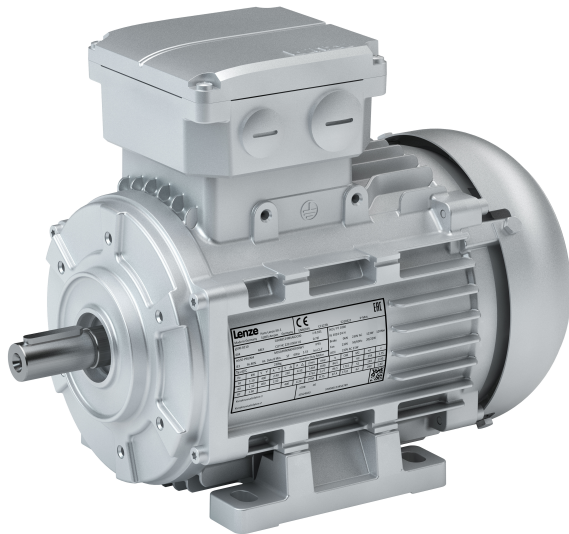


IE2 three-phase AC motor m550-H Version B

IE3 three-phase AC motor m550-P Version B



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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: "EASY Starter", "PLC Designer"
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 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 be operated on the mains or on the inverter.
- Only certified application brakes may be used as safety brakes for functional safety.
- 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

Diagram of a motor nameplate layout with numbered fields 1 through 23, including sections for technical specifications, motor data, and identification.

Position	Contents	Position	Contents
1	Manufacturer	12	Motor code for Lenze frequency inverter
2	Country of production	13	Gearbox output data
3	Approvals	13.1	Output torque
4	Standards	13.2	Output speed
5	Motor type	13.3	Load capacity
6	Gearbox data	14	Temperature monitoring
6.1	Product name	15	Feedback
6.2	Product code	16	Brake
6.3	Gearbox ratio	16.1	Size and if required ABRs1 / ABRs2
6.4	Position: Shaft, flange, terminal box/motec	16.2	Supply voltage
6.5	Mounting position	16.3	Power
6.6	Lubricant	16.4	Braking torque
6.7	Lubricant quantity	17	Blower
7	Motor data	17.1	Rated voltage
7.1	Product name	17.2	Rated frequency
7.2	Product key	17.3	Rated power
7.3	Degree of protection	18	Anti-condensation heater
7.4	Efficiency class	19	Customer data
7.5	Operating mode	20	Year of manufacture / week of manufacture
7.6	Rated frequency	21	Country of production, code
7.7	Service factor	22	Material number
7.8	Class of insulation	23	Serial number
8	Ambient temperature	24	Bar code
9	Weight		
10	UL product category		
11	Motor data at rated frequency		
11.1	Rated frequency		
11.2	Rated power		
11.3	Rated voltage		
11.4	Rated current		
11.5	Rated voltage		
11.6	Rated current		
11.7	Rated speed		
11.8	Power factor		
11.9	Efficiency		



Product codes

Motor product code

Example		M	55	B	H	063	S	04	5	E	0	0	C	C
Product type	Motor	M												
Product family			55											
Version				B										
Efficiency class	IE2				H									
	IE3				P									
Size						063 071 080 090 100 112 132 160 180								
Overall length	Short						S							
	Medium						M							
	Long						L							
Number of poles	4-pole							04						
Degree of protection	IP54/IP55								5					
	IP65/IP66								6					
Cooling	Self-ventilation									E				
	Forced ventilation									F				
Brake	Without										0			
	Spring-applied brakes										F			
Feedback	Without											0		
	Absolute value encoder											A		
	Incremental encoder											E		
	Resolver											R		
Approvals	None												N	
	CE												C	
	CE, CCC												3	
	CE, cULus												L	
	CE, cULus, CCC												5	
	CE, cURus												U	
	CE, cURus, CCC												W	
Design type	Internal key													C



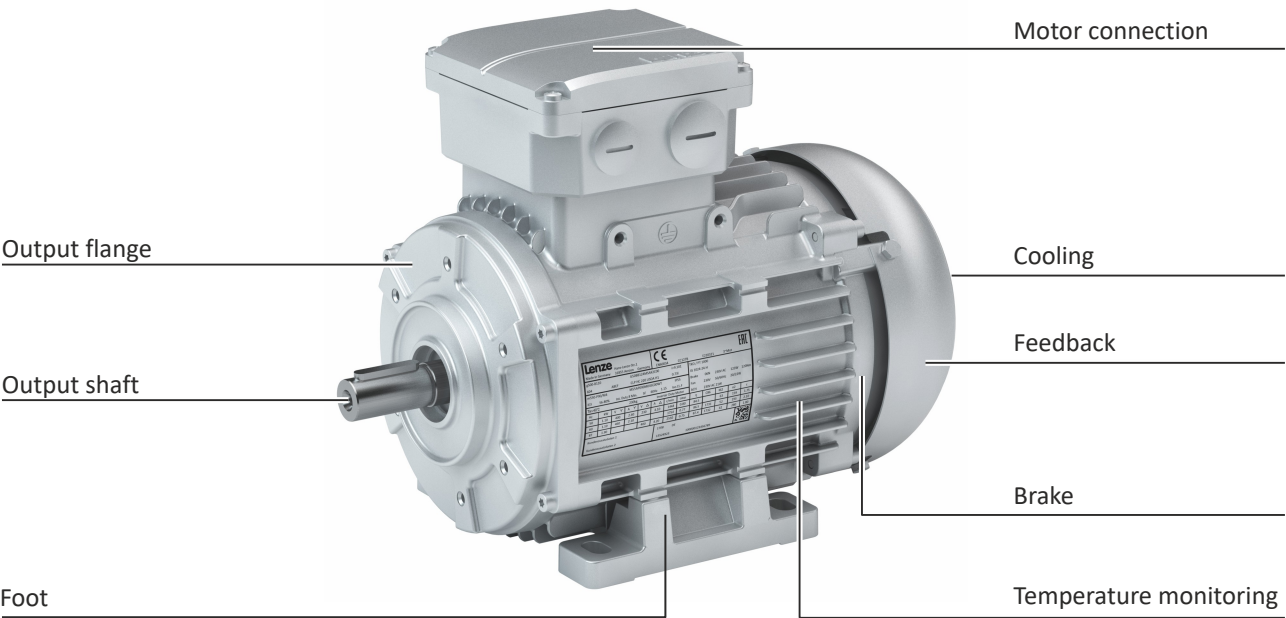
Product code feedbacks

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	



Features

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.



The transport weights can be found in the shipping documents!



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](#)  52



Mechanical installation

Important notes

- Install the product according to the information in the chapter "Standards and operating conditions".
 - ▶ [Standards and operating conditions](#)  51
- 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

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.



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

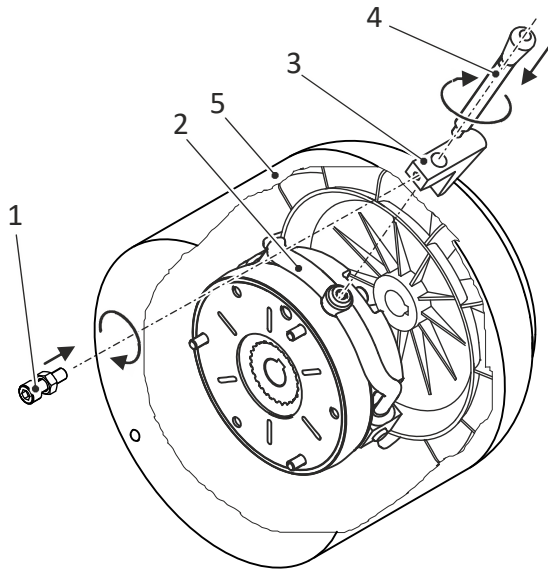
- Use screws with a minimum property class of 8.8.
- Observe prescribed tightening torques.
- Secure against unintended loosening.
- For alternating loads, we recommend applying anaerobic curing adhesive between flange and mounting surface.

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



Product extensions

Assembly of lockable manual release lever in operating position



- | | | | |
|---|------------------------------------|---|----------------------|
| 1 | Cheese head screw with hexagon nut | 4 | Manual release lever |
| 2 | Manual release shackle | 5 | Fan cover |
| 3 | Terminal block | | |

How to mount the manual release lever

1. Screw the cheese head screw with hexagon nut (1) loosely into the terminal block (3).
2. Push the terminal block (3) over the manual release lever (4).
3. Guide the manual release lever with terminal block (3+4) through the slot in the fan cover (5) and screw it into the threaded hole in the manual release shackle (2).
4. Tighten the manual release lever (4) to the prescribed torque.
5. Align the terminal block (3) (see fig.) and insert it from above into the slot of the fan cover (5) up to the stop.
6. Tighten the cheese head screw (1) to the specified torque and counter with hexagon head screw.

Mechanical installation

Mounting
Product extensions

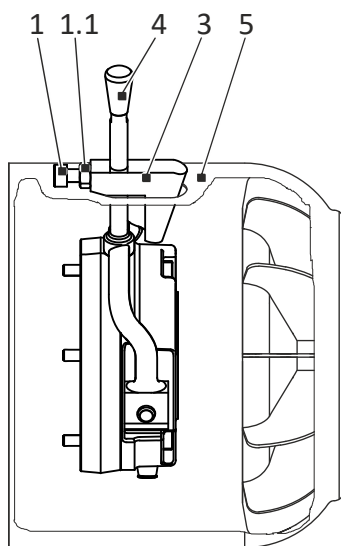


Handling of lockable manual release lever

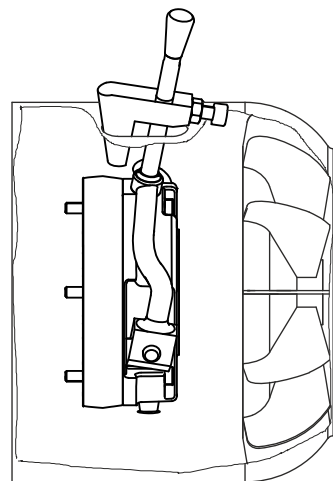
NOTICE

- Only lock the hand release in the service position for service work!
- The manual release must not be locked in the service position during operation, otherwise the brake could be damaged!
- Always secure the terminal block against loosening in every position with cheese head screw and nut!

Operating position, brake is not released



Service position, brake is released



- 1 Cheese head screw with hexagon nut
- 3 Terminal block

- 4 Manual release lever
- 5 Fan cover

How to lock the manual release lever:

1. Loosen hexagon nut (1.1) and cheese head screw (1).
2. Pull the terminal block (3) out of the slot in the fan cover and turn it by 180°.
3. Actuate the manual release lever (4) and bring it into the service position, pushing the terminal block (3) under slight pressure into the slot of the fan cover (5).
4. Tighten the cheese head screw (1) to the specified torque and counter with hexagon nut (1.1).



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.

Connection for high leakage current

If the leakage current is greater than 3.5 mA for alternating current or greater than 10 mA for direct current, the standard EN 61800-5-1 requires that at least one or more of the following measures be met:

- The minimum PE conductor cross-section is 10 mm² with Cu or 16 mm² with Al.
- Attachment of an additional protective grounding conductor with the same cross-section as the original protective grounding conductor.
 - Do not place the additional terminal on the same terminal.
- Provide automatic disconnection of the mains in case of interruption of the protective conductor.

Operation on an external inverter

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

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

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



Preparation

EMC-compliant wiring



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



Motor connection

To connect the motor correctly, you must follow:

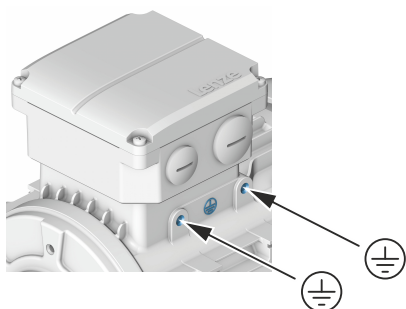
- The notes in the terminal box of the motor.
- The notes in the configuration document of the motor.
- The technical data on the motor nameplate.

Second ground connection on the motor

According to the EN 61800-5-1 standard, additional measures are required for the protective earth connection if the leakage current is greater than 3.5 mA for alternating current or greater than 10 mA for direct current.

► [Important notes](#) 25

A possible measure is the execution via a second ground connection.



Scope of delivery when a second ground connection is selected:

- Toothed lock washer
- Washer
- Fixing screw



An additional grounding cable is not included in the scope of delivery.
The dimensioning of the grounding is done by the customer.

Electrical installation

Motor connection
Connection via terminal box



Connection via terminal box

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

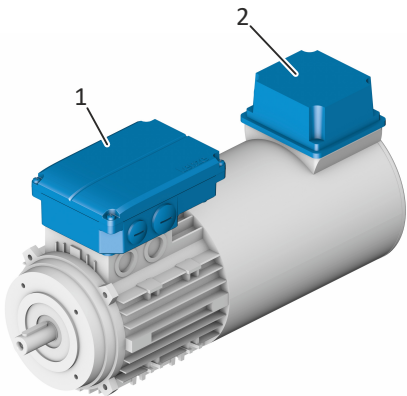
The connection must ensure a continuous and safe electrical supply:

- 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

Position of the connections



Note	Meaning	Note
1	Power connection Brake connection PE connection Feedback connection Connection of temperature monitoring	
2	Blower connection	If required, the terminal box cover can be rotated step by step by 90 ° after loosening the screws on the terminal box.

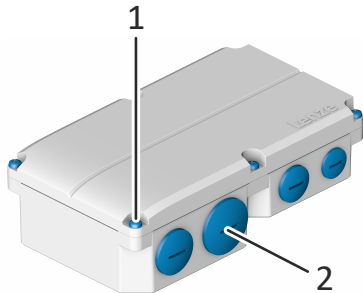


Tightening torques for cover screw connections and cable glands



The opening cutouts for the cable glands are closed with plugs.

In the case of the blower terminal box, the opening is only arranged on one side. If required, the terminal box can be rotated step by step by 90 ° after loosening the screws in the terminal box.



Cover screw connections, position 1								
Thread diameter		M4		M5		M6		
Tightening torques ±10 %	Nm	2.2		3.5		4.5		

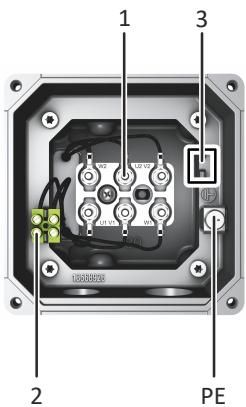
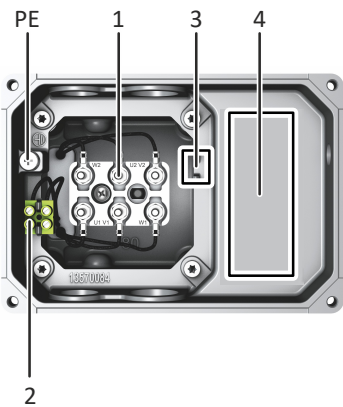
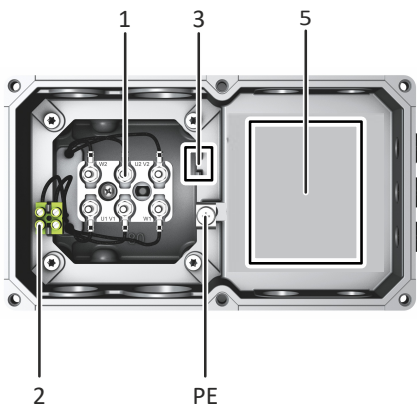
Cable glands, position 2								
Cable glands		M12x1.5	M16x1.5	M20x1.5	M25x1.5	M32x1.5	M40x1.5	M50x1.5
Tightening torques ±10 %								
Plastics	Nm	0.7	1.0	1.0	2.5	3.0	3.0	3.0
Metal	Nm	3.0	3.0	4.0	6.0	8.0	10	14

Electrical installation

Motor connection
Connection via terminal box



Terminal data

					
PE	PE connection	3	Second temperature monitoring		
1	Mains connection	4	Brake or feedback		
2	Temperature monitoring	5	Brake and feedback		

Motor frame size		063	071	080	090	0100	112	132	160	180
Mains connection										
Terminal		U1, V1, W1								
Tightening bolt		M4	M4	M4	M5	M5	M5	M6	M6	M8
Tightening torque	Nm	1.5	1.5	1.5	2	2	2	3.5	6	6
PE connection										
Terminal		PE								
Connection type		Screw terminal								
Max. cable cross-section	mm ²	2.5	2.5	2.5	2.5	2.5	2.5	6	10	10
Stripping length	mm	10	10	10	10	10	10	10	10	10
Tightening torque	Nm	5.9	5.9	5.9	5.9	5.9	5.9	10.1	24.6	24.6
Temperature monitoring										
Terminal		TB1, TB2								
Connection type		Luster terminal								
Terminal		1TP1, 1TP2, 2TP1, 2TP2, R1, R2								
Connection type		Spring terminal								
Max. cable cross-section	mm2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Blower										
Terminal		U1, V1, W1, PE/U1, U2, PE								
Tightening bolt		M4	M4	M4	M4	M4	M4	M4	M4	M4
Tightening torque	Nm	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Brake		DC	AC, half-wave rectifier	AC, bridge rectifier
Terminal		BD1, BD2	~	~
Connection type		Spring terminal	Spring terminal	Screw terminal
Max. cable cross-section	mm2	1.5	1.5	4
Stripping length	mm	9	6	6
Tightening torque	Nm	-	-	0.45

Feedback		Resolver	TTL encoder	Incremental HTL encoder	Hiperface absolute value encoder
Terminal		B1 ... B7	+, -, A, A ⁺ , B, B ⁺ , 0, 0 ⁺ , B10	+, -, A, A ⁺ , B, B ⁺ , 0, 0 ⁺ , B10	B1 ... B10
Connection type		Spring terminal	Spring terminal	Spring terminal	Spring terminal
Max. cable cross-section	mm ²	0.5	0.5	0.5	0.5



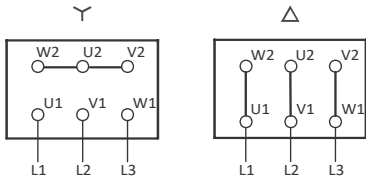
Electrical installation

Motor connection
Connection via terminal box

Power connection

Bridge arrangement

Y/Δ circuit

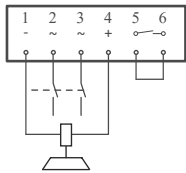


Terminal box, power		
Contact	Name	Meaning
PE	PE	PE conductor
U1	L1	Motor winding phase
V1	L2	
W1	L3	

DC brake connection

Terminal box, DC brake		
Contact	Name	Meaning
BD1	+	Brake +
BD2	-	Brake -

AC brake connection



 Switching contact - DC switching

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

Feedback connection

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	Cosine stator windings
B5	-COS	
B6	+SIN	Sine stator windings
B7	-SIN	
B8		Not assigned

Electrical installation

Motor connection
Connection via terminal box



Terminal box, incremental encoder HTL/TTL		
Contact	Name	Meaning
+	+ UB	Supply +
-	GND	Mass
A	A/+COS	Track A / + COS
A ⁻	A ⁻ /Ref COS	Track A inverse /-COS
B	B/+SIN	Track B / +SIN
B ⁻	B ⁻ /Ref SIN	Track B inverse/-SIN
0	0	Zero track / + RS485
0 ⁻	0 ⁻	Zero track inverse /-RS485

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

Connection of temperature monitoring

Terminal box, temperature monitoring		
Contact	Name	Meaning
TB1		Temperature monitoring: TCO
TB2		
1TP1		PTC150 thermistor
2TP1		PTC130 thermistor
R1	+	Temperature sensor PT1000 +
R2	-	Temperature sensor PT1000 -
1TP2		PTC150 thermistor
2TP2		PTC130 thermistor

Blower connection

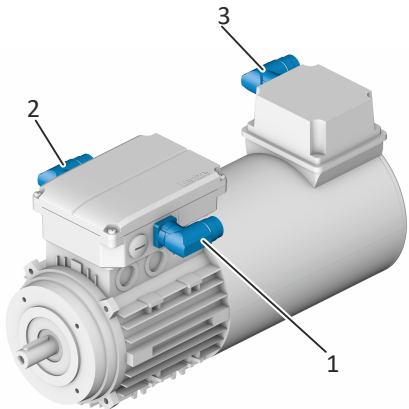
Terminal box, 1-phase separate fan		
Contact	Name	Meaning
PE	PE	PE conductor
U1	L1	Mains
U2	N	

Terminal box, 3-phase separate fan		
Contact	Name	Meaning
PE	PE	PE conductor
U1	L1	Mains connection
V1	L2	
W1	L3	



Connection via ICN connector

Position of the connections

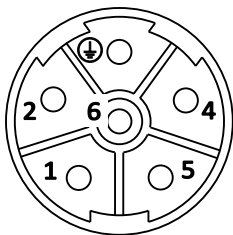


Position	Meaning	Note
1	ICN-M23 6-pin connector - Power connection - Brake connection - PE connection	Indicate the mounting position of connectors in the order: - Shown “R” - On the opposite side “L”
	Additionally for ICN-M23 8-pin connector: Thermal contact temperature monitoring connection	Caution: Max. Brake connection voltage ≤ 230 V
2	ICN-M23 connector - Feedback connection - PT1000 temperature sensor connection	The mounting position for the feedback connector is on the opposite side to the power connection (position L/R).
3	ICN-M17 connector Blower connection	Indicate the mounting position of terminal boxes in the order: - Shown “T” - L, R or B If required, the terminal box cover can be gradually rotated by 90° after loosening the screws on the terminal box.

Power and brake connection

ICN-M23 connector assignment

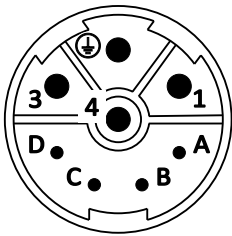
6-pole



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

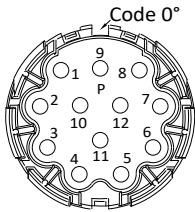


M23 connector assignment
8-pole



ICN M23 8-pole		
Contact	Name	Meaning
1	U	Power phase U
PE	PE	PE conductor
3	W	Power phase W
4	V	Power phase V
A	TB1	Temperature monitoring: TCO
B	TB2	Temperature monitoring: TCO
C	BD1 / BA1	Brake DC +/-AC ≤ 230 V
D	BD2 / BA2	Brake DC-/AC ≤ 230V

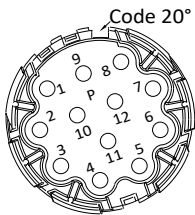
Feedback and temperature monitoring connection
ICN-M23 connector assignment
Resolver



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

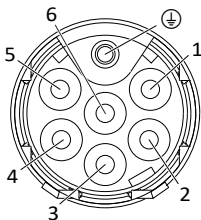


ICN-M23 connector assignment
Incremental and SinCos absolute value encoder Hiperface©



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		Not assigned
11	+	Temperature monitoring: PT1000
12	-	Temperature monitoring: PT1000

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

ICN M17 for blowers 3-ph		
Contact	Name	Meaning
PE	PE	PE conductor
1	U	Power phase U
2		Not assigned
3	V	Power phase V
4		Not assigned
5		Not assigned
6	W	Power phase W



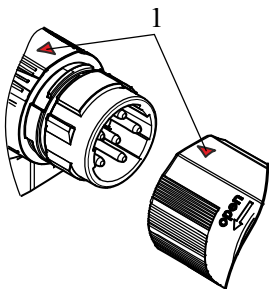
Assembly of ICN connectors

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

Connection via M12 connector

M12 pin assignment
Incr. encoder IG128-24V-H

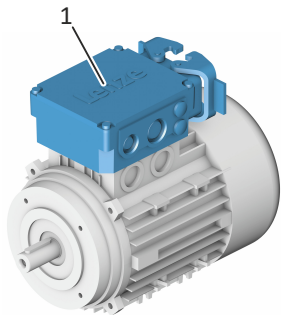


ICN M12		
Contact	Name	Meaning
1	+UB	Supply +
2	B	Track B
3	GND	Mass
4	A	Track A



Connection via HAN connector

Position of the connections

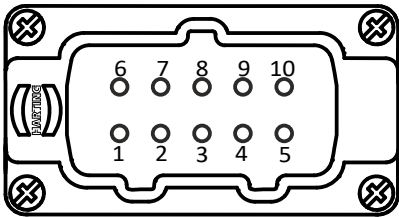


Position	Meaning
1	Power connection Brake connection PE connection Temperature monitoring connection Additionally for the Han-Modular: Rectifier connection

HAN 10E connector

The motor connection is specified in the counter plug.
The connector is only suitable for motors with the connection method Y/ Δ .

HAN 10E connector assignment



Bridge arrangement in the HAN 10E mating connector		
Contact	Name	Meaning
6-7-8	Y	Connection
1-6	Δ	
2-7		
3-8		

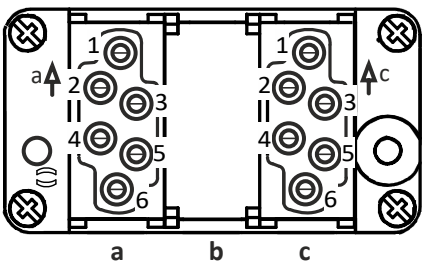
HAN 10 E		
Contact	Name	Meaning
1	U1	Motor winding phase
2	V1	
3	W1	
4	+ / AC	Brake
5	- / AC	
6	W2	Motor winding phase
7	U2	
8	V2	
9	TKO / +PT1000	Temperature monitoring
10	TKO / -PT1000	



Han-Modular connector

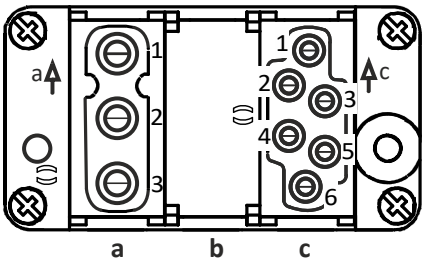
The motor circuit is defined in the terminal box.

Han-Modular 16 A connector assignment



HAN modular 16 A			
Module	Contact	Name	Meaning
a	1	U1	Motor winding phase
	2	V1	
	3	W1	
b			Blank module
c	1	TKO +PT1000	Temperature monitoring
	2	+/AC	Brake
	3	-/AC	
	4	Schaltkontakt	Rectifier
	5		
	6	TKO -PT1000	Temperature monitoring

Han-Modular 40 A connector assignment



HAN modular 40 A			
Module	Contact	Name	Meaning
a	1	U1	Motor winding phase
	2	V1	
	3	W1	
b			Blank module
c	1	TKO +PT1000	Temperature monitoring
	2	+/AC	Brake
	3	-/AC	
	4	Schaltkontakt	Rectifier
	5		
	6	TKO -PT1000	Temperature monitoring



Commissioning

Important notes

Temperature ranges

The following temperature ranges are available matched to your ambient conditions:

- Default
- Deep-freeze
- Wide range



Check the ambient temperature shown on the nameplate.

► [Nameplates](#)  12

Pay attention to the notes on the temperature ranges!

Temperature ranges	
Default	
Ambient temperature	0 °C ... +40 °C
Note	At an ambient temperature generally over +30 °C: • A check of the application case by Lenze is required.
Deep-freeze	
Ambient temperature	-30 °C ... +10 °C
Note	When starting a cold motor at below -20 °C, you have to expect an increased starting torque on account of the higher viscosity of the roller bearing grease. • Take a starting torque reserve for the motor of around 20 % into account during the configuration. Commissioning at over +10 °C: • Operate the drive with max. 50 % of the rated torque to avoid any shortening of the service life.
Wide range	
Ambient temperature	-30 °C ... +40 °C
Note	When starting a cold motor at below -20 °C, you have to expect an increased starting torque on account of the higher viscosity of the roller bearing grease. • Take a starting torque reserve for the motor of around 30 % into account during the configuration. At an ambient temperature generally over +30 °C: • A check of the application case by Lenze is required. At a temperature constantly between -30 °C and -25 °C, the service life is up to 20 % lower than with the deep-freeze package.

NOTICE

Emergency stops are permissible when commissioning the holding brake.

► Observe the permissible maximum switching work.

 **DANGER!**

An emergency stop during operation can cause the holding brake to malfunction.

Possible consequences: Personal injury and/or damage to property.

► After an emergency stop, check the air gap and the friction lining for damage.

► If the air gap is too large or the friction lining is damaged, replace the brake rotor.



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 $\leq 1 \text{ k}\Omega$ 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 $> 1 \text{ k}\Omega$ 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

Brakes

⚠ WARNING!

Functional safety

Certain brakes support safety functions in accordance with the requirements of the 2006/42/EC: Machinery Directive [UKCA: S.I. 2008/1597 - The Supply of Machinery (Safety) Regulations 2008] .

Work on the safety brake that has not been carried out correctly will result in the loss of the safety functions.

- ▶ Maintenance, repair or replacement of the safety brake may only be carried out by Lenze Service or its authorized 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.



Maintenance intervals

Motor

Time interval	Measures	Description of the operations
Every 6 months	Clean motor	Remove dirt and dust deposits. To be inspected more frequently in the case of heavy dirt accumulation.
After 3 hours, then every 2 years	Check fastening elements	Check all fixing screws on the motor (foot and flange fixing ...) for tightness.

Spring-applied brake

NOTICE

► A maintenance concept adapted to the operating conditions and the stresses to which the brakes are subjected must be drawn up for every application.

Holding brake HBR

Holding brake with emergency stop	Description of the operations
- At least every two years - Standard brake: After 1 million cycles at the latest - Provide shorter intervals in the case of frequent emergency stops	- Remove contamination by oil and grease with brake cleaner, if necessary replace the brake after clarifying the cause. - Remove dirt and particles in the air gap between stator and armature plate. - Check ventilation function and activation/deactivation - Check air gap (if required, re-adjust it) - Measure rotor thickness (if required, replace rotor) - Check for thermal damage of the armature plate or flange (tarnished in dark blue)

Application brake ABR

Service brake	Holding brake with emergency stop	Description of the operations
- According to service life calculation - Otherwise every six months - After 4,000 operating hours at the latest	- At least every two years - Standard brake: After 1 million cycles at the latest - LongLife design: After 10 million cycles at the latest - Provide shorter intervals in the case of frequent emergency stops	- Remove contamination by oil and grease with brake cleaner, if necessary replace the brake after clarifying the cause. - Remove dirt and particles in the air gap between stator and armature plate. - Check ventilation function and activation/deactivation - Check air gap (if required, re-adjust it) - Measure rotor thickness (if required, replace rotor) - Check for thermal damage of the armature plate or flange (tarnished in dark blue)

LongLife also valid ABRS1 and ABRS2

General information about spring-applied brakes ABRS1 and ABRS2

- The microswitch option is not protected
- The permissible ambient temperature is -20 to +40°C
- The relative humidity during operation must be < 85 % and must not be condensing
- Maintenance of these brakes must be carried out by Lenze Service

Spring-applied safety brake, IP54/IP55 single brake

The spring-applied brakes are application brakes for use in safety applications.

ABRS1 spring-applied safety brakes achieve safety level SIL 1. These can be used together with the Safe Brake Control (SBC) function.

Preconditions

It should be noted that the safety brake is selected so that 80 % of the characteristic torque is sufficient for the safety-related function..



Spring-applied safety brake, IP54/IP55 double brake

The spring-applied brakes are application brakes for use in safety applications.

ABRS2 double brakes achieve safety level SIL1 or SIL2. These can be used together with the Safe Brake Control (SBC) function.

Preconditions

It should be noted that the safety brake is selected so that 80 % of the characteristic torque is sufficient for the safety-related function.



Maintenance work

Maintenance work at the spring-applied brake

NOTICE

- Brakes with defective armature plates, springs or flanges must be completely replaced.
- Before carrying out maintenance work, identify the brake and motor protection type from the nameplate.

► Nameplates 12



Before working on the brake, remove the integral fan cover or blower cover on the motor.

How to remove the fan cover:

1. Loosen and remove screws at the cover circumference.
2. If necessary, disconnect the connecting cable on the blower cover.
3. Remove fan cover.

Release brake and check voltage

DANGER!

Risk of injury due to rotary parts.

- Do not touch rotating components.

DANGER!

Risk of injury by electric shock.

- Do not touch live connections.

1. Check the function of the brake while the drive is running: The armature plate must be tightened and the rotor must move free of residual torque.
2. Measure the DC voltage on the brake.
 - Compare the measured DC voltage with the voltage specification on the nameplate. A deviation up to $\pm 10\%$ is permissible.
 - When using bridge/half-wave rectifiers: After switching over to one-way voltage, the measured DC voltage may drop to 45% of the voltage indicated on the nameplate.

Check and adjust air gap

DANGER!

Risk of injury due to rotary parts.

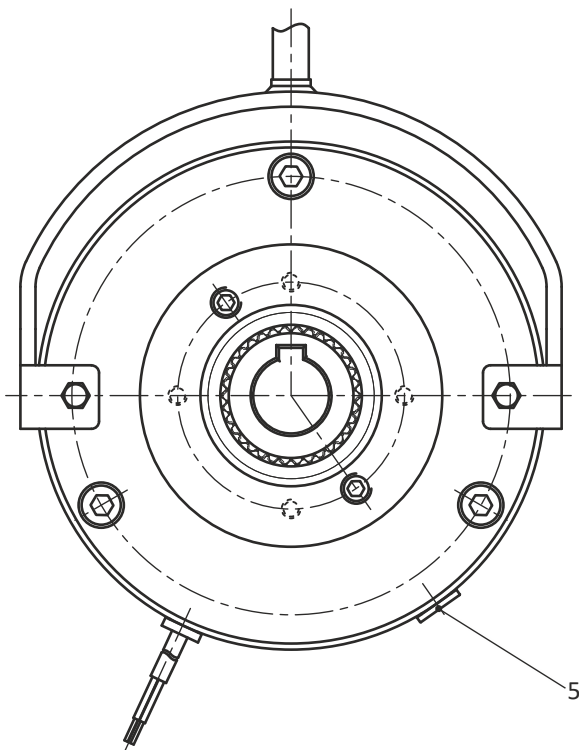
- The motor must not be running when checking the air gap.

NOTICE

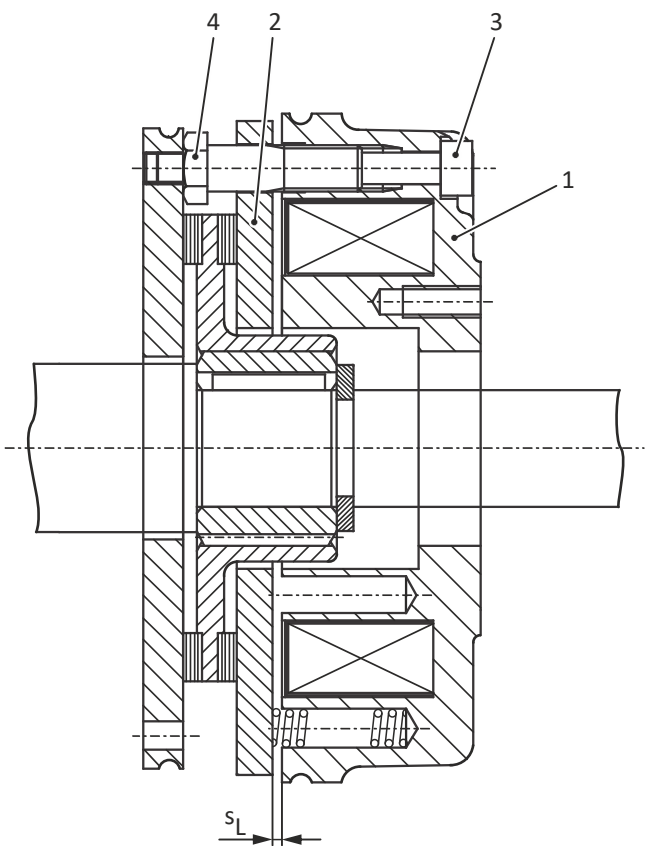
- With the holding brake HBR and application brake ABR (motor protection class IP65/66) the air gap cannot be adjusted! If the air gap $s_{L,max}$ is reached, the brakes must be replaced.



Spring-applied brake ABR IP65/66



Spring-applied brake HBR IP54/55
Spring-applied brake ABR IP54/55



- 1 Stator
- 2 Armature plate
- 3 Cheese head screw

- 4 Sleeve bolt with hexagon
- 5 Sealing plug
- s_L Air gap

How to check the air gap:

1. Do not energize the brake.
2. For brake ABR IP65/66: Lever out the sealing plug (5) on the circumference of the brake and check the air gap s_L through the bore. After checking, push the sealing plug back in, taking care not to tilt the plug.
3. Measure the air gap s_L between stator (1) and armature disk (2) in the vicinity of the cap screws (3) using a surface feeler gauge.
4. Compare the air gap with the value for the maximum permissible air gap $s_{L,max}$.
5. Set air gap to $s_{L,N}$.

How to set the air gap on the ABR IP54/55 brake

1. Loosen cheese head screws (3) with an Allen key.
2. Screw the sleeve bolts (4) further into the stator (1) using an open-end wrench. 1/6 revolution reduces the air gap by approx. 0.15 mm.
3. Tighten the cheese head screws (3) to the prescribed torque.
4. Measure the air gap s_L between stator (1) and armature disk (2) in the vicinity of the cap screws (3) using a surface feeler gauge.



Holding brake HBR

Brake	Braking torque is static	Air gap	
		$s_{L,max}$	$s_{L,N}$
	Nm	mm	mm
HBR 06	4	0.30	0.2 ±0.1
HBR 08	8	0.30	0.2 ±0.1
HBR 10	16	0.35	0.25 ±0.1
	23	0.45	0.3 ±0.1
HBR 12	32	0.45	0.3 ±0.1
HBR 14	60	0.45	0.3 ±0.1
HBR 16	80	0.45	0.3 ±0.1
HBR 18	150	0.60	0.4 ±0.1

Application brake ABR, protection class IP54/55

Brake	Tightening torque	Air gap		
		$s_{L,max}$		$s_{L,N}$
		Service brake	Holding brake	
	Nm	mm		mm
ABR 06	3.0	0.50	0.30	0.2 ^{+0.10} _{-0.05}
ABR 08	5.9			
ABR 10	10.1			
ABR 12	10.1	0.75	0.45	0.3 ^{+0.10} _{-0.05}
ABR 14	24.6			
ABR 16	24.6			
ABR 18	24.6	1.00	0.60	0.4 ^{+0.10} _{-0.05}
ABR 20	48.0			
ABR 25	48.0	1.25	0.75	0.5 ^{+0.10} _{-0.05}

Application brake ABR, protection class IP65/66

Brake	Air gap		
	$s_{L,max}$		$s_{L,N}$
	Service brake	Holding brake	
	mm		mm
ABR 06	0.50	0.30	0.2 ^{+0.08} _{-0.05}
ABR 08	0.50	0.30	0.2 ^{+0.08} _{-0.05}
ABR 10	0.50	0.30	0.2 ^{+0.13} _{-0.05}
ABR 12	0.60	0.45	0.3 ^{+0.08} _{-0.10}
ABR 14	0.75	0.45	0.3 ±0.1
ABR 16	0.80	0.50	0.3 ^{+0.15} _{-0.05}
ABR 18	1.0	0.65	0.4 ^{+0.20} _{-0.10}



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](#)  49
- 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	



For resistance measurement, observe the data on the brake nameplate.

Trouble	Possible cause	Remedy
Brake does not release, Air gap is not zero	Coil is interrupted	Measure the resistance of the coil with a multimeter: • Compare measured resistance with rated resistance. • If resistance is too high, replace the spring-applied brake completely
	Coil has interturn fault or short circuit to ground	Measure the resistance of the coil with a multimeter: • Compare measured resistance with rated resistance. • If the resistance is too low, replace the stator completely. Check coil for short circuit to ground with a multimeter: • Replace the spring-applied brake completely in case of short circuit to ground.
	Wiring defective or incorrect	Check and correct wiring: • Check cable for continuity with a multimeter. • Replace defective cable.
	Rectifier defective or incorrect	Measure the DC voltage at the rectifier with a multimeter. If DC voltage is zero: • Measure AC voltage at the rectifier. • If AC voltage is zero: • Switch on voltage • Check fuse • Check wiring If AC voltage is ok: • Check rectifier • Replace defective rectifier Check coil for interturn fault or short circuit to ground If the rectifier is repeatedly faulty, replace the spring-applied brake completely, even if no interturn fault or short circuit to earth can be measured. The error may only occur when the temperature rises.
	Microswitch wired incorrectly	Check and correct wiring of microswitch.
	Microswitch incorrectly set	Replace stator completely and complain to the manufacturer about the setting of the microswitch.
	Air gap s_L too large	Readjust air gap
Rotor cannot rotate freely	Air gap s_L too small	Check air gap s_L and readjust if necessary.
Rotor thickness too small	Rotor was not replaced in time	Replace rotor
Voltage too high	Brake voltage does not match rectifier	Adjust rectifier and brake voltage to each other.
Voltage too low	Brake voltage does not match rectifier	Adjust rectifier and brake voltage to each other.
	Diode in rectifier defective	Replace defective rectifier with suitable undamaged rectifier
AC voltage is not mains voltage	Fuse is missing or defective	Select a connection where the fuse is not removed and is ok.



Technical data

Standards and operating conditions

Conformities and approvals

More information and certificates of approval can be found under
[E2/IE3 m500 three-phase AC motors \(Lenze.com\)](#)

Europe		
Country	Conformity/approval	Labelling on product
European Union	CE	CE mark
Eurasian Economic Union (EAWU)	EAC	EAC mark
Great Britain	UKCA	UKCA mark

America		
Country	Conformity/approval	Labelling on product
Brazil	INMETRO	INMETRO mark
Canada	CSA	cULus mark
	NrCan	UL Energy mark
USA	UL	cULus mark
	DOE	UL Energy mark + CC number

Asia		
Country	Conformity/approval	Labelling on product
China	CCC	CCC mark
	-	EFUP mark
	-	CEL
Singapore	NEA	-
South Korea	KEA	KEL KC mark

Australia and Oceania		
Country	Mark	Labelling on product
Australia	E3	-

Protection of persons and device protection

Degree of protection			
EN	EN IEC 60529,EN IEC 60034-5	IP54	Information applies to the mounted and ready-for-use state
		IP55	
		IP65	
		IP66	

Temperature class			
Utilization	EN IEC 60034-1	B (130 °C)	Utilization
Insulation system		F (155 °C)	Insulation system

Permissible voltage		
IVIC C	IEC 60034-18-41	At 500 V

EMC data

Noise emission		
Fulfills requirements according to	EN IEC 60034-1	A final overall assessment of the drive system is indispensable

Noise immunity		
Fulfills requirements according to	EN IEC 60034-1	A final overall assessment of the drive system is indispensable



Environmental conditions

Energy efficiency			
High Efficiency	EN IEC 60034-30-1	Class IE2	
Premium Efficiency		IE3 class	
Climate			
Storage	EN 60721-3-1:1997	1K3 (-25 ... +60 °C)	
Transport	EN 60721-3-2:1997	2K3 (-25 ... +70 °C)	
Operation	EN 60721-3-3:1995 + A2:1997	3K3 (0 ... +40 °C)	
	-	-30 ...+10 °C	Depending on the temperature package! Observe ambient temperature on the nameplate!
		-30 ...+40 °C	
Site altitude			
0 ... 1000 m amsl	-	Without current derating	
1000 ... 4000 m amsl		Reduce power by 5 %/1000 m	
Air humidity			
Without condensation	-	Average relative humidity 85 %	



Rated data

Rated data 50 Hz

Motor			M55BH				
			063S04	063M04	063L04	071M04	071L04
Rated power	P _{rated}	kW	0.12	0.18	0.25	0.37	0.55
Rated speed	n _{rated}	rpm	1415	1400	1390	1425	1430
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500
Rated voltage							
Delta	V _{rated, Δ}	V	230	230	230	230	230
Star	V _{rated, Y}	V	400	400	400	400	400
Rated current							
230 V	I _{rated, Δ}	A	0.710	0.940	1.18	1.71	2.34
400 V	I _{rated, Y}	A	0.410	0.540	0.680	0.990	1.35
Starting current	I _a	A	1.40	1.94	2.60	4.23	6.32
Rated torque	M _{rated}	Nm	0.810	1.23	1.72	2.48	3.67
Starting torque	M _a	Nm	1.54	2.46	3.44	4.45	6.95
Stalling torque	M _b	Nm	1.94	2.83	3.78	6.92	11.3
Power factor	cos φ		0.68	0.72	0.76	0.74	0.76
Efficiency							
at 50 % P _{rated}	η		0.549	0.625	0.695	0.695	0.758
at 75 % P _{rated}	η		0.591	0.647	0.685	0.727	0.771
at 100 % P _{rated}	η		0.591	0.647	0.685	0.727	0.771
Moment of inertia	J	kgcm ²	2.4	2.9	3.7	9.1	13.3
Weight	m	kg	4.32	4.77	5.77	7.77	8.97

Technical data

Rated data
Rated data 50 Hz



Motor			M55BP					
			080M04	090M04	090L04	100M04	100L04	112M04
Rated power	P _{rated}	kW	0.75	1.1	1.5	2.2	3	4
Rated speed	n _{rated}	rpm	1455	1465	1465	1470	1470	1470
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Rated voltage								
Delta	V _{rated, Δ}	V	230	230	230	230	230	230
Star	V _{rated, Y}	V	400	400	400	400	400	400
Rated current								
230 V	I _{rated, Δ}	A	2.77	4.00	5.51	7.72	10.6	13.5
400 V	I _{rated, Y}	A	1.60	2.31	3.18	4.46	6.10	7.82
Starting current	I _a	A	8.91	16.4	22.5	35.8	47.1	58.3
Rated torque	M _{rated}	Nm	4.92	7.17	9.78	14.3	19.5	26.0
Starting torque	M _a	Nm	7.38	14.4	20.6	31.3	43.1	44.1
Stalling torque	M _b	Nm	16.2	25.2	34.3	49.8	66.6	83.1
Power factor	cos φ		0.84	0.83	0.82	0.83	0.84	0.86
Efficiency								
at 50 % P _{rated}	η		0.826	0.844	0.851	0.879	0.883	0.898
at 75 % P _{rated}	η		0.825	0.841	0.853	0.867	0.877	0.886
at 100 % P _{rated}	η		0.825	0.841	0.853	0.867	0.877	0.886
Moment of inertia	J	kgcm ²	27.2	53.8	58.3	123	130.3	198
Weight	m	kg	12.28	17.33	18.43	30.41	31.61	40.38

Motor			M55BP					
			132M04	132L04	160M04	160L04	180M04	180L04
Rated power	P _{rated}	kW	5.5	7.5	11	15	18.5	22
Rated speed	n _{rated}	rpm	1480	1480	1485	1485	1485	1480
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Rated voltage								
Delta	V _{rated, Δ}	V	230	230	230	230	230	230
Star	V _{rated, Y}	V	400	400	400	400	400	400
Rated current								
230 V	I _{rated, Δ}	A	18.3	25.4	36.0	49.2	57.6	67.2
400 V	I _{rated, Y}	A	10.6	14.6	20.8	28.4	33.3	38.8
Starting current	I _a	A	84.9	117	163	228	315	312
Rated torque	M _{rated}	Nm	35.5	48.4	70.7	96.5	119	142
Starting torque	M _a	Nm	53.3	77.6	98.9	144	251	241
Stalling torque	M _b	Nm	131	179	226	308	465	467
Power factor	cos φ		0.86	0.85	0.86	0.849	0.893	0.906
Efficiency								
at 50 % P _{rated}	η		0.903	0.908	0.920	0.928	0.932	0.937
at 75 % P _{rated}	η		0.896	0.904	0.914	0.921	0.926	0.930
at 100 % P _{rated}	η		0.896	0.904	0.914	0.921	0.926	0.930
Moment of inertia	J	kgcm ²	470.6	485.9	1360	1550	2330	2400
Weight	m	kg	61.82	64.26	168.4	183.2	244.6	255.3



Rated data 60 Hz

Motor			M55BH				
			063S04	063M04	063L04	071M04	071L04
Rated power	P _{rated}	kW	0.12	0.18	0.25	0.37	0.55
Rated speed	n _{rated}	rpm	1725	1715	1710	1735	1740
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500
Rated voltage							
Star	V _{rated, Y}	V	460	460	460	460	460
Rated current							
460 V	I _{rated, Y}	A	0.370	0.480	0.600	0.880	1.21
Starting current	I _a	A	1.47	2.07	2.68	4.28	6.32
Rated torque	M _{rated}	Nm	0.700	1.00	1.40	2.00	3.00
Starting torque	M _a	Nm	1.54	2.32	3.08	3.88	5.74
Stalling torque	M _b	Nm	2.01	2.83	3.78	6.94	10.9
Power factor	cos φ		0.62	0.67	0.71	0.7	0.73
Efficiency							
at 50 % P _{rated}	η		0.564	0.640	0.704	0.708	0.762
at 75 % P _{rated}	η		0.637	0.680	0.700	0.720	0.755
at 100 % P _{rated}	η		0.640	0.680	0.700	0.720	0.755
Moment of inertia	J	kgcm ²	2.4	2.9	3.7	9.1	13.3
Weight	m	kg	4.32	4.77	5.77	7.77	8.97

Technical data

Rated data
Rated data 60 Hz



Motor			M55BP					
			080M04	090M04	090L04	100M04	100L04	112M04
Rated power	P _{rated}	kW	0.75	1.1	1.5	2.2	3	4
Rated speed	n _{rated}	rpm	1760	1770	1770	1775	1770	1775
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Rated voltage								
Star	V _{rated, Y}	V	460	460	460	460	460	460
Rated current								
460 V	I _{rated, Y}	A	1.40	2.02	2.78	3.93	5.31	6.82
Starting current	I _a	A	8.71	16.2	22.0	35.6	46.1	57.2
Rated torque	M _{rated}	Nm	4.10	5.90	8.10	11.8	16.2	21.5
Starting torque	M _a	Nm	6.09	12.5	17.8	27.3	37.1	38.7
Stalling torque	M _b	Nm	15.8	23.8	32.4	46.2	62.9	79.6
Power factor	cos φ		0.82	0.81	0.8	0.82	0.82	0.85
Efficiency								
at 50 % P _{rated}	η		0.831	0.846	0.855	0.880	0.885	0.901
at 75 % P _{rated}	η		0.852	0.865	0.865	0.895	0.895	0.895
at 100 % P _{rated}	η		0.855	0.865	0.865	0.895	0.895	0.895
Moment of inertia	J	kgcm ²	27.2	53.8	58.3	123	130.3	198
Weight	m	kg	12.28	17.33	18.43	30.41	31.61	40.38

Motor			M55BP					
			132M04	132L04	160M04	160L04	180M04	180L04
Rated power	P _{rated}	kW	5.5	7.5	11	15	18.5	22
Rated speed	n _{rated}	rpm	1780	1780	1785	1785	1785	1780
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Rated voltage								
Star	V _{rated, Y}	V	460	460	460	460	460	460
Rated current								
460 V	I _{rated, Y}	A	9.26	12.8	18.2	24.7	29.0	33.8
Starting current	I _a	A	81.3	112	156	216	305	304
Rated torque	M _{rated}	Nm	29.5	40.2	58.8	80.2	99.0	118
Starting torque	M _a	Nm	44.2	64.5	82.1	120	208	212
Stalling torque	M _b	Nm	121	169	205	281	425	423
Power factor	cos φ		0.85	0.83	0.85	0.843	0.885	0.901
Efficiency								
at 50 % P _{rated}	η		0.902	0.909	0.919	0.926	0.929	0.936
at 75 % P _{rated}	η		0.914	0.917	0.924	0.930	0.936	0.936
at 100 % P _{rated}	η		0.917	0.917	0.924	0.930	0.936	0.936
Moment of inertia	J	kgcm ²	470.6	485.9	1360	1550	2330	2400
Weight	m	kg	61.82	64.26	168.4	183.2	244.6	255.3



Rated data 87 Hz

Motor			M55BH				
			063S04	063M04	063L04	071M04	071L04
Rated power	P _{rated}	kW	0.21	0.33	0.45	0.66	1
Rated speed	n _{rated}	rpm	2525	2505	2500	2535	2540
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500
Max. torque	M _{max}	Nm	3.20	4.90	6.90	9.90	14.7
Rated voltage							
Delta	V _{rated, Δ}	V	400	400	400	400	400
Rated current							
400 V	I _{rated, Δ}	A	0.740	0.970	1.19	1.75	2.42
Rated torque	M _{rated}	Nm	0.794	1.26	1.72	2.49	3.76
Power factor	cos φ		0.6	0.68	0.72	0.7	0.74
Efficiency							
at 50 % P _{rated}	η		0.598	0.675	0.729	0.730	0.781
at 75 % P _{rated}	η		0.670	0.726	0.768	0.777	0.816
at 100 % P _{rated}	η		0.702	0.744	0.776	0.792	0.826
Moment of inertia	J	kgcm ²	2.4	2.9	3.7	9.1	13.3
Weight	m	kg	4.32	4.77	5.77	7.77	8.97

Technical data

Rated data
Rated data 87 Hz



Motor			M55BP					
			080M04	090M04	090L04	100M04	100L04	112M04
Rated power	P _{rated}	kW	1.35	1.9	2.6	3.9	5.2	7.35
Rated speed	n _{rated}	rpm	2565	2575	2575	2580	2580	2580
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Max. torque	M _{max}	Nm	19.7	28.7	39.1	57.2	78.0	104
Rated voltage								
Delta	V _{rated, Δ}	V	400	400	400	400	400	400
Rated current								
400 V	I _{rated, Δ}	A	2.82	3.94	5.48	7.83	10.4	14.1
Rated torque	M _{rated}	Nm	5.03	7.05	9.64	14.4	19.2	27.2
Power factor	cos φ		0.83	0.82	0.8	0.83	0.82	0.86
Efficiency								
at 50 % P _{rated}	η		0.845	0.855	0.864	0.889	0.893	0.909
at 75 % P _{rated}	η		0.865	0.878	0.883	0.904	0.906	0.917
at 100 % P _{rated}	η		0.868	0.882	0.886	0.906	0.907	0.913
Moment of inertia	J	kgcm ²	27.2	53.8	58.3	123	130.3	198
Weight	m	kg	12.28	17.33	18.43	30.41	31.61	40.38

Motor			M55BP					
			132M04	132L04	160M04	160L04	180M04	180L04
Rated power	P _{rated}	kW	9.6	13.1	19.2	26.3	32.2	38.5
Rated speed	n _{rated}	rpm	2590	2590	2595	2595	2590	2590
Max. speed	n _{max}	rpm	4500	4500	4500	4500	4500	4500
Max. torque	M _{max}	Nm	142	194	283	386	476	568
Rated voltage								
Delta	V _{rated, Δ}	V	400	400	400	400	400	400
Rated current								
400 V	I _{rated, Δ}	A	18.4	25.4	36.1	49.2	57.5	67.6
Rated torque	M _{rated}	Nm	35.4	48.3	70.7	96.8	119	142
Power factor	cos φ		0.85	0.84	0.85	0.847	0.892	0.906
Efficiency								
at 50 % P _{rated}	η		0.908	0.914	0.922	0.929	0.932	0.939
at 75 % P _{rated}	η		0.920	0.925	0.934	0.939	0.941	0.945
at 100 % P _{rated}	η		0.922	0.925	0.935	0.940	0.942	0.944
Moment of inertia	J	kgcm ²	470.6	485.9	1360	1550	2330	2400
Weight	m	kg	61.82	64.26	168.4	183.2	244.6	255.3



Ecodesign Directive

Product information acc. to REGULATION (EU) 2019/1781 (ANNEX I, Section 2)

Legend

Efficiency (η_{rated} , η) The efficiency refers to the rated voltage and an ambient reference temperature of 25 °C.
Operating points (n; M) n = Speed as a percentage of the rated speed n_{rated} ; M= Torque as a percentage of the rated torque M_{rated}
Power losses P_V (n; M) Power losses as a percentage of the rated output power P_{rated} for the operating points (n; M).

Rated efficiency at full load	η_{rated}	%	59.1	64	64.7	68	68.5	70	72.7	72
Efficiency at 75 % rated load	η	%	59.1	63.7	64.7	68	68.5	70	72.7	72
Efficiency at 50 % rated load	η	%	54.9	56.4	62.5	64	69.5	70.4	69.5	70.8
Efficiency level			IE2							
Manufacturer's name			Lenze SE · Hans-Lenze-Str. 1 · 31855 Aerzen · GERMANY							
Commercial register number			Hannover HRB 204803							
Product's model identifier			M55BH063S04		M55BH063M04		M55BH063L04		M55BH071M04	
Number of poles of the motor			4							
Rated output power	P_{rated}	kW	0.12		0.18		0.25		0.37	
Rated input frequency	f_{rated}	Hz	50	60	50	60	50	60	50	60
Rated voltage	V_{rated}	V	400	460	400	460	400	460	400	460
Rated speed	n_{rated}	rpm	1415	1725	1400	1715	1390	1710	1425	1735
Number of motor phases			Three-phase motor							
Altitudes above sea level		m	0 ... 1000							
Ambient air temperature		°C	-30 ... +40							
Maximum operating temperature		°C	155							
Potentially explosive atmospheres			Operation in explosive atmospheres not permitted							
Power losses										
25; 25	P_V (n; M)	%	31.7	32.5	27.8	28.8	16.8	16.8	14.9	14.8
25; 100	P_V (n; M)	%	45	38.5	41.1	34.8	36.8	28.3	27	21.6
50; 25	P_V (n; M)	%	34.2	36.2	31.1	33.4	17.6	18.4	14.9	15.6
50; 50	P_V (n; M)	%	34.2	35.3	31.1	32.4	20	19.5	15.9	15.8
50; 100	P_V (n; M)	%	46.7	41.8	42.8	38.2	35.6	28.6	27.6	22.6
90; 50	P_V (n; M)	%	41.7	46.5	38.3	42.7	24	26.4	20	23.1
90; 100	P_V (n; M)	%	54.2	53.4	49.4	48.6	38.8	35.6	31.1	29



Rated efficiency at full load	η_{rated}	%	77.1	75.5	82.5	85.5	84.1	86.5	85.3	86.5
Efficiency at 75 % rated load	η	%	77.1	75.5	82.5	85.2	84.1	86.5	85.3	86.5
Efficiency at 50 % rated load	η	%	75.8	76.2	82.6	83.1	84.4	84.6	85.1	85.5
Efficiency level			IE2		IE3					
Manufacturer's name			Lenze SE · Hans-Lenze-Str. 1 · 31855 Aerzen · GERMANY							
Commercial register number			Hannover HRB 204803							
Product's model identifier			M55BH071L04		M55BP080M04		M55BP090M04		M55BP090L04	
Number of poles of the motor			4							
Rated output power	P_{rated}	kW	0.55		0.75		1.1		1.5	
Rated input frequency	f_{rated}	Hz	50	60	50	60	50	60	50	60
Rated voltage	V_{rated}	V	400	460	400	460	400	460	400	460
Rated speed	n_{rated}	rpm	1430	1740	1455	1760	1465	1770	1465	1770
Number of motor phases			Three-phase motor							
Altitudes above sea level		m	0 ... 1000							
Ambient air temperature		°C	-30 ... +40							
Maximum operating temperature		°C	155							
Potentially explosive atmospheres			Operation in explosive atmospheres not permitted							
Power losses										
25; 25	$P_V (n; M)$	%	9.1	9.1	5.9	5.7	4.5	4.4	4.9	4.9
25; 100	$P_V (n; M)$	%	20	15.9	17.3	13.1	13.1	10	13.8	10.6
50; 25	$P_V (n; M)$	%	10	10.6	6.3	6.5	5.1	5.4	5.4	5.7
50; 50	$P_V (n; M)$	%	11.6	11.5	8.1	7.7	6.5	6.3	6.8	6.5
50; 100	$P_V (n; M)$	%	21.1	17.5	17.2	13.5	13.5	10.8	14.1	11.3
90; 50	$P_V (n; M)$	%	15.1	16.9	10.3	11.2	8.7	9.7	9	10
90; 100	$P_V (n; M)$	%	24.4	22.5	18.9	16.8	15.6	14.3	16.3	14.8



Rated efficiency at full load	η_{rated}	%	86.7	89.5	87.7	89.5	88.6	89.5	89.6	91.7
Efficiency at 75 % rated load	η	%	86.7	89.5	87.7	89.5	88.6	89.5	89.6	91.4
Efficiency at 50 % rated load	η	%	87.9	88	88.3	88.5	89.8	90.1	90.3	90.2
Efficiency level			IE3							
Manufacturer's name			Lenze SE · Hans-Lenze-Str. 1 · 31855 Aerzen · GERMANY							
Commercial register number			Hannover HRB 204803							
Product's model identifier			M55BP100M04	M55BP100L04		M55BP112M04		M55BP132M04		
Number of poles of the motor			4							
Rated output power	P_{rated}	kW	2.2		3		4		5.5	
Rated input frequency	f_{rated}	Hz	50	60	50	60	50	60	50	60
Rated voltage	V_{rated}	V	400	460	400	460	400	460	400	460
Rated speed	n_{rated}	rpm	1470	1775	1470	1770	1470	1775	1480	1780
Number of motor phases			Three-phase motor							
Altitudes above sea level		m	0 ... 1000							
Ambient air temperature		°C	-30 ... +40							
Maximum operating temperature		°C	155							
Potentially explosive atmospheres			Operation in explosive atmospheres not permitted							
Power losses										
25; 25	$P_V (n; M)$	%	3.1	3.1	3.4	3.3	2.7	2.7	1.6	1.7
25; 100	$P_V (n; M)$	%	9.2	7.2	10.7	8.2	11	8	6.2	4.8
50; 25	$P_V (n; M)$	%	3.8	4.1	4	4.2	3.2	3.4	2.2	2.4
50; 50	$P_V (n; M)$	%	4.9	4.8	5.3	5.1	4.5	4.2	3.1	3
50; 100	$P_V (n; M)$	%	10	8.2	11.2	9	10.9	8.4	6.8	5.6
90; 50	$P_V (n; M)$	%	6.9	7.7	7.1	7.7	6	6.4	4.4	4.8
90; 100	$P_V (n; M)$	%	12	11.1	13	11.8	12.3	10.8	8.2	7.4



Rated efficiency at full load	η_{rated}	%	90.4	91.7	91.4	92.4	92.1	93	92.6	93.6
Efficiency at 75 % rated load	η	%	90.4	91.7	91.4	92.4	92.1	93	92.6	93.6
Efficiency at 50 % rated load	η	%	90.8	90.9	92	91.9	92.8	92.6	93.2	92.9
Efficiency level			IE3							
Manufacturer's name			Lenze SE · Hans-Lenze-Str. 1 · 31855 Aerzen · GERMANY							
Commercial register number			Hannover HRB 204803							
Product's model identifier			M55BP132L04		M55BP160M04		M55BP160L04		M55BP180M04	
Number of poles of the motor			4							
Rated output power	P_{rated}	kW	7.5		11		15		18.5	
Rated input frequency	f_{rated}	Hz	50	60	50	60	50	60	50	60
Rated voltage	V_{rated}	V	400	460	400	460	400	460	400	460
Rated speed	n_{rated}	rpm	1480	1780	1485	1785	1485	1785	1485	1785
Number of motor phases			Three-phase motor							
Altitudes above sea level		m	0 ... 1000							
Ambient air temperature		°C	-30 ... +40							
Maximum operating temperature		°C	155							
Potentially explosive atmospheres			Operation in explosive atmospheres not permitted							
Power losses										
25; 25	$P_V (n; M)$	%	1.8	1.8	1.1	1.1	0.9	0.9	0.9	0.9
25; 100	$P_V (n; M)$	%	7	5.2	4.2	3.2	4.4	3.2	4.3	3.2
50; 25	$P_V (n; M)$	%	2.3	2.5	1.6	1.8	1.3	1.5	1.4	1.6
50; 50	$P_V (n; M)$	%	3.2	3	2.2	2.2	1.9	1.9	2	2
50; 100	$P_V (n; M)$	%	7.3	5.8	4.5	3.8	4.8	3.8	4.7	3.9
90; 50	$P_V (n; M)$	%	4.4	4.6	3.4	3.8	2.9	3.2	3.2	3.6
90; 100	$P_V (n; M)$	%	8.8	7.9	6.2	6.1	6.1	5.5	6.2	5.8



Technical data
Ecodesign Directive

Rated efficiency at full load	η_{rated}	%	93	93.6
Efficiency at 75 % rated load	η	%	93	93.6
Efficiency at 50 % rated load	η	%	93.7	93.6
Efficiency level			IE3	
Manufacturer's name			Lenze SE · Hans-Lenze-Str. 1 · 31855 Aerzen · GERMANY	
Commercial register number			Hannover HRB 204803	
Product's model identifier			M55BP180L04	
Number of poles of the motor			4	
Rated output power	P_{rated}	kW	22	
Rated input frequency	f_{rated}	Hz	50	60
Rated voltage	V_{rated}	V	400	460
Rated speed	n_{rated}	rpm	1480	1780
Number of motor phases			Three-phase motor	
Altitudes above sea level		m	0 ... 1000	
Ambient air temperature		°C	-30 ... +40	
Maximum operating temperature		°C	155	
Potentially explosive atmospheres			Operation in explosive atmospheres not permitted	
Power losses				
25; 25	$P_V (n; M)$	%	0.8	0.9
25; 100	$P_V (n; M)$	%	4.4	3.2
50; 25	$P_V (n; M)$	%	1.3	1.5
50; 50	$P_V (n; M)$	%	1.9	1.9
50; 100	$P_V (n; M)$	%	4.8	3.8
90; 50	$P_V (n; M)$	%	3	3.3
90; 100	$P_V (n; M)$	%	6	5.5



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.

 The crossed-out wheeled bin symbol is located on the equipment. This information indicates that used electrical and electronic products must not be disposed of with normal household waste.
The EU Directive 2012/19/EU: Directive on waste electrical and electronic equipment (WEEE) [UKCA: S.I. 2013/3113 - The Waste Electrical and Electronic Equipment Regulations 2013], which has been transposed into national law by the respective EU member states, applies to the disposal of equipment. As a customer, you have the option of disposing of the electrical and electronic equipment that you have purchased from us and that is subject to WEEE via the Lenze branch in your country.
Lenze addresses in Europe: <https://www.lenze.com/en-de/company/global-presence>

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

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

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

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

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

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

 Further information on Lenze's environmental and climate responsibility and on the topic of energy efficiency can be found on the Internet:
[www.Lenze.com](https://www.lenze.com) → search word: "Sustainability"

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