



**THK Electrical Actuator Precision Stage Series
1-Axis / XY Stage**

A/AX

INSTRUCTION MANUAL

No.124M-1(0)E

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1. Introduction

1-1

Acknowledgment

Thank you for purchasing the Precision Stage Series 1-Axis/XY Stage A/AX.

This is a high-accuracy precision stage using LM guides in the guide part and a precision ball screw in the feed mechanism.

We hope our creative inventions and unique technologies contribute to your further prosperity.

1-2

About this manual

1-2-1

Intended audience

The person in charge of designing embedded systems of the product and installing, wiring, and maintaining the product, and the person who actually uses the product.

1-2-2

Using this manual

This manual describes correct handling methods and precautions for the product.

For the maximum performance and long life of the product, carefully read and understand this manual to safely and correctly use the product.

If you use the printed version of this manual, be sure to keep it in the place that the audience can refer to it when needed.

1-2-3

Notice and attention

- Do not use or handle the product in the ways that are not described in this manual.
- Do not reproduce, reprint, or lend the whole contents or a part of this manual without permission.
- Please note that the description in this manual is subject to change without prior notice in the future, due to improvements of the product or other reasons.
- We have made all possible efforts to make the content of this manual accurate. However, if you find any mistake or uncertainty in this manual, please contact THK.
- Drawings throughout this manual are only intended as typical examples, and may differ from your product.
- Note that THK shall not be liable for any result incurred by applying this manual, regardless of the reason.
- This manual is also applied to custom products. However, the descriptions provided in the delivery specification drawings or delivery specification documents of those custom products take precedence over this manual.

* Custom products represent the products that have different materials and specifications from those of the standard products on catalogs.

1-3 How to use this product

- This product must not be used for the devices or systems that are used under the situations that may be fatal to human life.
- If you consider using this product for special applications such as passenger movement vehicle, medical, aerospace, nuclear power, and electric power devices or systems, be sure to consult with THK in advance.
- This product is manufactured under the strict quality control, however, that does not mean that the product is free from failure. For applications to the equipment that may suffer serious accidents or loss from the failure of this product, install safety devices or backup devices that prevent such serious accidents or loss.

1-4 About product support

We have made all possible efforts to make the content of this manual accurate. However, if you find any mistake or uncertainty in this manual, please contact THK.

For the following information, please contact THK.

- Technical support for this product

1-5 Product and company information

To find the latest product and company information, we recommend you to periodically access our website.

- Website URL: <https://www.thk.com/>
- THK technical support website: <https://tech.thk.com/>

2. Safety Precautions

2. Safety Precautions

2-1

Warning indications on safety

This manual uses the following warning indications according to safety matters. The descriptions next to warning indications on safety are important messages. Be sure to observe those descriptions.



Warning

“Erroneous handling may cause death or serious injury to a person”



Caution

“Erroneous handling may cause injury to a person or property damage only”



“Prohibitions (don't)”



“Obligations (do)”

2-2

Safety precautions

This section describes important precautions that you must observe.



Warning



■ General

- **While this product is operating or operable, do not enter the working area of any moving part.**
Otherwise, it may cause you to touch the moving part and injure you.
- **While the motor or sensor is energized, do not move or install this product.**
Otherwise, it may cause electric shocks, or cause malfunction that could lead to injury.



■ Installation and operation

- **Wire and connect the electric components correctly and securely.**
Failure to do so may cause fire and electric shocks, or may cause abnormal operation that could lead to injury, fault or fracture.
- **If any moving part may fall by its own weight in vertical application or the like, provide a safeguard for preventing the part from falling.**
If any moving part falls, it may cause injury or damage.



- **While this product is operating, do not touch any moving part or rotating part.**
Otherwise, it may cause your hand to be caught and injured.

2. Safety Precautions

2. Safety Precautions

Warning



■ Maintenance

- **Turn off the machine (turning power off) before conducting any maintenance.**
Otherwise, it may cause electric shocks, or cause malfunction that could lead to injury.
- **If two or more people are involved in the operation, confirm the procedures such as sequences, signs, and abnormalities in advance, and appoint another person for monitoring the operation.**
Failure to do so may cause an unexpected accident.



Caution



■ General

- **Do not stand on this product or the packaging box.**
Otherwise, it may cause fault or damage, or cause falling that could lead to injury.
- **Do not impact this product.**
Otherwise, it may cause fault or damage, or injure you.
- **Do not apply a load that exceeds the permissible level.**
Otherwise, it may cause fault or damage, or cause abnormal operation that could lead to injury.
* For your reference, see the general catalog of electric actuators, which contains the payload, and the Appendix, which contains the static permissible moment and permissible input torque.



- **Do not disassemble or alter this product.**
Otherwise, it may cause foreign material to enter the product, which could result in fault or adversely affect the performance or service life. Or it may cause abnormal operation that could lead to injury.
* If you wish to disassemble or alter the product, contact THK.



■ Unpacking

- **Be careful not to hit your hands or body against protruded parts.**
Otherwise, it may cause injury, or cause fault or fracture of the product.
- **Check whether the delivered product is the product you ordered.**
Using a wrong product may cause malfunction that could lead to injury or fault.
* In the packaging box, an accuracy inspection report is attached.
- **Check whether the product has any fractured parts.**
Using a fractured product may cause injury or fault.
* If you find any defect, contact our Sales Division.



■ Transportation

- **Do not drop or hit this product.**
Otherwise, it may cause injury or fracture, or a functional loss.
- **When transporting this product, do not hold any moving part or the bellows.**
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.
- **When transporting this product, do not hold the motor, the sensor or the cable.**
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.

2. Safety Precautions

2. Safety Precautions

Caution



- **Transport this product horizontally so that the moving parts do not shift. When the moving parts are likely to shift, secure them for transport.**

Otherwise, it may cause the product to fall or allow contact with the moving parts, leading to injury, or cause fault or fracture of the product.

* The standard models do not have fixing brackets. Contact THK for custom mounting of fixing brackets.

- **When carrying this product, hold the bottom face of the base. Most models of this product are heavy articles (20 kg or heavier). Two or more people should hold the product as necessary.**

Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.

* For more information on the weight of the product, see the general catalog of electric actuators.

- **When hanging this product, hang the base at the specified position using a hanger. (Do not hang the table or saddle.)**

Note) This hanging work must be carried out only by the qualified personnel wearing the protective equipment such as helmets and safety shoes.

Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.

* Also see the appendix, which contains the hanger mounting hole positions. (A05 to A15 and AX0505 to AX1515 do not have hanger mounting hole processing.)

* This product does not come with a hanger. When one is necessary, prepare it on your side or contact THK.



■ Installation and operation

- **Firmly secure this product before operating it.**

Failure to do so may cause abnormal operation that could cause injury, fault or fracture.

- **Pay attention to avoid applying the tension or bending to cables.**

Failure to do so may cause abnormal operation that could cause injury, fault or fracture.

- **If anomaly occurs, immediately stop the machine.**

Failure to do so may cause abnormal operation that could cause injury, fault or fracture.



- **Do not allow the ball screw to exceed the permissible rotational speed when using the product.**

Otherwise, it may cause fault or damage, or cause abnormal operation that could lead to injury.

* The permissible rotational speed of the A/AX standard ball screw is 3000 min⁻¹. If exceeding the permissible rotational speed in use, contact THK.

- **Do not use the failed and broken product.**

Otherwise, it may cause injury or machine failure.

3. Structure and Model Numbers

3-1 Structure and part names

Figs.1 and 2 show the structure and part names of this product.

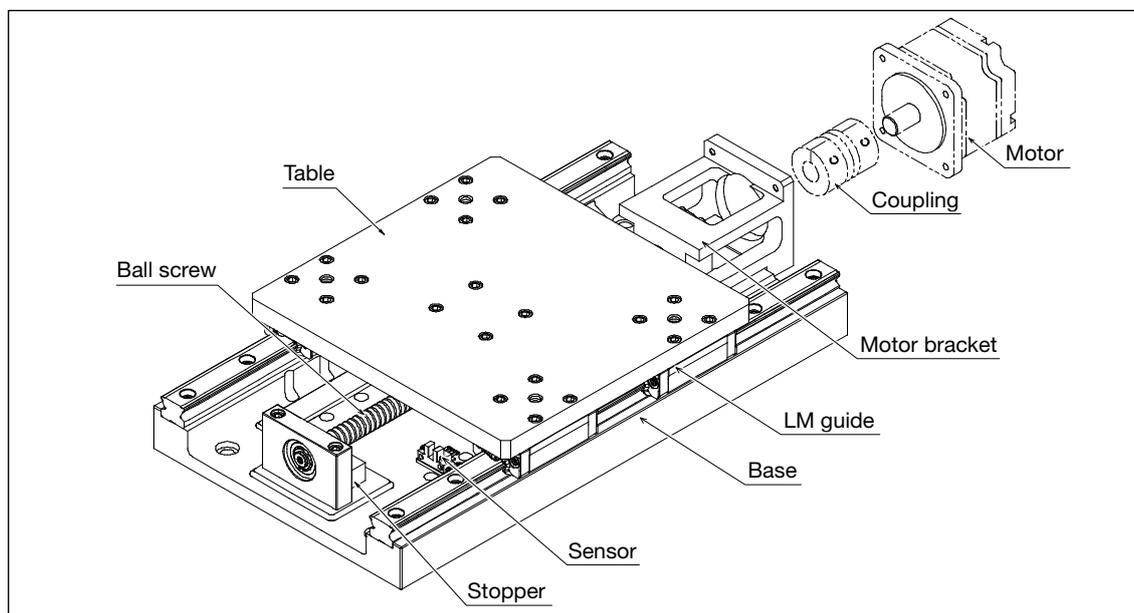


Fig. 1 Structure and part names of the 1-axis stage

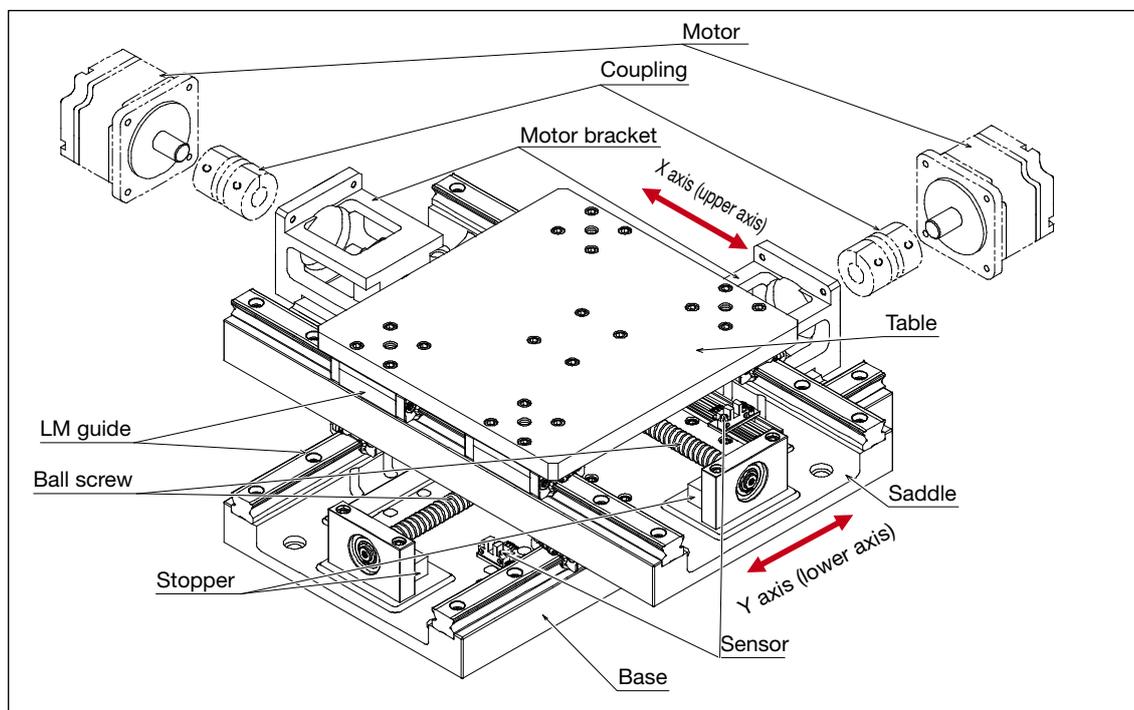


Fig. 2 Structure and part names of the XY stage

* For details such as the dimensions and accuracy, see the delivery specification drawings or general catalog of electrical actuators.

If you have any question, contact THK.

3. Structure and Model Numbers

3-2

Model configuration

The following is an example of model number coding.

■ 1-Axis Stage

A 25 P4 A E

(1) (2) (3) (4) (5)

(1) Model number	A
(2) Stroke	25 : 250 mm
(3) Precision class	P6, P5, P4
(4) Motor type	A : Stepper motor (Sanyo Denki Co., Ltd.), with driver (without cable) B : Servo motor (Yaskawa Electric Corporation) SGMPS S : Your specified motor, with driver
(5) Custom specifications	E : Top table etc. alteration J : With bellows

■ XY Stage

AX 25 30 P4 A E

(1) (2) (3) (4) (5) (6)

(1) Model number	AX
(2) X/upper axis stroke	25 : 250 mm
(3) Y/lower axis stroke	30 : 300 mm
(4) Precision class	P6, P5, P4
(5) Motor type	A : Stepper motor (Sanyo Denki Co., Ltd.), with driver (without cable) B : Servo motor (Yaskawa Electric Corporation) SGMPS S : Your specified motor, with driver
(6) Custom specifications	E : Top table etc. alteration J : With bellows

* For details, see the general catalog of the electric actuators.

4. Storage and Transportation

4-1

Precautions to be observed for safe use

Caution



- **Do not drop or hit this product.**
Otherwise, it may cause injury or fracture, or a functional loss.
- **When transporting this product, do not hold any moving part or the bellows.**
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.
- **When transporting this product, do not hold the motor, the sensor or the cable.**
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.



- **Transport this product horizontally so that the moving parts do not shift. When the moving parts are likely to shift, secure them for transport.**
Otherwise, it may cause the product to fall or allow contact with the moving parts, leading to injury, or cause fault or fracture of the product.
* The standard models do not have fixing brackets. Contact THK for custom mounting of fixing brackets.
- **When carrying this product, hold the bottom face of the base. Most models of this product are heavy articles (20 kg or heavier). Two or more people should hold the product as necessary.**
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.
* For more information on the weight of the product, see the general catalog of electric actuators.
- **When hanging this product, hang the base at the specified position using a hanger. (Do not hang the table or saddle.)**
Note) This hanging work must be carried out only by the qualified personnel wearing the protective equipment such as helmets and safety shoes.
Otherwise, it may cause the product to fall, leading to injury, or cause fault or fracture of the product.
* Also see the appendix, which contains the hanger mounting hole positions. (A05 to A15 and AX0505 to AX1515 do not have hanger mounting hole processing.)
* This product does not come with a hanger. When one is necessary, prepare it on your side or contact THK.

4. Storage and Transportation

4-2

Precautions to be observed for prevention of fault or lowered performance of this product



- **Since using in an adverse storage environment may cause fault or degradation, store the product in the environment described below:**

- A place at ambient temperature within the following storage temperature range

Storage temperature : -10°C to 50°C

(no freezing or condensation, main unit only)

* With the packaging unopened

- A place with no sudden temperature change
- A place with non-corrosive gas nor flammable gas
- A place with little dust, salt or metallic powder
- A place with no exposure to water, oil or chemicals
- A place where no direct sunlight nor radiation heat reaches
- A place where no strong electric field nor strong magnetic field develops
- A place where a vibration or shock does not transmit to the main unit

- **This product is provided with antirust treatment before being packed. When storing the product, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.**



- **Do not apply an excessive load on the package, otherwise, it may cause fault or fracture.**

5. Installation and Operation

5-1

Precautions to be observed for safe use

Warning



- **Wire and connect the electric components correctly and securely.**
Failure to do so may cause fire and electric shocks, or may cause malfunction that could lead to injury, fault or fracture.
- **If any moving part may fall by its own weight in vertical application or the like, provide a safeguard for preventing the part from falling.**
If any moving part falls, it may cause injury, fault or damage.



- **While this product is operating, do not touch any moving part or rotating part.**
Otherwise, it may cause your hand to be caught and injured.

Caution



- **Firmly secure this product before operating it.**
Failure to do so may cause abnormal operation that could cause injury, fault or fracture.
- **Pay attention to avoid applying the tension or bending to cables.**
Failure to do so may cause abnormal operation that could cause injury, fault or fracture.
- **If anomaly occurs, immediately stop the machine.**
Failure to do so may cause abnormal operation that could cause injury, fault or fracture.



- **Do not allow the ball screw to exceed the permissible rotational speed when using the product.**
Otherwise, it may cause fault or damage, or cause abnormal operation that could lead to injury.
* The permissible rotational speed of the A/AX standard ball screw is 3000 min⁻¹. If exceeding the permissible rotational speed in use, contact THK.
- **Do not use the failed and broken product.**
Otherwise, it may cause injury or machine failure.

5. Installation and Operation

5-2

Precautions to be observed for prevention of product fault or fracture



- **Since using an adverse service environment may cause fault, use the product in the environment described below.**
 - A place within the following operating temperature range
Operating temperature: 0°C to 40°C (ambient humidity less than 85% RH, no freezing or condensation)
 - * The accuracy of this product is the value at 22 ±2°C. When used at other than 22 ±2°C, the accuracy may vary.
 - * If you desire to use the product outside of the operating temperature range, contact THK.
 - A place with no sudden temperature change
 - A place with non-corrosive gas nor flammable gas
 - A place with no floating of dust, salt or metallic powder
 - A place with no exposure to water, oil or chemicals
 - A place where no direct sunlight, ultraviolet rays, nor radiation heat reaches
 - A place where no strong electric field nor strong magnetic field develops
 - A place where a vibration or shock does not transmit to the main unit
- **Standard models of this product are designed based on use in a horizontal position. Use in other positions may or may not be possible depending on the conditions. Contact THK for details.**

Use of standard models in other than horizontal positions may cause faults or adversely affect the performance or the service life. As well, for the model with bellows, the bellows may detach.

 - * When the standard model cannot be used, contact THK for custom products.
- **Certain types of coolants may cause trouble to the function of the product. If using the product in an environment where the coolant may enter into the product, contact THK.**
- **Prevent foreign material such as dust or metallic powder from entering the LM guide or ball screw, as it may cause abnormal wear or shorten the service life.**

If foreign material enter the product, take a dustproof measure that matches the service atmosphere.
- **Use the product within the effective stroke range.**
 - * For more information on the effective stroke, see the general catalog of the electric actuators.

5. Installation and Operation



- **Be careful not to let the parts to be mounted on the table of this product interfere with any other parts near the stroke end.**

Note) The motor bracket of A05 to A15 and AX0505 to AX1515 is higher than the table upper surface. Be careful when designing parts to be mounted on the table. See Fig. 3.

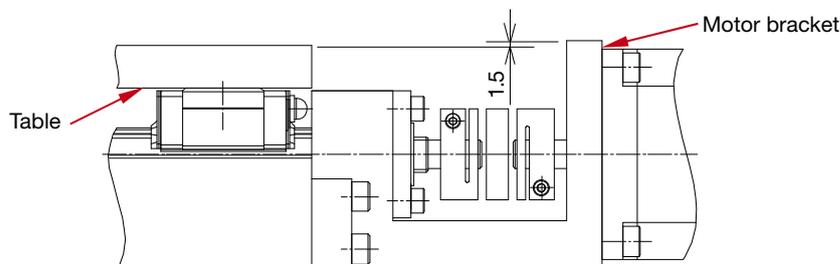


Fig. 3 A05 side surface diagram

- **For the model with bellows, the bellows are higher than the table upper surface. Be careful that the parts mounted on the table do not interfere with the bellows and vice versa.**

* For more information on the dimensions of the bellows, see the general catalog of electric actuators.

- **The mounting surface for this product must be a machined plane or have the accuracy equivalent to the machined plane. If the surface is insufficiently accurate, it may adversely affect the performance or the service life. In addition, be sure to mount the product on a sufficiently rigid base.**

* This product has been measured for accuracy on a JIS grade 0 equivalent surface plate. When all accuracies are required, we recommend the flatness in Table 1.

Model	Precision class	Recommended flatness (μm)	Surface plate grade guidelines
A05 to A15 AX0505 to AX1515	P6	7	JIS grade 1 equivalent
	P5, P4	3.5	JIS grade 0 equivalent
A20 to A30 AX2020 to AX3030	P6	9	JIS grade 1 equivalent
	P5, P4	4.5	JIS grade 0 equivalent
A40, A50 AX4040 to AX5050	P6	11	JIS grade 1 equivalent
	P5, P4	5.5	JIS grade 0 equivalent

* The surface plate grade is in accordance with the JIS B 7513 precision surface plate.

Table 1 Stage mounting surface recommended flatness

5. Installation and Operation



- Adjust the position and the settings so that the OT sensor (limit sensor) reacts effectively before the moving parts strike the stopper.
- When adjusting sensor position, secure it so that the sensor dog does not contact the sensor. See Fig. 4.

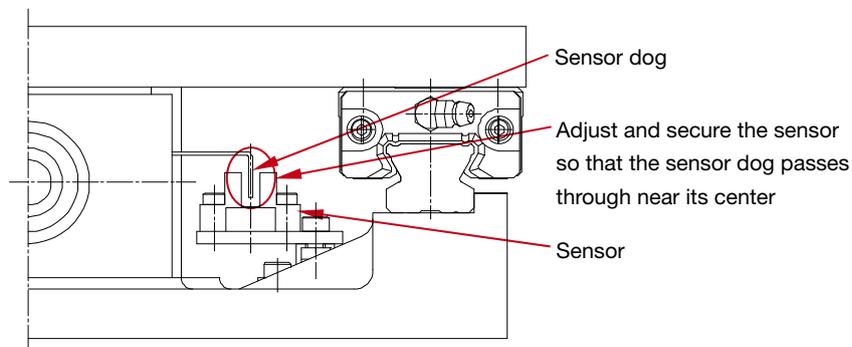


Fig. 4 Drawing for mounting the sensor

- Check that there is no tool or bolt in the product before operating it.



- The stoppers attached to both stroke ends are not for positioning. Do not use them for positioning.



- Anti-rust oil is applied on the product. Thoroughly wipe off the oil before operating the product. As well, after trial run, supply the specified grease to LM guide and ball screw before using the product.

In addition, the standard models contain the THK AFB-LF grease.



- The standard sensors (photomicro sensors) do not have the water-proof or dust-proof structure. Do not use it in a place where much dust or oil mist is present, or where water, oil or chemical directly or indirectly flies. For other detail information, see the catalog issued by the sensor manufacturer.

* Standard sensor (does not come with connector or cord)

- With stepper motor EE-SX671, EE-SX670: OMRON Corporation
- With AC servo motor EE-SX671: OMRON Corporation

5. Installation and Operation

5-3

Other precautions

- **The accuracy of this product is the value in a horizontal position without moment load applied.**
When used in other positions or with large moment load applied, the accuracy may vary.
- **THK does not adjust driver parameters or gain. Adjust according to usage conditions.**
- **For selection and handling of a motor and a driver, see the respective catalog and instruction manual issued by the motor and driver manufacturers.**
For data required to select a motor, see the appendix for your reference.
- **For selection, handling and mounting of a coupling, see the respective catalog issued by the coupling manufacturer.**
Check necessary data such as permissible torque, eccentricity, deflection angle and tightening torque of the assembly bolt.

* For models of standard couplings, see Table 2.

Model	With stepper motor	With AC servo motor
A05 to A15 AX0505 to AX1515	SFC-020DA2-T012 (With slit panel) *1 : Miki Pulley Co., LTD.	SFC-020DA2 : Miki Pulley Co., LTD.
A20 to A30 AX2020 to AX3030	Custom product *2	SFC-030DA2 : Miki Pulley Co., LTD.
A40, A50 AX4040 to AX5050	Custom product *2	SFC-035DA2 : Miki Pulley Co., LTD.

*1: Contact THK for purchase of these A/AX custom specifications.

*2: Contact THK for custom product specifications.

Table 2 Standard coupling models

5. Installation and Operation

5-4 Mounting method

Using the mounting holes in the base, secure this product to the mounting surface using hexagonal-socket-head type bolts. See Fig. 5. Also see Table 3, which shows the size and the recommended length of bolts for securing to base.

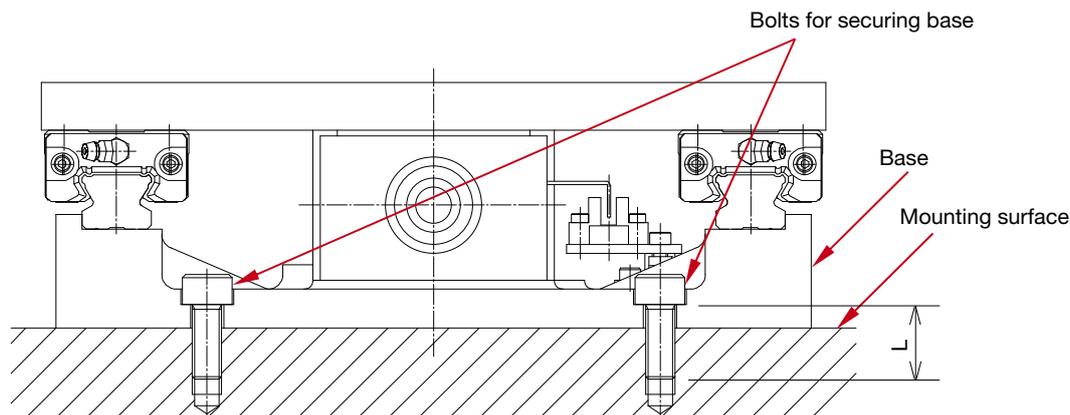


Fig. 5 Mounting drawing

Model	Bolt size	Recommended bolt length (L)	Mounting surface Recommended female thread depth
A05 to A15 AX0505 to AX1515	M6	14 mm or more	12 mm or more
A20 to A30 AX2020 to AX3030	M10	25 mm or more	20 mm or more
A40, A50 AX4040 to AX5050	M12	30 mm or more	24 mm or more

Table 3 Base securing bolt size and recommended length

6. Maintenance

6. Maintenance

6-1

Precautions to be observed for safe use

Warning



- **Turn off the machine (turning power off) before conducting any maintenance.**
Otherwise, it may cause electric shocks, or cause malfunction that could lead to injury.
- **If two or more people are involved in the operation, confirm the procedures such as sequences, signs, and abnormalities in advance, and appoint another person for monitoring the operation.**
Failure to do so may cause an unexpected accident.

Caution



- **When handling grease, wear a protective glasses and protective gloves.**
If grease gets into eyes or touch the skin, it may affect your body such as causing inflammation.
 - * If grease gets into eyes, clean them with clean water for 15 minutes and visit the doctor.
 - * If grease touches skin, wash it sufficiently with water and soap.
- **After greasing, travel the block back and forth throughout, and wipe off the surplus grease.**
If you restart operation immediately after greasing, the surplus grease flies and may cause faults and affect your body.
- **Do not expose grease to a flame, spark or high-temperature object.**
Otherwise, it may ignite the grease, which could cause fire.
 - * For other information on handling grease, see the precautions indicated on the grease package or catalog. We have "Material Safety Data Sheets" for THK original greases. Contact THK for details.
- **Prevent grease from adhering to the photomicro sensors.**
Failure to do so may cause malfunction that could lead to injury, fault or fracture.



6-2

Precautions to be observed for prevention of product fault or fracture



- **To have this product fully exert its functions, it is essential to lubricate the product. Be sure to supply grease on a regular basis.**
Using the product with insufficient lubrication may shorten the service life.
- **Do not let foreign materials enter into the LM guide or the ball screw.**
Otherwise, it may cause fault, or could adversely affect the performance or service life.



- **Do not mix different types of grease.**
Otherwise, it may affect the performance.

6. Maintenance

6. Maintenance

6-3 Daily inspection

- Before operating the product, visually check any exterior damage or stain.
- Check the grease state (stain, etc.). If the grease is significantly stained, wipe off the grease, and then supply new grease. (Supply the new grease until it comes out from the inner block, and exhaust the stained grease.)
- Check whether abnormal noise or vibration occurs during operation. If abnormal noise or vibration occurs, immediately stop the machine and inspect the state of the product.
Insufficient lubrication or loosened mounting bolts may cause abnormal noise or vibration.

6-4 Periodical inspection

- Perform more detailed inspection approximately once every 3 to 6 months.
 - Check the lubrication state, and then clean the product and replenish the grease.
 - Inspect whether each mounting bolt has loosened, and if any of them has loosened, retighten it.

6. Maintenance

6. Maintenance

6-5

Lubrication

- **The standard models are supplied with the following grease before shipment.**
THK AFB-LF grease
See the appendix for details of the greases.
- **For normal use, replenish grease approximately every 100 km travel distance or 6 months, whichever is earlier. *See “Method for supplying grease” on the next page.**
Note that the greasing interval varies with the service conditions or service environment.
We recommend determining the greasing interval through the initial inspection.
* Note that the greasing interval becomes shorter than usual under the environment where oil content decreases.
- **For lubrication, the LM guide part has a grease nipple as standard.**
Table 4 shows the model numbers of the grease nipples and applicable nozzle types of the grease gun. As well, Fig. 6 shows the shape of the grease nipples.

Model	LM guide model number	Grease nipple model number	Applicable nozzle type
A05 to A15 AX0505 to AX1515	SR15	PB1021B	Dedicated nozzle U type N type attachment
A20 to A30 AX2020 to AX3030	SR25	B-M6F	H type nozzle
A40, A50 AX4040 to AX5050	SR30	B-M6F	H type nozzle

Table 4 Grease nipple model number and applicable nozzle type

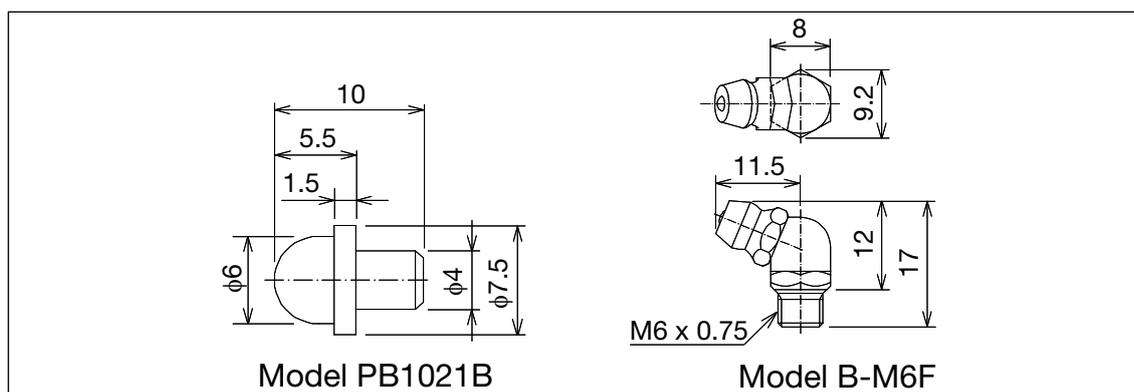


Fig. 6 Shapes of the grease nipples

- **The appendix introduces the grease gun unit for lubrication for your reference.**

6. Maintenance

6. Maintenance

6-6

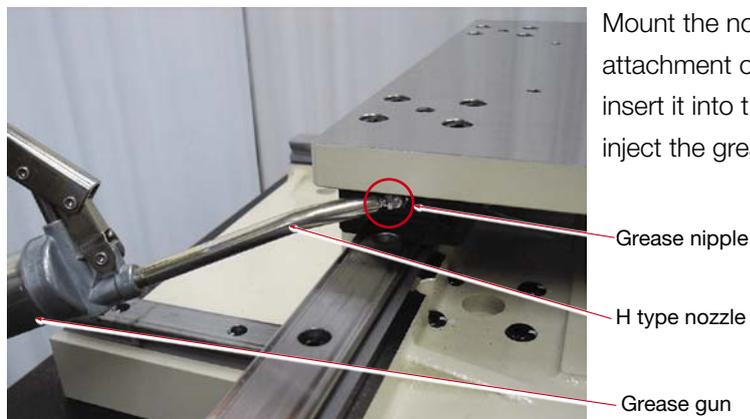
Method for supplying grease

Fig. 7 shows a representative greasing method for your reference.

Procedure

1. Wipe off the old grease or stains using a clean waste cloth.
2. Supply grease using a grease gun as indicated in the figure below: (Move the table or ball screw by hand to permeate the grease throughout.)
3. Carry out pre-conditioning operation to apply the grease throughout.
4. Wipe off grease leaking or accumulating in the corner.

Lubrication of LM Guide



Mount the nozzle or nozzle and attachment on the grease gun, insert it into the nipple, and inject the grease.

Grease nipple

H type nozzle

Grease gun

Supply grease from the grease nipple attached on the end face of the LM block.
(1-axis stage/4 locations, XY stage/8 locations)

Ball screw lubrication



(1) Apply grease directly to the ball screw shaft using the grease gun.

(2) Spread the grease on the raceway of the ball screw, using hands or a brush.

Note) We recommend the use of a nylon brush which will not shed.

Fig. 7 Method for supplying grease

6. Maintenance

6. Maintenance

6-7 Free warranty period

The warranty period shall be 12 months from the product delivery date or 18 months from the date of shipping (based on the manufacture date), whichever is earlier.

If the free warranty period has been expired at the time of receiving notice of any defect, repair works will be charged.

6-8 Usage conditions (range)

The normal usage conditions (range) specified in our catalogs and/or instruction manuals shall apply.

6-9 Warranty scope

6-9-1 Failure diagnosis

Please inform us of the trouble description, content, and model and serial number indicated on the product label. Then we will perform the initial diagnosis of the product failure.

When we recognize that the failure occurred within the free warranty period set forth above and the responsibility of the cause rests on us, the warranty is applied without charge. Otherwise any repair or replacement will be charged.

The final judgment of the warranty qualification is determined when we check the product in our site.

6-9-2 Consumables and spare parts

- Cables, LM guide, ball screw, bearings, and sensors are the consumables.

6. Maintenance

6. Maintenance

6-9-3 Repair

We will perform free repair works or replacement for any failure occurred within the free warranty period set forth above.

However, it is our discretion whether we provide repair or replacement.

Free warranty is not applicable even within the warranty period for any of the following cases:

- Failure arising out of improper storage or handling by the customer, or software and/or hardware installed by the customer.
- Failure arising out of any alteration of our products by the customer.
- Failure arising out of any use of our products out of the usage conditions set forth in section 6-8 of this manual.
- Failure arising out of any use of the product without taking appropriate water-, oil-, and dust-proof measures.
- Lack of maintenance works specified in our instruction manual.
- Wearing caused by usage conditions.
- Wearing of consumables such as cables, LM guide, ball screw, bearings, or sensors.
- Failure arising out of any convulsion of nature, such as earthquake, lightning, flood and wind damage.
- Failure arising out of any factor that is not recognized as our responsibility.
 - * In case of any free repair work within the free warranty period, the warranty period of the pertinent product shall still be the period set forth in section 6-7, not the period originating from the time of free repair work.
 - * In case of any paid repair work, the warranty period of the repaired section shall be six months from the repair work regardless of the warranty period of the product itself.
 - * Repair work is performed at our Japanese site. Whether free or paid repair work, cost of returning the product to our site shall be customer's responsibility.
 - * The cost of delivering the repaired or replacing product to customer's site is our responsibility in case of free warranty, or included in the repair charge in case of a paid repair service. However, the destination must be in Japan.

6-9-4 Repair period

The warranty period of 1-axis/XY stage A/AX shall be seven years from the date of purchase or five years from the product discontinuation date, whichever comes first.

6-10 Exclusion of warranty liability

- Regardless of whether it is within the free warranty period or not, any damage to the equipment other than our products and opportunity loss incurred by the customer due to the failure of the products are not covered by the warranty.
- We hold no responsibility for removal of the product for repair work, reinstallation after repair work, and other costs caused thereby.
- We hold no responsibility for any damage arising out of any use of the product without taking appropriate water-, oil-, and dust-proof measures.

6-11 Delivery conditions

Delivery products will be shipped by mixed cargo and passed on the car.

Unpacking, transportation, installation, on-site adjustment and trial run after delivery are not our responsibility.

7. Appendix

7. Appendix

7-1

Basic static load rating and static permissible moment

- Basic static load rating and static permissible moment are shown in Table 5. As well, static permissible moment direction is shown in Fig. 8.

	Model	Basic Static Load Rating (kN)	Static permissible moment (kN · m)		
			Ma direction	Mb direction	Mc direction
1-Axis Stage	A05 to A15	44.3	1.11	0.95	1.37
	A20 to A30	157.9	5.53	4.75	8.29
	A40, A50	226.9	15.3	13.1	19.8
XY Stage	AX0505 to AX1515	44.3	1.11	0.95	1.37
	AX2020 to AX3030	157.5	5.53	4.75	5.53
	AX4040 to AX5050	225.6	15.3	13.1	15.3

Table 5 Static permissible moment

- * Static permissible moment does not allow for the customer-mounted ball strength. As well, it indicates the value of the applied moment load in only one direction, not including radial load.
- * The accuracy of this product is the value without moment load applied. When used with moment load applied, the accuracy may vary.

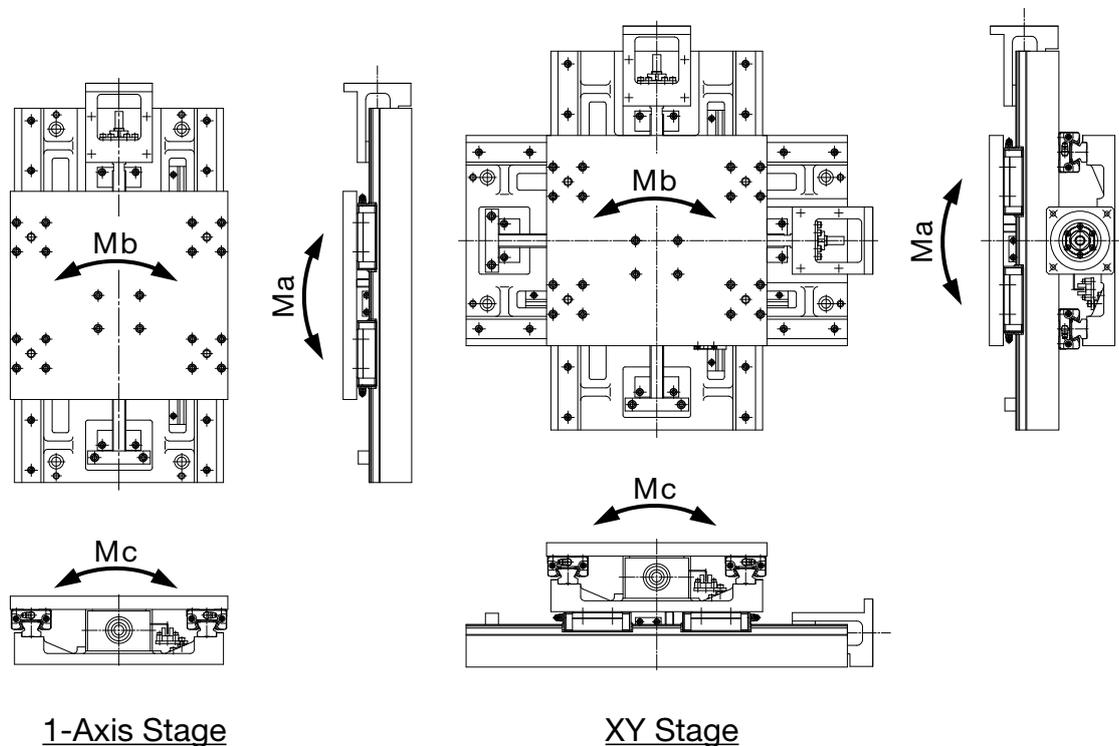


Fig. 8 Static permissible moment direction

7. Appendix

7. Appendix

7-2 Maximum speed

- Table 6 shows the maximum speed of the standard motor for your reference.

Model	Maximum speed (mm/s)	
	With stepper motor (Motor type symbol: A)	With AC servo motor (Motor type symbol: B)
A05 to A15 AX0505 to AX1515	150	250
A20 to A30 AX2020 to AX3030	100	250
A40, A50 AX4040 to AX5050	100	250

Table 6 Maximum speed

Note) If exceeding the maximum speed in use, contact THK.

7-3 Permissible input torque

- Table 7 shows the permissible input torque and the outer diameter of ball screw shaft end. If you use a motor that exceeds the permissible input torque, consider taking a necessary measure such as limiting the motor torque.

Model	Permissible input torque (N · m)	Outer diameter of ball screw shaft end (mm)
A05 to A15 AX0505 to AX1515	0.80	φ8
A20 to A30 AX2020 to AX3030	1.26	φ9.5
A40, A50 AX4040 to AX5050	2.12	φ14

Table 7 Permissible input torque

- * The permissible input torque value is calculated from the bearing permissible axial load.
- * If you use a motor that exceeds the permissible input torque, consider taking a necessary measure such as limiting the motor torque. (Be careful, as the standard servo motor maximum peak torque value is larger than the permissible input torque above.)

7. Appendix

7. Appendix

7-4

Motor selection

- The data required to select a motor is shown in Tables 8 to 10.

Model	Ball screw			Coupling inertial moment (x 10 ⁻⁴ kg · m ²)		Guide part resistance (N)	Moving part weight (kg)
	Lead (mm)	Shaft diameter (mm)	Length (mm)	With stepper motor	With AC servo motor		
A05	5	12	200	0.0373	0.0343	13.6	3.3
A10			250				
A15			300				
A20	5	16	425	0.270	0.0940	33.6	11.2
A25			475				
A30			525				
A40	5	20	665	0.507	0.270	57.2	32.1
A50			765				

Table 8 1-axis stage motor selection sheet

Model	Ball screw			Coupling inertial moment (x 10 ⁻⁴ kg · m ²)		Guide part resistance (N)	Moving part weight (kg)
	Lead (mm)	Shaft diameter (mm)	Length (mm)	With stepper motor	With AC servo motor		
AX0505	5	12	200	0.0373	0.0343	13.6	3.3
AX0510							
AX0515							
AX1010			250				
AX1015							
AX1515	300						
AX2020	5	16	425	0.270	0.0940	33.6	11.2
AX2025							
AX2030							
AX2525			475				
AX2530							
AX3030	525						
AX4040	5	20	665	0.507	0.270	57.2	32.1
AX4050							
AX5050			765				

Table 9 XY stage (upper axis) motor selection sheet

7. Appendix

7. Appendix

Model	Ball screw			Coupling inertial moment (x 10 ⁻⁴ kg · m ²)		Guide part resistance (N)	Moving part weight (kg)
	Lead (mm)	Shaft diameter (mm)	Length (mm)	With stepper motor	With AC servo motor		
AX0505	5	12	200	0.0373	0.0343	16.0	11.0
AX0510			250				
AX0515			300				
AX1010			250				
AX1015			300				
AX1515			300				
AX2020	5	16	425	0.270	0.0940	33.6	43.0
AX2025			475				
AX2030			525				
AX2525			475				
AX2530			525				
AX3030			525				
AX4040	5	20	665	0.507	0.270	57.2	150.7
AX4050			765				
AX5050			765				

Table 10 XY stage (lower axis) motor selection sheet

7. Appendix

7. Appendix

7-5

Calculation of the service life

- The data required to calculate the service life of the LM guide is shown in Tables 11 to 13.

Model	LM guide model number *1	Dimensions (mm)								Moving part weight (kg) m1
		Thrust position		Rail span	Block span	Moving part center of gravity			Table height	
		B1	B2	W	L1	G1	G2	G3	H	
A05	SR15V	62.0	-5.0	124.0	100.0	62.0	50.0	24.5	36.0	2.8
A10										
A15										
A20	SR25W	105.0	-8.0	210.0	140.0	105.0	70.0	34.0	49.0	9.6
A25										
A30										
A40	SR30W	175.0	-14.0	350.0	270.0	175.0	135.0	46.5	62.0	28.9
A50										

*1: 2-axis parallel use, 1 rail with 2 blocks

Table 11 1-axis stage LM guide service life calculation sheet

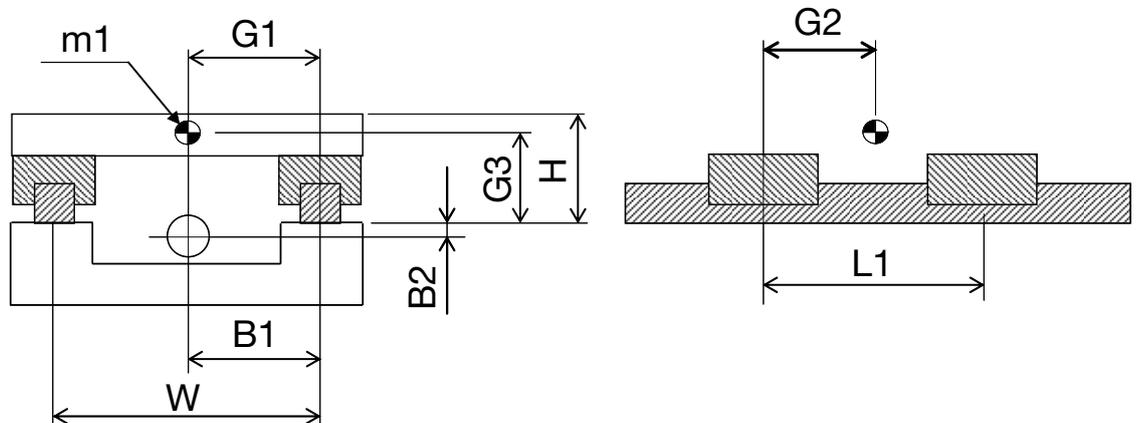


Fig. 9 1-axis stage dimensional diagram

7. Appendix

7. Appendix

Model	LM guide model number *1	Dimensions (mm)								Moving part weight (kg) m1
		Thrust position		Rail span	Block span	Moving part center of gravity			Table height	
		B1	B2	W	L1	G1	G2	G3	H	
AX0505	SR15V	62.0	-5.0	124.0	100.0	62.0	50.0	24.5	36.0	2.8
AX0510										
AX0515										
AX1010										
AX1015										
AX1515										
AX2020	SR25W	105.0	-8.0	210.0	140.0	105.0	70.0	34.0	49.0	9.6
AX2025										
AX2030										
AX2525										
AX2530										
AX3030										
AX4040	SR30W	175.0	-14.0	350.0	270.0	175.0	135.0	46.5	62.0	28.9
AX4050										
AX5050										

*1: 2-axis parallel use, 1 rail with 2 blocks

Table 12 XY stage (upper axis) LM guide service life calculation sheet

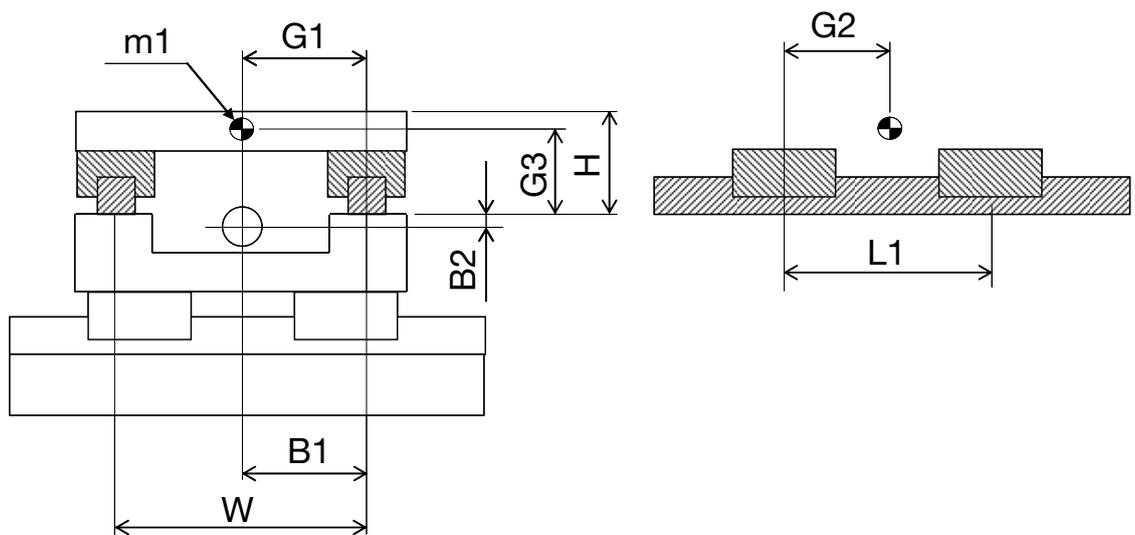


Fig. 10 XY stage (upper axis) dimensional diagram

7. Appendix

7. Appendix

Model	LM guide model number *1	Dimensions (mm)								Moving part weight (kg) m1
		Thrust position		Rail span	Block span	Moving part center of gravity			Table height	
		B1	B2	W	L1	G1	G2	G3	H	
AX0505	SR15W	62.0	-5.0	124.0	100.0	62.0	37.0	88.0	50.5	10.5
AX0510										
AX0515										
AX1010										
AX1015										
AX1515	SR25W	105.0	-8.0	210.0	140.0	105.0	70.0	115.0	63.0	42.8
AX2020										
AX2025										
AX2030										
AX2525										
AX2530	SR30W	175.0	-14.0	350.0	270.0	175.0	135.0	142.0	75.5	149.6
AX3030										
AX4040										
AX4050										
AX5050										

*1: 2-axis parallel use, 1 rail with 2 blocks

Table 13 XY stage (lower axis) LM guide service life calculation sheet

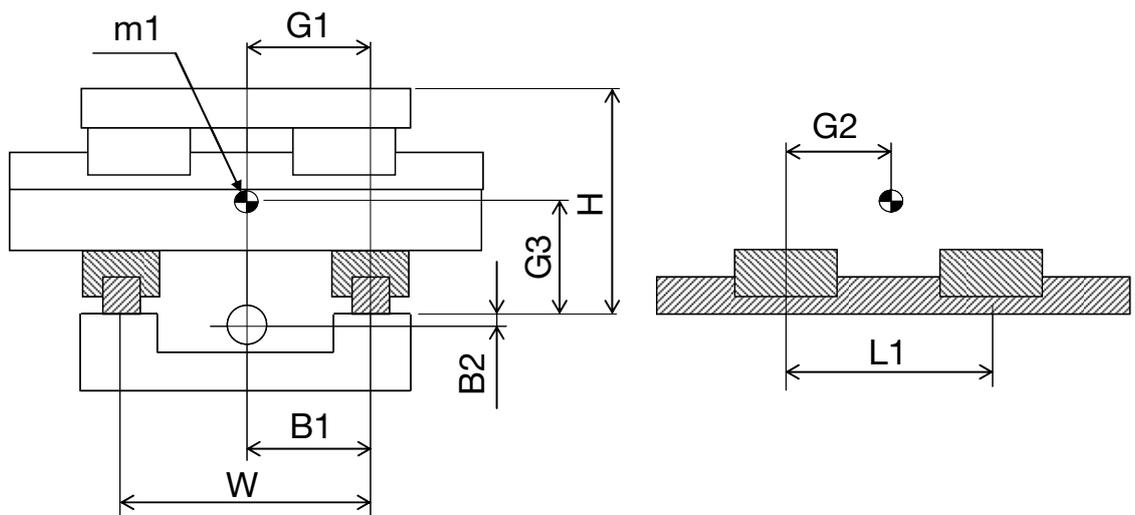


Fig. 11 XY stage (lower axis) dimensional diagram

7. Appendix

7. Appendix

- The data required to calculate the service life of the ball screw is shown in Tables 14 to 16.

Model	Ball screw (classification: precision - preload)							Guide part resistance (N)	Moving part weight (kg)
	Model	Ball center-to-center diameter (mm)	Thread minor diameter (mm)	Basic load rating		Mounting method	Distance between two mounting surfaces (mm)		
				Ca (kN)	C _{0a} (kN)				
A05	BIF1205-3	12.3	9.9	2.4	3.8	Secured - Free	105	13.6	3.3
A10							155		
A15							205		
A20	DIF1605-6	16.75	13.2	7.4	13	Secured - Supported	290	33.6	11.2
A25							340		
A30							390		
A40	DIF2005-6	20.75	17.2	8.5	17.3	Secured - Supported	495	57.2	32.1
A50							595		

Table 14 1-axis stage ball screw service life calculation sheet

Model	Ball screw (classification: precision - preload)							Guide part resistance (N)	Moving part weight (kg)
	Model	Ball center-to-center diameter (mm)	Thread minor diameter (mm)	Basic load rating		Mounting method	Distance between two mounting surfaces (mm)		
				Ca (kN)	C _{0a} (kN)				
AX0505	BIF1205-3	12.3	9.9	2.4	3.8	Secured - Free	105	13.6	3.3
AX0510									
AX0515									
AX1010									
AX1015									
AX1515									
AX2020	DIF1605-6	16.75	13.2	7.4	13	Secured - Supported	290	33.6	11.2
AX2025									
AX2030									
AX2525									
AX2530									
AX3030									
AX4040	DIF2005-6	20.75	17.2	8.5	17.3	Secured - Supported	495	57.2	32.1
AX4050									
AX5050									

Table 15 XY stage (upper axis) ball screw service life calculation sheet

7. Appendix

7. Appendix

Model	Ball screw (classification: precision - preload)							Guide part resistance (N)	Moving part weight (kg)
	Model	Ball center-to-center diameter (mm)	Thread minor diameter (mm)	Basic load rating		Mounting method	Distance between two mounting surfaces (mm)		
				Ca (kN)	C _{0a} (kN)				
AX0505	BIF1205-3	12.3	9.9	2.4	3.8	Secured - Free	105	16.0	11.0
AX0510							155		
AX0515							205		
AX1010							155		13.5
AX1015							205		
AX1515									
AX2020	DIF1605-6	16.75	13.2	7.4	13	Secured - Supported	290	33.6	43.0
AX2025							340		
AX2030							390		
AX2525							340		45.0
AX2530							390		
AX3030									
AX4040	DIF2005-6	20.75	17.2	8.5	17.3	Secured - Supported	495	57.2	150.7
AX4050							595		
AX5050									160.7

Table 16 XY stage (lower axis) ball screw service life calculation sheet

- The data required to calculate the service life of the bearings is shown in Table 17.

Model	Angular bearing			
	Bearing model number *1	Basic load rating		Permissible axial load (kN)
		Ca (kN)	C _{0a} (kN)	
A05 to A15 AX0505 to AX1515	7200CDB/GNP5	5.41	5.76	1.01
A20 to A30 AX2020 to AX3030	7201CDB/GNP5	7.04	7.52	1.59
A40, A50 AX4040 to AX5050	7203CDB/GNP5	11.13	12.58	2.67

*1: Preload is regular preload.

Table 17 Bearing service life calculation sheet

7. Appendix

7. Appendix

7-6

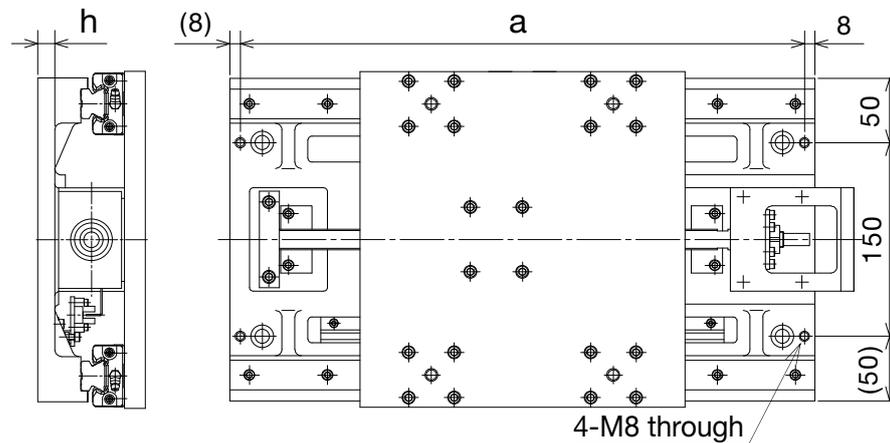
Hanger mounting hole position

- The hanger mounting hole position is shown in Table 18.

Model	Screw size	Diagram	a dimension (mm)	h dimension (mm)
A20, AX2020	M8	Fig. 12	434	13
A25, AX2025, AX2525	M8	Fig. 12	484	13
A30, AX2030, AX2530, AX3030	M8	Fig. 12	534	13
A40, AX4040	M10	Fig. 13	650	22
A50, AX4050, AX5050	M10	Fig. 13	750	22

Table 18 Hanger mounting hole position

* For the XY stage, it shows the lower axis position.



Note) Regular eyebolts cause interference and cannot be secured directly onto the base. Secure using hexagonal posts etc., or use swivel eyebolts.

Fig. 12 Hanger mounting hole position

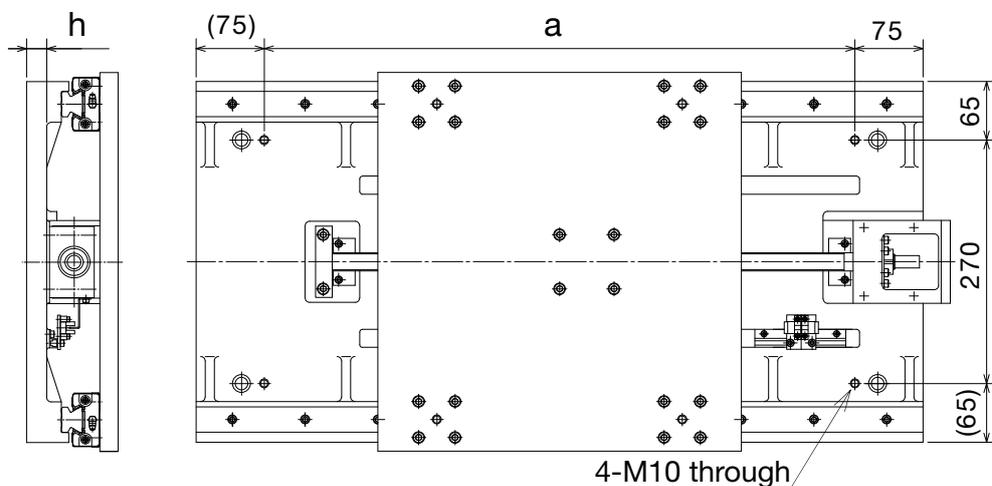


Fig. 13 Hanger mounting hole position

7. Appendix

7. Appendix

7-7

Introduction of the grease

THK original grease

AFB-LF Grease

It is universal grease using a lithium-based consistency enhancer with refined mineral oil as the base oil.

● Characteristics

- Excels in abrasion resistance and extreme pressure resistance in comparison to off-the-shelf universal lithium-based grease due to the action of a special additive.
- Not easily softens and excels in mechanical stability even if used for a long period.
- Unsusceptible to influences of water such as softening in case of water entrance and decrease in extreme pressure resistance.

● Representative properties

Test items	Representative property values	
Consistency enhancer	Lithium-based grease	
Base oil	Refined mineral oil	
Base oil kinetic viscosity: mm ² /s (40°C)	170	
Worked penetration (25°C, 60 W)	275	
Mixing stability (100,000 W)	345	
Dropping point: °C	193	
Evaporation: mass% (99°C, 22 h)	0.4	
Oil separation rate: mass% (100°C, 24 h)	0.6	
Copper plate corrosion (B method, 100°C, 24 h)	Accepted	
Low temperature torque: mN · m (-20°C)	Startup	130
	Rotation	51
4-ball test (fusion load): N	3089	
Operating temperature range (°C)	-15 to 100	
Appearance color	Brownish yellow	



Fig. 14 Appearance of the grease tube and the product box

7. Appendix

7. Appendix

7-8

Introduction of the grease gun unit

Grease Gun Unit MG70



The grease gun unit MG70 is capable of supplying grease by replacing the dedicated nozzle. The grease gun has a slit window that allows you to visually check the remaining amount of grease. Since grease is contained in a 70 g bellows cartridge, you can replace the nozzle without soiling your hand.

Table 19 shows the specifications of the grease gun while Fig. 15 shows its appearance.

Discharge pressure	19.6 MPa max
Discharge rate	0.6 cc/stroke
Grease	70 g bellows cartridge
Overall length	235 mm (excluding nozzle)
Weight	480 g (with nozzle, excluding grease)

Table 19 Specifications of the grease gun

7. Appendix

7. Appendix

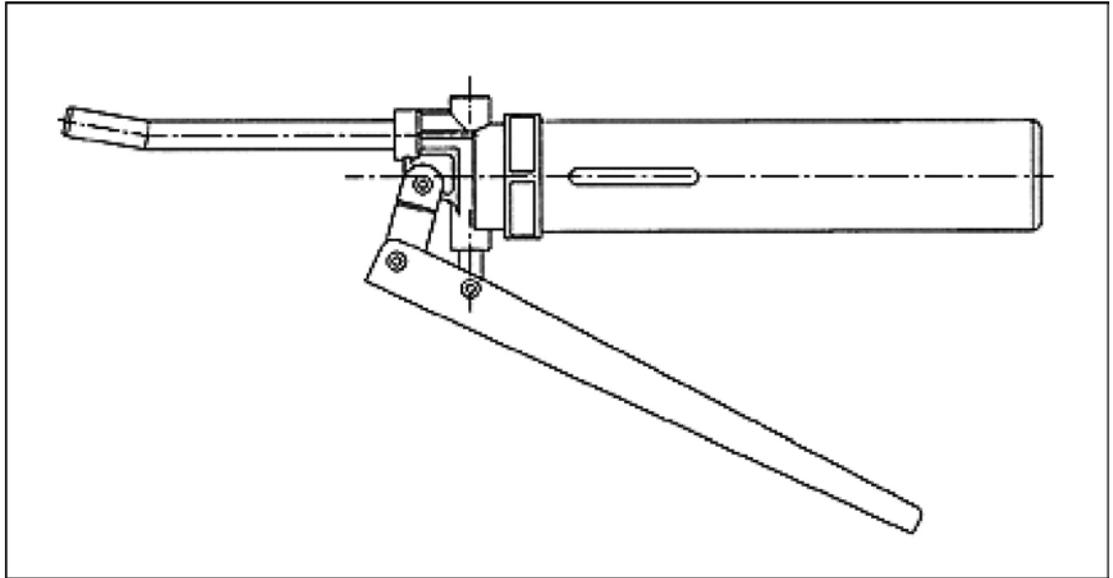


Fig. 15 Appearance of the grease gun

Fig. 16 shows the shapes of the nozzles and attachment for the grease gun used for lubrication.
 * It allows you to supply grease to a part difficult to lubricate (by dropping grease onto the raceway) by using the P type attachment.

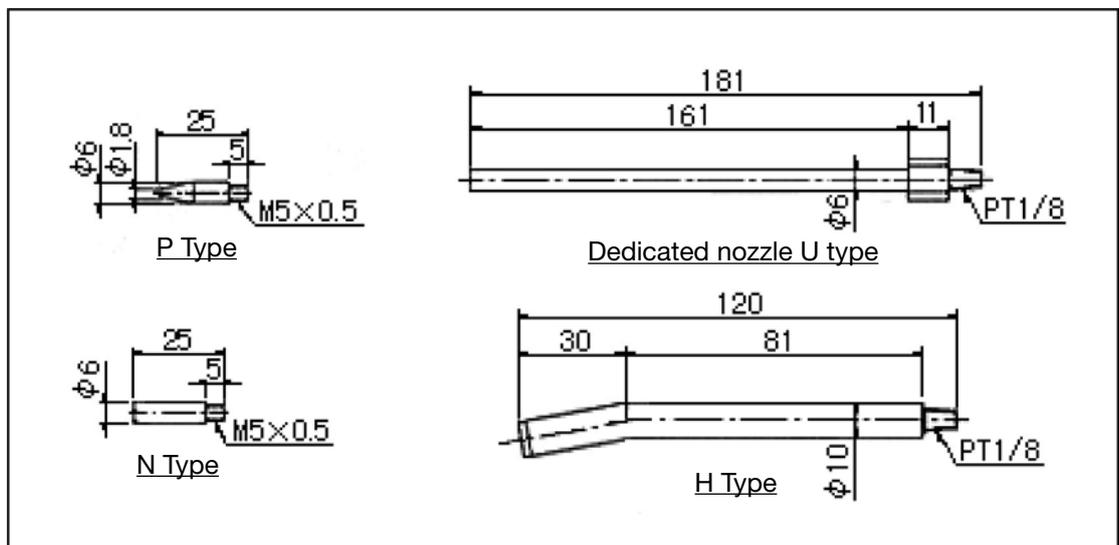


Fig. 16 Shapes of the nozzle and attachment for the grease gun

Appendix

Revision history

The instruction manual No. is described on the back cover.

Date of issue	Instruction manual No.	Details
April 2015	No.124M-1(0)E	First edition



**THK Electric Actuator Precision Stage Series
1-Axis / XY Stage**

A/AX

INSTRUCTION MANUAL