Discontinue

CKD

SM-396073-A

INSTRUCTION MANUAL

ELECTRIC SLIDER

KBB Series

KBB-10

KBB-30

KBB-50

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

Discontinue

Table of Contents

General Descriptions

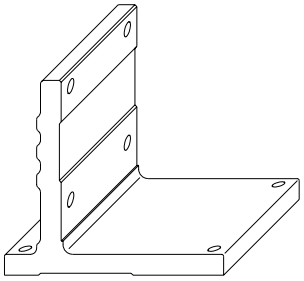
This manual describes the installation methods when the actuator is used as the single axis and is used in combination with other equipment.
For the basic installation procedures, see Section 2.
For the combined use, only the basic X–Y combination is explained in this manual.

Section 1 Explanation on Axis Configuration Parts

- For the axis configuration, the following parts are used in addition to the actuator.

1.1 Angle Bracket (Bracket)

This part is used to connect multiple actuators (axes). It is roughly classified into the angle type and plate type. Select either type according to the axis combination to be used.



Angle type (Angle bracket)

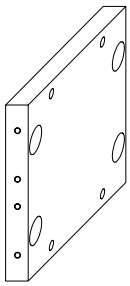
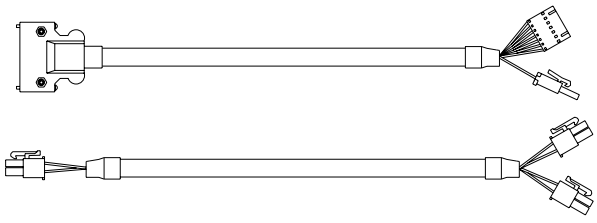


Plate type (Bracket)

1.2 Controller Cable

- This cable connects the axis (actuator) with the controller.
  One (1) set of two (2) cables for signal and power drive is provided.
- One (1) set of controller cables is required for each axis (actuator).
- As this controller cable is bending-resistant, it can be used as a movable cable.



For signal

For power drive

One (1) set

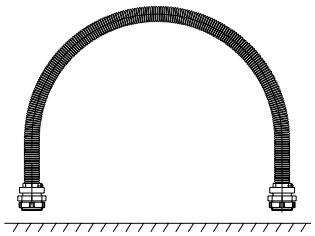
1.3 CN Box

- This is the relay box for the controller cable, or the cables and air pipelines provided by the customer.
- The CN box is mounted on the axis (actuator), frame, etc.
  For details on the mounting procedures, see Para. 2.4.

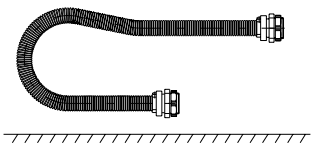
Note DO NOT mount the CN box in the working range of the slider or hand.

1.4 Flexible Tube

- This tube is used to protect the controller cable, or the cables and air pipelines provided by the customer. (The cables, etc., run through the tube for use.)
- The tube with oval cross-sectional profile (KBA–10–FT–M) can be used for the vertical or horizontal layout.
- The tube with round cross-sectional profile (KBA–10–FT–L) can be used for the vertical layout.



Vertical layout

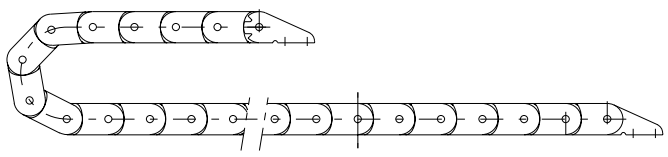


Horizontal layout

Note When using the tube, the minimum radius of curvature should be considered. For details, see Para. 2.5.

1.5 Flexible Duct

- This duct is used to protect the controller cable, or the cables and air pipelines provided by the customer. (The cables, etc., run through the duct for use.)



Section 2 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.

! CAUTION 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.

  (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.

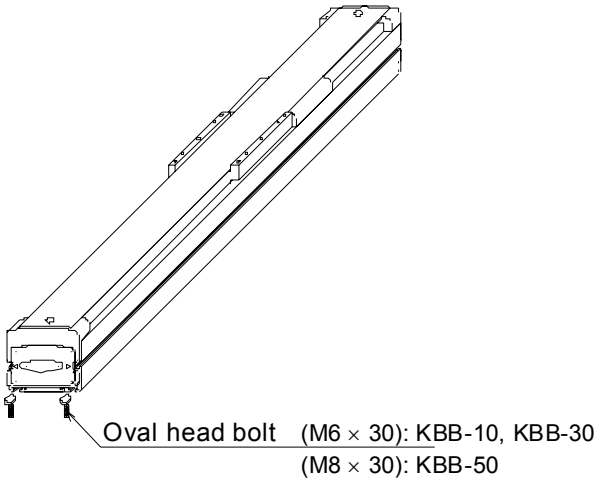
  (4) At the time of installation:
  - Install the actuator on a leveled set base.
  - The set base shall have such a length that allows mounting of the frame only.
  - The set base should be made of steel plate which is machined to 9 mm or over in thickness for KBB–10 and KBB–30, and 20 mm or over in thickness for KBB–50, 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.
  - The oval head bolts (i.e., set bolts) of the actuator should be mounted at pitches of about 150 mm.

2.1 Installing Actuator (Axis)

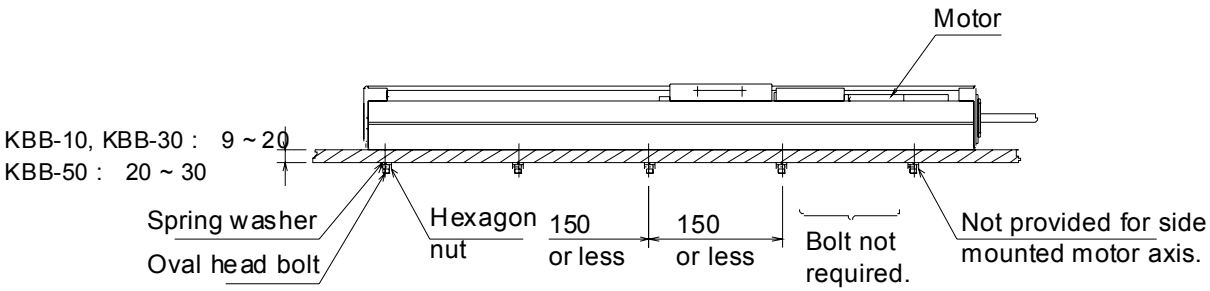
To install the actuator, observe the following procedures.

(1) Setting oval head bolts

Insert the oval head bolts into the T-slots on the actuator frame set surface.



(2) Installing actuator on set base

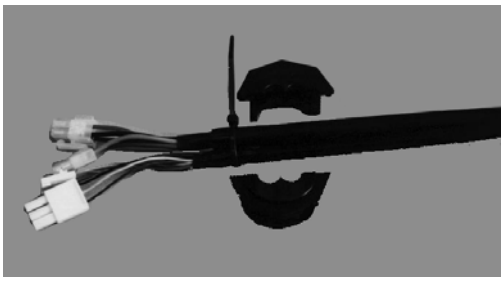


CAUTION

- T-slots (for M4 nuts) on the lateral side and top of the frame are reserved for mounting the CN box and options. NEVER use these T-slots for mounting the actuator.
- For the nut clamping torque, see Para. 2.10.

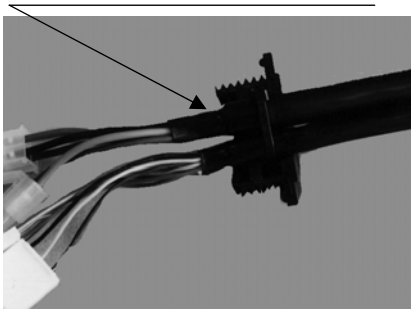
2.2 Connecting Cable with Actuator End

- Cable connection (KBB–10)
  Make sure that the cable will not enter too far.

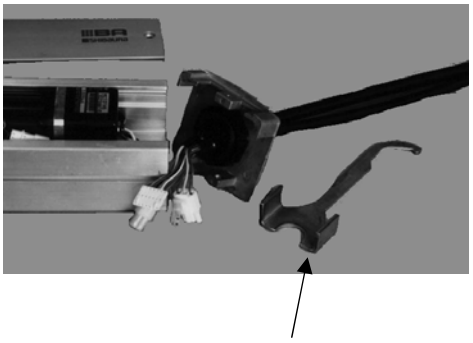


Secure the cable with a band.

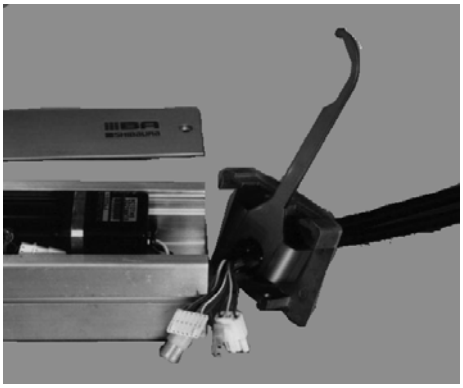
Set the band in the groove on the cable grip.



Assemble the cable grip.



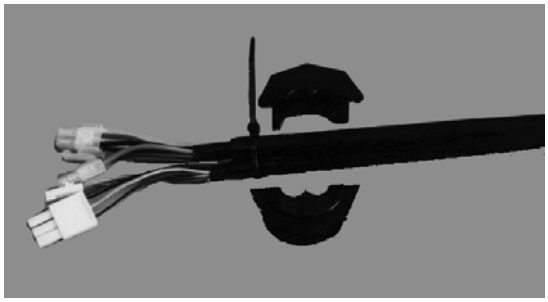
Key wrench (option)



Clamp the resin nut.

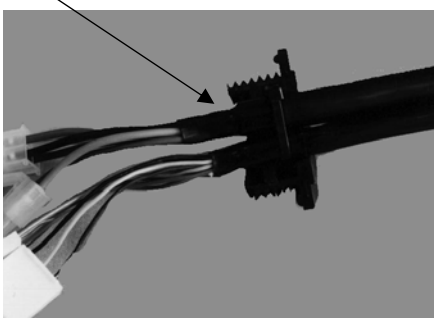
Connecting cable with actuator end

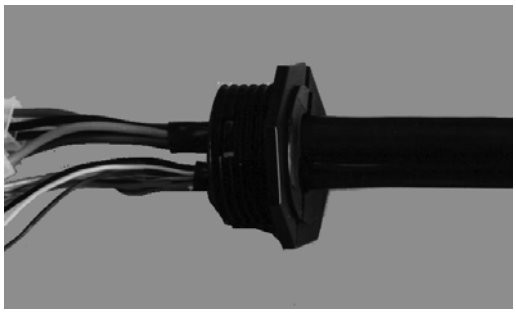
- Cable connection (KBB–30, KBB–50)
  Make sure that the cable will not enter too far.



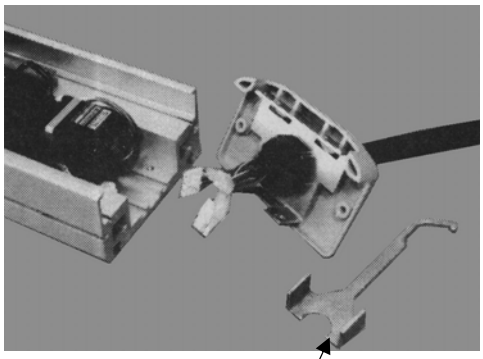
Secure the cable with a band.

Set the band in the groove on the cable grip.

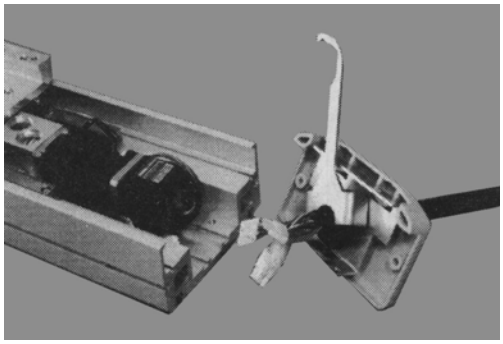


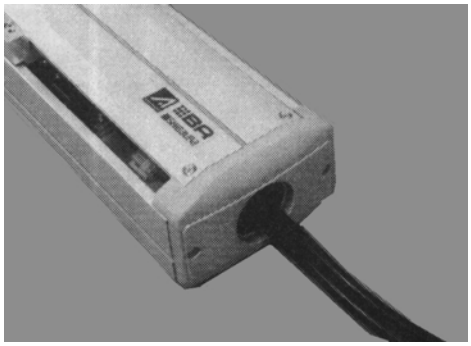


Assemble the cable grip.



Key wrench (option)



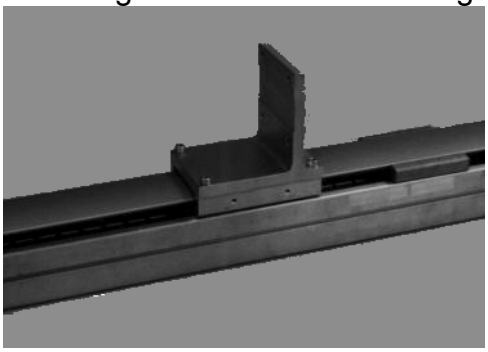


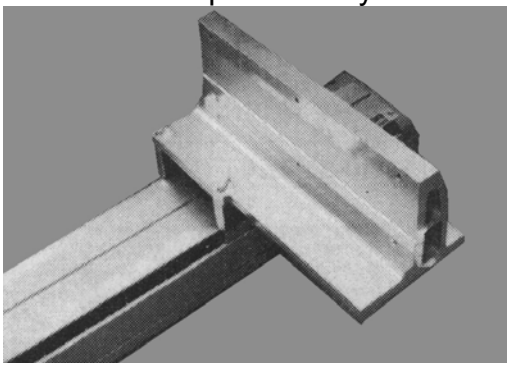
Clamp the resin nut. (Clamp both the end plate and end cover.)

Connecting cable with actuator end

2.3 Mounting Angle Bracket

The following explanation is made, taking the X–Y combination for example.
When using the actuator as the single axis, mount the hand provided by the customer.

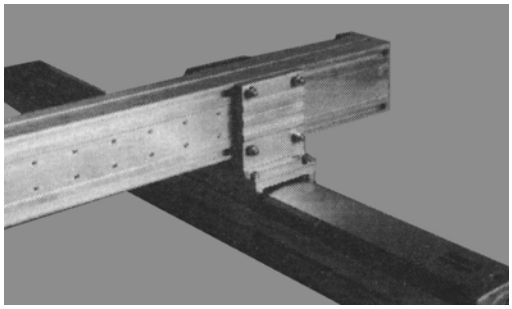


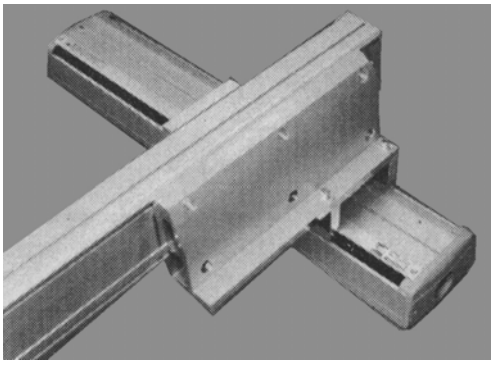


CAUTION

For the bolt clamping torque, see Para. 2.10.

(1) Mounting Y-axis
Insert the oval head bolts into the Y-axis and mount the Y-axis as shown below.





- The Y-axis should be mounted so that it can make right angles with the X-axis and run parallel with the base.

CAUTION

For the nut clamping torque, see Para. 2.10.

If the sticker or warning label on the frame cover is upside down due to the axis combination, remove the frame cover, then reverse it left to right and mount it again.

For the KBB–30–KBB–10 (X–Y) combination, if the Y-axis is a straight axis, it is secured to the bracket with eight (8) oval head bolts. For the side mounted motor axis, insert the oval head bolts into the six (6) holes on the bracket in the direction of the axis (actuator) end.

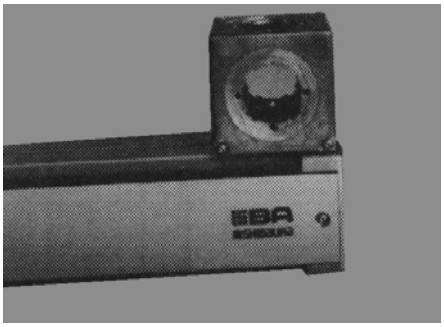
Points

- The set base should be rigid enough with good flatness.
- Use the attached oval head bolts for the set bolts.
- The pitches for setting the oval head bolts should be 150 mm or less.
- T-slots on the lateral side and top of the frame are not intended for mounting the axis (actuator).

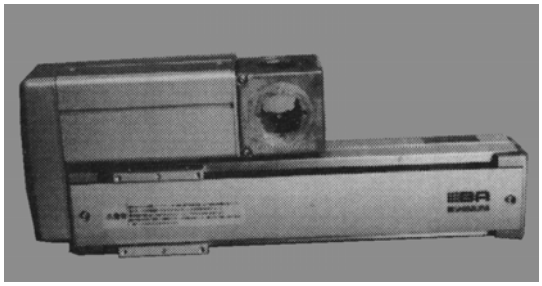
2.4 Mounting CN Box

- The CN box is used for the purposes of relay, branch and securing when wiring and piping to the robot and hand.
- The CN box can be mounted on the side of the actuator (axis), motor cover end, side of the motor cover, frame other than the actuator, etc.

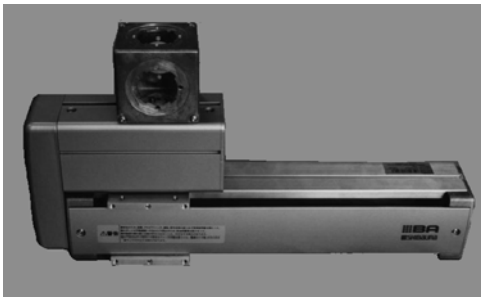
<Example of main connection 1>
[KBA–10–BX–B10]



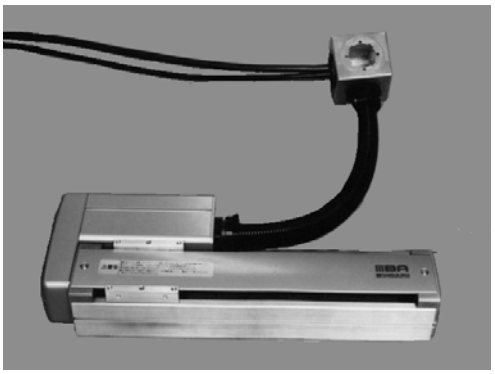
Side of axis (actuator)



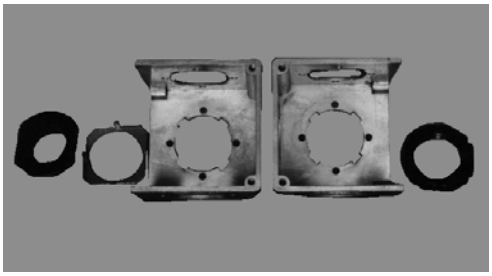
Motor cover end

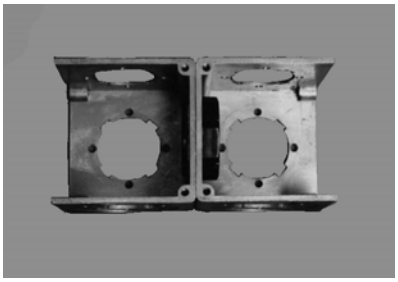


Side of motor cover



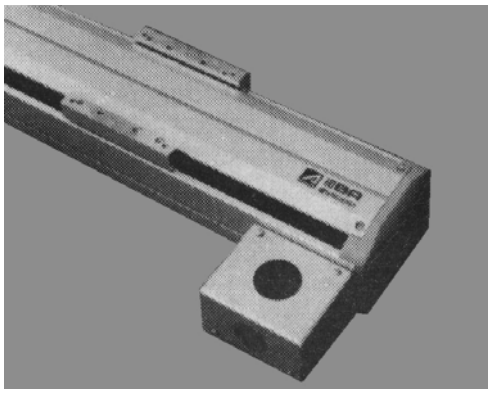
Other than actuator



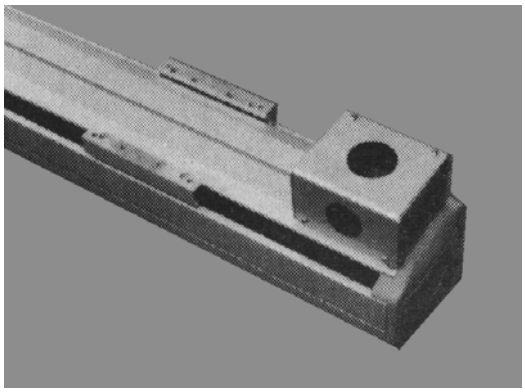


Coupling of CN boxes

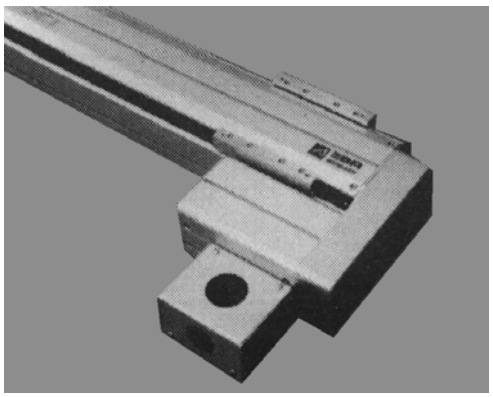
<Example of main connection 2>
[KBA–10–BX–B20]



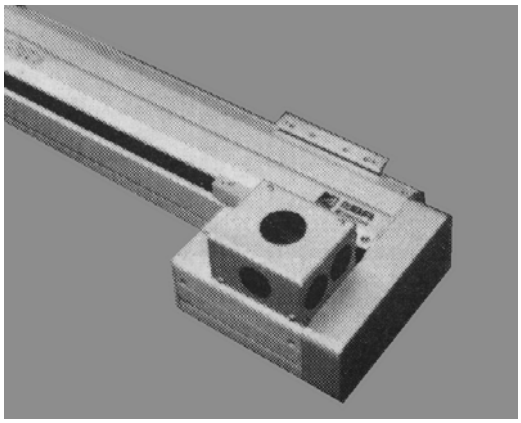
Side of axis (actuator)



Top of actuator



Side of motor cover

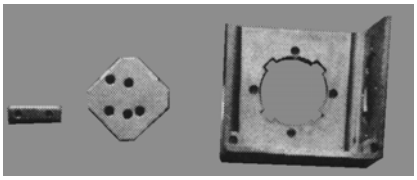


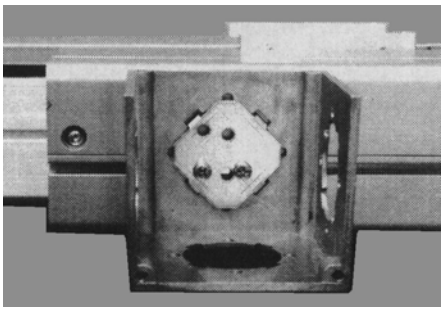
Top of motor cover

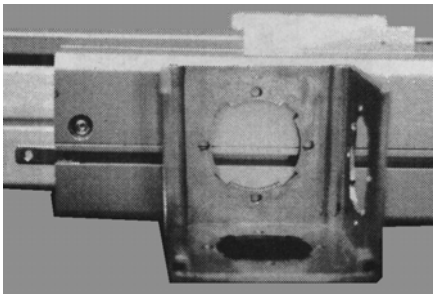
Note DO NOT mount the CN box in the movable range of the slider or hand.

<Example of securing CN box 1>

- Use of box metal fitting
  [KBA–10–BX–B10]

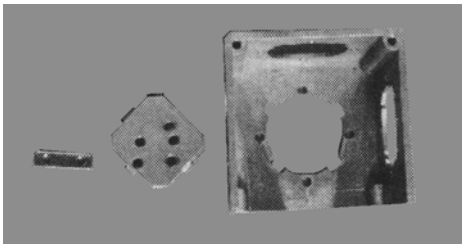


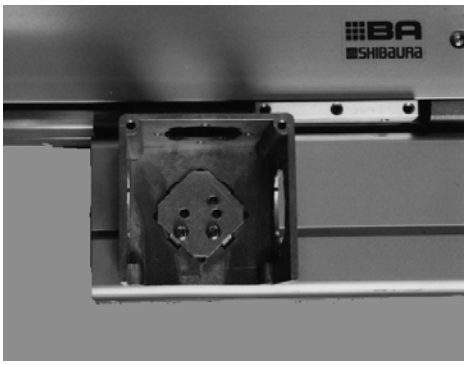


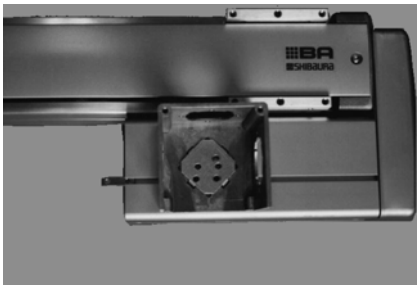


Mount the CN box so that it will not project the top of the axis (actuator) slider.

Side of motor cover

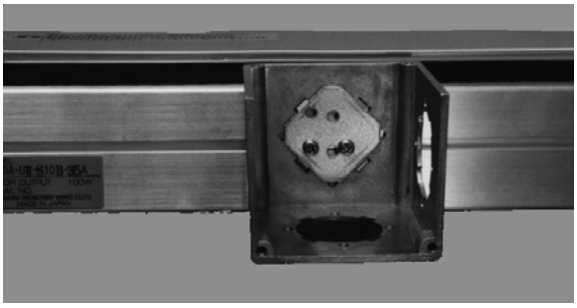






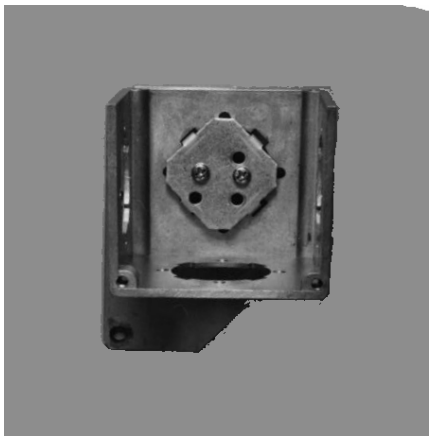
Mount the CN box so that it will not collide with the axis slider.

Top of motor cover



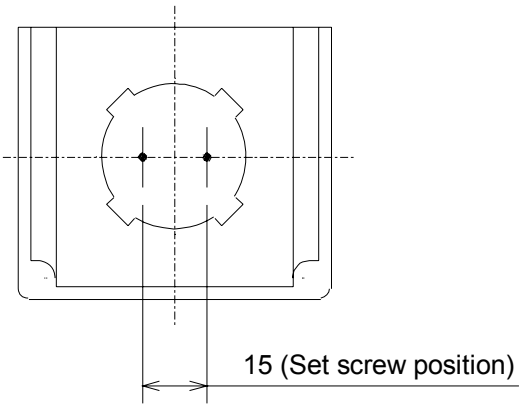
Mount the CN box so that it will not project the top of the actuator slider.

Side of actuator

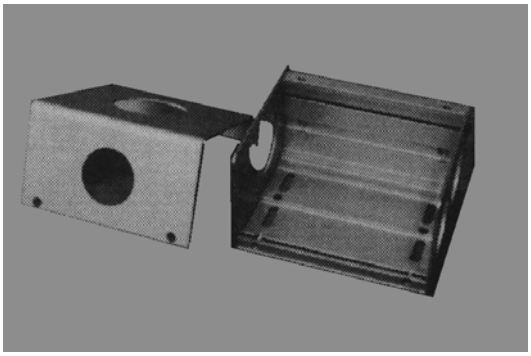


Other than actuator

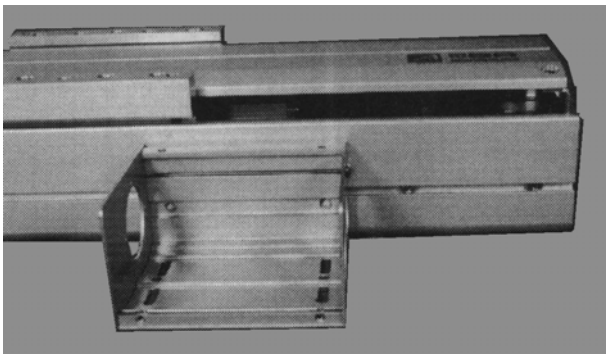
When mounting the CN box on other than the actuator, make sure that the set screws are positioned as shown below.

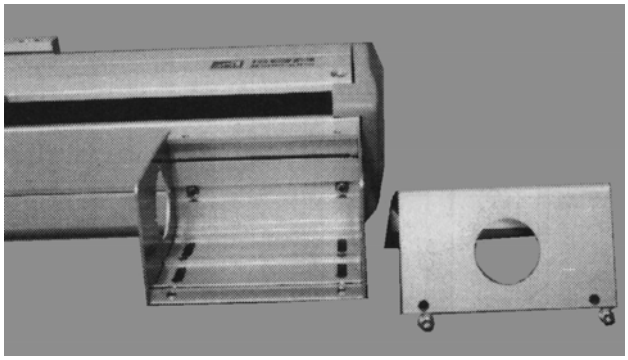


<Example of securing CN box 2>
[KBA–10–BX–B20]



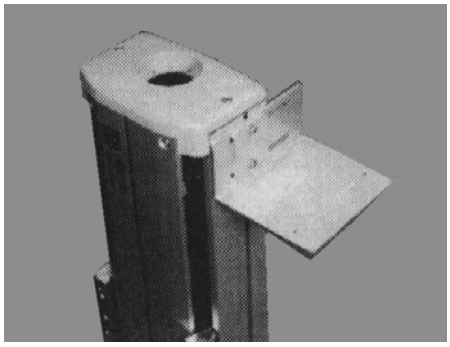
Insert the hexagon nuts into the T-slot and mount the CN box so that it will not collide with the slider.

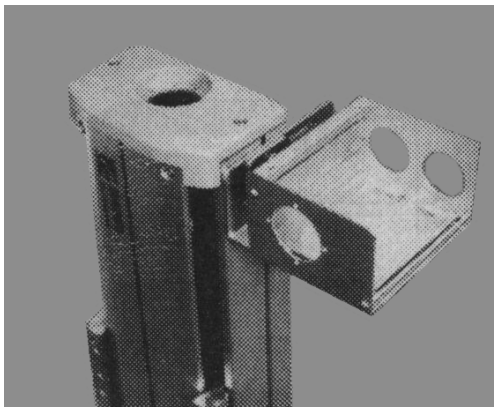




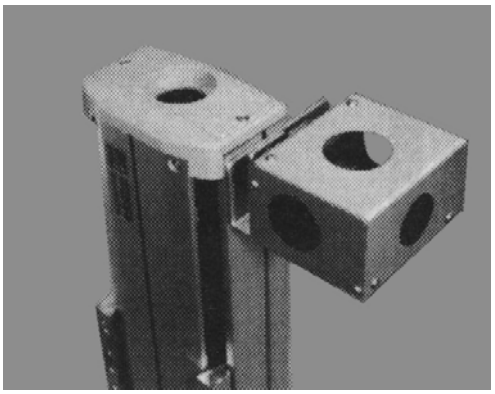
<Example of securing CN box 3 (Z-axis)>
[KBA–10–BX–B20]

Use of L-shaped metal fittings

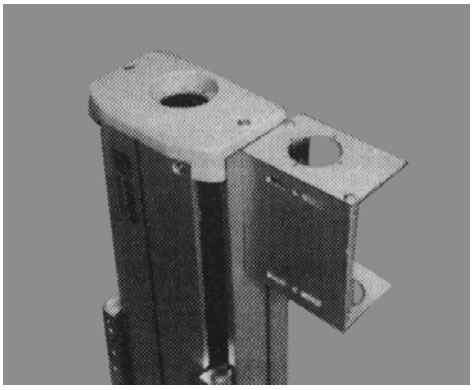




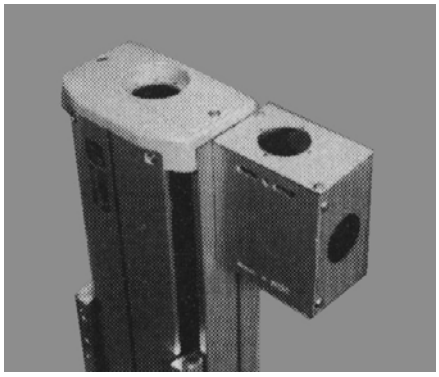
- Insert the hexagon nuts into the T-slot, then secure the two (2) L-shaped metal fittings (large and small) to the side of the actuator.
- Mount the CN box on the L-shaped metal fittings so that it will not interfere with the slider.



Direct mounting



- Insert the hexagon nuts into the T-slot, then secure the CN box to the side of the actuator.

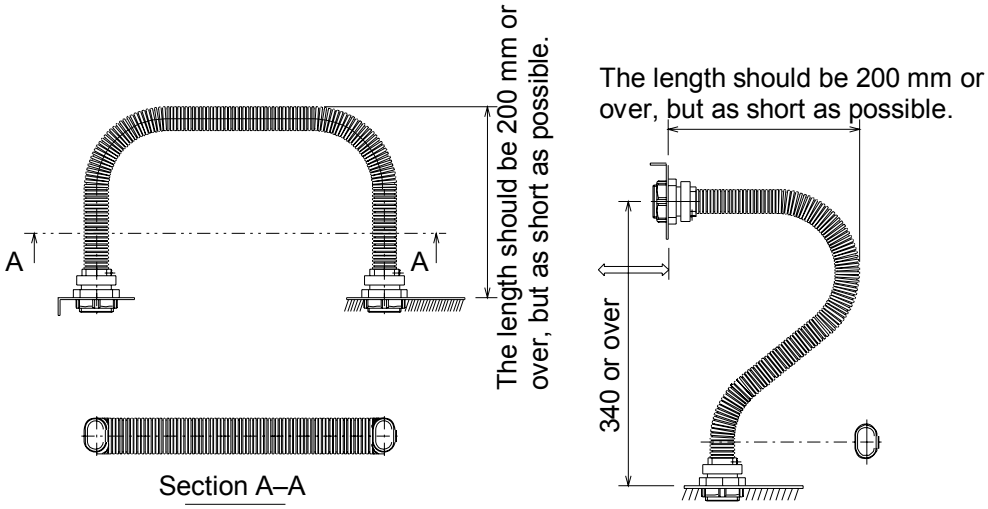


2.5 Connecting Flexible Tube and Cable

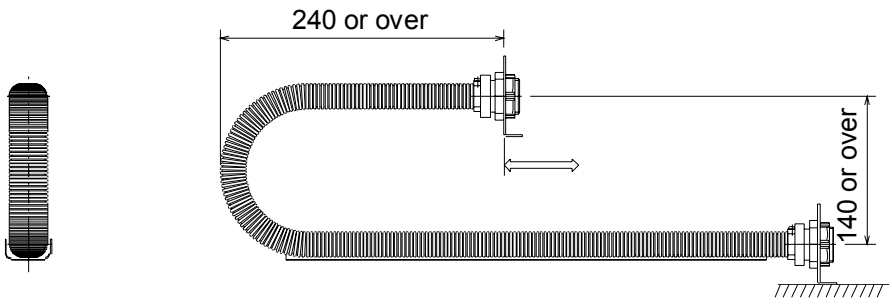
The flexible tube is used to protect the controller cable, and wiring and piping from the hand.
Cut the flexible tube to an appropriate length according to the application.
(The tube can be cut easily with a knife, etc.)

- Cautions on use of flexible tube:
  When using the flexible tube, pass the controller cable, etc., through it before mounting the tube, as shown below.
  The dimensions in the figure below refer to the KBA–10–FT–M. The same dimensions are also applicable for the KBA–10–FT–L.

  Vertical layout



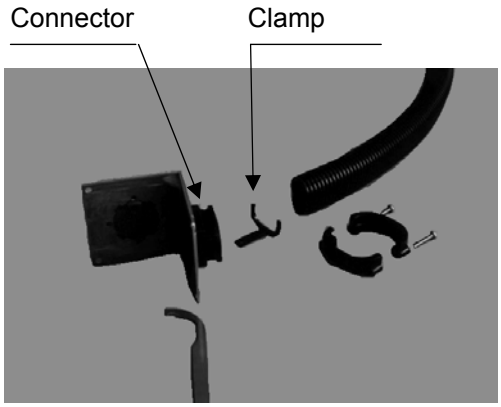
  Horizontal layout

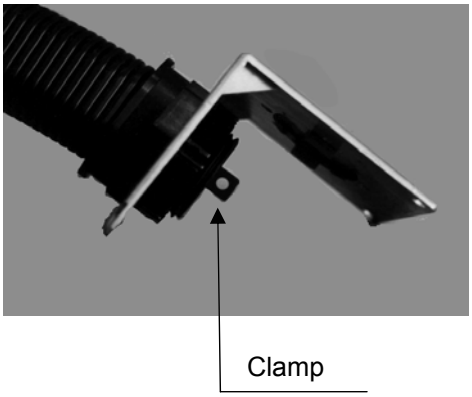


Notes

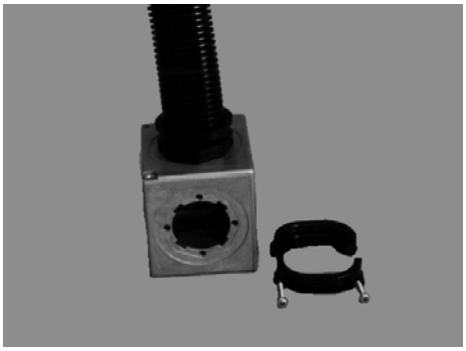
- When the cross-sectional profile is round (KBA–10–FT–L), only the vertical layout can be used.
- If used with dimensions other than those given above, the service life of the tube will reduce drastically.
- When the axis stroke is 600 mm or over (yardstick), use of the horizontal layout or use of a flexible duct is recommended. If the vertical layout is used, the flexible tube may not function.
- DO NOT place too many cables, etc., in the tube. Otherwise, the life of the cable will reduce sharply.

Example of flexible tube connection (KBA–10–FT–M)





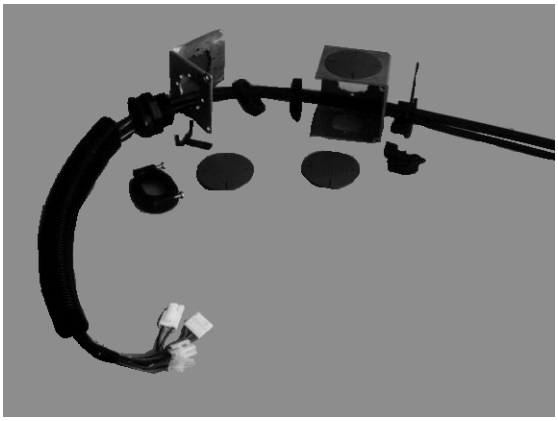
After inserting the clamp into the connector, mount the flexible tube on the connector.



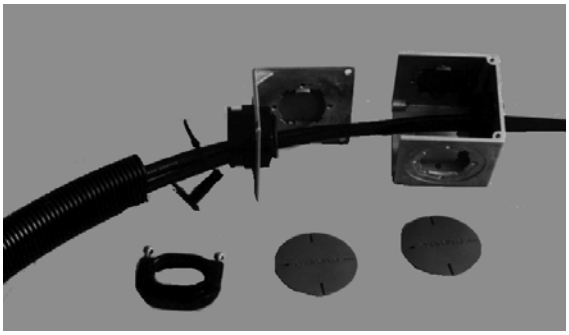
CAUTION

When using the tube, the minimum radius of curvature should be considered. For details, see the descriptions above in this paragraph.

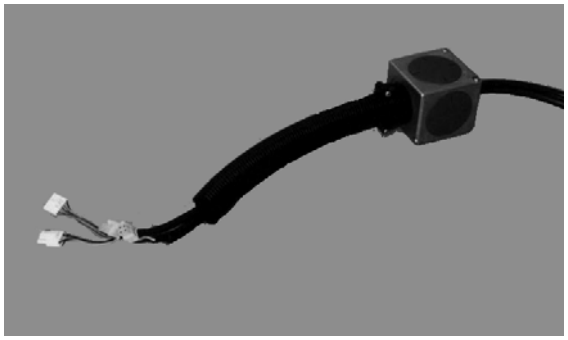
- Example of cable connection 1 (KBA–10–FT–M)



Pass all necessary parts through the cable beforehand.



Secure the cable with a band at either the cable inlet or outlet.

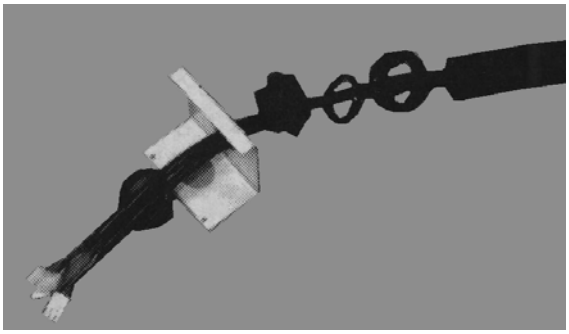


Connecting cable with CN box

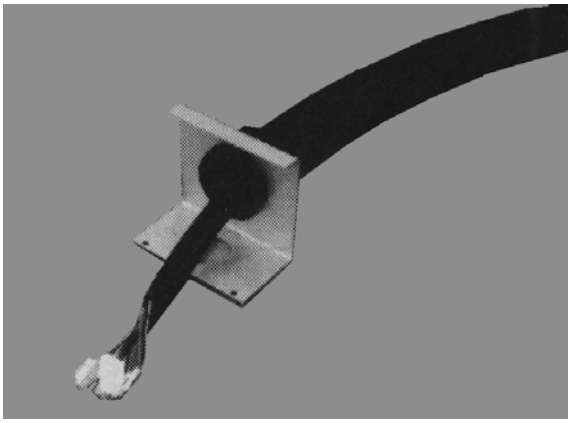
Points

- To tighten the resin nut, you can use a wrench key (option).
- Pass all necessary parts through the cable beforehand.
- DO NOT bend the flexible tube too much.
- To secure the cable, use a band (Insulock; cable tie).

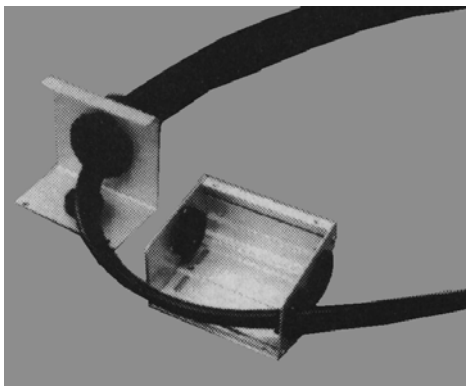
- Example of cable connection 2 (KBA–10–FT–M)

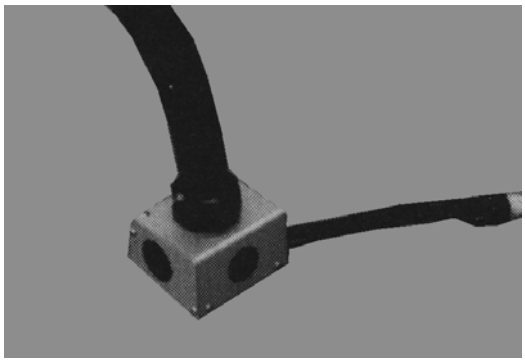


Pass all necessary parts through the cable beforehand.



Secure the cable with the resin nut from the rear side of the CN box.





Connecting cable with CN box

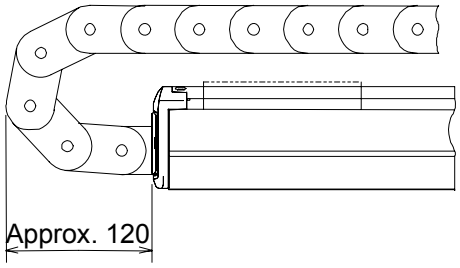
Points

- To tighten the resin nut, you can use a wrench key (option).
- Pass all necessary parts through the cable beforehand.
- DO NOT bend the flexible tube too much.

2.6 Connecting Flexible Duct and Cable

The flexible duct is used to protect the controller cable, and wiring and piping from the hand.
Cut the flexible duct to an appropriate length according to the application.
(The flexible duct link can be removed easily, using a screwdriver, etc.)
For the X–Y combination, the KBA–10–BX–F10 CN box is used for the X-axis, and the KBA–10–BX–F30 for the Y-axis.

- Cautions on use of flexible duct:
  When using the flexible duct, pass the controller cable, etc., through it before mounting the duct, as shown below.
  When the X-axis slider is located at the end of the actuator, the flexible duct should project by about 120 mm.



Notes

- If used with dimensions other than those given above, the service life of the duct will reduce drastically.
- DO NOT place too many cables, etc., in the flexible duct. Otherwise, the life of the cable will reduce sharply.

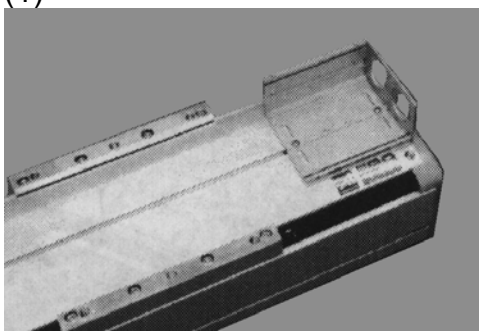
Example of connecting with X-axis (KBB–50)

(1) Insert the hexagon nuts into the T-slot on the frame cover and mount the CN box on top of the actuator.

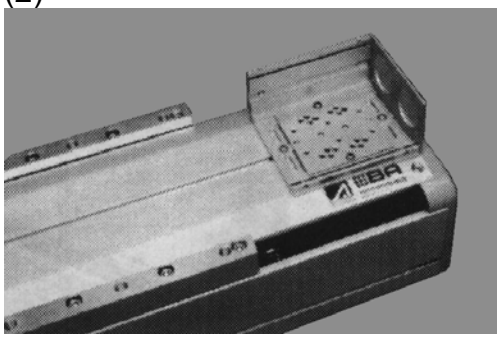
(2) Mount the clamp plate on the CN box.

(3) Attach the flexible duct link set metal fitting to the clamp plate. Mount the clamp base on the clamp plate.

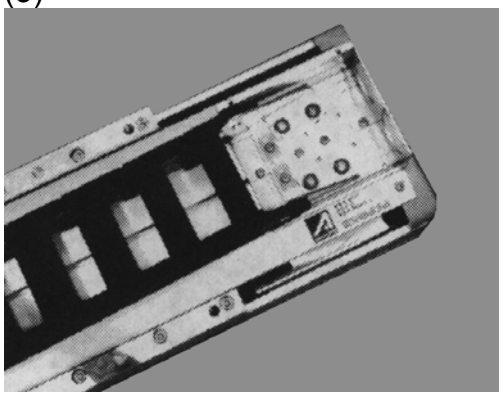
(1)



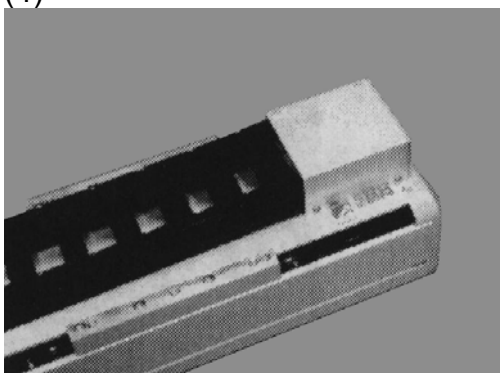
(2)



(3)



(4)



Points

When connecting with the side of the actuator, mount the CN box on the side, then connect the flexible duct in the same manner as above.

For connecting the CN box on the side of the actuator, see Para. 2.4.

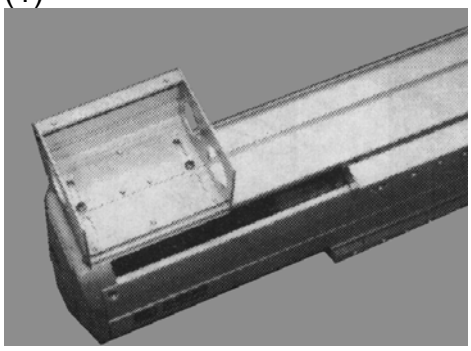
Example of connecting with Y-axis (KBB–50)

(1) Insert the hexagon nuts into the T-slot on the side of the actuator and mount the CN box on the actuator.

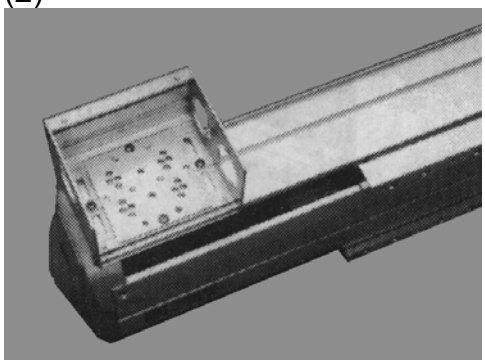
(2) Mount the clamp plate on the CN box.

(3) Attach the flexible duct link set metal fitting to the clamp plate. Mount the cable clamp base on the clamp plate.

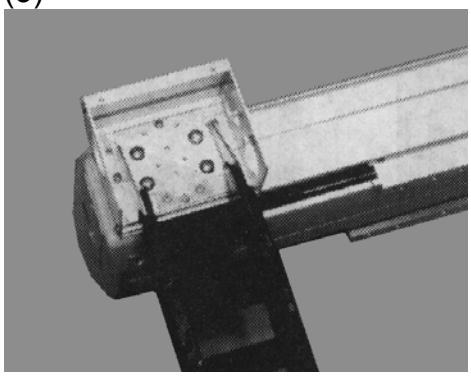
(1)



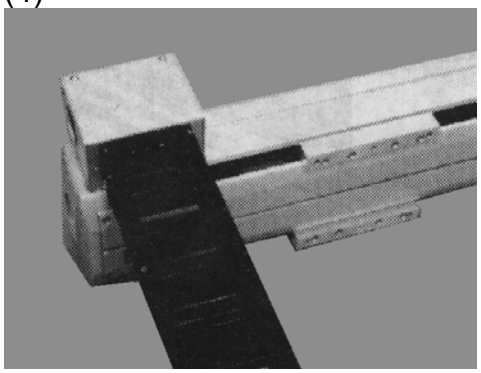
(2)



(3)

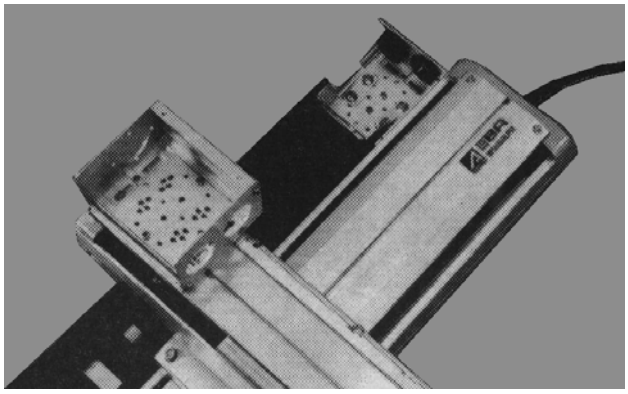


(4)

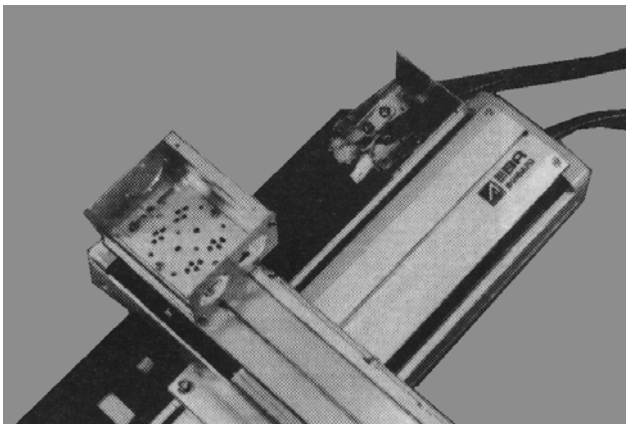


Example of cable connection (X-axis)

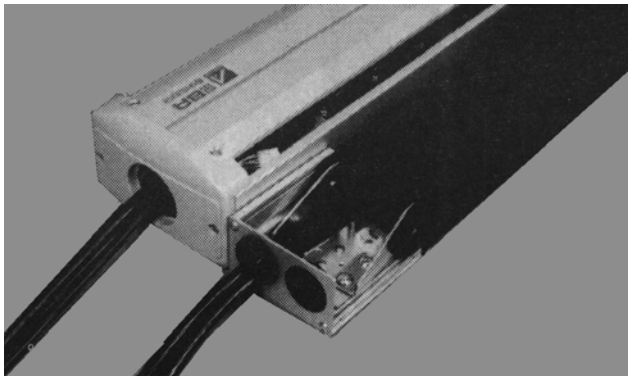
Assemble the cable by passing it through the required parts and flexible duct ink, or pass the cable through the flexible duct after securing the duct to the X-axis.



Secure the flexible duct to the X-axis.



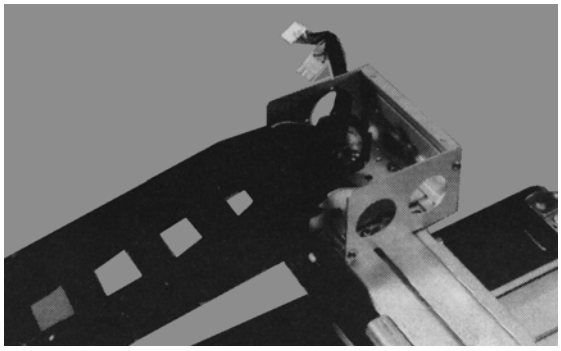
Pass the cable through the flexible duct.



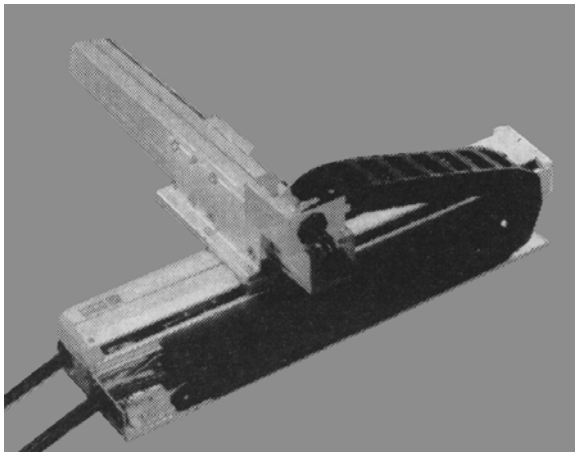
Points

It is easy to pass the cable through the duct by bundling the cable connectors in a small vinyl bag, etc.

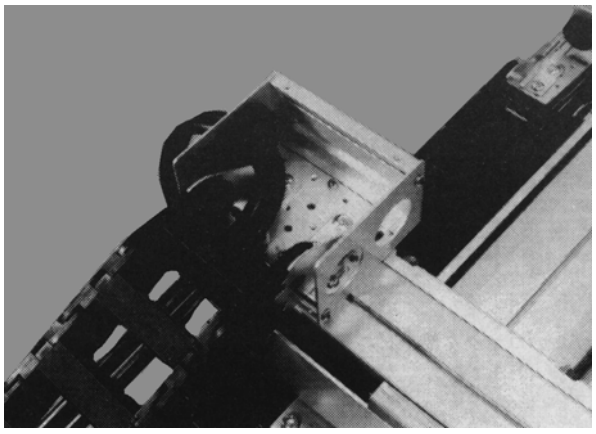
Example of cable connection (Y-axis)



Pass the cable through the CN box and resin nut, then connect it with the Y-axis.



After attaching the cable grip to the Y-axis, attach the CN box cable grip.

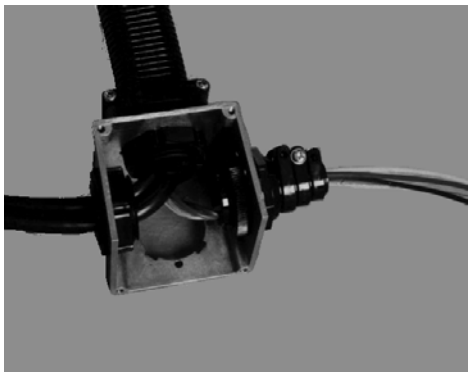


Adjust the length of the cable running from the Y-axis, then secure the cable with a band.

2.7 Mounting, Wiring and Piping of Hand

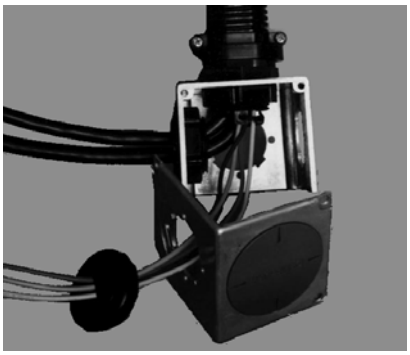
- After installing the robot, mount the hand provided by the customer.
  Make sure that the hand weight and moment load on the slider will not exceed the axis specifications.
- Use the CN box, flexible tube or flexible duct for wiring and piping to the hand.

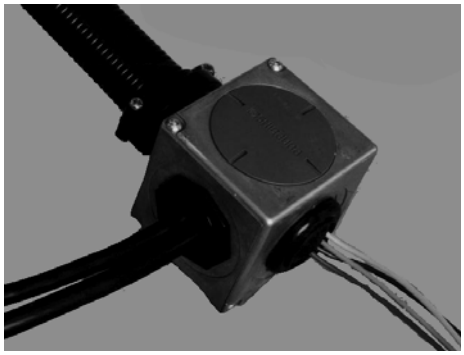
<Example of wiring and piping>



Sleeve cone

<Example of using sleeve cone>



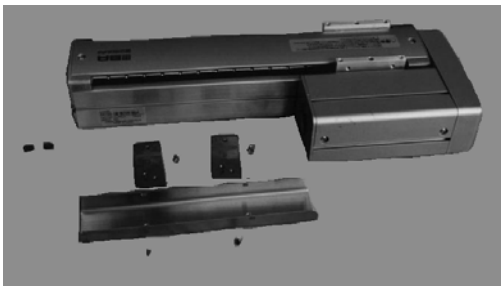


Grommet

2.8 Mounting Tube Tray

- The tube tray is required when the flexible tube is arranged in the horizontal condition (⊂).
  Mount the tray so that excessive force is not exerted on the height direction and horizontal direction of the flexible tube.

- When mounting the tube tray on the axis (actuator), refer to the following photos.

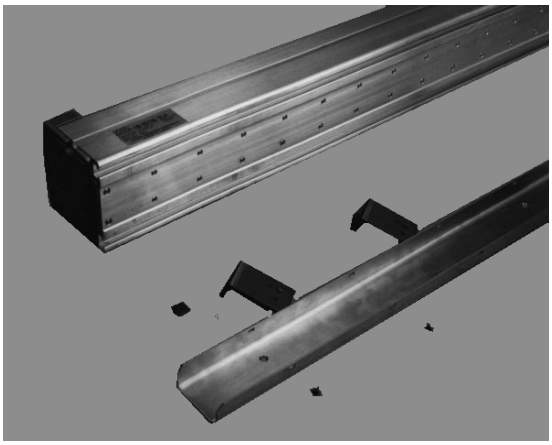


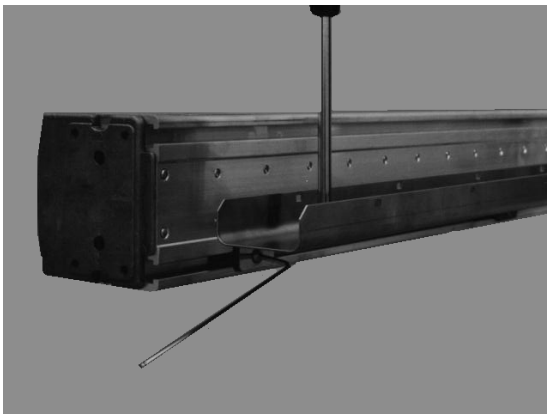
Mounting tube tray on the side of actuator (using L-shaped metal fitting)

Mounting tube tray directly on the side of actuator

Discontinue

Mounting tube tray on the lower side of actuator

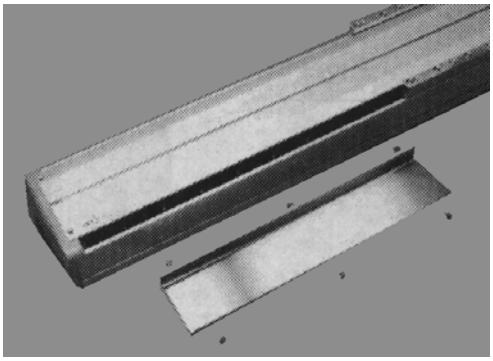


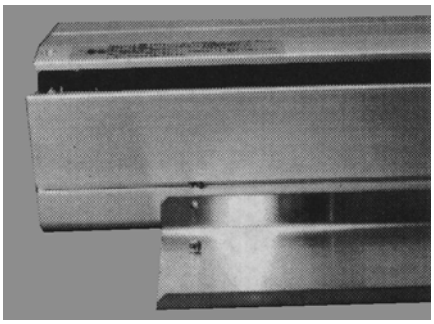


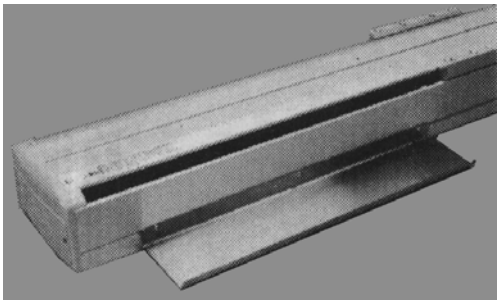
2.9 Mounting Duct Tray

- The duct tray is required when the flexible duct is used on the side of the axis (actuator).
- Mount the tray so that excessive force is not exerted on the height direction and horizontal direction of the flexible duct.
- To mount the tray on the actuator, pass the hexagon nuts through the T-slot on the actuator, then secure it. See the photos below.

Mounting duct try directly on the side of actuator







2.10 Bolt and Nut Clamping Torque Tabl

Part name	Nominal screw size	Clamping torque (N·m)	Remarks
Hexagon socket head cap screw	M4	2.45	
	M5	5.10	
	M6	8.60	
	M8	21.6	
Pan head screw Hexagon socket head button screw	M3	0.59	
	M4	1.37	
	M5	2.84	
Hexagon nut	M4	1.37	
	M5	2.84	
	M6	5.30	
	M8	12.0	
Resin nut	G1	2.94	

Section 3 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.

3.1 Type of Robot by Axis

The main types of robot by axis are shown below. For any axis (new model, etc.) not listed below, see the relevant actuator instruction manual provided separately.
When using the axes in combination, perform setting for each axis , referring to the following table.

(Example: When using an X–Y combination with the side mounted motor axis selected for the X-axis, the linear axis for the Y-axis and each lead being 20 mm, the type of the robot is as follows: X-axis: 510000, Y-axis 510100)

[Type of robot for KBB–10]

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

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-10E-ST-*20-**	510101
	10	KBB-10E-ST-*10-**	510111
	5	KBB-10E-ST-*05-**	510121
Side mounted motor axis	20	KBB-10E-U*-*20-**	510001
	10	KBB-10E-U*-*10-**	510011
	5	KBB-10E-U*-*05-**	510021

Point For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

(2) When the actuator serves as the travel type axis:

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-10E-ST-*20-**	511101
	10	KBB-10E-ST-*10-**	511111
	5	KBB-10E-ST-*05-**	511121
Side mounted motor axis	20	KBB-10E-U*-*20-**	511001
	10	KBB-10E-U*-*10-**	511011
	5	KBB-10E-U*-*05-**	511021

Note: The home point change sensor (option) is required when the home point is located at the end of the axis (actuator).

Points
- For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.
- When the home position has been changed to the position opposite to the normal position (i.e., end or motor side) by using the home point change sensor (option), enter the type of robot effective before the change, then change the value of Parameter 1 "Motor revolving direction" in Para. 3.2.2 from 1 to 0 or 0 to 1.

Discontinue

[Type of robot for KBB–30E]

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

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-30E-ST-*20-**	520101
	10	KBB-30E-ST-*10-**	520111
	5	KBB-30E-ST-*05-**	520121
Side mounted motor axis	20	KBB-30E-U*-*20-**	520001
	10	KBB-30E-U*-*10-**	520011
	5	KBB-30E-U*-*05-**	520021

Point For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

(2) When the actuator serves as the travel type axis:

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-30E-ST-*20-**	521101
	10	KBB-30E-ST-*10-**	521111
	5	KBB-30E-ST-*05-**	521121
Side mounted motor axis	20	KBB-30E-U*-*20-**	521001
	10	KBB-30E-U*-*10-**	521011
	5	KBB-30E-U*-*05-**	521021

Note: The home point change sensor (option) is required when the home point is located at the end of the axis (actuator).

Points
- For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

  When the home position has been changed to the position opposite to the normal position (i.e., end or motor side) by using the home point change sensor (option), enter the type of robot effective before the change, then change the value of Parameter 1 "Motor revolving direction" in Para. 3.2.2 from 1 to 0 or 0 to 1.

Discontinue

[Type of robot for KBB–30F]

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

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-30F-ST-*20-**	510101
	10	KBB-30F-ST-*10-**	510111
	5	KBB-30F-ST-*05-**	510121
Side mounted motor axis	20	KBB-30F-U*-*20-**	510001
	10	KBB-30F-U*-*10-**	510011
	5	KBB-30F-U*-*05-**	510021

Point For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

(2) When the actuator serves as the travel type axis:

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-30F-ST-*20-**	511101
	10	KBB-30F-ST-*10-**	511111
	5	KBB-30F-ST-*05-**	511121
Side mounted motor axis	20	KBB-30F-U*-*20-**	511001
	10	KBB-30F-U*-*10-**	511011
	5	KBB-30F-U*-*05-**	511021

Note: The home point change sensor (option) is required when the home point is located at the end of the axis (actuator).

Points
- For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.
- When the home position has been changed to the position opposite to the normal position (i.e., end or motor side) by using the home point change sensor (option), enter the type of robot effective before the change, then change the value of Parameter 1 "Motor revolving direction" in Para. 3.2.2 from 1 to 0 or 0 to 1.

Discontinue

[Type of robot for KBB–50F]

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

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-50F-ST-*20-**	520101
	10	KBB-50F-ST-*10-**	520111
	5	KBB-50F-ST-*05-**	520121
Side mounted motor axis	20	KBB-50F-U*-*20-**	520001
	10	KBB-50F-U*-*10-**	520011
	5	KBB-50F-U*-*05-**	520021

Point For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

(2) When the actuator serves as the travel type axis:

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-50F-ST-*20-**	521101
	10	KBB-50F-ST-*10-**	521111
	5	KBB-50F-ST-*05-**	521121
Side mounted motor axis	20	KBB-50F-U*-*20-**	521001
	10	KBB-50F-U*-*10-**	521011
	5	KBB-50F-U*-*05-**	521021

Note: The home point change sensor (option) is required when the home point is located at the end of the axis (actuator).

Points
- For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.
- When the home position has been changed to the position opposite to the normal position (i.e., end or motor side) by using the home point change sensor (option), enter the type of robot effective before the change, then change the value of Parameter 1 "Motor revolving direction" in Para. 3.2.2 from 1 to 0 or 0 to 1.

Discontinue

[Type of robot for KBB–50G

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

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-50G-ST-*20-**	510101
	10	KBB-50G-ST-*10-**	510111
	5	KBB-50G-ST-*05-**	510121
Side mounted motor axis	20	KBB-50G-U*-*20-**	510001
	10	KBB-50G-U*-*10-**	510011
	5	KBB-50G-U*-*05-**	510021

Point For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.

(2) When the actuator serves as the travel type axis:

	Lead of ball screw (mm)	Axis code designation	Type of robot
Straight axis	20	KBB-50G-ST-*20-**	511101
	10	KBB-50G-ST-*10-**	511111
	5	KBB-50G-ST-*05-**	511121
Side mounted motor axis	20	KBB-50G-U*-*20-**	511001
	10	KBB-50G-U*-*10-**	511011
	5	KBB-50G-U*-*05-**	511021

Note: The home point change sensor (option) is required when the home point is located at the end of the axis (actuator).

Points

- For the type of axis, see Para. 3.1 of the actuator instruction manual provided separately.
- When the home position has been changed to the position opposite to the normal position (i.e., end or motor side) by using the home point change sensor (option), enter the type of robot effective before the change, then change the value of Parameter 1 "Motor revolving direction" in Para. 3.2.2 from 1 to 0 or 0 to 1.

Note The values of servo gain are automatically set once the type of robot has been specified. For the KBB–50G–**–*20–** axis (lead 20 mm), however, these set values have to be changed manually according to the load conditions. Change the values, referring to the following table.

Parameter \ Type of robot		510101 / 510001 / 511101 / 511001 (Lead 20)	
Mass of load		60 kg or less	Over 60 kg ~ 100 kg or less
		Automatically set value	Changed value
Servo gain (Position/speed)	P (Position)	7	3
	V (Speed)	6	13

For the servo gain values, the conditions will change with the load set state, etc. They should be changed when necessary. For change of the setting, see the instruction manual (basic) provided separately.

3.2 Parameter Values

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.

3.2.1 Parameter 1 Assigned by Type of Robot

These are the parameters used very frequently.

- Straight axis (slider type)

Auto setting	Parameter \ Type of robot		510101 (Lead 20)	510111 (Lead 10)	510121 (Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	7	7	7
		V (Speed)	6	6	6
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

- Side mounted motor axis (slider type)

Auto setting	Parameter \ Type of robot		510001 (Lead 20)	510011 (Lead 10)	510021 (Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	7	7	7
		V (Speed)	6	6	6
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

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.

Note For the KBB–50G axis, the values of servo gain should be changed manually according to the load conditions. (For details, see Para. 3.1.)

Discontinue

- Straight axis (axis travel type)

Auto setting	Parameter \ Type of robot		511101	511111	511121
			(Lead 20)	(Lead 10)	(Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	7	7	7
		V (Speed)	6	6	6
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

- Side mounted motor axis (axis travel type)

Auto setting	Parameter \ Type of robot		511001	511011	511021
			(Lead 20)	(Lead 10)	(Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	7	7	7
		V (Speed)	6	6	6
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

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.

Note For the KBB–50G axis, the values of servo gain should be changed manually according to the load conditions. (For details, see Para. 3.1.)

- Straight axis (slider type)

Auto setting	Parameter \ Type of robot		520101 (Lead 20)	520111 (Lead 10)	520121 (Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	3	3	3
		V (Speed)	13	13	13
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

- Side mounted motor axis (slider type)

Auto setting	Parameter \ Type of robot		520001 (Lead 20)	520011 (Lead 10)	520021 (Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	3	3	3
		V (Speed)	13	13	13
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

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.

Discontinue

- Straight axis (axis travel type)

Auto setting	Parameter \ Type of robot		521101	521111	521121
			(Lead 20)	(Lead 10)	(Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	3	3	3
		V (Speed)	13	13	13
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

- Side mounted motor axis (axis travel type)

Auto setting	Parameter \ Type of robot		521001	521011	521021
			(Lead 20)	(Lead 10)	(Lead 5)
	Soft limit value (plus)		0000.00	0000.00	0000.00
	Soft limit value (minus)		0000.00	0000.00	0000.00
○	Servo gain (position/speed)	P (Position)	3	3	3
		V (Speed)	13	13	13
	Path area		Not applicable	Not applicable	Not applicable
	Home point offset value		0000.00	0000.00	0000.00
	Order of home return		1 (Note)	1 (Note)	1 (Note)
	Jog speed	L (low speed)	10	10	10
		H (High speed)	50	50	50
	Jog travel distance		0.01	0.01	0.01

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.

3.2.2 Parameter 2 Assigned by Type of Robot

- Straight axis (slider type)

Auto setting	Parameter \ Type of robot		510101 (Lead 20)	510111 (Lead 10)	510121 (Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		1	1	1
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Side mounted motor axis (slider type)

Auto setting	Type of robot / Parameter		510001 (Lead 20)	510011 (Lead 10)	510021 (Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		0	0	0
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Straight axis (axis travel type)

Auto setting	Type of robot / Parameter		511101	511111	511121
			(Lead 20)	(Lead 10)	(Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		0	0	0
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Side mounted motor axis (axis travel type)

Auto setting	Type of robot / Parameter		511001	511011	511021
			(Lead 20)	(Lead 10)	(Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		1	1	1
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Straight axis (slider type)

Auto setting	Type of robot / Parameter		520101 (Lead 20)	520111 (Lead 10)	520121 (Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		1	1	1
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Side mounted motor axis (slider type)

Auto setting	Type of robot / Parameter		520001 (Lead 20)	520011 (Lead 10)	520021 (Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		0	0	0
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Straight axis (axis travel type)

Auto setting	Type of robot / Parameter		521101	521111	521121
			(Lead 20)	(Lead 10)	(Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		0	0	0
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

- Side mounted motor axis (axis travel type)

Auto setting	Type of robot / Parameter		521001	521011	521021
			(Lead 20)	(Lead 10)	(Lead 5)
	Axis display		X	X	X
	In-position data		0.05	0.05	0.05
	Overflow data		20000	20000	20000
○	Feed forward data		2000	2000	2000
○	Motor revolving direction		1	1	1
○	Maximum speed data		1200	600	300
	Home return speed data	L (low speed)	2	2	2
		M (Mid speed)	20	20	20
		H (High speed)	100	100	100
○	Home return method		0	0	0
○	Logic of home point sensor		1	1	1
	High-speed home return position		20	20	20
○	Lead		20	20	20
○	Encoder resolutions		2000	2000	2000
○	Multiple of encoder pulse		4	4	4
	Setting of type of encoder (Note)		a	a	a
	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 Para. 11.4.14 of the instruction manual (basic) provided separately.

Section 4 Installing X–Y Combination Axes

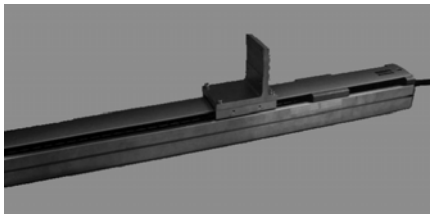
4.1 KBB–10–KBB–10 (X–Y) Combination

Installation procedures (when the flexible tube is used)

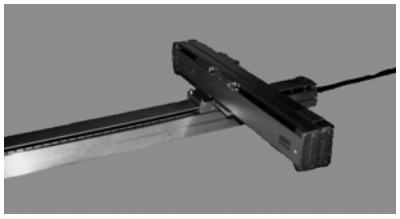
(1) Install the 1st axis (actuator).
(2) Mount the angle bracket.
(3) Mount the 2nd axis (actuator).
(4) Mount the CN box.
(5) Cut the flexible tube to a desired length. Pass the required parts through the cables, then pass the cables through the tube.
(6) Secure the cables in turn, starting from the Y-axis (2nd axis) motor side.
(7) Secure the cables with band (Insulock).
(8) Mount the CN box cover.

Point For details, see Section 2.

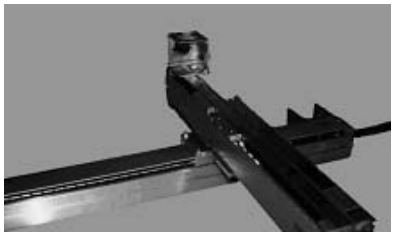
(1), (2)



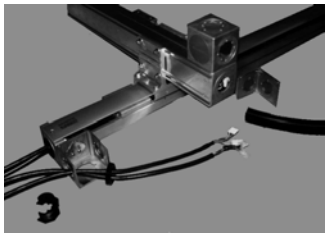
(3)



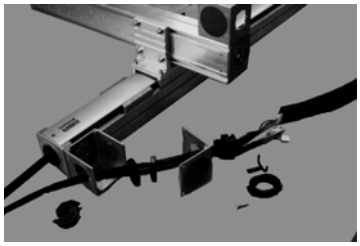
(4)



(5)–1

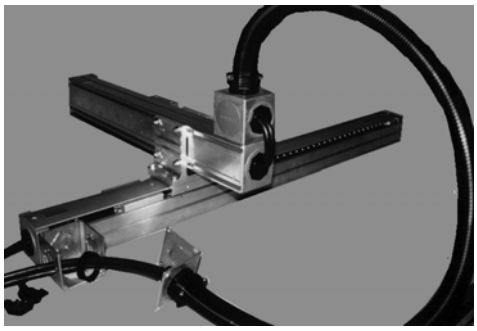


(5)–2

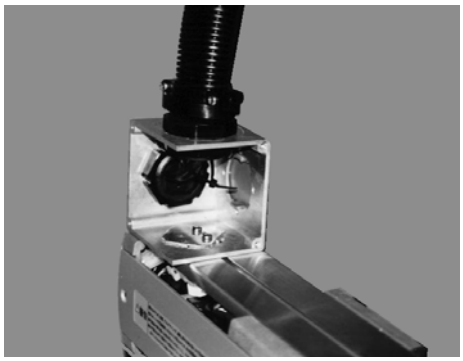


(5)–3

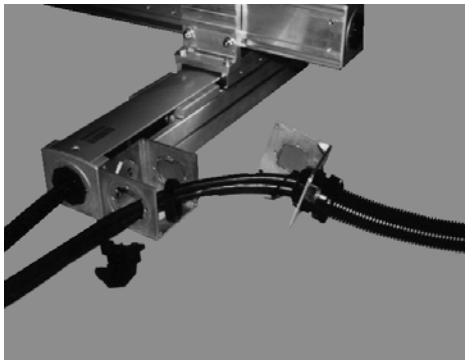
(6)



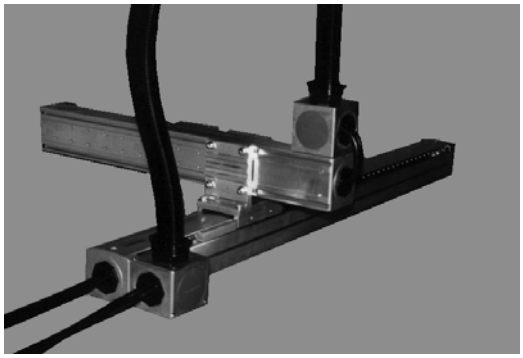
(7)–1



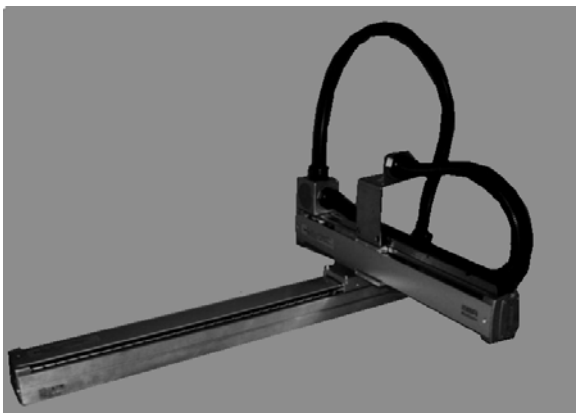
(7)–2



(8)



(9) When connecting the flexible tube with the hand, refer to the following photo.

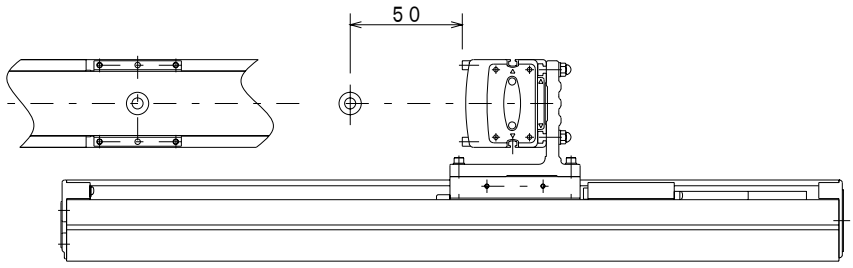


Note: This procedure refers to the combination of X–Y straight axes with vertically arranged flexible tube.

4.1.1 Yardstick for Combination Specifications

Type of axis	X-axis	KBB-10E-**-M20M-** (medium slider)					
	Y-axis	KBB-10E-**-S20M-** (short slider)					
Motor	X-axis	AC servo motor, 100 W					
	Y-axis	AC servo motor, 100 W					
Drive system	X-axis	Ball screw (dia. 15 mm, lead 20 mm)					
	Y-axis	Ball screw (dia. 15 mm, lead 20 mm)					
Axis stroke (mm)	X-axis	100 ~ 1,000 (in increments of 100)					
	Y-axis	150 ~ 650 (in increments of 100)					
Maximum payload mass (kg)	Axis stroke	150	250	350	450	550	650
		9	8	6.5	5	3	1
Maximum speed (mm/s)	X-axis	1,200 (Note 1)					
	Y-axis	1,200 (Note 1)					
Repeatability (mm)	X-axis	±0.01					
	Y-axis	±0.01					
Resolution (mm)	X-axis	0.01					
	Y-axis	0.01					
Acceleration/deceleration time (s)	X-axis	0.36					
	Y-axis	0.36					

- The above specifications refer to the combination as given in Para. 4.1.2.
- When the dimensions or configuration of the combination differ, the specifications will also differ accordingly.
- The center-of-gravity position of the load is indicated by in the figure below.

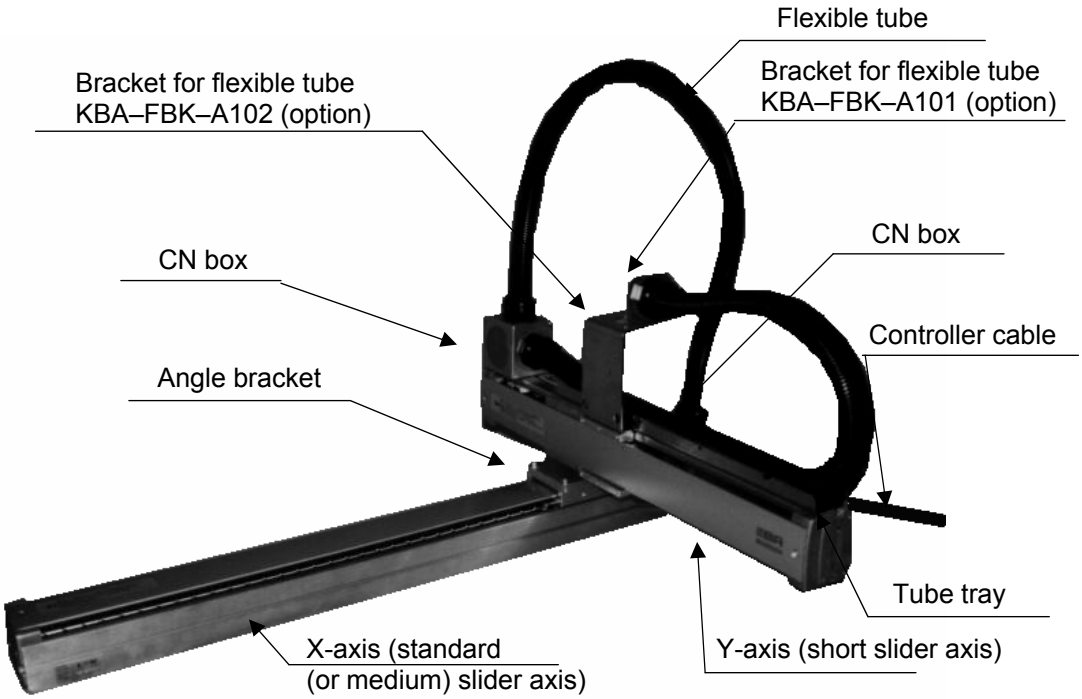


Note 1: The maximum speed is as follows according to the axis stroke.

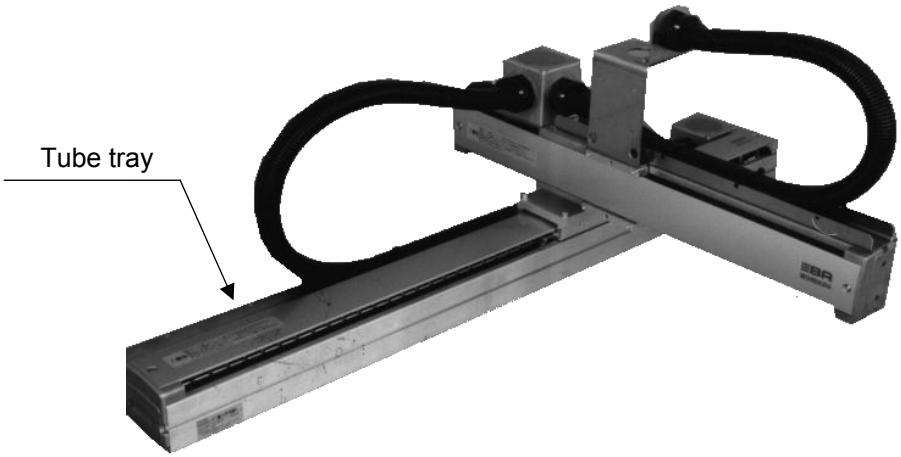
Axis stroke 600 mm or less ····· Specified values
Axis stroke 650 ~ 700 mm ····· 1,000 mm/s
Axis stroke 750 ~ 800 mm ····· 800 mm/s
Axis stroke 850 ~ 1,050 mm ····· 600 mm/s

4.1.2 Example of Basic Combination

Straight axis



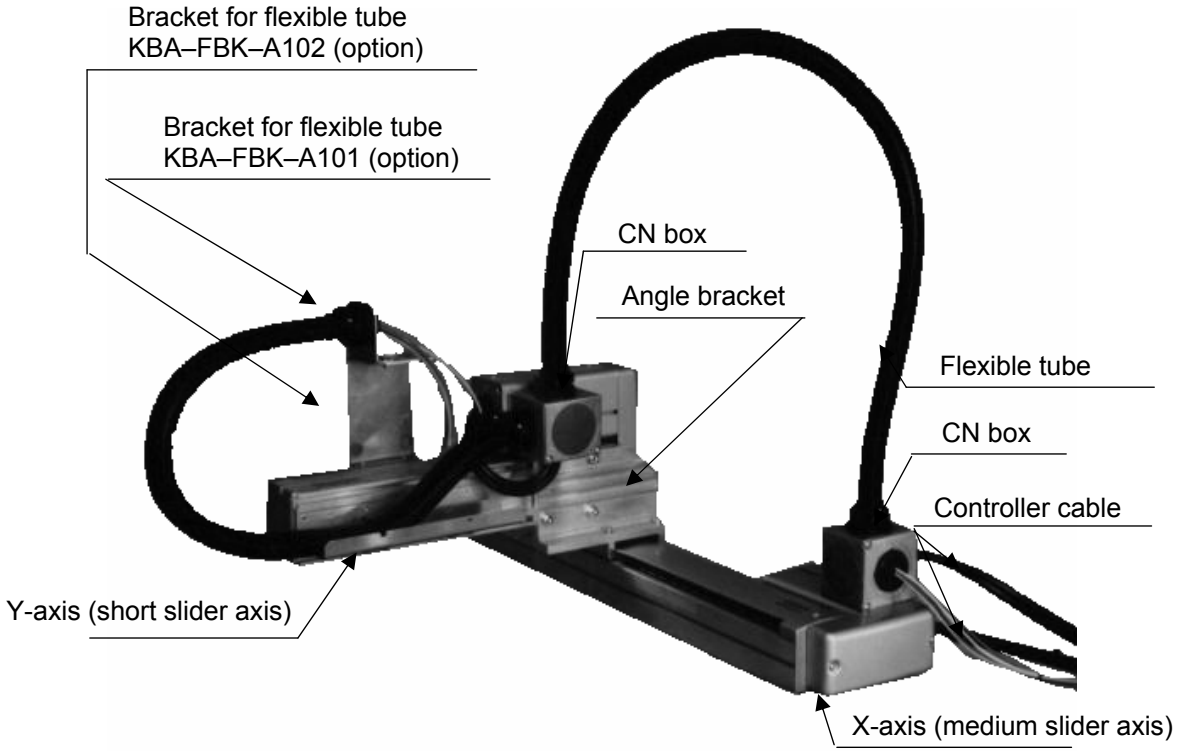
Example of vertically arranged flexible tube (between X- and Y-axes)



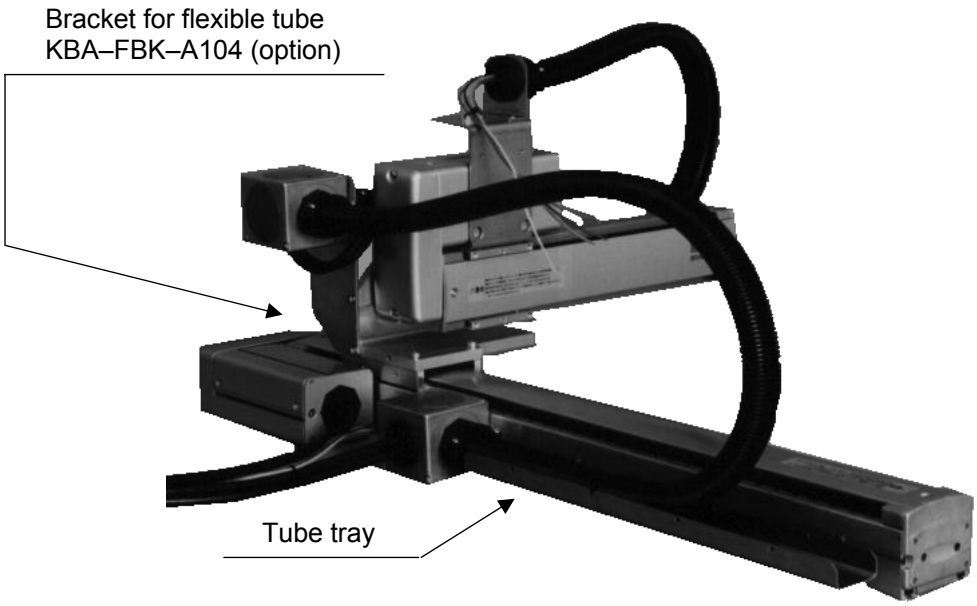
Example of horizontally arranged flexible tube

Point For the precautions on flexible tube connection, see Para. 2.4.

Side mounted motor axis



Example of vertically arranged flexible tube (between X- and Y-axes)



Example of horizontally arranged flexible tube

Point For the precautions on flexible tube connection, see Para. 2.5.

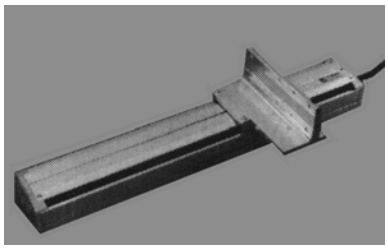
4.2 KBB–30–KBB–10 (X–Y) Combination

Installation procedures (when the flexible duct is used)

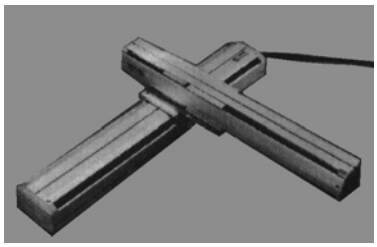
(1) Install the 1st axis (actuator).
(2) Mount the angle bracket.
(3) Mount the 2nd axis (actuator).
(4) Mount the CN box.
(5) Prepare the flexible duct of an appropriate length. Pass the required parts through the cables, then pass the cables through the duct.
(6) Secure the cables in turn, starting from the Y-axis (2nd axis) motor side.
(7) Secure the cables with band (Insulock).
(8) Mount the CN box cover.

Point For details, see Section 2.

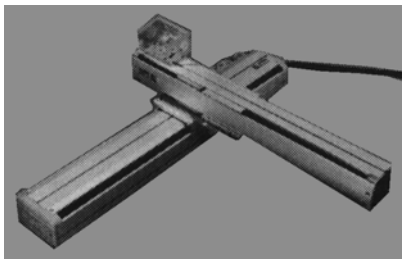
(1), (2)



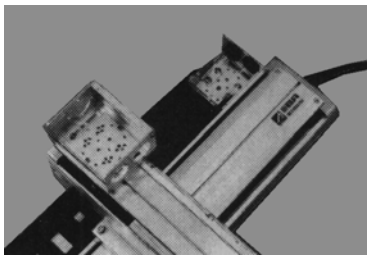
(3)



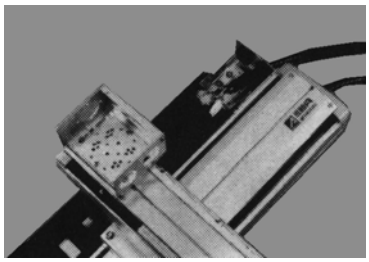
(4)



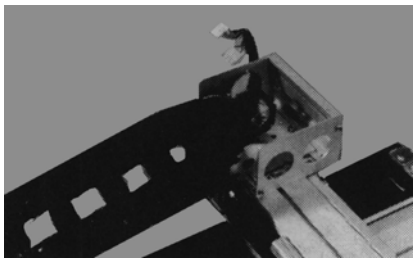
(5)–1



(5)–2

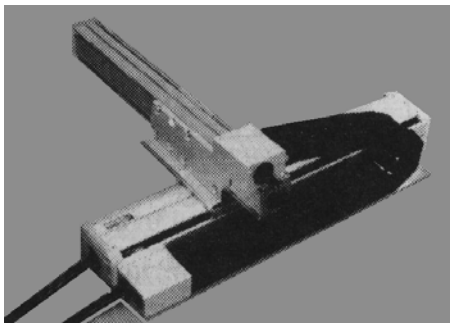


(5)–3

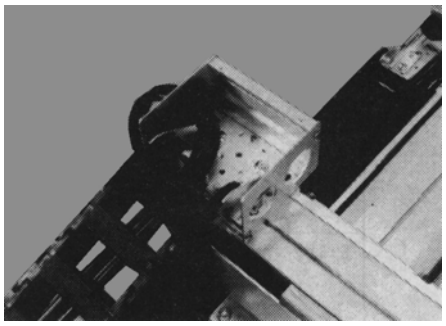


Discontinue

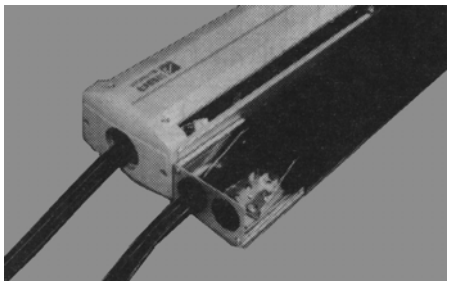
(6)



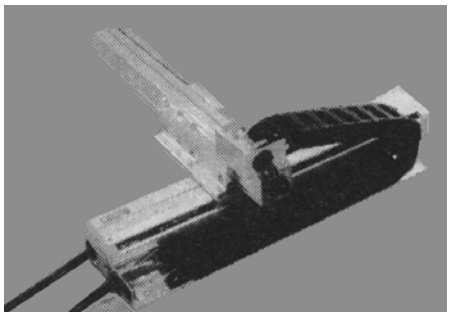
(7)–1

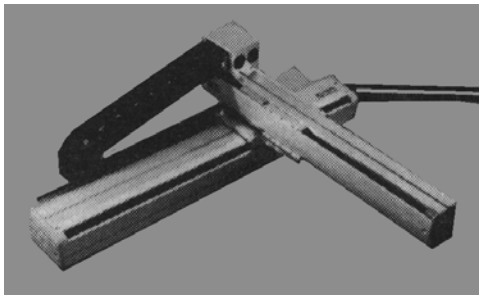


(7)–2



(8)

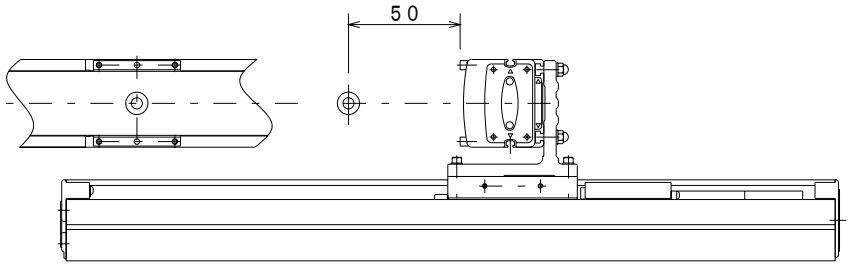




4.2.1 Yardstick for Combination Specifications

Type of axis	X-axis	KBB-30F-**-M20M-** (medium slider)						
	Y-axis	KBB-10E-**-M20M-** (medium slider)						
Motor	X-axis	AC servo motor, 200 W						
	Y-axis	AC servo motor, 100 W						
Drive system	X-axis	Ball screw (dia. 15 mm, lead 20 mm)						
	Y-axis	Ball screw (dia. 15 mm, lead 20 mm)						
Axis stroke (mm)	X-axis	100 ~ 1,000 (in increments of 100)						
	Y-axis	100 ~ 800 (in increments of 100)						
Maximum payload mass (kg)	Axis stroke	100	200	300	400	500	600	700	800
		15	15	14	11	8	6	3	2
Maximum speed (mm/s)	X-axis	1,200 (Note 1)						
	Y-axis	1,200 (Note 1)						
Repeatability (mm)	X-axis	±0.01						
	Y-axis	±0.01						
Resolution (mm)	X-axis	0.01						
	Y-axis	0.01						
Acceleration/deceleration time (s)	X-axis	0.36						
	Y-axis	0.36						

- The above specifications refer to the combination as given in Para. 4.2.2.
- When the dimensions or configuration of the combination differ, the specifications will also differ accordingly.
- The center-of-gravity position of the load is indicated by in the figure below.

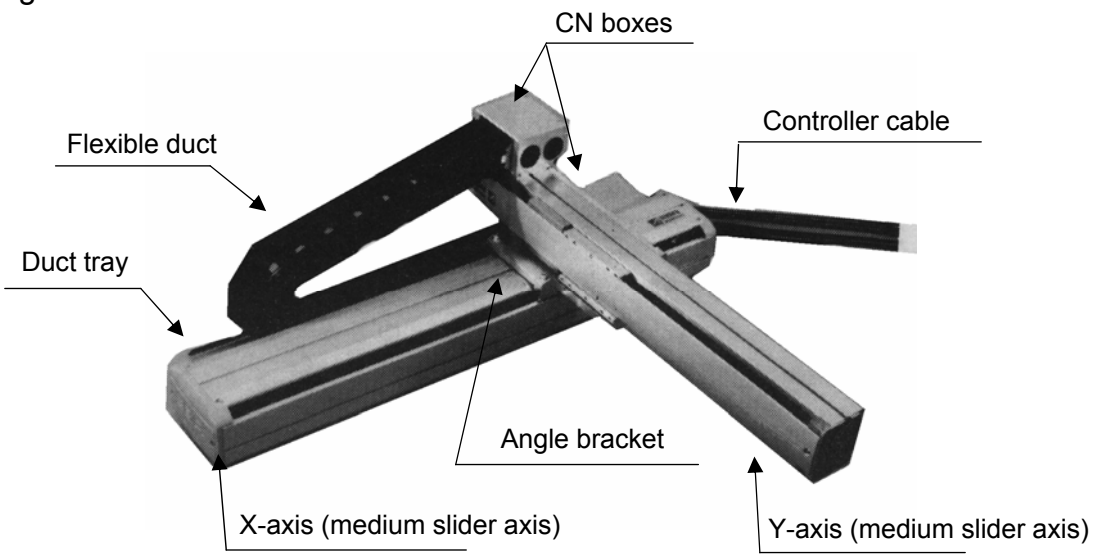


Note 1: The maximum speed is as follows according to the axis stroke.

Axis stroke 600 mm or less ····· Specified values
Axis stroke 650 ~ 700 mm ····· 1,000 mm/s
Axis stroke 750 ~ 800 mm ····· 800 mm/s
Axis stroke 850 ~ 1,050 mm ····· 600 mm/s

4.2.2 Example of Basic Combination

Straight axis



Example of laterally arranged flexible duct (between X- and Y-axes)

Point For the precautions on flexible duct connection, see Para. 2.6.

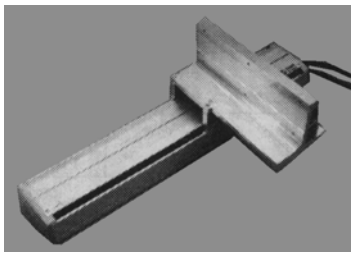
4.3 KBB–50–KBB–30 (X–Y) Combination

Installation procedures (when the flexible duct is used)

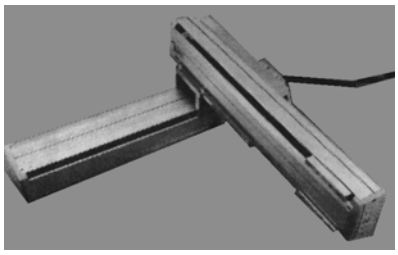
(1) Install the 1st axis (actuator).
(2) Mount the angle bracket.
(3) Mount the 2nd axis (actuator).
(4) Mount the CN box.
(5) Prepare the flexible duct of an appropriate length. Pass the required parts through the cables, then pass the cables through the duct.
(6) Secure the cables in turn, starting from the Y-axis (2nd axis) motor side.
(7) Secure the cables with band (Insulock).
(8) Mount the CN box cover.

Point For details, see Section 2.

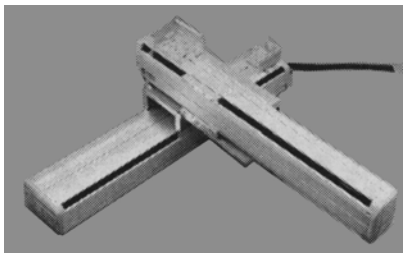
(1), (2)



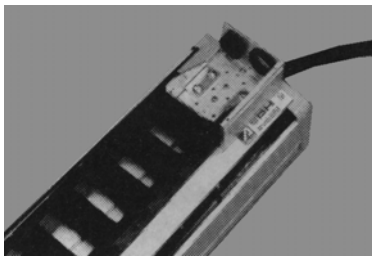
(3)



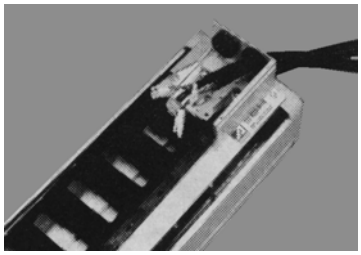
(4)



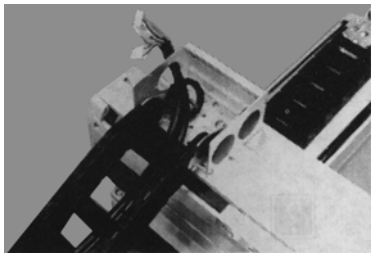
(5)–1



(5)–2

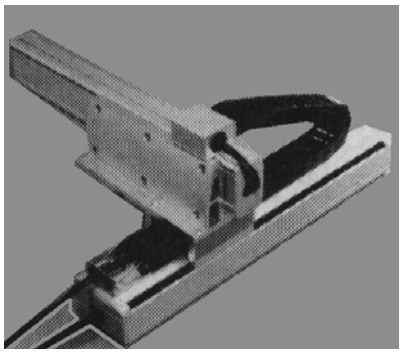


(5)–3

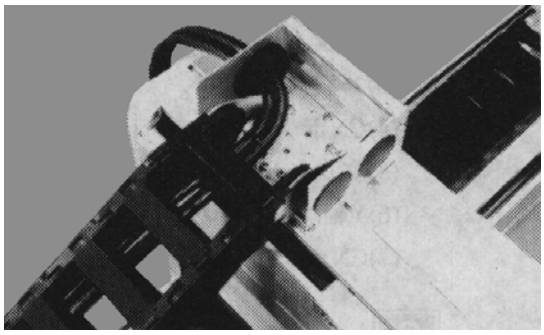


Discontinue

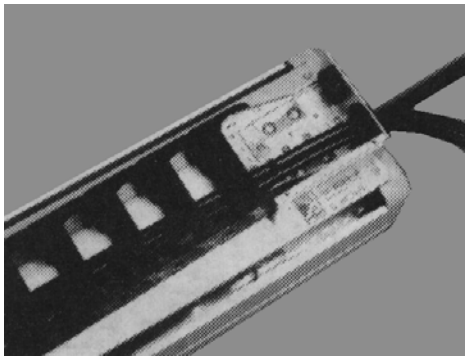
(6)



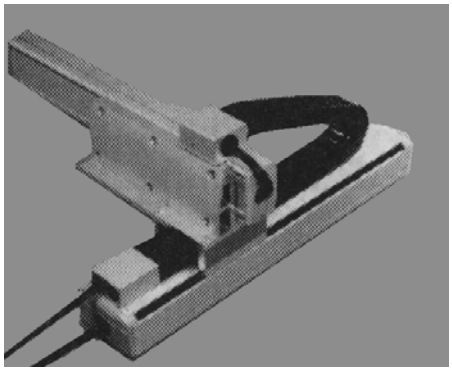
(7)–1

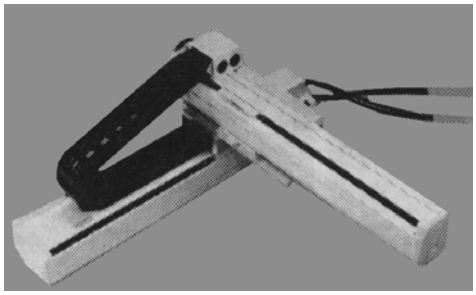


(7)–2



(8)



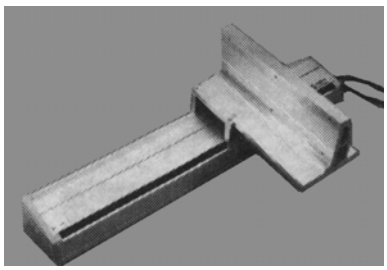


Installation procedures (when the flexible tube is used)

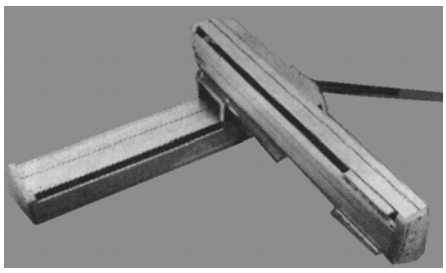
(1) Install the 1st axis (actuator).
(2) Mount the angle bracket.
(3) Mount the 2nd axis (actuator).
(4) Mount the CN box.
(5) Cut the flexible tube to an appropriate length. Pass the required parts through the cables, then pass the cables through the tube.
(6) Secure the cables in turn, starting from the Y-axis (2nd axis) motor side.
(7) Secure the cables with band (Insulock).
(8) Mount the CN box cover.

Point For details, see Section 2.

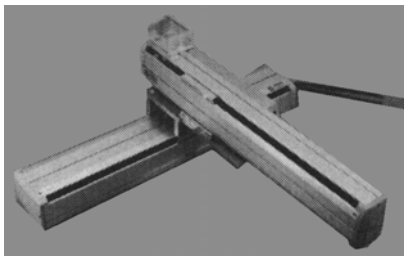
(1), (2)



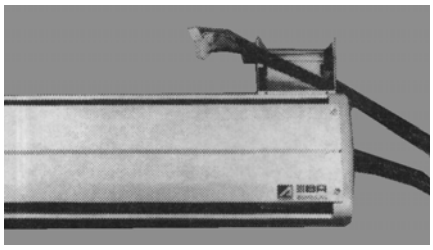
(3)



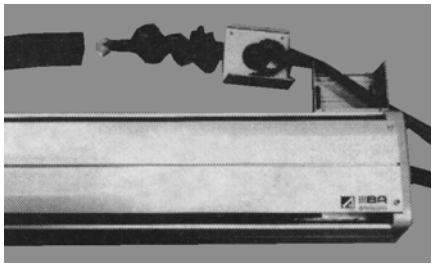
(4)



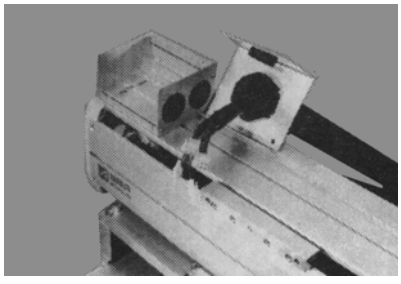
(5)–1



(5)–2

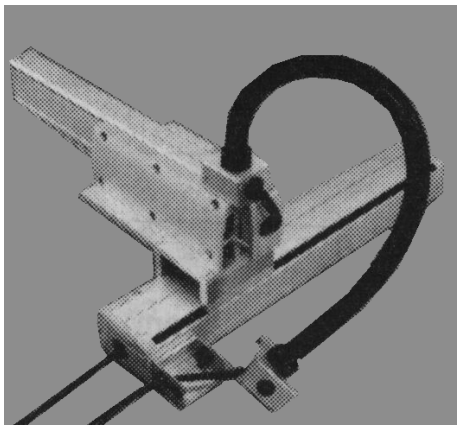


(5)–3

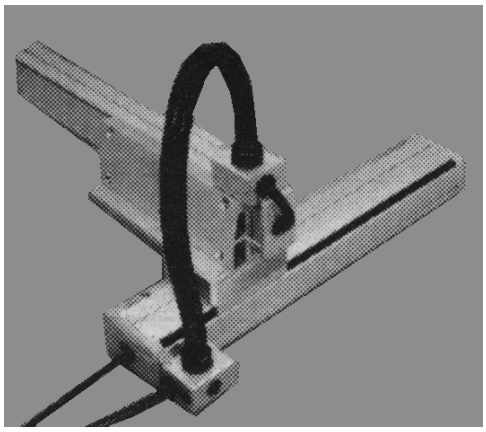


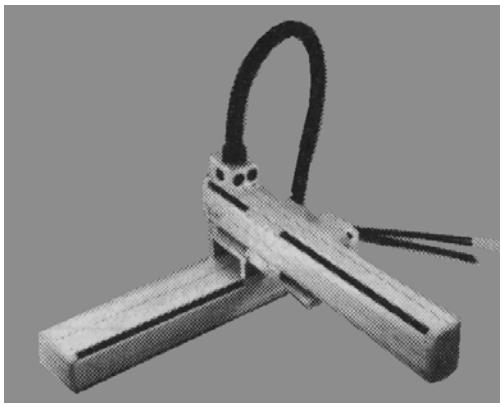
Discontinue

(6)



(7)

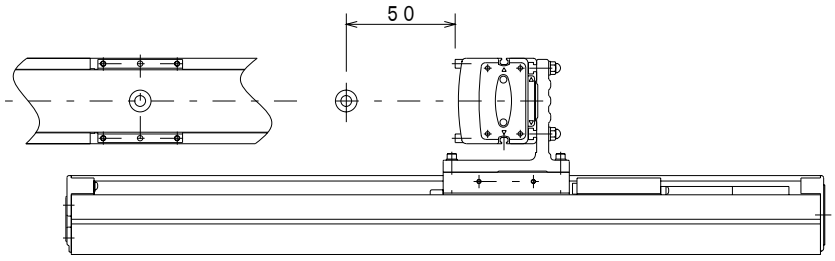




4.3.1 Yardstick for Combination Specifications

Type of axis	X-axis	KBB-50F-**-M20M-** (medium slider)								
	Y-axis	KBB-30F-**-M20M-** (medium slider)								
Motor	X-axis	AC servo motor, 200 W								
	Y-axis	AC servo motor, 200 W								
Drive system	X-axis	Ball screw (dia. 20 mm, lead 20 mm)								
	Y-axis	Ball screw (dia. 15 mm, lead 20 mm)								
Axis stroke (mm)	X-axis	100 ~ 1,500 (in increments of 100)								
	Y-axis	100 ~ 1,000 (in increments of 100)								
Maximum payload mass (kg)	Axis stroke	100	200	300	400	500	600	700	800	900	1000
		31	30	29	28	27	23	20	17	14	12
Maximum speed (mm/s)	X-axis	1,200 (Note 1)								
	Y-axis	1,200 (Note 1)								
Repeatability (mm)	X-axis	±0.01								
	Y-axis	±0.01								
Resolution (mm)	X-axis	0.01								
	Y-axis	0.01								
Acceleration/deceleration time (s)	X-axis	0.36								
	Y-axis	0.36								

- The above specifications refer to the combination as given in Para. 4.3.2.
- When the dimensions or configuration of the combination differ, the specifications will also differ accordingly.
- The center-of-gravity position of the load is indicated by in the figure below.



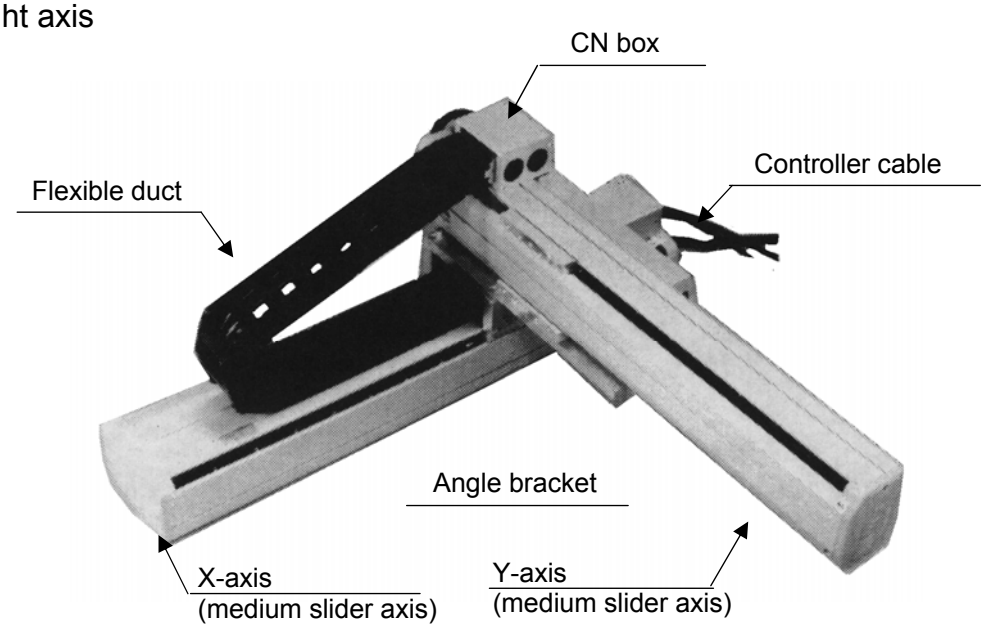
Note 1: The maximum speed is as follows according to the axis stroke.

[KBB–30F]
- Axis stroke 600 mm or less ····· Specified values
- Axis stroke 650 ~ 700 mm ····· 1,000 mm/s
- Axis stroke 750 ~ 800 mm ····· 800 mm/s
- Axis stroke 850 ~ 1,050 mm ····· 600 mm/s

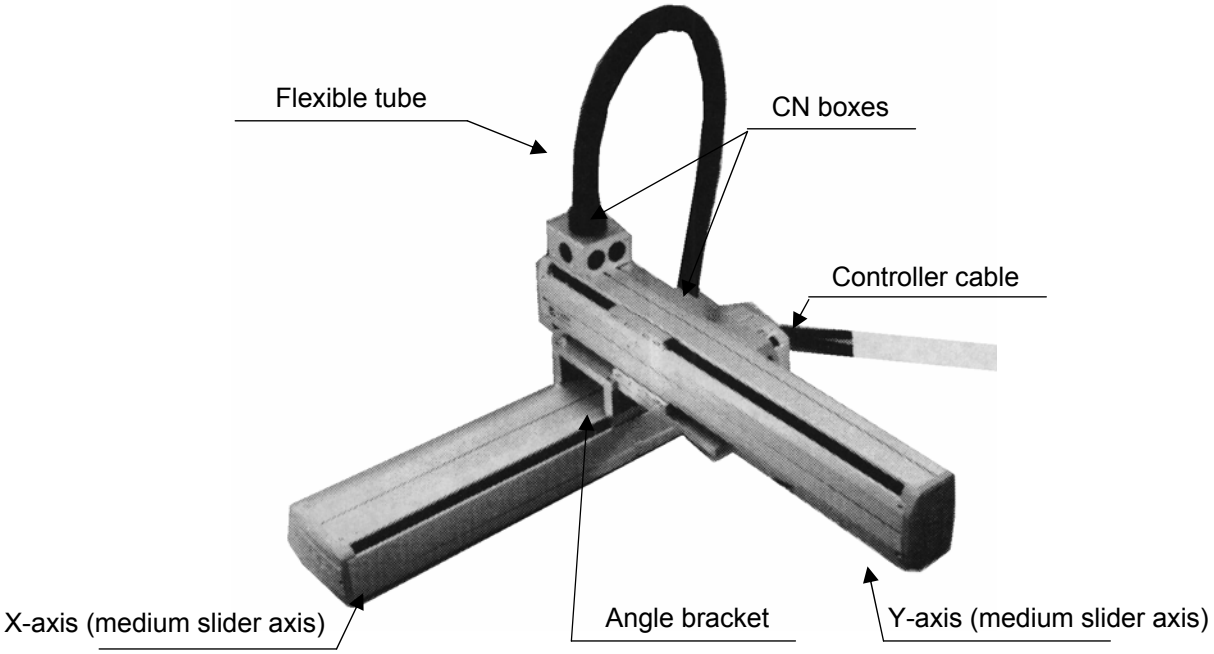
[KBB–50F]
- Axis stroke 600 mm or less ····· Specified values
- Axis stroke 650 ~ 800 mm ····· 1,100 mm/s
- Axis stroke 850 ~ 1,000 mm ····· 1,000 mm/s
- Axis stroke 1,050 ~ 1,200 mm ····· 700 mm/s
- Axis stroke 1,250, 1,300 mm ····· 500 mm/s
- Axis stroke 1,350, 1,400 mm ····· 400 mm/s
- Axis stroke 1,450, 1,500 mm ····· 300 mm/s

4.3.2 Example of Basic Combination

Straight axis



Example of laterally arranged flexible duct (between X- and Y-axes)



Example of horizontally arranged flexible tube

Points

- For the precautions on flexible duct connection, see Para. 2.6.
- For the precautions on flexible tube connection, see Para. 2.5.

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.

5.3.1 Inspection of Timing Belt

The timing belt should be inspected every 500 hours of operation.
• Check the belt for deterioration, fatigue, scratch, etc., and replace it immediately if any abnormality is found, referring to Para. 4.4 of the appropriate actuator instruction manual provided separately.
• When using the side mounted motor axis with brake for vertical use (as the Z-axis), strictly observe the following matters.

1. Be sure to replace the belt on a regular basis within 3,000 hours of operation.

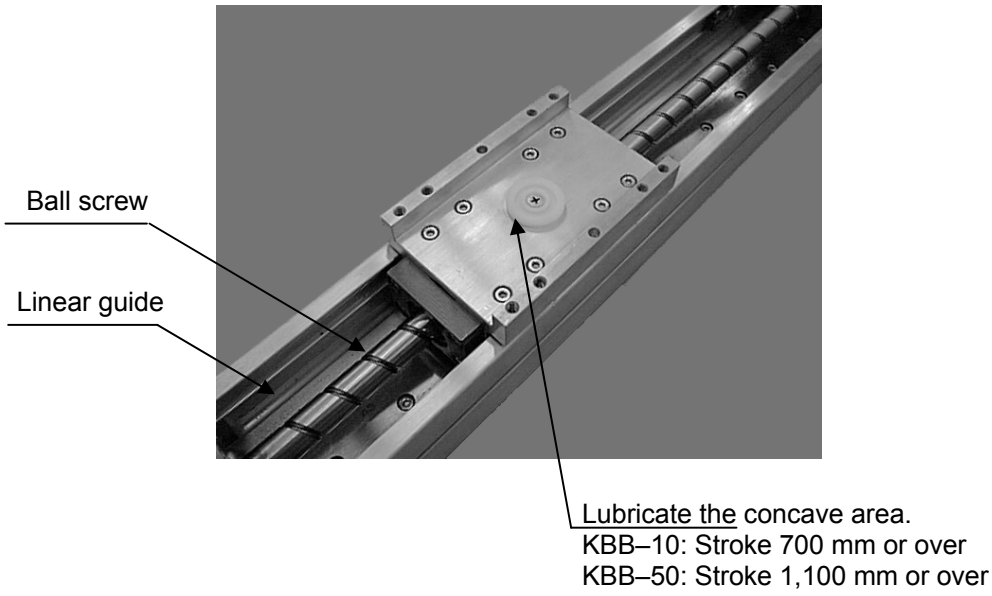
2. The service life of the belt is largely affected by the working environment and conditions. If any abnormality is found during inspection, replace the belt immediately.

If the belt has snapped while it was used vertically, it is very dangerous. To avoid this, replace the belt at an early stage.

5.4 Lubricating Each Part

(1) Lubricating points

The KBB–10 is exemplified in the photo below. Lubricate the same points also for the KBB–30 and KBB–50.



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 shaft.
Linear guide			Fill the oil of about 1 cc to each point from the grease nipple.

(2) Lubricating procedures

1. Turn off the drive power.
2. Remove the frame cover from the actuator.
3. Lubricate the above points requiring lubrication.
4. Wipe away any oozing oil and tarnished oil.
5. Attach the frame cover again.

5.5 Cleaning

Clean the robot body.

[Cleaning procedures]

1. Turn off the drive power.
2. Wipe off any dust or dirt left on the frame, each cover, etc., with a waste cloth.
3. Remove the frame cover, then wipe off any dust or dirt inside. Then, lubricate according to the lubricating procedures given in Para. 5.4.
4. Mount the frame cover again.

5.6 Spare Parts

5.6.1 Spare Parts for Actuator

- See the relevant actuator instruction manual provided separately.