Mounting and switch-on instructions EN

Servo motors

MCS synchronous servo motor

Lenze

Contents

Contents

About this document

⚠WARNING!

Read this documentation carefully before starting any work.

▸ Please observe the safety instructions!

Document description

This document is intended for skilled personnel who work with the products described.

The data and information compiled in this document serve to support you in the electrical and mechanical installation and commissioning.

- The document is only valid together with the complete documentation of the product!
- For safety-rated attachments observe the enclosed operating instructions of the manufacturer!
- 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

Conventions are used in this document to distinguish between different types of information.

Numeric notation		
Decimal separator	Point	Generally shown as a decimal point. Example: 1 234.56
Warnings		
UL Warnings	UL	Are used in English and French.
UR warnings	UR	
Text		
Engineering Tools	" "	Software Example: "Engineer", "EASY Starter"
Icons		
Page reference	🕮	Reference to another page with additional information. Example: 🕮 16 = see page 16
Documentation reference	ⓚ	Reference to other 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.

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!

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

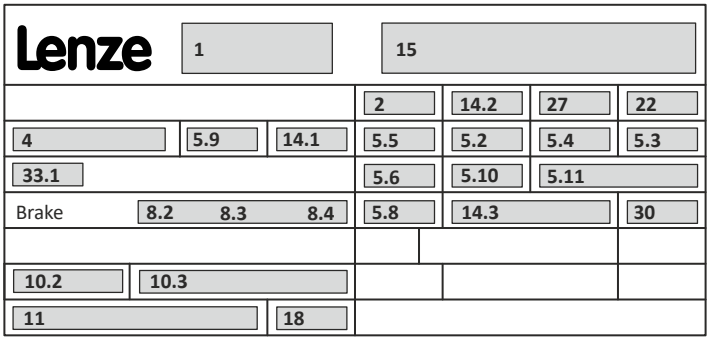
- Installed temperature sensors are no full protection for the machine.
  - If necessary, limit the maximum current. Parameterize the inverter so that it will be switched off after some seconds of operation with $I > I_{rated}$, especially if there is a risk of blocking.
  - Integrated overload protection 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.

Product information

Identification of the products

Nameplates

Synchronous servo motors



Pos.	Contents
1	Manufacturer / production location
2	Motor type
4	Motor type
5	Technical data
5.2	Rated torque
5.3	Rated speed
5.4	Rated frequency
5.5	Rated voltage
5.6	Rated current
5.8	Rated power [kW]
5.9	Efficiency
5.10	Continuous standstill torque
5.11	Induced voltage V_{in} [V]
8	Brake data
8.2	Brake supply voltage
8.3	Electrical power input
8.4	Braking torque
10	Production data
10.2	Material number
10.3	Serial number
11	Bar code
14	Additional motor specifications
14.1	Temperature class
14.2	Degree of protection
14.3	Motor protection
15	Applicable conformities, approvals and certificates
18	Year of manufacture / week of manufacture
22	C86 = motor code for controller parameterization (code 0086)
27	Permissible ambient temperature (e.g. Ta < 40°C)
30	Weight
33	Encoder data
33.1	Encoder type

Motor protection:

For the thermal sensors "1x PT1000 + 2x PTC", the short designation "PT1k +2PTC" is given on the nameplate.

Product codes

Product code of MCS synchronous servo motor

Example	M	C	S	06	C	41	-	RS0	B0

Meaning	Variant	Product code
Product family	Motor	M
Type	Compact servo motors	C
Version	Synchronous	S
Motor frame size	Square dimension 62 mm	06
	Square dimension 89 mm	09
	Square dimension 116 mm	12
	Square dimension 142 mm	14
	Square dimension 192 mm	19
Overall length		C ... P
Rated speed	rpm x 100	11 ... 60
Inverter mains connection	3 x 230 V	L
	3 x 400 V	-
Feedback	SinCos absolute value encoder, single-turn, EnDat AS2048-5V-E	ECN
	Digital absolute value encoder, multi-turn, Hiperface DSL® AM20-8V-D	EKM
	SinCos absolute value encoder, multi-turn, EnDat AM32-5V-E	EQI
	SinCos absolute value encoder, multi-turn, EnDat AM2048-5V-E	EQN
	Digital safety absolute value encoder, multi-turn, Hiperface DSL® AM20-8V-D2	EVM
	Resolver p=1	RS0
	Safety resolver, p=1 RV03	RV0
	SinCos absolute value encoder, multi-turn, Hiperface® AM128-8V-H	SKM
	SinCos absolute value encoder, multi-turn, Hiperface® AM1024-8V-H	SRM
	SinCos absolute value encoder, single-turn, Hiperface® AS1024-8V-H	SRS
	SinCos safety absolute value encoder, multi-turn, Hiperface® AM128-8V-K2	SVM
	SinCos safety absolute value encoder, multi-turn, Hiperface® AM1024-8V-K2	SVM
	SinCos safety absolute value encoder, single-turn, Hiperface® AS1024-8V-K2	SVS
Brake	Without brake	B0
	Permanent magnet brake DC 24V	P1
	Permanent magnet brake DC 24V, reinforced	P2

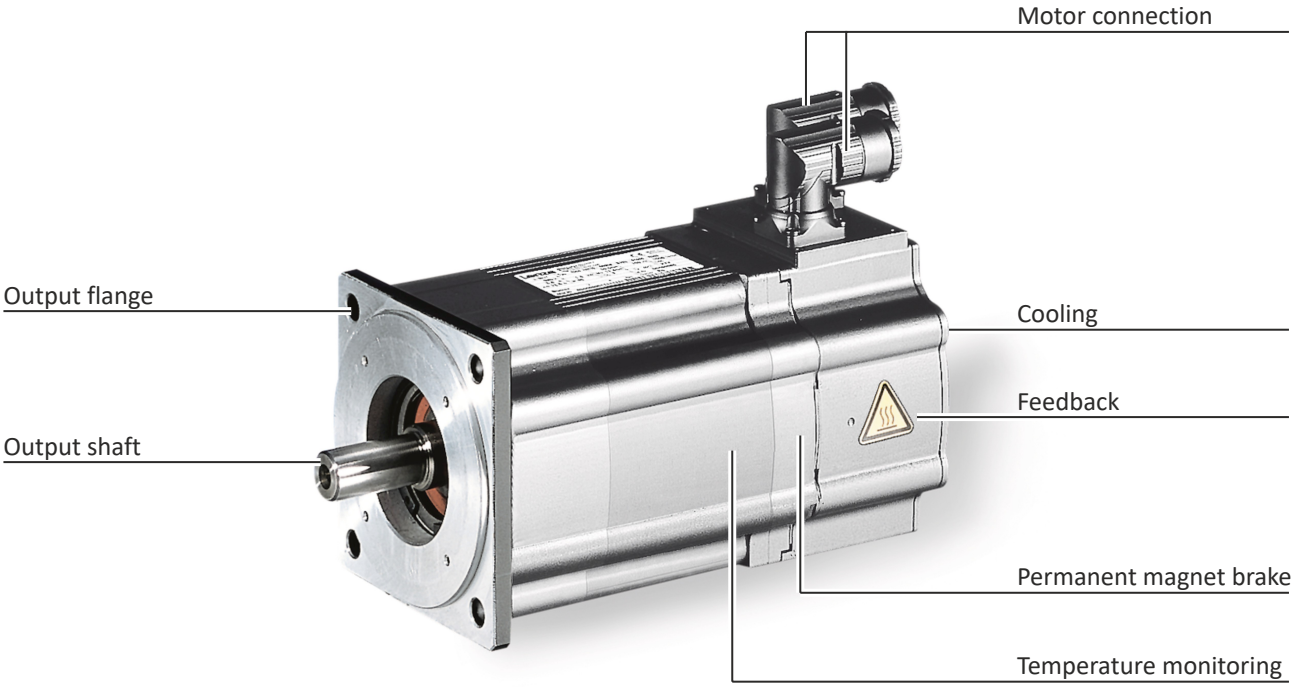
Product code feedbacks

Example	AS	1024	-	8 V	-	K	2

Meaning	Variant	Product code						
Product family	Resolver	RS						
	Resolver for safety function	RV						
	Incremental encoder	IG						
	Incremental encoder with commutation signal	IK						
	Absolute value encoder, singleturn	AS						
	Absolute value encoder, multiturn	AM						
Number	2-pole Resolver for servo motors		0					
	2-pole Resolver for three-phase AC motors		1					
	Number of pole pairs for resolvers		2 3 4 ...					
	Number of bits, steps or increments per revolution		20 32 128 512 1024 2048 ...					
Supply voltage					5 V 8 V 15 V 24 V ...			
Interface or signal level	Standard							
	TTL						T	
	HTL (for incremental encoders)						H	
	Hiperface (for absolute value encoders)						H	
	EnDat						E	
	SinCos 1 Vss						S	
	Digital						D	
	For safety function							
	TTL						U	
	HTL (for incremental encoders)						K	
	Hiperface (for absolute value encoders)						K	
	EnDat						F	
	SinCos 1 Vss						V	
	Digital						D	
	Safety Integrity Level (SIL)							1 2 3 4

Equipment

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



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.

Storage

Storage up to one year:

- If possible, in the manufacturer's packaging
- In dry, low-vibration environment without aggressive atmosphere
- Protect against dust and impacts
- Observe the climatic conditions according to the technical data
  - ▸ Environmental conditions 🕮 34

Mechanical installation

Important notes

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

  ▸ Standards and operating conditions 📖 33
- 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.

Preparation

- Protect shaft sealing rings from contact with solvents.
- Remove protection covers from shafts.
- Thoroughly remove anticorrosion agents from the shaft and from flange faces.
- Draw the transmission elements onto the output shaft only by using the centering thread.
- Align the output shaft and transmission elements exactly to avoid tensions.
- Mount belt pulleys, sprockets, or gear wheels as close as possible to the shaft shoulder in order to keep the bending load of the shaft and the bearing forces at a minimum level.
- Tighten all screw connections with the specified torques and secure them with standard screw locking adhesive.
- Check paint for damage and repair professionally.

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.

Dimensions

Dimensions are contained in the configuration document.

Mounting

Transmission elements

- Fit or remove transmission elements only using suitable equipment.
- For fitting the transmission elements use the center hole in the shaft.
- Avoid impacts and shocks.
- In case of a belt drive, tension the belt in a controlled manner according to manufacturer information.
- Be sure to carry out mounting in a manner free from distortion.
- Compensate minor inaccuracies by suitable flexible couplings.

Fastening

- Use screws with a minimum property class of 8.8.
- Observe prescribed tightening torques.
- Secure against unintended loosening.
- For alternating loads, we recommend applying anaerobic curing adhesive between flange and mounting surface.

Thread		**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Strength		Tightening torque Nm ±10 %											
8.8	Nm	1.3	3.0	5.9	10.1	24.6	48	84	206	415	714	1050	1428
10.9	Nm	1.9	4.6	8.6	14.9	36.1	71	123	302	592	1017	1496	2033

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.

Motor connection

Connection via terminal box

Observe the notes on wiring, data on the nameplate, and the connection diagram in the terminal box.

The connection must ensure a continuous and safe electrical supply:

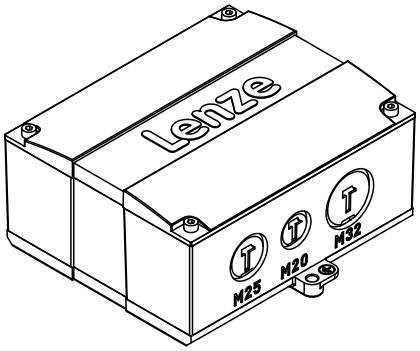
- No protruding wire ends
- Use assigned cable end fittings
- Ensure good electrical conductivity of the contact (remove paint residues) if an additional PE connection is used
- Establish a safe protective earth connection
- After the connection is completed, make sure that all connections on the terminal board are firmly tightened
- The terminal box has to be free of foreign bodies, dirt, and humidity
- All unused cable entries and the terminal box itself must be sealed so that they are dust-tight and waterproof

The smallest air gaps between uncoated, live parts and against earth must not fall below the following values:

Minimum requirements for basic insulation according to IEC/EN 60664-1 (CE)	Higher requirements for UL design	Motor diameter
3.87 mm	6.4 mm	<178 mm
	9.5 mm	> 178 mm

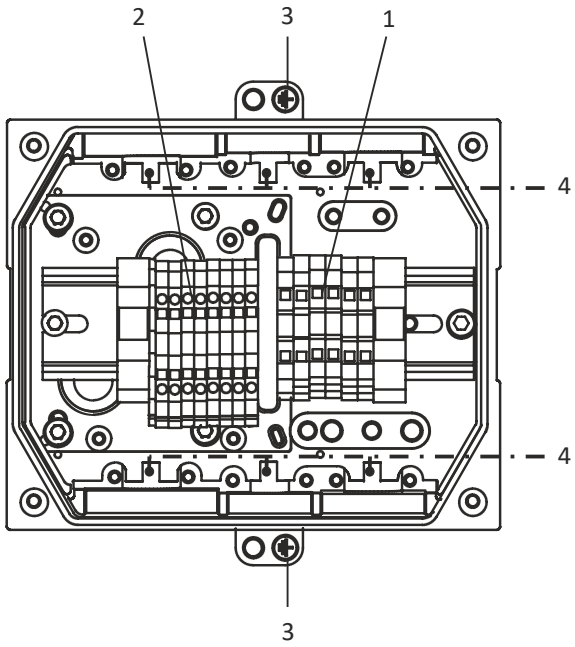
Cable glands

The bore holes for the cable glands M25, M20 and M32 are located on both sides and closed. They can be opened according to need.



Motor		MCS09 MCS12 MCS14H	MCS14L15 MCS14P14 MCS19F15 MCS19J15	MCS14L32 MCS14P32 MCS19F13 MCS19J30 MCS19P
Screwed connections		2x M20 2x M25 2x M32		
cable cross-section	mm^2	0.08 ... 2.5 4 (without wire end ferrule)		0.2 ... 10
Stripping length	mm	10 ... 11		
Terminal design		Spring-loaded terminal		

Position of the connections



Position	Meaning
1	Power connection Brake connection
2	Feedback connection Connection of temperature monitoring
3	PE connection
4	Large area shield contact.

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, resolver		
Contact	**Name**	**Meaning**
B1	+Ref	Transformer windings (reference windings)
B2	-Ref	
B3	+VCC ETS	Supply: Electronic nameplate (only for variant with electronic nameplate ETS)
B4	+COS	Stator windings cosine
B5	-COS	
B6	+SIN	Sine stator windings
B7	-SIN	
B8		Not assigned

Terminal box, SinCos absolute value encoder with Hiperface		
Contact	**Name**	**Meaning**
B1	+ UB	Supply +
B2	GND	Mass
B3	A	Track A / + COS
B4	A^-	Track A inverse /- COS
B5	B	Track B / +SIN
B6	B^-	Track B inverse/-SIN
B7	Z	Zero track / + RS485
B8	Z^-	Zero track inverse /-RS485
B10		Incremental encoder shield

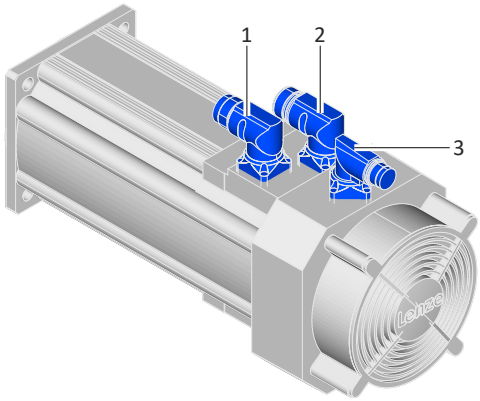
Terminal box, SinCos absolute value encoder with EnDat		
Contact	**Name**	**Meaning**
B1	+ UB	Supply +
B2	GND	Mass
B3	A	Track A / + COS
B4	A-	Track A inverse /- COS
B5	B	Track B / +SIN
B6	B-	Track B inverse/-SIN
B7	Daten	EnDat interface data
B8	Daten-	Data inverse EnDat interface
B20	Takt	EnDat interface cycle
B21	Takt-	Inverse EnDat interface cycle
B22	Up Sensor	Up Sensor
B23	0 V Sensor	0 V sensor
B24	Schirm	Encoder housing shield
B25		Not assigned

Terminal box with temperature monitoring R		
Contact	**Name**	**Meaning**
R1	+	Temperature sensor +
R2	-	Temperature sensor -

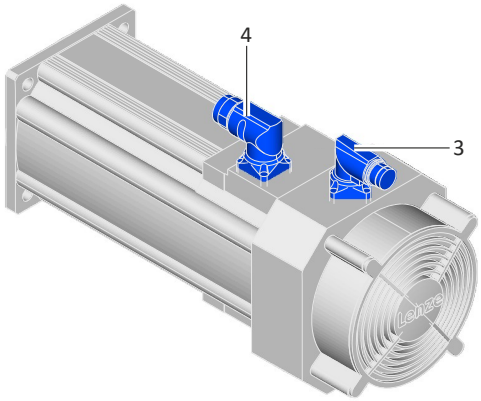
Connection via ICN connector

Position of the connections

Standard connection



One Cable Technology (OCT)



Position	Meaning	Position	Meaning
1	ICN-M23 connector, 6-pole ICN-M40 connector, 8-pole • Power connection • Brake connection • PE connection	4	For One Cable Technology (OCT) ICN-M23 connector, hybrid ICN-M40 connector, hybrid • Power connection • Brake connection • PE connection • Connection of digital absolute value encoder • Connection of temperature monitoring
2	ICN-M23 connector • Feedback connection • Connection of temperature monitoring		
3	ICN-M17 connector • Blower connection		

Motor/ICN connector assignment

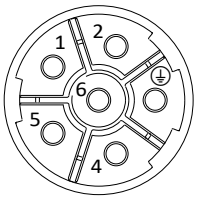
Standard connection: Power and brake One Cable Technology (OCT): Power connection, brake, feedback and temperature monitoring							
Motor	**Connector**	**Motor**	**Connector**	**Motor**	**Connector**	**Motor**	**Connector**
MCS06...	ICN-M23	MCS14H15-	ICN-M23	MCS14P14-	ICN-M23	MCS19J14-	ICN-M23
MCS09...	ICN-M23	MCS14H28-	ICN-M40	MCS14P26-	ICN-M40	MCS19J29-	ICN-M40
MCS12...	ICN-M23	MCS14H32-	ICN-M23	MCS14P32-	ICN-M40	MCS19J30-	ICN-M40
MCS14D14-	ICN-M23	MCS14L14-	ICN-M23	MCS19F12-	ICN-M23	MCS19P12-	ICN-M40
MCS14D15-	ICN-M23	MCS14L15-	ICN-M23	MCS19F14-	ICN-M23	MCS19P14-	ICN-M40
MCS14D30-	ICN-M23	MCS14L30-	ICN-M40	MCS19F29-	ICN-M40	MCS19P29-	ICN-M40
MCS14D36-	ICN-M23	MCS14L32-	ICN-M40	MCS19F30-	ICN-M40	MCS19P30-	ICN-M40
MCS14H12-	ICN-M23	MCS14P11-	ICN-M23	MCS19J12-	ICN-M40		

Standard connection

Connection of power and brake

ICN-M23 connector assignment

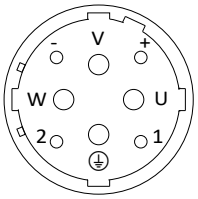
6-pole



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

ICN-M40 connector assignment

8-pole

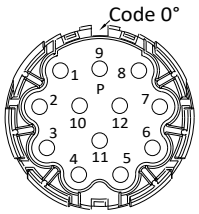


ICN M40 8-pole		
Contact	**Name**	**Meaning**
U	U	Power phase U
+	BD1	Holding brake +
-	BD2	Holding brake -
W	W	Power phase W
V	V	Power phase V
PE	PE	PE conductor
1		Not assigned
2		Not assigned

Feedback and temperature monitoring connection

ICN-M23 connector assignment

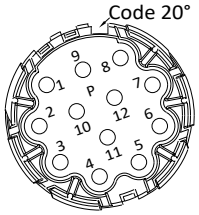
Resolver



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	Stator windings cosine
5	-COS	Stator windings cosine
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

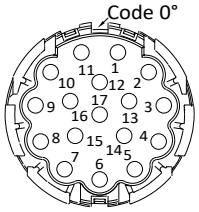
Incremental and SinCos absolute value encoder Hiperface©



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

ICN-M23 connector assignment

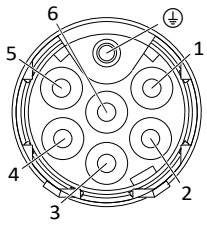
SinCos absolute value encoder with EnDat interface



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

Blower

Pin assignment ICN-M17



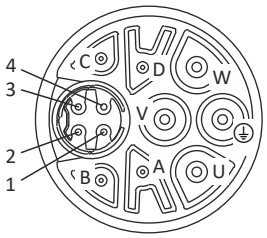
ICN M17 for blowers 1-ph		
Contact	**Name**	**Meaning**
PE	PE	PE conductor
1	U1	Fan
2	U2	Fan
3		Not assigned
4		Not assigned
5		Not assigned
6		Not assigned

One Cable Technology (OCT)

Connection of power, brake, feedback and temperature monitoring

ICN-M23 connector assignment, hybrid

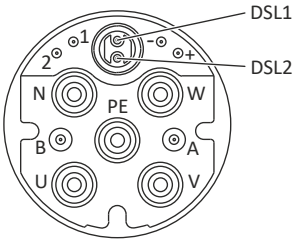
For One Cable Technology (OCT) with digital absolute value encoder



ICN M23 Hybrid for One Cable Technology (OCT) with digital absolute value encoder		
Contact	**Name**	**Meaning**
U	U	Power phase U
V	V	Power phase V
W	W	Power phase W
PE	PE	PE
A	BD1	Holding brake +
B	BD2	Holding brake -
C	+	Optional temperature monitoring: PTC +
D	-	Optional temperature monitoring: PTC -
1		Not assigned
2	+	VCC/data +
3	-	GND/data -
4		Not assigned

ICN-M40 connector assignment, hybrid

For One Cable Technology (OCT) with digital absolute value encoder



ICN M40 Hybrid for One Cable Technology (OCT) with digital absolute value encoder		
Contact	**Name**	**Meaning**
U	U	Power phase U
V	V	Power phase V
W	W	Power phase W
A	BD1	Holding brake +
B	BD2	Holding brake -
PE	PE	PE
N		Not assigned
DSL1	+	VCC/data +
DSL2	-	GND/data -
+		Not assigned
-		Not assigned
1	+	Optional temperature monitoring: PTC +
2	-	Optional temperature monitoring: PTC -

Assembly of ICN connectors

NOTICE

Live cables!

Possible destruction of the connector.

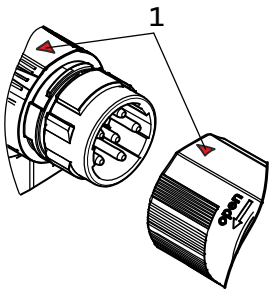
- ▸ Never remove connector when voltage is being applied!
- ▸ Disable inverter before removing the connector!

NOTICE

Loss of the protection class due to incorrect mounting!

Malfunctions may occur.

- ▸ ICN connector with screwed connection: Do not remove O-ring
- ▸ ICN connector with bayonet lock: remove O-ring and dispose of it.



1. When connecting the connector to the motor connector, make sure that the aids to orientation (pos. 1) are facing each other.
2. Tighten the box nut of the connector!

Motors with additional PE conductor connection

As an additional protective measure, a second PE conductor can be connected at the motor housing if required:

- Use PE-labelled bore hole at the motor housing
- Remove coating for contact surface in the area of the bore hole
- Ensure a good electrical conductivity of the contact
- Establish a permanently safe electrical connection

Commissioning

Important notes

NOTICE

Do not brake the motor by short-circuit operation.

Short-circuit braking may damage the motor.

Before initial switch-on

- That the drive does not show any visible signs of damage.
- Is the mechanical fixing o.k.?
- Is the electrical connection ok?
- Are all rotating parts and surfaces that may become hot protected against contact?
- Is the featherkey radially secured during the test run without output elements?
- Have all screwed connections of the mechanical and electrical parts been tightened?
- Is it ensured that the cooling air can be freely supplied and discharged?
- Has the PE conductor been connected correctly?
- Are the protective devices against overheating (e.g. thermal sensor evaluation) working?
- Has the inverter been parameterized suitably for the motor?
- Is the phase sequence of the motor connection correct?
- Is the contact of good electrical conductivity if a PE connection on the motor housing is used?

After a long period of downtime or after overhauling the motor, check the insulation resistance prior to initial switch-on, as condensation may have formed.

- If the values measured are ≤1 kΩ per volt of the rated voltage, the insulation resistance is inadequate and no voltage is to be applied.
- Dry the winding until the insulation resistance is >1 kΩ per volt of the rated voltage.

Functional test

After commissioning, check all individual functions of the drive:

- Rotating direction in decoupled state
- Torque behavior and current consumption
- Function of the feedback system
- Brake function

During operation, carry out inspections on a regular basis. Pay special attention to:

- Unusual noises
- Irregular running
- Increased vibration
- Loose fixing elements
- Condition of electrical cables
- Speed variations
- Deposits on the drive and in the cooling channels

Maintenance

⚠WARNING!

Risk of injury due to non-compliance with the following safety measures

Disregarding the following safety measures may lead to severe personal injury and damage to property.

- Only work on the drive system when it is de-energised.
- Wait for the surfaces to cool down.
- Put the drive system in a load-free state or secure any loads acting on the drive.
- Protect the motors against the ingress of foreign bodies.

- Clean surfaces regularly
- If equipped with blower: clean the air inlets regularly

Brake

- The brakes are not accessible from the outside.
- Maintenance work of the brake must only be carried out by Lenze Service personnel.

Feedback

⚠WARNING!

Functional safety

Certain feedback systems support safety functions according to the requirements of the 2006/42/EC: Machinery Directive [UKCA: S.I. 2008/1597 - The Supply of Machinery (Safety) Regulations 2008] .

Any work on the safety encoder which has not been executed professionally will cause a loss of the safety functions.

- The safety encoder may only be repaired or replaced by the Lenze service or its authorised persons.

Repair

NOTICE

We recommend having all repairs carried out by the Lenze service department.

If faults occur during the operation of the drive system:

- First check the possible causes of malfunction according to the ▸ Diagnostics and fault elimination 📖 32
- If the fault cannot be remedied using one of the measures listed, please contact the Lenze service department. The contact data can be found on the rear of this documentation.

Diagnostics and fault elimination

Malfunctions

If faults occur during the operation of the drive, the table below helps you to identify the causes. If it is not possible to remedy the fault using the measures listed, please contact the Lenze service department.

Error	Possible causes	Remedy
Motor too hot Can only be evaluated by measuring the surface temperature: • Non-ventilated motors >140 °C • Externally ventilated or self-ventilated motors > 110 °C	Insufficient cooling air, blocked air ducts.	Ensure unimpeded circulation of cooling air
	Preheated cooling air	Ensure a sufficient supply of fresh cooling air
	Overload, with normal mains voltage the current is too high and the speed too low	Use larger drive (determined by power measurement)
	Rated operating mode (S1 to S8 IEC/EN 60034-1) exceeded	Adjust rated operating mode to the specified operating conditions. Determination of correct drive by expert or Lenze customer service
	Loose contact in supply cable (temporary single-phase operation!)	Tighten loose contact
	Fuse has blown (single-phasing!)	Replace fuse
	Overload of the drive	Check load and, if necessary, reduce by means of longer ramp-up times
		Check winding temperature
	Heat dissipation impeded by deposits	Clean surface and cooling fins of the drives
	Heat dissipation hindered by thermally insulated attachment	Note the cooling effect of the mounting flange during project planning
Motor suddenly stops and does not restart	Overload monitoring of the inverter is activated	Check inverter settings
		Reduce load caused by longer acceleration times
Incorrect direction of rotation of the motor, correct display on the inverter	Motor cable with reverse polarity	Check and correct polarity
	Polarity of encoder cable reversed	
Motor rotates normally but does not reach the expected torque	Motor cable interchanged cyclically Not all motor phases connected	Connect the phases at the motor cable connection correctly
Motor turns in one direction at maximum speed in an uncontrolled manner	Motor cable interchanged cyclically	Check motor connection and, if necessary, correct
	Polarity of encoder cable reversed	Check encoder connection and, if necessary, correct
Motor slowly rotates in one direction and is not influenced by the inverter	Polarity of motor cable and encoder cable reversed	Check and correct polarity
Irregular running	Insufficient shielding of motor or resolver cable	Checking shielding and earth connection
	Inverter gain too large	Adjust the gains of the controllers (see operating instructions for the inverter)
Vibrations	Insufficiently balanced coupling elements or machine	Rebalance
	Inadequate alignment of drive train	Realign machine unit, check foundation, if necessary.
	Loose fixing screws	Check and tighten screw connections
Running noises	Foreign particles inside the motor	Repair by the manufacturer, if necessary
	Bearing damage	

Technical data

Standards and operating conditions

Conformities and approvals

More information and certificates of approval can be found under

MCS synchronous servo motors (Lenze.com)

Europa		
Country	**Conformity/approval**	**Product representation**
European Union	CE	CE mark
Eurasian Economic Union (EAC)	EAC	EAC mark
Great Britain	UKCA	UKCA mark

America		
Country	**Conformity/approval**	**Product representation**
Canada	CSA	cURus mark
USA	UL	

Asia		
Country	**Conformity/approval**	**Product representation**
China	-	CEL mark
		EFUP mark

Protection of persons and device protection

Protection class			
-	EN IEC 60529,EN IEC 60034-5	IP54	Self-ventilated: MCS06 ... MCS19
			Forced ventilated: MCS12 ... MCS19
		IP65	Self-ventilated: MCS06 ... MCS19

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 with brake
		3K3 (-15 ...+40 °C)	Operation without brake, forced ventilated
		3K3 (-20 ...+40 °C)	Operation without brake, self-ventilated

Site altitude			
0 … 1000 m amsl	-	Without current derating	
1000 … 4000 m amsl		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
		3M6	

Vibration severity		
-	EN IEC 60034-14	A

Vibration velocity		
Free suspension	-	1.6 mm/s

Smooth running, axial runout, concentricity		
-	EN 50347 / IEC 60072-1	Normal class

Rated data

Inverter power supply 400 V, self-ventilated motors

Motor			MCS06C60-	MCS06C41-	MCS06F60-	MCS06F41-	MCS06I60-	MCS06I41-
Standstill torque	M_0	Nm	0.800	0.800	1.50	1.50	2.00	2.00
Rated torque	M_{rated}	Nm	0.500	0.600	0.900	1.20	1.20	1.50
Max. torque	M_{max}	Nm	2.40	2.40	4.40	4.40	6.20	6.20
Rated speed	n_{rated}	rpm	6000	4050	6000	4050	6000	4050
Max. speed	n_{max}	rpm	8000	8000	8000	8000	8000	8000
Rated power	P_{rated}	kW	0.31	0.25	0.57	0.51	0.75	0.64
Standstill current	I_0	A	2.50	1.30	2.90	1.50	3.40	1.70
Rated current	I_{rated}	A	2.40	1.30	2.50	1.50	2.90	1.60
Max. current	I_{max}	A	10.8	5.40	10.5	5.30	11.8	5.90
Rated voltage	V_{rated}	V	135	225	180	320	190	325
Rated frequency	f_{rated}	Hz	400	270	400	270	400	270
Moment of inertia	J	kgcm²	0.140	0.140	0.220	0.220	0.300	0.300
Efficiency	η		0.7	0.65	0.81	0.77	0.84	0.81
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.320	0.615	0.517	1.00	0.588	1.18
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	17.89	35.79	29.33	58.76	35.88	71.77
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	6.8	27	5.4	21.8	4.6	18.8
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	10.248	40.689	8.138	32.853	6.932	28.332
Stator inductance	L	mH	12.8	51.0	15.9	63.5	15.1	60.2
Weight	m	kg	2.30	2.30	2.70	2.70	3.40	3.40

Technical data

Rated data

Inverter power supply 400 V, self-ventilated motors

Motor			MCS09D60-	MCS09D41-	MCS09F60-	MCS09H60-	MCS09F38-	MCS09L51-
Standstill torque	M_0	Nm	3.30	3.30	4.20	5.50	4.20	7.50
Rated torque	M_{rated}	Nm	1.80	2.30	2.40	3.00	3.10	3.60
Max. torque	M_{max}	Nm	9.50	9.50	15.0	20.0	15.0	32.0
Rated speed	n_{rated}	rpm	6000	4050	6000	6000	3750	5100
Max. speed	n_{max}	rpm	7000	7000	7000	7000	7000	7000
Rated power	P_{rated}	kW	1.1	1	1.5	1.9	1.2	1.9
Standstill current	I_0	A	5.30	2.60	6.00	8.50	3.00	12.4
Rated current	I_{rated}	A	3.80	2.30	4.50	6.00	2.50	6.90
Max. current	I_{max}	A	20.0	10.0	30.0	40.0	15.0	64.0
Rated voltage	V_{rated}	V	210	320	230	190	330	180
Rated frequency	f_{rated}	Hz	400	270	400	400	250	340
Moment of inertia	J	kgcm²	1.10	1.10	1.50	1.90	1.50	2.80
Efficiency	η		0.87	0.82	0.9	0.91	0.9	0.91
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.623	1.27	0.700	0.647	1.40	0.605
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	34.81	69.62	39.01	36.96	78.02	35.1
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	1.8	7	1.2	0.8	5.2	0.44
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	2.713	10.549	1.808	1.206	7.836	0.663
Stator inductance	L	mH	6.30	25.1	6.15	4.02	24.6	2.50
Weight	m	kg	4.80	4.80	5.70	6.60	5.70	8.40

Motor			MCS09H41-	MCS09L41-	MCS12D41-	MCS12D20-	MCS12H35-	MCS12H15-
Standstill torque	M_0	Nm	5.50	7.50	6.40	6.40	11.4	11.4
Rated torque	M_{rated}	Nm	3.80	4.50	4.30	5.50	7.50	10.0
Max. torque	M_{max}	Nm	20.0	32.0	18.0	18.0	29.0	29.0
Rated speed	n_{rated}	rpm	4050	4050	4050	1950	3525	1500
Max. speed	n_{max}	rpm	7000	7000	6000	6000	6000	6000
Rated power	P_{rated}	kW	1.6	1.9	1.8	1.1	2.8	1.6
Standstill current	I_0	A	4.30	6.20	5.50	2.70	8.20	4.10
Rated current	I_{rated}	A	3.40	4.20	4.50	2.60	5.70	3.80
Max. current	I_{max}	A	20.0	32.0	20.0	10.0	24.0	12.0
Rated voltage	V_{rated}	V	300	295	310	345	325	300
Rated frequency	f_{rated}	Hz	270	270	270	130	235	100
Moment of inertia	J	kgcm²	1.90	2.80	4.00	4.00	7.30	7.30
Efficiency	η		0.91	0.91	0.84	0.85	0.91	0.88
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.28	1.21	1.16	2.37	1.39	2.78
Voltage constant	$KE_{LL\ 150\ °C}$	V/ (1000/ min)	74.02	70.1	67.07	133.95	84.58	169.15
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	3.2	1.8	2.2	8.7	1.4	5.8
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	4.822	2.713	3.315	13.111	2.11	8.741
Stator inductance	L	mH	16.1	9.90	13.0	52.2	10.5	42.1
Weight	m	kg	6.60	8.40	7	7	10.1	10.1

Technical data

Rated data

Inverter power supply 400 V, self-ventilated motors

Motor			MCS12L41-	MCS12L20-	MCS14D36-	MCS14D15-	MCS14H32-	MCS14H15-
Standstill torque	M_0	Nm	15.0	15.0	11.0	11.0	21.0	21.0
Rated torque	M_{rated}	Nm	11.0	13.5	7.50	9.20	14.0	16.0
Max. torque	M_{max}	Nm	56.0	56.0	29.0	29.0	55.0	55.0
Rated speed	n_{rated}	rpm	4050	1950	3600	1500	3225	1500
Max. speed	n_{max}	rpm	6000	6000	6000	6000	6000	6000
Rated power	P_{rated}	kW	4.7	2.8	2.8	1.45	4.7	2.5
Standstill current	I_0	A	12.4	6.20	10.0	5.00	16.9	8.50
Rated current	I_{rated}	A	10.2	5.90	7.50	4.50	11.9	6.60
Max. current	I_{max}	A	56.0	28.0	33.0	16.5	51.5	25.8
Rated voltage	V_{rated}	V	300	330	295	305	295	325
Rated frequency	f_{rated}	Hz	270	130	240	100	215	100
Moment of inertia	J	kgcm²	10.6	10.6	8.10	8.10	14.2	14.2
Efficiency	η		0.91	0.9	0.92	0.88	0.93	0.92
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.21	2.42	1.10	2.20	1.24	2.47
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	72.94	145.69	62.77	126.13	74.6	149.6
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.6	2.2	1	4	0.52	2.08
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.904	3.315	1.507	6.028	0.784	3.135
Stator inductance	L	mH	5.45	21.8	12.5	49.8	8.53	34.1
Weight	m	kg	13.2	13.2	11.4	11.4	16.2	16.2

Motor			MCS14L32-	MCS14P32-	MCS14L15-	MCS14P14-	MCS19F30-	MCS19F14-
Standstill torque	M_0	Nm	28.0	37.0	28.0	37.0	32.0	32.0
Rated torque	M_{rated}	Nm	17.2	21.0	23.0	30.0	21.0	27.0
Max. torque	M_{max}	Nm	77.0	105	77.0	105	86.0	86.0
Rated speed	n_{rated}	rpm	3225	3225	1500	1350	3000	1425
Max. speed	n_{max}	rpm	6000	6000	6000	6000	4000	4000
Rated power	P_{rated}	kW	5.8	7.1	3.6	4.2	6.6	4
Standstill current	I_0	A	24.0	24.3	12.0	12.2	19.8	9.90
Rated current	I_{rated}	A	15.0	15.6	9.70	10.8	14.0	8.60
Max. current	I_{max}	A	74.5	92.0	37.3	46.0	62.5	31.3
Rated voltage	V_{rated}	V	275	315	315	340	300	335
Rated frequency	f_{rated}	Hz	215	215	100	90	200	95
Moment of inertia	J	kgcm²	23.4	34.7	23.4	34.7	65.0	65.0
Efficiency	η		0.93	0.93	0.9	0.9	0.93	0.92
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.17	1.52	2.33	3.03	1.62	3.23
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	74.5	87.41	148.62	175.02	95.04	190.66
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.4	0.28	1.2	1.2	0.32	1.3
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.603	0.422	1.808	1.808	0.482	1.959
Stator inductance	L	mH	5.51	5.99	22.0	23.9	5.20	20.8
Weight	m	kg	20.8	25.6	20.8	25.6	24	24

Technical data

Rated data

Inverter power supply 400 V, self-ventilated motors

Motor			MCS19J30-	MCS19P30-	MCS19J14-	MCS19P14-
Standstill torque	M_0	Nm	51.0	64.0	51.0	64.0
Rated torque	M_{rated}	Nm	29.0	32.0	40.0	51.0
Max. torque	M_{max}	Nm	129	190	129	190
Rated speed	n_{rated}	rpm	3000	3000	1425	1350
Max. speed	n_{max}	rpm	4000	4000	4000	4000
Rated power	P_{rated}	kW	9.1	10	6	7.2
Standstill current	I_0	A	30.5	34.9	15.2	17.5
Rated current	I_{rated}	A	18.5	19.0	12.3	14.3
Max. current	I_{max}	A	89.6	120	44.8	60.0
Rated voltage	V_{rated}	V	300	320	330	330
Rated frequency	f_{rated}	Hz	200	200	95	90
Moment of inertia	J	kgcm²	105	160	105	160
Efficiency	η		0.93	0.93	0.92	0.92
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.67	1.83	3.36	3.66
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	97.29	105.6	194.57	211.19
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.16	0.14	0.66	0.54
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.241	0.211	0.995	0.814
Stator inductance	L	mH	3.20	2.40	12.8	9.60
Weight	m	kg	31	41	31	41

Inverter power supply 400 V, forced ventilated motors

Motor			MCS12H34-	MCS12H14-	MCS12L39-	MCS12L17-	MCS12D35-	MCS12D17-
Standstill torque	M_0	Nm	12.8	12.8	19.0	19.0	7.50	7.50
Rated torque	M_{rated}	Nm	10.5	12.0	14.0	17.0	6.00	7.00
Max. torque	M_{max}	Nm	29.0	29.0	56.4	56.4	17.7	17.7
Rated speed	n_{rated}	rpm	3375	1350	3900	1650	3525	1650
Max. speed	n_{max}	rpm	6000	6000	6000	6000	6000	6000
Rated power	P_{rated}	kW	3.7	1.7	5.7	2.9	2.2	1.2
Standstill current	I_0	A	8.50	4.60	14.4	7.20	6.40	3.20
Rated current	I_{rated}	A	7.50	4.10	11.7	6.70	5.60	3.00
Max. current	I_{max}	A	24.0	12.0	57.0	28.0	20.0	10.0
Rated voltage	V_{rated}	V	320	310	295	300	300	330
Rated frequency	f_{rated}	Hz	225	90	260	110	235	110
Moment of inertia	J	kgcm²	7.30	7.30	10.6	10.6	4.00	4.00
Efficiency	η		0.86	0.8	0.94	0.9	0.85	0.75
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.51	2.78	1.32	2.64	1.17	2.34
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	84.58	169.15	72.94	145.69	67.07	133.95
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	1.4	5.8	0.6	2.2	4.4	17.4
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	2.11	8.741	0.904	3.315	6.631	26.222
Stator inductance	L	mH	10.5	42.1	5.45	21.8	13.0	52.2
Weight	m	kg	12.2	12.2	15.3	15.3	9.1	9.1

Technical data

Rated data

Inverter power supply 400 V, forced ventilated motors

Motor			MCS14D30-	MCS14D14-	MCS14H28-	MCS14H12-	MCS14L30-	MCS14L14-
Standstill torque	M_0	Nm	12.5	12.5	25.5	25.5	34.5	34.5
Rated torque	M_{rated}	Nm	10.5	12.0	20.5	23.5	25.5	30.5
Max. torque	M_{max}	Nm	29.0	29.0	54.8	54.8	77.1	77.1
Rated speed	n_{rated}	rpm	3000	1350	2775	1200	3000	1350
Max. speed	n_{max}	rpm	6000	6000	6000	6000	6000	6000
Rated power	P_{rated}	kW	3.3	1.7	6	3	8	4.3
Standstill current	I_0	A	11.4	5.70	18.4	9.30	26.7	13.4
Rated current	I_{rated}	A	9.70	5.40	15.0	8.30	20.8	11.8
Max. current	I_{max}	A	33.0	16.5	51.5	25.8	74.5	37.3
Rated voltage	V_{rated}	V	325	345	325	335	310	335
Rated frequency	f_{rated}	Hz	200	90	185	80	200	90
Moment of inertia	J	kgcm²	8.10	8.10	14.2	14.2	23.4	23.4
Efficiency	η		0.92	0.84	0.93	0.87	0.92	0.88
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.10	2.19	1.39	2.74	1.29	2.57
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	62.77	126.13	74.6	149.6	74.5	148.62
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	1	4	0.52	2.08	0.4	1.2
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	1.507	6.028	0.784	3.135	0.603	1.808
Stator inductance	L	mH	12.5	49.8	8.53	34.1	5.51	22.0
Weight	m	kg	15.2	15.2	20.2	20.2	24.7	24.7

Motor			MCS14P26-	MCS14P11-	MCS19F29-	MCS19F12-	MCS19J29-	MCS19P29-
Standstill torque	M_0	Nm	43.5	43.5	41.5	41.5	70.5	86.0
Rated torque	M_{rated}	Nm	33.0	42.0	32.5	38.0	50.5	53.0
Max. torque	M_{max}	Nm	105	105	86.0	86.0	129	190
Rated speed	n_{rated}	rpm	2625	1050	2850	1200	2850	2850
Max. speed	n_{max}	rpm	6000	6000	4000	4000	4000	4000
Rated power	P_{rated}	kW	9.1	4.6	9.7	4.8	15.1	15.8
Standstill current	I_0	A	28.3	14.1	24.5	12.2	40.6	44.7
Rated current	I_{rated}	A	21.9	13.4	20.1	11.3	31.0	29.5
Max. current	I_{max}	A	92.0	46.0	62.5	31.3	89.6	120
Rated voltage	V_{rated}	V	325	330	320	320	315	315
Rated frequency	f_{rated}	Hz	175	70	190	80	190	190
Moment of inertia	J	kgcm²	34.7	34.7	65.0	65.0	105	160
Efficiency	η		0.92	0.86	0.95	0.9	0.93	0.93
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	1.54	3.09	1.69	3.40	1.74	1.92
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	87.41	175.02	95.04	190.66	97.29	105.6
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.28	1.2	0.32	1.3	0.16	0.14
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.422	1.808	0.482	1.959	0.241	0.211
Stator inductance	L	mH	5.99	23.9	5.20	20.8	3.20	2.40
Weight	m	kg	29.7	29.7	30	30	37	47

Technical data

Rated data

Inverter power supply 400 V, forced ventilated motors

Motor			MCS19J12-	MCS19P12-
Standstill torque	M_0	Nm	70.5	86.0
Rated torque	M_{rated}	Nm	62.5	72.0
Max. torque	M_{max}	Nm	129	190
Rated speed	n_{rated}	rpm	1200	1200
Max. speed	n_{max}	rpm	4000	4000
Rated power	P_{rated}	kW	7.9	9
Standstill current	I_0	A	20.3	22.4
Rated current	I_{rated}	A	18.3	21.3
Max. current	I_{max}	A	44.8	60.0
Rated voltage	V_{rated}	V	320	310
Rated frequency	f_{rated}	Hz	80	80
Moment of inertia	J	kgcm²	105	160
Efficiency	η		0.89	0.9
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	3.47	3.84
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	194.57	211.19
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.66	0.54
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.995	0.814
Stator inductance	L	mH	12.8	9.60
Weight	m	kg	37	47

Inverter power supply 230 V, self-ventilated motors

Motor			MCS06C60L	MCS06C41L	MCS06F60L	MCS06F41L	MCS06I60L	MCS06I41L
Standstill torque	M_0	Nm	0.800	0.800	1.50	1.50	2.00	2.00
Rated torque	M_{rated}	Nm	0.500	0.600	0.900	1.20	1.20	1.50
Max. torque	M_{max}	Nm	2.40	2.40	4.40	4.40	6.20	6.20
Rated speed	n_{rated}	rpm	6000	4050	6000	4050	6000	4050
Max. speed	n_{max}	rpm	8000	8000	8000	8000	8000	8000
Rated power	P_{rated}	kW	0.31	0.25	0.57	0.51	0.75	0.64
Standstill current	I_0	A	4.30	2.50	3.80	2.90	4.20	3.10
Rated current	I_{rated}	A	4.00	2.50	3.40	2.90	3.60	2.90
Max. current	I_{max}	A	18.5	10.8	16.5	10.5	16.0	11.8
Rated voltage	V_{rated}	V	85	125	125	165	150	175
Rated frequency	f_{rated}	Hz	400	270	400	270	400	270
Moment of inertia	J	kgcm²	0.140	0.140	0.220	0.220	0.300	0.300
Efficiency	η		0.7	0.65	0.82	0.81	0.84	0.81
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.186	0.320	0.395	0.517	0.476	0.645
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	12.22	21.02	21.71	33.73	27.87	37.15
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	2.148	5.926	2.222	5.481	2.519	4.593
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	3.237	8.93	3.349	8.26	3.796	6.922
Stator inductance	L	mH	4.30	12.8	6.90	15.9	9.30	15.1
Weight	m	kg	2.30	2.30	2.70	2.70	3.40	3.40

Technical data

Rated data

Inverter power supply 230 V, self-ventilated motors

Motor			MCS09D60L	MCS09D41L	MCS09F60L	MCS09H60L	MCS09F38L	MCS09H41L
Standstill torque	M_0	Nm	3.30	3.30	4.20	5.50	4.20	5.50
Rated torque	M_{rated}	Nm	1.80	2.30	2.40	3.00	3.10	3.80
Max. torque	M_{max}	Nm	9.50	9.50	15.0	20.0	15.0	20.0
Rated speed	n_{rated}	rpm	6000	4050	6000	6000	3750	4050
Max. speed	n_{max}	rpm	7000	7000	7000	7000	7000	7000
Rated power	P_{rated}	kW	1.1	1	1.5	1.9	1.2	1.6
Standstill current	I_0	A	10.3	5.30	10.5	12.0	6.00	8.50
Rated current	I_{rated}	A	7.00	4.60	7.90	8.00	5.00	6.80
Max. current	I_{max}	A	39.0	20.0	52.5	57.0	30.0	40.0
Rated voltage	V_{rated}	V	110	165	125	145	160	160
Rated frequency	f_{rated}	Hz	400	270	400	400	250	270
Moment of inertia	J	kgcm²	1.10	1.10	1.50	1.90	1.50	1.90
Efficiency	η		0.87	0.87	0.9	0.91	0.9	0.91
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.320	0.623	0.400	0.458	0.700	0.647
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	17.89	34.81	22.29	26.01	39.01	36.96
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.45	1.75	0.415	0.356	1.333	0.889
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.678	2.637	0.625	0.536	2.009	1.34
Stator inductance	L	mH	1.70	6.30	2.00	2.00	6.20	4.00
Weight	m	kg	4.90	4.90	5.80	6.70	5.80	6.70

Motor			MCS09L41L	MCS12H15L	MCS12L20L	MCS12D41L	MCS12D20L	MCS12H30L
Standstill torque	M_0	Nm	7.50	11.4	15.0	6.40	6.40	11.4
Rated torque	M_{rated}	Nm	4.50	10.0	13.5	4.30	5.50	8.00
Max. torque	M_{max}	Nm	32.0	29.0	56.0	18.0	18.0	29.0
Rated speed	n_{rated}	rpm	4050	1500	1950	4050	1950	3000
Max. speed	n_{max}	rpm	7000	6000	6000	6000	6000	6000
Rated power	P_{rated}	kW	1.9	1.6	2.8	1.8	1.1	2.5
Standstill current	I_0	A	12.4	8.20	12.4	10.7	5.50	13.5
Rated current	I_{rated}	A	8.40	7.60	11.8	8.80	5.20	10.5
Max. current	I_{max}	A	64.0	24.0	57.0	40.0	20.0	39.0
Rated voltage	V_{rated}	V	145	158	165	155	175	165
Rated frequency	f_{rated}	Hz	270	100	130	270	130	200
Moment of inertia	J	kgcm²	2.80	7.30	10.6	4.00	4.00	7.30
Efficiency	η		0.91	0.86	0.9	0.84	0.85	0.87
Torque constant	$Kt_{0\ 150\ °C}$	Nm/A	0.605	1.39	1.21	0.598	1.16	0.844
Voltage constant	$KE_{LL\ 150\ °C}$	V/(1000/min)	35.1	84.58	75.19	34.22	67.07	51.82
Stator terminal resistance	$R_{UV\ 20\ °C}$	Ω	0.44	1.41	0.548	0.55	2.2	0.489
Stator terminal resistance	$R_{UV\ 150\ °C}$	Ω	0.663	2.125	0.826	0.829	3.315	0.737
Stator inductance	L	mH	2.50	10.5	5.50	3.40	13.0	4.00
Weight	m	kg	8.50	10.2	13.3	7.10	7.10	10.2

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"

Lenze SE
Postfach 101352 · 31763 Hameln
Hans-Lenze-Straße 1 · 31855 Aerzen
GERMANY
Hannover HRB 204803
Phone +49 5154 82-0
Fax +49 5154 82-2800
sales.de@lenze.com
www.Lenze.com