



1 Safety instructions

1.1 General safety instructions

	<p>⚠ DANGER</p> <p>Electric shock and danger to life due to other energy sources</p> <p>Touching live components can result in death or severe injury.</p> <ul style="list-style-type: none"> • Only work on electrical devices when you are qualified for this job. • Always observe the country-specific safety rules. <p>Generally, the following six steps apply when establishing safety:</p> <ol style="list-style-type: none"> 1. Prepare for disconnection. Notify all those who will be affected by the procedure. 2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again. 3. Wait until the discharge time specified on the warning labels has elapsed. 4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection. 5. Check whether the existing auxiliary supply circuits are de-energized. 6. Ensure that the motors cannot move. 7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state. 8. Check that the correct drive system is completely locked. <p>After you have completed the work, restore the operational readiness in the inverse sequence.</p>
	<p>⚠ WARNING</p> <p>Electric shock due to connection to an unsuitable power supply</p> <p>When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.</p> <ul style="list-style-type: none"> • Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV- (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.
	<p>⚠ WARNING</p> <p>Electric shock due to damaged motors or devices</p> <p>Improper handling of motors or devices can damage them. Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.</p> <ul style="list-style-type: none"> • Ensure compliance with the limit values specified in the technical data during transport, storage and operation. • Do not use any damaged motors or devices.
	<p>⚠ WARNING</p> <p>Electric shock due to unconnected cable shield</p> <p>Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.</p> <ul style="list-style-type: none"> • As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.
	<p>⚠ WARNING</p> <p>Arcing when a plug connection is opened during operation</p> <p>Opening a plug connection when a system is operation can result in arcing that may cause serious injury or death.</p> <ul style="list-style-type: none"> • Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.
	<p>⚠ WARNING</p> <p>Risk of electric shock and fire from supply networks with an excessively high impedance</p>

	<p>Excessively low short-circuit currents can lead to the protective devices not tripping or tripping too late, and thus causing electric shock or a fire.</p> <ul style="list-style-type: none"> • In the case of a conductor-conductor or conductor-ground short-circuit, ensure that the short-circuit current at the point where the inverter is connected to the line supply at least meets the minimum requirements for the response of the protective device used. • You must use an additional residual-current device (RCD) if a conductor-ground short circuit does not reach the short-circuit current required for the protective device to respond. The required short-circuit current can be too low, especially for TT supply systems.
	<p>⚠ WARNING</p> <p>Risk of electric shock and fire from supply networks with an excessively low impedance</p> <p>Excessively high short-circuit currents can lead to the protective devices not being able to interrupt these short-circuit currents and being destroyed, and thus causing electric shock or a fire.</p> <ul style="list-style-type: none"> • Ensure that the prospective short-circuit current at the line terminal of the inverter does not exceed the breaking capacity (SCCR or I_{cc}) of the protective device used.
	<p>⚠ WARNING</p> <p>Electric shock if there is no ground connection</p> <p>For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.</p> <ul style="list-style-type: none"> • Ground the device in compliance with the applicable regulations.
	<p>⚠ WARNING</p> <p>Electric shock due to residual charges in power components</p> <p>Because of the capacitors, a hazardous voltage is present for up to 5 minutes after the power supply has been switched off. Contact with live parts can result in death or serious injury.</p> <ul style="list-style-type: none"> • Wait for 5 minutes before you check that the unit really is in a no-voltage condition and start work.
	<p>NOTICE</p> <p>Property damage due to loose power connections</p> <p>Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.</p> <ul style="list-style-type: none"> • Tighten all power connections to the prescribed torque. • Check all power connections at regular intervals, particularly after equipment has been transported.
	<p>⚠ WARNING</p> <p>Spread of fire from built-in devices</p> <p>In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.</p> <ul style="list-style-type: none"> • Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel. • Ensure that smoke can only escape via controlled and monitored paths.
	<p>⚠ WARNING</p> <p>Active implant malfunctions due to electromagnetic fields</p> <p>Inverters generate electromagnetic fields (EMF) in operation. People with active implants in the immediate vicinity of this equipment are at particular risk.</p> <ul style="list-style-type: none"> • As the operator of an EMF-emitting installation, assess the individual risks of persons with active implants. The following clearances are usually adequate: <ul style="list-style-type: none"> - No clearance to closed control cabinets and shielded MOTION-CONNECT supply cables - Forearm length (approx. 35 cm clearance) to distributed drive systems and open control cabinets

	<p>⚠ WARNING</p> <p>Active implant malfunctions due to permanent-magnet fields</p> <p>Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.</p> <ul style="list-style-type: none"> • If you have a heart pacemaker or implant, maintain a minimum distance of 2 m. • When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached. • Clearly mark the storage locations with the appropriate warning labels. • IATA regulations must be observed when transported by air.
	<p>⚠ WARNING</p> <p>Unexpected movement of machines caused by radio devices or mobile phones</p> <p>When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.</p> <ul style="list-style-type: none"> • If you come closer than around 2 m to such components, switch off any radios or mobile phones. • Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.
	<p>⚠ WARNING</p> <p>Damage to motor insulation due to excessive voltages</p> <p>When operated on systems with grounded line conductor or in the event of a ground fault in the IT system, the motor insulation can be damaged by the higher voltage to ground. If you use motors that have insulation that is not designed for operation with grounded line conductors, you must perform the following measures:</p> <ul style="list-style-type: none"> • IT system: Use a ground fault monitor and eliminate the fault as quickly as possible. • TN or TT systems with grounded line conductor: Use an isolating transformer on the line side.
	<p>⚠ WARNING</p> <p>Unexpected movement of machines caused by inactive safety functions</p> <p>Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.</p> <ul style="list-style-type: none"> • Observe the information in the appropriate product documentation before commissioning. • Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components. • Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing. • Perform a function test. • Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.
	<p>⚠ WARNING</p> <p>Unrecognized dangers due to missing or illegible warning labels</p> <p>Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.</p> <ul style="list-style-type: none"> • Check that the warning labels are complete based on the documentation. • Attach any missing warning labels to the components, where necessary in the national language. • Replace illegible warning labels.

	<p>NOTICE</p> <p>Device damage caused by incorrect voltage/insulation tests</p> <p>Incorrect voltage/insulation tests can damage the device.</p> <ul style="list-style-type: none"> • Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.
	<p>⚠ WARNING</p> <p>Injury caused by moving or ejected parts</p> <p>Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.</p> <ul style="list-style-type: none"> • Remove any loose parts or secure them so that they cannot be flung out. • Do not touch any moving parts. • Safeguard all moving parts using the appropriate safety guards.
	<p>NOTE</p> <p>Important safety notices for Safety Integrated functions</p> <p>If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.</p>
	<p>⚠ WARNING</p> <p>Malfunctions of the machine as a result of incorrect or changed parameter settings</p> <p>As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.</p> <ul style="list-style-type: none"> • Protect the parameterization (parameter assignments) against unauthorized access. • Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.
	<p>⚠ WARNING</p> <p>Fire due to inadequate ventilation clearances</p> <p>Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.</p> <ul style="list-style-type: none"> • Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.
	<p>⚠ WARNING</p> <p>Fire due to inadequate cooling</p> <p>Inadequate cooling can cause the motor to overheat, resulting in death or severe injury as a result of smoke and fire. This can also result in increased failures and reduced service lives of motors.</p> <ul style="list-style-type: none"> • Comply with the specified cooling requirements for the motor.
	<p>⚠ WARNING</p> <p>Fire due to incorrect operation of the motor</p> <p>When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.</p> <ul style="list-style-type: none"> • Operate the motor according to the relevant specifications. • Only operate the motors in conjunction with effective temperature monitoring. • Immediately switch off the motor if excessively high temperatures occur.
	<p>⚠ CAUTION</p> <p>Burn injuries caused by hot surfaces</p> <p>In operation, the motor can reach high temperatures, which can cause burns if touched.</p> <ul style="list-style-type: none"> • Mount the motor so that it is not accessible in operation.

Measures when maintenance is required:

- Allow the motor to cool down before starting any work.
- Use the appropriate personnel protection equipment, e.g. gloves.

1.2 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.



NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
 - Wearing an ESD wrist strap
 - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.3 Residual risks of power drive systems

Residual risks of power drive systems

When assessing the machine- or system-related risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

- Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
 - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
 - Response times of the control system and of the drive
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - Parameterization, programming, cabling, and installation errors
 - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
 - External influences/damage
 - X-ray, ionizing radiation and cosmic radiation
- Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
 - Component failure
 - Software errors
 - Operation and/or environmental conditions outside the specification
 - External influences/damage
- Hazardous shock voltages caused by, for example,
 - Component failure
 - Influence during electrostatic charging
 - Induction of voltages in moving motors
 - Operation and/or environmental conditions outside the specification
 - Condensation/conductive contamination
 - External influences/damage
- Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
- Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of

components safely and correctly

- Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

NOTE

Protect the device, e.g. by installing it in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12. Further measures may be necessary for particularly critical operating conditions.

If condensation or conductive pollution can be excluded at the installation site, a lower degree of control cabinet protection may be permitted.

1.4 Warning labels

Warning labels on servo motors



Do not exert any shock at the shaft end; otherwise, the encoder may be damaged.



The surface temperature of the motor may exceed 80°C. Do not touch the **hot surfaces**.

Warning labels in this document



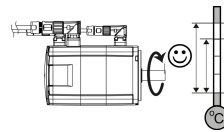
Indicates that death, severe personal injuries or material damages may result if proper precautions are not taken.



Indicates the actions that must not be performed.

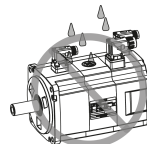
2 Installation environment

Ambient temperature



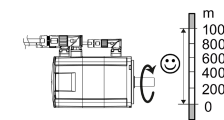
- Operation: 0°C to 40°C
Note: When the surrounding temperature is between 30 °C and 40 °C, the 1FL605□ motors and 1FL609□ motors with brake will have a power derating of 10%.
- Storage: -20°C to 65°C

Ambient humidity



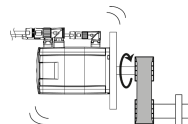
- Operation: ≤ 90% RH (non-condensing at 30°C)
- Storage: ≤ 90% RH (non-condensing at 30°C)

Operation altitude



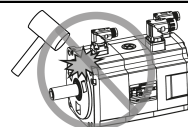
≤ 1000 m

Vibration resistance



≤ 49 m/s²

Shock resistance

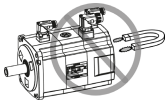
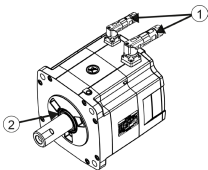


- Continuous axial shock: ≤ 25 m/s²
- Continuous radial shock: ≤ 50 m/s²
- Short-term (6 ms) shock: ≤ 250 m/s²

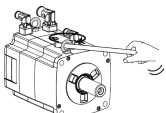
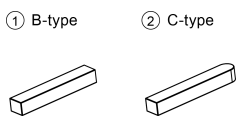
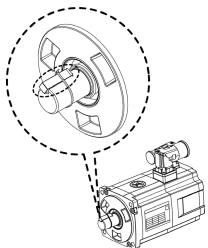
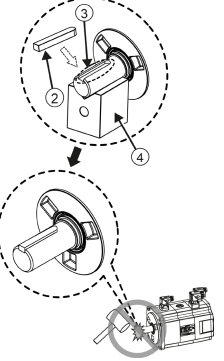
Magnetic field

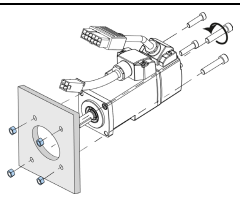
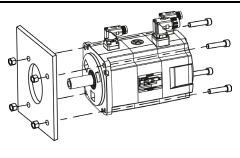
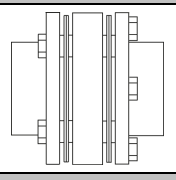
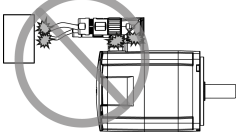
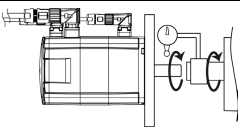
NOTICE

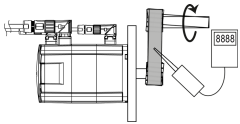
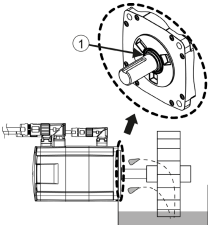
To avoid magnetic interference to the absolute encoder, do not use electromagnetic devices near the absolute encoder, such as electromagnetic memory sticks, memory cards, and key cards.

	Keep the servo motor with an absolute encoder at least 15 mm away from the devices that produce a magnetic field stronger than 10 mT.
Protection class	
	<ul style="list-style-type: none"> A motor with fitted connectors has a protection class of IP65 (dust-tight and water jetting proof). The shaft opening (2) is protected with an oil seal. To guarantee adequate protection, use specified connectors (1) when wiring.


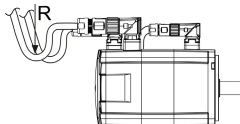
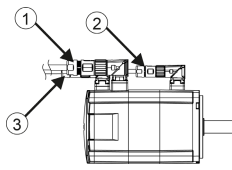
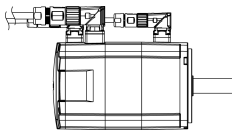
3 Mechanical installation

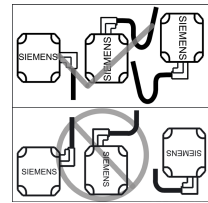
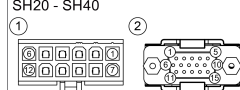
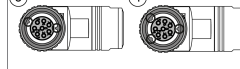

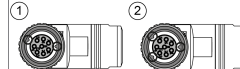
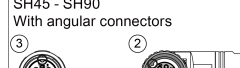
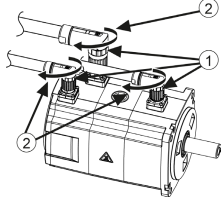
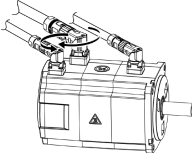
Lifting a motor (for high inertia motor only)							
WARNING							
Death or injuries by unresolved burdens							
At the transport the motor can cause death or injuries by unchecked movements.							
<ul style="list-style-type: none"> Use lifting equipment and load suspension devices which are only interpreted for the burden of the motor and intact. Do not stay under and in the jib range of unresolved burdens. Safeguard the motor against rolling away at the side when removing. Do not lift a motor by pulling the cables. 							
NOTICE							
Do not overtighten the eyebolts of 1FL609□ motors.							
	<ul style="list-style-type: none"> For 1FL609□ motors, the eyebolts must be manually screwed in completely. Lift 1FL609□ motors at the eyebolts. 						
Installing a key (optional)							
WARNING							
Injuries by an ejected key							
When a motor using a key is running, the fitted key on the shaft may be ejected, which can cause personal injuries. The fitted key on the shaft must be firmly secured to prevent them from being flung out.							
 <p>① B-type ② C-type</p>	<p>Two kinds of keys are used on the motors:</p> <table border="1"> <thead> <tr> <th>Key type</th> <th>Used on</th> </tr> </thead> <tbody> <tr> <td>B-type</td> <td>Low inertia motors</td> </tr> <tr> <td>C-type</td> <td>High inertia motors</td> </tr> </tbody> </table>	Key type	Used on	B-type	Low inertia motors	C-type	High inertia motors
Key type	Used on						
B-type	Low inertia motors						
C-type	High inertia motors						
	For the motor using a key, the key (1/2) is strapped on the shaft extension at delivery. You need to remove it from the shaft extension before installing it.						
	<p>NOTICE</p> <p>Install the well lubricated key (2) to the key slot (3) and make sure that the key and the key slot are fitted closely. To install the key, you are recommended to place a V-type block (4) under the shaft extension for supporting and then knock the key into the key slot by using a copper bar; or you can wrap the shaft extension in copper sheets after fitting the key into the key slot and then clamp the shaft extension by using a vise.</p> <p>When installing the key, pay attention to the installation direction of the key and do not strike the key slot.</p>						

Mounting a motor											
WARNING											
Personal injuries and material damages by the drop of a vertical axis											
When a servo motor with a brake is used as a vertical axis, the axis will drop if the positive and negative poles of the 24 V DC power supply for the servo drive are connected inversely. Unexpected drop may cause personal injuries and material damages.											
Before commissioning, mechanical end stops should be fixed at the end of the absolute traversing range of the machine axis in prevention of an unexpected drop. In addition, make sure that the 24 V DC power supply is correctly connected.											
NOTE											
To ensure better heat dissipation, do not insert any insulators between the motor flange and the mounting flange.											
Mount the motor through a mounting steel flange, as shown in the left figure.											
	<p>Low inertia motor</p> <table border="1"> <thead> <tr> <th>Screw</th> <th>Flange (mm)</th> </tr> </thead> <tbody> <tr> <td>1FL602□ : 2 x M4 (2.4 Nm)</td> <td>120 x 100 x 40</td> </tr> <tr> <td>1FL603□ : 4 x M5 (4.7 Nm)</td> <td>120 x 100 x 40</td> </tr> <tr> <td>1FL604□ : 4 x M6 (8 Nm)</td> <td>120 x 100 x 40</td> </tr> <tr> <td>1FL605□ : 4 x M8 (20 Nm)</td> <td>120 x 100 x 40</td> </tr> </tbody> </table>	Screw	Flange (mm)	1FL602□ : 2 x M4 (2.4 Nm)	120 x 100 x 40	1FL603□ : 4 x M5 (4.7 Nm)	120 x 100 x 40	1FL604□ : 4 x M6 (8 Nm)	120 x 100 x 40	1FL605□ : 4 x M8 (20 Nm)	120 x 100 x 40
Screw	Flange (mm)										
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1FL603□ : 4 x M5 (4.7 Nm)	120 x 100 x 40										
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1FL605□ : 4 x M8 (20 Nm)	120 x 100 x 40										
	<p>High inertia motor</p> <table border="1"> <thead> <tr> <th>Screw</th> <th>Flange (mm)</th> </tr> </thead> <tbody> <tr> <td>1FL604□ : 4 x M6 (8 Nm)</td> <td>270 x 270 x 10</td> </tr> <tr> <td>1FL606□ : 4 x M8 (20 Nm)</td> <td>390 x 390 x 15</td> </tr> <tr> <td>1FL609□ : 4 x M12 (85 Nm)</td> <td>420 x 420 x 20</td> </tr> </tbody> </table>	Screw	Flange (mm)	1FL604□ : 4 x M6 (8 Nm)	270 x 270 x 10	1FL606□ : 4 x M8 (20 Nm)	390 x 390 x 15	1FL609□ : 4 x M12 (85 Nm)	420 x 420 x 20		
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Selecting a coupling											
	Use a flexible coupling with high torsional rigidity specifically designed for servo motors, which allow to transfer the motor torque to the mechanics and to compensate radial, axial and angular misalignments.										
Installing a coupling											
	NOTICE										
Do not strike the shaft when installing a coupling and ensure that the radial and axial forces are smaller than the allowable maximum values specified in the Operating Instructions.											
Aligning a coupling											
NOTICE											
When a motor is used with a flange coupling, ensure that the radial deviation is smaller than 0.03 mm. Otherwise, the bearing will be damaged.											
NOTE											
The required alignment accuracy differs with the motor speed and the coupling type. Please determine the accuracy according to actual applications.											
	<ul style="list-style-type: none"> Turn the motor shaft and the machine shaft to align the coupling. An alignment accuracy test is preferred. If unachievable, judge the accuracy by observing whether the coupling can slide smoothly on both shafts. 										
Coupling realignment											
If the coupling gives out abnormal sounds, refer to the step "Aligning a coupling" to realign the coupling until the sounds disappear.											

Tension measurement	
NOTICE	
The belt tension must be smaller than the allowable radial forces of the motor.	
	<ul style="list-style-type: none"> Measure the belt tension at multiple points using a tension meter while turning the motor shaft by 45° Try your best to reduce the axial misalignment of the belt-pulleys to keep the axial forces to the motor shaft to a minimum.
Lubricating the oil seal	
NOTICE	
Do not use a motor with an oil seal submerged in oil.	
	The oil seal (①) should be used with sufficient lubricant oil splashed on it.

4 Electrical installation

⚠ WARNING	
Personal injuries by hazardous voltage and unregulated move	
If you connect the cables with the power supply switched on, it may cause personal injuries by a hazardous voltage and unregulated move from the motor.	
<ul style="list-style-type: none"> Switch off the power supply. Make sure that there are no voltage conditions. Prevent the energy sources from switching on again. 	
Before connecting	
	Before connecting the cables, you must take necessary ESD protection measures, e.g. wearing an ESD wrist strap, ESD gloves, and ESD clothes.
Connecting sequence	
NOTICE	
Do not put much stress upon cables or connectors while wiring.	
	The minimum static bending radii for the cables are 5 x outer diameter . The minimum dynamic bending radii of the cables are all 155 mm .
	Connect the cables in the following order: 1. Encoder cable (③) 2. Brake cable (②) 3. Power cable (①)
Connecting the brake cable	
NOTICE	
Before connecting the brake cable, ensure that the 24 V power supply has a voltage tolerance of ±10%. Otherwise, the brake cannot work normally.	
NOTE	
The motor brake is designed for holding purpose only. Unless absolutely necessary, do not apply the motor brake as an emergency stop or deceleration mechanism.	
	<ul style="list-style-type: none"> Check the opening time and the closing time of the holding brake when starting the servo motor. When the brake is powered up, the servo motor will generate heat even if it is in the state of servo off. Note that this is not a fault.

Routing cables																						
	Route the power cables and the encoder cables as shown in the figure, especially in a humid environment.																					
Connecting the encoder cable																						
NOTICE																						
Do not touch the encoder pins at the motor with naked hands to avoid being contaminated.																						
<p>SH20 - SH40</p>  <p>SH50 With straight connector</p>  <p>With angular connector</p> 	<p>Low inertia motors</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Encoder type</th> <th>Number of notches</th> </tr> </thead> <tbody> <tr> <td>①</td> <td>Incremental</td> <td>-</td> </tr> <tr> <td>②</td> <td>Absolute</td> <td>-</td> </tr> <tr> <td>③</td> <td>Incremental</td> <td>Two</td> </tr> <tr> <td>④</td> <td>Absolute</td> <td>Three</td> </tr> <tr> <td>⑤</td> <td>Incremental</td> <td>Three</td> </tr> <tr> <td>⑥</td> <td>Absolute</td> <td>Two</td> </tr> </tbody> </table>	No.	Encoder type	Number of notches	①	Incremental	-	②	Absolute	-	③	Incremental	Two	④	Absolute	Three	⑤	Incremental	Three	⑥	Absolute	Two
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⑥	Absolute	Two																				
<p>SH45 - SH90 With straight connectors</p>  <p>SH45 - SH90 With angular connectors</p> 	<p>High inertia motors</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Encoder type</th> <th>Number of notches</th> </tr> </thead> <tbody> <tr> <td>①</td> <td>Incremental</td> <td>Two</td> </tr> <tr> <td>②</td> <td>Absolute</td> <td>Three</td> </tr> <tr> <td>③</td> <td>Incremental</td> <td>Three</td> </tr> </tbody> </table>	No.	Encoder type	Number of notches	①	Incremental	Two	②	Absolute	Three	③	Incremental	Three									
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②	Absolute	Three																				
③	Incremental	Three																				
Adjusting cable directions																						
⚠ WARNING																						
Before adjusting the cables, switch off the power supply. Otherwise, the motor contains a hazardous voltage and a risk of electrical shock.																						
	<p>Low inertia motors of SH50 + high inertia motors with straight connectors:</p> <ol style="list-style-type: none"> Loosen the connectors by rotating the screw rings (①) in the illustrated direction (②). Adjust the cable directions by rotating the connectors. Tighten the connectors by rotating the screw rings inversely. 																					
	<p>High inertia motors with angular connectors:</p> <p>Adjust the cable directions by rotating the connectors.</p>																					

5 Technical support

Country	Hotline
China	+86 400 810 4288
Germany	+49 911 895 7222
Italy	+39 (02) 24362000
India	+91 22 2760 0150
Turkey	+90 (216) 4440747
For further service contact information, visit: https://support.industry.siemens.com/cs/ww/en/ .	






The diagrams in this installation guide are illustrated with the high inertia motor. For more information, see the SINAMICS V90, SIMOTICS S-1FL6 Operating Instructions.





1 安全说明

1.1 一般安全说明

	<p>⚠ 危险</p> <p>其他能源可导致电击危险和生命危险</p> <p>接触带电部件可能会造成人员重伤，甚至是死亡。</p> <ul style="list-style-type: none"> 只有专业人员才允许在电气设备上作业。 在所有作业中必须遵守本国的安全规定。 <p>通常有以下安全步骤：</p> <ol style="list-style-type: none"> 1. 准备断电。通知会受断电影响的组员。 2. 给驱动系统断电并确保不会再次接通。 3. 请等待至警告牌上说明的放电时间届满。 4. 确认功率接口和安全接地连接无电压。 5. 确认辅助电压回路已断电。 6. 确认电机无法运动。 7. 检查其他所有危险的能源供给，例如：压缩空气、液压、水。将能源供给置于安全状态。 8. 确保正确的驱动系统已经完全闭锁。 <p>结束作业后以相反的顺序恢复设备的就绪状态。</p>
	<p>⚠ 警告</p> <p>电网阻抗过高可引发电击以及火灾危险</p> <p>短路电流过低时，保护装置可能完全不动作或动作不够及时，从而引发电击或火灾。</p> <ul style="list-style-type: none"> 确保线间短路或对地短路时变频器电源输入端上出现的短路电流都至少达到保护装置的动作电流。 如果对地短路时出现短路电流不够高，没有达到保护装置的动作电流，必须额外使用 一个故障电流保护装置（RCD）。尤其是在 TT 电网上，所需的短路电流有可能极小。
	<p>⚠ 警告</p> <p>电网阻抗过低可引发电击以及火灾危险</p> <p>短路电流过高时，保护装置可能因无法分断该短路电流而损坏，进而引发电击或火灾。</p> <ul style="list-style-type: none"> 确保变频器电源输入端上可能出现的、未经控制的短路电流不会超出使用的保护装置的分断容量（SCCR 或者 Icc）。
	<p>⚠ 警告</p> <p>缺少接地可导致电击危险</p> <p>防护等级 I 的设备缺少安全接地连接或连接出错时，在其裸露的部件上会留有高压，接触该部件会导致重伤或死亡。</p> <ul style="list-style-type: none"> 按照规定对设备进行接地。
	<p>⚠ 警告</p> <p>连接不合适的电源可导致电击危险</p> <p>连接不合适的电源会导致可接触部件携带危险电压，从而导致人员重伤，甚至是死亡。</p> <ul style="list-style-type: none"> 所有的连接和端子只允许使用可以提供 SELV (Safety Extra Low Voltage: 安全低压) 或 PELV (Protective Extra Low Voltage: 保护低压) 输出电压的电源。
	<p>⚠ 警告</p> <p>电机损坏或设备损坏可导致电击危险</p> <p>未按规定操作电机或设备可能会对其造成损坏。电机或设备损坏后，其外壳或裸露部件可能会带有危险电压。</p>


	<ul style="list-style-type: none"> 在运输、存放和运行设备时应遵循技术数据中给定的限值。 不要使用已损坏的电机或设备。
	<p>⚠ 警告</p> <p>电缆屏蔽层未接地可导致电击危险</p> <p>电缆屏蔽层未接地时，电容超临界耦合可能会出现致命的接触电压。</p> <ul style="list-style-type: none"> 电缆屏蔽层和未使用的电缆芯线至少有一侧通过接地的外壳接地。
	<p>⚠ 警告</p> <p>运行时断开插接可产生电弧</p> <p>运行时断开插接会产生电弧，从而导致人员重伤或死亡。</p> <ul style="list-style-type: none"> 如果没有明确说明可以在运行时断开插接，则只能在断电时才能断开连接。
	<p>⚠ 警告</p> <p>功率组件中的剩余电荷可导致电击危险</p> <p>由于电容器的作用，在切断电源后的 5 分钟内仍有危险电压。接触带电部件会造成人员重伤，甚至死亡。</p> <ul style="list-style-type: none"> 等待 5 分钟，确认无电压再开始作业。
	<p>注意</p> <p>功率接口松动可造成财产损失</p> <p>紧固扭矩太小或振动会导致功率接口松动。可能因此导致火灾、设备损坏或功能故障。</p> <ul style="list-style-type: none"> 用规定的紧固扭矩拧紧所有功率接口。 请定期检查所有的功率接口，尤其是在运输后。
	<p>⚠ 警告</p> <p>内置型设备内可引起火灾</p> <p>发生火灾时，内置型设备的外壳无法避免火苗和烟雾冒出。这可能导致人员重伤或财产损失。</p> <ul style="list-style-type: none"> 将内置型设备安装在合适的金属控制柜中，从而保护人员免受火苗和烟雾伤害，或者对人员采取其他合适的防护措施。 确保烟雾只能经所设安全通道排出。
	<p>⚠ 警告</p> <p>电磁场会影响工作中的医疗植入体</p> <p>变频器在运行时会产生电磁场（EMF）。因此可能会对设备附近的人员，特别是带有正在工作的医疗植入体的人员，造成危险。</p> <ul style="list-style-type: none"> 作为可发射电磁场设备的操作人员，应对携带工作中的医疗植入体的人员的个体危险作出判断。通常应保证以下隔离距离： <ul style="list-style-type: none"> - 与关闭的电柜和屏蔽接线电缆 MOTION-CONNECT 无需隔离 - 与分布式驱动系统和打开的电柜保持一个前臂的距离（约 35 cm）
	<p>⚠ 警告</p> <p>永磁场会影响工作中的医疗植入体</p> <p>具有永磁场的电机即使在停止状态也会对变频器/电机附近佩戴有心脏起搏器或医疗植入体的人员有伤害。</p> <ul style="list-style-type: none"> 此类人员至少应保持 2 m 的间距。 运输和储存永磁电机时请使用原包装并设置警示牌。 采用相应的警示牌标记储存位置。 在用飞机进行运输时请遵守 IATA 规定！
	<p>⚠ 警告</p> <p>无线设备或移动电话可导致机器意外运动</p> <p>在设备的无屏蔽范围内使用发射功率超过 1 W 的无线设备或移动电话，会干扰设备功能。功能异常会对设备功能安全产生影响并能导致人员伤亡或财产损失。</p>

	<ul style="list-style-type: none"> • 大约距离组件 2 m 时，请关闭无线电设备或移动电话。 • 仅在已关闭的设备上使用“SIEMENS Industry Online Support App”。
	<p>警告</p> <p>电压过高会损坏电机绝缘装置</p> <p>在相线接地的电网下或者接地的 IT 电网下运行时，过高的对地电压会损坏电机的绝缘装置。如果使用了绝缘装置未针对运行条件而进行相线接地的电机，则必须采取以下措施：</p> <ul style="list-style-type: none"> • IT 电网：请使用接地继电器并尽快消除故障。 • 相线接地的 TN 或 TT 电网：请在电网侧使用隔离变压器。
	<p>警告</p> <p>通风空间不足可引起火灾</p> <p>通风空间不足会导致过热，产生烟雾，引发火灾，从而造成人身伤害。这可能就是导致重伤或死亡的原因。此外，设备/系统故障率可能会因此升高，使用寿命缩短。</p> <ul style="list-style-type: none"> • 组件之间应保持规定的最小间距，以便通风。
	<p>警告</p> <p>缺少警示牌或警示牌不清晰可导致未知危险</p> <p>缺少警示牌或警示牌不清晰可导致未知危险。未知危险可能导致人员重伤或死亡。</p> <ul style="list-style-type: none"> • 根据文档检查警示牌的完整性。 • 将缺少的警示牌固定在组件上，必要时安装本国语言的警示牌。 • 替换掉不清晰的警示牌。
	<p>注意</p> <p>不符合规定的电压/绝缘检测可损坏设备</p> <p>不符合规定的电压/绝缘检测可导致设备损坏。</p> <ul style="list-style-type: none"> • 进行机器/设备的电压/绝缘检测前应先断开设备，因为所有的变频器和电机在出厂时都已进行过高压检测，所以无需在机器/设备内再次进行检测。
	<p>警告</p> <p>安全功能失效可导致机器意外运动</p> <p>无效的或不适合的安全功能可引起机器意外运动，可能导致重伤或死亡。</p> <ul style="list-style-type: none"> • 调试前请注意相关产品文档中的信息。 • 对整个系统和所有安全相关的组件进行安全监控，以确保安全功能。 • 进行适当设置，以确保所使用的安全功能是与驱动任务和自动化任务相匹配并激活的。 • 执行功能测试。 • 在确保了机器的安全功能正常工作后，才开始投入生产。
	<p>说明</p> <p>Safety Integrated 功能的重要安全说明</p> <p>使用 Safety Integrated 功能时务必要注意 Safety Integrated 手册中的安全说明。</p>
	<p>警告</p> <p>因参数设置错误或修改参数设置引起机器误操作</p> <p>参数设置错误可导致机器出现误操作，从而导致人员重伤或死亡。</p> <ul style="list-style-type: none"> • 防止恶意访问参数设置。 • 采取适当措施（如驻停或急停）应答可能的误操作。

	<p>警告</p> <p>运行部件和弹出部件可导致人员受伤</p> <p>接触正在运行的电机部件或驱动元件以及松动电机部件的弹出（例如：棱键）会导致人员重伤或死亡。</p> <ul style="list-style-type: none"> • 拆除或拧紧松动部件，防止弹出。 • 严禁接触正在运行的部件。 • 使用接触保护装置确保不会接触正在运行的部件。
	<p>警告</p> <p>冷却不足可引起火灾</p> <p>电机通风空间不足会导致过热，产生烟雾，引发火灾，从而造成严重人身伤害或死亡。此外，电机故障率可能会因此升高，使用寿命缩短。</p> <ul style="list-style-type: none"> • 请遵守电机冷却的相关规定和要求。
	<p>警告</p> <p>电机不按规定运行可导致火灾</p> <p>不按规定操作会导致过热，产生烟雾，引发火灾，从而导致严重人身伤害或死亡。此外，温度过高会损坏电机组件，提高故障率，降低使用寿命。</p> <ul style="list-style-type: none"> • 根据说明运行电机。 • 仅允许在采取有效的温度监控措施后运行电机。 • 温度过高时立即关闭电机。
	<p>小心</p> <p>灼热表面可导致灼伤</p> <p>电机在运行时表面温度很高，接触电机会导致灼伤。</p> <ul style="list-style-type: none"> • 采取运行时接触不到电机的安装方式。 • 维护情况下应采取的措施： • 待电机冷却后再进行操作。 • 请穿着和佩戴相应的防护装备（如手套）。

1.2 操作静电敏感设备（ESD）

静电敏感元器件（ESD）是可被静电场或静电放电损坏的元器件、集成电路、电路板或设备。





	<p>注意</p> <p>静电场或静电放电可导致设备损坏</p> <p>电场或静电放电可能会损坏单个元件、集成电路、模块或设备，从而导致功能故障。</p> <ul style="list-style-type: none"> • 仅允许使用原始产品包装或其他合适的包装材料（例如：导电的泡沫橡胶或铝箔）包装、存储、运输和发运电子元件、模块和设备。 • 只有采取了以下接地措施之一，才允许接触元件、模块和设备： <ul style="list-style-type: none"> – 佩戴防静电腕带 – 在带有导电地板的防静电区域中穿着防静电鞋或配带防静电接地带 • 电子元件、模块或设备只能放置在导电性的垫板上（带防静电垫板的工作台、导电的 • 防静电泡沫材料、防静电包装袋、防静电运输容器）。
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1.3 驱动系统（电气传动系统）的遗留风险

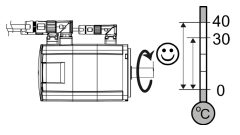
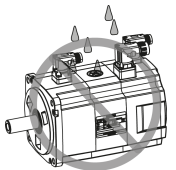
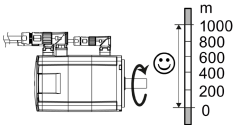
<p>驱动系统（电气传动系统）的遗留风险</p> <p>机器或设备制造商在依据相应的本地指令（比如欧盟机械指令）对机器或设备进行风险评估时，必须注意驱动系统的控制组件和驱动组件会产生以下遗留风险：</p> <p>1. 调试、运行、维护和维修时机器或设备部件意外运行，原因（举例）：</p> <ul style="list-style-type: none"> – 编码器、控制器、执行器和连接器中出现了硬件故障和/或软件故障 – 控制器和传动设备的响应时间 – 运行和/或环境条件不符合规定 – 凝露/导电杂质 – 参数设置、编程、布线和安装出错 – 在电子器件附近使用无线电装置/移动电话
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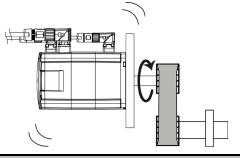
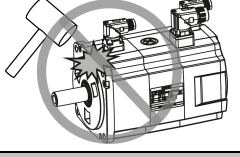
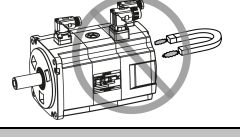
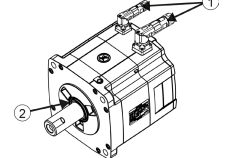
<ul style="list-style-type: none"> - 外部影响/损坏 - X 射线辐射、电离辐射和宇宙辐射
<p>2. 在出现故障时，组件内/外部出现异常温度、明火以及异常亮光、噪音、杂质、气体等，原因可能有：</p> <ul style="list-style-type: none"> - 零件失灵 - 软件故障 - 运行和/或环境条件不符合规定 - 外部影响/损坏
<p>3. 危险的接触电压，原因（举例）：</p> <ul style="list-style-type: none"> - 零件失灵 - 静电充电感应 - 静充电感应 - 运行和/或环境条件不符合规定 - 凝露/导电杂质 - 外部影响/损坏
<p>4. 设备运行中产生的电场、磁场和电磁场可能会损坏近距离的心脏起搏器支架、医疗植入体或其它金属物。</p>
<p>5. 当不按照规定操作以及/或违规处理废弃组件时，会释放破坏环境的物质并且产生辐射。</p>
<p>6. 影响通讯系统，如中央控制发送器或通过电网进行的数据通讯其它有关驱动系统组件产生的遗留风险的信息见用户技术文档的相关章节。</p>
<p>说明</p> <p>保护设备，例如：将组件装入符合 EN 60529 IP54 防护等级或符合 NEMA 12 的控制柜中。在特别关键的使用条件中必要时还需采取其他措施。</p> <p>如果安装地点排除了凝露或导电异物，则使用较低防护等级的控制柜。</p>

1.4 警告标识

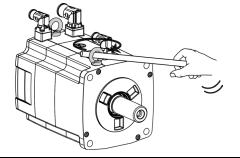


伺服电机上的警告标识	
	严禁敲打轴端，否则会导致编码器损坏。
	严禁触摸电机，其表面温度可能超过 80°C。
文档中的警告标识	
	表示如不采取相应的预防措施会导致死亡、严重的人身伤害或设备损坏。
	表示禁止执行的操作。

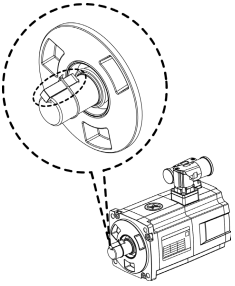
2 安装环境

环境温度	
	<ul style="list-style-type: none"> 运行温度：0°C 至 40°C 注意：当环境温度在 30°C 至 40°C 之间时，1FL605□ 电机和 1FL609□ 电机的带抱闸系列会有 10% 的功率降额。 储存温度：-20°C 至 65°C
环境湿度	
	<ul style="list-style-type: none"> 运行湿度：≤ 90% RH (30°C 时无凝露) 储存湿度：≤ 90% RH (30°C 时无凝露)
运行高度	
	≤ 1000 m

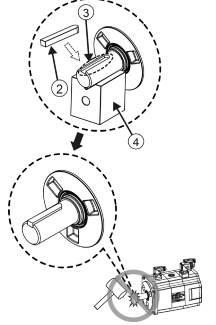
耐振性	
	≤ 49 m/s ²
抗冲击性	
	<ul style="list-style-type: none"> • 连续轴向冲击：≤ 25 m/s² • 连续径向冲击：≤ 50 m/s² • 短时（6 ms）冲击：250 m/s²
磁场干扰	
<p>注意</p> <p>为防止绝对编码器受到磁干扰，请勿在绝对编码器附近使用电磁设备，如记忆棒、存储卡和钥匙卡。</p>	
	<p>请勿在带绝对值编码器的伺服电机附近 15 mm 范围内放置会产生强磁场（高于 10 mT）的设备。</p>
防护等级	
	<ul style="list-style-type: none"> • 装配连接器的电机的防护等级为 IP65（防尘防水冲）。轴贯通部（②）有油封保护。 • 为保证防护能力，连线时请使用专用连接器（①）。

3 机械安装

吊装电机（仅用于高惯量电机）							
<p>警告</p> <p>不稳定重物导致死亡或人身伤害</p> <p>运输时电机不定移动可能导致死亡或人身伤害。</p> <ul style="list-style-type: none"> • 请使用针对电机及其负载的专用吊装设备。 • 切勿站在负载吊臂下方或其移动范围内。 • 移动时必须固定电机，防止侧翻掉落。 • 切勿通过提拉电缆来吊装电机。 							
<p>注意</p> <p>旋拧 1FL609□ 电机吊环时不可过紧。</p>							
	<ul style="list-style-type: none"> • 对于 1FL609□ 电机，吊装前必须手动完全拧紧吊环。 • 必须通过吊环进行 1FL609□ 电机的吊装。 						
安装轴键（可选）							
<p>警告</p> <p>甩飞轴键导致人身伤害</p> <p>当带键电机运行时，安装于轴端的轴键可能会甩出，从而导致人身伤害。</p> <p>轴端的轴键必须安装紧固，以防甩出。</p>							
<p>① B 型</p> 	<p>② C 型</p> 						
<p>对于高惯量电机和低惯量电机，其轴键的类型不同：</p> <table border="1"> <thead> <tr> <th>轴键类型</th> <th>用于</th> </tr> </thead> <tbody> <tr> <td>B 型</td> <td>低惯量电机</td> </tr> <tr> <td>C 型</td> <td>高惯量电机</td> </tr> </tbody> </table>		轴键类型	用于	B 型	低惯量电机	C 型	高惯量电机
轴键类型	用于						
B 型	低惯量电机						
C 型	高惯量电机						



对于带键电机，发货时，轴键 (①/②) 会绑扎在轴端上，安装时须首先将轴键拆下。



注意

将轴键 (②) 充分润滑后压装在键槽 (③) 中，使轴键底平面与键槽底面紧贴。压装时，建议在轴下方使用 V 型垫块 (④) 进行支撑，然后用铜棒将轴键敲入键槽，或者将轴键放入键槽后，用铜皮包裹轴伸，然后用虎钳将轴键夹紧。

安装轴键时，须注意轴键的安装方向，且勿敲打键槽。

安装电机

警告

垂直轴掉落导致人身伤害和设备损坏

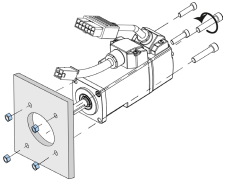
当带抱闸的伺服电机用作垂直轴时，如果伺服驱动的 24 V 直流电源正负极接反，该垂直轴则会掉落。垂直轴的意外掉落可能会导致人身伤害和设备损坏。

调试前，应在该轴的最大行程处安装机械挡板，以防意外掉落。另外还必须确保 24 V 直流电源连接正确。

说明

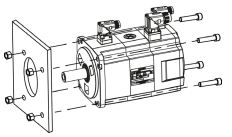
为保证良好的散热效果，请勿在电机法兰和安装法兰之间插入任何绝热体。

将电机安装到钢制安装法兰上。法兰和螺钉的信息如下。



低惯量电机

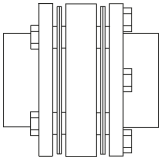
螺钉	法兰 (mm)
1FL602□: 2 x M4 (2.4 Nm)	120 x 100 x 40
1FL603□: 4 x M5 (4.7 Nm)	120 x 100 x 40
1FL604□: 4 x M6 (8 Nm)	120 x 100 x 40
1FL605□: 4 x M8 (20 Nm)	120 x 100 x 40



高惯量电机

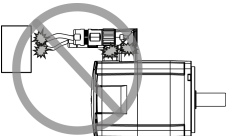
螺钉	法兰 (mm)
1FL604□: 4 x M6 (8 Nm)	270 x 270 x 10
1FL606□: 4 x M8 (20 Nm)	390 x 390 x 15
1FL609□: 4 x M12 (85 Nm)	420 x 420 x 20

选择联轴器



请选择伺服电机专用的具有高扭转刚度的挠性联轴器，且该联轴器可将电机扭矩传递给机构，并补偿轴向、径向和角度的偏移。

安装联轴器



注意

安装联轴器时请勿敲打轴，且需确保轴向和径向负载小于操作说明手册中规定的最大值。

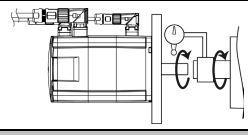
联轴器定芯

注意

当电机使用凸缘联轴器时，请确保径向偏差小于 0.03 mm。否则会损坏电机轴承。

说明

定芯的精度要求因电机转速和联轴器类型而异。请根据实际的应用来确定精度要求。



- 通过旋转两侧轴来定芯。
- 建议通过测试来校正定芯精度。如果条件不具备，通过观察联轴器可否在两侧轴上自由滑动来判断定芯精度。

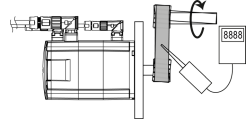
定芯调整

联轴器发出异常声响时，请参见上一步“联轴器定芯”来重新调整定芯直至异响消失。

拉力测量

注意

传动带的拉力必须小于电机允许的最大径向力。

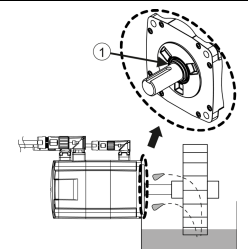


- 以 45° 角旋转电机轴，然后通过拉力计测量传动带各点的拉力。
- 尽量降低皮带轮的轴向偏差，使电机轴所受的轴向力降到最低。

油封润滑

注意

电机运行时请勿将油封浸到油面以下。



油封 (①) 应在带有足够润滑油的情况下使用，但不可浸到油面以下使用。

4 电气安装


警告

危险电压和电机意外运动导致人身伤害

电机上电时连接电缆，存在危险电压和电机意外运动风险，会导致人身伤害。

- 切断电源。
- 确保无电压存在。
- 防止电源再次打开。

接线前准备

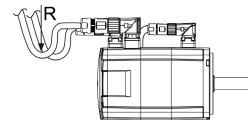


连接电缆前请采取必要的静电防护措施，如套上防静电带、带上防静电手套和穿着防静电服。

接线顺序

注意

接线时请勿对电缆或连接器过度用力。

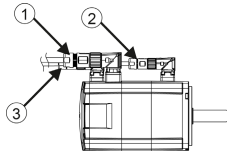


电缆的**最小静态折弯半径**为 5 x 电缆外径。

电缆的**最小动态折弯半径**均为 155 mm。

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请按以下顺序连接电缆：

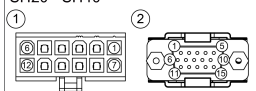
- 编码器电缆 (③)
- 连接抱闸连电缆 (②)
- 动力电缆 (①)

连接编码器电缆

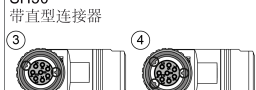
注意

切勿触摸电机的编码器引脚，以防受到污染。


SH20 - SH40



SH50 带直型连接器



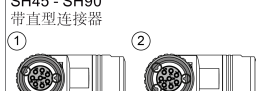
带直角连接器




低惯量电机：

编号	编码器类型	凹槽数目
①	增量	-
②	绝对值	-
③	增量	两个
④	绝对值	三个
⑤	增量	三个
⑥	绝对值	两个

SH45 - SH90 带直型连接器



SH45 - SH90 带直角连接器



高惯量电机：

编号	编码器类型	凹槽数目
①	增量	两个
②	绝对值	三个
③	增量	三个

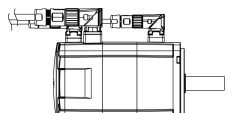
连接抱闸电缆

注意

连接抱闸电缆前，请确保 DC 24 V 电源的电压范围为 ±10%。否则抱闸不能正常工作。

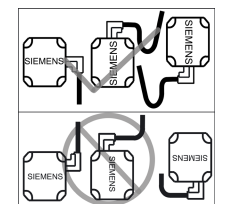
说明

制动器仅设计用于电机的停机抱闸。如非必要，请勿将制动器用作急停或减速装置。



- 运行伺服电机前请确认抱闸的实际打开时间和关闭时间。
- 抱闸上电后，电机即使处于伺服关闭的状态也会发热。注意这并非故障。

走线

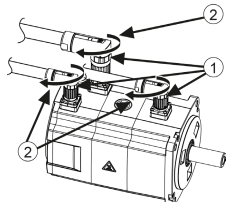


请按左图所示的正确方向连接电源电缆和编码器电缆，特别是在潮湿环境中。

调整电缆方向

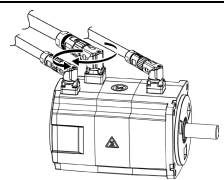
警告

调整接线或电缆方向前请先关闭电源，否则电机可能存在危险电压和触电风险。



轴高 50 mm 的低惯量电机 + 带直型连接器的高惯量电机：

1. 按图示方向 (②) 旋转螺环 (①) 以松开连接器。
2. 通过转动连接器来调整确定电缆方向。
3. 反方向旋转螺环以固定连接器。



带直角连接器的高惯量电机：
通过转动连接器来调整确定电缆方向。

5 技术支持

国家	热线
中国	+86 400 810 4288
德国	+49 911 895 7222
意大利	+39 (02) 24362000
印度	+91 22 2760 0150
土耳其	+91 (216) 4440747

更多服务联络信息，请访问：
<https://support.industry.siemens.com/cs/ww/en/>。

本安装指南中的图示以高惯量电机为例。更多产品信息，请参见 SINAMICS V90，SIMOTICS S-1FL6 操作说明。