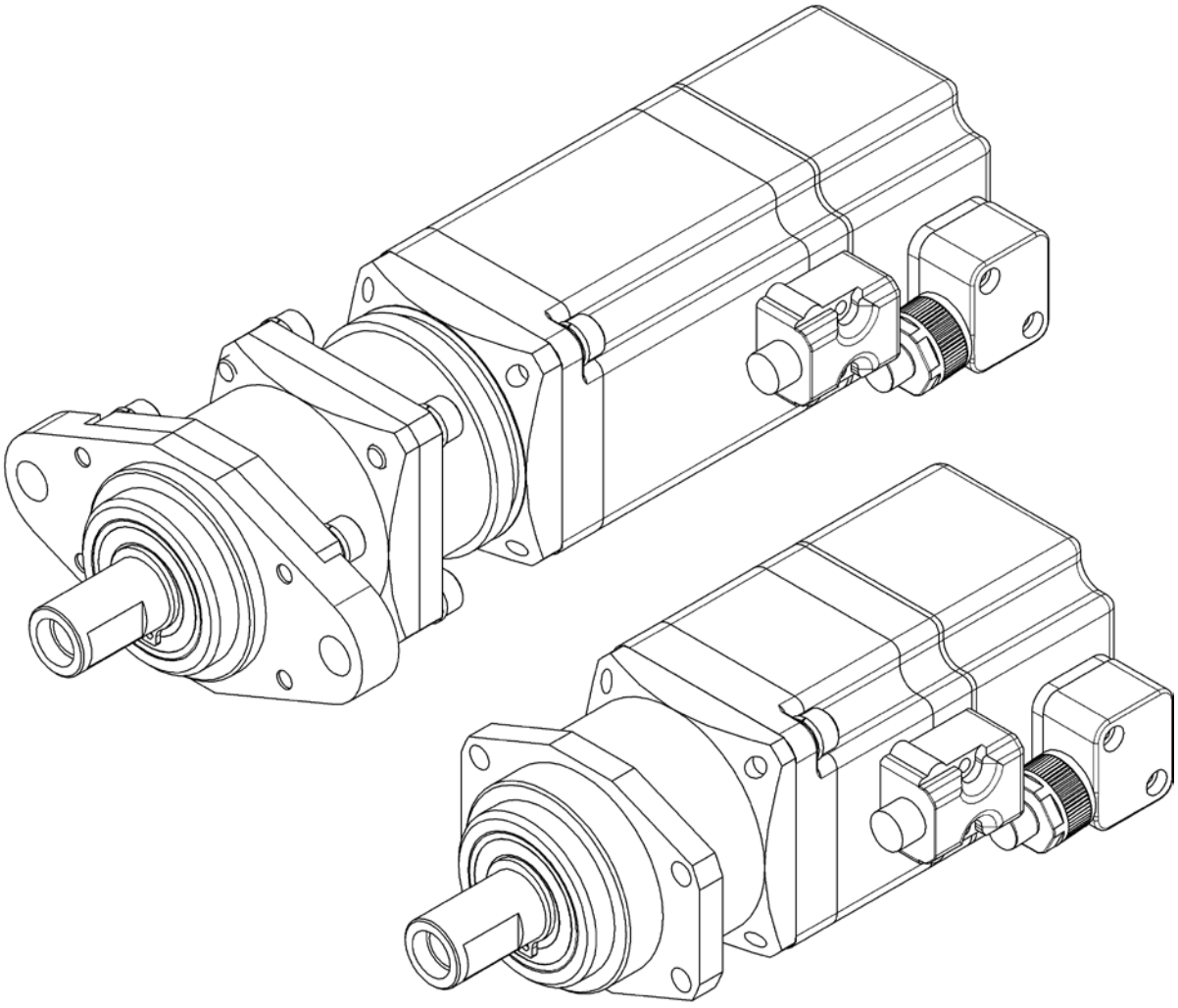
KX (T2) series (for SD550)

KX driver tool unit

Instruction manual Ver1.10



NITTO SEIKO CO.,LTD.

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Introduction

Thank you for purchasing the “KX driver”. The “KX driver”, which combines a tool unit and a controller unit (SD550 series) into one, is a high-performance driver using an AC servo motor for fastening screws etc.
To use the “KX driver” controllers correctly for many years, read this manual carefully.

General precautions

- By provision of operating manual recorded on CD-ROM, you shall be deemed to have agreed to the Terms and Conditions written in “readme.txt” on it.
- Contents of this manual are subject to update without notice according to specification change of the products.
- Unique nouns like the product name indicated in this brochure are registered or not registered trademark of each company.
- In the figures of this manual, the products may be shown with the covers and safety shielding materials removed for the ease of explanation on detailed parts. When you operate a product, be sure to replace specified covers and shielding materials and follow the Instruction manual.
- Since the figures in the manual show typical examples, the products you have received may differ from the figures.
- The Instruction manual may be changed as appropriate due to product modification and improvement of ease of use of this manual.
- If the Instruction manual is damaged or lost and you require a new one, contact our agent or nearest sales office.
- The products modified by users are out of warrantee coverage. We are not responsible for such products.

Precautions for use

- A final fastening torque value may vary depending on the output shaft rotation speed of a driver, and the inertia of the joint attached to the output shaft and so on. Set the motor current value and rotation speed properly according to the Instruction manual.
- Parameters (motor characteristic values) vary depending on tool unit model. Be sure to specify proper parameter values in accordance with the Instruction manual when a tool unit and the controller are connected. If an incorrect value is specified, the tool unit or the controller may be damaged.

Tool units covered by this Instruction manual

- KX050T2-01M*-20
- KX100T2-01M*-20
- KX150T2-01M*-20
- KX100T2-03M*-20
- KX150T2-03M*-20
- KX150T2-07M*-20
- KX400T2-07S*-20
- KX400T2-14S*-20
- KX050T2-01H*-20
- KX100T2-01H*-20
- KX150T2-01H*-20
- KX100T2-03H*-20
- KX150T2-03H*-20
- KX150T2-07H*-20
- KX150T2-01S*-20
- KX100T2-03S*-20
- KX150T2-03S*-20
- KX150T2-07S*-20

「*」 mark into the version number

Contents

For safe usage

When using this product (for installation, operation, maintenance, and inspection), be sure to understand the meaning of the following precautions and handle it correctly with much care for safety.
It is difficult to state clearly all items regarding safety in this manual. Therefore, be aware that accurate judgment about safety by persons handling this product is very important to avoid a risk.

DANGER	Indicates that incorrect handling may lead to an imminent injury accident (death or serious injury).
WARNING	Indicates that incorrect handling may lead an injury accident (death or serious injury).
CAUTION	Indicates that incorrect handling may lead to injury, physical damage, or machine operation failure.

Even the following items covered by “CAUTION” may lead to a serious accident. All the items are important. Be sure to follow the precautions:

Meanings of signs

(Example of sign)

INDICATES WHAT SHOULD BE TAKEN CARE OF.

INDICATES WHAT MUST NOT BE DONE.

INDICATES WHAT MUST BE DONE.

DANGER

- **Be sure to establish a ground.**

  Make sure to connect the earth terminal to an external ground. Otherwise, an electric shock or fire may occur.

WARNING

- **Don't touch rotating part.**

  During operation, don't touch rotating part of a driver. Otherwise, you may be injured.

- **Turn off power when an abnormal symptom is exhibited.**

  When an abnormal symptom is exhibited, such as smoke emission or bad smell, turn off the power and contact our agent or sales office to ask for repair. If the product is used without repair, a fire or electric shock accident may occur.

⚠ WARNING

- **Don't use a voltage other than specified.**

  Don't use the driver with a voltage other than specified. Otherwise, a fire, electric shock, or failure occurs.

- **Don't touch a part inside the controller.**

  Don't touch a part inside the controller. Otherwise, an electric shock or failure may occur.

- **Don't use the product in a place with much humidity, greasy fumes, or dust.**

  Don't use the product in a place where water is splashed, in a flammable gas atmosphere, and near a flammable substance. Otherwise, a fire, electric shock, or failure may occur.

- **Don't damage a cable.**

  Don't place a heavy object on, pull forcefully, or twist a cable.
  Otherwise, a cable may be broken, causing a fire, electric shock, accident, or failure.

- **Don't disassemble or modify the product.**

  Otherwise, a fire, electric shock, accident, or failure may occur.

⚠ CAUTION

- **Use a tool with a specified setting.**

  Since a parameter setting of a controller may vary depending on a tool unit, use the controller after configuring settings as specified. Otherwise, a fire or failure may occur.

- **Don't obstruct the ventilation hole of the controller.**

  Otherwise, heat is kept inside, and a fire or failure may occur.

- **Don't change wiring while power is turned on.**

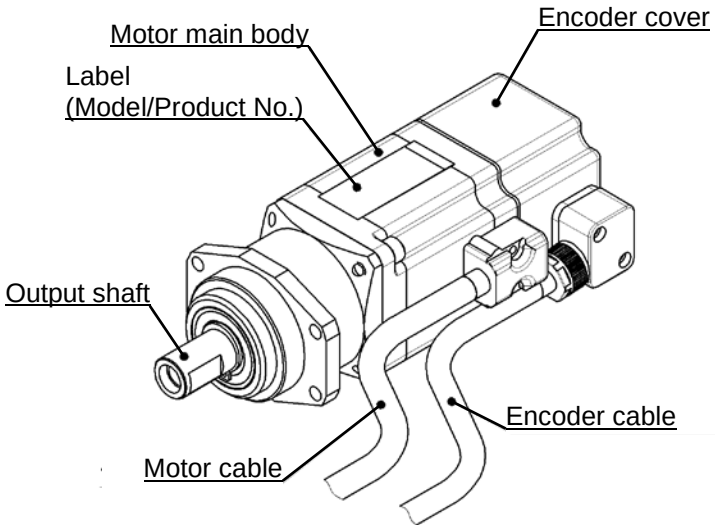
  Otherwise, an electric shock or failure may occur.

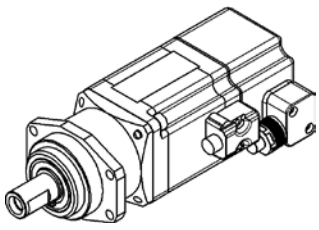
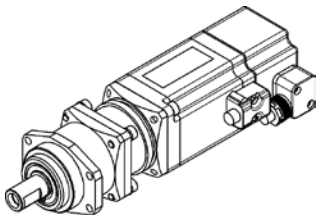
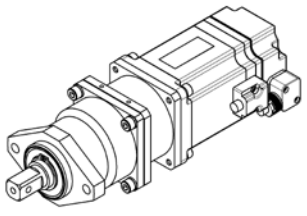
- **Fix each unit securely.**

  Fix a tool and controller securely before using.
  Otherwise, injury or failure may occur.

Preparation of driver

1. Part names



External view of tool unit	Tool type	Model
	Direct-coupling type 1/3 reduction type	KX□□□T2－□□□＊※3－20 ◎Rated output (Motor capacity) 050：50W 100：100W 150：150W 400：400W ◎Reduction ratio KX050T2：01 KX100T2：01，03 KX150T2：01，03，07 KX400T2：07，14 ◎Output shaft shape M：M8 Thread※1 H：Hex (6.35mm)※1 S：Square※2 (9.5mm except KX400 / 12.7mm for KX400)
	1/7 reduction type	※1 Output shaft of KX400 is Square type only. Internal thread type and Hex type are not available. ※2 Square type output shaft is not available for KX050 and KX100 with gear ratio 1/1 (direct coupled type). ※3「*」mark into the version number
	High Torque 1/7 reduction type 1/14 reduction type	

2. Inspection and Delivery

When you receive a KX driver series product, check and inspect it as follows:

Check/inspection item	Remarks
[1] Is the product what you have ordered?	Check it with the "Model" shown on the labels of the tool unit and the controller. (Refer to the table in previous clause.)
[2] Does the output shaft of the tool unit rotate smoothly?	It's OK if you can rotate it lightly with your hand.
[3] Is there any broken part?	Check for any damage caused during transportation etc. by viewing its appearance.
[4] Is there any tightened part, such as a screw, that comes loose?	Make a check with a tool, such as a wrench, as necessary.

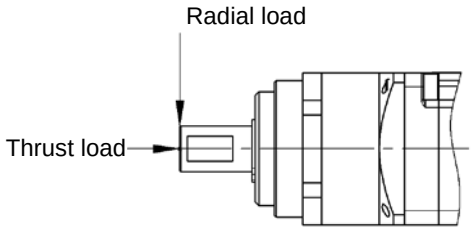
If you find any problem mentioned above, contact the agent you have purchased from or our sales office immediately.

3. Handling precautions

(1) Don't give a shock to the motor in the tool unit. Otherwise, a failure may occur.

(2) Don't pull a cable (encoder, motor power supply) of the tool unit. Otherwise, it may be broken. Be sure to fix the cable when installing the tool unit.

(3) Don't give a strong shock to or place a load on the output shaft of the tool unit. Otherwise, a failure may occur.
(Allowable loads are as follows.)



Allowable load (N)
Single load Axial load: 100 N max. Radial load: 50 N max. Combined load At axial load 80 N → Radial load 23 N max. At axial load 50 N → Radial load 43 N max.

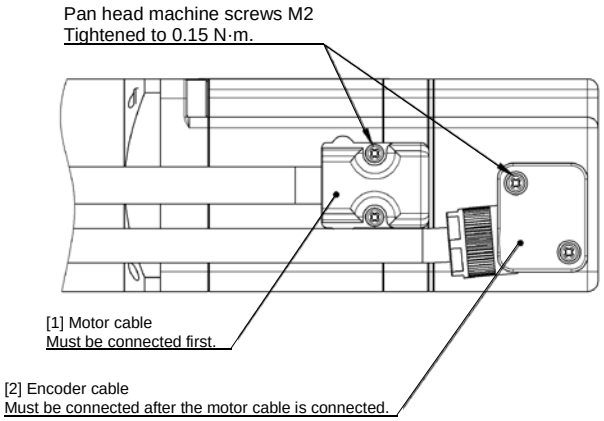
(4) The tool unit is designed to be used indoors. Use it under the following environment.
(The motor section supports IP55 (with some exception))

- **Indoor environment free from corrosive and explosive gas**
- **Well-ventilated and free from dust and humidity**
- **Ambient temperature range: 0–40°C**
- **Humidity range: 20-80%RH without condensation**
- **1000m less or equal above sea level.**
- **Environment enabling easy inspection and cleaning**
- **Locations free from strong electric or magnetic field**
- **Locations in which atmosphere is free from conductive powders including iron powder**
- **Locations free from excessive vibration or impact**

4. Cable connection

Connect a motor cable and an encoder cable to the tool unit as shown in the right figure. (For connection at the controller, refer to a separate document “Driver controller SD550 Instruction manual ”.)

Be sure to connect the motor cable first, and then connect the encoder cable. Fix each connector with 2 M2 pan head machine screws (supplied with the connector). Tighten the screws securely to a torque of 0.15 N·m and confirm the connector is not loose. Since each connector uses packing, don’t lose it when attaching/detaching the connector.

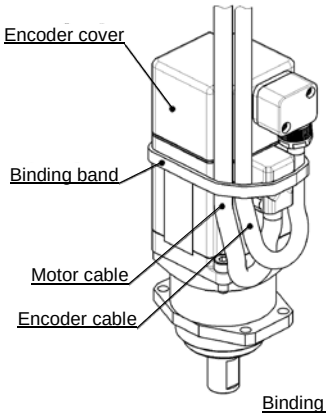


* Be careful not to lose the rubber packing.

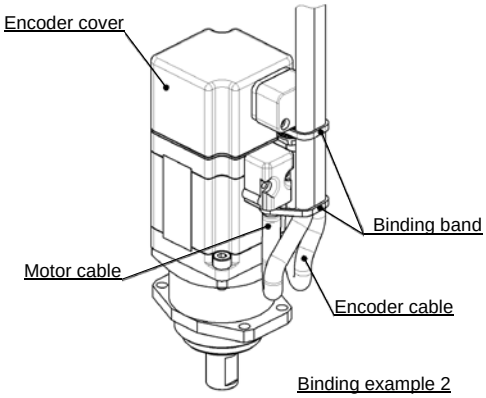
Example of fixing a cable

Fix a cable with a binding band etc. as shown in the right figure.

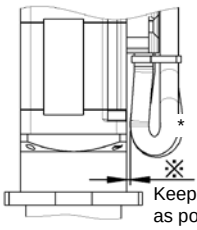
(Note 1) Be sure to connect a motor cable first, and then connect an encoder cable.
(Note 2) When fixing a cable, be sure to hold the connector.
(Note 3) Bending radius of the motor cable should be not less than 50 mm.
(Note 4) Prevent the binding band and the cable etc. from applying an external force to the encoder cover.
Otherwise, the encoder may fail.
(Note 5) In the case of the binding example 1, be sure to fix the cables in such a way that the encoder cable comes between the motor cable and the connector.



Binding example 1



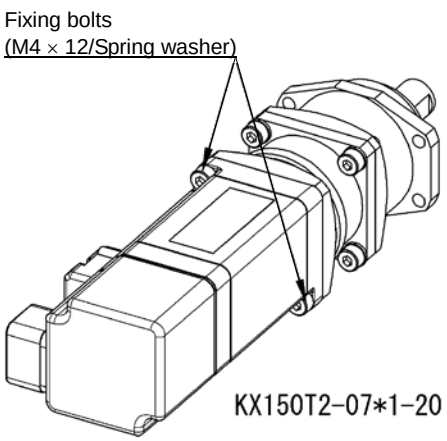
Binding example 2

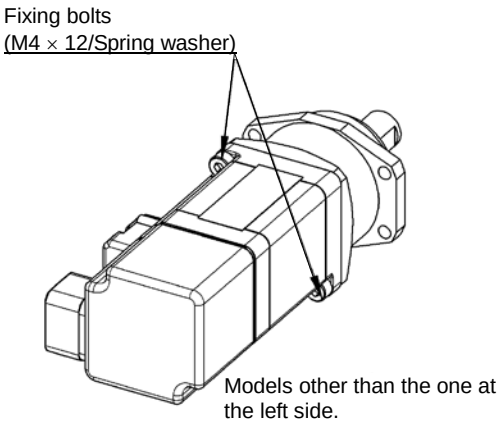


5. How to change the orientation of the motor connector

Normally, the cable connector at the motor of the KX driver is oriented as shown in the figure below. However, the cable connector may cause interference when multiple drivers are installed next to each other or depending on the shape of equipment to be attached. Be sure to follow the procedure below when you are forced to change the orientation of the motor connector due to the interference.

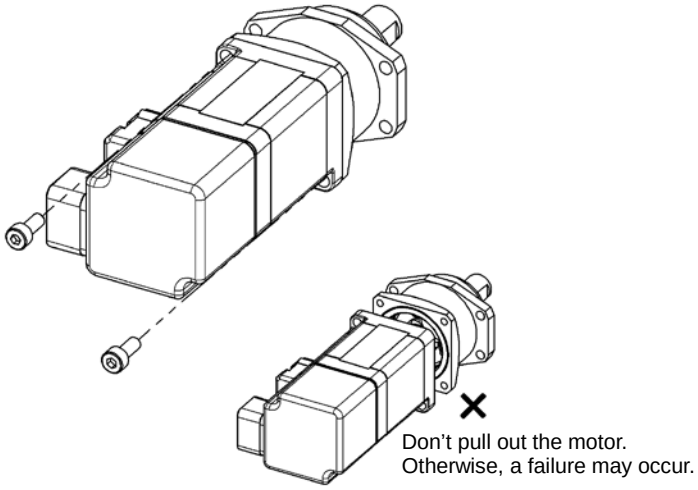
*** Remove only the fixing screws, and don't pull out the motor from the driver case. Otherwise, a malfunction or a failure may occur.**



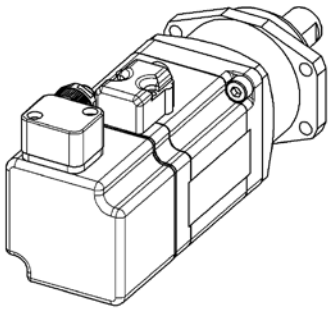


Procedure to change the orientation of the motor connector

[1] Remove the hexagon socket cap screws (M4 × 12) fixing the motor and the spring washers.

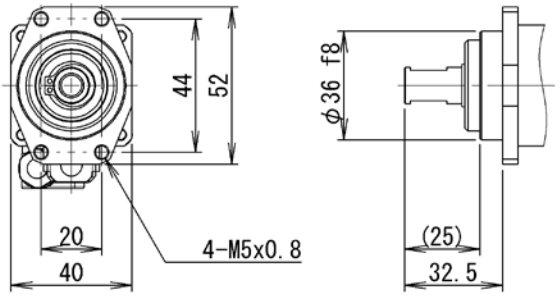


[2] Rotate the motor in any direction without pulling it out.
[3] Fix the fixing bolts to 3 ±0.3 N·m.

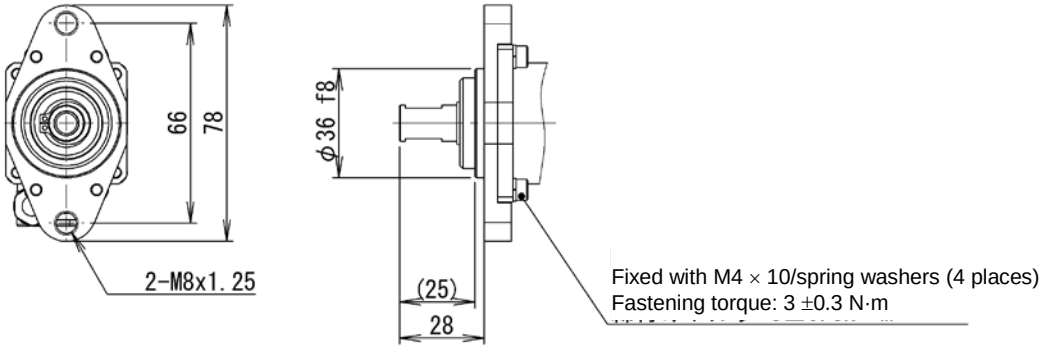


6. Flange (optional) compatible with previous models

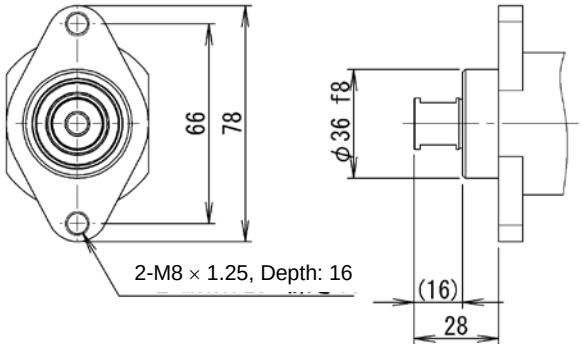
The mounting flange of the KX***T2 series is made smaller than that of previous KX***-T1/TU series to increase flexibility in installation. For this reason, mounting hole pitch of KX050T2～KX150T2 is different from that of previous models.
If previous pitch is required for mounting, attach the optional BU specification flange compatible with previous models. In this case, the distance between the output shaft end and the flange, and the hole diameter are the same as those of previous models.



KX***T2: Standard specification



OP: BU specification (with previous model-compatible flange)



KX***-T1/TU series (Previous model)

7. Parameter setting

The parameters referred to here are the setting values indicating the characteristics of the tool unit. The parameters vary depending on the combination of a tool and a controller.
When a tool unit or a controller is changed, be sure to set the parameters shown in the table below.
Incorrect setting values may **damage** a tool unit or a controller unit. So, set the parameters correctly.
(For how to set parameters, refer to a separate document “Driver controller SD550 Instruction manual ”.)

Tool unit model / Parameter number	**KX050T2-01**	**KX100T2-01**	**KX150T2-01**	**KX100T2-03**	**KX150T2-03**	**KX150T2-07**	**KX400T2-07**	**KX400T2-14**
Pa 18 （ LP 18 ）	0350	0350	0350	0350	0350	0350	0350	0350
Pa 60 （ LP 60 ）	0001	0001	0001	0096	0096	0078	0064	0225
Pa 61 （ LP 61 ）	0001	0001	0001	0029	0029	0011	0009	0016
Pa 121 （ LP. 21 ）	0004	0004	0003	0004	0003	0003	0003	0003
Pa 122 （ LP. 22 ）	0450	0348	0170	0348	0170	0170	0230	0230
Pa 123 （ LP. 23 ）	0113	0158	0156	0158	0156	0156	0220	0220
Pa 124 （ LP. 24 ）	0087	0122	0191	0122	0191	0191	0177	0177
Pa 125 （ LP. 25 ）	0305	0427	0669	0427	0669	0669	0620	0620

(Note): The numeric values in parentheses in the parameter number column indicate the display of the controller.

♦ **How to set parameter**

Set parameters as follows:

(For more information on each parameter, refer to a separate document “Parameter list”.)

(Controller display example)

[1] Press ◄ key to move the cursor (blinking digit) to the upper most digit.

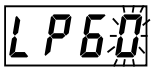
[2] While holding down # key, press ▼ key or ▲ key to change the digit at cursor position to “L”.

[3] Press ► key to move the cursor to the next right digit.

[4] While holding down # key, press ▼ key or ▲ key to change the digit at cursor position to “P”.
(When you set parameters 100-199, press # key and ▼ key at the same time while holding down ▲ key to change the digit to “P.”.)

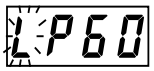
[5] Press ► key to move the cursor to the right, and press ▲ ▼ key to change the number of a parameter that you want to set.

[6] Press ► key to move the cursor to the right most digit (4th digit).

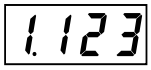


[7] If ► key is pressed further, the setting value of current parameter is displayed. Using ►, ▲ or ▼ key, change the value displayed.

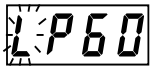
[8] After the setting value of the parameter is changed, press ◄ key to move the cursor to the upper most digit (“L” is displayed).



[9] Press and hold down ◄ key until the display changes to numeric values.
(Previous display is restored if the key is released.)



[10] Writing the setting values to the flash memory is completed with the steps above.
To change a setting value of another parameter, repeat the steps from [4] to [9].



[11] After all the changes have been completed, **turn off the power. After the indication on the display has been disappeared, turn on the power again.**

(Caution) The values shown on the controller display are for example only. So, actual values may be different.

8. Torque and output shaft rotation speed settings

Normally, the torque setting is configured to the specification of customers. However, you may change the setting as necessary. Configure the fastening torque setting for the KX driver, referring to the two graphs (and comparison tables).
Use the comparison table as an aid when you read torque values from the graph.
(For how to set a torque, refer to a separate document “Driver controller SD550 Instruction manual ”.)

Graph [1]: “Relation between output shaft rotation speed and impact torque”
[Output shaft rotation speed – Impact torque comparison table]
(Mainly used for setting current value[*1] and rotation speed[*2] during initial rundown.)

Graph [2]: “Relation between set current value and shaft output torque”
[Set current value – Shaft output torque comparison table]
(Mainly used for setting current value during final fastening.)

*1: As the current becomes lower, the rotation speed can be increased, so that the time required for fastening becomes shorter. However, if the current is decreased too low, the 2nd stage setting value takes effect in the middle of fastening (before seating), so that the time may be prolonged instead.

*2: If the rotation speed is increased too high during initial rundown, a target fastening torque is exceeded because of the driver output shaft characteristic, a force (inertia) that keeps the shaft rotating. So, take much care!

The next page explains how to read graphs and shows graphs by tool unit model.

Caution (1): Set the rotation speed of the output shaft of a tool unit to 30 rpm or higher.
Caution (2): The comparison table and graph are for your reference. Use the values as rough standard.

[Remarks]

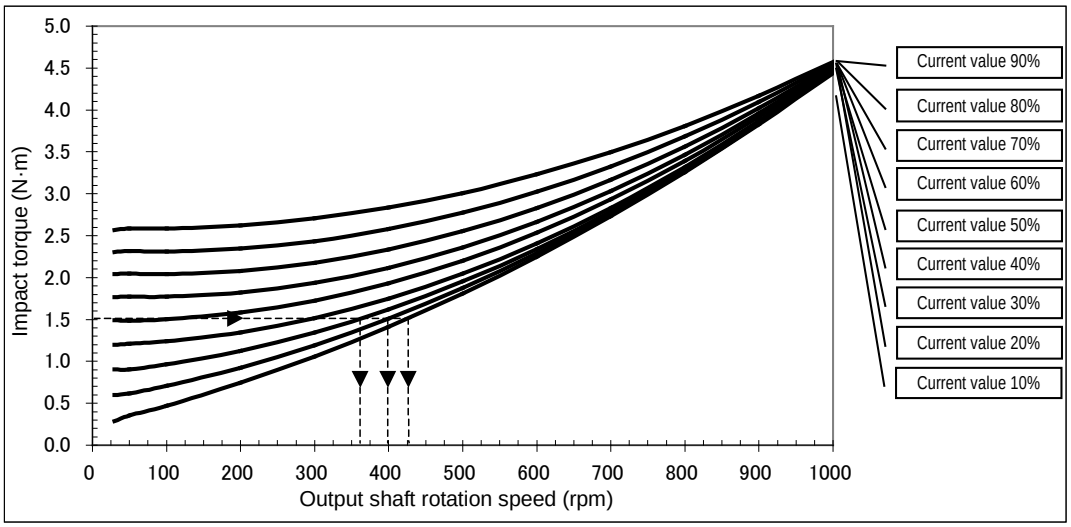
Current value:	The value of a current applied to the motor of a KX driver tool unit.
Set current value:	A value expressed when the maximum output of a KX driver is assumed 100%
Impact torque:	A momentary torque generated (due to inertia) to keep rotating the shaft when the rotating output shaft of a KX driver tool unit is stopped suddenly

♦ **How to read graph [1]**

(Example) When target torque is 1.5 N·m

Read the intersections of the horizontal line of the impact torque 1.5 N·m and the "Output shaft rotation speed - Impact torque" curves. You can find

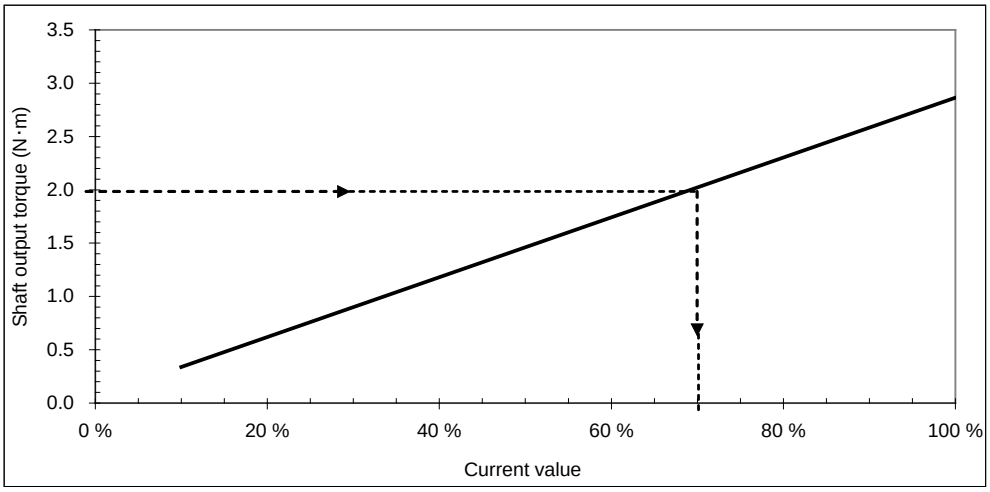
(1) Output shaft rotation speed is 360 rpm when set current value is 30%.
(2) Output shaft rotation speed is 400 rpm when set current value is 20%.
(3) Output shaft rotation speed is 425 rpm when set current value is 10%.



♦ **How to read graph [2]**

(Example) When target torque is 2.0 N·m

Read the intersection of the horizontal line of the impact torque 2.0 N·m and the "Set current value - Output shaft rotation speed" line. You can find the set current value is 70%.



♦ **Setting procedure**

At first, the KX series drivers perform temporary fastening (from fastening start to seating) at a high speed. Next, the drivers perform final fastening at a low speed. By so doing, the XY drivers balance a fastening speed and torque accuracy. For this reason, the most important point to decrease a tact time is to increase the rotation speed as much as possible for initial rundown.

[1] Setting torque during initial rundown/Rotation speed

First, set a torque during initial rundown. For machine screws, a current value of 10% is specified normally. For screws requiring higher torque, such as tapping screws, specify as low a torque as possible to the extent that stable seating can be achieved.

The rotation speed during initial rundown should be as high as possible. However, if it is specified too high, a target torque for final fastening is exceeded due to the inertia of the rotation system, spoiling correct fastening.

For example, assume that you tighten a machine screw using the KX150T1-01*1-20 and the final target torque is 3 N·m.

Set the set current value during initial rundown to **10%** because almost no torque is required for initial rundown until seating is achieved.

Stable fastening can't be expected unless the impact torque at seating due to inertia is limited to 80–90% of a target torque for final fastening. Since a target torque is 3 N·m in this example, the impact torque to 2.6 N·m (87%) is decided to be allowed. From the graph [1], you can read that it is 900 rpm that generates an impact torque of 2.6 N·m when the set current value is set to 10%. Therefore, set the rotation speed during initial rundown to **900 rpm**. (The value varies depending on workpiece, screw, and output shaft shape etc.)

[2] Setting final fastening set current value/Rotation speed

From the graph [2], set a final fastening set current value to **68%** because the final fastening target torque is 3 N·m. Since fastening becomes more stable as the rotation speed is decreased as much as possible, contrary to initial rundown, **50 rpm** is specified. However, fastening becomes unstable if the speed is decreased to 30 rpm. So, set it to 50 rpm normally.

Setting values

Current value during initial rundown 10%
Revolving speed during initial rundown 900 rpm

Current value for final fastening 68%
Revolving speed for final fastening 50 rpm

[3] Trial fastening・Adjustment

After configuring the SD550 controller to satisfy the above conditions, perform trial fastening using a torque checker etc. If the torque is stable, setting up is completed. Or, you may make an adjustment to increase temporary fastening rotation speed within a range in which torque is stable. If the torque is not stable, the fastening rotation speed may be too high. If you have specified a value higher than 50 rpm for final fastening rotation speed, try decreasing it. If no improvement is seen, the impact torque at seating due to a low rotation speed during initial rundown may be the cause of the problem. Try decreasing the rotation speed during initial rundown.

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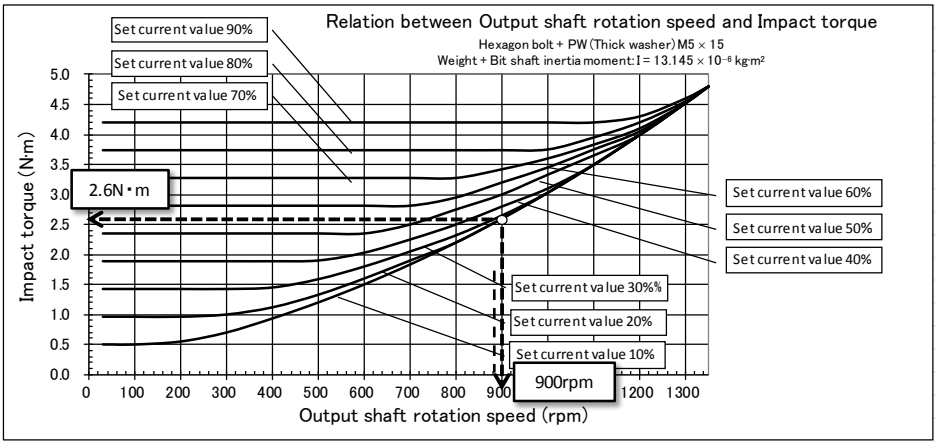
Graph [1] (Output shaft rotation speed – Impact torque comparison table)

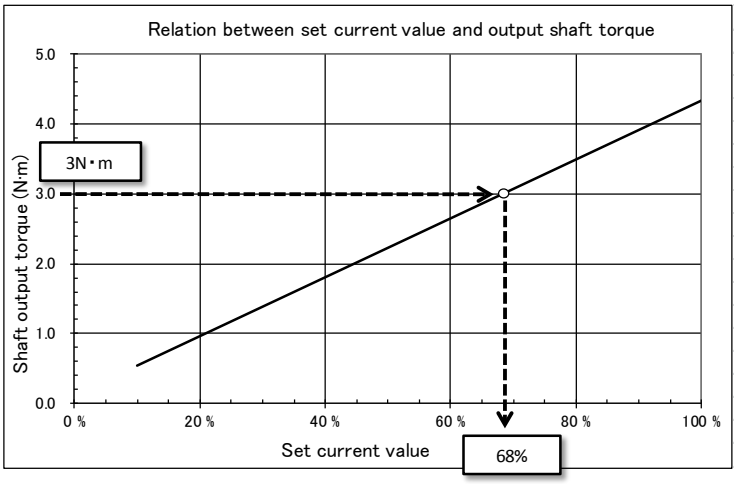
	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
30 rpm	**0.50 N・m**	0.96 N・m	1.43 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
50 rpm	**0.50 N・m**	0.96 N・m	1.43 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
100 rpm	**0.50 N・m**	0.96 N・m	1.43 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
200 rpm	**0.55 N・m**	0.96 N・m	1.43 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
300 rpm	**0.70 N・m**	1.00 N・m	1.43 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
400 rpm	**0.93 N・m**	1.12 N・m	1.45 N・m	1.89 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
500 rpm	**1.20 N・m**	1.33 N・m	1.59 N・m	1.90 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
600 rpm	**1.50 N・m**	1.60 N・m	1.80 N・m	2.03 N・m	2.35 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
700 rpm	**1.83 N・m**	1.90 N・m	2.05 N・m	2.25 N・m	2.50 N・m	2.81 N・m	3.28 N・m	3.74 N・m	4.20 N・m
800 rpm	**2.20 N・m**	2.20 N・m	2.32 N・m	2.50 N・m	2.75 N・m	2.95 N・m	3.28 N・m	3.74 N・m	4.20 N・m
900 rpm	**2.60 N・m**	2.60 N・m	2.65 N・m	2.80 N・m	3.00 N・m	3.20 N・m	3.42 N・m	3.74 N・m	4.20 N・m
1000 rpm	**3.03 N・m**	3.03 N・m	3.03 N・m	3.10 N・m	3.33 N・m	3.45 N・m	3.60 N・m	3.75 N・m	4.20 N・m
1100 rpm	**3.49 N・m**	3.49 N・m	3.49 N・m	3.49 N・m	3.65 N・m	3.75 N・m	3.83 N・m	3.95 N・m	4.20 N・m
1200 rpm	**3.99 N・m**	3.99 N・m	3.99 N・m	3.99 N・m	3.99 N・m	4.05 N・m	4.10 N・m	4.20 N・m	4.30 N・m
1300 rpm	**4.52 N・m**	4.52 N・m	4.52 N・m	4.52 N・m	4.52 N・m	4.52 N・m	4.52 N・m	4.55 N・m	4.60 N・m
1350 rpm	**4.80 N・m**	4.80 N・m	4.80 N・m	4.80 N・m	4.80 N・m	4.80 N・m	4.80 N・m	4.80 N・m	4.80 N・m

Graph [2] (Set current value - Shaft output torque comparison table)



Graph [2] (Set current value – Shaft output torque comparison table)

Set current value	Shaft output torque
10 %	0.46 N・m
15 %	0.69 N・m
20 %	0.93 N・m
25 %	1.16 N・m
30 %	1.39 N・m
35 %	1.61 N・m
40 %	1.83 N・m
45 %	2.05 N・m
50 %	2.27 N・m
55 %	2.48 N・m
60 %	2.69 N・m
65 %	**2.90 N・m**
70 %	**3.10 N・m**
75 %	3.30 N・m
80 %	3.50 N・m
85 %	3.69 N・m
90 %	3.89 N・m
95 %	4.07 N・m
100 %	4.26 N・m



This setting method is an example. The setting values vary depending on screw type, workpiece, fastening direction, and output shaft shape etc.

Graphs of various models are shown on the next pages onward. The data is acquired with actual output shaft assumed and a weight (inertia moment I = 13.145×10^{-6} kg·m^2) attached.

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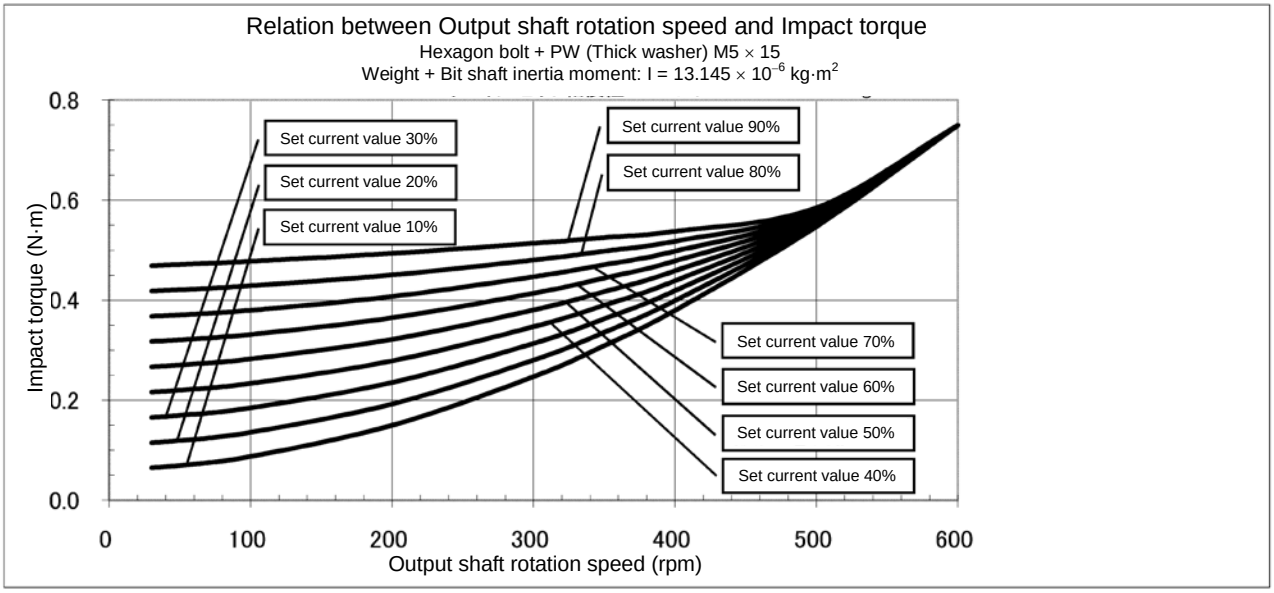
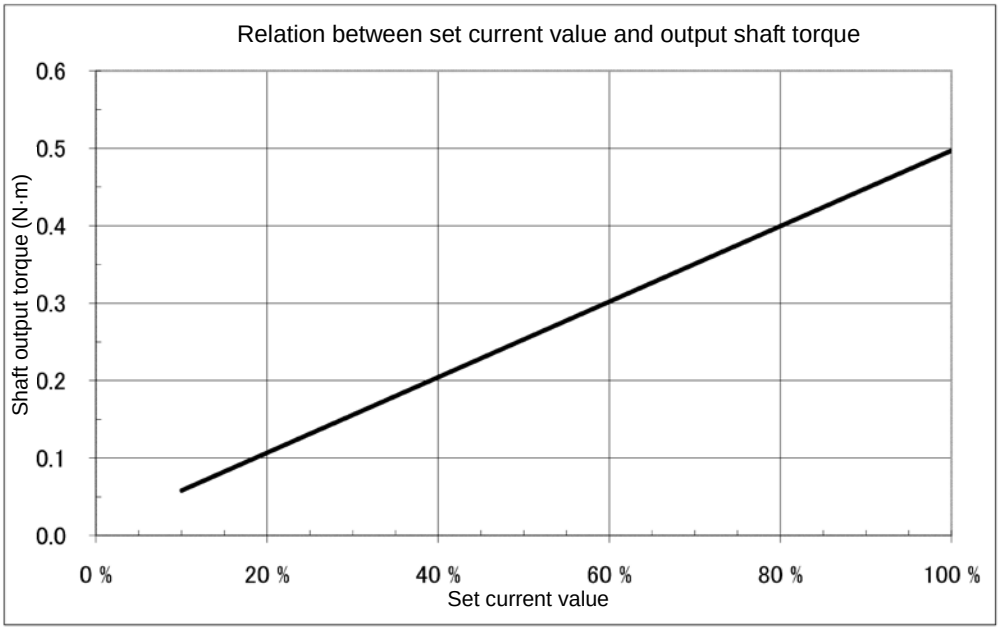
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
30 rpm	0.07 N･m	0.12 N･m	0.17 N･m	0.22 N･m	0.27 N･m	0.32 N･m	0.37 N･m	0.42 N･m	0.47 N･m
50 rpm	0.07 N･m	0.12 N･m	0.17 N･m	0.22 N･m	0.27 N･m	0.32 N･m	0.37 N･m	0.42 N･m	0.47 N･m
100 rpm	0.09 N･m	0.14 N･m	0.19 N･m	0.23 N･m	0.28 N･m	0.33 N･m	0.38 N･m	0.43 N･m	0.48 N･m
200 rpm	0.15 N･m	0.19 N･m	0.24 N･m	0.28 N･m	0.32 N･m	0.36 N･m	0.41 N･m	0.45 N･m	0.49 N･m
300 rpm	0.25 N･m	0.28 N･m	0.31 N･m	0.35 N･m	0.38 N･m	0.41 N･m	0.45 N･m	0.48 N･m	0.51 N･m
350 rpm	0.31 N･m	0.34 N･m	0.36 N･m	0.39 N･m	0.42 N･m	0.44 N･m	0.47 N･m	0.50 N･m	0.53 N･m
400 rpm	0.38 N･m	0.40 N･m	0.42 N･m	0.44 N･m	0.46 N･m	0.48 N･m	0.50 N･m	0.52 N･m	0.54 N･m
500 rpm	0.55 N･m	0.55 N･m	0.56 N･m	0.56 N･m	0.57 N･m	0.57 N･m	0.58 N･m	0.58 N･m	0.59 N･m
600 rpm	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m	0.75 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

Set current value	Shaft output torque
10 %	0.05 N･m
15 %	0.08 N･m
20 %	0.10 N･m
25 %	0.13 N･m
30 %	0.16 N･m
35 %	0.18 N･m
40 %	0.21 N･m
45 %	0.23 N･m
50 %	0.26 N･m
55 %	0.28 N･m
60 %	0.31 N･m
65 %	0.33 N･m
70 %	0.36 N･m
75 %	0.38 N･m
80 %	0.40 N･m
85 %	0.42 N･m
90 %	0.44 N･m
95 %	0.47 N･m
100 %	0.49 N･m



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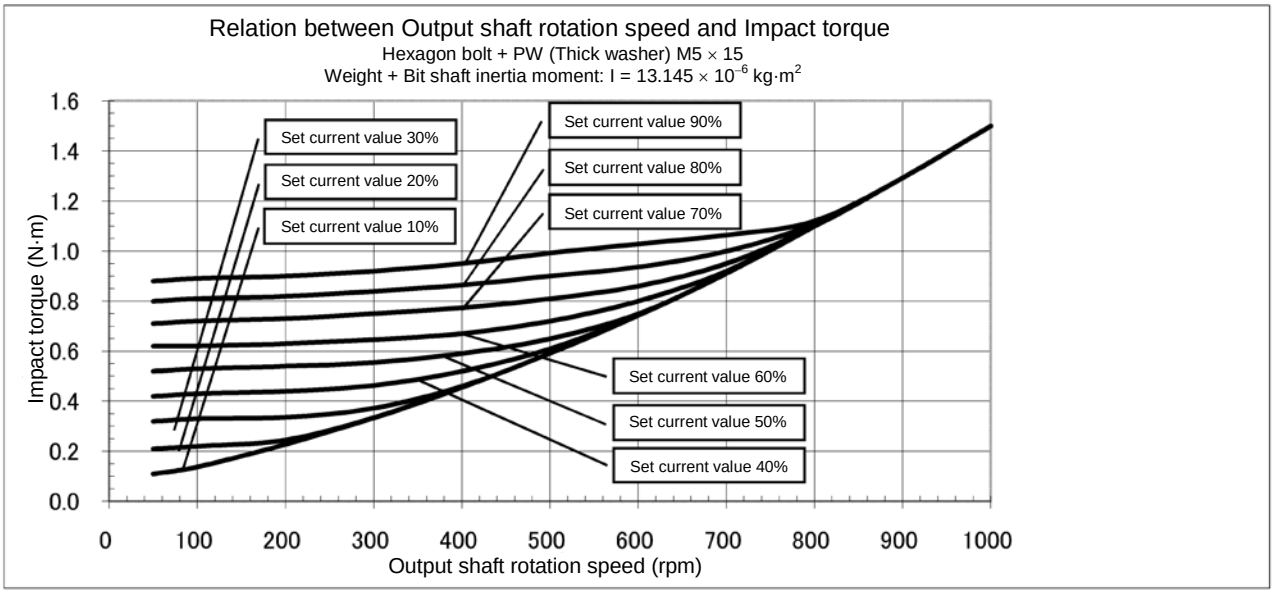
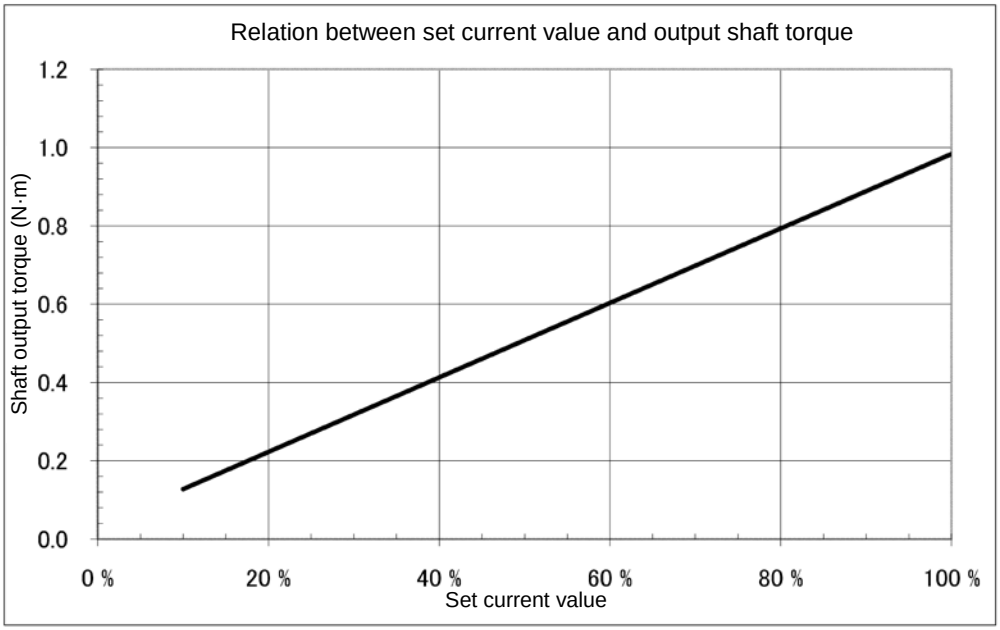
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
50 rpm	0.11 N･m	0.21 N･m	0.32 N･m	0.42 N･m	0.52 N･m	0.62 N･m	0.71 N･m	0.80 N･m	0.88 N･m
100 rpm	0.14 N･m	0.22 N･m	0.33 N･m	0.43 N･m	0.53 N･m	0.62 N･m	0.72 N･m	0.81 N･m	0.89 N･m
200 rpm	0.23 N･m	0.25 N･m	0.34 N･m	0.44 N･m	0.54 N･m	0.63 N･m	0.73 N･m	0.82 N･m	0.90 N･m
300 rpm	0.33 N･m	0.33 N･m	0.37 N･m	0.46 N･m	0.56 N･m	0.65 N･m	0.75 N･m	0.84 N･m	0.92 N･m
400 rpm	0.46 N･m	0.46 N･m	0.46 N･m	0.52 N･m	0.59 N･m	0.67 N･m	0.77 N･m	0.86 N･m	0.95 N･m
500 rpm	0.59 N･m	0.59 N･m	0.59 N･m	0.61 N･m	0.65 N･m	0.72 N･m	0.81 N･m	0.90 N･m	0.99 N･m
600 rpm	0.74 N･m	0.74 N･m	0.74 N･m	0.74 N･m	0.75 N･m	0.80 N･m	0.86 N･m	0.94 N･m	1.03 N･m
700 rpm	0.91 N･m	0.91 N･m	0.91 N･m	0.91 N･m	0.91 N･m	0.92 N･m	0.95 N･m	1.00 N･m	1.06 N･m
800 rpm	1.10 N･m	1.10 N･m	1.10 N･m	1.10 N･m	1.10 N･m	1.10 N･m	1.10 N･m	1.11 N･m	1.12 N･m
900 rpm	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m	1.29 N･m
1000 rpm	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m	1.50 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

Set current value	Shaft output torque
10 %	0.11 N･m
15 %	0.16 N･m
20 %	0.21 N･m
25 %	0.27 N･m
30 %	0.32 N･m
35 %	0.37 N･m
40 %	0.42 N･m
45 %	0.47 N･m
50 %	0.52 N･m
55 %	0.57 N･m
60 %	0.62 N･m
65 %	0.66 N･m
70 %	0.71 N･m
75 %	0.75 N･m
80 %	0.80 N･m
85 %	0.84 N･m
90 %	0.88 N･m
95 %	0.92 N･m
100 %	0.96 N･m



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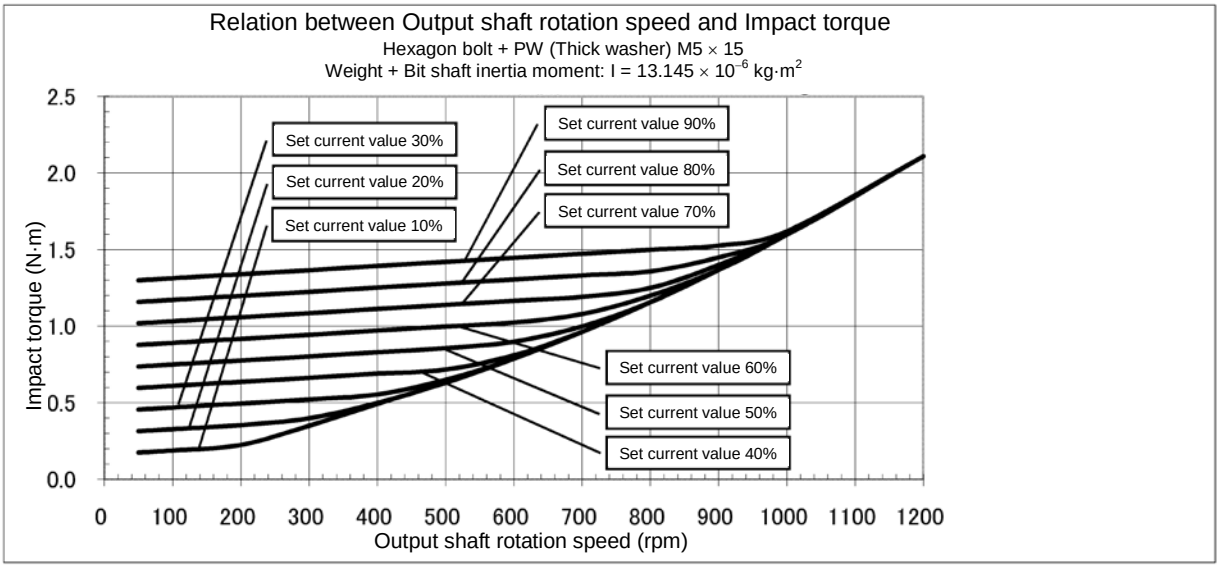
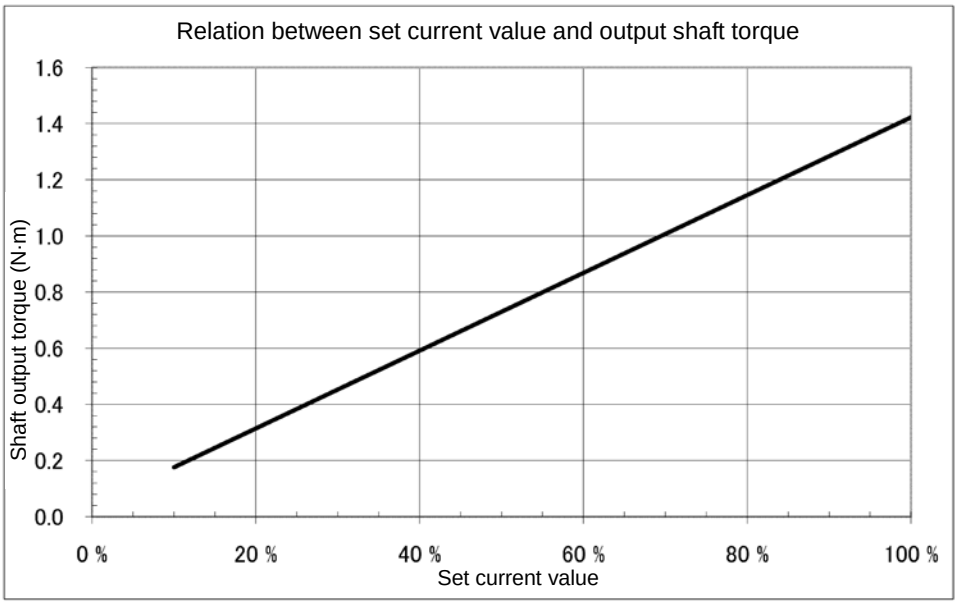
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
50 rpm	0.18 N･m	0.32 N･m	0.46 N･m	0.60 N･m	0.74 N･m	0.88 N･m	1.02 N･m	1.16 N･m	1.30 N･m
100 rpm	0.19 N･m	0.33 N･m	0.47 N･m	0.61 N･m	0.75 N･m	0.89 N･m	1.03 N･m	1.17 N･m	1.31 N･m
200 rpm	0.23 N･m	0.36 N･m	0.50 N･m	0.64 N･m	0.78 N･m	0.92 N･m	1.06 N･m	1.20 N･m	1.34 N･m
300 rpm	0.35 N･m	0.40 N･m	0.52 N･m	0.66 N･m	0.80 N･m	0.94 N･m	1.09 N･m	1.23 N･m	1.37 N･m
400 rpm	0.49 N･m	0.50 N･m	0.56 N･m	0.69 N･m	0.83 N･m	0.97 N･m	1.11 N･m	1.25 N･m	1.39 N･m
500 rpm	0.63 N･m	0.63 N･m	0.65 N･m	0.72 N･m	0.86 N･m	1.00 N･m	1.14 N･m	1.28 N･m	1.42 N･m
600 rpm	0.79 N･m	0.79 N･m	0.79 N･m	0.81 N･m	0.90 N･m	1.02 N･m	1.17 N･m	1.31 N･m	1.45 N･m
700 rpm	0.96 N･m	0.96 N･m	0.96 N･m	0.96 N･m	1.00 N･m	1.08 N･m	1.19 N･m	1.33 N･m	1.47 N･m
800 rpm	1.16 N･m	1.16 N･m	1.16 N･m	1.16 N･m	1.16 N･m	1.20 N･m	1.25 N･m	1.36 N･m	1.50 N･m
900 rpm	1.37 N･m	1.37 N･m	1.37 N･m	1.37 N･m	1.37 N･m	1.37 N･m	1.40 N･m	1.45 N･m	1.53 N･m
1000 rpm	1.60 N･m	1.60 N･m	1.60 N･m	1.60 N･m	1.60 N･m	1.60 N･m	1.60 N･m	1.60 N･m	1.62 N･m
1200 rpm	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m	2.11 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

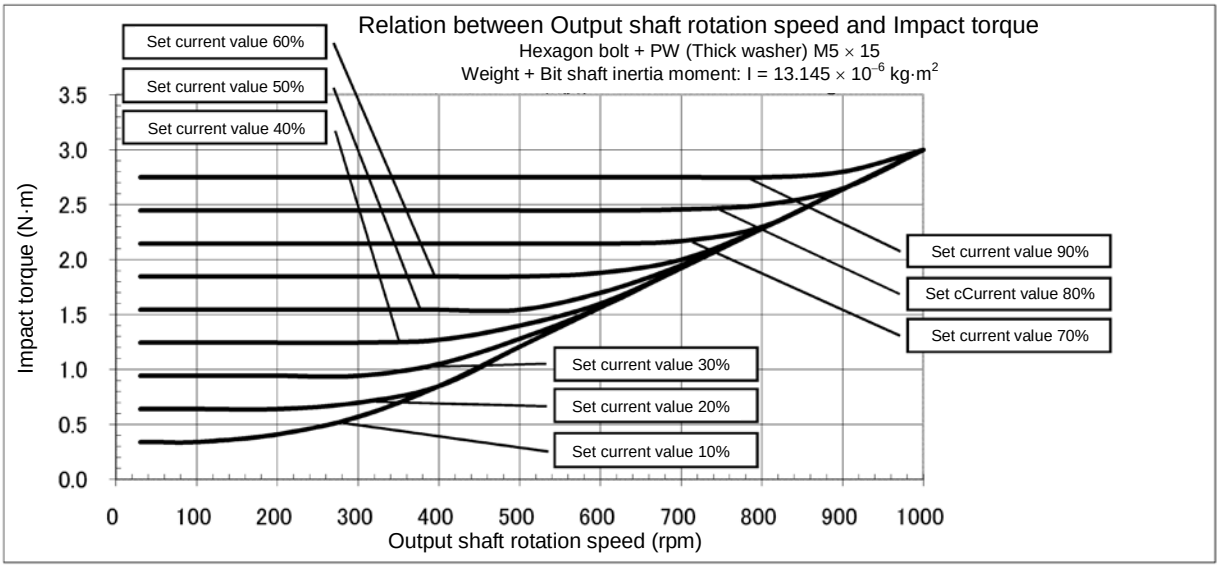
Set current value	Shaft output torque
10 %	0.14 N･m
15 %	0.22 N･m
20 %	0.30 N･m
25 %	0.38 N･m
30 %	0.46 N･m
35 %	0.53 N･m
40 %	0.61 N･m
45 %	0.68 N･m
50 %	0.75 N･m
55 %	0.82 N･m
60 %	0.89 N･m
65 %	0.96 N･m
70 %	1.02 N･m
75 %	1.09 N･m
80 %	1.15 N･m
85 %	1.21 N･m
90 %	1.27 N･m
95 %	1.33 N･m
100 %	1.39 N･m



KX100T2-03■＊-20

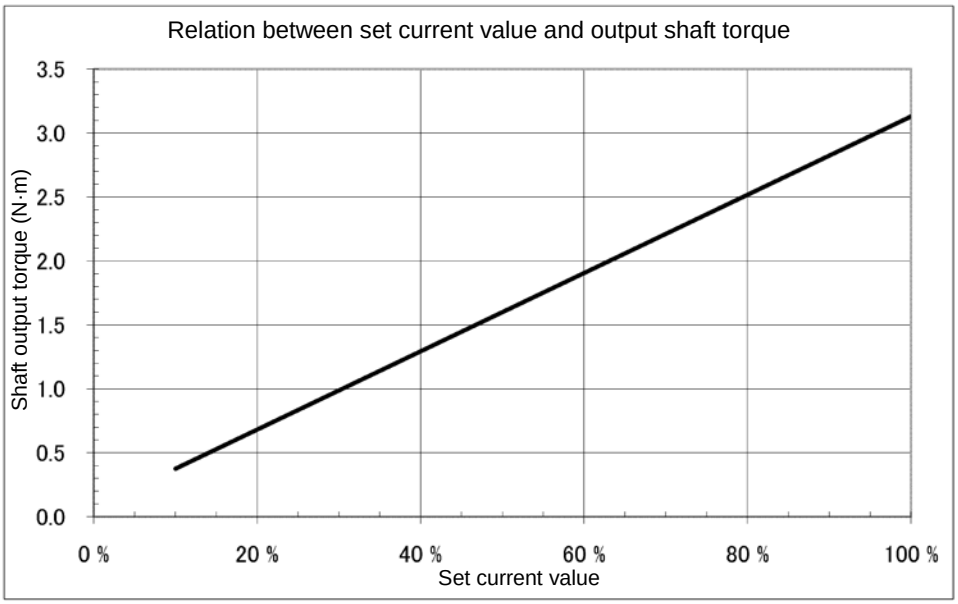
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
30 rpm	0.34 N･m	0.64 N･m	0.94 N･m	1.24 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
50 rpm	0.34 N･m	0.64 N･m	0.94 N･m	1.24 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
100 rpm	0.34 N･m	0.64 N･m	0.94 N･m	1.24 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
200 rpm	0.41 N･m	0.64 N･m	0.94 N･m	1.24 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
300 rpm	0.57 N･m	0.70 N･m	0.94 N･m	1.24 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
400 rpm	0.85 N･m	0.85 N･m	1.05 N･m	1.27 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
500 rpm	1.21 N･m	1.21 N･m	1.28 N･m	1.40 N･m	1.55 N･m	1.85 N･m	2.15 N･m	2.45 N･m	2.75 N･m
600 rpm	1.57 N･m	1.57 N･m	1.57 N･m	1.60 N･m	1.70 N･m	1.88 N･m	2.15 N･m	2.45 N･m	2.75 N･m
700 rpm	1.92 N･m	1.92 N･m	1.92 N･m	1.92 N･m	1.95 N･m	2.00 N･m	2.17 N･m	2.46 N･m	2.75 N･m
800 rpm	2.28 N･m	2.28 N･m	2.28 N･m	2.28 N･m	2.28 N･m	2.28 N･m	2.30 N･m	2.50 N･m	2.75 N･m
900 rpm	2.64 N･m	2.64 N･m	2.64 N･m	2.64 N･m	2.64 N･m	2.64 N･m	2.64 N･m	2.65 N･m	2.80 N･m
1000 rpm	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m	3.00 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

Set current value	Shaft output torque
10 %	0.31 N･m
15 %	0.49 N･m
20 %	0.66 N･m
25 %	0.83 N･m
30 %	0.99 N･m
35 %	1.16 N･m
40 %	1.32 N･m
45 %	1.48 N･m
50 %	1.64 N･m
55 %	1.79 N･m
60 %	1.94 N･m
65 %	2.09 N･m
70 %	2.24 N･m
75 %	2.38 N･m
80 %	2.52 N･m
85 %	2.66 N･m
90 %	2.80 N･m
95 %	2.94 N･m
100 %	3.07 N･m



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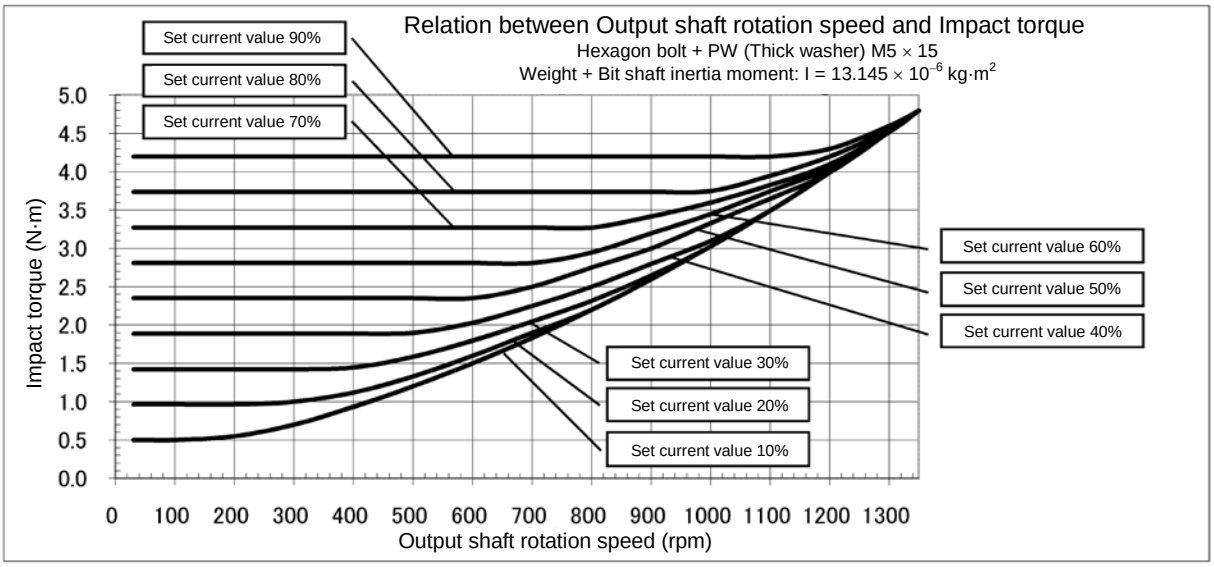
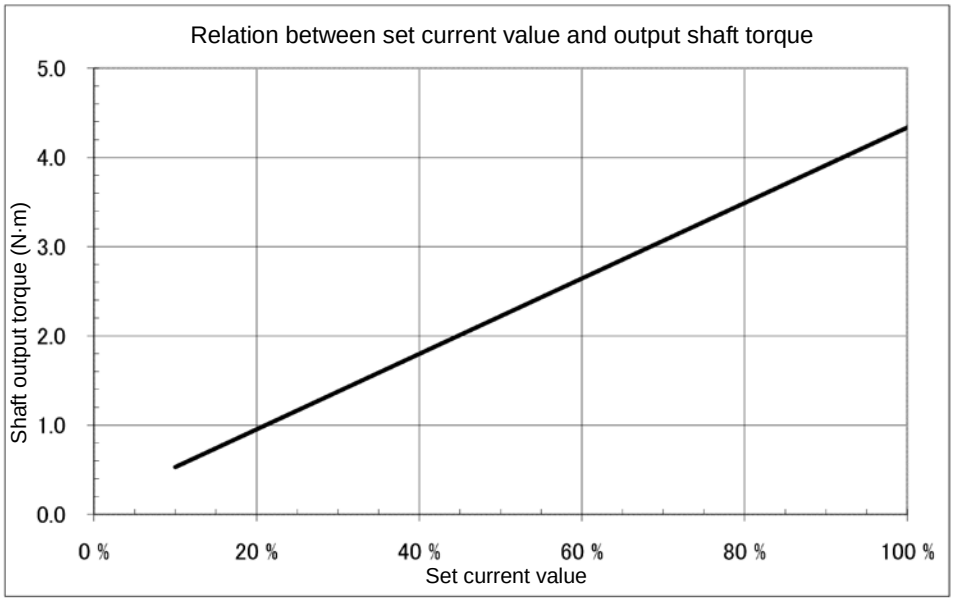
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
30 rpm	0.50 N･m	0.96 N･m	1.43 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
50 rpm	0.50 N･m	0.96 N･m	1.43 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
100 rpm	0.50 N･m	0.96 N･m	1.43 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
200 rpm	0.55 N･m	0.96 N･m	1.43 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
300 rpm	0.70 N･m	1.00 N･m	1.43 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
400 rpm	0.93 N･m	1.12 N･m	1.45 N･m	1.89 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
500 rpm	1.20 N･m	1.33 N･m	1.59 N･m	1.90 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
600 rpm	1.50 N･m	1.60 N･m	1.80 N･m	2.03 N･m	2.35 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
700 rpm	1.83 N･m	1.90 N･m	2.05 N･m	2.25 N･m	2.50 N･m	2.81 N･m	3.28 N･m	3.74 N･m	4.20 N･m
800 rpm	2.20 N･m	2.20 N･m	2.32 N･m	2.50 N･m	2.75 N･m	2.95 N･m	3.28 N･m	3.74 N･m	4.20 N･m
900 rpm	2.60 N･m	2.60 N･m	2.65 N･m	2.80 N･m	3.00 N･m	3.20 N･m	3.42 N･m	3.74 N･m	4.20 N･m
1000 rpm	3.03 N･m	3.03 N･m	3.03 N･m	3.10 N･m	3.33 N･m	3.45 N･m	3.60 N･m	3.75 N･m	4.20 N･m
1100 rpm	3.49 N･m	3.49 N･m	3.49 N･m	3.49 N･m	3.65 N･m	3.75 N･m	3.83 N･m	3.95 N･m	4.20 N･m
1200 rpm	3.99 N･m	3.99 N･m	3.99 N･m	3.99 N･m	3.99 N･m	4.05 N･m	4.10 N･m	4.20 N･m	4.30 N･m
1300 rpm	4.52 N･m	4.52 N･m	4.52 N･m	4.52 N･m	4.52 N･m	4.52 N･m	4.52 N･m	4.55 N･m	4.60 N･m
1350 rpm	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m	4.80 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

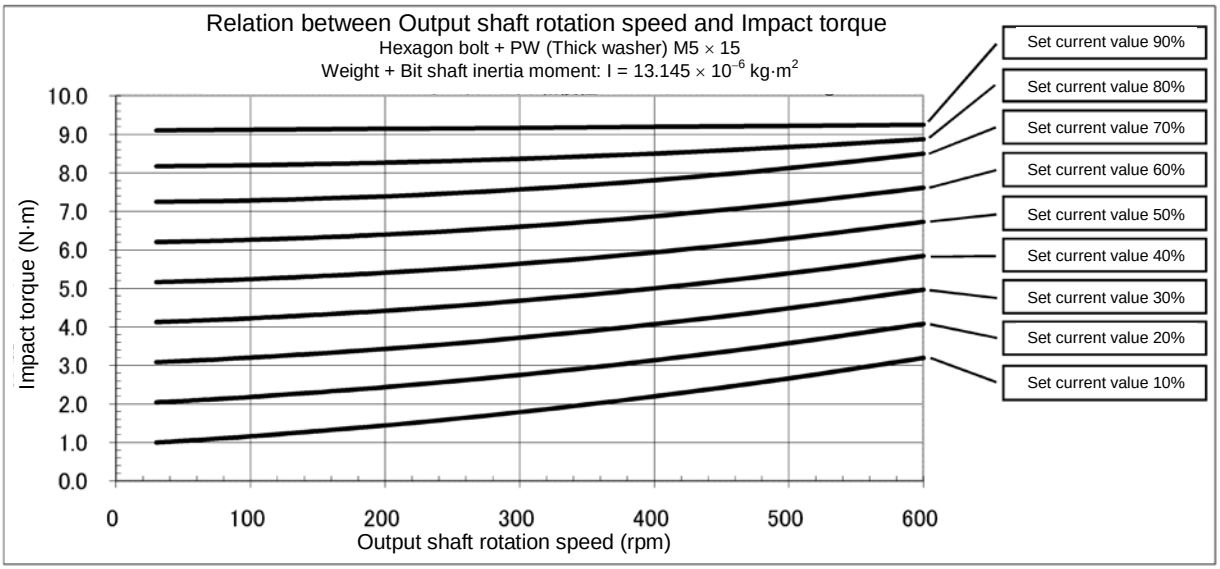
Set current value	Shaft output torque
10 %	0.46 N･m
15 %	0.69 N･m
20 %	0.93 N･m
25 %	1.16 N･m
30 %	1.39 N･m
35 %	1.61 N･m
40 %	1.83 N･m
45 %	2.05 N･m
50 %	2.27 N･m
55 %	2.48 N･m
60 %	2.69 N･m
65 %	2.90 N･m
70 %	3.10 N･m
75 %	3.30 N･m
80 %	3.50 N･m
85 %	3.69 N･m
90 %	3.89 N･m
95 %	4.07 N･m
100 %	4.26 N･m



KX150T2-07■＊-20

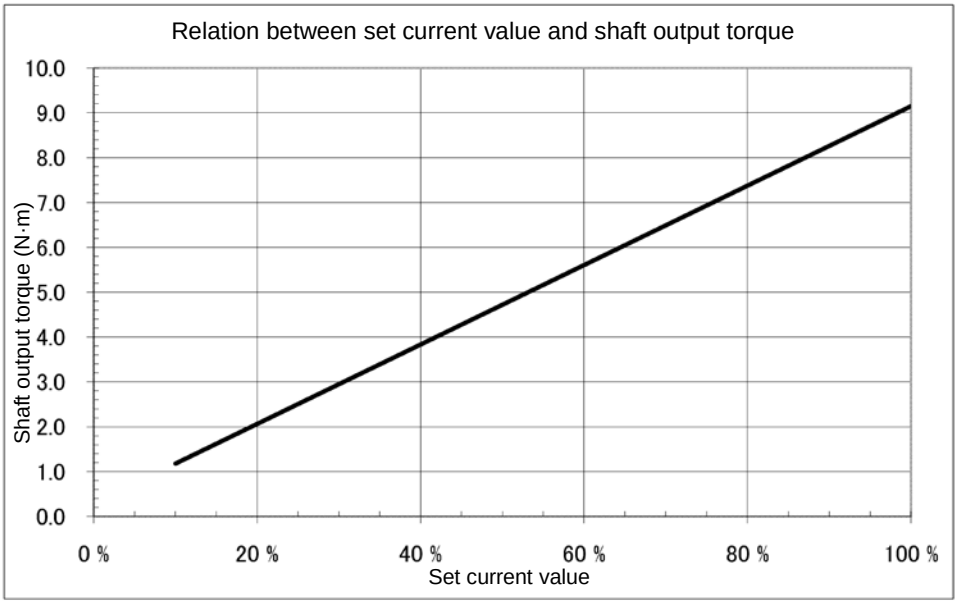
Graph [1] (Output shaft rotation speed - Impact torque comparison table)

	Set current value								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
30 rpm	1.00 N･m	2.04 N･m	3.08 N･m	4.13 N･m	5.17 N･m	6.21 N･m	7.25 N･m	8.18 N･m	9.10 N･m
50 rpm	1.04 N･m	2.08 N･m	3.11 N･m	4.15 N･m	5.19 N･m	6.22 N･m	7.26 N･m	8.18 N･m	9.11 N･m
100 rpm	1.16 N･m	2.18 N･m	3.20 N･m	4.22 N･m	5.24 N･m	6.27 N･m	7.29 N･m	8.20 N･m	9.12 N･m
200 rpm	1.45 N･m	2.44 N･m	3.43 N･m	4.42 N･m	5.41 N･m	6.40 N･m	7.39 N･m	8.27 N･m	9.14 N･m
300 rpm	1.79 N･m	2.76 N･m	3.72 N･m	4.68 N･m	5.64 N･m	6.61 N･m	7.57 N･m	8.37 N･m	9.17 N･m
400 rpm	2.20 N･m	3.14 N･m	4.07 N･m	5.01 N･m	5.94 N･m	6.88 N･m	7.81 N･m	8.51 N･m	9.20 N･m
500 rpm	2.67 N･m	3.58 N･m	4.49 N･m	5.40 N･m	6.30 N･m	7.21 N･m	8.12 N･m	8.67 N･m	9.22 N･m
600 rpm	3.20 N･m	4.08 N･m	4.97 N･m	5.85 N･m	6.73 N･m	7.62 N･m	8.50 N･m	8.88 N･m	9.25 N･m



Graph [2] (Set current value - Shaft output torque comparison table)

Set current value	Shaft output torque
10 %	0.98 N･m
15 %	1.49 N･m
20 %	1.99 N･m
25 %	2.48 N･m
30 %	2.97 N･m
35 %	3.45 N･m
40 %	3.92 N･m
45 %	4.38 N･m
50 %	4.83 N･m
55 %	5.28 N･m
60 %	5.72 N･m
65 %	6.15 N･m
70 %	6.57 N･m
75 %	6.99 N･m
80 %	7.40 N･m
85 %	7.80 N･m
90 %	8.19 N･m
95 %	8.57 N･m
100 %	8.95 N･m



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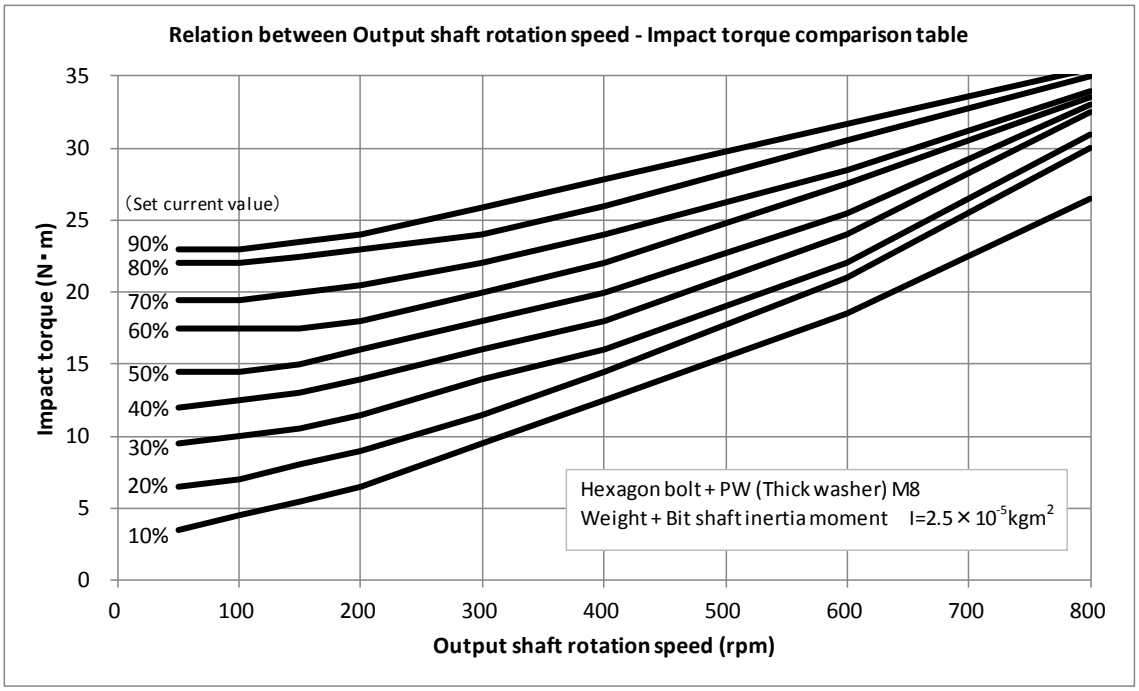
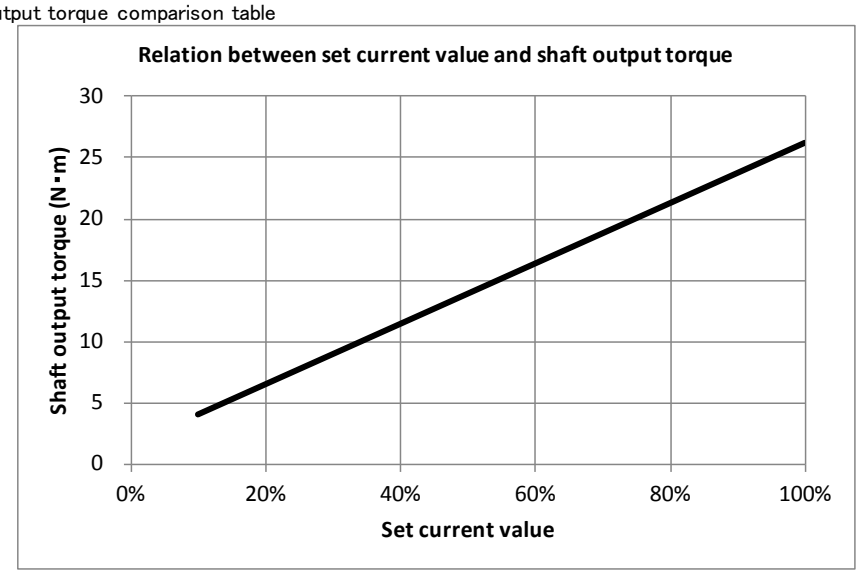


Set current value – Shaft output torque comparison table

Set current value	Shaft output torque
10%	3.08N・m
15%	4.61N・m
20%	6.13N・m
25%	7.61N・m
30%	9.08N・m
35%	10.44N・m
40%	11.79N・m
45%	13.04N・m
50%	14.29N・m
55%	15.52N・m
60%	16.74N・m
65%	17.99N・m
70%	19.23N・m
75%	20.32N・m
80%	21.40N・m
85%	22.37N・m
90%	23.35N・m
95%	24.32N・m
100%	25.30N・m



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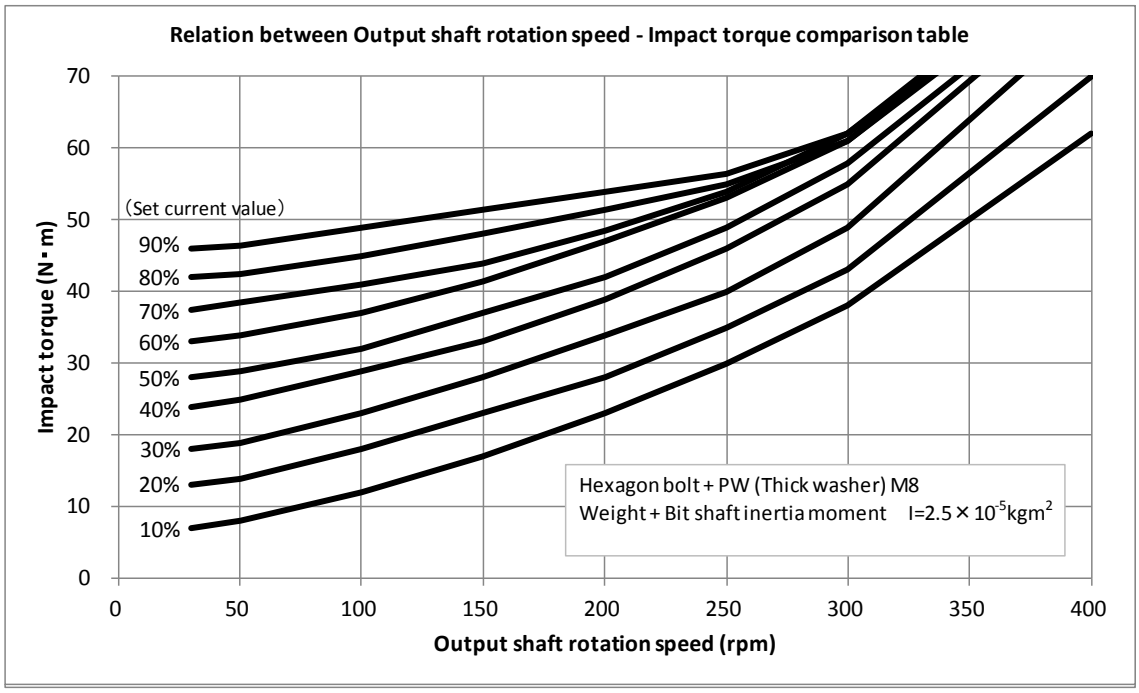
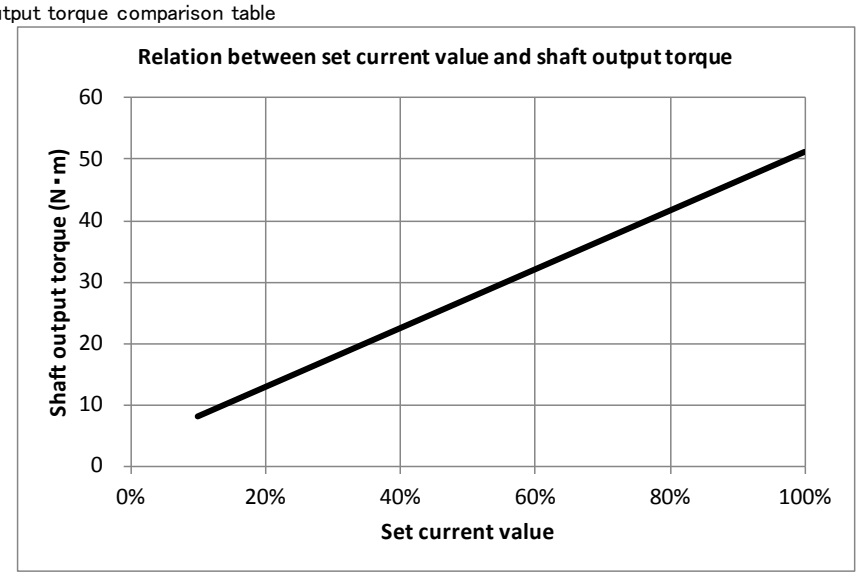


Set current value – Shaft output torque comparison table

Set current value	Shaft output torque
10%	6.09N・m
15%	9.14N・m
20%	12.19N・m
25%	15.10N・m
30%	18.01N・m
35%	20.66N・m
40%	23.31N・m
45%	25.76N・m
50%	28.21N・m
55%	30.65N・m
60%	33.10N・m
65%	35.34N・m
70%	37.59N・m
75%	39.78N・m
80%	41.96N・m
85%	43.90N・m
90%	45.85N・m
95%	47.70N・m
100%	49.56N・m



Maintenance and inspection

Since the tool unit is of a brushless type, no check is required other than a simple daily check. Perform an inspection following the items in the table below. The “Inspection cycle” in the table is a rough standard. Increase or decrease the inspection cycle according to use status/environment. Note that turn off the power before starting maintenance and inspection unless otherwise instructed.

No.	Inspection cycle	Inspection item	Inspection/repair instruction	Remarks
1	Every day*	Inspection on connectors	Perform a visual and tactile inspection.	Free from looseness, removal, and contamination
2	Every day*	Inspection on cables	Perform a visual and tactile inspection.	Free from damages, such as scratches and gouge
3	Every day*	Vibration and sound check	Check by touching and hearing	Increase in the level is not allowed.
4	According to the degree of contamination	Unit appearance check	Cleaning using cloth or air	

* Perform an inspection before starting operation.

[Remarks: Replacement of grease]
Since grease is filled in the gear section of the tool unit, it is not necessary to replace grease in short intervals. However, the durability of machine parts, such as gear section, is increased if the grease is replaced with new every 3 years. In that case, ask us for overhaul (at your cost).

Typical Problems and Troubleshooting

Typical problems and troubleshooting methods are explained in this paragraph.
For electrical problems and problems with the controller, please refer to a separate document “Driver controller SD550 Instruction manual ”.

Problem	Cause	Check target	Troubleshooting
1. Output shaft does not rotate or does not rotate stably.	Breakage of coupling and gear etc.	Coupling or gear	Replace the tool unit.
	Loose clamp screw	Coupling or gear	Retightening
	Break in wire or breakage of connector	Cable & connector	Replace tool unit or cable.
	Contact failure	Connector	Reconnect the connector.
	Motor failure	……	Replacing tool unit
2. Tool is overheated.	Ambient temperature is high.	Check ambient temperature.	Set ambient temperature to 40°C or less.
	Tool surface is contaminated.	……	Clean tool surface.
	Overloaded.	Tool unit load on a workpiece is too high.	• Prolong down time. • Replace the tool unit of a higher-grade model.
3. Abnormal sound is generated.	Loose bolts	Fixing screws of each section	Retightening
	Bearing failure	Around output shaft or motor	Replace the tool unit.

Appendix

1. Specification

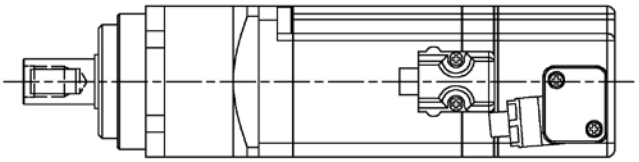
Major specifications of KX driver tool unit

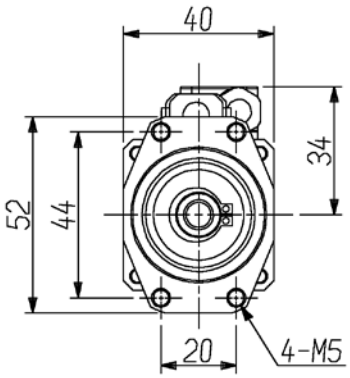
Type	Max. rotation speed (rpm)	Mass (g)	Allowable load (N)	Min. torque (N·m)	Recommend torque (N·m)	Max. torque (N·m)
KX050T2-01■*-20	3000	450	Single load Axial load: 100 N max. Radial load (*1): 50 N max. Combined load At axial load 80 N → Radial load 23 N max. At axial load 50 N → Radial load 43 N max. *1: Radial load on the end of output shaft	0.08	0.15 ~ 0.30	0.45
KX100T2-01■*-20	3000	550		0.16	0.3 ~ 0.6	0.91
KX150T2-01■*-20	3000	650		0.24	0.6 ~ 1.0	1.22
KX100T2-03■*-20	1360	660		0.5	1.0 ~ 2.0	2.6
KX150T2-03■*-20	1360	760		0.8	2.0 ~ 3.2	3.8
KX150T2-07■*-20	635	870		1.6	3.2 ~ 7.0	8.2
KX400T2-07S1-20	840	2100		5.0	7.0～20	24
KX400T2-14S1-20	420	2900		9.0	20～40	45

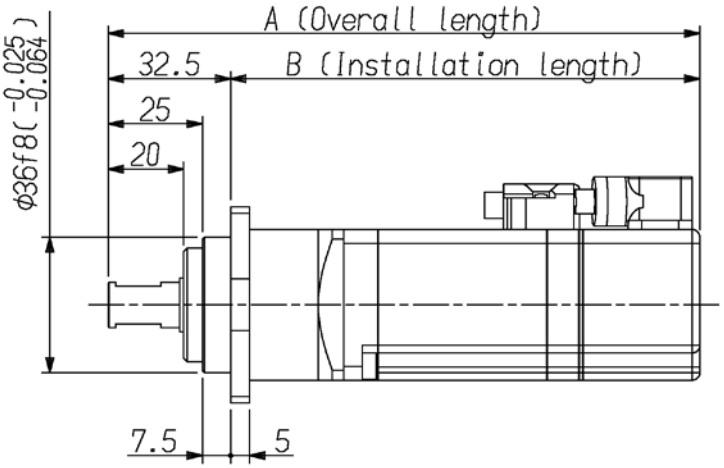
2. External dimensions

KX050～150T2

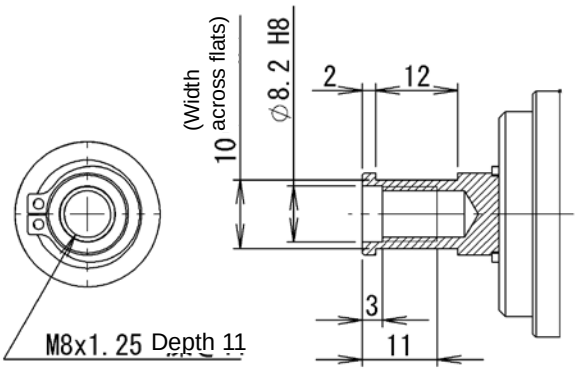
Type	A		B	
	∗=1	∗=2	∗=1	∗=2
KX050T2-01■∗-20	130	133	97.5	100.5
KX100T2-01■∗-20	142	145	109.5	112.5
KX150T2-01■∗-20	154	157	121.5	124.5
KX100T2-03■1-20	142	145	109.5	112.5
KX150T2-03■∗-20	154	157	121.5	124.5
KX150T2-07■∗-20	185	188	152.5	155.5



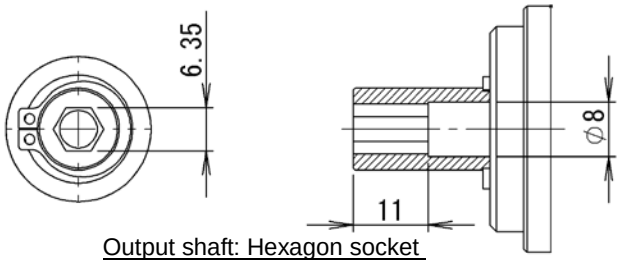




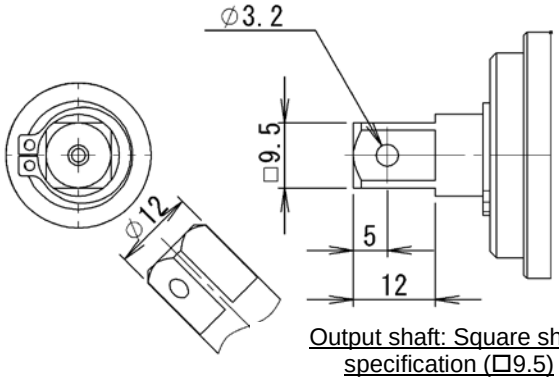
Dimensions of the end of output shaft



Output shaft: M8 specification

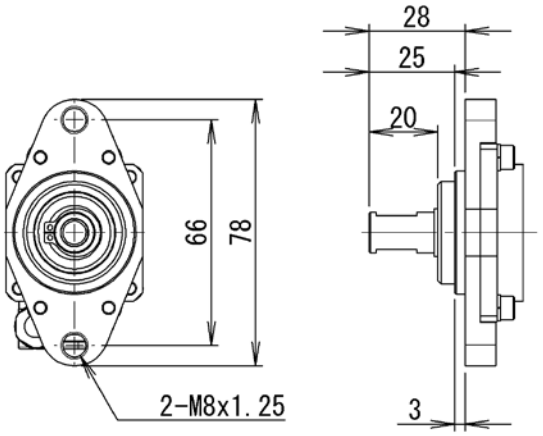


Output shaft: Hexagon socket specification (6.35H)



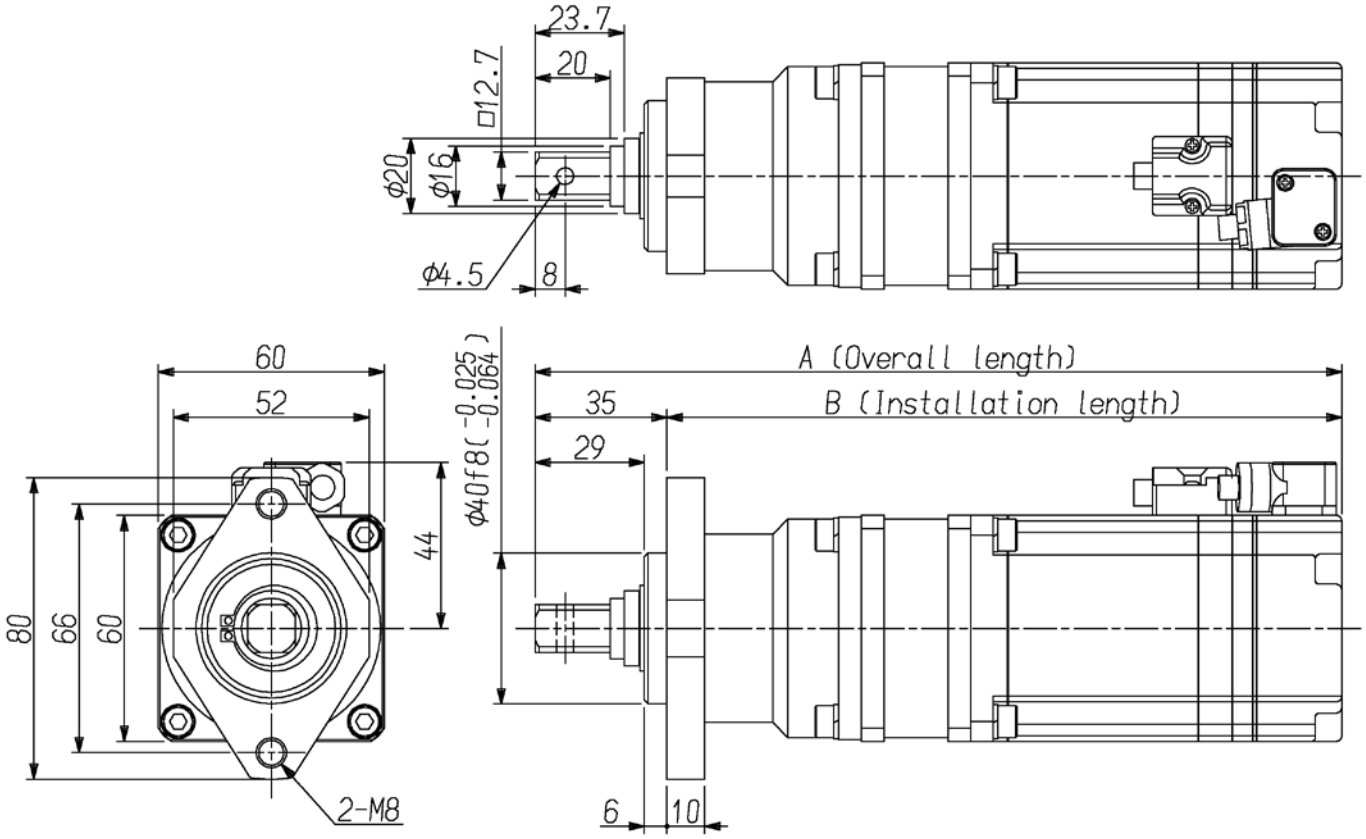
Output shaft: Square shaft specification (□9.5)

OP: BU specification (with a flange compatible with previous models)



KX400T2

Type	A (mm)	B (mm)
KX400T2-01S1-20	224.1	189.1
KX400T2-07S1-20	251.2	216.2



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