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CKD

SM-396063-A

INSTRUCTION MANUAL

ELECTRIC SLIDER

KBB Series

KBB-05

KBB-07

SLIDER INSTRUCTION MANUAL

- Read this manual carefully and thoroughly before using this product.
- Pay extra attention to the instructions concerning safety.
- After reading this manual, keep it in a safe and convenient place.

CKD Corporation

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Introduction

instruction manual to assure correct use.
For general details on the Electric Slider KBB series, see the instruction manual (basic) provided separately.

Cautions

1. The contents of this manual are subject to change without prior notice.
2. The contents of this manual are subject to change without prior notice to effect improvements.
3. All efforts have been made to assure the contents of this manual. If you have any questions, or find any mistakes, however, please contact CKD.
4. CKD will not be held responsible for any effects caused by using this equipment, regardless of Item 3 above.
5. This equipment does not have an explosion-proof structure. Take utmost care of the operating environment.

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General Descriptions

- This manual describes the axis code designation method, specifications and motor replacement procedures, etc., according to the type of axis.

Section 1 Safety

1.1 Safety Instructions

- Before the installation, programming, operation, maintenance and inspection of the equipment, be sure to read through this manual so that you can use the Electric Slider with safety.
- After you have read this manual, keep it nearby for future reference.

Be sure to strictly observe the following safety instructions to assure correct use of the Electric Slider KBB.

This manual contain the important information to prevent injury to the operators and persons nearby, to prevent damage to assets and to assure correct use of the equipment.
Make sure that you have well understood the following details (indications and symbols) before reading this manual. Always observe the information that is noted.

! **WARNING**	This means that "incorrect handling will lead to fatalities or serious injuries."
! **CAUTION**	This means that "incorrect handling" may lead to personal injuries or physical damage (i.e., damages to building, household goods, domestic animals and pets).
Note	Briefly describes the points and notices for the operating procedures, and the points for using the equipment efficiently.

 **WARNING**
• **Install the safety fences to prevent anyone from entering the working envelope of the robot.** When the door is attached to the safety fence, the robot should be stopped at emergency at the same time that the door has opened.
• **Connect the EMERGENCY STOP pushbutton switch to the emergency stop input terminal of the controller and mount the same switch at an easy-to-operate place in an emergency.** The EMEGENCY STOP switch must not be reset automatically and cannot be reset negligently by any person.
• **Wiring should be done safely and completely according to the Electrical Installations Technical Requirements and Interior Wiring Requirements of Japan.** Incorrect wiring will result in an electric shock or a fire.
• **The equipment MUST NOT be repaired or modified without prior written permission from the manufacturer.** Otherwise, an accident or damage will be caused.
• **Before the maintenance and inspection, be sure to turn off the controller main power switch. Take all necessary measures to prevent anyone other than the worker engaged in adjustment of the robot from negligently turning the power on. (Lock the switch and put a tag showing "DO NOT turn the power on.") Also, DO NOT touch the controller interior three (3) minutes after the power is turned off.** Otherwise, you may get an electric shock due to residual voltage of the capacitor.
• **DO NOT touch the heat sink and cement resistor in the controller.** They are too hot and you may get burnt. Before performing inspection, take enough time to cool them off.
• **Take careful precautions when handling the stainless sheet.** Otherwise, you may cut your finger by the end of the stainless sheet.

• **DO NOT pour water on the equipment interior or exterior, or drain water from it. Otherwise, you may get an electric shock, or the equipment will be damaged.** When the equipment has contaminated, wipe it off with a hard squeezed cloth. DO NOT use a thinner, benzine or other organic solvent.
• **DO NOT put your finger or hand on the movable part.** Otherwise, you may get injured.
• **When using the actuator in other than the horizontal state, be sure to select the actuator with brake.** Otherwise, the slider will drop at power OFF, and you will be injured.
• **As the equipment is heavy, make sure of its weight and gravity center position and disconnect the cables when carrying the equipment.** Also, DO NOT carry the equipment with the slider. Otherwise, the slider will move and you will get injured.
• **DO NOT use this equipment for the living body as a massaging machine.** Otherwise, you will be injured due to incorrect teaching or mis-operation.
• **This equipment is not completely sealed. During use, grease or wear of resin may scatter from the opening of the equipment.** When using this equipment for food and chemical applications, take appropriate measures against entry of them.
• **Enter the robot type and initialize the memory correctly.** Otherwise, the robot may move unexpectedly and you will be injured.
• **DO NOT use this equipment in an atmosphere of inflammable gas or an atmosphere inducing an explosion.** As this equipment is not explosion-proof, it may explode in the worst occasion.
• **DO NOT damage, break, process, forcibly bend, stretch, place a heavy object on or pinch the cables (power cable, controller cable).** Otherwise, an electric shock or a fire will be caused.
• **Should an abnormality such as smoke or nasty smell occur, turn the power off immediately and stop using the equipment.** If the equipment is used continuously, an electric shock or a fire will be caused.

! CAUTION
• **DO NOT place the equipment at a place where the ambient temperature exceeds 40°C, or where the temperature changes sharply, causing condensing, or where it is exposed to direct sunlight. DO NOT place it at a narrow place, either.** Otherwise, the ambient temperature rises due to heat generation in the controller itself or external device, which will result in malfunction or mis-operation of the equipment.
• **DO NOT use the equipment at a place where an impact or vibration is involved. Also, DO NOT use the equipment in an atmosphere where conductive dust, corrosive gas or oil mist generates.** Otherwise, a fire, electric shock, malfunction or mis-operation will be caused.
• **DO NOT exert external force which exceeds the maximum speed of the axis on the slider.** Otherwise, the equipment may malfunction or operate incorrectly.
• **DO NOT use the equipment at a place where too much dust or dirt exists.** If the equipment is used at such a place, it may malfunction because this equipment is not dust-proof.
• **DO NOT use repair parts other than those designated by the manufacturer.** Otherwise, the equipment cannot be operated to its full capacity and will cause malfunction.
• **Mount the robot on a highly rigid frame.** If rigidity of the frame is not enough, vibration (or resonance) may be caused during the robot operation, adversely affecting the operation.

1.2 To Use the Equipment Safely

The details of this paragraph are the same as those in Para. 1.2 of the KBB series instruction manual (basic) provided separately. Read through this paragraph before using the equipment.

Section 2 List of Shipment

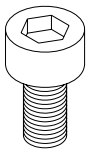
2.1 List of Shipment

The actuator to be shipped normally consists of the following parts.

(1) Actuator

(2) Hexagon socket head cap screw (M4 × 8)

- The following screws are attached per each axis (i.e., actuator).



Axis stroke (mm) KBB-05	Attached quantity KBB-05	Axis stroke (mm) KBB-07	Attached quantity KBB-07
50	2	50 ~ 100	4
100 ~ 150	4	150 ~ 200	6
200 ~ 250	6	250 ~ 300	8
300 ~ 350	8	350 ~ 400	10
400 ~ 450	10	450 ~ 500	12
500	12	550 ~ 600	14

Section 3 Axis (Actuator) Specifications

3.1 Type of Axis and Name of Each Part

- Type of axis
  The type of axis is as shown below.

KBB-05D–ST–M12N–40

Series name

Frame number

05	S size
07	M size

Type of motor

D	50 W absolute

Type of axis

ST	Straight axis

Type of slider

S	Short slider
M	Medium slider
L	Long slider

Lead of ball screw

06	6 mm
12	12 mm

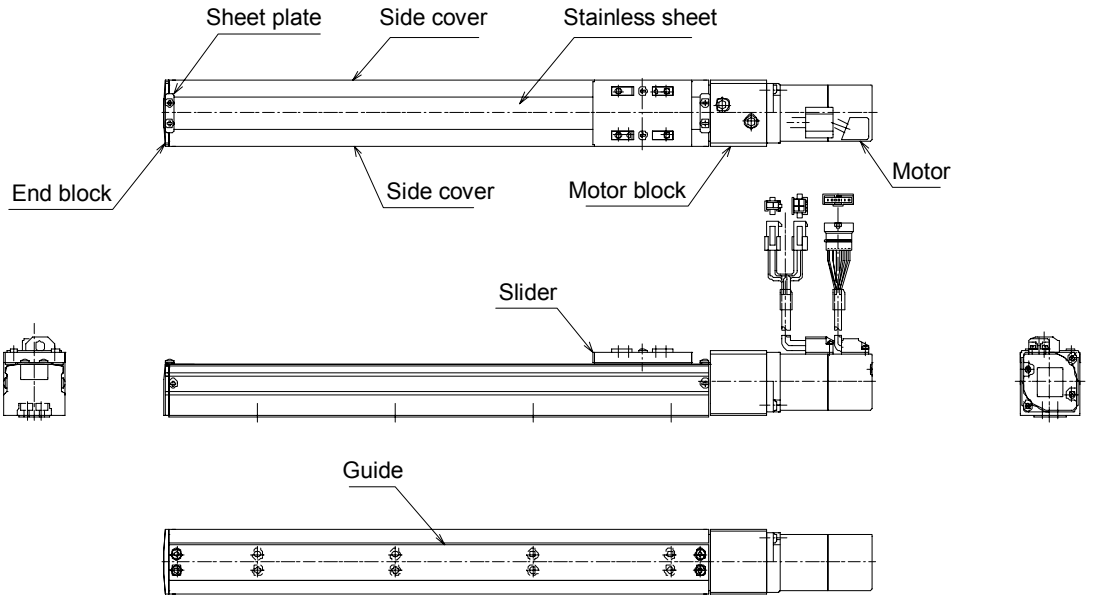
Brake

N	None
B	Provided

Axis stroke

05	50 mm
10	100 mm
15	150 mm
:	:
50	500 mm
55	550 mm
60	600 mm

- Name of each part



3.2 Single Axis Specifications

(1) Specifications

Type of axis: KBB–05D–ST–M□□□–□□

Motor		50 W absolute AC servo motor	
Drive system		Use of ball screw Diameter 8 mm Lead 12 mm, 6 mm	
Guide system		Use of linear guide and bearing block	
Maximum payload mass	Lead of ball screw	Horizontal	Vertical
	12 mm	6 kg	3 kg
	6 mm	15 kg	4 kg
Maximum speed	Lead of ball screw 12 mm	800 mm/s (Note 1)	
	Lead of ball screw 6 mm	400 mm/s (Note 2)	
Permissible static moment		MR: 16 N·m, MP: 6.5 N·m, MY: 6 N·m	
Repeatability		±0.02 mm	
Resolution		0.01 mm	
Rated thrust (axial force)	Lead of ball screw 12 mm	83 N	
	Lead of ball screw 6 mm	167 N	

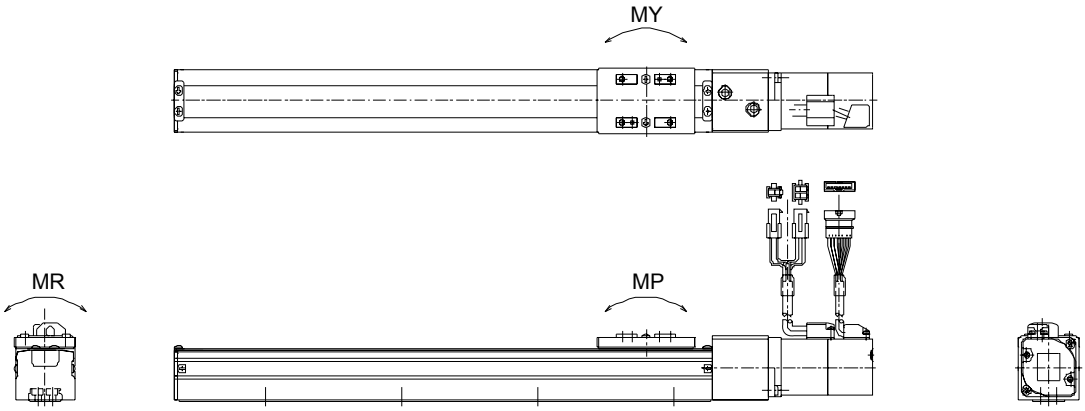
Note 1: 600 mm/s when the axis stroke is 450 mm or 500 mm.

Note 2: 300 mm/s when the axis stroke is 450 mm or 500 mm.

MR: Rolling moment

MP: Pitching moment

MY: Yawing moment



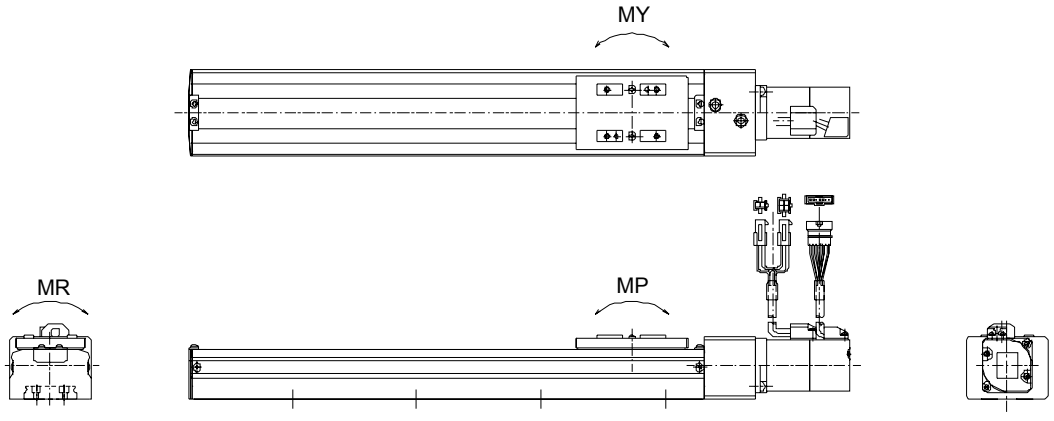
Type of axis: KBB–07D–ST–M□□□–□□

Motor		50 W absolute AC servo motor	
Drive system		Use of ball screw Diameter 8 mm Lead 12 mm, 6 mm	
Guide system		Use of linear guide and bearing block	
Maximum payload mass	Lead of ball screw	Horizontal	Vertical
	12 mm	12 kg	4 kg
	6 mm	30 kg	8 kg
Maximum speed	Lead of ball screw 12 mm	800 mm/s (Note 1)	
	Lead of ball screw 6 mm	400 mm/s (Note 2)	
Permissible static moment		MR: 46 N·m, MP: 13 N·m, MY: 12 N·m	
Repeatability		±0.02 mm	
Resolution		0.01 mm	
Rated thrust (axial force)	Lead of ball screw 12 mm	83 N	
	Lead of ball screw 6 mm	167 N	

Note 1: 600 mm/s when the axis stroke is 450 mm or 500 mm, and 400 mm/s when the axis stroke is 550 mm or 600 mm.

Note 2: 300 mm/s when the axis stroke is 450 mm or 500 mm, and 200 mm/s when the axis stroke is 550 mm or 600 mm.

MR: Rolling moment
MP: Pitching moment
MY: Yawing moment



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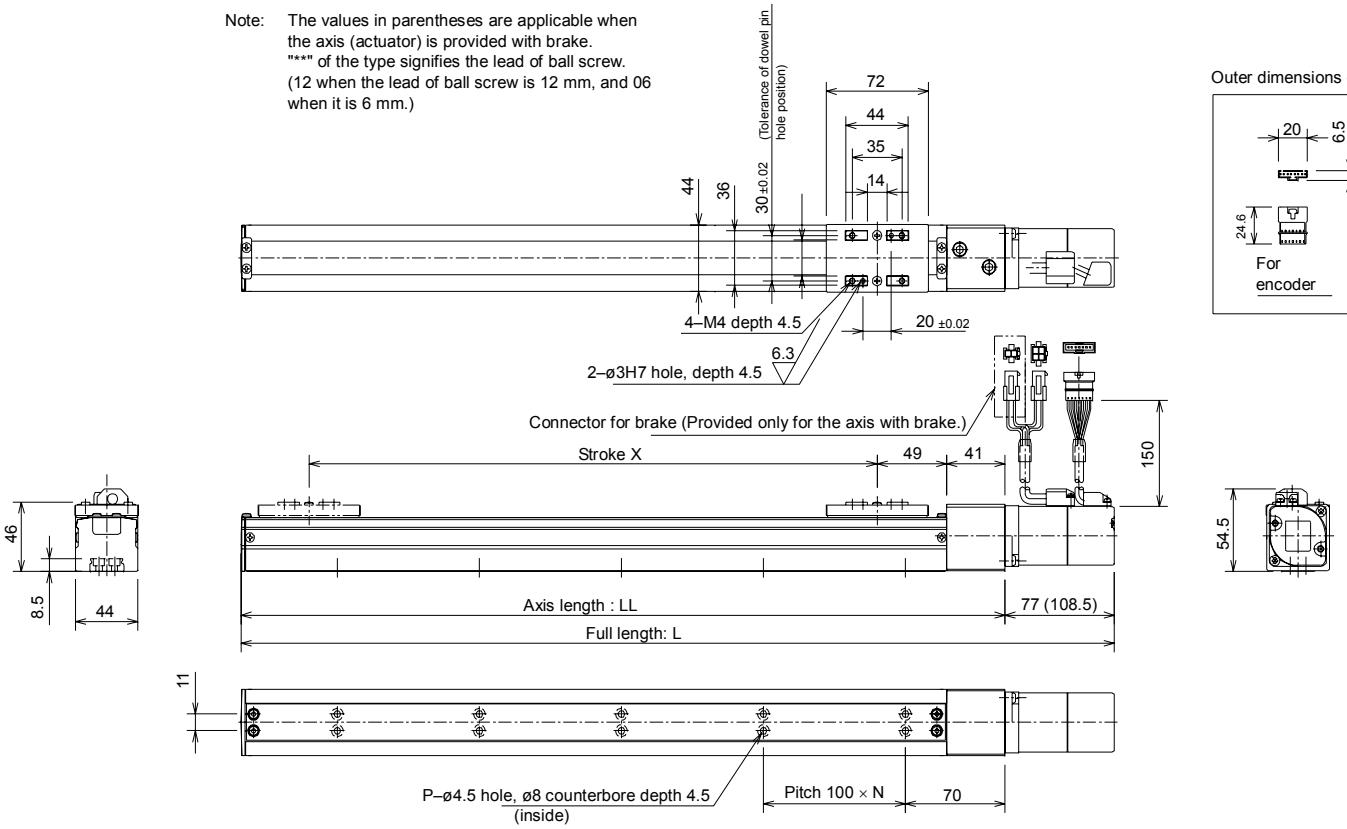
(2) Axis dimensions

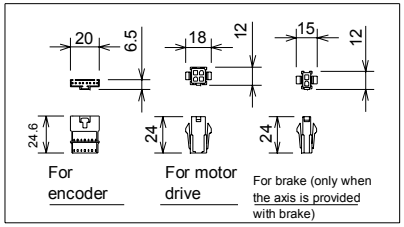
[KBB-05D-ST-***] (50 W absolute motor specifications)

Type											
	Without brake	KBB-05D-ST-M*N-05	KBB-05D-ST-M*N-10	KBB-05D-ST-M*N-15	KBB-05D-ST-M*N-20	KBB-05D-ST-M*N-25	KBB-05D-ST-M*N-30	KBB-05D-ST-M*N-35	KBB-05D-ST-M*N-40	KBB-05D-ST-M*N-45	KBB-05D-ST-M*N-50
	With brake	KBB-05D-ST-M*B-05	KBB-05D-ST-M*B-10	KBB-05D-ST-M*B-15	KBB-05D-ST-M*B-20	KBB-05D-ST-M*B-25	KBB-05D-ST-M*B-30	KBB-05D-ST-M*B-35	KBB-05D-ST-M*B-40	KBB-05D-ST-M*B-45	KBB-05D-ST-M*B-50
Stroke X (mm)		50	100	150	200	250	300	350	400	450	500
Full length L (mm)		265 (296.5)	315 (346.5)	365 (396.5)	415 (446.5)	465 (496.5)	515 (546.5)	565 (596.5)	615 (646.5)	665 (696.5)	715 (746.5)
Axis length LL (mm)		188	238	288	338	388	438	488	538	588	638
No. of set holes P		2	4	4	6	6	8	8	10	10	12
No. of spaces of set holes N		0	1	1	2	2	3	3	4	4	5
Mass of axis (kg)		1.3 (1.6)	1.4 (1.7)	1.5 (1.8)	1.6 (1.9)	1.7 (2.0)	1.8 (2.1)	1.9 (2.2)	2.0 (2.3)	2.1 (2.4)	2.2 (2.5)

Note: The values in parentheses are applicable when the axis (actuator) is provided with brake.
"**" of the type signifies the lead of ball screw.
(12 when the lead of ball screw is 12 mm, and 06 when it is 6 mm.)



Outer dimensions of connectors



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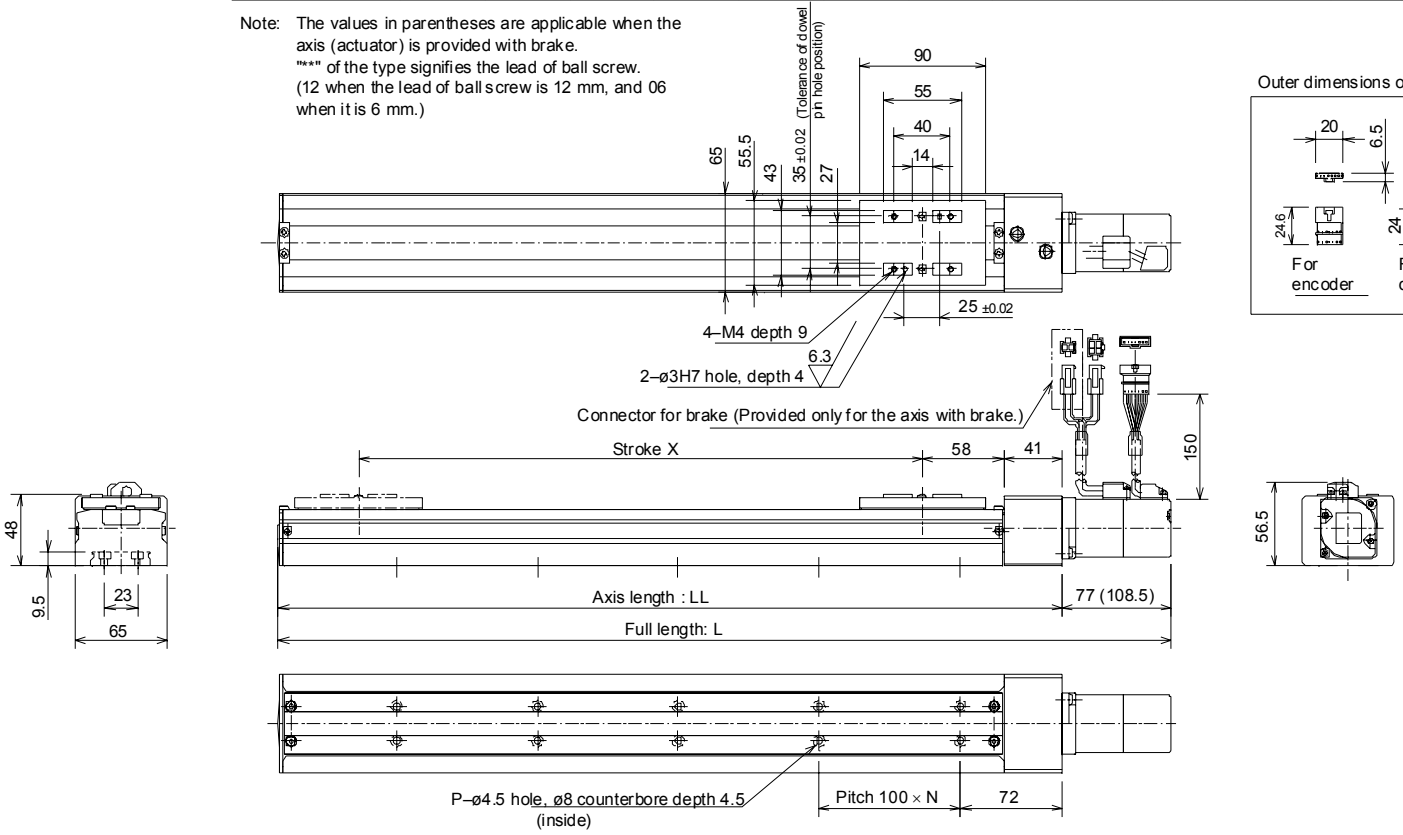
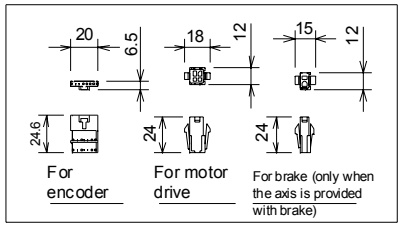
[KBB-07D-ST-***] (50 W absolute motor specifications)

Type													
	Without brake	KBB-07D-ST-M*N-05	KBB-07D-ST-M*N-10	KBB-07D-ST-M*N-15	KBB-07D-ST-M*N-20	KBB-07D-ST-M*N-25	KBB-07D-ST-M*N-30	KBB-07D-ST-M*N-35	KBB-07D-ST-M*N-40	KBB-07D-ST-M*N-45	KBB-07D-ST-M*N-50	KBB-07D-ST-M*N-55	KBB-07D-ST-M*N-60
	With brake	KBB-07D-ST-M*B-05	KBB-07D-ST-M*B-10	KBB-07D-ST-M*B-15	KBB-07D-ST-M*B-20	KBB-07D-ST-M*B-25	KBB-07D-ST-M*B-30	KBB-07D-ST-M*B-35	KBB-07D-ST-M*B-40	KBB-07D-ST-M*B-45	KBB-07D-ST-M*B-50	KBB-07D-ST-M*B-55	KBB-07D-ST-M*B-60
Stroke X (mm)		50	100	150	200	250	300	350	400	450	500	550	600
Full length L (mm)		282.9 (314.4)	332.9 (364.4)	382.9 (414.4)	432.9 (464.4)	482.9 (514.4)	532.9 (564.4)	582.9 (614.4)	632.9 (664.4)	682.9 (714.4)	732.9 (764.4)	782.9 (814.4)	832.9 (864.4)
Axis length LL (mm)		205.9	255.9	305.9	355.9	405.9	455.9	505.9	555.9	605.9	655.9	705.9	755.9
No. of set holes P		4	4	6	6	8	8	10	10	12	12	14	14
No. of spaces of set holes N		1	1	2	2	3	3	4	4	5	5	6	6
Mass of axis (kg)		1.8 (2.1)	2.0 (2.3)	2.2 (2.5)	2.4 (2.7)	2.6 (2.9)	2.8 (3.1)	3.0 (3.3)	3.2 (3.5)	3.4 (3.7)	3.6 (3.9)	3.8 (4.1)	4.0 (4.3)

Note: The values in parentheses are applicable when the axis (actuator) is provided with brake.
"**" of the type signifies the lead of ball screw.
(12 when the lead of ball screw is 12 mm, and 06 when it is 6 mm.)



Outer dimensions of connectors



Section 4 Installing Actuator (Axis)

4.1 Installing Actuator (Axis)

- This section describes the basic installation of the actuator (axis) and basic mounting of the peripheral parts.
- Install the actuator, referring to this section. If the actuator is installed incorrectly, the robot cannot be operated to its full capacity and its service life will shorten drastically.

Cautions on installation

- Environment of installation place

  (1) The actuator should be installed under the following environment.
  - Temperature: 0°C ~ 40°C
  - Humidity: 30 % ~ 90 %RH, non-condensing
  - Place where dust or oil mist does not exist.
  - Place where inflammable or corrosive gas does not exist.
  - Place where electric noise is not involved.
  - Place where vacuum or radioactivity does not exist.

  (2) This actuator is not designed to be explosion-proof. Avoid using it at a heavily contaminated place. Take careful precautions on the operating environment.

- Cautions on installation

  (1) DO NOT drop the actuator or hit it against any object during transport.

  (2) Provide an ample space for the maintenance and inspection beforehand.

  (3) Install the controller at a place where the standard cable can reach from the actuator.

(4) At the time of installation:

- Install the actuator on a leveled set base.
- The set base shall have such a length that allows mounting of the frame only.
- The set base should be made of steel plate which is machined to 9 mm or over in thickness and 0.2 or less in flatness. Mount the actuator on this base, then correct a bend or twist of the actuator frame and reinforce the same frame.

Procedures for installation

(1) Remove the screws securing each side cover and disengage the cover.

Note

For the KBB-05 model, the cover set screw on the motor side is long. Take careful precautions not to set the screws by mistake when mounting the cover.

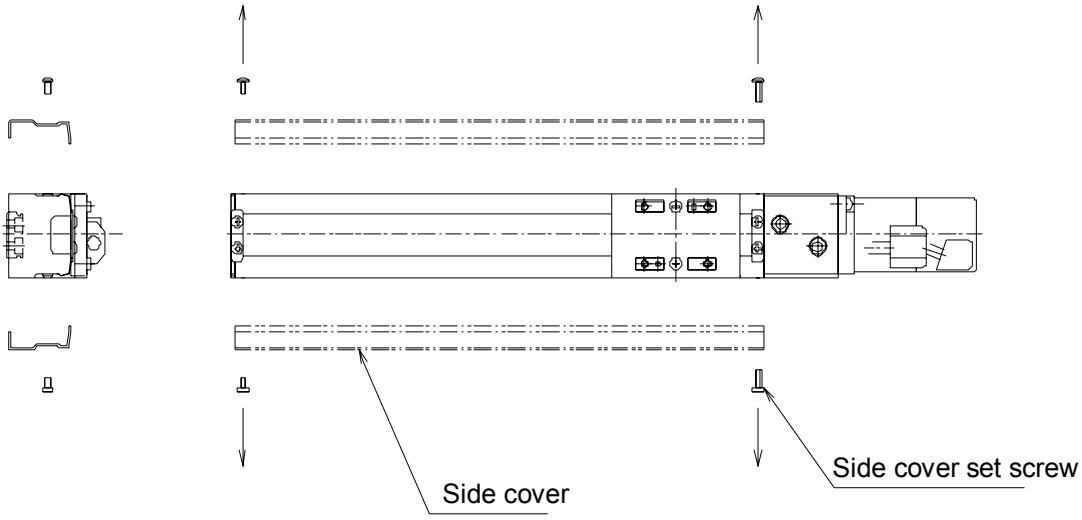


Fig. 4.1–1

(2) Secure the actuator on the set base by passing the attached bolts to the holes on the guide. For the set places, see Para. 3.2 (2).

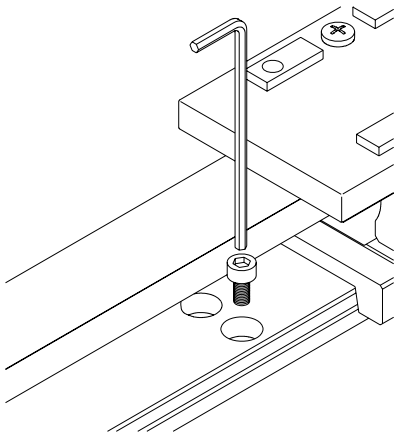


Fig. 4.1–2

(3) Mount each side cover according to Step (1) above. The side cover should be mounted at a position where you feel as if the stainless sheet were raised. If the stainless sheet is sagged, stretch it. (See Para. 5.7.)

4.2 Setting Type of Robot

The type of the robot refers to a six (6)-digit numerical number specified according to the type of the axis (actuator).
Once the type of the robot has been specified, various parameter values for the axis (actuator) to be used are set automatically. For how to specify the type of the robot, see Para. 2.4.7 of the instruction manual (basic) provided separately.

[Type of robot for KBB-05D/KBB-07D]

(1) When the actuator serves as the slider type axis (normal use):

	Lead of ball screw (mm)	Axis code designation	Type of robot
KBB-05D, KBB-07D	12	KBB-0□D-ST-□12□-□□	520181
KBB-05D, KBB-07D	6	KBB-0□D-ST-□06□-□□	520171

4.3 Setting Parameters

This equipment is provided with Parameter 1 and Parameter 2 according to the counts of use. The contents of each group of parameters and relationship between the type of robot and each group of parameters are shown below.
When the type of the robot is specified, parameter values marked "○" under the column of auto setting are set automatically.

4.3.1 Parameter 1 Assigned by Type of Robot

These are the parameters used very frequently.

- Straight axis (slider type axis)

Auto setting	Type of robot / Parameter		520181	520171
			(Lead: 12)	(Lead: 6)
	Soft limit value (plus)		0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	7	7
		V (Speed)	6	6
	Path area		200 (Note 1)	
	Home point offset value		0000.00	0000.00
	Order of home return		1 (Note 2)	1 (Note 2)
	Jog speed	L (low speed)	10	10
		H (High speed)	50	50
	Jog travel distance		0.01	0.01

Note 1: Can be used when KCA–10–M00 is selected for the master unit.
Cannot be used when KCA–10–M10 is selected for the master unit.

Note: The order of home return varies with the configuration, conditions for installation, etc. Specify it by the customer as per the operating conditions.
The default is "1" for all types of the robot. Unless changed, all axes return to respective home points at the same time.

4.3.2 Parameter 2 Assigned by Type of Robot

- Straight axis (slider type axis)

Auto setting	Type of robot / Parameter		520181	520171
			(Lead: 12)	(Lead: 6)
	Axis display		X	X
	In-position data		0.05	0.05
	Overflow data		20000	20000
○	Feed forward data		2000	2000
○	Motor revolving direction		1	1
○	Maximum speed data		800	400
○	Home return speed data	H (Low speed)	2	2
		M (Mid speed)	20	20
		H (High speed)	100	100
○	Home return method		2	2
○	Logic of home point sensor		0	0
	High-speed home return position		20	20
○	Lead of ball screw		12.000	6.000
○	No. of divisions of encoder		2000	2000
○	Multiple of encoder pulse		4	4
	Setting of type of encoder (Note)		i	i
	Combination of task and axis		[1] [0] [0] [0]	
	Task priority		[1] [1] [1] [1]	
	Task point table		999 999 999 999	
	No. of task steps		1000 0000 0000 0000	

Note: As the type of encoder cannot be set for each axis, it is not possible to designate it by the type of the robot. For details, see Section 11 of the instruction manual (basic) provided separately.

Section 5 Maintenance and Inspection

5.1 Cautions on Maintenance and Inspection

(1) Cautions on maintenance and inspection
When performing inspection and maintenance, observe the following matters.

1. Maintenance and inspection of the robot should be performed only by a qualified person well versed in the knowledge and having experiences. Unless such a person is present, consult with the manufacturer to take necessary measures such as having the relevant work done by the manufacturer or having the customer's responsible persons trained for the work by the manufacturer.

2. Use an appropriate illumination.

3. Put a tag showing "Under inspection (or maintenance)" on the start switch, etc., equipped on the stationary operation panel.
When entering the fence or premises, lock the power switch which is turned off to completely cut off the power. If the safety plug is attached to the entry of the fence or premises, carry it with you.

4. When you have to enter the fence or premises for inspection or maintenance of the control circuit, be sure to shut off the drive power source beforehand.

5. When you have to operate the industrial robot for inspection or maintenance inside the fence or premises, it is recommended to take the measures prescribed below.

   - The work should be performed by two (2) persons. That is, when one person executes the work, the other person keeps a watch.

   - The robot speed is desirably such that can avoid contact with the worker should the robot move unexpectedly. Determine the appropriate speed according to the work to be done.

   - During the work, take careful precautions on the robot motions. If the robot has not moved just as you intended, immediately press the EMERGENCY STOP pushbutton switch.

6. Before disassembling the air pressure gage, etc., or replacing the part, release the residual pressure from the cylinder.

7. When disassembling the hydraulic or pneumatic circuit or replacing the part, take utmost care not to allow adhesion or entry of contaminant.

(2) Measures to be taken at the end of inspection and maintenance

1. Persons in charge of inspection and maintenance should return all tools to the predetermined place after the work has finished.

2. After the maintenance, be sure to test-run the equipment for confirmation. In principle, the test-run for confirmation should be performed from outside the fence or premises.

3. After the work in Item 2 above has been performed, persons responsible for inspection and maintenance should report their manager that the inspection or maintenance has completed.

5.2 Inspection before Starting Operation

(1) Before starting the robot operation, perform check on the following matters.

1. Function of control unit.
2. Function of emergency stop switch.
3. Function of robot interlock with equipment for preventing contact.
4. Function of robot interlock with related equipment.
5. Damage of external power supply, piping, etc.
6. Abnormality of supply voltage, supply hydraulic pressure and supply pressure.
7. Nonconformity of operation.
8. Abnormal noise and abnormal vibration.
9. Condition of equipment for preventing contact.

(2) Execute the inspection outside the working envelope, where possible.

5.3 Regular Inspection

Determine the inspection standard including the check items, method, criteria for evaluation and time of execution for the following items, considering the robot installation place, frequency of use and durability of parts, then execute the inspection according to the same standard.

1. Looseness of main parts.
2. Lubrication state of movable parts and other abnormality of movable parts.
3. Abnormality of power transmission parts.
4. Abnormality of hydraulic and pneumatic circuits.
5. Abnormality of electric circuit.
6. Abnormality of function detecting a motion error.
7. Abnormality of encoder.
8. Abnormality of servo system.

[Check points of controller]

9. Make sure that the supply voltage to the controller falls under the predetermined range (i.e., rated voltage ±10 %).
10. Check for the air vent holes on the controller, and remove contaminant if any left on them.
11. Check for the controller cable (running from the controller to the actuator) and make sure that all screws, etc., are tightened completely.
12. Make sure that the controller set screws, etc., are tightened completely.
13. Check for each connector (motor output connector, encoder input connector, teach pendant connector) and make sure that they are tightened completely, not causing gap.

5.4 Adjusting Home Position

Adjust the home position in the following manner.

(1) Turn the power off.

(2) Loosen and remove the hexagon socket head taper screw plug on the motor block, which is located on the side distant from the motor.

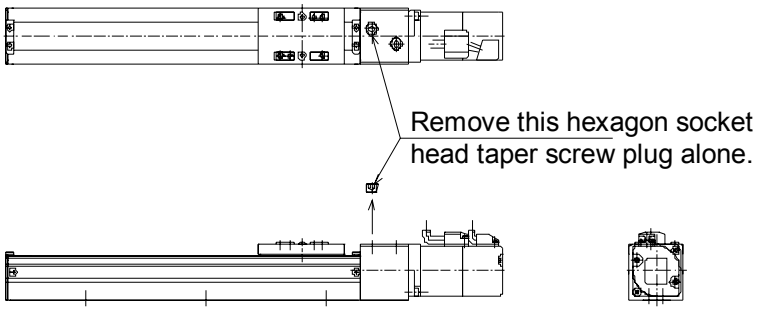


Fig. 5.4–1

(3) Loosen one (1) hexagon socket head cap screw (M2.5) of the coupling connecting the motor and ball screw from the hexagon socket head taper screw plug removed in Step (3) above. (DO NOT remove the screw.)

- If the coupling screw cannot be loosened so easily when the actuator (axis) is provided with a brake, rotate the motor shaft a little by jog operation until the tool can be inserted. (See Para. 15.5 of the instruction manual (basic) provided separately.)

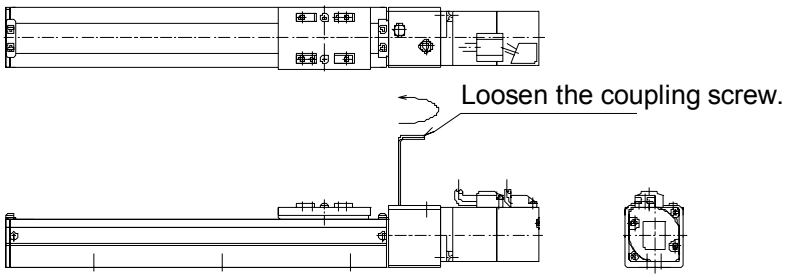


Fig. 5.4–2

(4) Temporarily connect the actuator and controller, connect the teach pendant with the controller, then turn the power on. For how to connect, see Para. 2.4.5 of the instruction manual (basic) provided separately.

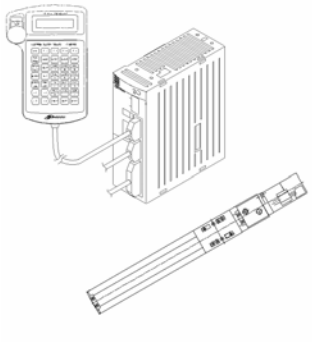


Fig. 5.4–3

(5) Set the servo gain values (position and speed) of Parameter 1 to zero (0). For the setting procedures, see Para. 11.3.3 of the instruction manual (basic).

(6) Specify "3" for the home return method of Parameter 2.

(7) Execute the home return. After the motor has stopped, move the slider manually to the position shown in Fig. 5.4–4 and tighten the coupling clamp bolt. (Clamping torque: 1.0 N·m) (See Fig. 5.4–4.)

! CAUTION

Before tightening the coupling clamp bolt, be sure to turn off the controller power.
DO NOT shift the motor shaft and coupling from the stopped positions.

The home position differs between the KBB-05 and KBB-07 actuators. (See Fig. 5.4–4.)

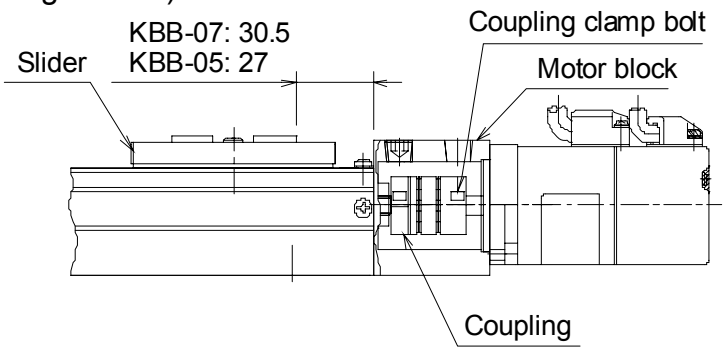


Fig. 5.4–4

(8) Turn off the controller power and tighten the coupling clamp bolt on the ball screw side. (Clamping torque: 1.0 N·m) (See Para. 5.11.)

CAUTION

Before tightening the coupling clamp bolt, be sure to turn off the controller power.
DO NOT shift the motor shaft and coupling from the stopped positions.

(9) Turn the power on again, return the servo gain values (position and speed) to the previous values, then specify "2" for the home return method of Parameter 2.

(10) After the power is turned off, then on again, execute the home return and make sure that the actuator is as shown in Fig. 5.4–4.

(11) Clamp the disconnected hexagon socket head taper screw plug to the screw hole on the motor block to stop the hole.

5.5 Changing Home Position

(1) Specify "1" for the motor revolving direction of Parameter 2.

(2) Adjust the home position. As in Para. 5.4 above, the position 4.5 mm away from the end block should be the home point. (See Fig. 5.5–1.)

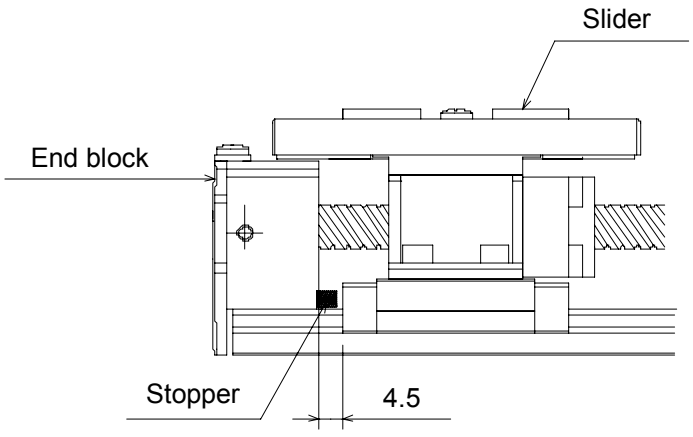


Fig. 5.5–1

5.6 Replacing Motor and Changing Motor Lead Wire Hole Direction

When replacing the motor or changing the direction of the motor lead wire hole, observe the following procedures.

(1) Turn the power off.

(2) Loosen and remove one (1) hexagon socket head taper screw plug provided on the motor block.

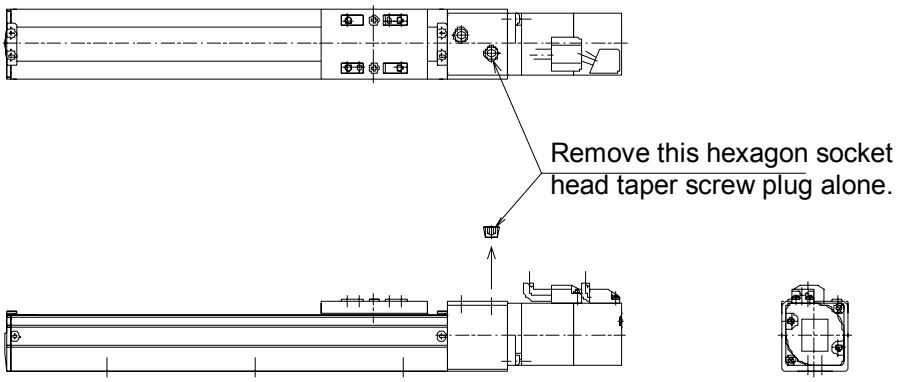


Fig. 5.6–1

(3) Loosen one (1) hexagon socket head cap screw (M2.5) of the coupling connecting the motor and ball screw from the hexagon socket head taper screw plug removed in Step (2) above.

- If the coupling screw cannot be loosened so easily when the actuator (axis) is provided with a brake, rotate the motor shaft a little by jog operation until the tool can be inserted. (See Para. 15.5 of the instruction manual (basic).)

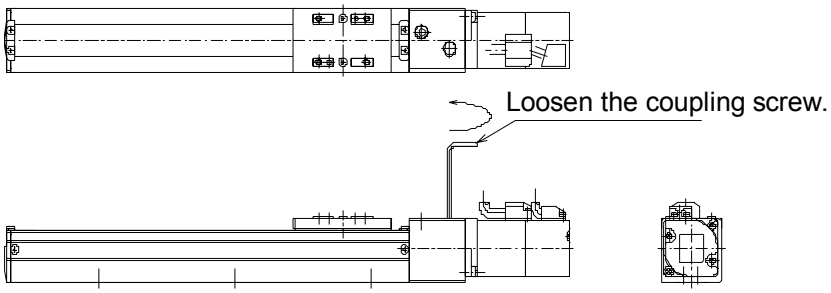


Fig. 5.6–2

(4) Remove the two (2) screws clamping the motor, and rotate the motor in a desired direction. Mount the motor on the actuator again, using the removed screws.

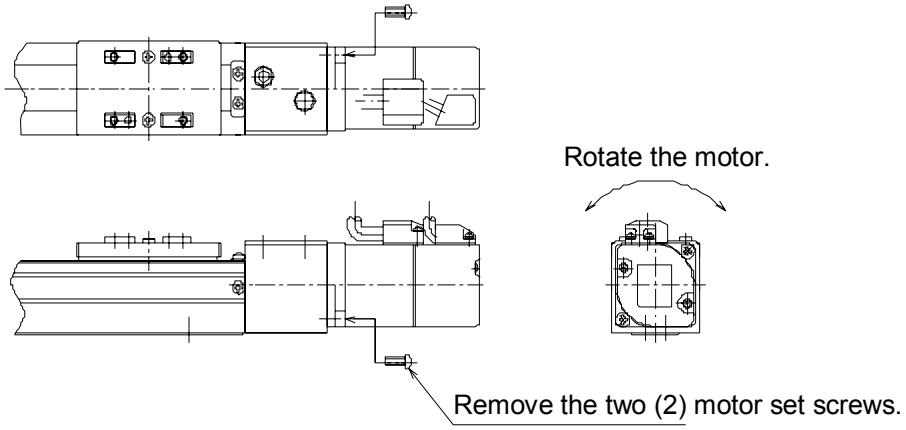


Fig. 5.6–3

(5) Temporarily connect the actuator and controller, connect the teach pendant with the controller, then turn the power on. For how to connect, see Para. 2.4.5 of the instruction manual (basic) provided separately.

(6) Set the servo gain values (position and speed) of Parameter 1 to zero (0). For the setting procedures, see Para. 11.3.3 of the instruction manual (basic).

(7) Specify "3" for the home return method of Parameter 2.

(8) Execute the home return. After the motor has stopped, move the coupling until it comes into contact with the ball screw.

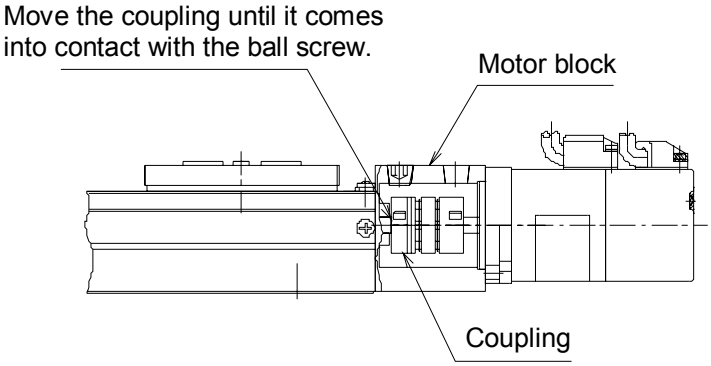


Fig. 5.6–4

(9) Move the slider to the position shown in Fig. 5.6–5 and tighten the coupling clamp bolt. (Clamping torque: 1.0 N·m) (See Para. 5.11.)

CAUTION

Before tightening the coupling clamp bolt, be sure to turn off the controller power.
DO NOT shift the motor shaft and coupling from the stopped positions.

The home position differs between the KBB-05 and KBB-07 actuators. (See Fig. 5.6–5.)

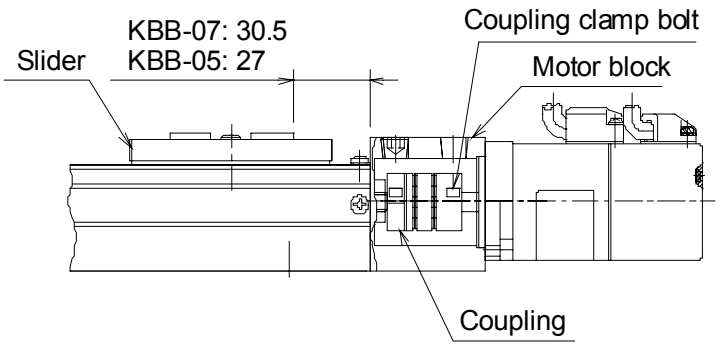


Fig. 5.6–5

(10) Turn the power on again, return the servo gain values (position and speed) to the previous values, then specify "2" for the home return method of Parameter 2.

(11) After the power is turned off, then on again, execute the home return and make sure that the actuator is as shown in Fig. 5.6–5.

(12) Clamp the disconnected hexagon socket head taper screw plug into the screw hole on the motor block to stop the hole.

5.7 Replacing Stainless Sheet

To replace the stainless sheet, observe the following procedures.

! CAUTION

Take careful precautions not to cut your hand by the stainless sheet.

(1) Remove the four (4) screws securing the stainless sheet, using a screwdriver, and remove the plate.

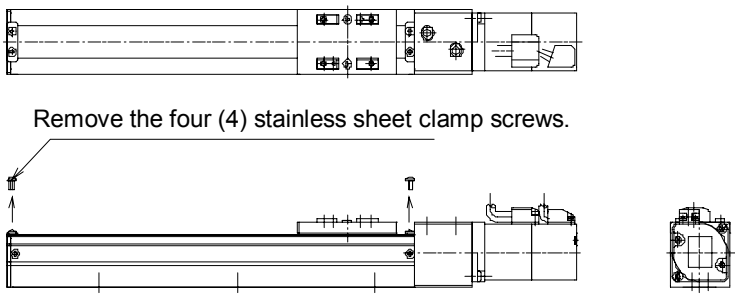


Fig. 5.7–1

(2) Likewise, remove the two (2) screws securing the slider cover, then remove the cover followed by the four (4) springs.

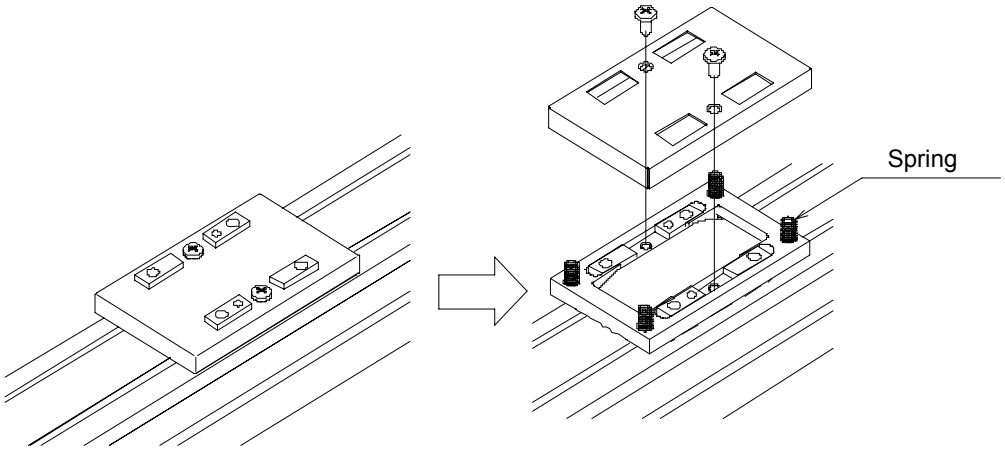


Fig. 5.7–2

Note The springs inside may bound. Take utmost care not to miss them.

(3) Remove the slide table together with the stainless sheet.

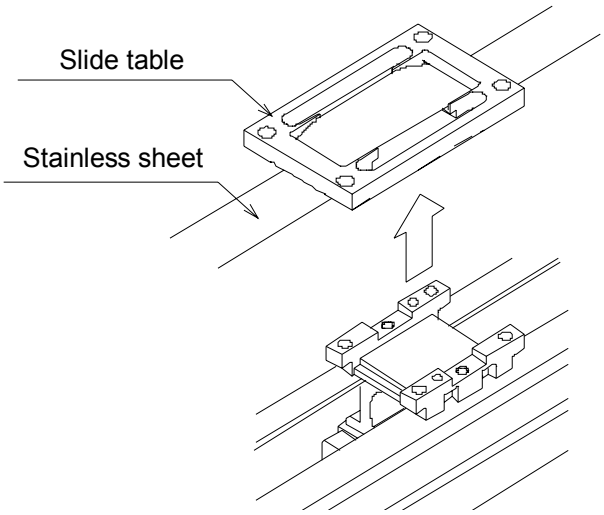


Fig. 5.7–3

(4) Draw out the stainless sheet, and the sheet can come off the slide table. Mount a new sheet on the slide table.

(5) Reassemble according to Steps (3) to (1) in the reverse order. The stainless sheet should be stretched to prevent it from sagging.

- If the stainless sheet which was stretched distorts (i.e., clearance exists with the side cover) when the slider is moved, correct the stretching condition.

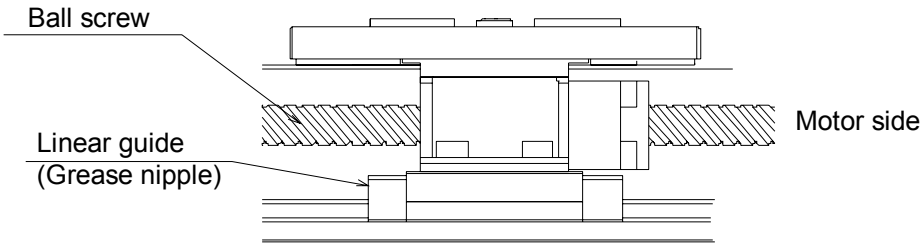
5.8 Lubricating Each Part

[Lubricating procedures]

- Ball screw and linear guide

1. Turn off the drive power.
2. Remove the side covers from the actuator. (See Para. 4.1.)
3. Lubricate according to the table and figure shown below.

Lubricating point	Type of oil (Maker)	Lubricating intervals	Lubricating volume
Ball screw	Alvania No.2 (Shell)	Every three (3) months	Apply a thin coat of oil to the ball screw.
Linear guide			Fill the oil of about 1 cc from grease nipples.

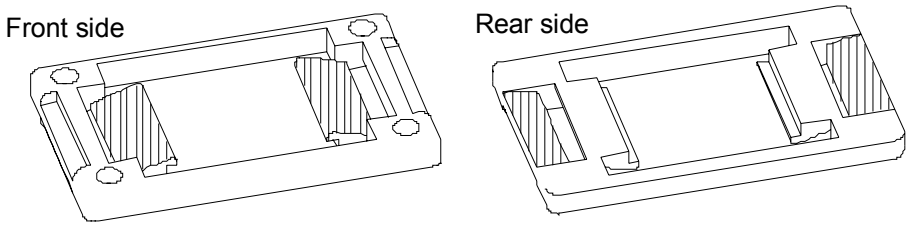


4. Wipe away any oozing oil and tarnished oil.
5. Attach the side covers again.

- Slide table

1. Turn off the drive power.
2. Remove the slide table from the actuator, then remove the stainless sheet from the slide table. (See Steps (1) through (4) of Para. 5.7.)
3. Lubricate according to the table and figure shown below.

Lubricating point	Type of oil (Maker)	Lubricating intervals	Lubricating volume
Slide table	Alvania No.2 (Shell)	Every three (3) months	Apply a thin coat of oil to the shaded areas in the figure below (i.e., worn out areas of the stainless sheet).



4. Wipe away any oozing oil and tarnished oil.
5. Mount the stainless sheet and slide table again.

5.9 Replacing Ball Screw

- If replacement of the ball screw is required, contact our sales agent in your territory. NEVER replace the ball screw by the customer.
- Only the ball screw built in a single actuator can be replaced. Replacement of the ball screw built in the machine or combined with other equipment is not possible.

5.10 Replacing Linear Guide

- If replacement of the linear guide is required, contact our sales agent in your territory. NEVER replace the linear guide by the customer.
- Only the linear guide built in a single actuator can be replaced. The linear guide built in the equipment or combined with other equipment is not possible.

5.11 Clamping Torque of Bolts and Nuts

Part name	Nominal size of screw	Clamping torque (N·m)	Remarks
Hexagon socket head cap screw	M2.5	1.0	For coupling
	M3	1.06	
	M4	2.45	
Bind screw	M3	0.59	For securing cover and stainless sheet

Section 6 Spare Parts

6.1 Spare Parts

If the robot went wrong, but no repair part is available at hand, it cannot be repaired even if a trouble has been found at an early stage. To avoid this, it is recommended that each customer keep the spare parts at hand.

No.	Part name	Description
1	Stainless sheet	For KBB-05 For KBB-07 (Differs with the stroke.)
2	AC servo motor (Absolute encoder)	For KBB-05 and KBB-07 (commonly used) (50 W)
3	AC servo motor with brake (Absolute encoder)	For KBB-05 and KBB-07 (commonly used) (50 W)
4	Slide table	For KBB-05 For KBB-07