




1 安全说明

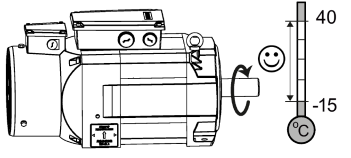
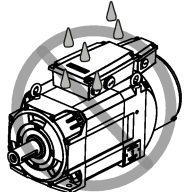
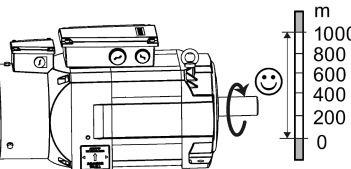
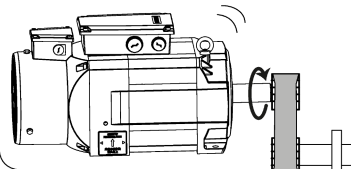
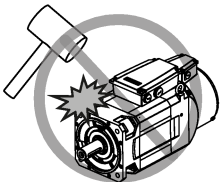
1.1 一般安全说明

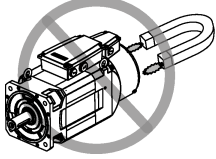
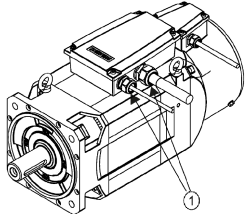
 警告
<p>不遵守安全说明和操作说明可导致生命危险</p> <p>本安装指南只包含电机的重要信息。如不遵守相关文档中的安全说明和操作说明,会导致人员重伤或死亡等事故。</p> <ul style="list-style-type: none"> 请遵守相关文档中的安全说明和操作说明。

1.2 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。

2 安装环境

环境温度	
	<ul style="list-style-type: none"> 运行温度: -15 °C 到 40 °C (无功率降额) 储存温度: -20 °C 到 65 °C
环境湿度	
	<ul style="list-style-type: none"> 运行湿度: ≤ 90% RH 储存湿度: ≤ 95% RH
运行高度	
	≤ 1000 m (无功率降额)
振动强度等级	
	<ul style="list-style-type: none"> 1PH11□□-1□F: B (1800 rpm 及以下) S (1800 rpm 至10000 rpm) 1PH11□□-1□D: B (1800 rpm 及以下) R (1800 rpm 至6000 rpm)
抗冲击性	
	<ul style="list-style-type: none"> 连续轴向冲击: ≤ 2.25 m/s² 连续径向冲击: ≤ 10 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"> 电机的防护等级为 IP54 (电机运行时,防尘防水溅落) 接线盒部分防护等级为 IP65。 为保证防护能力,连线时请使用专用电缆固定头 (①)。

3 机械安装

吊装电机	
<p>警告</p> <p>不稳定重物导致死亡或人身伤害</p> <p>运输时电机非正常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。 移除时必须固定电机,防止侧翻掉落。 切勿通过提拉电缆来吊装电机。 	
<p>注意</p> <p>旋拧电机吊环时不可过紧。</p>	
	<ul style="list-style-type: none"> 吊装前必须手动完全拧紧吊环。 必须通过吊环进行电机的吊装。 当需要竖直安装电机时,请将吊环拧入后端盖两侧的螺孔内。
安装轴键 (可选)	
<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>注意</p> <p>对于带键电机,轴键 (②) 已预装在轴上。重新安装时,请勿敲打键槽 (①)。</p>

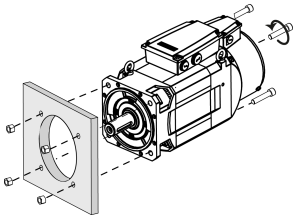


A 5 E 3 6 2 4 7 3 2 4 A

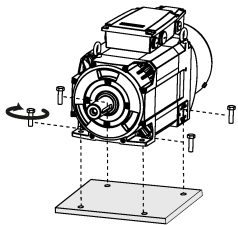
安装电机

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缘体。



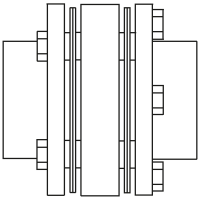
将电机安装到钢制安装法兰上。请使用 4 个 M12 的螺钉，拧紧扭矩为 84 Nm。



对于地脚安装型电机，应先用扳手取下地脚盖板，拧上地脚螺钉，将电机固定于安装板，再合上地脚盖板。请按如下要求正确使用螺钉：

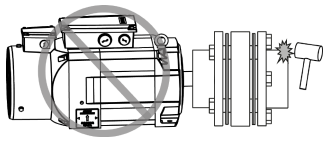
电机型号	螺钉	拧紧扭矩
1PH110□	4 x M10	39 Nm
1PH113□	4 x M12	84 Nm

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械结构，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。

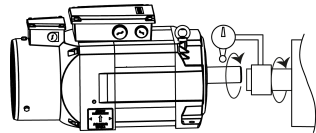
联轴器对中

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

对中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。



- 通过旋转两侧轴来对中。
- 建议通过测试来校正对中精度。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对中精度。

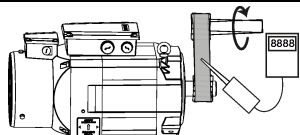
对中调整

联轴器发出异常声响时，请参见上一步“联轴器对中”来重新调整对中直至异响消失。

张紧力测量

注意

传动带的张紧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张紧力。
- 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。

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

注意

接线时请勿对电缆或连接器过度用力。

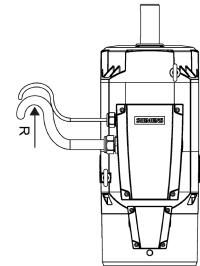
注意

对于绝对值编码器电缆，务必将电缆屏蔽层接地，以确保满足 EMC 要求。

说明

- 推荐的电缆连接顺序依次为编码器电缆、动力电缆、以及风扇电缆。
- 接线盒两侧均有电缆过线孔。如有必要，可选择从任意一侧的过线孔连接各电缆。

电缆最小折弯半径 (R)



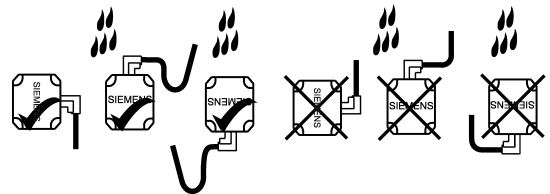
电缆的最小折弯半径如下表所示：

电缆类型	电缆截面积 (mm ²)	静态最小折弯半径 (mm) ¹⁾	动态最小折弯半径 (mm) ²⁾
动力电缆	4x2.5	5x10	180
	4x4	5x11.4	210
	4x10	5x20	360
4x16	5x24.2	440	
编码器电缆	6x0.2 + 4x0.25	5x7.4	20x7.4

1) = 5 倍的电缆外径

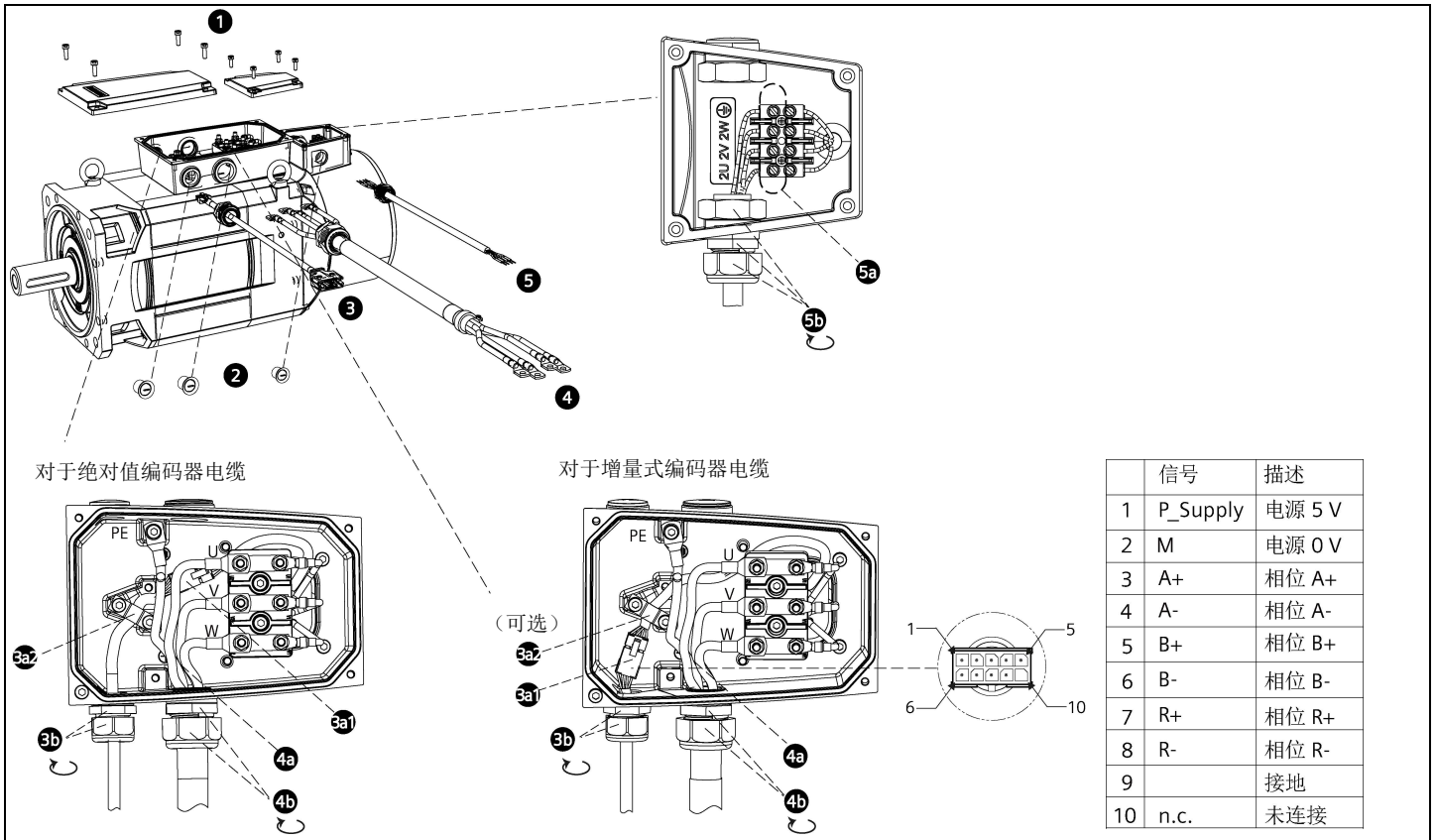
2) = 20 倍的电缆外径 (仅编码器电缆)

布线



注意

请按图所示的正确方向连接电源电缆、编码器电缆和风扇电缆，特别是在潮湿环境中。



1. 分别松开电机接线盒及风扇接线盒顶盖上的螺钉，取下接线盒顶盖。
2. 拧下位于两个接线盒同一侧的三个旋转塞头。
3. 拧松编码器电缆上预安装好的电缆固定头。将编码器电缆穿过电机接线盒上已取下塞头的第一个过线孔。按以下步骤连接编码器电缆：
 - 对于绝对值编码器电缆：
 - 3a1. 将电缆端部的插头与接线盒内对应的绝对值编码器电缆插座对插。
 - 3a2. 拧下接线盒内的接地螺钉并取下卡箍。合理敷设绝对值编码器电缆。将卡箍压在电缆屏蔽层上，然后拧紧螺钉。可选择在三个螺孔中任意两个螺孔处拧紧卡箍从而将电缆固定于所需方向上。
 - 对于增量式编码器电缆：
 - 3a1. 将电缆端部的插头与接线盒内对应的增量式编码器电缆插座对插。
 - 3a2. (可选) 可选择在三个螺孔中任意两个螺孔处拧紧卡箍从而将电缆固定于所需方向上。关于如何固定电缆的更多信息，请参见上述连接绝对值编码器电缆中的步骤 3a2。
- 3b. 将编码器电缆上的电缆固定头旋紧在过线孔上。
4. 将动力电缆穿过电缆固定头，而后穿过电机接线盒上已取下塞头的第二个过线孔。按以下步骤连接动力电缆：
 - 4a. 拧下接线盒内与 U、V、W 端子对应的三个接线螺母。将动力电缆上的三个接线端子分别套在对应的接线螺柱上，然后锁紧螺母（3 x M5，最大 4.7 Nm）。拧下 PE 端子的接地螺钉。将 PE 接线端子套在接地螺钉上，然后拧紧螺钉（1PH110□：1 x M5，最大 4.7 Nm；1PH113□：1 x M6，最大 4.7 Nm）。
 - 4b. 将动力电缆上的电缆固定头旋紧在过线孔上。
5. 对于 1PH113□ 电机：将用户自备的风扇电缆（建议电缆外径为 4 mm 至 8 mm）穿过电缆固定头，而后穿过风扇接线盒上已取下塞头的过线孔。
对于 1PH110□ 电机：将用户自备的风扇电缆（建议电缆外径为 4 mm 至 8 mm）穿过电缆固定头，而后穿过风扇接线盒上已取下塞头的过线孔，最后穿过风扇接线盒内的防松螺母。
按以下步骤连接风扇电缆：
 - 5a. 拧松接线盒内与 U、V、W、PE 端子对应的四个螺钉。将风扇电缆上的四个接线端子分别插入螺柱下方对应的接线槽内，然后用螺钉锁紧端子。
 - 5b. 对于 1PH113□ 电机：将风扇电缆上的电缆固定头旋紧在过线孔上。
对于 1PH110□ 电机：将风扇电缆上的电缆固定头旋紧在风扇接线盒内的防松螺母上。
6. 重新装上接线盒顶盖，然后分别拧紧电机接线盒（4 x M5，最大 4.7 Nm）和风扇接线盒（4 x M4，最大 2.4 Nm）的螺钉。

5 技术支持

国家	热线
中国	+86 400 810 4288
德国	+49 911 895 7222
印度	+91 22 2760 0150

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

6 更多信息

更多关于 1PH1 主轴电机的产品信息，请参见 SINUMERIK 808D ADVANCED 调试手册。
<https://support.industry.siemens.com/cs/ww/en/ps/13210/man>

1 Safety instructions

1.1 General safety instructions



Danger to life if the safety instructions and operating instruction are not observed

The installation guide only contains the most important information for the motor. If the safety instruction and operating instructions in the associated documentation are not observed, accidents involving severe injuries or death can occur.

- Observe the safety instructions and operating instructions given in the associated documentation.

1.2 Warning labels

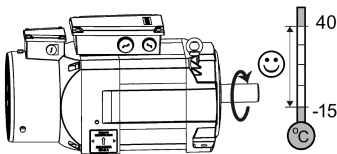
Warning labels on servo motors

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**.

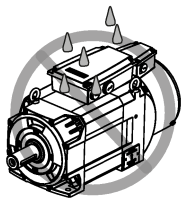
2 Installation environment

Ambient temperature



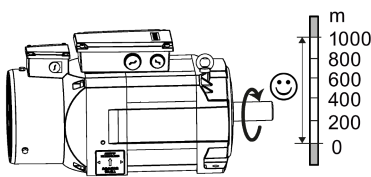
- Operation: -15 °C to 40 °C (without power derating)
- Storage: -20 °C to 65 °C

Ambient humidity



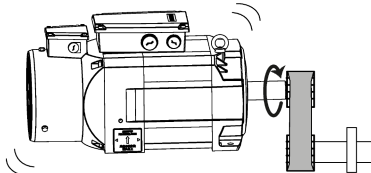
- Operation: ≤ 90% RH
- Storage: ≤ 95% RH

Operation altitude



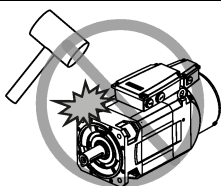
- ≤ 1000 m (without power derating)

Vibration severity grade



- 1PH11 □□ -1□F:
B (up to 1800 rpm)
S (1800 rpm to 10000 rpm)
- 1PH11 □□ -1□D:
B (up to 1800 rpm)
R (1800 rpm to 6000 rpm)

Shock resistance

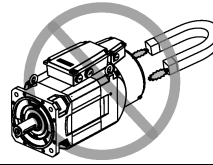


- Continuous axial shock: ≤ 2.25 m/s²
- Continuous radial shock: ≤ 10 m/s²

Magnetic field

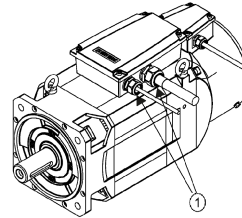
NOTICE

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



- A motor with fitted connectors has a protection class of IP54 (dust-tight and splash-proof during motor operation).
- The terminal box has a protection class of IP65.
- To guarantee adequate protection, use the specified cable glands (①) when wiring.

3 Mechanical installation

Lifting a motor



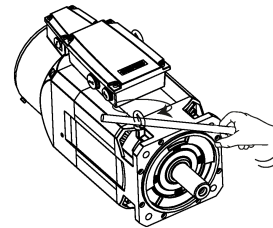
Death or injuries by unresolved burdens

At the transport the motor can cause death or injuries by unchecked movements.

- Use lifting equipments 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 motors.



- Screw in the eyebolts manually and completely before lifting the motors.
- Lift the motors only at the eyebolts.
- When mounting the motors vertically, screw the eyebolts in the screw holes on the two side walls of the non-drive end shield.

Installing a key (optional)

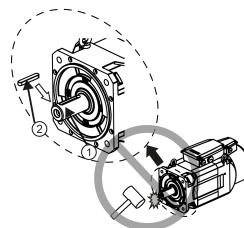


Injury caused by moving or ejected parts

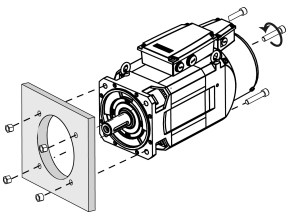
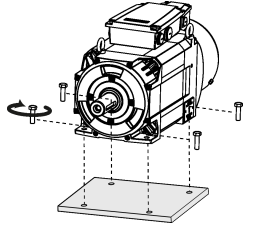
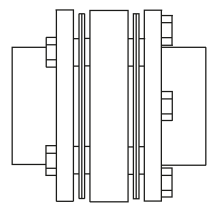
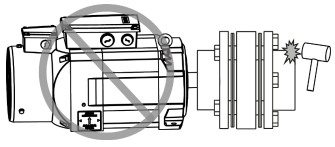
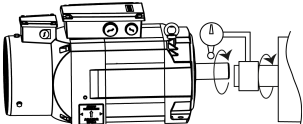
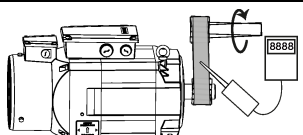
Contact with moving motor parts or drive output elements and the ejection of loose motor parts out of the motor enclosure can result in severe injury or death.

- 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.

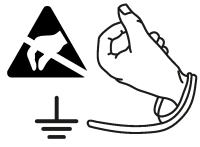
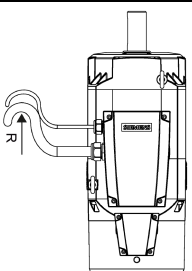
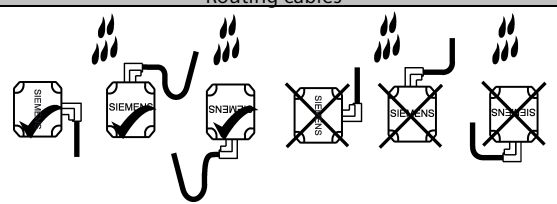
NOTICE

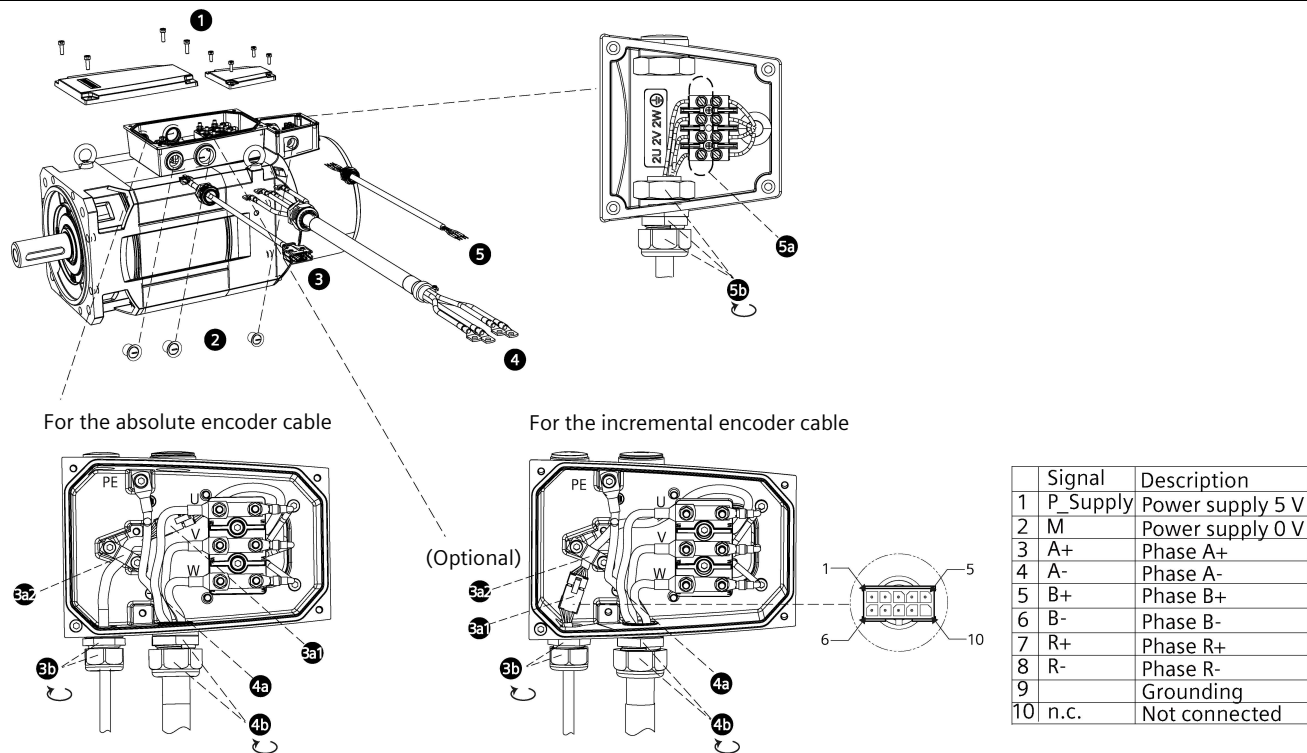


For the motor using a key (②), the key is preinstalled on the shaft extension. When reinstalling it, do not strike the key slot (①).

Mounting a motor										
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. Use four M12 screws with a tightening torque of 84 Nm.									
	Remove the anchor plates with a wrench, tighten the screws to fix the motor to the mounting plate, and then reinstall the anchor plates. Use the screws properly as required below:									
	<table border="1"> <thead> <tr> <th>Motor variant</th> <th>Screw</th> <th>Tightening torque</th> </tr> </thead> <tbody> <tr> <td>1PH110 □</td> <td>4 x M10</td> <td>39 Nm</td> </tr> <tr> <td>1PH113 □</td> <td>4 x M12</td> <td>84 Nm</td> </tr> </tbody> </table>	Motor variant	Screw	Tightening torque	1PH110 □	4 x M10	39 Nm	1PH113 □	4 x M12	84 Nm
Motor variant	Screw	Tightening torque								
1PH110 □	4 x M10	39 Nm								
1PH113 □	4 x M12	84 Nm								
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 equipped 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. 									

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.																					
Cable connecting																						
NOTICE Do not put much stress upon cables or connectors while wiring.																						
NOTICE For the absolute encoder cable, make sure that you connect the cable shield to earth to ensure better EMC compliance.																						
NOTE <ul style="list-style-type: none"> The recommended sequence for cable connections is as follows: encoder cable first, power cable next, and then the fan cable. There are threaded holes available on both sides of the terminal box housing for you to pass the cables through. You can select to connect the individual cables to the terminal boxes from the threaded holes on the desired side. 																						
Minimum cable bending radius (R)																						
	The minimum cable bending radii are listed as follows:																					
	<table border="1"> <thead> <tr> <th>Cable type</th> <th>Cable cross-section (mm²)</th> <th>Minimum static bending radius,¹⁾ (mm)</th> <th>Minimum dynamic bending radius,²⁾ (mm)</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Power cable</td> <td>4x2.5</td> <td>5x10</td> <td>180</td> </tr> <tr> <td>4x4</td> <td>5x11.4</td> <td>210</td> </tr> <tr> <td>4x10</td> <td>5x20</td> <td>360</td> </tr> <tr> <td rowspan="2">Encoder cable</td> <td>4x16</td> <td>5x24.2</td> <td>440</td> </tr> <tr> <td>6x0.2 + 4x0.25</td> <td>5x7.4</td> <td>20x7.4</td> </tr> </tbody> </table>	Cable type	Cable cross-section (mm ²)	Minimum static bending radius, ¹⁾ (mm)	Minimum dynamic bending radius, ²⁾ (mm)	Power cable	4x2.5	5x10	180	4x4	5x11.4	210	4x10	5x20	360	Encoder cable	4x16	5x24.2	440	6x0.2 + 4x0.25	5x7.4	20x7.4
Cable type	Cable cross-section (mm ²)	Minimum static bending radius, ¹⁾ (mm)	Minimum dynamic bending radius, ²⁾ (mm)																			
Power cable	4x2.5	5x10	180																			
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Encoder cable	4x16	5x24.2	440																			
	6x0.2 + 4x0.25	5x7.4	20x7.4																			
	¹⁾ = 5 x outer diameter ²⁾ = 20 x outer diameter (encoder cable only)																					
Routing cables																						
																						
NOTICE Route the power cables, encoder cables, and fan cables as shown in the figure, especially in a humid environment.																						



- Loosen the screws on the top of both the motor terminal box and the fan terminal box to remove the terminal box covers.
- Remove the three screw plugs on one side of the two terminal boxes.
- Loosen the cable gland pre-assembled on the encoder cable. Pass the encoder cable through the first threaded hole in the motor terminal box housing. Follow the steps below to connect the encoder cable to the motor terminal box:
 - For the absolute encoder cable:
 - Insert the male connector of the absolute encoder cable into the female connector in the motor terminal box.
 - Remove from the terminal box the grounding screws as well as the hose clamp. Lay the absolute encoder cable appropriately. Place the hose clamp onto the cable shield, and then tighten the screws. You can select to fix the cable in the desired direction by screwing the hose clamp at any two of the three screw holes.
 - For the incremental encoder cable:
 - Insert the male connector of the incremental encoder cable into the female connector in the motor terminal box.
 - (Optional) You can select to fix the cable in the desired direction by screwing the hose clamp at any two of the three screw holes. For detailed information about how to fix the cable, see step 3a2 for connecting the absolute encoder cable mentioned above.
- Pass the power cable through the cable gland, and then through the second threaded hole in the motor terminal box housing. Follow the steps below to connect the power cable to the motor terminal box:
 - Remove from the terminal box the three binding post nuts that correspond to the power cable terminals U, V, and W. Place the three terminal lugs at the end of the power cable conductors onto the corresponding binding posts. Fasten the cable conductors with the nuts (3 x M5, max. 4.7 Nm). Remove the grounding screw for power terminal PE. Place the terminal lug of the PE conductor on the grounding screw, and then tighten the screw for the PE terminal (1PH110□: 1 x M5, max. 4.7 Nm; 1PH113□: 1 x M6, max. 4.7 Nm).
 - Tighten the cable gland of the power cable onto the threaded hole.
- For 1PH113□ motors: pass your own fan cable (recommended cable outer diameter: 4 mm to 8 mm) through the cable gland, and then through the threaded hole in the fan terminal box housing.
 For 1PH110□ motors: first pass your own fan cable (recommended cable outer diameter: 4 mm to 8 mm) through the cable gland, next the fan cable hole, and then through the lock nut within the fan terminal box housing.
 Follow the steps below to connect the power cable to the motor terminal box:
 - Loosen the four screws that correspond to the fan cable terminals U, V, W and PE. Insert the terminal lugs at the end of fan cable conductors into the corresponding sockets under the binding posts, and then fasten the cable conductors with the screws.
 - For 1PH113□ motors, tighten the cable gland of the fan cable onto the threaded hole.
 For 1PH110□ motors, tighten the cable gland of the fan cable onto the threaded lock nut within the fan terminal box.
- Replace the covers of the terminal boxes, and then tighten the screws respectively for the motor terminal box (4 x M5, max. 4.7 Nm) and the fan terminal box (4 x M4, max. 2.4 Nm).

5 Technical support

Country	Hotline
China	+86 400 810 4288
Germany	+49 911 895 7222
India	+91 22 2760 0150

For further service contact information, visit:
<https://support.industry.siemens.com/cs/ww/en/>

6 Further information

For more information about 1PH1 main motors, refer to the SINUMERIK 808D ADVANCED Commissioning Manual.
<https://support.industry.siemens.com/cs/ww/en/ps/13210/man>