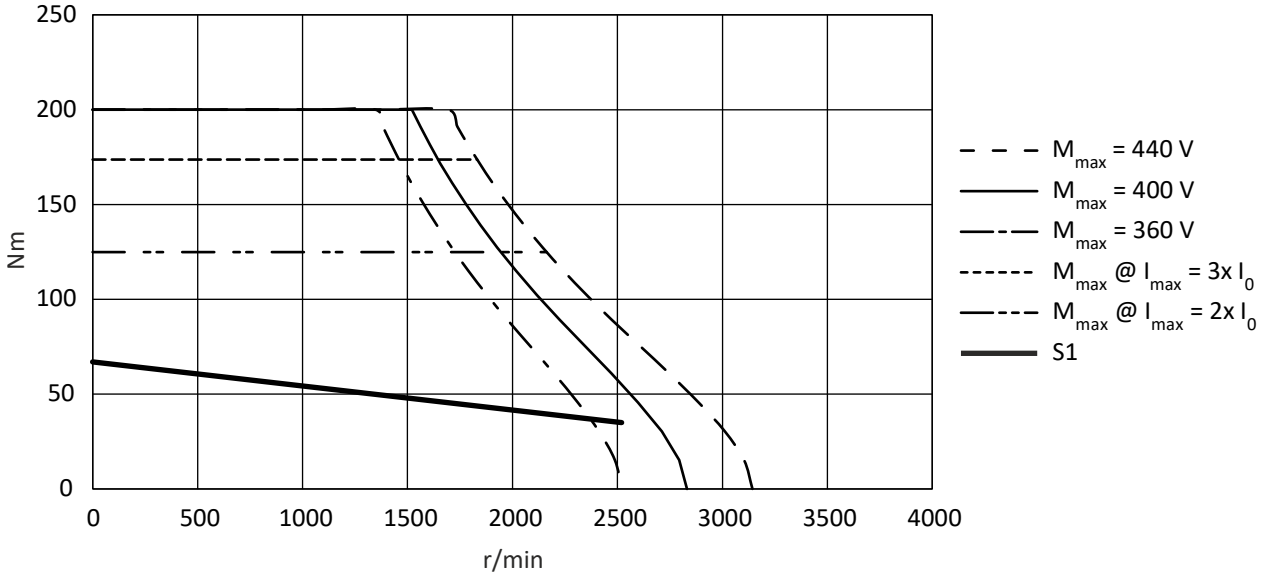
m850-S190/S3000



m850-S190/M3000



m850-S190/L2520



Dimensions

Notes on the basic dimensions

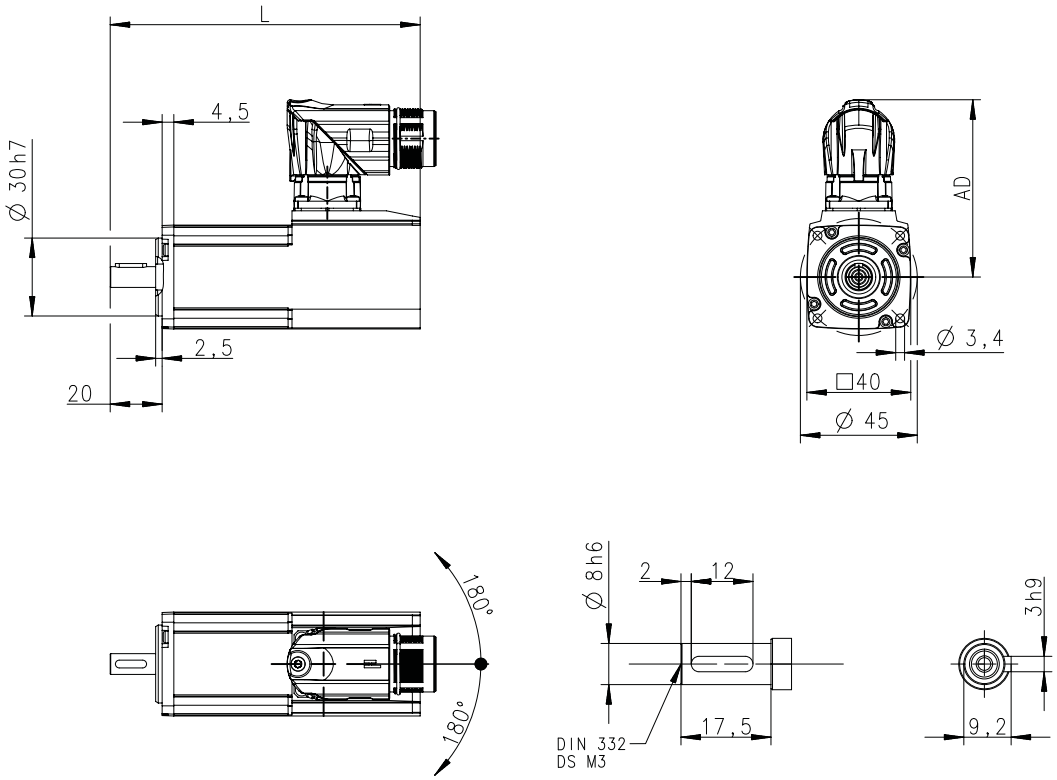
The dimensions also apply for motors with One Cable Technology (OCT).

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

Basic dimensions

m850-S40, selbstbelüftet

Abtriebsflansch FF45

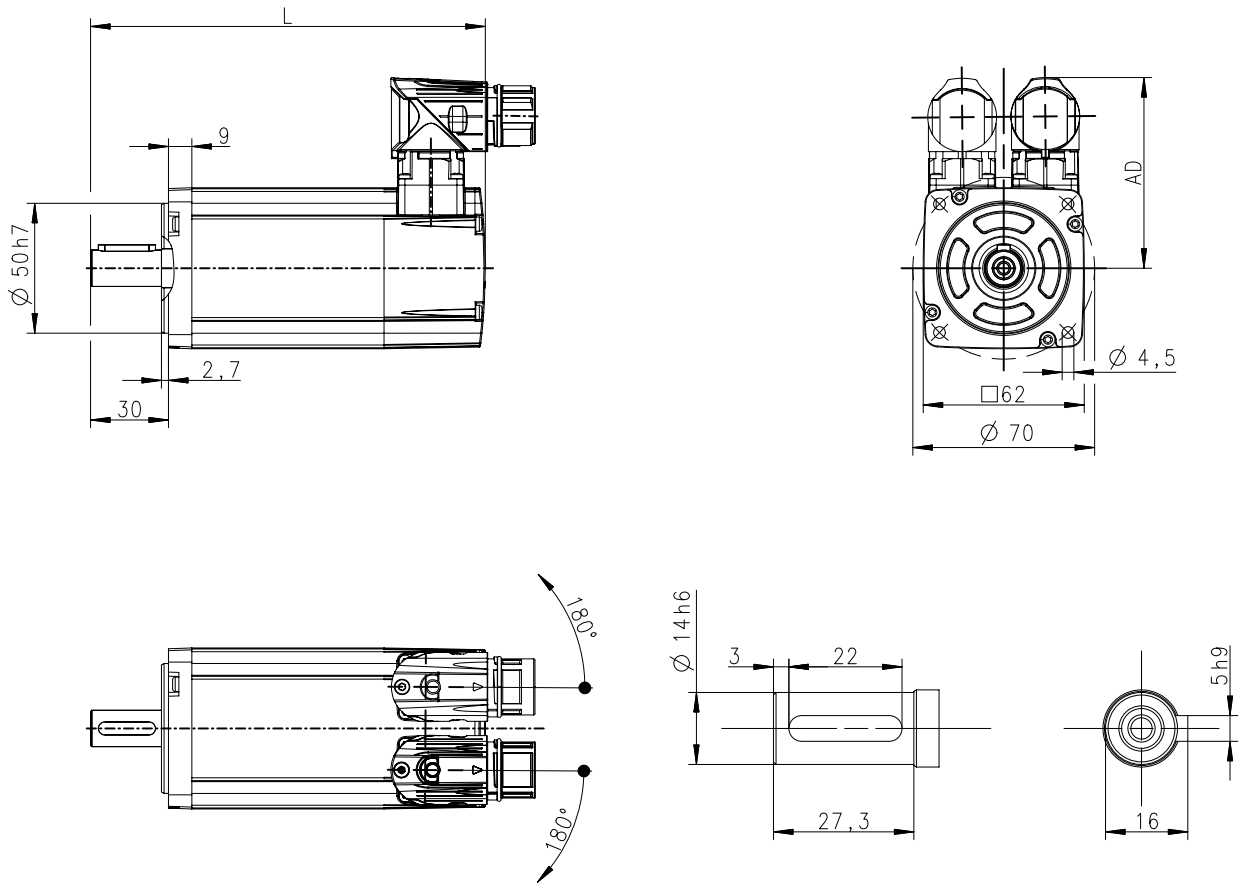


8801755-00

Motor			m850-S40/S9000	m850-S40/L9000
Total length without brake	L	mm	119	144
Total length with brake	L	mm	155	180
Motor/connection distance	AD	mm	70	

m850-S60, selbstbelüftet

Abtriebsflansch FF70



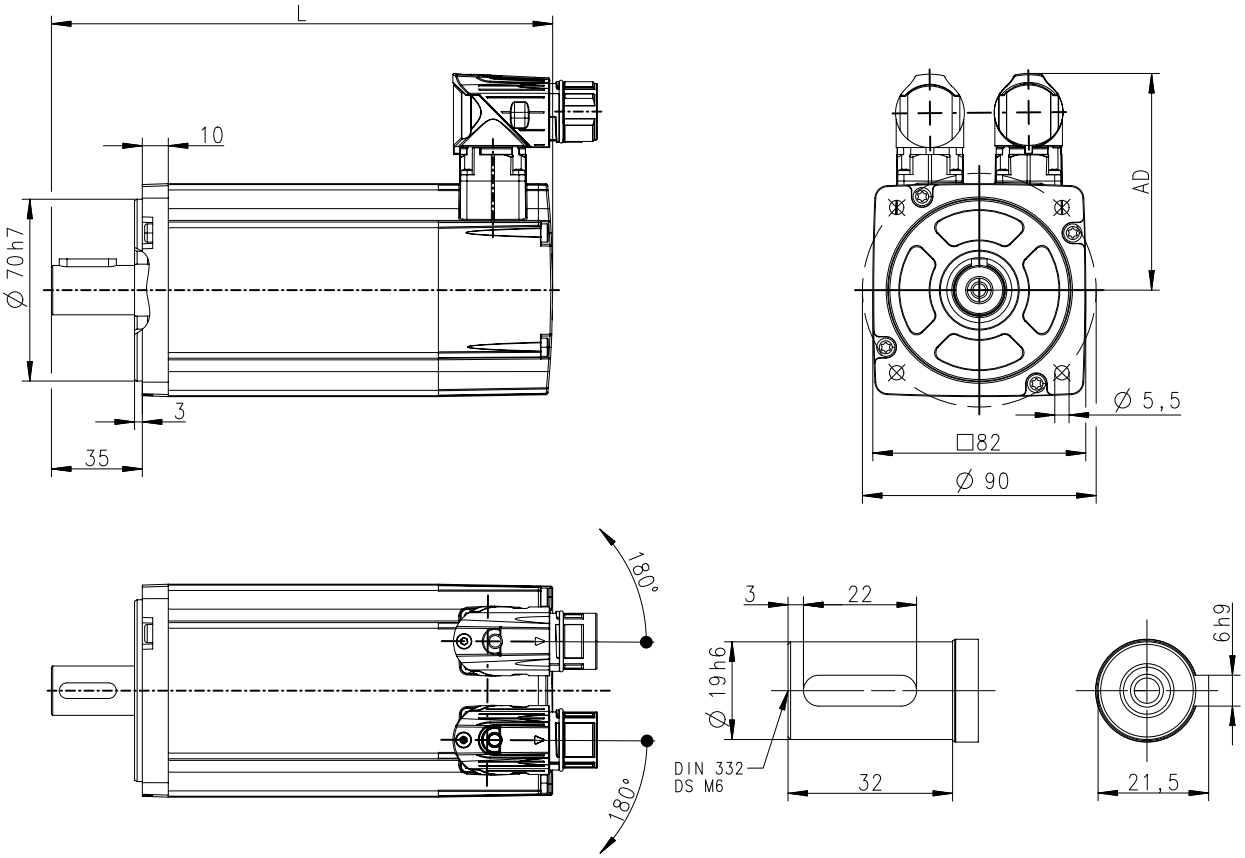
8801756-00

Motor			m850-S60/S6000	m850-S60/L6000
Total length without brake	L	mm	152	182
Total length with brake	L	mm	186	216
Motor/connection distance	AD	mm	73	

One Cable Technology (OCT): AD = 77 mm

m850-S80, selbstbelüftet

Abtriebsflansch FF90



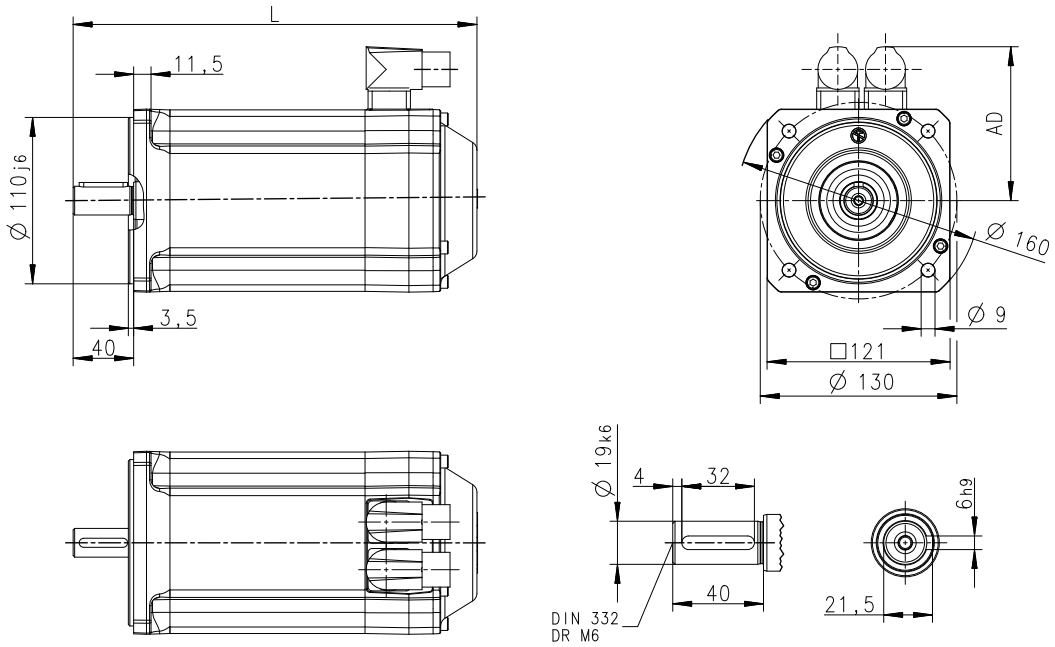
8801757-00

Motor			m850-S80/S5500	m850-S80/L5500
Total length without brake	L	mm	193	213
Total length with brake	L	mm	235	255
Motor/connection distance	AD	mm	83	

One Cable Technology (OCT): AD = 87 mm

m850-S120, self-ventilated

Output flange FF130

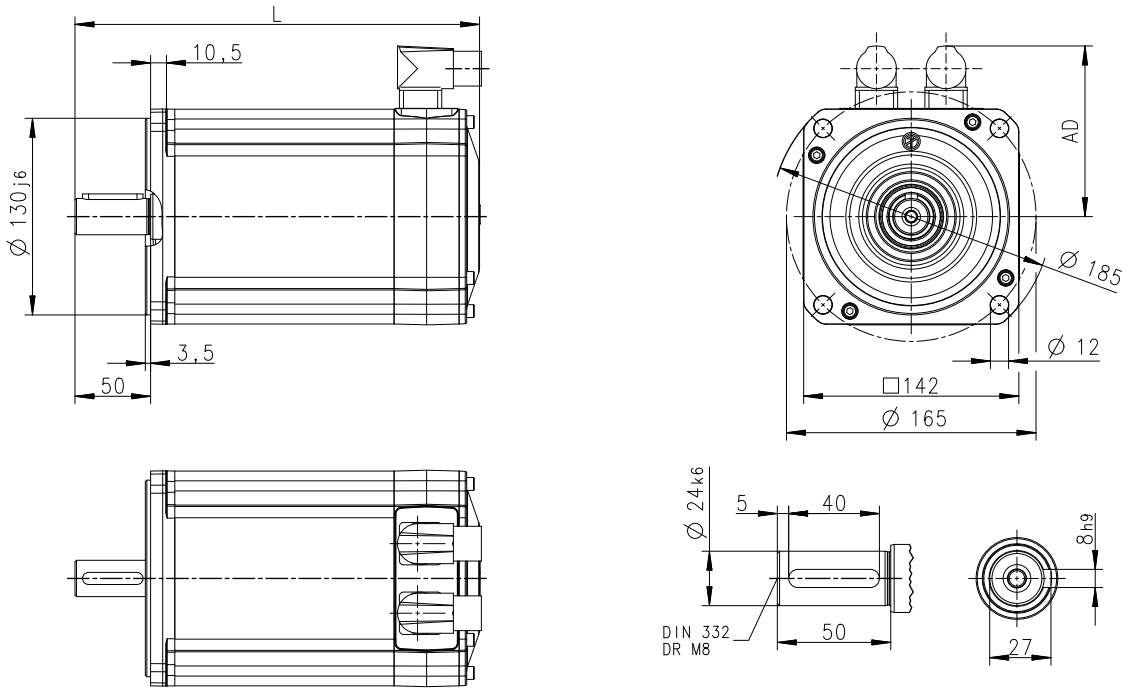


8800564-00

Motor			m850-S120/S3960	m850-S120/M3960	m850-S120/L3960
Total length without brake	L	mm	229	267	305
Total length with brake	L	mm	275	313	351
Motor/connection distance	AD	mm	102		

m850-S140, self-ventilated

Output flange FF165

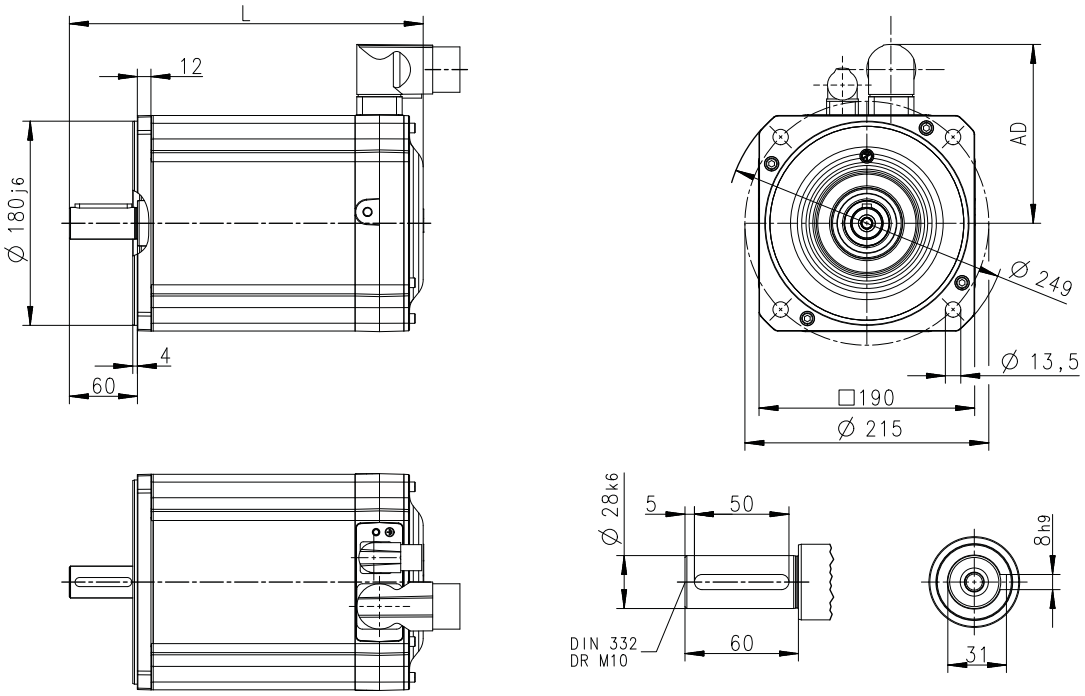


8800565-00

Motor			m850-S140/S3240	m850-S140/M3240	m850-S140/L3240
Total length without brake	L	mm	232	272	312
Total length with brake	L	mm	285	325	365
Motor/connection distance	AD	mm	114		135

m850-S190, self-ventilated

Output flange FF215



8800566-00

Motor			m850-S190/S3000	m850-S190/M3000	m850-S190/L2520
Total length without brake	L	mm	264	312	376
Total length with brake	L	mm	332	380	444
Motor/connection distance	AD	mm	137	158	

Weights

Basic weights

The basic weights are listed in the rated data.

▸ Rated data 33

Observe ▸ Additional weights 57!

Additional weights

Holding brake

Motor			m850-S40/ S9000	m850-S40/ L9000	m850-S60/ S6000	m850-S60/ L6000	m850-S80/ L5500	m850-S80/ S5500
Weight	m	kg	0.085	0.085	0.2	0.2	0.4	0.4

Motor			m850-S120/ L3960	m850-S120/ S3960	m850-S120/ M3960	m850-S140/ M3240	m850-S140/ L3240	m850-S140/ S3240
Weight	m	kg	2.0	2.0	2.0	3.0	3.0	3.0

Motor			m850-S190/S3000	m850-S190/M3000	m850-S190/L2520
Weight	m	kg	6.70	6.70	6.70

Product extensions

Motor connection

Connection via connector

The electrical connection to the servo motors is made via M23 or M40 plug connectors as standard.

The connection is made via two connectors:

- For power and brake
- For feedback and temperature monitoring

Alternatively, Lenze offers a One Cable Technology (OCT).

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.

Preassembled Lenze system cables are available for fast and error-free connection of Lenze motors to Lenze inverters.

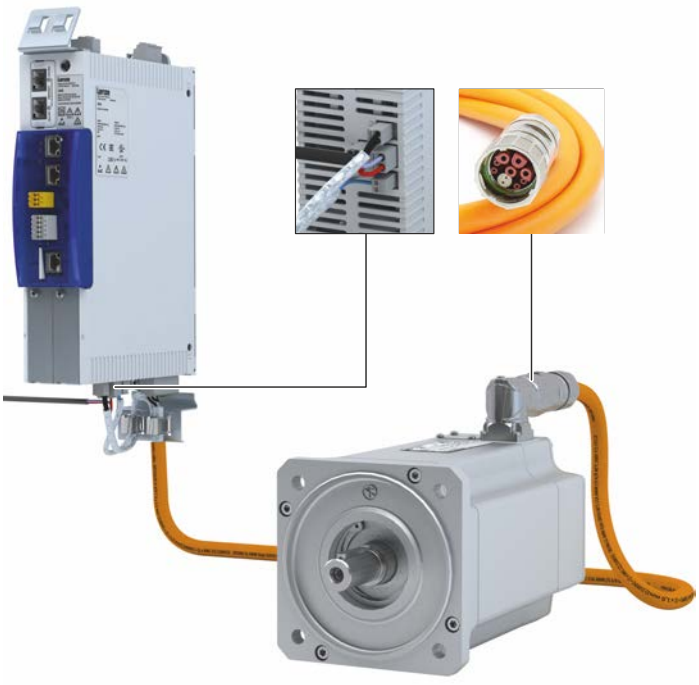
Details and data can be found in the "Accessories" brochure on the Internet.

One Cable Technology (OCT)

With the help of digital absolute value encoders and the HIPERFACE DSL® open motor feedback protocol, the motor supports the use of future-oriented One Cable Technology (OCT).

Advantages

- All the wiring required is carried out in just one connector.
- The use of system cables merges the servo and feedback cables.
- Connection cables, cable variance, and connection costs are thus reasonably minimized.
- The motor temperature is transmitted digitally together with the encoder signal. An additional connection for a motor temperature sensor is not required.
- Speed-dependent safety functions can be realized by using the safety-rated digital absolute value encoder.



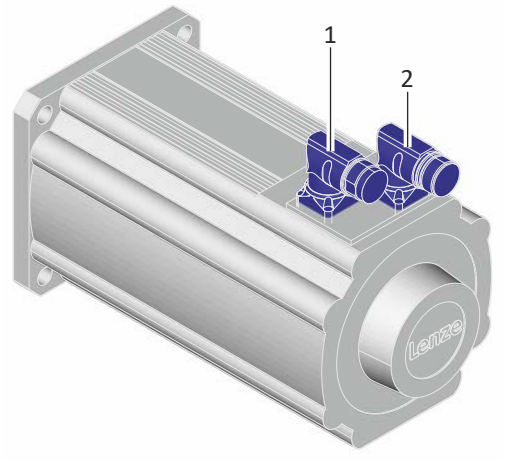
The M23 connector for One Cable Technology (OCT) has been changed; the change can be recognized by the color of the connector:

- Old connector: Blue
- New connector: Red

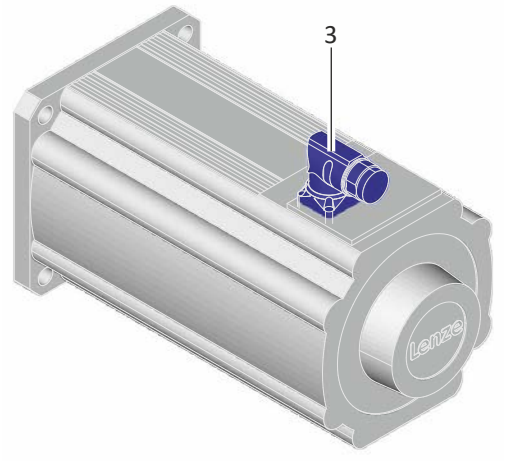
Only motor/system cable connectors of the same color can be plugged in.

Position of the connections

Standard connection



One Cable Technology (OCT)



Assignment motor - connector m850-S40 ... m850-S80

Position	Meaning	Position	Meaning
1	M23 connector, 6-pole • Feedback connection • Connection of temperature monitoring	3	For One Cable Technology (OCT) M23 connector • Power connection • Brake connection • PE connection • Digital absolute value encoder connection • Temperature monitoring connection
2	M23 connector • Power connection • Brake connection • PE connection		

Standard connection: Power and brake **One Cable Technology (OCT): Power, brake, feedback and temperature monitoring connection**					
Motor	**Connector**	**Motor**	**Connector**	**Motor**	**Connector**
m850-S40/S9000	M23	m850-S60/S6000	M23	m850-S80/S5500	M23
m850-S40/L9000	M23	m850-S60/L6000	M23	m850-S80/L5500	M23

Assignment motor - connector m850-S120 ... m850-S190

Position	Meaning	Position	Meaning
1	M23 connector, 6-pole M40 connector, 8-pole • Power connection • Brake connection • PE connection	3	For One Cable Technology (OCT) M23 connector M40 connector • Power connection • Brake connection • PE connection • Digital absolute value encoder connection • Temperature monitoring connection
2	M23 connector • Feedback connection • Temperature monitoring connection		

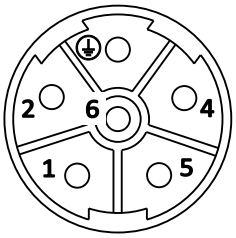
Standard connection: Power and brake **One Cable Technology (OCT): Power, brake, feedback and temperature monitoring connection**					
Motor	**Connector**	**Motor**	**Connector**	**Motor**	**Connector**
m850-S120/S3960	M23	m850-S140/S3240	M23	m850-S190/S3000	M23
m850-S120/M3960	M23	m850-S140/M3240	M23	m850-S190/M3000	M40
m850-S120/L3960	M23	m850-S140/L3240	M40	m850-S190/L2520	M40

Standard connection

Connection of power and brake

ICN-M23 connector assignment

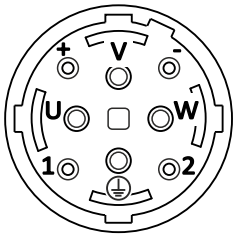
6-pole



M23 6-pole		
Contact	**Name**	**Meaning**
PE	PE	PE conductor
1	BD1	DC +/AC brake
2	BD2	DC -/AC brake
4	U	Power phase U
5	V	Power phase V
6	W	Power phase W

M40 connector assignment for motor cables

8-pole

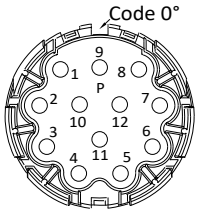


M40 8-pole		
Contact	**Name**	**Meaning**
+	BD1	Holding brake +
PE	PE	PE conductor
W	W	Power phase W
U	U	Power phase U
V	V	Power phase V
-	BD2	Holding brake -
1		Not assigned
2		Not assigned

Feedback and temperature monitoring connection

ICN-M23 connector assignment

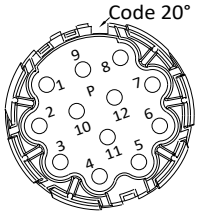
Resolver



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©

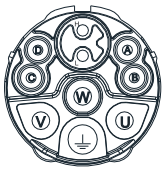


ICN M23 for encoders		
Contact	**Name**	**Meaning**
1	B	Track B / +SIN
2	A^-	Track A inverse /-COS
3	A	Track A / + COS
4	+UB	Supply +
5	GND	Mass
6	Z^-	Zero track inverse /-RS485
7	Z	Zero track / + RS485
8		Not assigned
9	B^-	Track B inverse/-SIN
10	Schirm	Encoder housing shield
11	+	Temperature monitoring: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

One Cable Technology (OCT)

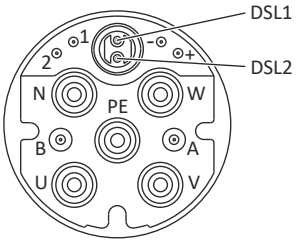
Power, brake, feedback and temperature monitoring connection

M23 connector assignment for OCT motor cables



M23_OCT		
Contact	**Name**	**Meaning**
A	BD1	Holding brake +
B	BD2	Holding brake -
C		Not assigned
D		Not assigned
H	VCC/Daten +	VCC/data +
L	GND/Daten -	GND/data -
PE	PE	PE
U	U	Power phase U
V	V	Power phase V
W	W	Power phase W

M40 connector assignment for OCT motor cables



M40_OCT		
Contact	**Name**	**Meaning**
-		Not assigned
+		Not assigned
1		Not assigned
2		Not assigned
A	BD1	Holding brake +
B	BD2	Holding brake -
DSL1	+	VCC/data +
DSL2	-	GND/data -
N		Not assigned
PE	PE	PE
U	U	Power phase U
V	V	Power phase V
W	W	Power phase W

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:

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

$$Q = \frac{1}{2} \times J_{ges} \times \left(2\pi \times \frac{\Delta n}{60} \right)^2 \times \frac{M_N}{M_N - M_L}$$

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.

Permanent magnet brakes

Rated data

NOTICE

Engagement and disengagement times apply to rated voltage (± 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.

Requirements with regard to the DC 24 V brake: smoothed DC voltage, ripple ≤ 1 %.

Maximum switching energy per emergency stop with n= 3000 rpm for at least 2000 emergency stops.

Motor			m850-S40/ S9000	m850-S40/ L9000	m850-S60/ S6000	m850-S60/ L6000	m850-S80/ S5500	m850-S80/ L5500
Supply voltage range	V_{in}	V	21.6 ... 26.4					
Supply voltage	V_{rated}	V	24					
Bemessungsdrehmoment								
At 20 °C	M_{rated}	Nm	0.4		2		4.5	
At 120 °C	M_{rated}	Nm	0.35		1.8		4	
Rated current	I_{rated}	A	0.33		0.46		0.5	
Engagement time t1	t_1	ms	9		20		15	
Disengagement time t2	t_2	ms	10		38		40	
Friction energy	Q_E	kJ	0.001					
Weight	m	kg	0.085		0.2		0.4	
Massenträgheitsmoment								
Brake	J	kgcm²	0.0143		0.0691		0.185	
Brake motor	J_{MB}	kgcm²	0.055	0.079	0.319	0.512	1.68	2.2
Load/brake motor ratio	J_L/J_{MB}		13263	9234	3620	2255	970	741

Spring-applied brakes

Rated data

NOTICE

Engagement and disengagement times apply to rated voltage (± 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.

Requirements with regard to the DC 24 V brake: smoothed DC voltage, ripple ≤ 1 %.

Maximum switching energy for each emergency stop with n= 3000 rpm for a maximum of 3-6 emergency stops per hour.

Motor			m850-S120/ S3960	m850-S120/ M3960	m850-S120/ L3960	m850-S140/ S3240	m850-S140/ M3240	m850-S140/ L3240
Supply voltage range	V_{in}	V	21.6 ... 26.4					
Supply voltage	V_{rated}	V	24					
Bemessungsdrehmoment								
At 20 °C	M_{rated}	Nm	20			34		
At 120 °C	M_{rated}	Nm	18			32		
Rated current	I_{rated}	A	1.2			1.4		
Engagement time t1	t_1	ms	30			50		
Disengagement time t2	t_2	ms	110			150		
Friction energy	Q_E	kJ	3.1					
Weight	m	kg	2.0			3.0		
Massenträgheitsmoment								
Brake	J	kgcm²	0.75			2.01		
Brake motor	J_{MB}	kgcm²	7.5	13.3	19.2	18.1	32.5	46.9
Load/brake motor ratio	J_L/J_{MB}		74	47	32	34	19	13

Motor			m850-S190/S3000	m850-S190/M3000	m850-S190/L2520
Supply voltage range	V_{in}	V	21.6 ... 26.4		
Supply voltage	V_{rated}	V	24		
Bemessungsdrehmoment					
At 20 °C	M_{rated}	Nm	102		
At 120 °C	M_{rated}	Nm	100		
Rated current	I_{rated}	A	2.1		
Engagement time t1	t_1	ms	40		
Disengagement time t2	t_2	ms	230		
Friction energy	Q_E	kJ	5.7		
Weight	m	kg	6.70		
Massenträgheitsmoment					
Brake	J	kgcm²	10.42		
Brake motor	J_{MB}	kgcm²	72.6	128.9	204.3
Load/brake motor ratio	J_L/J_{MB}		15	8	5

Feedback

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

m850-S40 ... m850-S80

Inverter	Feedback without functional safety		
	Resolver (only m850-S60, m850-S80)	Absolute value encoder (only m850-S60, m850-S80)	Digital absolute value encoder for OCT
i950 servo inverter	RS2	AM128-8V-H	AM17-8V-D
i750 servo inverter	RS2	AM128-8V-H	AM17-8V-D
8400 TopLine Inverter Drives	RS2	AM128-8V-H	-
9400 HighLine Servo Drives	RS2	AM128-8V-H	-

Inverter	Feedback with functional safety		
	Resolver (only m850-S60, m850-S80)	Absolute value encoder (only m850-S60, m850-S80)	Digital absolute value encoder for OCT (only m850-S60, m850-S80)
i950 servo inverter	RV22	AM128-8V-K2	AM17-8V-D2
9400 HighLine Servo Drives	RV22	AM128-8V-K2	-

m850-S120 ... m850-S190

Inverter	Feedback without functional safety		
	Resolver	Absolute value encoder	Digital absolute value encoder for OCT
i950 servo inverter	RS0	AM128-8V-H	AM20-8V-D
i750 servo inverter	RS0	AM128-8V-H	AM20-8V-D
8400 TopLine Inverter Drives	RS0	AM128-8V-H	-
9400 HighLine Servo Drives	RS0	AM128-8V-H	-

Inverter	Feedback with functional safety		
	Resolver	Absolute value encoder	Digital absolute value encoder for OCT
i950 servo inverter	RV03	AM128-8V-K2	AM20-8V-D2
9400 HighLine Servo Drives	RV03	AM128-8V-K2	-

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**	**RS2**	**RV03**	**RV22**
Speed-dependent safety functions			Nein	Nein	Ja	Ja
Design			Mounting			
Resolution - angle		'	0.8	0.8	0.8	0.8
Min. accuracy		'	-10	-10	-10	-10
Max. accuracy		'	10	10	10	10
Absolute positioning			1 revolution	1 revolution	1 revolution	1 revolution
Max. speed	n_{max}	rpm	8000	20000	8000	20000
Max. DC input voltage	$V_{in,max}$	V	10	7	10	7
Max. input frequency	$f_{in,max}$	kHz	4	10	4	10
Ratio stator/rotor			0.3	0.5	0.3	0.5
Min ratio tolerance		%	-5	-10	-5	-10
Max ratio tolerance		%	5	10	5	10
Rotor impedance	Z_{ro}	Ω	51+j90	86+j120	51+j90	86+j120
Stator impedance	Z_{so}	Ω	102+j150	140+j273	102+j150	140+j273
Impedance	Z_{rs}	Ω	44+j76	70+j106	44+j76	70+j106
Min. insulation resistance at DC 500 V	R_{min}	MΩ	10	10	10	10
Number of pole pairs			1	1	1	1
Max. angle error Min		'	-10	-10	-10	-10
Max. angle error Max		'	10	10	10	10

Speed-dependent safety functions

Feedback			**RV03**	**RV22**
Max. permissible angular acceleration	α	rad/s^2	19000	200000
Functional safety				
EN IEC 61800-5-2/EN IEC 61508			SIL3	
EN IEC 61800-5-2/EN IEC 62061				SIL2
EN ISO 13849-1			Up to Performance Level e	Up to Performance Level d

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.

In conjunction with the AMxx-8V-**D** digital absolute value encoder, the motor supports the HIPERFACE DSL® open motor feedback protocol for One Cable Technology (OCT).

Feedback type			**Digital absolute value encoder**				**SinCos absolute value encoder**	
Feedback			**AM17-8V-D**	**AM17-8V-D2**	**AM20-8V-D**	**AM20-8V-D2**	**AM128-8V-H**	**AM128-8V-K2**
Speed-dependent safety functions			Nein	Ja	Nein	Ja	Nein	Ja
Design			Mounting	Mounting	Mounting	Mounting	Mounting	Mounting
Encoder type			Multi-turn	Multi-turn	Multi-turn	Multi-turn	Multi-turn	Multi-turn
Resolution		bit	-	-	20	20	-	-
Pulses			-	-	-	-	128	128
Output signals			Digital	Digital	Digital	Digital	SinCos 1 Vss	SinCos 1 Vss
Interfaces			Hiperface	Hiperface	Hiperface	Hiperface	Hiperface	Hiperface
Absolute revolution			4096	4096	4096	4096	4096	4096
Resolution - angle			-	-	0.02	0.02	0.4	0.4
Min. accuracy		'	-	-	-	-	-1.3	-1.3
Max. accuracy		'	-	-	-	-	1.3	1.3
Fehlergrenze Positionswert								
System accuracy			-	-	1.7	1.7	-	-
Integral nonlinearity			-	-	1	1	-	-
Min. DC input voltage	$V_{in,min}$	V	7	7	-	-	7	7
Max. DC input voltage	$V_{in,max}$	V	12	12	-	-	12	12
Max. current consumption	I_{max}	A	0.15	0.15	0.15	0.15	0.06	0.06
Limit frequency	f_{max}	kHz	-	-	-	-	200	200

Speed-dependent safety functions

Feedback			**AM17-8V-D2**	**AM20-8V-D2**	**AM128-8V-K2**
Max. permissible angular acceleration	α	rad/s^2	240000	240000	240000
Functional safety					
EN IEC 61800-5-2/EN IEC 61508				SIL2	SIL2
EN IEC 61800-5-2/EN IEC 62061			SIL2		
EN ISO 13849-1			Up to Performance Level d		

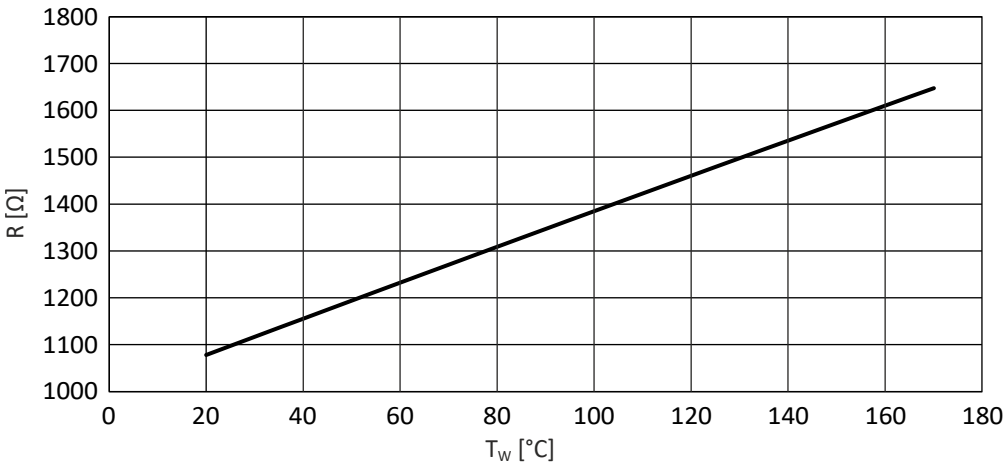
Temperature monitoring

Thermal detectors PT1000

The thermal sensors used continuously monitor 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!**

The motors are monitored via three thermal sensors connected in series (1x PT1000 + 2x PTC 150 °C). This makes it possible to determine the motor temperature in the permissible operating range and at the same time execute the overtemperature response configured in the inverter in one of the winding strands.

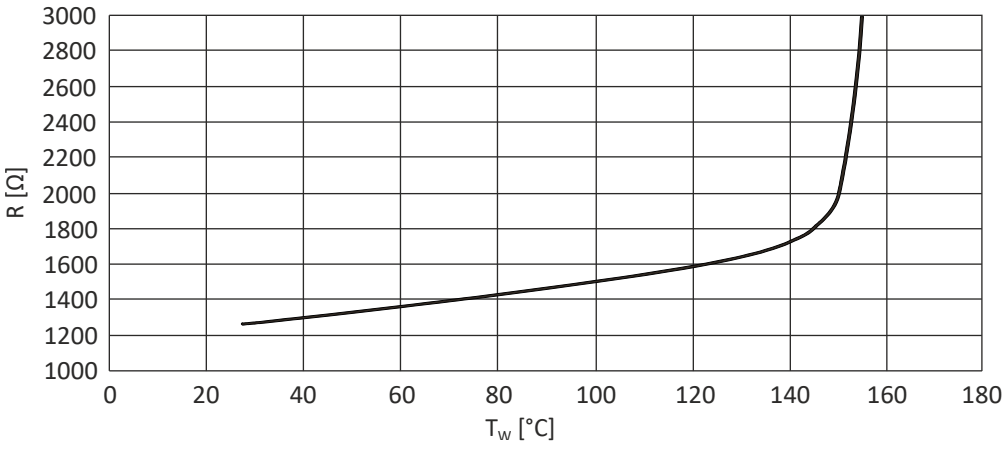
When supplying the thermal sensors with a measurement current of 1 mA, the connection between the temperature and the resistance measured applies.



R Resistance
T_W Winding temperature

The three thermal sensors connected in series are identified on the nameplate by the short designation "PT1k+2PTC".

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 ID m850 synchronous servo motor

Example	M	8	5	A	S	120	S	25	5	S	0	R	C	C	0

Meaning	Variant	Product ID
Portfolio segment		M
Product family	8	8
Product level	5	5
Product generation	1	A
Product type	Synchronous servo motor	S
Flange height	40	40
	60	60
	80	80
	120	120
	140	140
	190	190
Motor length	Short	S
	Medium	M
	Long	L
Speed	25 x 100 rpm	25
	30 x 100 rpm	30
	32 x 100 rpm	32
	40 x 100 rpm	40
	55 x 100 rpm	55
	60 x 100 rpm	60
	90 x 100 rpm	90
Degree of protection	IP5x	5
	IP6x	6
Cooling	No cooling	S
Brake mounting	No brake	0
	Spring-applied brake	F
	Permanent magnet brake	P
encoder mounting	Resolver	R
	Absolute value encoder	A
	Digital absolute value encoder Hiperface DSL®	D
Product approval	CE	C
	CE; cULus	L
	CE; cURus	V
Internal key	40, 60, 80	V
	120, 140, 190	C
		0

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:

CE

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.

Lenze products are not subject to 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] , but some 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] . The disposal route, which is separate from household waste, is indicated by corresponding labels with the "crossed-out trash can".
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.

21 PAP

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"

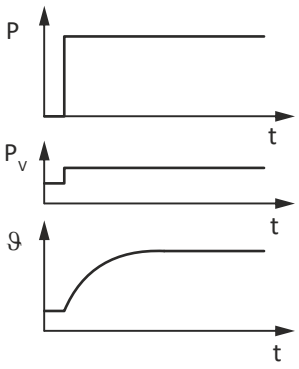
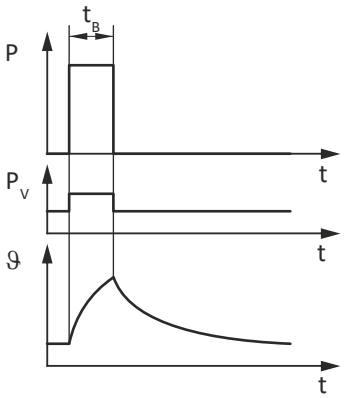
Appendix

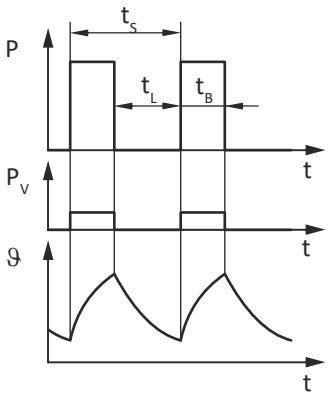
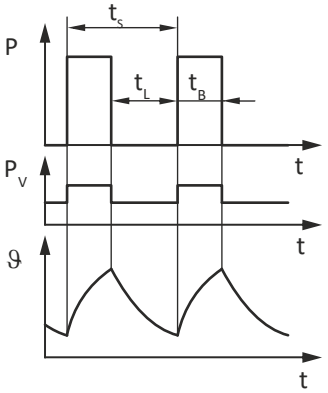
Good to know

Operating modes of the motor

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

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	P_V	Power loss
t	Time	t_B	Load period
t_L	Idle time	t_S	Cycle duration
ϑ	Temperature		

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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