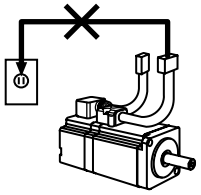
Precautions on Servomotor Installation

Servomotors can be installed either horizontally or vertically.

The service life of the servomotor will be shortened or unexpected problems will occur if the servomotor is installed incorrectly or in an inappropriate location. Always observe the following installation instructions.

⚠ CAUTION

Do not connect the servomotor directly to a commercial power line. This will damage the servomotor.
The servomotor cannot operate without the proper SERVOPACK.



(1) Installation Environment

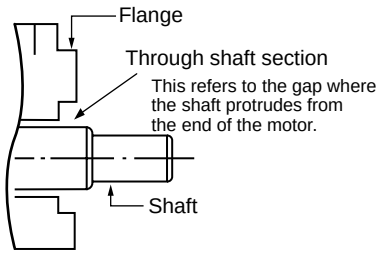
Items	Condition
Ambient Temperature	0 to 40˚C (no freezing)
Ambient Humidity	20% to 80%RH (no condensation)
Installation Site	· Free of corrosive or explosive gases. · Well-ventilated and free of dust and moisture. · Facilitates inspection and cleaning. · Elevation :1,000 m max. · Free of high magnetic field
Storage Environment	Store the servomotor in the following environment if it is stored with the power cable disconnected. Ambient temperature during storage: −20 to +60˚C (no freezing) Ambient humidity during storage: 20% to 80%RH (no condensation)

(2) Enclosure

The servomotor enclosure* is described table as follows.

Model	Without Gears	With Gears
SGMAV□SGMJV	IP65	IP55
SGMPS	IP55 IP67 (optional)	IP55
SGMGV	IP67	–
SGMSV	IP67 (SGMSV-70 servomotor only: IP22)	–

*: Except through shaft section. The enclosure specification can be satisfied only when using a specified cable.



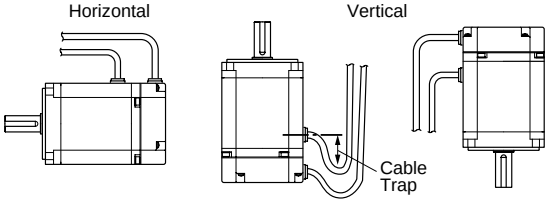
- Do not use servomotors in a location that is subject to oil. If the servomotor is used in a location that is subject to water or oil mist, order a servomotor with an oil seal to seal the through shaft section.

Precautions on Using Servomotor with Oil Seal:

- Put the oil surface under the oil seal lip.
- Use an oil seal in favorably lubricated condition.
- When using a servomotor with its shaft upward direction, be sure that oil will not stay in the oil seal lips.

(3) Orientation

- Servomotors can be installed either horizontally or vertically. When installing servomotors vertically, make cable traps to keep out water. When mounting servomotors with the shaft up, take measures with the connected machine to prevent oil from getting into the servomotors through gear boxes etc.

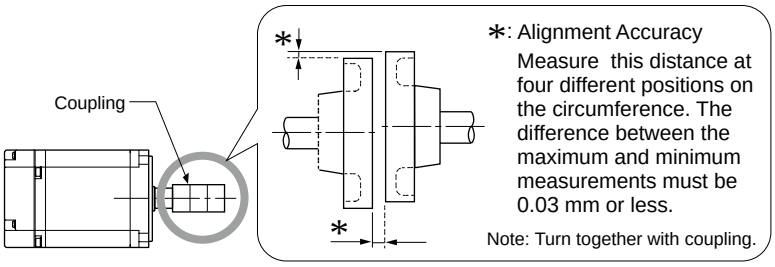


(4) Alignment

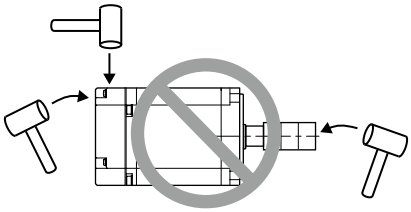
Align the shaft of the servomotor with the shaft of the equipment, and then couple the shafts.

IMPORTANT

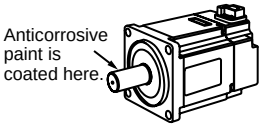
1 Install the servomotor so that alignment accuracy falls within the following range.
Vibration that will damage the bearings and encoders if the shafts are not properly aligned.



2 Do not allow any direct impact to the shafts when installing the couplings. Do not hit the area near encoders with a hammer etc., as impacts may damage the encoders.



3 Before installation, thoroughly remove the anticorrosive paint from the end of the motor shaft. Only after removing the paint can servomotors be installed on the machines.



(5) Cable Stress

- Make sure there is no bending or tension on the cables themselves, the connections, or the cable lead inlets.

Be especially careful to wire encoder cables so that they are not subject to stress because the core wires of encoder cables and main circuit cables are very thin at only 0.2 to 0.3 $mm^{2.}$

(6) Connectors

Observe the following precautions:

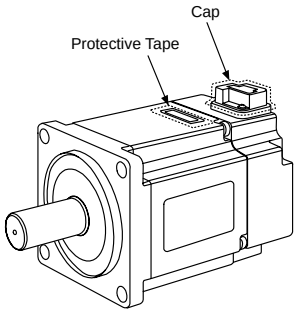
- When the connectors are connected to the motor, be sure to connect the end of motor main circuit cables before connecting the encoder cable's end.
  If the encoder cable's end is connected, the encoder may break because of the voltage differences between FG.
- Make sure there is no foreign matters such as dust and metal chips in the connector before connecting.
- Do not apply shock to resin connectors. Otherwise, they may be damaged.
- Make sure of the pin arrangement.
- Be sure not to apply stress on the connector, when using flexible cables. The connector may be damaged by stress.
- When handling a servomotor with its cables connected, hold the servomotor or the connectors and cables will be damaged.
- Fix the cable connector to SGMJV, SGMAV, SGMPS-01/-02/-04 or SGMGV-03/-05 servomotors with screws. Refer to "Cable connections to SGMJV, SGMAV and SGMPS servomotors" or "Cable connections to SGMGV-03/-05 servomotors."Make sure that the connector is securely fixed with screws.
- If connectors are not connected properly, the protective structure specifications may not be satisfied.

Cable Connections to SGMJV, SGMAV and SGMPS Servomotors

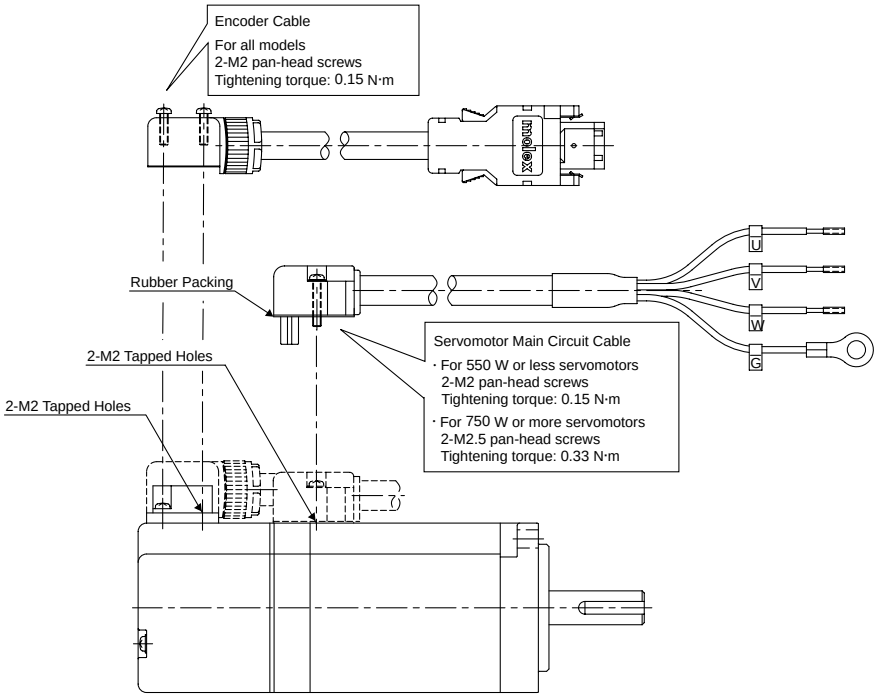
Connect the main circuit cable and encoder cable to SGMJV, SGMAV or SGMPS-01/-02/-04 servomotor in the following manner.

> **⚠ CAUTION**
>
> Do not directly touch the connector pins provided with the servomotor. Particularly, the encoder may be damaged by static electricity, etc.

STEP1 Remove the protective tape and cap from the servomotor connector.



STEP2 Mount the cable connector on the servomotor and fix it with screws as shown in the figure below.



IMPORTANT

- First, connect the servomotor to the servomotor main circuit cable end.
- Do not remove the rubber packing. Mount the connector so that the rubber packing is seated properly.

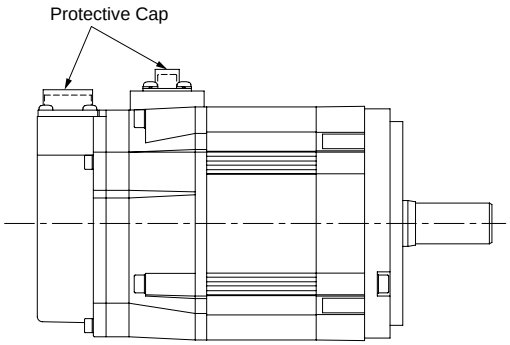
  If the rubber packing is not seated properly, the requirements for the protective structure specifications may not be met.

Cable Connections to SGMGV-03/-05 Servomotors

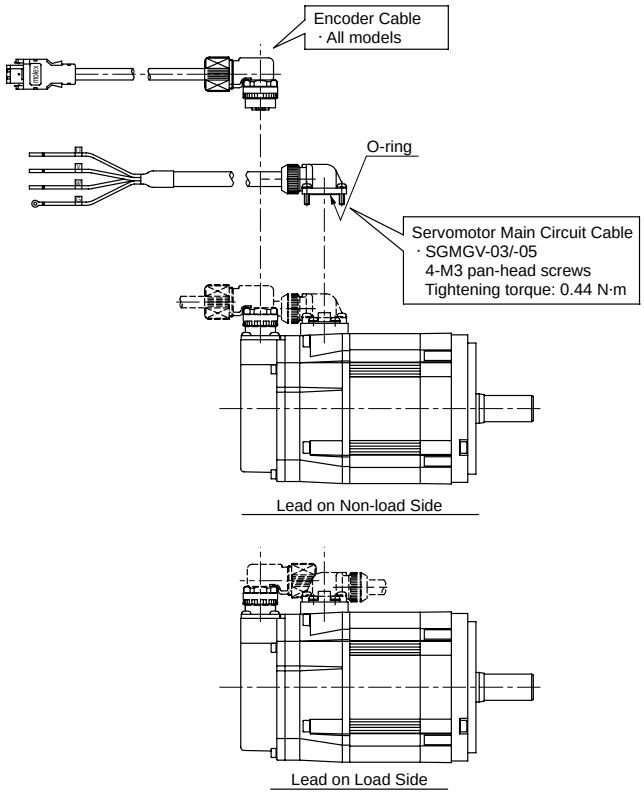
Connect the main circuit cable and encoder cable to SGMGV-03/-05 servomotor in the following manner.

> **⚠ CAUTION**
>
> Do not directly touch the connector pins provided with the servomotor. Particularly, the encoder may be damaged by static electricity, etc.

STEP1 Remove the protective cap from the servomotor connector.



STEP2 Mount the cable connector on the servomotor and fix it with screws as shown in the figure below.

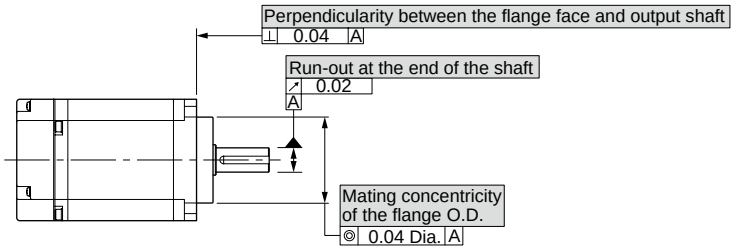


IMPORTANT
- First, connect the servomotor to the servomotor main circuit cable end.
- Do not remove the O-ring. Mount the connector so that the O-ring is seated properly.
  If the O-ring is not seated properly, the requirements for the protective structure specifications may not be met.

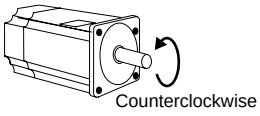
Mechanical Specifications

●Mechanical Tolerance(T.I.R. : Total Indicator Reading)

The following figure shows tolerances for the servomotor's output shaft and installation area. For more details on tolerances, refer to the external dimensions of the individual servomotor.



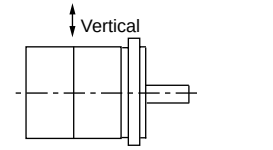
●Direction of Servomotor Rotation



Positive rotation of the servomotor without a gear is counterclockwise when viewed from the load.

Refer to Ratings and Specifications for each series regarding rotation direction of the servomotor with a gear. The direction of rotation can be reversed by changing the SERVOPACK parameters.

●Shock Resistance

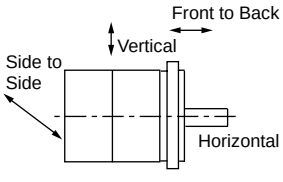


Impact Applied to the Servomotor

Mount the servomotor with the axis horizontal. The servomotor will withstand the following vertical impacts:

- Impact Acceleration: 490 m/s^2
- Impact occurrences: 2

●Vibration Resistance



Impact Applied to the Servomotor

Mount the servomotor with the axis horizontal. The servomotor will withstand the following vibration acceleration in three directions: Vertical, side to side, and front to back.

Servomotor Model	Vibration Acceleration at Flange
SGMJV, SGMAV, SGMPS	49 m/s^2
SGMGV -03 to -44, SGMSV -10 to -50	49 m/s^2 (Front to back direction: 24.5 m/s^2)
SGMGV -55 to -1E	24.5 m/s^2
SGMSV -70	14.7 m/s^2

IMPORTANT

The amount of vibration the servomotor endures will vary depending on the application. Check the vibration acceleration being applied to your servomotor for each application.

●Vibration Class

The vibration class for the servomotors at rated motor speed is V15.

(A vibration class of V15 indicates a total vibration amplitude of 15 μm maximum on the servomotor during rated rotation.)

Rotor Moment of Inertia

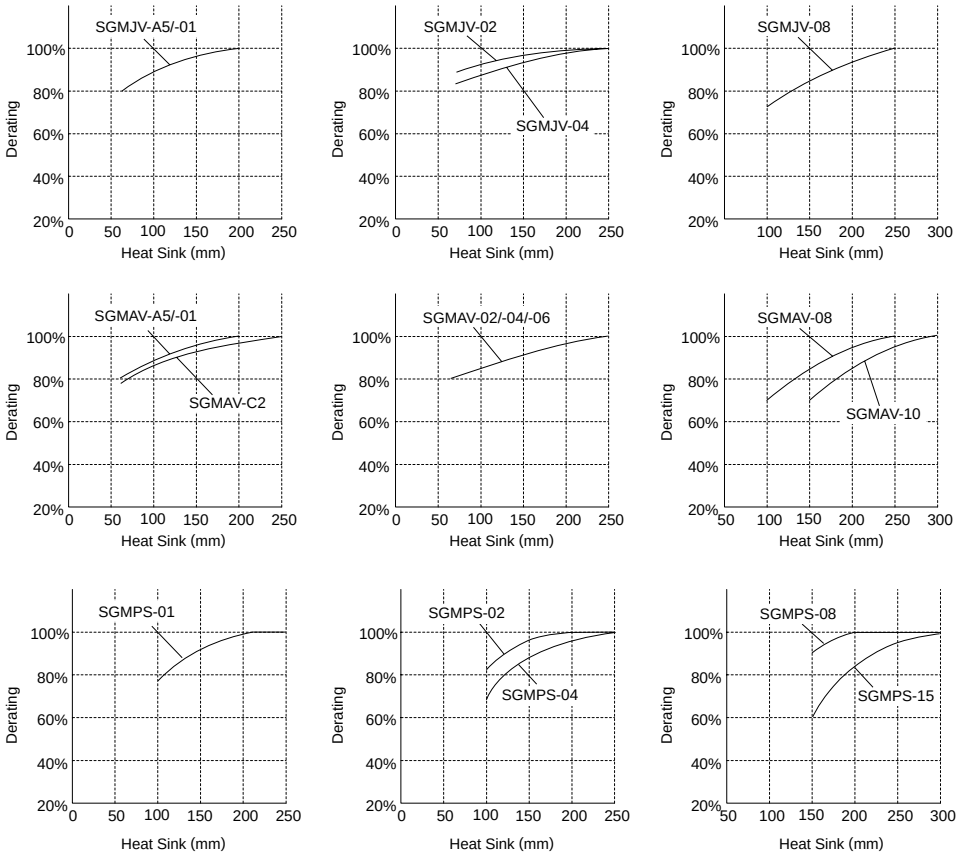
Small-capacity servomotors come in a medium inertia series "SGMJV servomotor," "SGMPS servomotor" and low inertia series "SGMAV servomotor." The rotor moment of inertia of SGMJV servomotor and SGMPS servomotor are twice as large as that of SGMAV. Select servomotors based on the specifications of your devices, such as load moment of inertia or machine rigidity.

- When the rotor moment of inertia is large:
  Servomotors are capable of corresponding load changes. This has the benefit of reducing settling time and speed ripple. This should also improve control stability of machines with low rigidity.
- When mounting the servomotor with low rotor moment of inertia to devices with load moment of inertia:
  Acceleration/deceleration torque increases and effective load ratio increases. Check the effective load ratio when you select motor capacity.

Servomotor Heating Conditions

The motor rated specifications are continuous allowable values at an ambient temperature of 40˚C when servomotors are installed with heat sinks. When the motor is mounted on a small surface, the motor temperature may rise considerably because of the limited heat radiating abilities of the surface. See the following graph for the relation between heat sink size and derating (derating ratio).

IMPORTANT The actual temperature rise depends on how the heat sink (servomotor mounting section) is fixed on the installation surface, what material is used for the motor mounting section, and motor speed. Always check the actual motor temperature.



Holding Brake Delay Time

Holding brakes have motion delay time that varies depending on when the brake is open and when the brake is operating. The following table shows the brake delay time of each servomotor.

IMPORTANT Make sure the holding brake delay time is correct for your servomotor.

- Example, switching the holding brakes on the DC side

Model	Voltage	Brake Open Time ms	Brake Operation Time ms	Model	Voltage	Brake Open Time ms	Brake Operation Time ms
SGMAV-A5 to -04	24 V	60	100	SGMGV-03 to -20	24 V, 90 V	100	80
SGMAV-06 to -10		80	100	SGMGV-30,-44		170	100 (24 V), 80 (90 V)
SGMJV-A5 to -04	24 V	60	100	SGMGV-55,-75,-1A		170	80
SGMJV-08		80	100	SGMGV-1E		250	80
SGMPS-01, -08	24 V	20	100	SGMSV-10 to -25		170	80
SGMPS-02, -04, -15		40	100	SGMSV-30 to -50		100	80

Rotary Cables with Model Numbers Beginning with "JZSP"

●Standard Cables

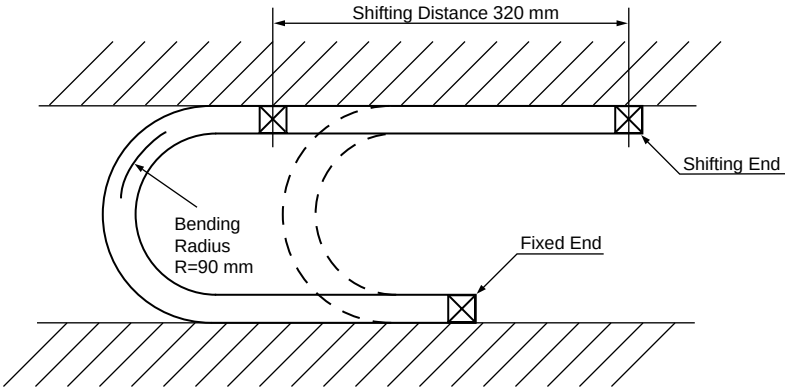
Standard servomotor main circuit cables, encoder cables, and relay cables cannot be used in cases where high flexibility is needed, as when the cables themselves move or are twisted or turned.
Recommended minimum bend radius of standard cables: R = radius (of cable) x 15. Use flexible cables for flexible applications.

●Flexible Cables

(1) Life of Flexible Cable

The flexible cable supports 10,000,000 or more operations of bending life with the recommended bending radius R = 90 mm under the following test conditions.

- Conditions
  1. Repeat moving one end of the cable forward and backward for 320 mm using the test equipment shown in the following figure.
  2. Connect the lead wires in parallel, and count the number of cable return motion times until a lead wire is disconnected. Note that one reciprocation is counted as one test.



Notes: 1 The life of flexible cable differs largely depending on the amount of mechanical shocks, mounting to the cable, and fixing methods.
The life of flexible cable is limited under the specified conditions.
2 The life of flexible cable indicates the number of bending times in which lead wires are electrically conducted and by which no cracks and damages that affects the performance of cable sheathing are caused. Disconnecting the shield wire is not taken into account.

(2) Wiring Precautions

Even if the recommended bending radius R is followed in the mechanical design, incorrect wiring may cause the early disconnection. Observe the following precautions when wiring.

(a) Cable twisting

Straighten the flexible cables wiring.
Twisted cables cause the early disconnection. Check the indication on the cable surface to make sure that the cable is not twisted.

(b) Fixing method

Do not fix the moving points of the flexible cable, or stress on the fixed points may cause early disconnection. Fix the cable at the minimum number of points. Do not put stress on the servomotor-end and SERVOPACK-end connectors.

(c) Cable length

If the cable length is too long, it may result the cable sagging. If the cable length is too short, excessive tension on the fixed points will cause the early disconnection. Use a flexible cable with the optimum length.

(d) Interference between cables

Avoid interference between cables.
Interference limits the motion of flexible cable, which causes early disconnection. Keep enough distance between cables, or provide a partition when wiring.

Rotary Cables with Model Numbers NOT Beginning with "JZSP"

●Standard Cables

Standard servomotor main circuit cables, encoder cables, and relay cables cannot be used in cases where high flexibility is needed, as when the cables themselves move or are twisted or turned. Use flexible cables for flexible applications.
For bend radius, refer to the following chart.

Model	B1EV	B2EV	B3EV	B4EV	B5EV	B6EV	B7EV	B6EP	B7EP	BABEV	BCBEV	BDBEV	BBEV	BFEV
Recommended Bend Radius (mm)	72	82		119.5	89.5	191.8	226.1	151.2	201.6	87.65	94.6	107.3	35.2	47.24
Outer Diameter (mm)	14.4	16.4		23.9	17.9	27.4	32.3	25.2	33.6	17.53	18.92	21.46	8.8	11.81

Note: All models in the chart refer to the first set of characters of the cable's model number.

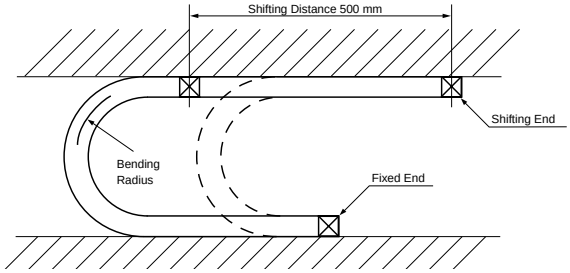
●Flexible Cables

(1) Life of Flexible Cable

The flexible cable supports several million cycles or more of bending life with the recommended bending radius under the following test conditions.

● Conditions

1 Repeat moving one end of the cable forward and backward for 500 mm using the test equipment shown in the following figure.
2 Connect the lead wires in parallel, and count the number of cable return motion times until a lead wire is disconnected. Note that one reciprocation is counted as one cycle.



Notes: 1 The life of flexible cable differs largely depending on the amount of mechanical shocks, mounting to the cable, and fixing methods.
The life of flexible cable is limited under the specified conditions.
2 The life of flexible cable indicates the number of bending times in which lead wires are electrically conducted and by which no cracks and damages that affect the performance of cable sheathing are caused. Disconnecting the shield wire is not taken into account.

(2) Specific Cable Details

The following chart contains details for each flexible cable with model not beginning with "JZSP"

Model	B1EP	B2EP	B3EP	B4EP	B5EP	BABEP	BCBEP	BDBEP	BBEP
Recommended Bend Radius (mm)	140	165		224	191	180	177.1	190.3	50
Outer Diameter (mm)	14.0	16.5		22.4	19.1	15.0	16.1	17.3	7.7
Cycles (million)	8-20					9			10

Note: All models in the chart refer to the first set of characters of the cable's model number..

(3) Wiring Precautions

Even if the recommended bending radius is followed in the mechanical design, incorrect wiring may cause early disconnection. Observe the following precautions when wiring.

(a) Cable twisting

Straighten the flexible cables wiring.

Twisted cables cause early disconnection. Check the indication on the cable surface to make sure the cable is not twisted.

(b) Fixing method

Do not fix the moving points of the flexible cable, or stress on the fixed points may cause early disconnection. Fix the cable at the minimum number of points. Do not put stress on the servomotor-end and SERVOPACK-end connectors.

(c) Cable length

If the cable length is too long, it may result in the cable sagging. If the cable length is too short, excessive tension on the fixed points will cause early disconnection. Use a flexible cable with the optimum length.

(d) Interference between cables

Avoid interference between cables.

Interference limits the motion of flexible cable, which causes early disconnection. Keep enough distance between cables, or provide a partition when wiring.

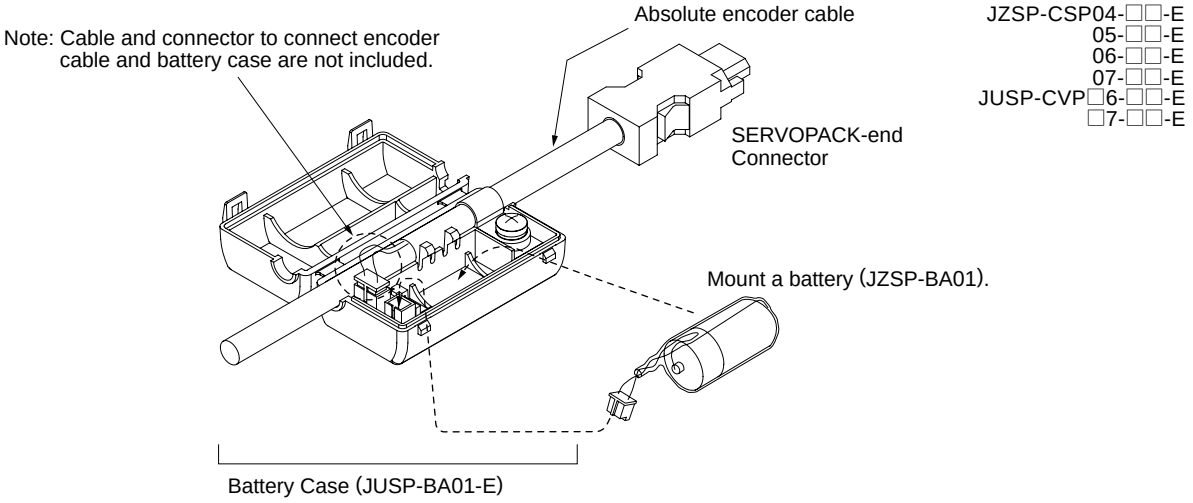
Battery Case

●Battery Case (Model: JUSP-BA01-E)

Use this battery case if your battery case needs replacing due to damage etc.. This battery case cannot be used with an incremental encoder cable.

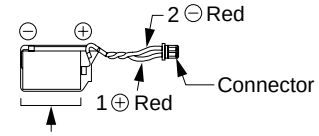
IMPORTANT

1 The battery case (JUSP-BA01-E) is not provided with a battery. A battery must be purchased separately.
2 Install the battery case where the ambient temperature is between 0˚C to 55˚C.



(1) Mounting a Battery in a Battery Case

Prepare a lithium battery (JZSP-BA01) and mount in a battery case.



ER3 V Lithium Battery
(3.6 V, 1000 mAh, manufactured by Toshiba Battery Co., Ltd.)

(2) Connecting a Battery to the Host Controller

Use a battery that meets the specifications of the host controller. Use an ER6VC3N (3.6 V, 2000 mAh, manufactured by Toshiba Battery Co., Ltd.) or equivalent battery.