



# **Separate Type Absolute Linear Scale**

**ABS ST1300 Series**

## **User's Manual - Instructions for use -**

Read this document thoroughly before operating  
the product. After reading,  
retain it close at hand for future reference.  
This English language version of the document  
contains the original instructions.

No. 99MBE084B5

Date of publication: May 1, 2025 (1)



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## ■ Product names and model numbers covered in this document

| Product name                        | Model number |
|-------------------------------------|--------------|
| Separate Type Absolute Linear Scale | ABS ST130*A  |
|                                     | ABS ST134*A  |
|                                     | ABS ST135*   |
|                                     | ABS ST137*A  |
|                                     | ABS ST138*A  |

## ■ Notice regarding this document

- Mitutoyo Corporation assumes no responsibilities for any damage to the product, caused by its use not conforming to the procedure described in this document.
- Upon loan or transfer of this product, be sure to attach this document to the product.
- In the event of loss or damage to this document, immediately contact the agent where you purchased the product or Mitutoyo sales office.
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety Precautions" and "Precautions for Use" in the preface.
- The contents in this document are based on the information current as of May 2025.
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## Conventions and Wording Used in This Document

### ■ Safety reminder conventions and wording warning against potential hazards

|                                                                                   |                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|  | Indicates a hazard with a high level of risk which, if not avoided, <b>will result in death or serious injury</b> .    |
|  | Indicates a hazard with a medium level of risk which, if not avoided, <b>could result in death or serious injury</b> . |
|  | Indicates a hazard with a low level of risk which, if not avoided, <b>could result in minor or moderate injury</b> .   |
|  | Indicates a situation which, if not avoided, <b>may result in property damage</b> .                                    |
|  | <b>Electricity</b><br>Alerts the user to a specific hazardous situation that means "Caution, risk of electric shock".  |

### ■ Conventions indicating prohibited and mandatory actions

|                                                                                     |                                                          |
|-------------------------------------------------------------------------------------|----------------------------------------------------------|
|  | Indicates concrete information about prohibited actions. |
|  | Indicates concrete information about mandatory actions.  |
|  | Indicates that grounding needs to be implemented.        |

### ■ Conventions and wording indicating referential information or referential locations

**Tips** Indicates further information and details relevant for the operating methods and procedures that are explained in that section.



Indicates referential locations if there is information that should be referred to in this document or an extraneous User's Manual.

E.g.: For details about XX, see  "1.2 System Configuration and Name of Each Part" (page 1).

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# Safety Precautions

Observe the following descriptions to make full use of the performance of this product:

## NOTICE

- Read this document thoroughly before operating the system to use it properly.
- Before connecting this product to the machine main unit, make sure that the power for the control unit is turned off.
- To maintain the shielding effect, firmly tighten the screws on the connectors of each connecting cable.
- To prevent defective contacts, do not touch the connecting terminals of the connectors with bare hands.

## Precautions for Use

### ■ General safety precautions

- This product is a measuring instrument.  
Do not use this product for any other purpose than measuring.
- This is an industrial product.  
Do not use this product for any other purpose than industrial use.
- This product is a precision instrument.  
Handle this product with extra care. Do not apply any strong impact or excessive force to the parts during use.

### ■ Required environment for installation

#### ● Vibration

To install this product onto the machine main unit, select a location where there is as little vibration as possible.

If the scale unit is used for an extended period of time on a machine where there is a substantial amount of vibration, the built-in precision parts may be damaged, thereby adversely influencing the performance of the unit.

#### ● Shock, dust, water protection

To protect the scale main unit from being directly exposed to machining oil and chips, or from being bumped by a workpiece, etc., prepare a cover that protects the entire scale main unit.

#### ● Ambient temperature and humidity

This product should be operated in an environment where the temperature is 0 °C–50 °C and where the relative humidity is 20 %RH–80 %RH (non condensation). Do not use this product in a place where sudden changes in temperature or humidity are observed.

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## Electromagnetic Compatibility (EMC)

This product complies with the EMC Directive and the UK Electromagnetic Compatibility Regulations; however, if this receives electromagnetic interference that exceeds these requirements, it will be out of warranty and require appropriate measures.

This is an industrial product. Not intended for use in a residential environment. Use of this product in a residential environment may cause an electromagnetic interference with other instruments. In such a case, appropriate measures against electromagnetic interference are required.

## Export Control Compliance

This product falls into the Catch-All-Controlled Goods and/or Catch-All-Controlled Technologies (including Programs) under Category 16 of Appended Table 1 of Export Trade Control Order or under Category 16 of Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan.

If you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country.

Also, if an option is added or modified to add a function to this product, this product may fall under the category of List-Control Goods and/or List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of the Export Trade Control Order or under Category 1 - 15 of the Appended Table of Foreign Exchange Control Order, based on Foreign Exchange and Foreign Trade Act of Japan. In that case, if you intend re-export of the product from a country other than Japan, re-sale of the product in a country other than Japan, or re-provision of the technology (including program), you are obligated to observe the regulations of your country. Please contact Mitutoyo in advance.

## Notes on Export to European Countries

When you intend exporting of this product to any of the European countries, it may be required to provide User's Manual(s) in English and Declaration of Conformity in English (in some cases, the official language of the country to be exported). For detailed information, please contact Mitutoyo in advance.

## Disposal of Products outside the European Countries

Please follow the official instruction in each community and country.

# Disposal of Old Electrical & Electronic Equipment (Applicable in the European Countries with Separate Collection Systems)



This symbol on the product or on its packaging is based on WEEE Directive (Directive on Waste Electrical and Electronic Equipment), and this symbol indicates that this product shall not be treated as household waste. To reduce the environmental impact and minimize the volume of landfills, please cooperate in reuse and recycle.

For how to dispose of the product, please contact the agent where you purchased the product or Mitutoyo sales office.

## China RoHS Compliance Information

This product meets China RoHS requirements. See the table below.

产品中有害物质的名称及含量

| 部件名称   | 有害物质 |      |      |          |       |        |
|--------|------|------|------|----------|-------|--------|
|        | 铅    | 汞    | 镉    | 六价铬      | 多溴联苯  | 多溴二苯醚  |
|        | (Pb) | (Hg) | (Cd) | (Cr(VI)) | (PBB) | (PBDE) |
| 本体     | ○    | ○    | ○    | ○        | ○     | ○      |
| 电气设备部分 | ×    | ○    | ○    | ○        | ○     | ○      |
| 配件     | ○    | ○    | ○    | ○        | ○     | ○      |

| 部件名称   | 有害物质      |           |           |                |
|--------|-----------|-----------|-----------|----------------|
|        | 邻苯二甲酸二正丁酯 | 邻苯二甲酸二异丁酯 | 邻苯二甲酸丁基苄酯 | 邻苯二甲酸二(2-乙基己)酯 |
|        | (DBP)     | (DIBP)    | (BBP)     | (DEHP)         |
| 本体     | ○         | ○         | ○         | ○              |
| 电气设备部分 | ○         | ○         | ○         | ○              |
| 配件     | ○         | ○         | ○         | ○              |

本表格依据 SJ/T 11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。



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# Warranty

This product has been manufactured under strict quality management, but should it develop problems within one year of the date of purchase in normal use, repair shall be performed free of charge. Please contact the agent where you purchased the product or Mitutoyo sales representative ( 図 "SERVICE NETWORK" on page App-1). This warranty, however, shall not affect any provisions of the Mitutoyo Software End User License Agreement.

If this product fails or is damaged for any of the following reasons, it will be subject to a repair charge, even if it is still under warranty.

- Failure or damage owing to fair wear and tear
- Failure or damage owing to inappropriate handling, maintenance or repair, or to unauthorized modification
- Failure or damage owing to transport, dropping, or relocation of the instrument after purchase
- Failure or damage owing to fire, salt, gas, abnormal voltage, lightning surge, or natural disaster
- Failure or damage owing to use in combination with hardware or software other than those designed or permitted by Mitutoyo
- Failure or damage owing to use in ultra-hazardous activities

This warranty is effective only where the instrument is properly installed and operated in conformance with the instructions in this manual within the original country of the installation.

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You assume all responsibility for all results arising out of its selection of this product to achieve its intended results.

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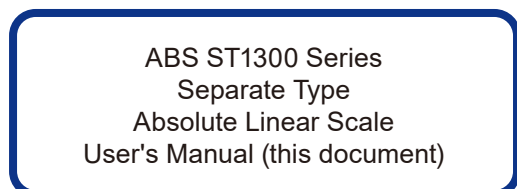
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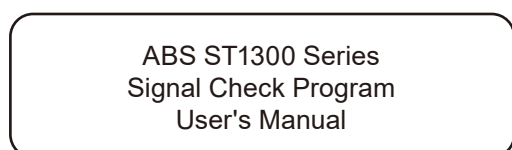
## About This Document

### ■ Positioning of this document in document map

#### ● For linear scale



#### ● For software



### ■ Intended readers and purpose of this document

#### ● Intended readers

This document is intended for first-time users of ABS ST1300 Series Separate Type Absolute Linear Scale.

Readers are assumed to be able to understand instructions by reading technical drawings.

#### ● Purpose

The purpose of this document is to help you understand the ABS ST1300 Series Separate Type Absolute Linear Scale.

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# 1 Overview

This chapter describes the features of this product, the names and functions of the parts, and the flow of the main tasks to use this product.

## 1.1 Features

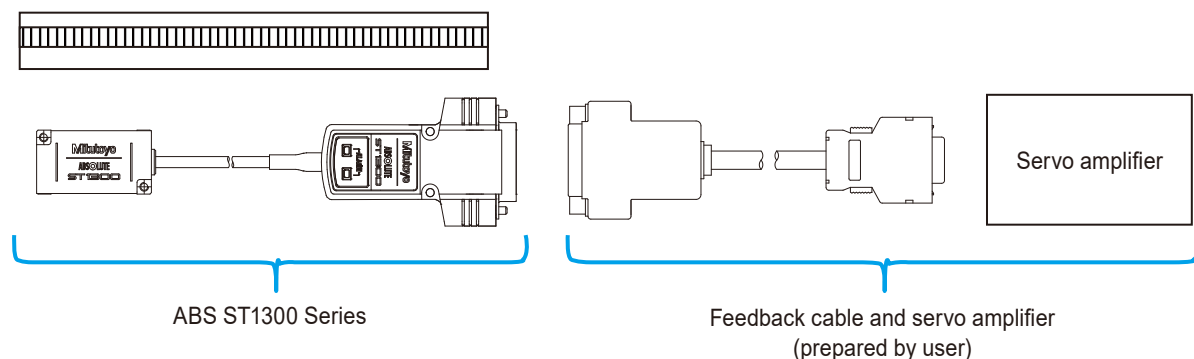
The ABS ST1300 Series is a reflective photoelectric linear encoder equipped with a two-sided telecentric imaging optical system. The two-sided telecentric imaging optical system captures a scale grid as an image and detects its travel distance using light receiving elements. With a focal depth deeper than the conventional optical system, this system has a greater allowance for changes in the gap, such as allowance for scale undulation, stage posture change, and Detector installation. It also secures a wide imaging range, resulting in a greater allowance even for dirt and small scratches on the scale.

This product achieves the maximum effective length of 12 m, maximum response speed of 8 m/s, and minimum resolution of 0.001  $\mu\text{m}$ . In addition, the following interface specifications compatible with the high-speed serial interface of the companies are available:

- Mitsubishi Electric Corporation specifications
- FANUC Corporation specifications
- Panasonic Corporation specifications
- Yaskawa Electric Corporation specifications
- Mitutoyo Corporation ENSIS® specifications

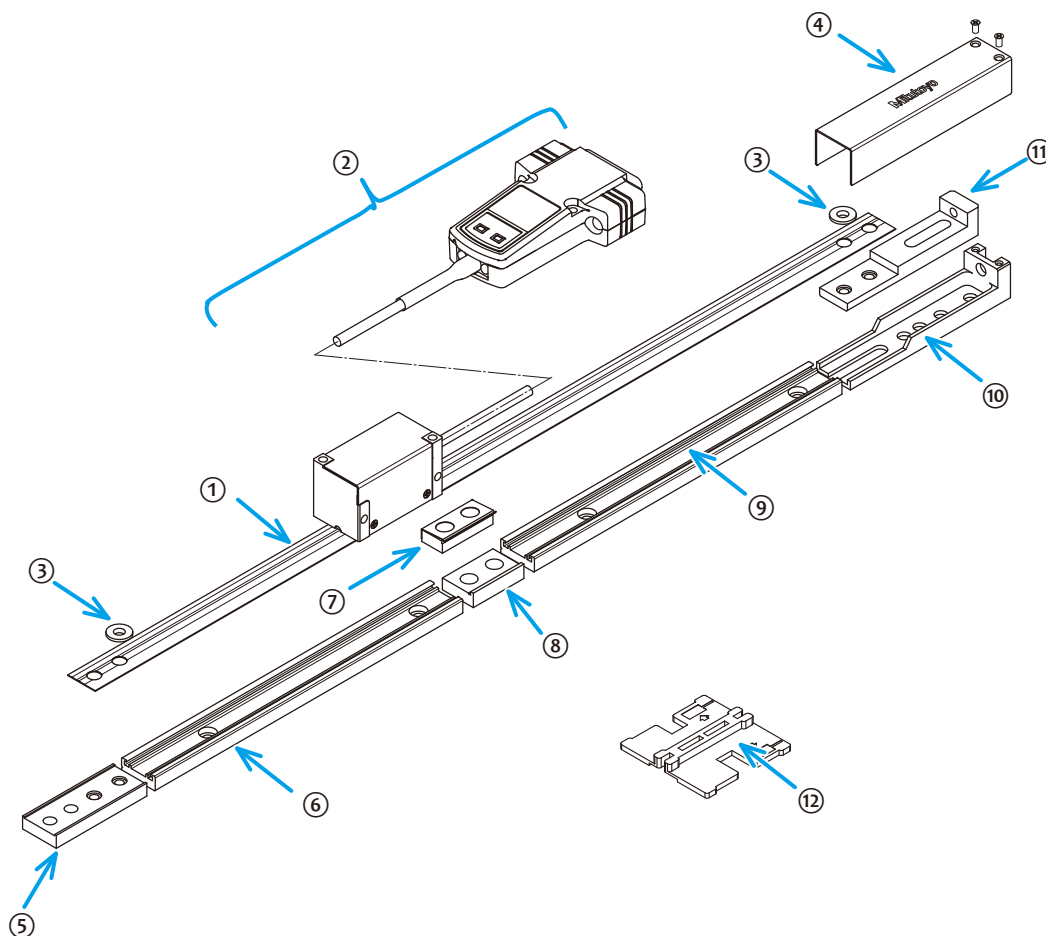
## 1.2 System Configuration and Name of Each Part

The system configuration and the name of each part are shown below.



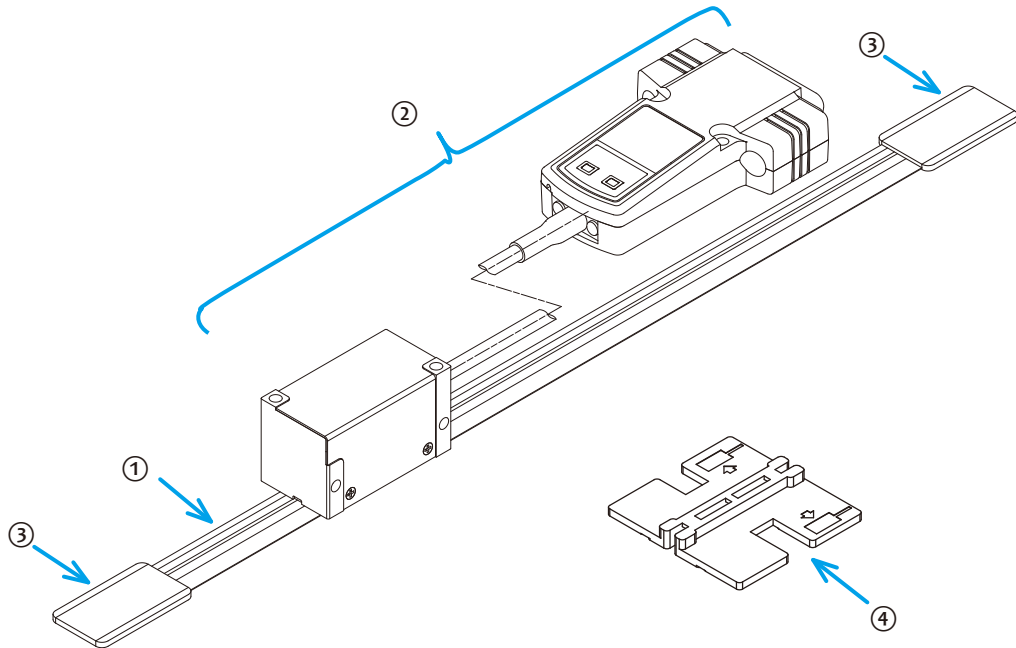
A feedback cable with the Yaskawa Electric specifications requires an optional ST1380A connection cable (P/N: 06AFA434A, 06AFA434B, or 06AFA434C).

## 1.2.1 Specifications for Fixing at Both Ends



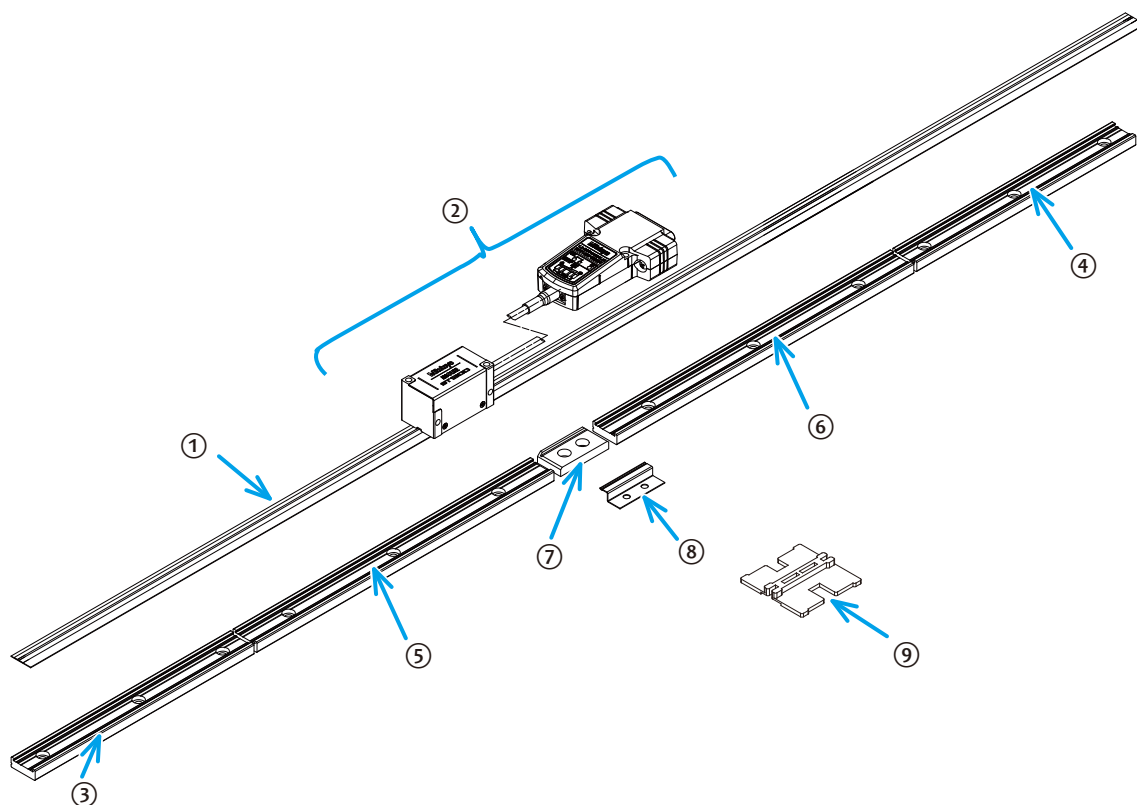
| No. | Name                                                                      |
|-----|---------------------------------------------------------------------------|
| ①   | Tape scale                                                                |
| ②   | Detection unit                                                            |
| ③   | Sleeve washer                                                             |
| ④   | Cover                                                                     |
| ⑤   | Fixing base                                                               |
| ⑥   | Scale holder B                                                            |
| ⑦   | Intermediate fixing spring Ass'y                                          |
| ⑧   | Intermediate fixing base                                                  |
| ⑨   | Scale holder A                                                            |
| ⑩   | Pull block A                                                              |
| ⑪   | Pull block B                                                              |
| ⑫   | Mounting auxiliary tool (for fixing at both ends or fixing at the center) |

1.2.2 Specifications for Fixing with Double-Sided Tape



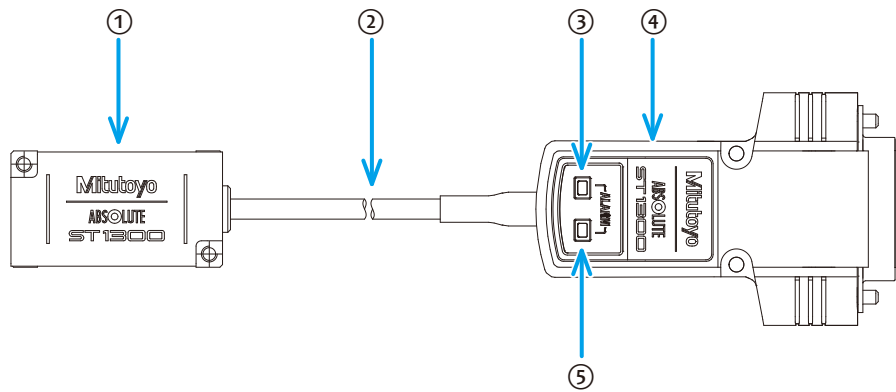
| No. | Name                                                        |
|-----|-------------------------------------------------------------|
| ①   | Tape scale                                                  |
| ②   | Detection unit                                              |
| ③   | End cap                                                     |
| ④   | Mounting auxiliary tool (for fixing with double-sided tape) |

## 1.2.3 Specifications for Fixing at the Center



| No. | Name                                                                      |
|-----|---------------------------------------------------------------------------|
| ①   | Tape scale                                                                |
| ②   | Detection unit                                                            |
| ③   | Scale holder C                                                            |
| ④   | Scale holder D                                                            |
| ⑤   | Scale holder E                                                            |
| ⑥   | Scale holder (998 mm)                                                     |
| ⑦   | Center fixing base                                                        |
| ⑧   | Intermediate fixing spring                                                |
| ⑨   | Mounting auxiliary tool (for fixing at both ends or fixing at the center) |

# 1.2.4 Detection Unit



| No. | Name                 |
|-----|----------------------|
| ①   | Detector             |
| ②   | Detector cable       |
| ③   | LED (yellow)         |
| ④   | Electrical connector |
| ⑤   | LED (red)            |

**Tips**

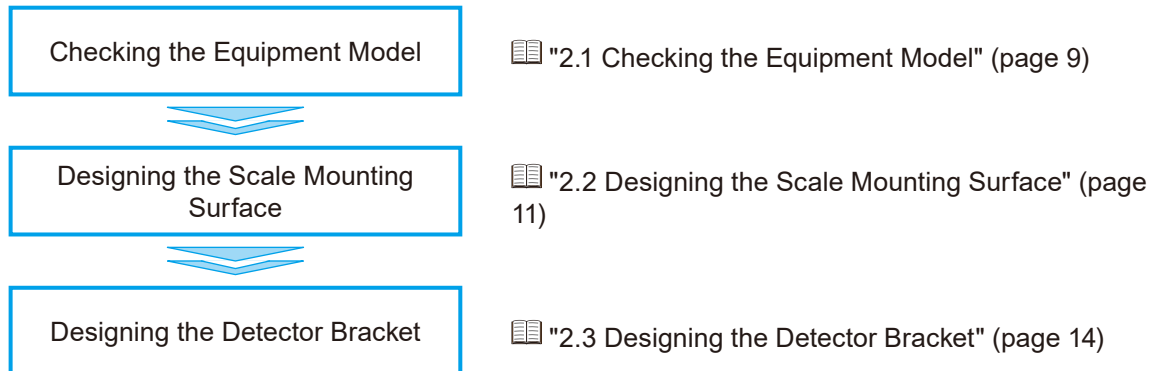
You can check the following states by the electrical connector LED.

| State    | LED state                                                                                                                        |
|----------|----------------------------------------------------------------------------------------------------------------------------------|
| Power on | The LED (yellow) and LED (red) turn on for about 2 seconds at power-on and then turn off.                                        |
| Caution  | The LED (yellow) turns on when a caution occurs. When the cause is eliminated, the LED (yellow) turns off.                       |
| Error    | The LED (red) turns on when an error occurs. The state will be maintained until the error is reset, or the power is re-supplied. |

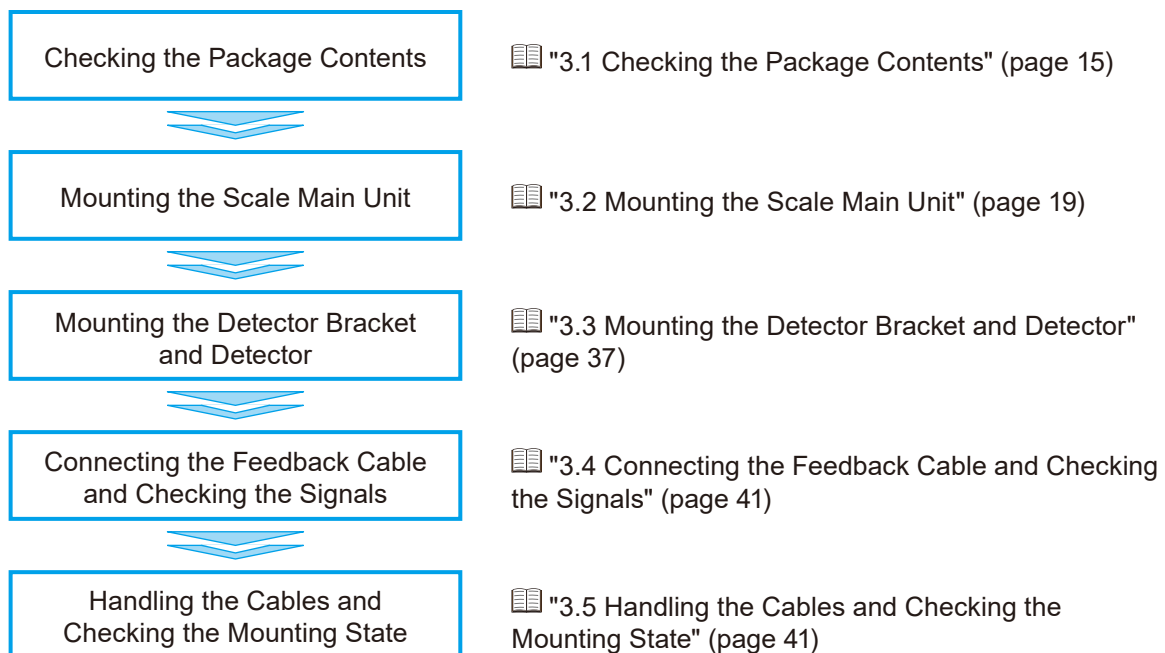
## 1.3 The Flow of Main Tasks

The following chart shows the flow of preliminary preparation and installation onto the machine main unit as tasks to use this product.

### 1.3.1 Preliminary Preparation



### 1.3.2 Installation onto the Machine Main Unit





- After mounting the scale unit, check the Detector signals according to the instructions in "ABS ST1300 Series Signal Check Program User's Manual". For details, refer to "ABS ST1300 Series Signal Check Program User's Manual" (No. 99MBE085B).
- Use the tape scale and the Detector that have the same serial No. written on the attached sticker.
- To check the Detector signals after mounting the scale unit, you need a PC and peripheral equipment. Prepare the necessary equipment by referring to "1.3 Preparation" in "ABS ST1300 Series Signal Check Program User's Manual".

MEMO

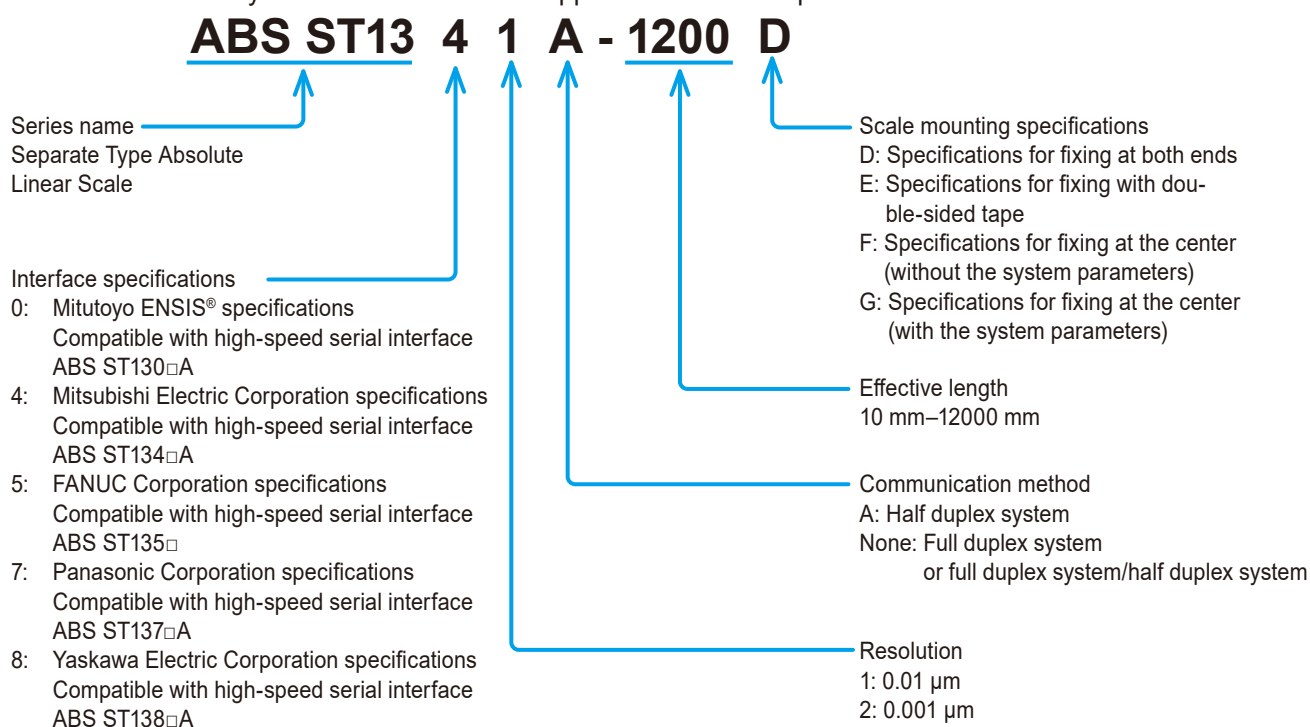
# 2 Setup for Installation

This chapter describes the preliminary preparation for installing this product onto the machine main unit.

## 2.1 Checking the Equipment Model

The linear scale ABS ST1300 Series model number is determined based on the interface specifications, resolution, communication method, effective length, and scale mounting specifications.

Make sure that your linear scale model supports the servo amplifier to be used.



### 2.1.1 System Parameters

Some linear scale ABS ST1300 Series models use the system parameters (scale-specific parameters) to make use of the predetermined performance.

Whether the system parameters are available or not depends on the scale mounting specifications as follows.

| Scale mounting specifications                       | System parameters | Indication accuracy (20 °C)                                                  |
|-----------------------------------------------------|-------------------|------------------------------------------------------------------------------|
| D: Specifications for fixing at both ends           | Available         | $\pm 5 \mu\text{m}$ (1 m or less)<br>$\pm 5 \mu\text{m/m}$ (1.1 m or more)   |
| E: Specifications for fixing with double-sided tape | Available         | $\pm 5 \mu\text{m}$ (1 m or less)<br>$\pm 5 \mu\text{m/m}$ (1.1 m or more)   |
| F: Specifications for fixing at the center          | Not available     | $\pm 10 \mu\text{m}$ (1 m or less)<br>$\pm 10 \mu\text{m/m}$ (1.1 m or more) |
| G: Specifications for fixing at the center          | Available         | $\pm 5 \mu\text{m}$ (1 m or less)<br>$\pm 5 \mu\text{m/m}$ (1.1 m or more)   |

For the scale mounting specifications D, E, and G, you can use the factory default set of scale and Detector as the system parameters are already written into the Detector before shipment. However, if the Detector fails or another Detector is added later (such as when two or more Detectors are used in one scale), the system parameters corresponding to the scale must be written into the new Detector.

For any questions about the system parameters, please contact your dealer or the nearest Mitutoyo sales office/service center.

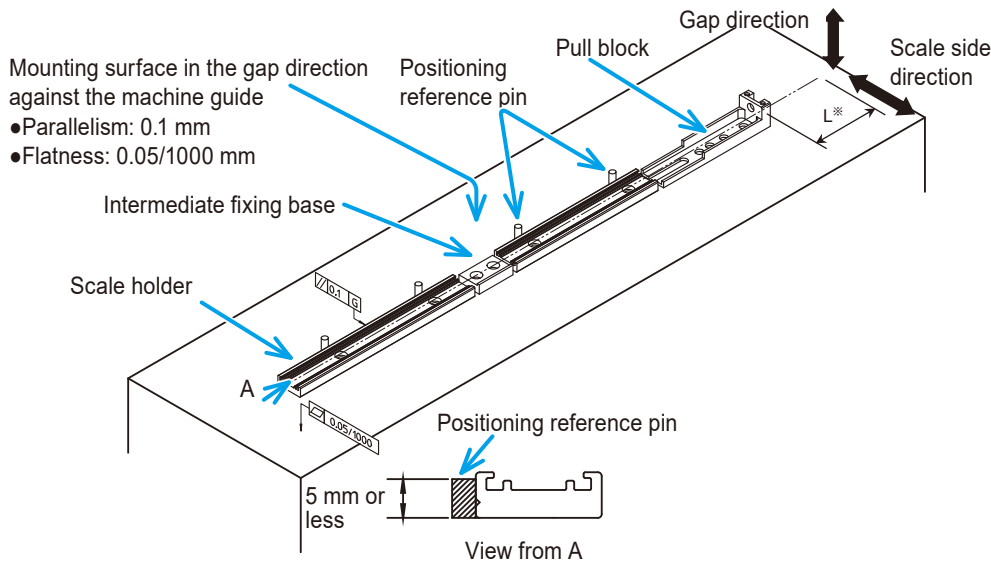


- Contact Mitutoyo for the cases below:
  - The Detector in use fails.
  - A Detector needs to be stocked up as a backup for failure.
  - A Detector needs to be added later.
- If the scale in use fails, both the scale and Detector need to be replaced.

## 2.2 Designing the Scale Mounting Surface

### 2.2.1 Mounting the Scale with the Specifications for Fixing at Both Ends

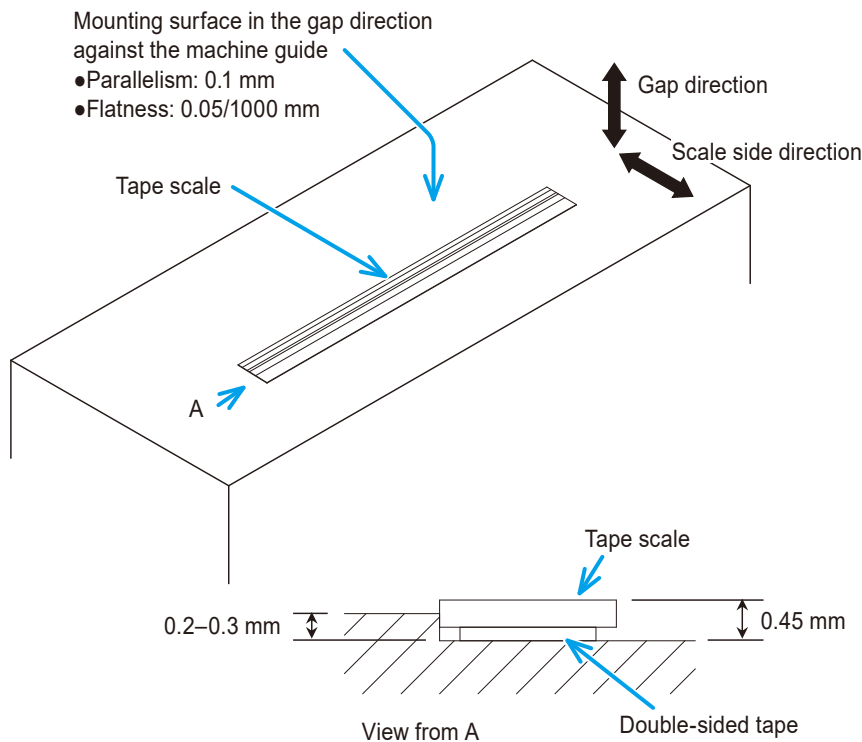
Design the scale mounting area as shown in the figure below according to "4.7.1 Specifications for Fixing at Both Ends (Effective Length of 500 mm–1000 mm)" (page 58) and "4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)" (page 60).



- L must be about 200 mm in size to secure a working space for fixing pull blocks and tightening pull screws.
- Design it so that the scale can be mounted with the parallelism in the scale side direction against the machine guide set to 0.1 mm. The scale holder surface with a groove on its side is the mounting reference surface in the scale side direction.
- For the scale with the effective length of 1100 mm–12000 mm, which comes with the intermediate fixing base, set the pin hole position in a location where the positioning reference pin does not come in contact with the intermediate fixing base.
- Set the positioning reference pin according to the pitch of the scale holder fixing screw.
- The abutting of the scale holder can be also set with stepped machining. Even in this case, secure the above specified value for the parallelism against the machine guide.

### 2.2.2 Mounting the Scale with the Specifications with Double-Sided Tape

Design the scale mounting area as shown in the figure below according to "4.7.3 Specifications for Fixing with Double-Sided Tape (Effective Length of 10 mm–3000 mm)" (page 63).



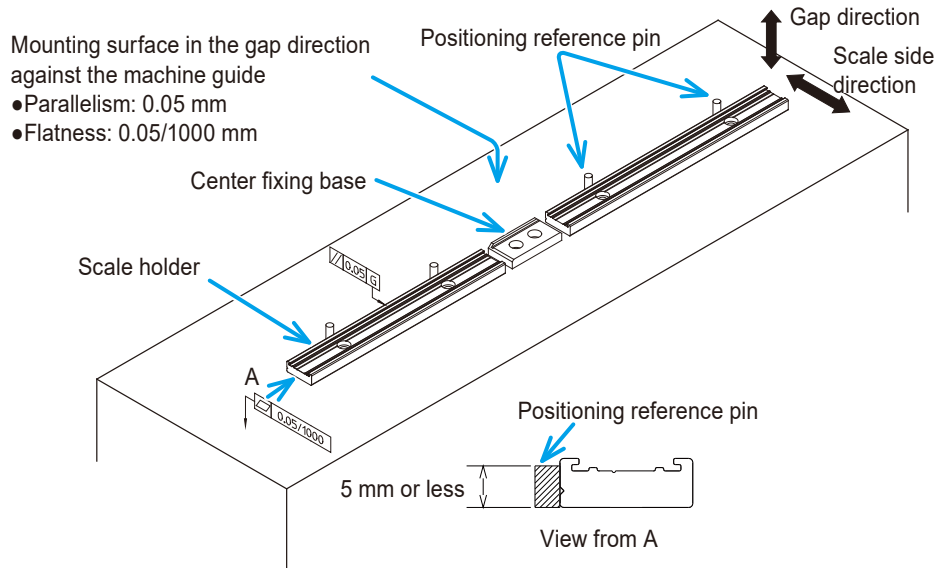
Design it so that the scale can be mounted with the parallelism in the scale side direction against the machine guide set to 0.1 mm.

#### Tips

Using the optional scale attaching auxiliary tool (P/N: 06AEQ305) makes it easier to mount the tape scale. For details, refer to "Effective length of 200 mm–3000 mm" (page 29).

### 2.2.3 Mounting the Scale with the Specifications for Fixing at the Center

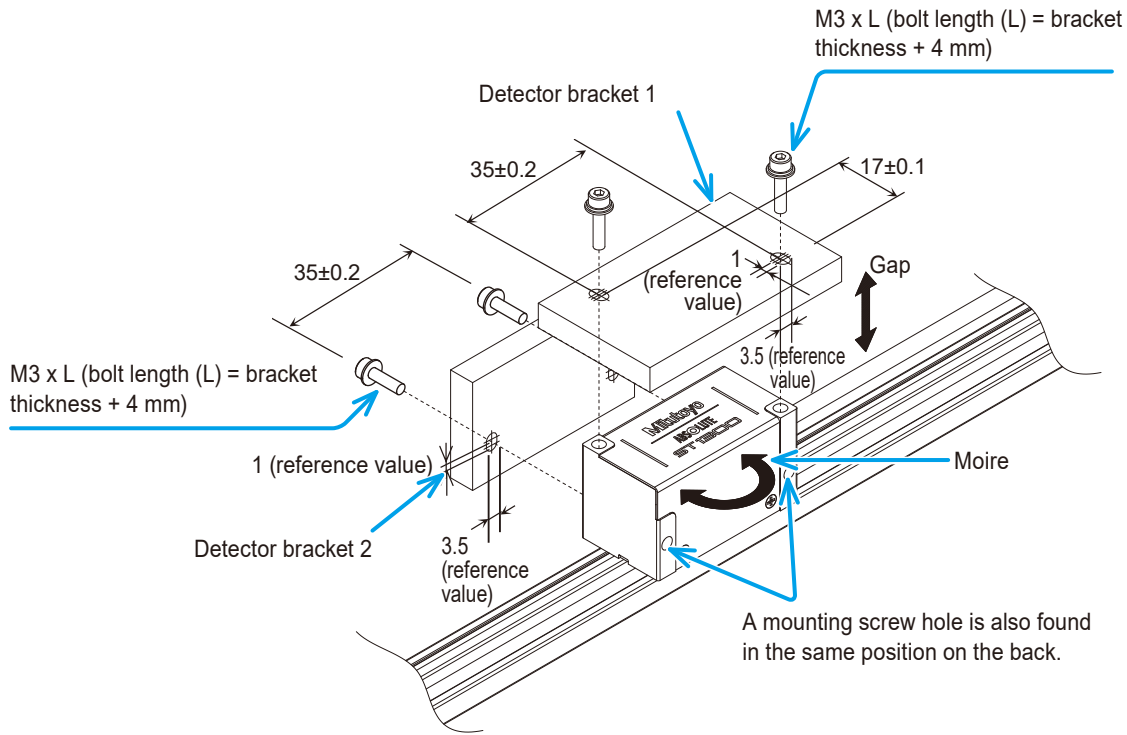
Design the scale mounting area as shown in the figure below according to "4.7.4 Specifications for Fixing at the Center (Effective Length of 500 mm–2200 mm)" (page 66), "4.7.5 Specifications for Fixing at the Center (Effective Length of 2400 mm–4200 mm)" (page 68), and "4.7.6 Specifications for Fixing at the Center (Effective Length of 4400 mm–6000 mm)" (page 70).



- Design it so that the scale can be mounted with the parallelism in the scale side direction against the machine guide set to 0.05 mm. The scale holder surface with a groove on its side is the mounting reference surface in the scale side direction.
- Set the pin hole position in a location where the positioning reference pin does not come in contact with the center fixing base.
- Set the positioning reference pin according to the pitch of the scale holder fixing screw.
- The abutting of the scale holder can be also set with stepped machining. Even in this case, secure the above specified value for the parallelism against the machine guide.

## 2.3 Designing the Detector Bracket

Design the Detector bracket according to the figure below. Its shape must allow adjustment of the Detector position (moire/gap). It is recommended that the Detector fixing screw holes should be long holes to make it easier to adjust the Detector position.



- Design it so that the parallelism of the Detector mounting surface against the scale mounting surface is within 0.05 mm.
- The change in the gap direction of the Detector within the maximum travel range of the machine unit must be within 0.05 mm.

### Tips

If the thickness of the Detector mounting bracket is insufficient, the rigidity of the bracket may decrease, which also lowers the rigidity of the servo mechanism. Take this into consideration when determining the thickness of the bracket.

# 3 Installation onto the Machine Main Unit

This chapter describes the procedures, methods, and precautions required when mounting this product onto the machine main unit.

## 3.1 Checking the Package Contents

Before installation, make sure that the product package contains the following items.

If your scale does not satisfy the specified specifications or you have any questions or concerns about the product, please contact your dealer or the nearest Mitutoyo sales office/service center.

### 3.1.1 Specifications for Fixing at Both Ends

| Name                                                                      | Quantity | Note                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tape scale                                                                | 1        | Check the effective length.                                                                                                                                                                                                                                                                                  |
| Detection unit                                                            | 1        |                                                                                                                                                                                                                                                                                                              |
| Scale holder A                                                            | 1        |                                                                                                                                                                                                                                                                                                              |
| Scale holder B                                                            |          | This accessory comes with the scale with the effective length of 1100 mm or more. For details on the quantity, refer to  "4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)" (page 60). |
| Pull block A                                                              | 1        |                                                                                                                                                                                                                                                                                                              |
| Pull block B                                                              | 1        |                                                                                                                                                                                                                                                                                                              |
| Fixing base                                                               | 1        |                                                                                                                                                                                                                                                                                                              |
| Sleeve washer                                                             | 2        |                                                                                                                                                                                                                                                                                                              |
| Intermediate fixing base                                                  |          | This accessory comes with the scale with the effective length of 1100 mm or more. For details on the quantity, refer to  "4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)" (page 60). |
| Intermediate fixing spring Ass'y                                          |          | This accessory comes with the scale with the effective length of 1100 mm or more. For details on the quantity, refer to  "4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)" (page 60). |
| Cover                                                                     | 1        |                                                                                                                                                                                                                                                                                                              |
| Countersunk screw (M2 x 4)                                                | 2        |                                                                                                                                                                                                                                                                                                              |
| Mounting auxiliary tool (for fixing at both ends or fixing at the center) | 1        |                                                                                                                                                                                                                                                                                                              |
| User's Manual                                                             | 1        | This document                                                                                                                                                                                                                                                                                                |
| Warranty card                                                             | 1        |                                                                                                                                                                                                                                                                                                              |
| Inspection certificate                                                    | 1        |                                                                                                                                                                                                                                                                                                              |



To mount the scale unit, prepare the following parts.

| Part name                                         | Quantity | Note                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hex socket head cap screw (M3 x 6)                | 16–165   | For fixing the scale holder, intermediate fixing base, and intermediate fixing spring Ass'y. For details on the required quantity, refer to  "4.7.1 Specifications for Fixing at Both Ends (Effective Length of 500 mm–1000 mm)" (page 58) and "4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)" (page 60). |
| Hex socket head cap screw (M4 x 5)                | 4        | For fixing the tape scale                                                                                                                                                                                                                                                                                                                                                                                                         |
| Hex socket head cap screw (M4 x 8)                | 2        | For fixing the pull block A                                                                                                                                                                                                                                                                                                                                                                                                       |
| Hex socket head cap screw (M4 x 10)               | 2        | For fixing the fixing base                                                                                                                                                                                                                                                                                                                                                                                                        |
| Hex socket head cap screw (M4 x 14)               | 2        | For fixing the pull block B                                                                                                                                                                                                                                                                                                                                                                                                       |
| Hex socket head cap screw (M4 x 16)               | 1        | Screw for pulling the tape scale                                                                                                                                                                                                                                                                                                                                                                                                  |
| Hex socket head cap screw (M3 x L)                | 2        | For mounting the Detector. Determine the screw length based on the thickness of the prepared Detector bracket and the depth of the Detector screw hole.                                                                                                                                                                                                                                                                           |
| Plain washer (polished round, nominal diameter 4) | 4        | For fixing the tape scale and pull block B                                                                                                                                                                                                                                                                                                                                                                                        |
| Plain washer (nominal diameter 3)                 | 2        | For fixing the Detector                                                                                                                                                                                                                                                                                                                                                                                                           |
| Spring washer (nominal diameter 3)                | 2        | For fixing the Detector                                                                                                                                                                                                                                                                                                                                                                                                           |

### 3.1.2 Specifications for Fixing with Double-Sided Tape

| Name                                                        | Quantity | Note                        |
|-------------------------------------------------------------|----------|-----------------------------|
| Tape scale                                                  | 1        | Check the effective length. |
| Detection unit                                              | 1        |                             |
| End cap                                                     | 2        |                             |
| Mounting auxiliary tool (for fixing with double-sided tape) | 1        |                             |
| User's Manual                                               | 1        | This document               |
| Warranty card                                               | 1        |                             |
| Inspection certificate                                      | 1        |                             |



- To mount the scale unit, prepare the following parts.

| Part name                          | Quantity | Note                                                                                                                                                    |
|------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hex socket head cap screw (M3 x L) | 2        | For mounting the Detector. Determine the screw length based on the thickness of the prepared Detector bracket and the depth of the Detector screw hole. |
| Plain washer (nominal diameter 3)  | 2        | For fixing the Detector                                                                                                                                 |
| Spring washer (nominal diameter 3) | 2        | For fixing the Detector                                                                                                                                 |
| Roller                             | 1        | Option (P/N: 06AEJ505)                                                                                                                                  |

- To mount the tape scale with the effective length of 200 mm–3000 mm, prepare the following parts.

| Part name                      | Quantity | Note                   |
|--------------------------------|----------|------------------------|
| Scale attaching auxiliary tool | 1        | Option (P/N: 06AEQ305) |

### 3.1.3 Specifications for Fixing at the Center

| Name                                                                      | Quantity | Note                                                                                                                                                              |
|---------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tape scale                                                                | 1        | Check the effective length.                                                                                                                                       |
| Detection unit                                                            | 1        |                                                                                                                                                                   |
| Scale holder C                                                            | 1        |                                                                                                                                                                   |
| Scale holder D                                                            | 1        |                                                                                                                                                                   |
| Scale holder E                                                            |          | One holder comes with the scale with the effective length of 2400 mm or more.                                                                                     |
| Scale holder (998 mm)                                                     |          | One holder comes with the scale with the effective length of 2400 mm–4200 mm, and three holders come with the scale with the effective length of 4400 mm–6000 mm. |
| Center fixing base                                                        | 1        |                                                                                                                                                                   |
| Center fixing spring                                                      | 1        |                                                                                                                                                                   |
| Mounting auxiliary tool (for fixing at both ends or fixing at the center) | 1        |                                                                                                                                                                   |
| User's Manual                                                             | 1        | This document                                                                                                                                                     |
| Warranty card                                                             | 1        |                                                                                                                                                                   |
| Inspection certificate                                                    | 1        |                                                                                                                                                                   |

### 3 Installation onto the Machine Main Unit

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To mount the scale unit, prepare the following parts.

| Part name                                      | Quantity | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hex socket head cap screw (M3 x 6)             | 10–70    | For details on the quantity required to fix the scale holders, refer to  "4.7.4 Specifications for Fixing at the Center (Effective Length of 500 mm–2200 mm)" (page 66), "4.7.5 Specifications for Fixing at the Center (Effective Length of 2400 mm–4200 mm)" (page 68), and "4.7.6 Specifications for Fixing at the Center (Effective Length of 4400 mm–6000 mm)" (page 70). |
| Plain washer (small round, nominal diameter 3) | 2        | For fixing the center fixing spring                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 3.2 Mounting the Scale Main Unit

### NOTICE

Be very careful that the tape scale is not damaged or broken.



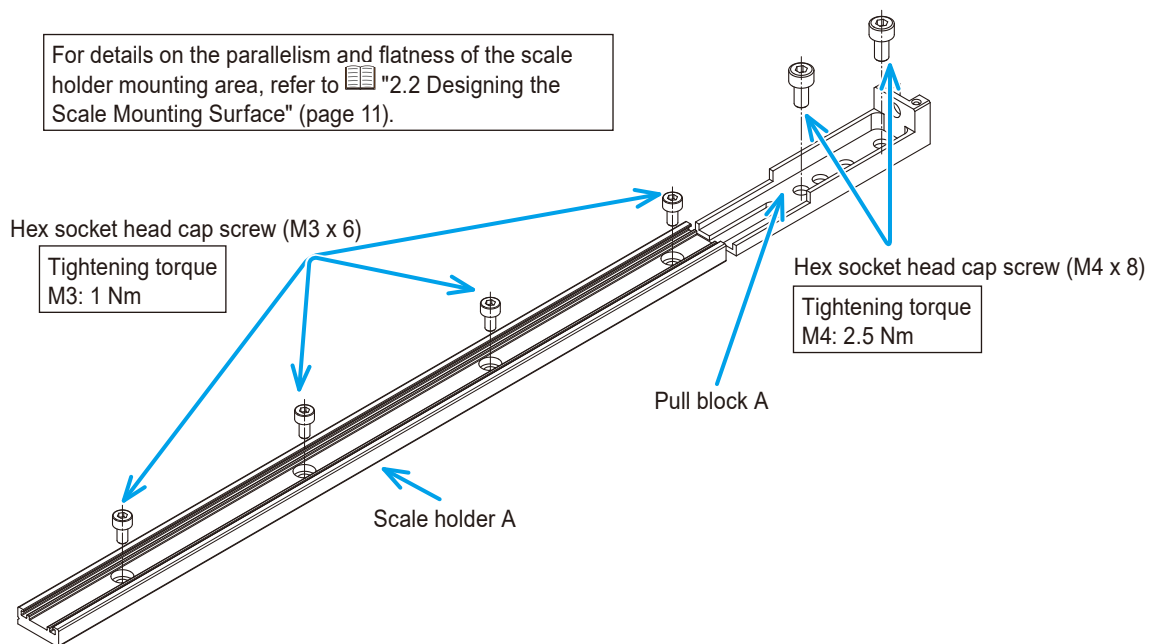
If dirt and dust are attached to the tape scale, it causes a malfunction or deteriorates the accuracy. Wipe off the dirt and dust with a soft cloth soaked in ethanol or cleaning paper. Similarly, clean the tape scale mounting surface of the machine unit thoroughly with ethanol. Even for parts that come in contact with the tape scale, such as scale holders, clean them fully with ethanol.

### Tips

- Conduct temperature leveling thoroughly for both the tape scale and mounting parts before fixing them. The accuracy of this product is guaranteed at 20 °C. The recommended temperature leveling is about 8 hours or longer at 20 °C for both the tape scale and parts for mounting the scale. Perform installation after temperature leveling.
- If the temperature environment is insufficient, including temperature leveling, the predetermined indication accuracy may not be achieved.
- To prevent any differences in temperature between the tape scale and the machine unit resulting from heat from the hands, wear gloves during installation.
- Please note that wiping the tape scale with ethanol after temperature leveling drops the temperature of the wiped area.

### 3.2.1 Specifications for Fixing at Both Ends

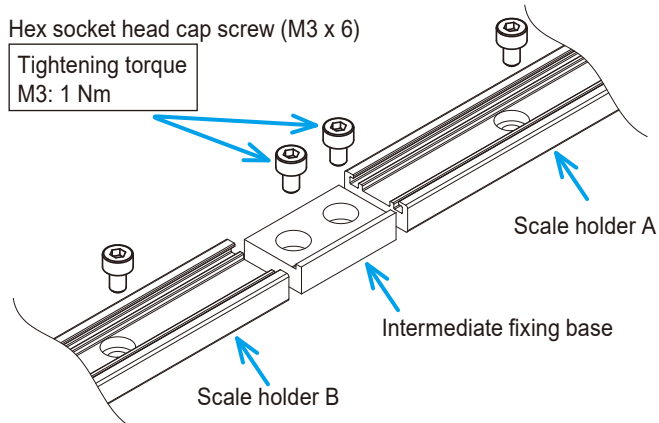
#### 1 Fix the scale holder A and pull block A.



### 3 Installation onto the Machine Main Unit



For the scale with the effective length of 1100 mm or more, fix as many scale holder B units and intermediate fixing base units as supplied.

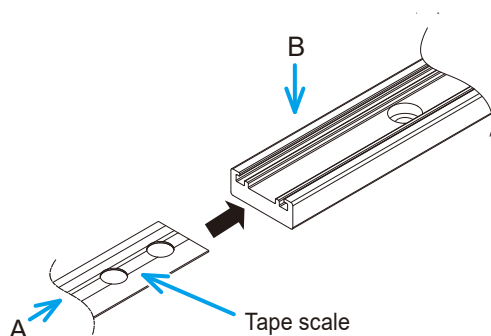


#### 2 Peel the scale protection tape.

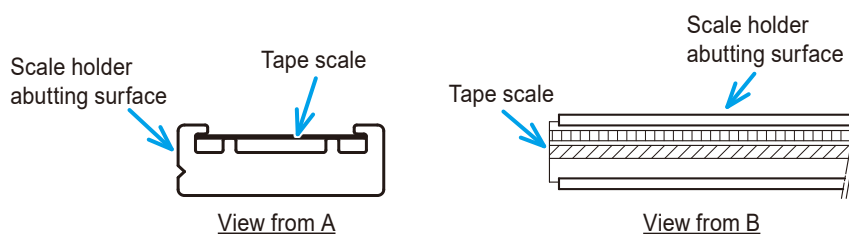
##### Tips

Wipe the tape scale thoroughly with a soft cloth soaked in ethanol or cleaning paper.

#### 3 Insert the tape scale into the scale holder.



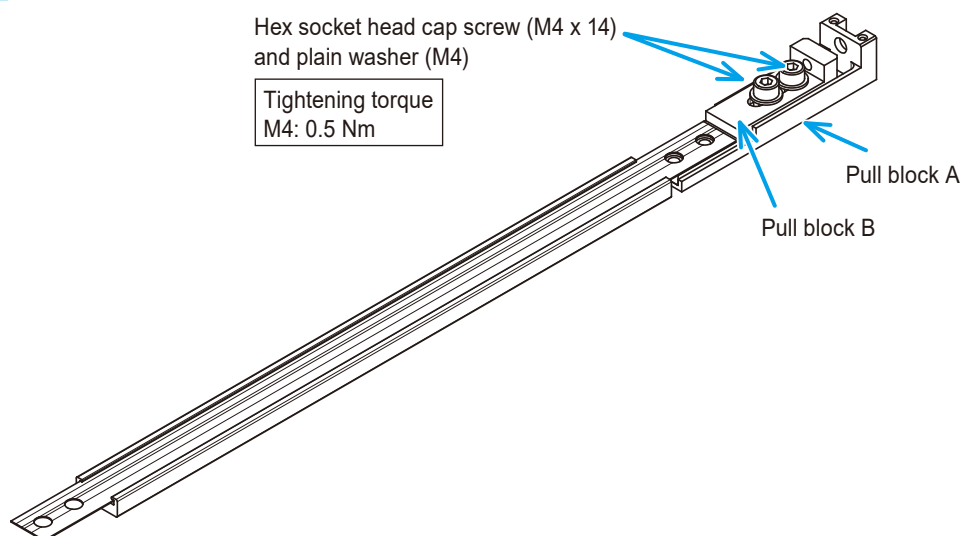
Make sure that the tape scale is inserted into the scale holder in the correct scale pattern direction.



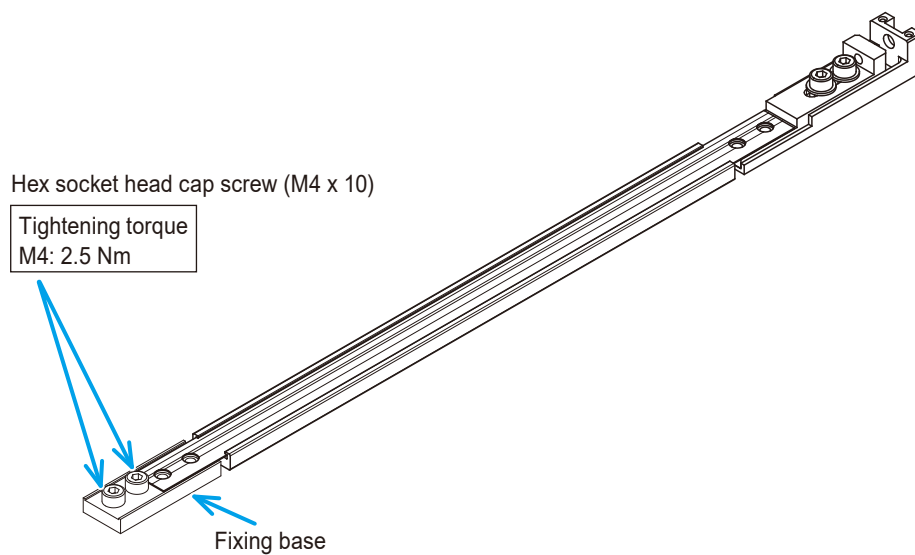
### 3 Installation onto the Machine Main Unit

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- 4** Put the pull block B on the pull block A and temporarily fix it.

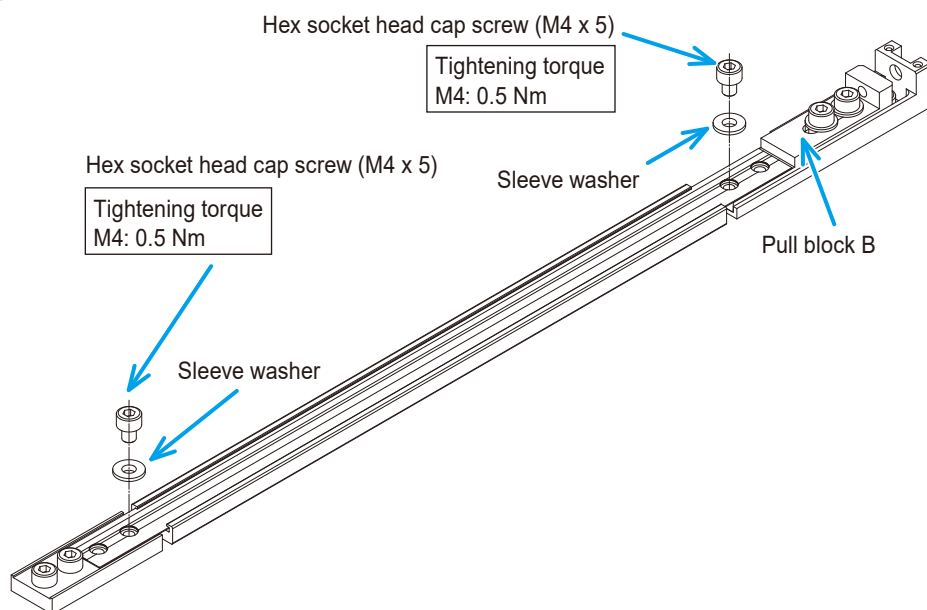


- 5** Fix the fixing base.

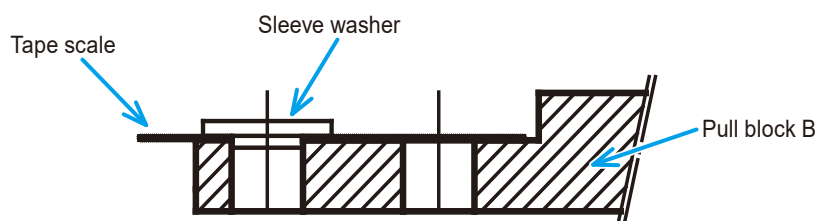


### 3 Installation onto the Machine Main Unit

- 6** Temporarily fix the tape scale at both ends with the sleeve washers.

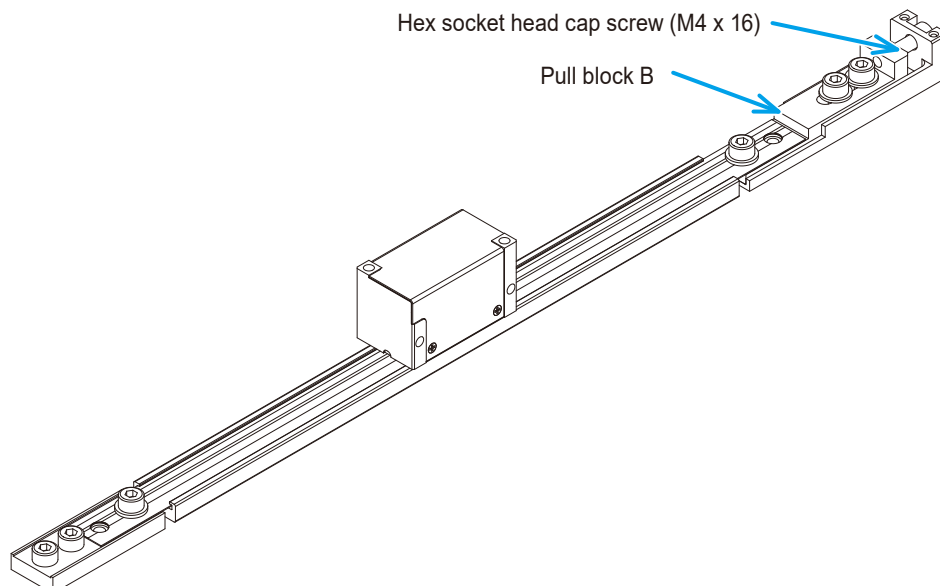


- Be sure to use the supplied sleeve washers.
- Make sure that the sleeve washers and hex socket head cap screws are installed into the inside holes at both ends of the tape scale.
- The convex part of each sleeve washer must be put in the bolt hole on the tape scale.

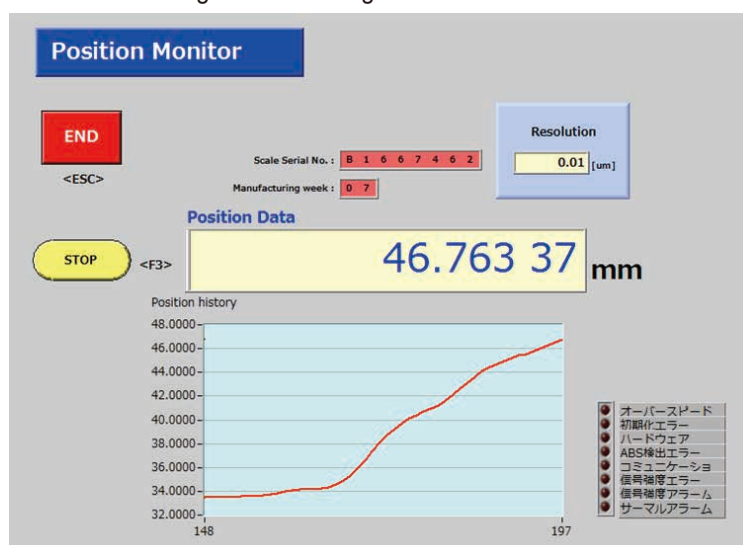


### 3 Installation onto the Machine Main Unit

- 7** Pull the tape scale up to the specified amount with the pull block B.
  - 1** Mount the Detector by referring to  "3.3 Mounting the Detector Bracket and Detector" (page 37).
  - 2** Be prepared to check the Detector signals according to the instructions in "ABS ST1300 Series Signal Check Program User's Manual".
  - 3** Install the hex socket head cap screw (M4 x 16) on the pull block B.

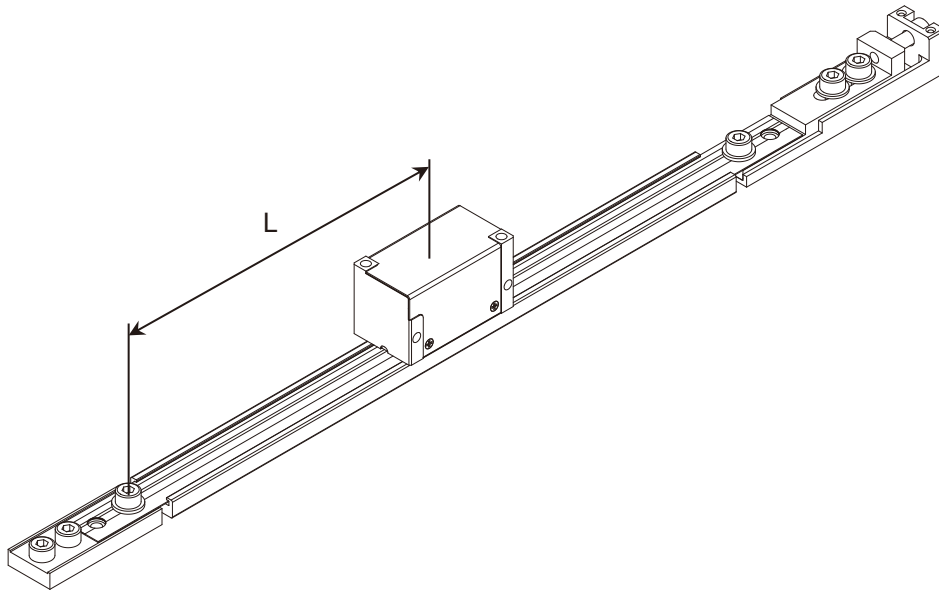


- 4** Display the Position Monitor screen according to the instructions in "3.4 Checking the Position Data" in "ABS ST1300 Series Signal Check Program User's Manual".



### 3 Installation onto the Machine Main Unit

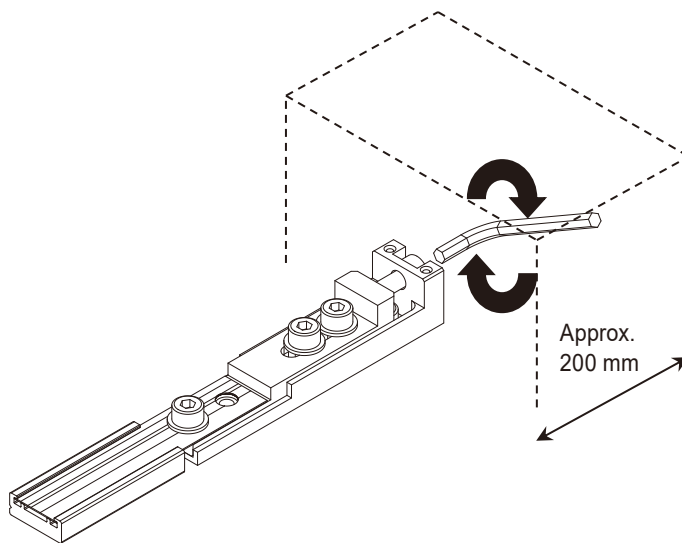
- 5 While checking [Position Data] on the Position Monitor screen, move the Detector to an appropriate position.



#### Tips

Move the Detector to a position where the pulling amount of the tape scale can be easily calculated such as 1000 mm.

- 6 Turn the hex socket head cap screw (M4 x 16) installed on the pull block B. Then, while checking [Position Data] on the Position Monitor screen, pull the tape scale.



Pull the tape scale until the [Position Data] value reaches the amount calculated by the following formula:

[Position Data] value = Detector position (L) - Detector position (L) x 0.00025

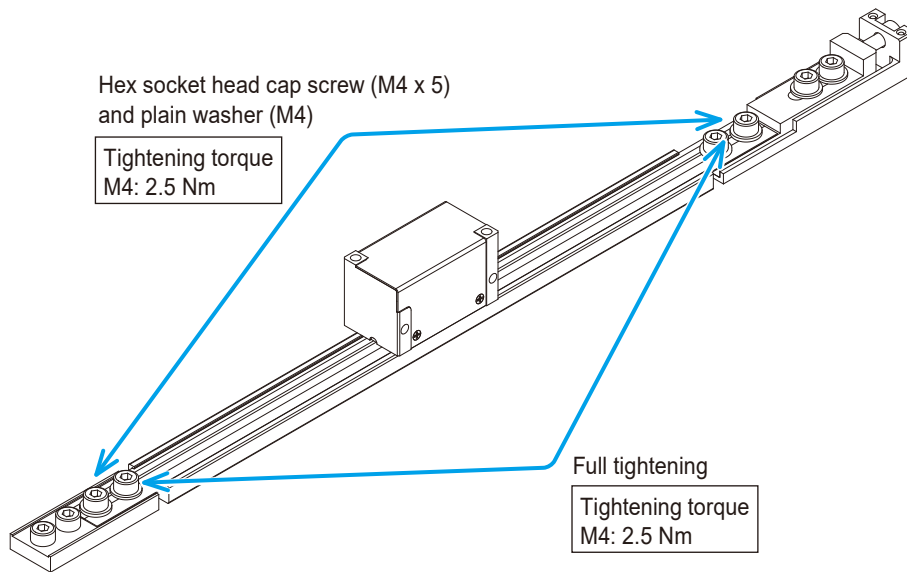
For example, when the Detector position is 1000 mm, pull the tape scale until the [Position Data] value reaches the following amount:

[Position Data] value = 1000 - 1000 x 0.00025 = 999.75

- 8 Install the plain washers (M4) and hex socket head cap screws (M4 x 5) into the outside holes at both ends of the tape scale.

### 3 Installation onto the Machine Main Unit

- 9** Fully tighten the bolts at both ends of the tape scale.



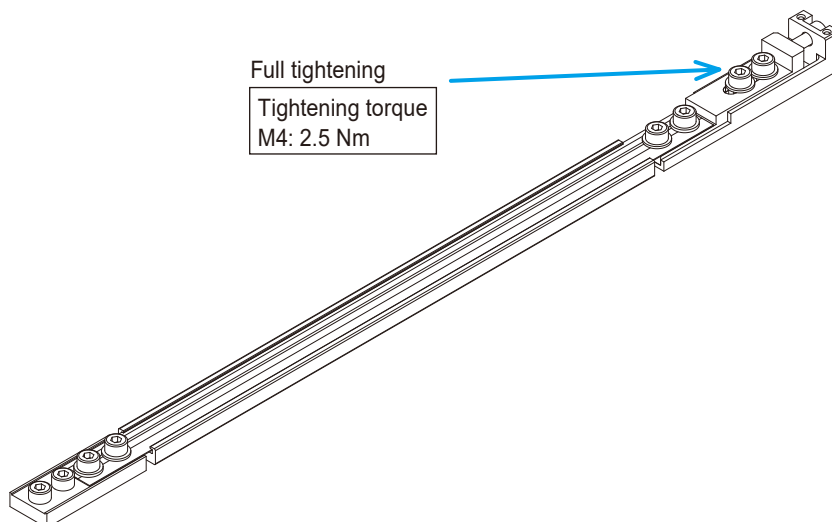
Do not move the Detector when fixing at both ends of the tape scale.

- 10** Loosen the hex socket head cap screws (M4 x 16) to release the pull block B's tension (pulling force) to the tape scale.
- 11** On the Position Monitor screen of the Signal Check Program, make sure that the Detector position (pulling amount) has not changed.



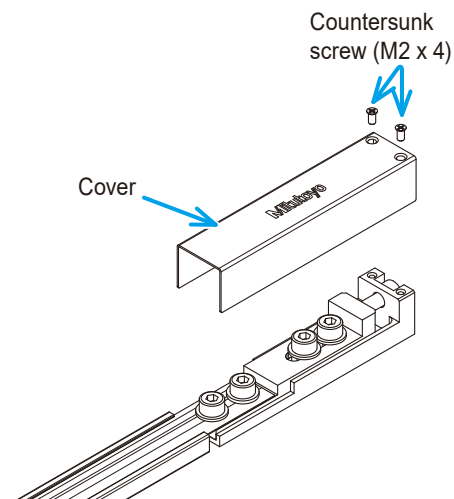
If the Detector position (pulling amount) has changed, turn the hex socket head cap screws (M4 x 16) to pull the tape scale up to the calculated pulling amount.

- 12** Fully tighten the pull block B.



### 3 Installation onto the Machine Main Unit

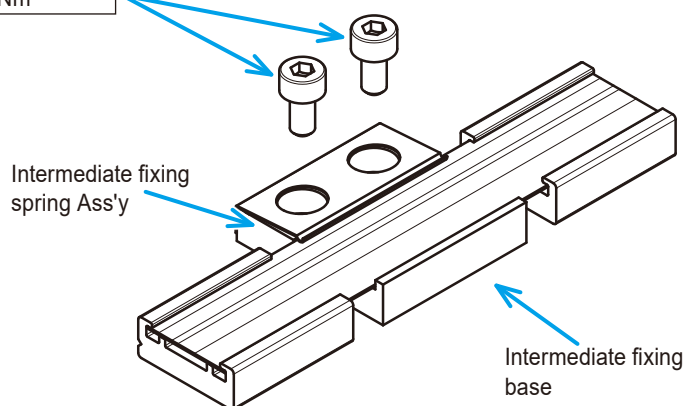
- 13** Put the cover.



- 14** Mount the intermediate fixing spring Ass'y on the intermediate fixing base and fix it.

Hex socket head cap screw (M3 x 6)

Tightening torque  
M3: 1 Nm

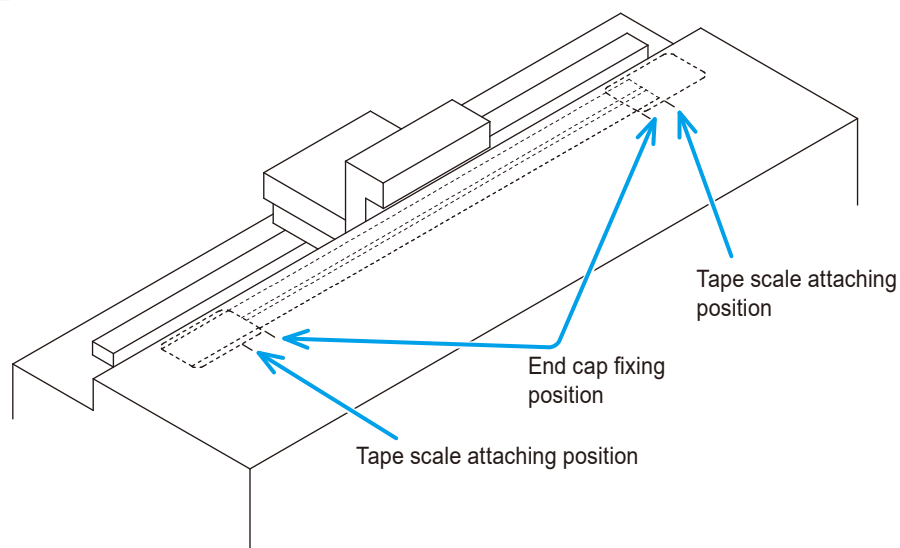


The intermediate fixing spring Ass'y is used for the scale with the effective length of 1100 mm or more.

## 3.2.2 Specifications for Fixing with Double-Sided Tape

### ■ Effective length of 10 mm–150 mm

- 1 Mark with a felt pen to the side of the tape scale attaching position and end cap fixing position.



#### **Tips**

The end cap fixing position must be 10 mm inside the tape scale attaching position.

- 2 Peel the release paper of the double-sided tape on the tape scale.

#### **Tips**

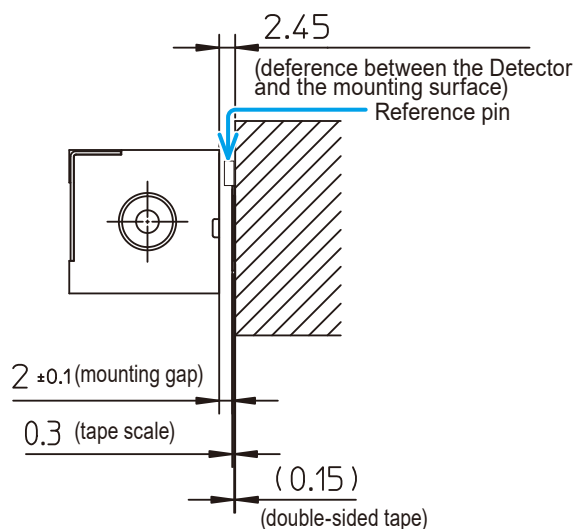
Do not touch the adhesive surface of the double-sided tape.

- 3 Attach the tape scale.

### 3 Installation onto the Machine Main Unit

#### Tips

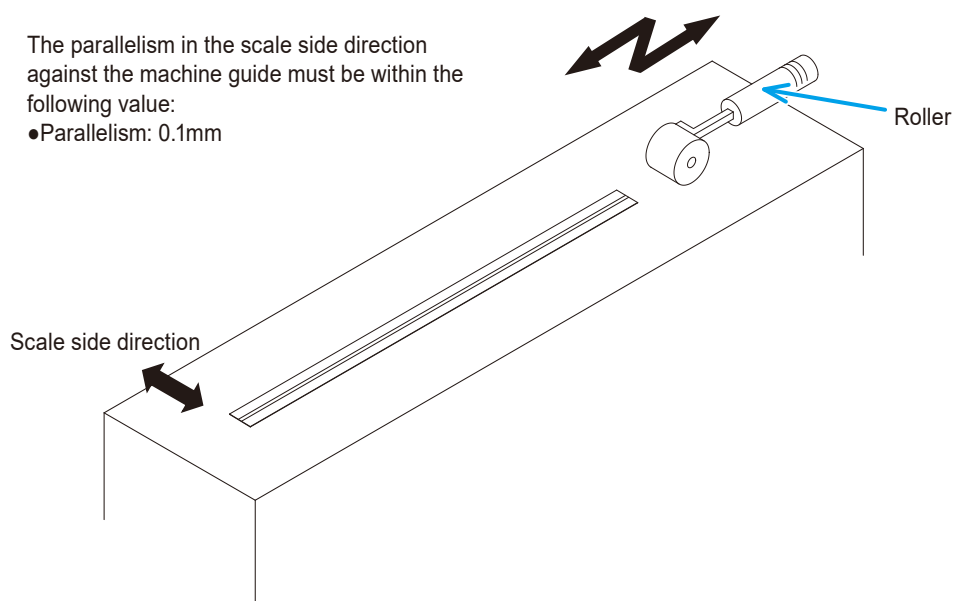
If you use a reference pin to attach the tape scale, make sure that it does not interfere with the Detector.



- 4** Press the roller on the top surface of the tape scale to level the adhesive surface against the machine unit.

The parallelism in the scale side direction against the machine guide must be within the following value:

- Parallelism: 0.1mm



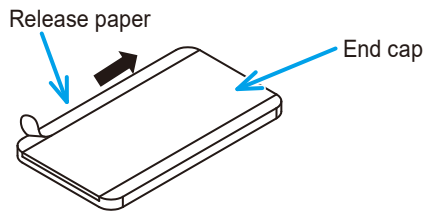
#### Tips

Apply a gentle force on the roller first and then gradually increase it so that the tape scale is attached evenly.

- 5** Peel the protection tape on the front of the tape scale.

### 3 Installation onto the Machine Main Unit

- 6 Peel the release paper of the tape on the back of each end cap and attach the end cap while aligning with the marked end cap fixing position.



#### Tips

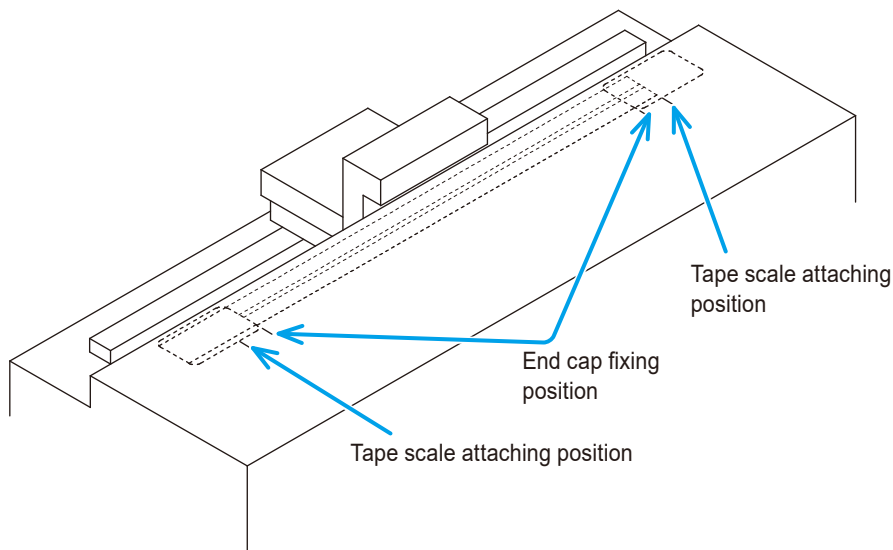
Attach the end caps to the end cap fixing position at both ends of the tape scale while aligning the concave part with the tape scale.

### ■ Effective length of 200 mm–3000 mm

#### Tips

To attach the tape scale with the specifications for fixing with double-sided tape with the effective length of 200 mm–3000 mm, it is recommended that the optional scale attaching auxiliary tool (P/N: 06AEQ305) should be used.

- 1 Mark with a felt pen to the side of the tape scale attaching position and end cap fixing position.

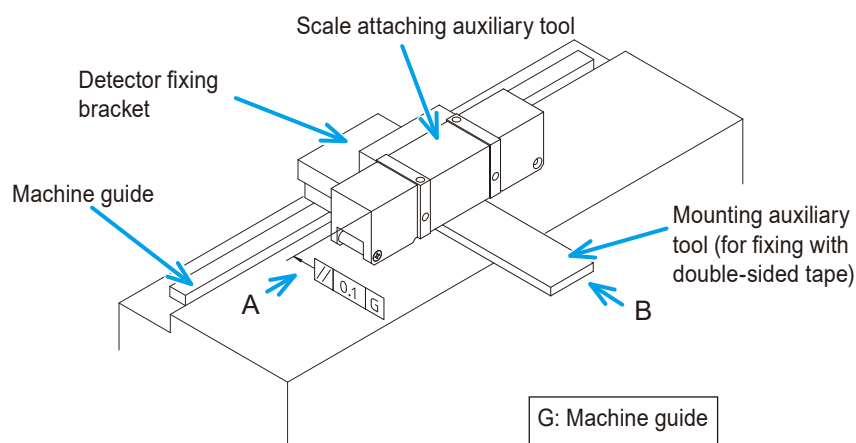


#### Tips

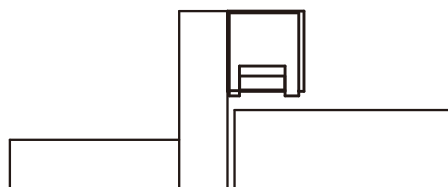
The end cap position must be 10 mm inside the tape scale attaching position.

### 3 Installation onto the Machine Main Unit

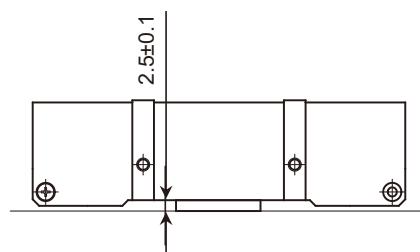
- 2** Mount the scale attaching auxiliary tool on the Detector bracket.



Use the mounting auxiliary tool (for double-sided tape) so that the gap between the scale attaching auxiliary tool and the tape scale mounting surface is  $2.5 \pm 0.1$  mm.

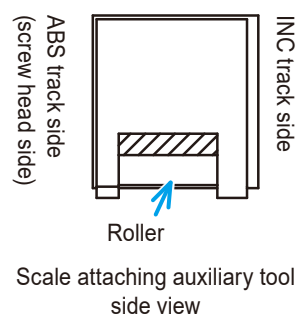
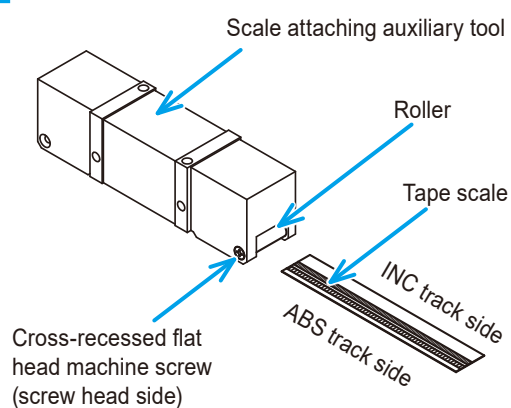


View from A



View from B

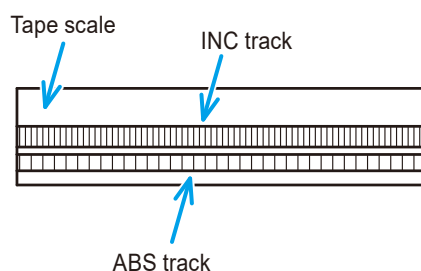
- 3** Put the tape scale in between the scale attaching auxiliary tool and the roller.



### 3 Installation onto the Machine Main Unit

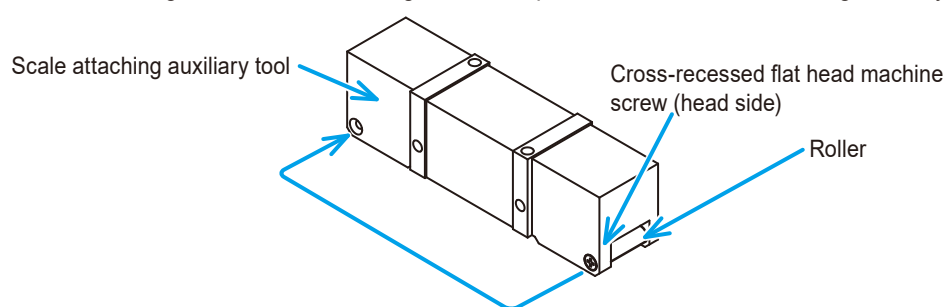


Put the tape scale in so that the ABS track of the tape scale is on the head side of the cross-recessed flat head machine screw.



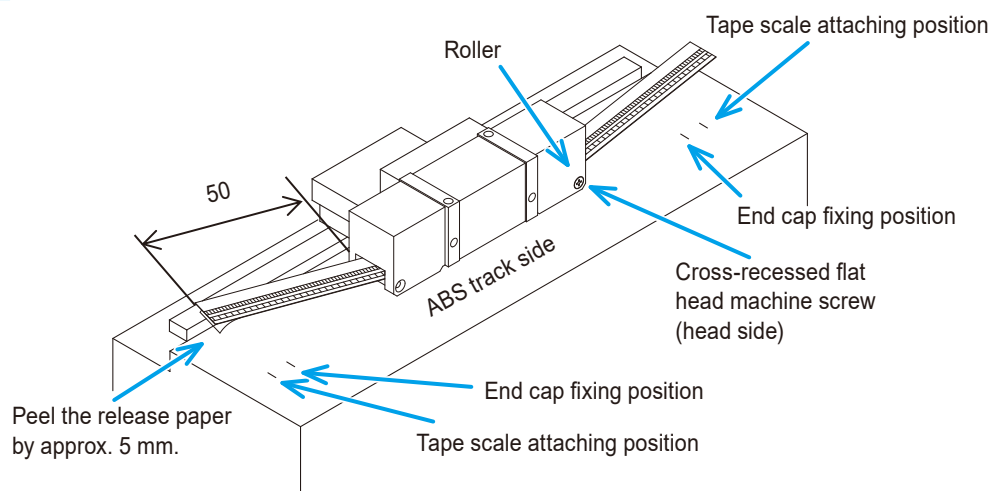
#### Tips

In this example, the tape scale is attached from the left-handed side using the scale attaching auxiliary tool. To attach it from the right-handed side, change the roller position of the scale attaching auxiliary tool.



**4** Pull out the tape scale by about 50 mm.

**5** Peel the release paper of the tape on the tape scale by about 5 mm.



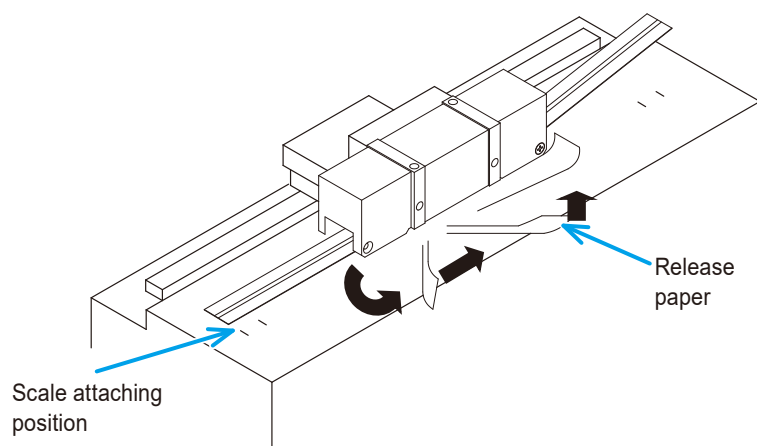
**6** Attach the tape scale while aligning both ends with the marked scale attaching position.

#### Tips

Do not touch the adhesive surface of the double-sided tape.

### 3 Installation onto the Machine Main Unit

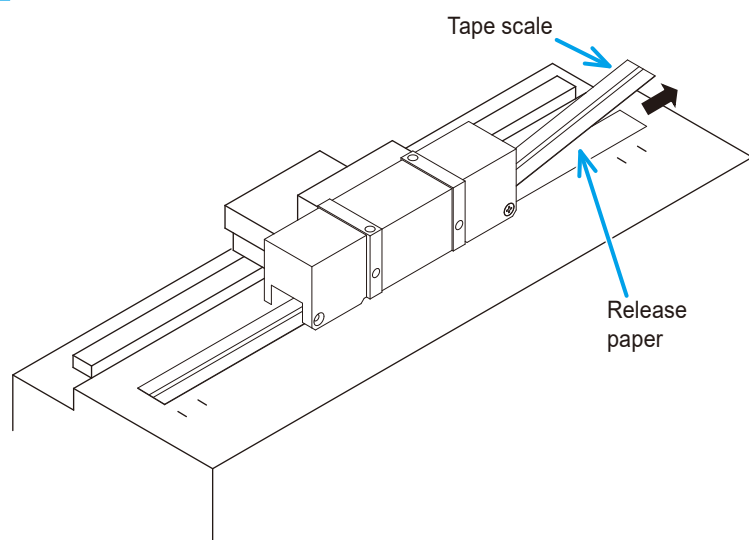
- 7** Peel the release paper of the tape and fold it to the roller of the scale attaching auxiliary tool.



#### **Tips**

If you pull the release paper forcibly, it may be torn in the middle.

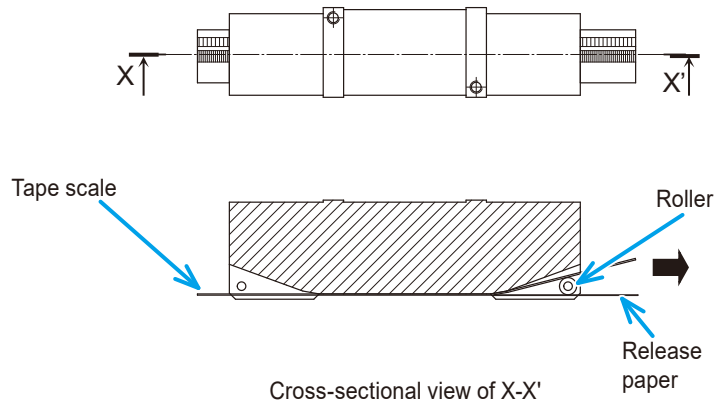
- 8** Attach the tape scale by moving the scale attaching auxiliary tool while peeling the release paper.



### 3 Installation onto the Machine Main Unit

#### Tips

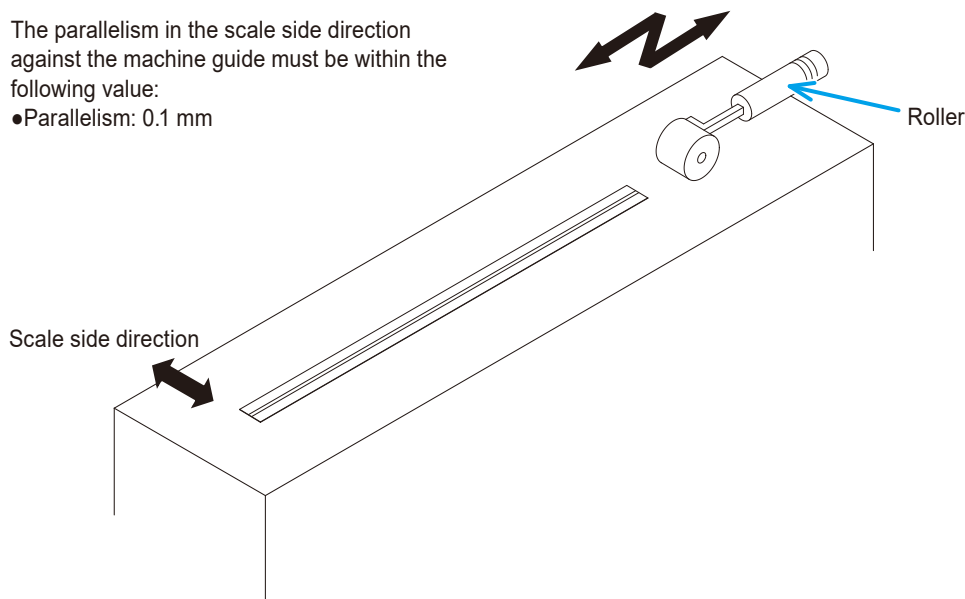
- The release paper must be peeled by hand, parallel to the tape scale. If you pull the release paper diagonally or forcibly, it may be torn in the middle.
- If the travel range of the machine guide is shorter than the tape scale full length, you cannot attach the tape scale by moving the scale attaching auxiliary tool to the end of the tape scale. In such a cause, remove the roller of the scale attaching auxiliary tool before attaching the tape scale.



- 9** Press the roller on the top surface of the tape scale to level the adhesive surface against the machine unit.

The parallelism in the scale side direction against the machine guide must be within the following value:

- Parallelism: 0.1 mm



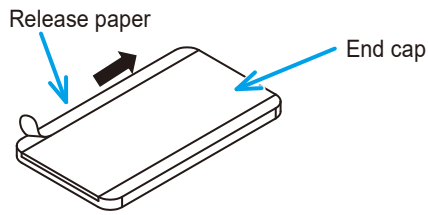
#### Tips

Apply a gentle force on the roller first and then gradually increase it so that the tape scale is attached evenly.

- 10** Peel the protection tape on the front of the tape scale.

### 3 Installation onto the Machine Main Unit

- 11 Peel the release paper of the tape on the back of each end cap and attach the end cap while aligning with the marked end cap fixing position.



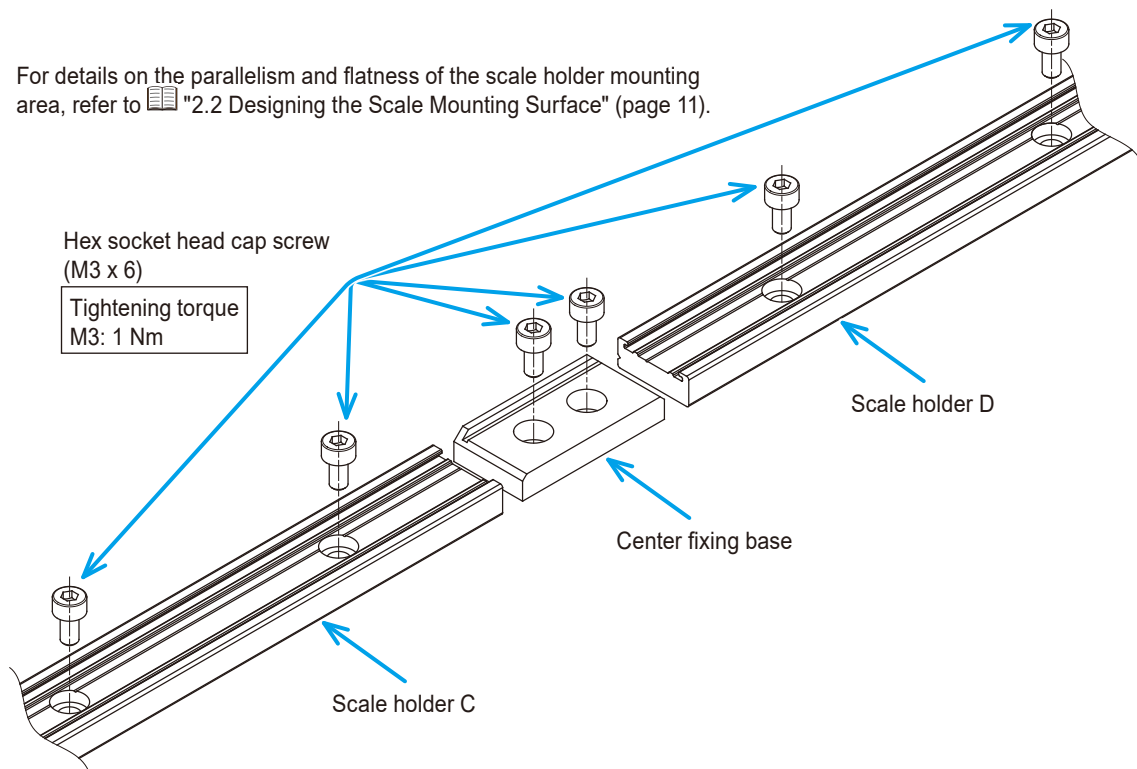
#### Tips

Attach the end caps to the end cap fixing position at both ends of the tape scale while aligning the concave part with the tape scale.

### 3.2.3 Specifications for Fixing at the Center

- 1 Fix the scale holder C, scale holder D, and center fixing base.

For details on the parallelism and flatness of the scale holder mounting area, refer to  "2.2 Designing the Scale Mounting Surface" (page 11).

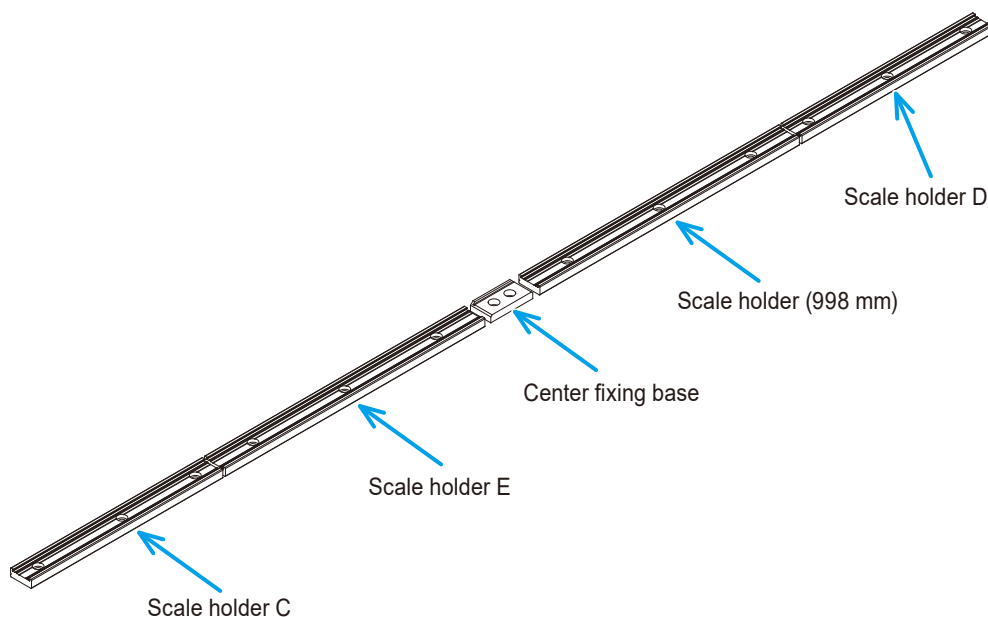


### 3 Installation onto the Machine Main Unit

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- For the scale with the effective length of 2400 mm or more, fix as many scale holder E units and scale holder (998 mm) units as supplied.



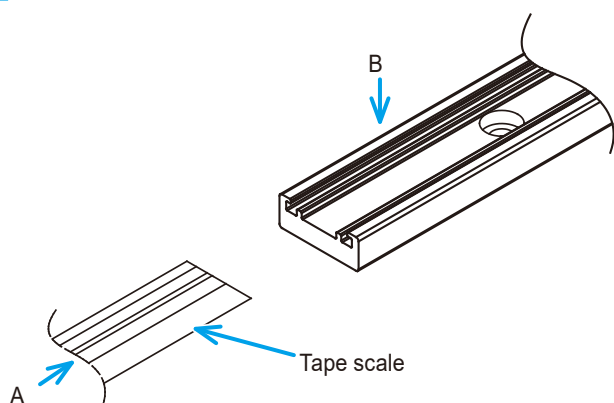
- For the scale with the effective length of 4400 mm or more, you also need to insert the scale holder (998 mm) between the scale holder C and the scale holder E.

#### 2 Peel the scale protection tape.

##### **Tips**

Wipe the tape scale thoroughly with a soft cloth soaked in ethanol or cleaning paper.

#### 3 Insert the tape scale into the scale holder.



### 3 Installation onto the Machine Main Unit

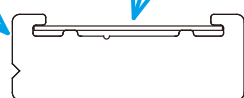
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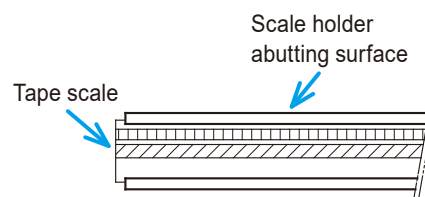
Make sure that the tape scale is inserted into the scale holder in the correct scale pattern direction.

Scale holder  
abutting surface

Tape scale



View from A

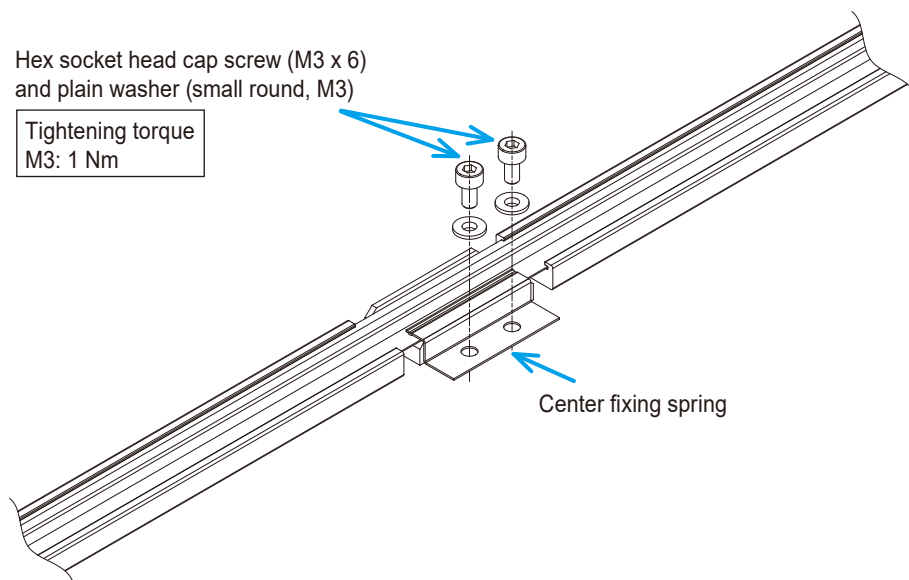


View from B

#### 4 Fix the tape scale with the center fixing spring.

Hex socket head cap screw (M3 x 6)  
and plain washer (small round, M3)

Tightening torque  
M3: 1 Nm



Center fixing spring

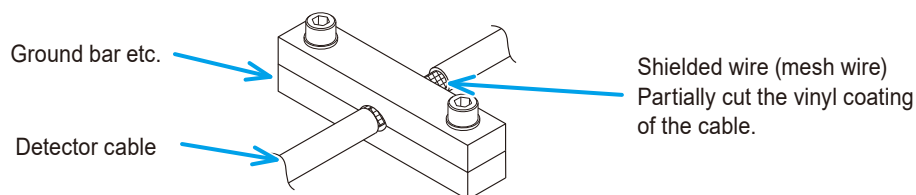
### 3.3 Mounting the Detector Bracket and Detector

#### NOTICE

Do not directly touch the electrical connector pins during the Detector installation. Otherwise, electronic parts may be damaged by static electricity. Be sure to take measures to prevent static electricity for the Detector installation.

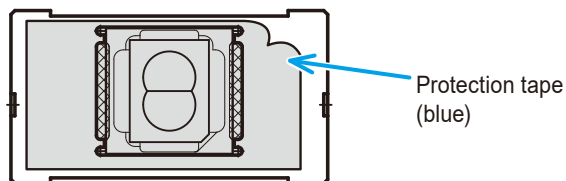


To use the scale with the Detector mounted, the machine main unit, as well as the attachment bracket, must be electrically grounded. Failure to do so may cause the scale unit and the Detector to be affected by external noise. When it is difficult to ground due to the characteristics of the bracket material, make sure that the shielded part of the Detector cable is grounded using a ground bar.



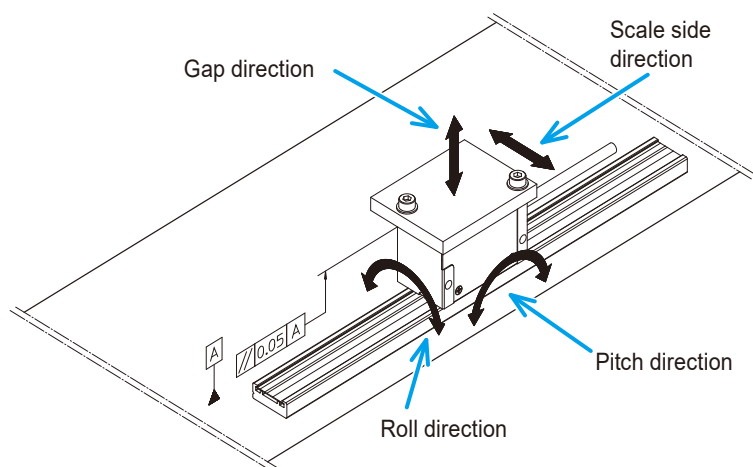
Example: Drawing of using a ground bar

- 1 Peel the protection tape (blue) off the detecting surface of the Detector.

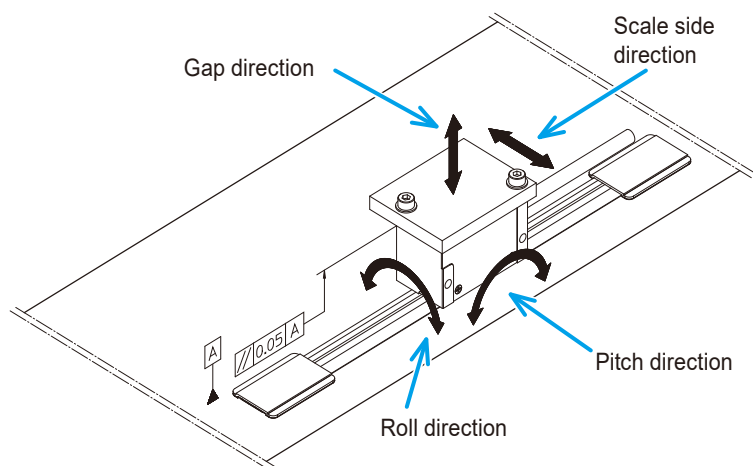


- 2 Attach the Detector to the Detector bracket.

#### ■ Specifications for fixing at both ends or fixing at the center



#### ■ Specifications for fixing with double-sided tape



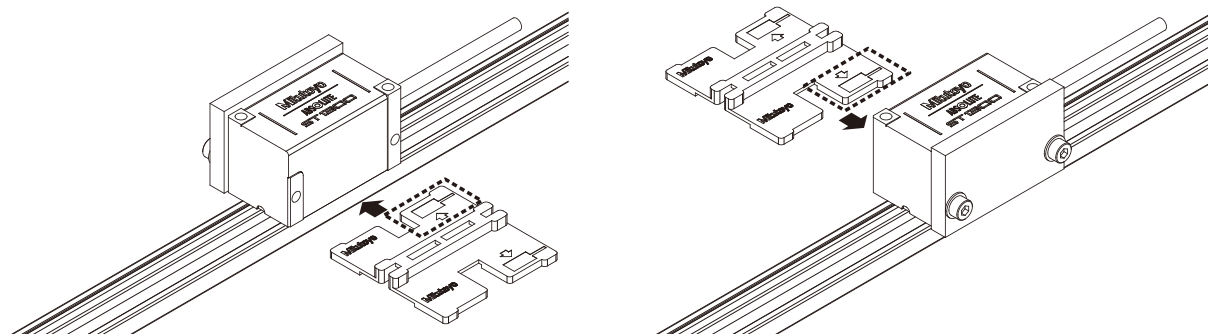
- 3 Insert the mounting auxiliary tool between the tape scale and the Detector.

#### Tips

If a space for inserting the mounting auxiliary tool is small, cut the mounting auxiliary tool in the middle.

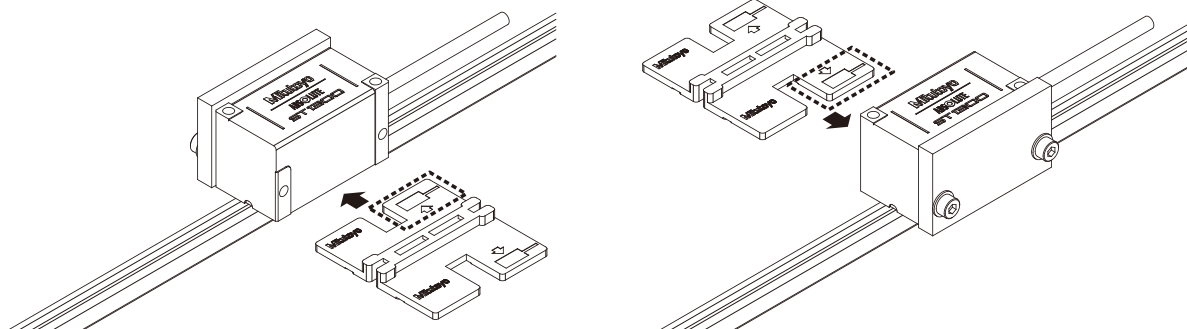
#### ■ Specifications for fixing at both ends or fixing at the center

- 1 Insert the mounting auxiliary tool (for fixing at both ends or fixing at the center) in the arrow direction.



#### ■ Specifications for fixing with double-sided tape

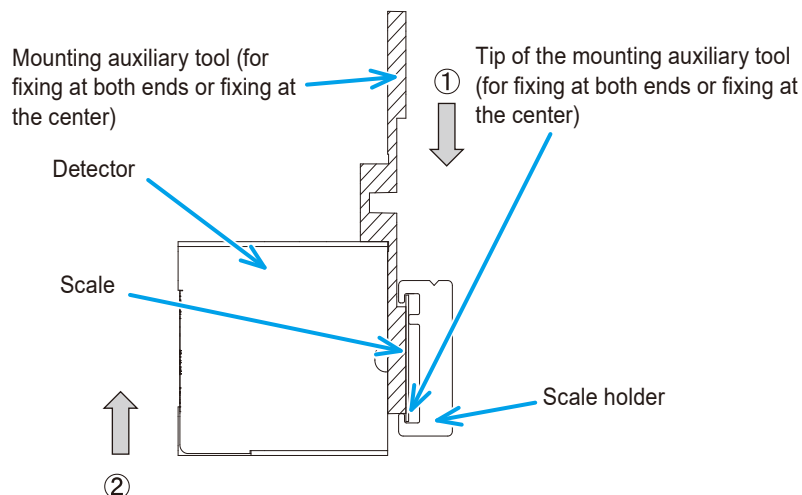
- 1 Insert the mounting auxiliary tool (for fixing with double-sided tape) in the arrow direction.



- 4 Temporarily fix the Detector while pressing it against the mounting auxiliary tool.

#### ■ Specifications for fixing at both ends or fixing at the center

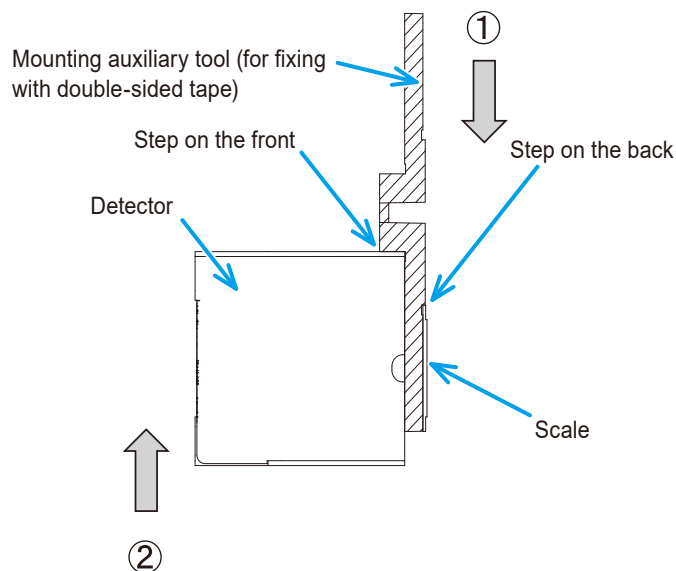
- 1 Press the tip of the mounting auxiliary tool (for fixing at both ends or fixing at the center) against the bottom end inside the scale holder.



- 2 With the mounting auxiliary tool (for fixing at both ends or fixing at the center) pressed against the scale holder, temporarily fix the Detector while pressing it against the step on the front of the mounting auxiliary tool (for fixing at both ends or fixing at the center).

#### ■ Specifications for fixing with double-sided tape

- 1 Press the step on the back of the mounting auxiliary tool (for fixing with double-sided tape) against the side of the scale.



- 2 With the mounting auxiliary tool (for fixing with double-sided tape) pressed against the scale, temporarily fix the Detector while pressing it against the step on the front of the mounting auxiliary tool (for fixing with double-sided tape).

- 5 Check the parallelism of the Detector against the tape scale with a lever-type dial indicator or electric micrometer.



The parallelism of the Detector against the tape scale must be within 0.05 mm.

- 6 Make sure that the distance between the Detector and the tape scale is within the specified value (gap:  $2.0 \pm 0.1$  mm) with the mounting auxiliary tool (for fixing at both ends or fixing at the center) or mounting auxiliary tool (for fixing with double-sided tape).

- 7 Fix the Detector (recommended screw tightening torque: 1 Nm).

## 3.4 Connecting the Feedback Cable and Checking the Signals



- Be sure to turn off the control unit before connecting the scale unit to the control unit with a feedback cable.
- A feedback cable must be prepared by the user. Find a cable that supports your model according to  "4.4 Production of a Feedback Cable" (page 50) and "4.4.6 Calculation of Feedback Cable Length" (page 53).

- 1 Connect the electrical connector to the control unit with the feedback cable.
- 2 Turn on the control unit.
  - » The electrical connector LED (yellow) and LED (red) turn on for about 2 seconds.
- 3 Check the signals.
  - » For details, refer to "ABS ST1300 Series Signal Check Program User's Manual" (No. 99MBE085B).

## 3.5 Handling the Cables and Checking the Mounting State

### 3.5.1 Handling the Cables

Fix the electrical connector and feedback cable.

- 1 Perform wiring paying attention to the twisting or bends of the cables.

#### NOTICE

Note that the feedback cable may malfunction if bundled with other cables that may cause electrical noise, or if it is located near a switching relay dealing with a large current.

- 2 Fix the Detector cable and feedback cable with cable clamps.



Clamp the feedback cable to a nearby part that moves along with the Detector so that force is not applied to the Detector when the machine unit is running.



Be sure to fix the electrical connector to the machine main unit with screws.

## 3.5.2 Checking the Mounting and Adjustment States

After fixing the electrical connector and feedback cable, check the mounting and adjustment states of the tape scale and Detector again.

#### Tips

Perform this operation while making sure that the Detector does not make contact or interfere with any part of the machine unit or tape scale.

- 1 Make sure that all the part screws and clamps are firmly tightened.
- 2 Turn off the control unit and turn it on again after 5 to 10 seconds.

#### Tips

Turning off the control unit resets the alarm that occurred during adjustment.

- 3 Make sure that no electrical connector LEDs turn on throughout the entire travel range of the machine unit.

#### Tips

If an electrical connector LED lights up, check the tape scale for any dirt or the Detector moire/gap again.

- 4 Make sure that no control unit alarm occurs throughout the entire travel range of the machine unit.

## 3.5.3 Putting the Protection Cover

After checking the mounting and adjustment states of the tape scale and Detector again, put the protection cover.

### 3 Installation onto the Machine Main Unit

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- Make sure that the protection cover does not make contact with any machine unit part or scale unit cable.
- Check the above for the entire travel range of the machine unit.

#### MEMO

# 4 Specifications

## 4.1 Specifications

### 4.1.1 Specifications for Fixing at Both Ends

| Item                                 | Specification                                                                                                                                                                                                                                                                                     |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Detection method                     | Optical system                                                                                                                                                                                                                                                                                    |
| Scale type                           | Metal tape                                                                                                                                                                                                                                                                                        |
| Maximum effective length             | 12 m                                                                                                                                                                                                                                                                                              |
| Indication accuracy (20 °C)<br>(*1)  | $\pm 5 \mu\text{m}$ (1 m or less)<br>$\pm 5 \mu\text{m/m}$ (1.1 m or more)                                                                                                                                                                                                                        |
| Tape scale grid pitch                | 20 $\mu\text{m}$                                                                                                                                                                                                                                                                                  |
| Main signal (sine wave) output pitch | 20 $\mu\text{m}$                                                                                                                                                                                                                                                                                  |
| Resolution                           | 0.001 $\mu\text{m}$ /0.01 $\mu\text{m}$ (fixed to one of the two depending on the model)                                                                                                                                                                                                          |
| Maximum Response Speed               | 8 m/s                                                                                                                                                                                                                                                                                             |
| Supported interface                  | Mitutoyo ENSIS®, Mitsubishi I/F, FANUC I/F, Yaskawa I/F, Panasonic I/F                                                                                                                                                                                                                            |
| Thermal expansion coefficient        | Scale material<br>$\approx 10 \times 10^{-6}/\text{K}$ (*2)                                                                                                                                                                                                                                       |
| GAP allowance                        | Initial: $\pm 0.1 \text{ mm}$<br>Kinetic: $\pm 0.2 \text{ mm}$                                                                                                                                                                                                                                    |
| Detector cable length                | 1 m (highly flexible cable)                                                                                                                                                                                                                                                                       |
| Maximum cable length                 | 29 m (including the Detector cable length)                                                                                                                                                                                                                                                        |
| Detector size                        | 40 mm (D) x 22 mm (W) x 23 mm (H)                                                                                                                                                                                                                                                                 |
| Power supply voltage                 | 5 VDC $\pm 10 \%$                                                                                                                                                                                                                                                                                 |
| Maximum current consumption          | 270 mA (Mitutoyo, Mitsubishi, FANUC, Yaskawa)<br>250 mA (Panasonic)                                                                                                                                                                                                                               |
| Used temperature range               | 0 °C–50 °C                                                                                                                                                                                                                                                                                        |
| Storage temperature range            | -20 °C–70 °C                                                                                                                                                                                                                                                                                      |
| Used/storage humidity range          | 20 %RH–80 %RH (non condensation)                                                                                                                                                                                                                                                                  |
| Vibration resistance                 | $\leq 100 \text{ m/s}^2$ (55 Hz–2000 Hz)                                                                                                                                                                                                                                                          |
| Shock resistance                     | $\leq 200 \text{ m/s}^2$ (1/2 sin, 11 ms)                                                                                                                                                                                                                                                         |
| CE marking / UKCA marking            | EMC Directive/Electromagnetic Compatibility Regulations: EN 61326-1<br>Immunity test requirement: Clause 6.2 Table 2<br>Emission limit: Class B<br><br>RoHS Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations: EN IEC 63000 |

\*1: The accuracy needs to be corrected throughout the system because the scale is pulled at 250  $\mu\text{m/m}$  to stabilize the temperature characteristics.

\*2: The thermal expansion coefficient after installation depends on the expansion of the mounting surface due to changes in outside air.

## 4.1.2 Specifications for Fixing with Double-Sided Tape

| Item                                 | Specification                                                                                                                                                                                                                                                                                     |                                                    |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Detection method                     | Optical system                                                                                                                                                                                                                                                                                    |                                                    |
| Scale type                           | Metal tape                                                                                                                                                                                                                                                                                        |                                                    |
| Maximum effective length             | 3 m                                                                                                                                                                                                                                                                                               |                                                    |
| Indication accuracy (20 °C)          | ±5 μm (1 m or less)<br>±5 μm/m (1.1 m or more)                                                                                                                                                                                                                                                    |                                                    |
| Tape scale grid pitch                | 20 μm                                                                                                                                                                                                                                                                                             |                                                    |
| Main signal (sine wave) output pitch | 20 μm                                                                                                                                                                                                                                                                                             |                                                    |
| Resolution                           | 0.001 μm/0.01 μm (fixed to one of the two depending on the model)                                                                                                                                                                                                                                 |                                                    |
| Maximum Response Speed               | 8 m/s                                                                                                                                                                                                                                                                                             |                                                    |
| Supported interface                  | Mitutoyo ENSIS®, Mitsubishi I/F, FANUC I/F, Yaskawa I/F, Panasonic I/F                                                                                                                                                                                                                            |                                                    |
| Thermal expansion coefficient        | Scale material<br>≈ 10 × 10 <sup>-6</sup> /K (*1)                                                                                                                                                                                                                                                 |                                                    |
| GAP allowance                        | Initial: ±0.1 mm<br>Kinetic: ±0.2 mm                                                                                                                                                                                                                                                              |                                                    |
| Detector cable length                | 1 m (highly flexible cable)                                                                                                                                                                                                                                                                       |                                                    |
| Maximum cable length                 | 29 m (including the Detector cable length)                                                                                                                                                                                                                                                        |                                                    |
| Detector size                        | 40 mm (D) x 22 mm (W) x 23 mm (H)                                                                                                                                                                                                                                                                 |                                                    |
| Power supply voltage                 | 5 VDC ± 10 %                                                                                                                                                                                                                                                                                      |                                                    |
| Maximum current consumption          | 270 mA (Mitutoyo, Mitsubishi, FANUC, Yaskawa)<br>250 mA (Panasonic)                                                                                                                                                                                                                               |                                                    |
| Mounting material                    | Equivalent to iron                                                                                                                                                                                                                                                                                | Other than equivalent to iron                      |
| Used temperature range               | 0 °C–50 °C                                                                                                                                                                                                                                                                                        | 0 °C–50 °C<br>Installation temperature ±10 °C (*2) |
| Storage temperature range            | -20 °C–70 °C                                                                                                                                                                                                                                                                                      | -20 °C–70 °C (*3)                                  |
| Used/storage humidity range          | 20 %RH–80 %RH (non condensation)                                                                                                                                                                                                                                                                  |                                                    |
| Vibration resistance                 | ≤100 m/s <sup>2</sup> (55 Hz–2000 Hz)                                                                                                                                                                                                                                                             |                                                    |
| Shock resistance                     | ≤200 m/s <sup>2</sup> (1/2 sin, 11 ms)                                                                                                                                                                                                                                                            |                                                    |
| CE marking / UKCA marking            | EMC Directive/Electromagnetic Compatibility Regulations: EN 61326-1<br>Immunity test requirement: Clause 6.2 Table 2<br>Emission limit: Class B<br><br>RoHS Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations: EN IEC 63000 |                                                    |

\*1: When the difference in thermal expansion coefficient between the scale material and the attachment surface material is large, the thermal expansion coefficient value may change.

\*2: When the attachment surface is other than equivalent to iron, there will be conditions on the used temperature range.

\*3: When the attachment surface is other than equivalent to iron, if the machine is stored in an environment outside the used temperature range, the accuracy may change. If such a circumstance is expected, it is recommended that the specifications for fixing at both ends should be used.

## 4.1.3 Specifications for Fixing at the Center

| Item                                 | Specification                                                                                                                                                                                                                                                                                     |                                                                                   |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Detection method                     | Optical system                                                                                                                                                                                                                                                                                    |                                                                                   |
| Scale type                           | Metal tape                                                                                                                                                                                                                                                                                        |                                                                                   |
| Maximum effective length             | 6 m                                                                                                                                                                                                                                                                                               |                                                                                   |
| Indication accuracy (20 °C)          | With the system parameters<br>±5 µm (1 m or less)<br>±5 µm/m (1.1 m or more)                                                                                                                                                                                                                      | Without the system parameters<br>±10 µm (1 m or less)<br>±10 µm/m (1.1 m or more) |
| Tape scale grid pitch                | 20 µm                                                                                                                                                                                                                                                                                             |                                                                                   |
| Main signal (sine wave) output pitch | 20 µm                                                                                                                                                                                                                                                                                             |                                                                                   |
| Resolution                           | 0.001 µm/0.01 µm (fixed to one of the two depending on the model)                                                                                                                                                                                                                                 |                                                                                   |
| Maximum Response Speed               | 8 m/s                                                                                                                                                                                                                                                                                             |                                                                                   |
| Supported interface                  | Mitutoyo ENSIS®, Mitsubishi I/F, FANUC I/F, Yaskawa I/F, Panasonic I/F                                                                                                                                                                                                                            |                                                                                   |
| Thermal expansion coefficient        | Scale material<br>≈ 10 x 10 <sup>-6</sup> /K                                                                                                                                                                                                                                                      |                                                                                   |
| GAP allowance                        | Initial: ±0.1 mm<br>Kinetic: ±0.2 mm                                                                                                                                                                                                                                                              |                                                                                   |
| Detector cable length                | 1 m (highly flexible cable)                                                                                                                                                                                                                                                                       |                                                                                   |
| Maximum cable length                 | 29 m (including the Detector cable length)                                                                                                                                                                                                                                                        |                                                                                   |
| Detector size                        | 40 mm (D) x 22 mm (W) x 23 mm (H)                                                                                                                                                                                                                                                                 |                                                                                   |
| Power supply voltage                 | 5 VDC ± 10 %                                                                                                                                                                                                                                                                                      |                                                                                   |
| Maximum current consumption          | 270 mA (Mitutoyo, Mitsubishi, FANUC, Yaskawa)<br>250 mA (Panasonic)                                                                                                                                                                                                                               |                                                                                   |
| Used temperature range               | 0 °C–50 °C                                                                                                                                                                                                                                                                                        |                                                                                   |
| Storage temperature range            | -20 °C–70 °C                                                                                                                                                                                                                                                                                      |                                                                                   |
| Used/storage humidity range          | 20 %RH–80 %RH (non condensation)                                                                                                                                                                                                                                                                  |                                                                                   |
| Vibration resistance                 | ≤100 m/s <sup>2</sup> (55 Hz—2000 Hz)                                                                                                                                                                                                                                                             |                                                                                   |
| Shock resistance                     | ≤200 m/s <sup>2</sup> (1/2 sin, 11 ms)                                                                                                                                                                                                                                                            |                                                                                   |
| CE marking / UKCA marking            | EMC Directive/Electromagnetic Compatibility Regulations: EN 61326-1<br>Immunity test requirement: Clause 6.2 Table 2<br>Emission limit: Class B<br><br>RoHs Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations: EN IEC 63000 |                                                                                   |

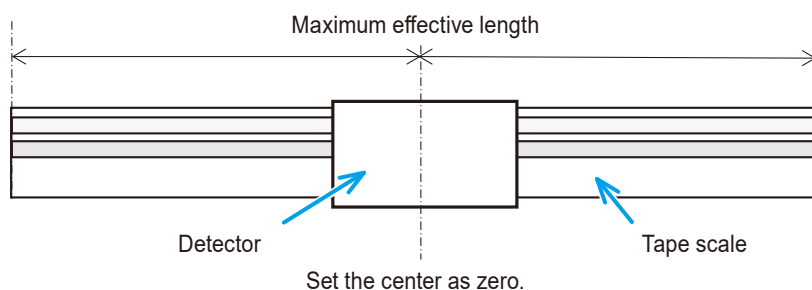
## 4.2 Relationship between the Resolution, Maximum Effective Length, and Maximum Response Speed

### 4.2.1 Resolution: 0.01 $\mu\text{m}$

| Interface                       | Maximum effective length (mm)          |                                                  |                                         | Maximum response speed (m/s) |
|---------------------------------|----------------------------------------|--------------------------------------------------|-----------------------------------------|------------------------------|
|                                 | Specifications for fixing at both ends | Specifications for fixing with double-sided tape | Specifications for fixing at the center |                              |
| Mitutoyo ENSIS®                 | 12000                                  | 3000                                             | 6000                                    | 8                            |
| Mitsubishi Electric Corporation | 12000                                  | 3000                                             | 6000                                    | 4                            |
| FANUC Corporation               | 12000                                  | 3000                                             | 6000                                    | 8                            |
| Panasonic Corporation           | 12000                                  | 3000                                             | 6000                                    | 4                            |
| Yaskawa Electric Corporation    | 12000                                  | 3000                                             | 6000                                    | 8                            |

### 4.2.2 Resolution: 0.001 $\mu\text{m}$

■ When the center of maximum effective length is set as zero

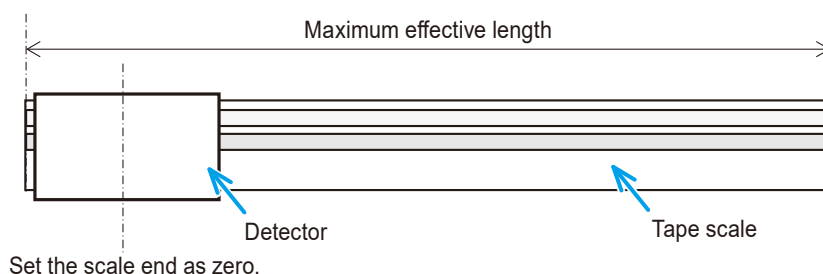


| Interface                       | Maximum effective length (mm)          |                                                  |                                         | Maximum response speed (m/s) |
|---------------------------------|----------------------------------------|--------------------------------------------------|-----------------------------------------|------------------------------|
|                                 | Specifications for fixing at both ends | Specifications for fixing with double-sided tape | Specifications for fixing at the center |                              |
| Mitutoyo ENSIS®                 | ±2100                                  | ±1500                                            | ±2100                                   | 8                            |
| Mitsubishi Electric Corporation | ±2100                                  | ±1500                                            | ±2100                                   | 4                            |
| FANUC Corporation               | ±2100                                  | ±1500                                            | ±2100                                   | 8                            |
| Panasonic Corporation           | ±2100                                  | ±1500                                            | ±2100                                   | 0.4                          |
| Yaskawa Electric Corporation    | ±1800                                  | ±1500                                            | ±1800                                   | 3.6                          |

### Tips

The center of maximum effective length is factory set as zero (origin).

### ■ When the scale end is set as zero



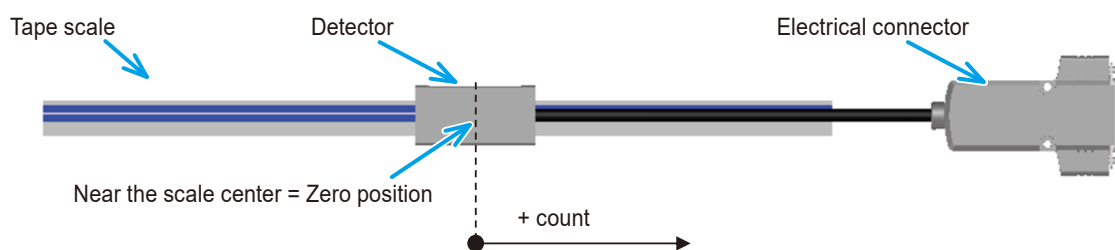
### Tips

When zero is set to the scale end, the maximum effective length is different from that of the scale center.

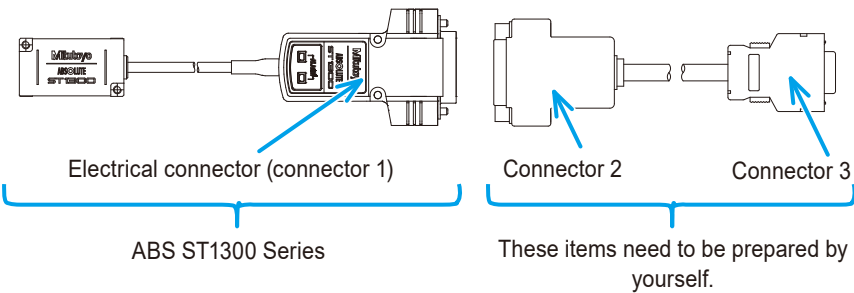
| Interface                       | Maximum effective length (mm)          |                                                  |                                         | Maximum response speed (m/s) |
|---------------------------------|----------------------------------------|--------------------------------------------------|-----------------------------------------|------------------------------|
|                                 | Specifications for fixing at both ends | Specifications for fixing with double-sided tape | Specifications for fixing at the center |                              |
| Mitutoyo ENSIS®                 | 0—+2100 or -2100—0                     |                                                  |                                         | 8                            |
| Mitsubishi Electric Corporation | 0—+2100 or -2100—0                     |                                                  |                                         | 4                            |
| FANUC Corporation               | 0—+2100 or -2100—0                     |                                                  |                                         | 8                            |
| Panasonic Corporation           | 0—+2100 or -2100—0                     |                                                  |                                         | 0.4                          |
| Yaskawa Electric Corporation    | 0—+1800 or -1800—0                     |                                                  |                                         | 3.6                          |

## 4.3 Data Zero Position and Counting Direction

When the center of maximum effective length is set as zero, the electrical connector direction is the + count direction.



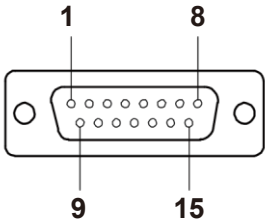
# 4.4 Production of a Feedback Cable



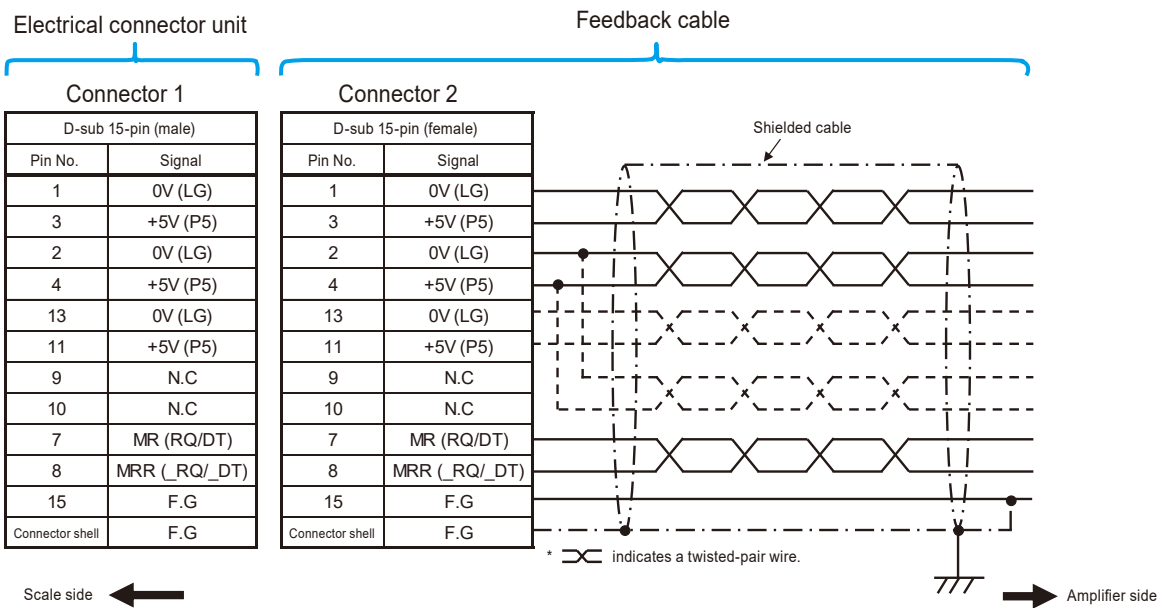
- If you use the machine in an environment affected by electromagnetic noise, partially remove the sheath of the feedback cable near the servo amplifier and connect the shielded wire to the ground bar to improve noise resistance.
- To set the cable length longer, it is recommended that you should wire the dotted lines (+5 V, 0 V) as shown in the following connection diagrams.

**Tips**

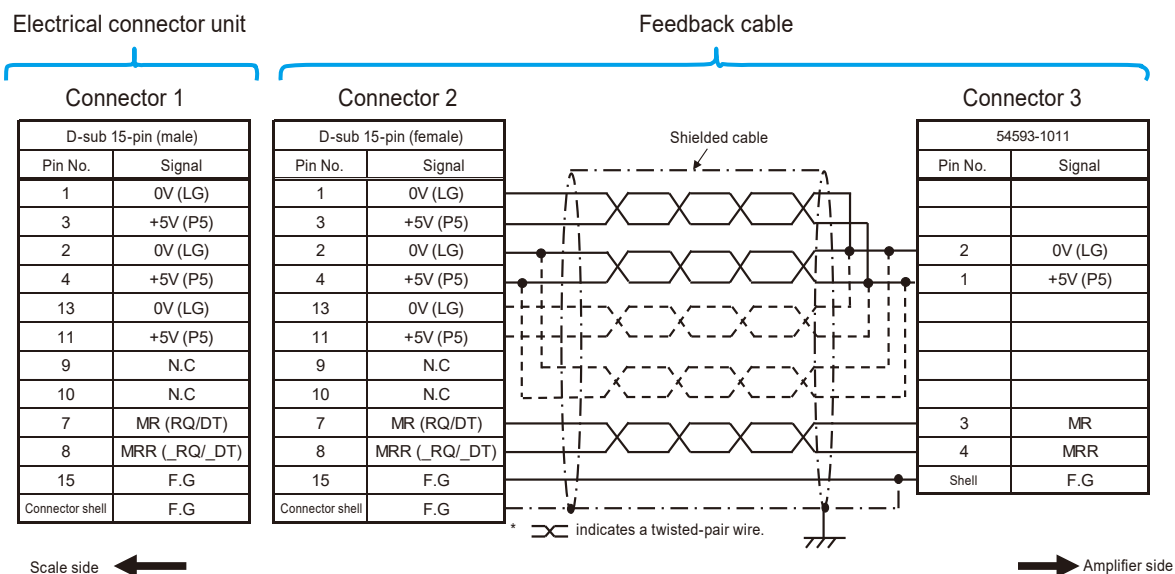
The pin assignment of the electrical connector (connector 1) is as follows. The applicable connector is HDAB-15S.



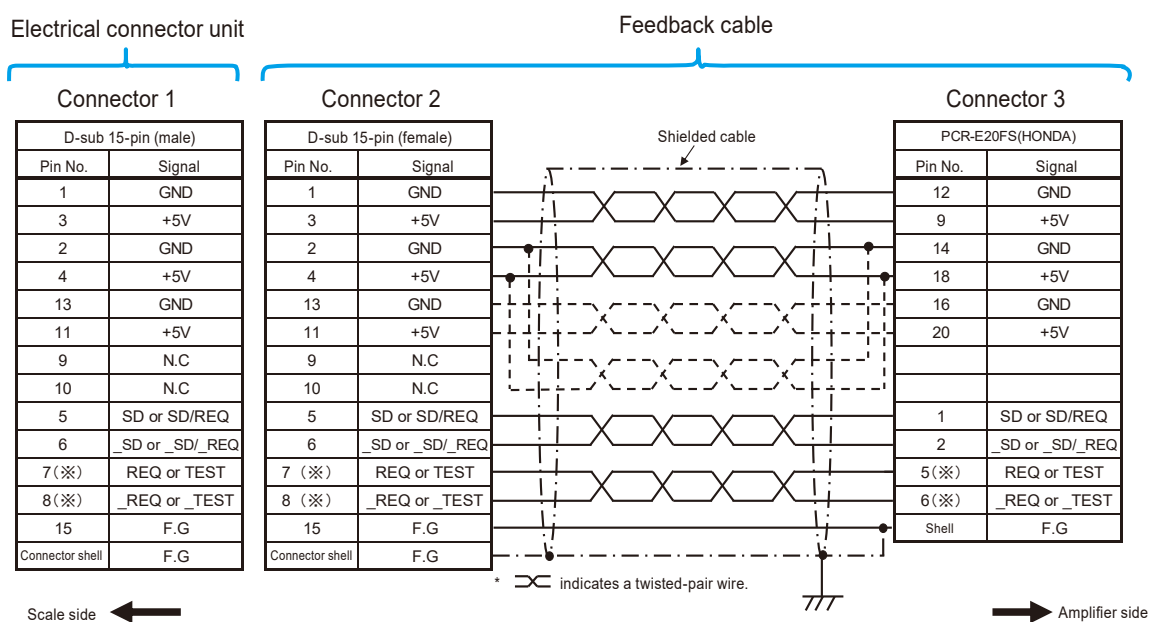
## 4.4.1 Connection Diagram for ABS ST1301A/ABS ST1302A



## 4.4.2 Connection Diagram for ABS ST1341A/ABS ST1342A

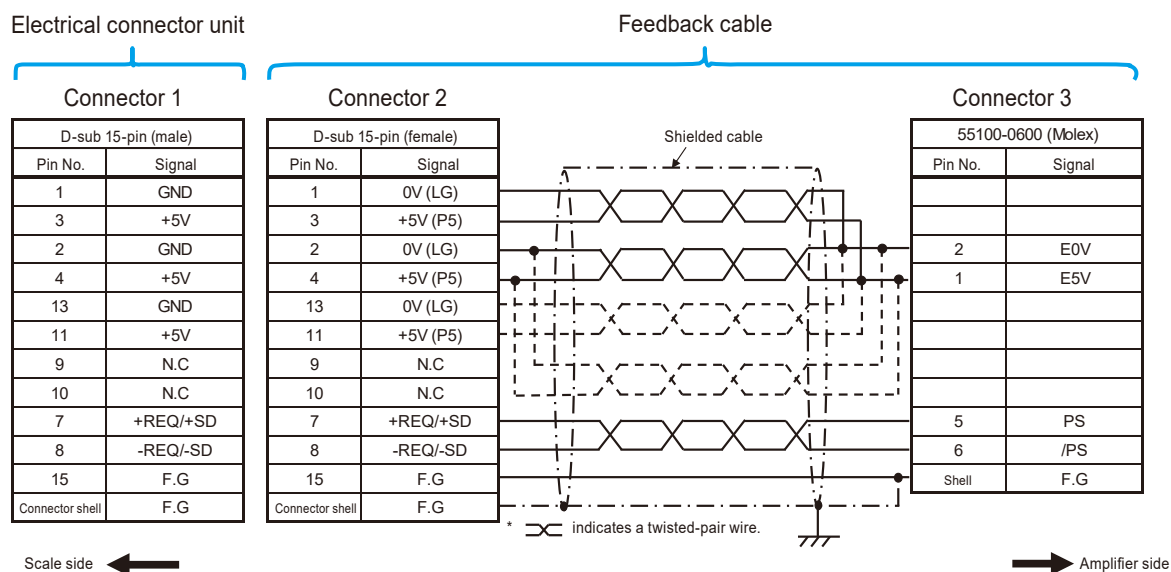


## 4.4.3 Connection Diagram for ABS ST1351/ABS ST1352

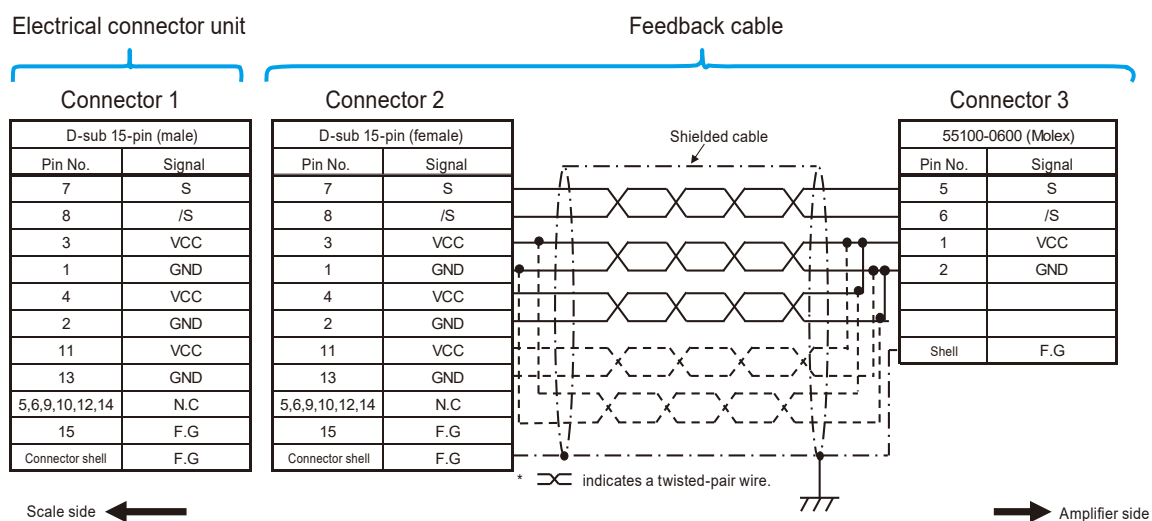


Be sure to connect the TEST/\_TEST signals as they are used as communication lines during signal check.

## 4.4.4 Connection Diagram for ABS ST1371A/ABS ST1372A



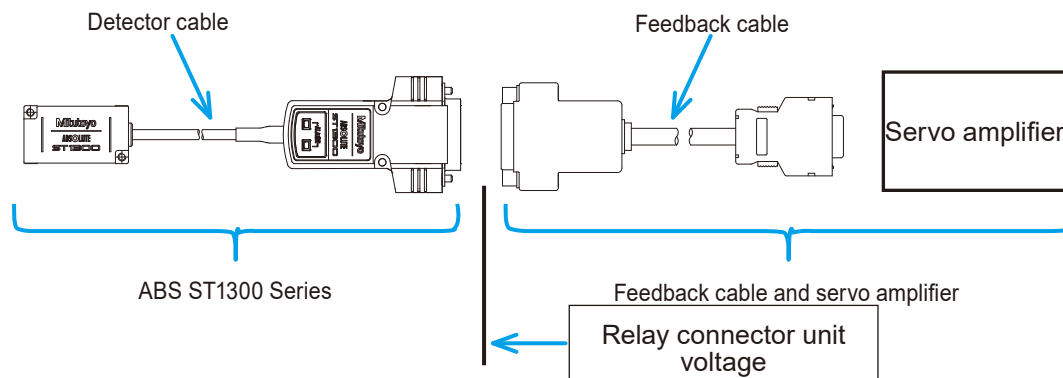
## 4.4.5 Connection Diagram for ABS ST1381A/ABS ST1382A



## 4.4.6 Calculation of Feedback Cable Length

When making a feedback cable, refer to the following calculation method of maximum cable length.

### ■ Configuration



### ■ Condition: When the Detector cable length is 1 m

| Name                                                    | Specifications and symbols | Unit  |
|---------------------------------------------------------|----------------------------|-------|
| Maximum cable length                                    | L                          | m     |
| Wire resistance of used wire material                   | a                          | Ω/m   |
| Number of pairs used for power supply line              | b                          | Wires |
| Supply voltage (minimum value) from the servo amplifier | Vin (*1)                   | V     |
| Current consumption value                               | I (*2)                     | A     |
| Relay connector unit voltage (minimum value)            | 4.5                        | V     |

\*1: This is the standard supply voltage from the servo amplifier.

\*2: For details on the current consumption value, refer to 4.1 Specifications" (page 45).

### ■ Calculation formula

Allowable voltage drop  $\geq$  (Current consumption x wire material resistance x 2 x max cable length) ÷  
Number of pairs used for power supply line (1)

Applying the conditions in the above table to formula (1) gives the following result.

$$(V_{in} - 4.5) [V] \geq (I [A] \times a [\Omega/m] \times 2 \times L [m]) \div b [\text{wires}] \quad (2)$$

Modify formula (2) above to the following one.

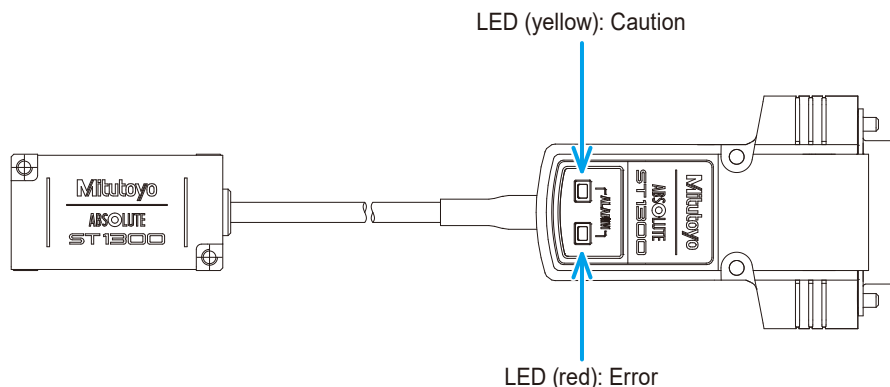
$$L [m] \leq \frac{b (V_{in} - 4.5)}{2 \times I \times a} \quad (3)$$

Produce the feedback cable of the max cable length (L[m]), wire resistance of used wire material (a[Ω/m]) and number of pairs used for power supply line (b[wires]) satisfying formula (3) above.

## 4.5 Alarm Function

The ABS ST1300 Series is equipped with the Alarm Detection function inside the Detector.

Alarms detected by the Alarm Detection function can be categorized into two groups as follows: Caution and Error.



- **Caution:** Indicates a low-level sensor signal strength or temperature rise inside the Detector. Once troubleshoot the causes, the normal state is restored.
- **Error:** Indicates a sensor signal strength error or absolute position detection error. Once it occurs, the error state will be maintained until the error is reset, or the power is re-supplied.

| Alarm detection type | Description           |                                                                                                                                                                                                                                                                                                                                                                |
|----------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Caution              | Signal strength alarm | <ul style="list-style-type: none"> <li>• It is output when the signal strength of the scale is too large or too small. There is no error in the position data, but check the mounting position relationship between the tape scale and the Detector.</li> <li>• When the signal strength returns to the predetermined range, the alarm is canceled.</li> </ul> |
|                      | Thermal alarm         | <ul style="list-style-type: none"> <li>• It is output when the temperature inside the Detector rises above 65 °C.</li> <li>• There is no error in the position data, but continuing to use it may cause a malfunction. Review the usage conditions or the installation environment.</li> </ul>                                                                 |
| Error                | Over speed error      | It is output when the speed of 8 m/s or more occurs.                                                                                                                                                                                                                                                                                                           |
|                      | Initialization error  | It is output when an error cause occurs during initialization immediately after turning on the power or receiving the reset ID.                                                                                                                                                                                                                                |
|                      | Hardware error        | It is output when abnormality occurs in self-diagnosis.                                                                                                                                                                                                                                                                                                        |
|                      | ABS detection error   | It is output when an error occurs in the combination of absolute positions.                                                                                                                                                                                                                                                                                    |
|                      | Communication error   | It is output when a communication error between the Detector and the electrical connector occurs.                                                                                                                                                                                                                                                              |
|                      | Signal strength error | It is output when the signal strength of the scale is too large or too small and there is a possibility of abnormality in the output data.                                                                                                                                                                                                                     |

## 4.6 Maintenance Parts/Optional Parts

There are the following maintenance parts and optional parts available for the ABS ST1300 Series.

### 4.6.1 Maintenance Parts

#### ■ Specifications for fixing at both ends

| Name                                                                      | Part number | Note               |
|---------------------------------------------------------------------------|-------------|--------------------|
| Mounting auxiliary tool (for fixing at both ends or fixing at the center) | 06AFT403    |                    |
| Pull block A                                                              | 06AEY098    |                    |
| Pull block B                                                              | 06AEY099    |                    |
| Fixing base                                                               | 06AEY100    |                    |
| Sleeve washer                                                             | 06AEX682    |                    |
| Intermediate fixing spring Ass'y                                          | 06AEX686    |                    |
| Intermediate fixing base                                                  | 06AEY101    |                    |
| Cover                                                                     | 06AEX690    |                    |
| Countersunk screw M2 x 4                                                  | 143032      | Cover fixing screw |

#### ■ Specifications for fixing with double-sided tape

| Name                                                        | Part number | Note |
|-------------------------------------------------------------|-------------|------|
| Mounting auxiliary tool (for fixing with double-sided tape) | 06AFT404    |      |
| End cap                                                     | 06AEF304    |      |

#### ■ Specifications for fixing at the center

| Name                                                                      | Part number | Note |
|---------------------------------------------------------------------------|-------------|------|
| Mounting auxiliary tool (for fixing at both ends or fixing at the center) | 06AFT403    |      |
| Center fixing base                                                        | 06AGB360    |      |
| Center fixing spring                                                      | 06AFZ195    |      |

## 4.6.2 Optional Parts

| Name                                                 | Part number | Note                                                                             |
|------------------------------------------------------|-------------|----------------------------------------------------------------------------------|
| ST1300A Signal Check Program conversion unit         | 06AFA406    | Used to check the signals                                                        |
| ST1340A Signal Check Program conversion unit         | 06AEX139    |                                                                                  |
| ST1350 Signal Check Program conversion unit          | 06AFA407    |                                                                                  |
| ST1370A/ST1380A Signal Check Program conversion unit | 06AEX140    |                                                                                  |
| Roller                                               | 06AEJ505    | Used to attach the tape scale (specifications for fixing with double-sided tape) |
| Scale attaching auxiliary tool                       | 06AEQ305    |                                                                                  |
| ST1380A connection cable (L = 200 mm)                | 06AFA434A   | Used to use the Yaskawa Electric feedback cable                                  |
| ST1380A connection cable (L = 500 mm)                | 06AFA434B   |                                                                                  |
| ST1380A connection cable (L = 1000 mm)               | 06AFA434C   |                                                                                  |

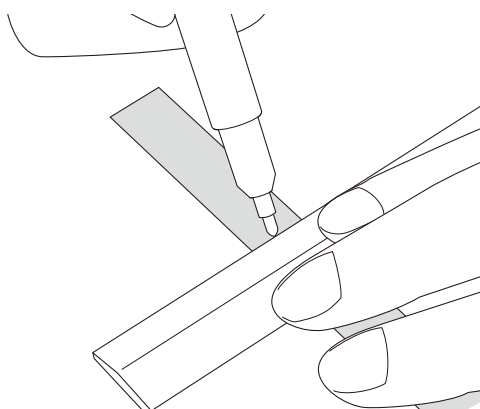
## 4.6.3 Cutting the Tape Scale



You need to prepare a tape scale cutting tool that can cut the following materials:

- Material: SUS material
- Thickness: 0.3 mm
- Width: 13 mm

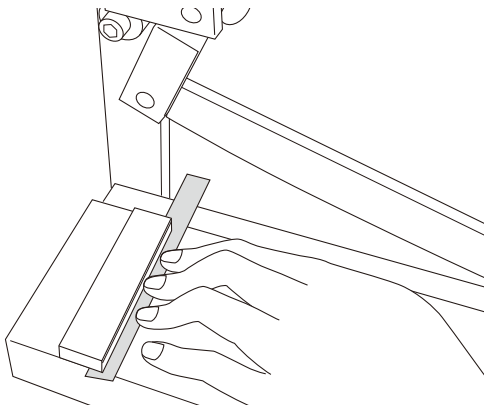
### 1 Mark the cutting position.



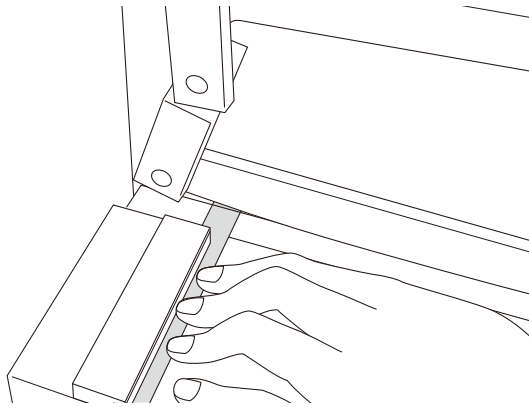
## 4 Specifications

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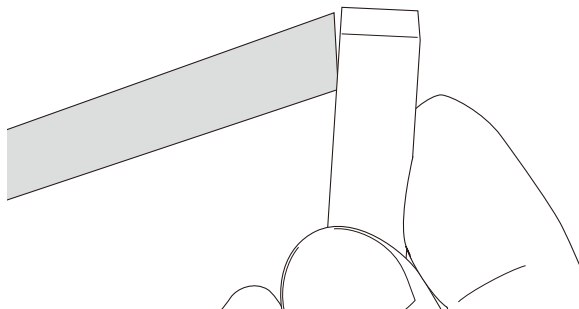
- 2** Set the tape scale on the cutting tool.



- 3** Cut the tape scale.



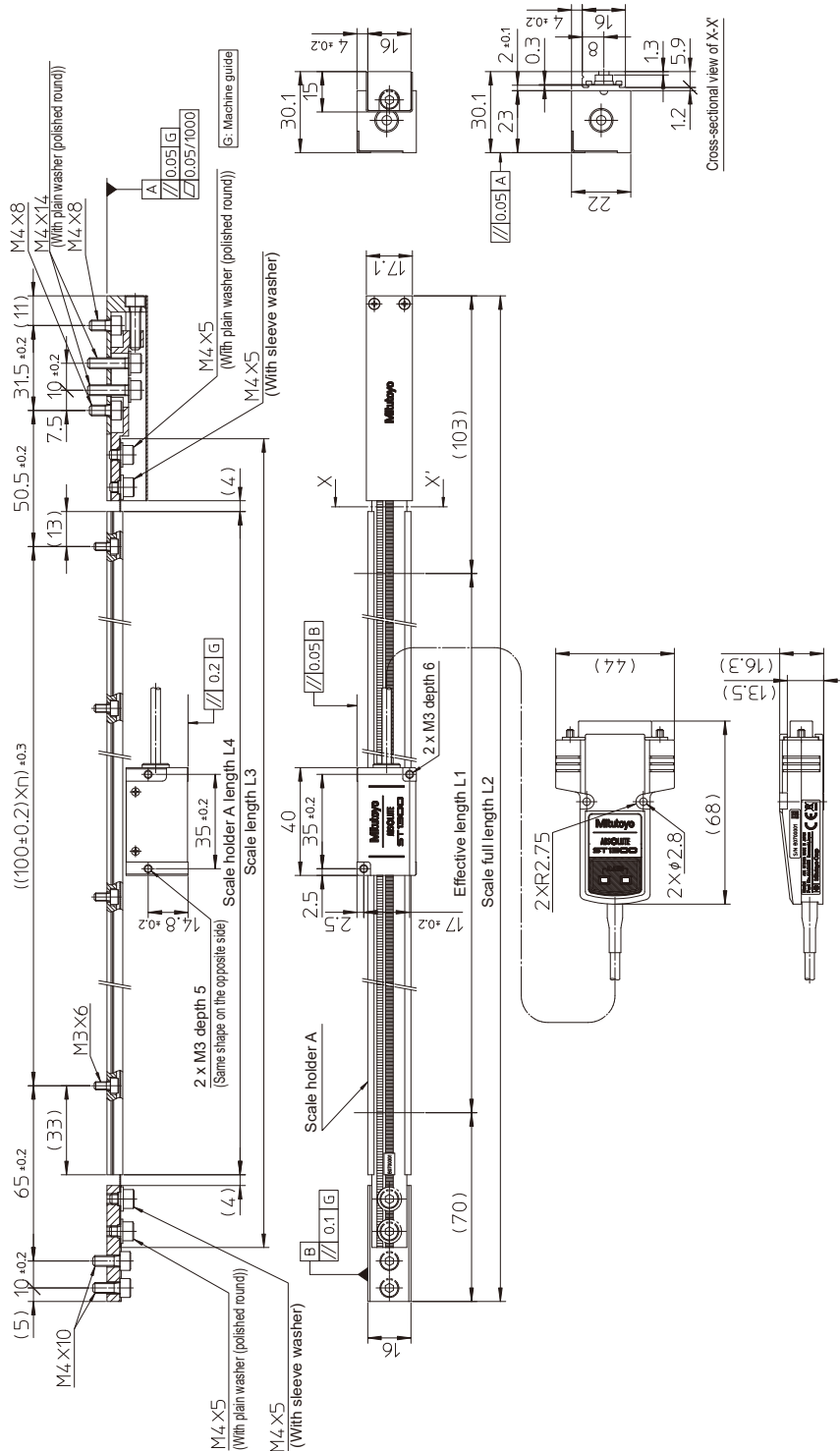
- 4** Remove burrs from the cutting surface with an oilstone.



## 4.7 External View and Dimensional Drawings

### 4.7.1 Specifications for Fixing at Both Ends (Effective Length of 500 mm–1000 mm)

#### ■ Dimensional drawings



## Dimensional drawings table

| Code No.<br>(*1, *2) | Model number<br>(*1, *2, *3) | Effective<br>length L1<br>(mm) | Scale full<br>length L2<br>(mm) | Scale<br>length L3<br>(mm) | Scale<br>holder A<br>length L4<br>(mm) | Number<br>of scale<br>holder A<br>mounting<br>holes n |
|----------------------|------------------------------|--------------------------------|---------------------------------|----------------------------|----------------------------------------|-------------------------------------------------------|
| 579-434-□◇           | ST13□◇△-00500D               | 500                            | 673                             | 600                        | 546                                    | 5                                                     |
| 579-435-□◇           | ST13□◇△-00600D               | 600                            | 773                             | 700                        | 646                                    | 6                                                     |
| 579-436-□◇           | ST13□◇△-00700D               | 700                            | 873                             | 800                        | 746                                    | 7                                                     |
| 579-437-□◇           | ST13□◇△-00800D               | 800                            | 973                             | 900                        | 846                                    | 8                                                     |
| 579-438-□◇           | ST13□◇△-00900D               | 900                            | 1073                            | 1000                       | 946                                    | 9                                                     |
| 579-439-□◇           | ST13□◇△-01000D               | 1000                           | 1173                            | 1100                       | 1046                                   | 10                                                    |

\*1: The □ mark in Code No. and Model number represents as follows:

0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface

4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface

5: FANUC Corporation specifications    Compatible with high-speed serial interface

7: Panasonic Corporation specifications    Compatible with high-speed serial interface

8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

\*2: The ◇ mark in Code No. and Model number represents as follows:

1: Resolution 0.01 μm

2: Resolution 0.001 μm

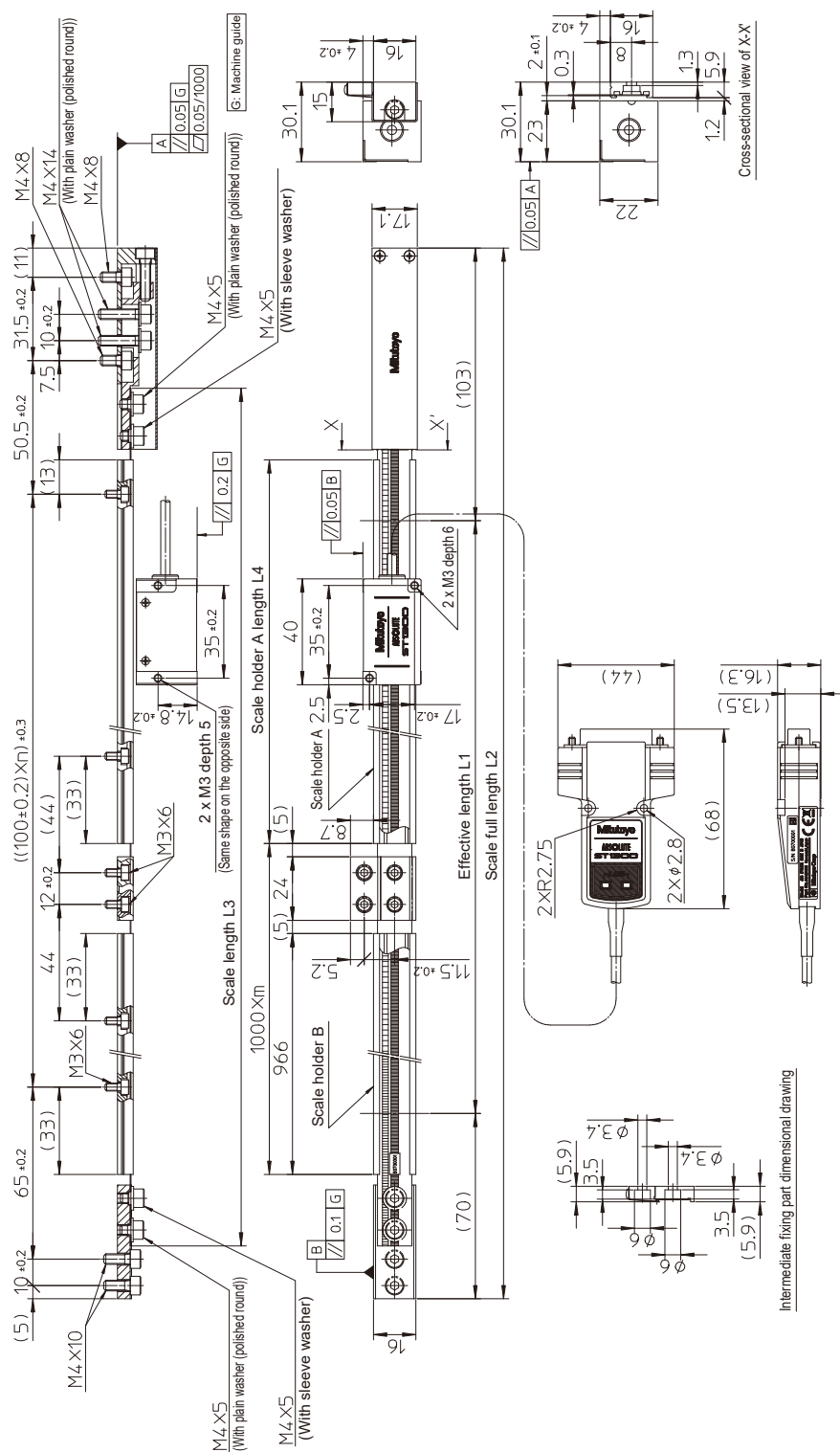
\*3: The △ mark in Model number represents as follows:

A: Half duplex system

None: Full duplex system or full duplex system/half duplex system

#### 4.7.2 Specifications for Fixing at Both Ends (Effective Length of 1100 mm–12000 mm)

## ■ Dimensional drawings



### ■ Dimensional drawings table

| Code No.<br>(*1, *2) | Model number<br>(*1, *2, *3) | Effective<br>length L1<br>(mm)<br>(*4) | Scale full<br>length L2<br>(mm) | Scale<br>length L3<br>(mm) | Scale<br>holder A<br>length L4<br>(mm) | Number of<br>scale holder<br>B units/inter-<br>mediate fixing<br>base units/<br>intermediate<br>fixing spring<br>Ass'y units | Number<br>of scale<br>holder<br>mounting<br>holes n |
|----------------------|------------------------------|----------------------------------------|---------------------------------|----------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 579-440-□◇           | ST13□◇△-01100D               | 1100                                   | 1273                            | 1200                       | 146                                    | 1                                                                                                                            | 11                                                  |
| 579-441-□◇           | ST13□◇△-01200D               | 1200                                   | 1373                            | 1300                       | 246                                    | 1                                                                                                                            | 12                                                  |
| 579-442-□◇           | ST13□◇△-01300D               | 1300                                   | 1473                            | 1400                       | 346                                    | 1                                                                                                                            | 13                                                  |
| 579-443-□◇           | ST13□◇△-01400D               | 1400                                   | 1573                            | 1500                       | 446                                    | 1                                                                                                                            | 14                                                  |
| 579-444-□◇           | ST13□◇△-01500D               | 1500                                   | 1673                            | 1600                       | 546                                    | 1                                                                                                                            | 15                                                  |
| 579-445-□◇           | ST13□◇△-01600D               | 1600                                   | 1773                            | 1700                       | 646                                    | 1                                                                                                                            | 16                                                  |
| 579-446-□◇           | ST13□◇△-01700D               | 1700                                   | 1873                            | 1800                       | 746                                    | 1                                                                                                                            | 17                                                  |
| 579-447-□◇           | ST13□◇△-01800D               | 1800                                   | 1973                            | 1900                       | 846                                    | 1                                                                                                                            | 18                                                  |
| 579-448-□◇           | ST13□◇△-02000D               | 2000                                   | 2173                            | 2100                       | 1046                                   | 1                                                                                                                            | 20                                                  |
| 579-449-□◇           | ST13□◇△-02200D               | 2200                                   | 2373                            | 2300                       | 246                                    | 2                                                                                                                            | 22                                                  |
| 579-450-□◇           | ST13□◇△-02400D               | 2400                                   | 2573                            | 2500                       | 446                                    | 2                                                                                                                            | 24                                                  |
| 579-451-□◇           | ST13□◇△-02500D               | 2500                                   | 2673                            | 2600                       | 546                                    | 2                                                                                                                            | 25                                                  |
| 579-452-□◇           | ST13□◇△-02600D               | 2600                                   | 2773                            | 2700                       | 646                                    | 2                                                                                                                            | 26                                                  |
| 579-453-□◇           | ST13□◇△-02800D               | 2800                                   | 2973                            | 2900                       | 846                                    | 2                                                                                                                            | 28                                                  |
| 579-454-□◇           | ST13□◇△-03000D               | 3000                                   | 3173                            | 3100                       | 1046                                   | 2                                                                                                                            | 30                                                  |
| 579-455-□◇           | ST13□◇△-03200D               | 3200                                   | 3373                            | 3300                       | 246                                    | 3                                                                                                                            | 32                                                  |
| 579-456-□◇           | ST13□◇△-03400D               | 3400                                   | 3573                            | 3500                       | 446                                    | 3                                                                                                                            | 34                                                  |
| 579-457-□◇           | ST13□◇△-03600D               | 3600                                   | 3773                            | 3700                       | 646                                    | 3                                                                                                                            | 36                                                  |
| 579-458-□◇           | ST13□◇△-03800D               | 3800                                   | 3973                            | 3900                       | 846                                    | 3                                                                                                                            | 38                                                  |
| 579-459-□◇           | ST13□◇△-04000D               | 4000                                   | 4173                            | 4100                       | 1046                                   | 3                                                                                                                            | 40                                                  |
| 579-460-□◇           | ST13□◇△-04200D               | 4200                                   | 4373                            | 4300                       | 246                                    | 4                                                                                                                            | 42                                                  |
| 579-461-□◇           | ST13□◇△-04400D               | 4400                                   | 4573                            | 4500                       | 446                                    | 4                                                                                                                            | 44                                                  |
| 579-462-□◇           | ST13□◇△-04600D               | 4600                                   | 4773                            | 4700                       | 646                                    | 4                                                                                                                            | 46                                                  |
| 579-463-□◇           | ST13□◇△-04800D               | 4800                                   | 4973                            | 4900                       | 846                                    | 4                                                                                                                            | 48                                                  |
| 579-464-□◇           | ST13□◇△-05000D               | 5000                                   | 5173                            | 5100                       | 1046                                   | 4                                                                                                                            | 50                                                  |
| 579-465-□◇           | ST13□◇△-05200D               | 5200                                   | 5373                            | 5300                       | 246                                    | 5                                                                                                                            | 52                                                  |
| 579-466-□◇           | ST13□◇△-05400D               | 5400                                   | 5573                            | 5500                       | 446                                    | 5                                                                                                                            | 54                                                  |
| 579-467-□◇           | ST13□◇△-05600D               | 5600                                   | 5773                            | 5700                       | 646                                    | 5                                                                                                                            | 56                                                  |
| 579-468-□◇           | ST13□◇△-05800D               | 5800                                   | 5973                            | 5900                       | 846                                    | 5                                                                                                                            | 58                                                  |
| 579-469-□◇           | ST13□◇△-06000D               | 6000                                   | 6173                            | 6100                       | 1046                                   | 5                                                                                                                            | 60                                                  |
| 579-470-□◇           | ST13□◇△-06200D               | 6200                                   | 6373                            | 6300                       | 246                                    | 6                                                                                                                            | 62                                                  |
| 579-471-□◇           | ST13□◇△-06400D               | 6400                                   | 6573                            | 6500                       | 446                                    | 6                                                                                                                            | 64                                                  |
| 579-472-□◇           | ST13□◇△-06600D               | 6600                                   | 6773                            | 6700                       | 646                                    | 6                                                                                                                            | 66                                                  |
| 579-473-□◇           | ST13□◇△-06800D               | 6800                                   | 6973                            | 6900                       | 846                                    | 6                                                                                                                            | 68                                                  |
| 579-474-□◇           | ST13□◇△-07000D               | 7000                                   | 7173                            | 7100                       | 1046                                   | 6                                                                                                                            | 70                                                  |
| 579-475-□◇           | ST13□◇△-07200D               | 7200                                   | 7373                            | 7300                       | 246                                    | 7                                                                                                                            | 72                                                  |
| 579-476-□◇           | ST13□◇△-07400D               | 7400                                   | 7573                            | 7500                       | 446                                    | 7                                                                                                                            | 74                                                  |
| 579-477-□◇           | ST13□◇△-07600D               | 7600                                   | 7773                            | 7700                       | 646                                    | 7                                                                                                                            | 76                                                  |
| 579-478-□◇           | ST13□◇△-07800D               | 7800                                   | 7973                            | 7900                       | 846                                    | 7                                                                                                                            | 78                                                  |
| 579-479-□◇           | ST13□◇△-08000D               | 8000                                   | 8173                            | 8100                       | 1046                                   | 7                                                                                                                            | 80                                                  |

## 4 Specifications

|            |                |       |       |       |      |    |     |
|------------|----------------|-------|-------|-------|------|----|-----|
| 579-480-□◇ | ST13□◇△-08200D | 8200  | 8373  | 8300  | 246  | 8  | 82  |
| 579-481-□◇ | ST13□◇△-08400D | 8400  | 8573  | 8500  | 446  | 8  | 84  |
| 579-482-□◇ | ST13□◇△-08600D | 8600  | 8773  | 8700  | 646  | 8  | 86  |
| 579-483-□◇ | ST13□◇△-08800D | 8800  | 8973  | 8900  | 846  | 8  | 88  |
| 579-484-□◇ | ST13□◇△-09000D | 9000  | 9173  | 9100  | 1046 | 8  | 90  |
| 579-485-□◇ | ST13□◇△-09200D | 9200  | 9373  | 9300  | 246  | 9  | 92  |
| 579-486-□◇ | ST13□◇△-09400D | 9400  | 9573  | 9500  | 446  | 9  | 94  |
| 579-487-□◇ | ST13□◇△-09600D | 9600  | 9773  | 9700  | 646  | 9  | 96  |
| 579-488-□◇ | ST13□◇△-09800D | 9800  | 9973  | 9900  | 846  | 9  | 98  |
| 579-489-□◇ | ST13□◇△-10000D | 10000 | 10173 | 10100 | 1046 | 9  | 100 |
| 579-490-□◇ | ST13□◇△-10200D | 10200 | 10373 | 10300 | 246  | 10 | 102 |
| 579-491-□◇ | ST13□◇△-10400D | 10400 | 10573 | 10500 | 446  | 10 | 104 |
| 579-492-□◇ | ST13□◇△-10600D | 10600 | 10773 | 10700 | 646  | 10 | 106 |
| 579-493-□◇ | ST13□◇△-10800D | 10800 | 10973 | 10900 | 846  | 10 | 108 |
| 579-494-□◇ | ST13□◇△-11000D | 11000 | 11173 | 11100 | 1046 | 10 | 110 |
| 579-495-□◇ | ST13□◇△-11200D | 11200 | 11373 | 11300 | 246  | 11 | 112 |
| 579-496-□◇ | ST13□◇△-11400D | 11400 | 11573 | 11500 | 446  | 11 | 114 |
| 579-497-□◇ | ST13□◇△-11600D | 11600 | 11773 | 11700 | 646  | 11 | 116 |
| 579-498-□◇ | ST13□◇△-11800D | 11800 | 11973 | 11900 | 846  | 11 | 118 |
| 579-499-□◇ | ST13□◇△-12000D | 12000 | 12173 | 12100 | 1046 | 11 | 120 |

\*1: The □ mark in Code No. and Model number represents as follows:

0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface

4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface

5: FANUC Corporation specifications    Compatible with high-speed serial interface

7: Panasonic Corporation specifications    Compatible with high-speed serial interface

8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

\*2: The ◇ mark in Code No. and Model number represents as follows:

1: Resolution 0.01 μm

2: Resolution 0.001 μm

\*3: The △ mark in Model number represents as follows:

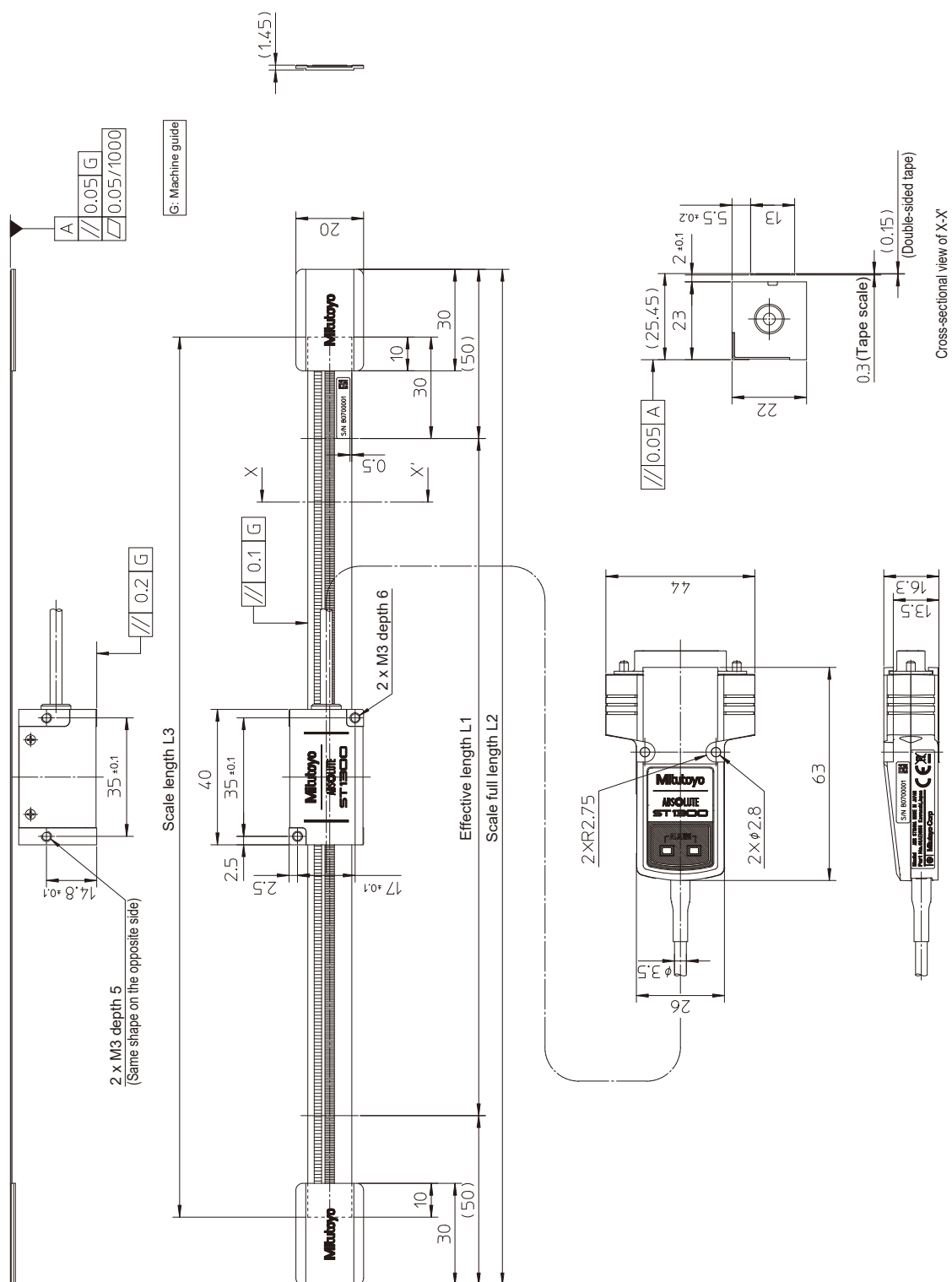
A: Half duplex system

None: Full duplex system or full duplex system/half duplex system

\*4: For the model number ST1382A-xxxxxD, the effective length is up to 3600 mm.

### 4.7.3 Specifications for Fixing with Double-Sided Tape (Effective Length of 10 mm–3000 mm)

#### ■ Dimensional drawings



## ■ Dimensional drawings table

| Code No.<br>(*1, *2) | Model number<br>(*1, *2, *3) | Effective<br>length L1<br>(mm) | Scale full<br>length L2<br>(mm) | Scale length<br>L3 (mm) |
|----------------------|------------------------------|--------------------------------|---------------------------------|-------------------------|
| 579-401-□◇           | ST13□◇△-00010E               | 10                             | 110                             | 70                      |
| 579-402-□◇           | ST13□◇△-00025E               | 25                             | 125                             | 85                      |
| 579-403-□◇           | ST13□◇△-00050E               | 50                             | 150                             | 110                     |
| 579-404-□◇           | ST13□◇△-00075E               | 75                             | 175                             | 135                     |
| 579-405-□◇           | ST13□◇△-00100E               | 100                            | 200                             | 160                     |
| 579-406-□◇           | ST13□◇△-00150E               | 150                            | 250                             | 210                     |
| 579-407-□◇           | ST13□◇△-00200E               | 200                            | 300                             | 260                     |
| 579-408-□◇           | ST13□◇△-00250E               | 250                            | 350                             | 310                     |
| 579-409-□◇           | ST13□◇△-00300E               | 300                            | 400                             | 360                     |
| 579-410-□◇           | ST13□◇△-00350E               | 350                            | 450                             | 410                     |
| 579-411-□◇           | ST13□◇△-00400E               | 400                            | 500                             | 460                     |
| 579-412-□◇           | ST13□◇△-00450E               | 450                            | 550                             | 510                     |
| 579-413-□◇           | ST13□◇△-00500E               | 500                            | 600                             | 560                     |
| 579-414-□◇           | ST13□◇△-00600E               | 600                            | 700                             | 660                     |
| 579-415-□◇           | ST13□◇△-00700E               | 700                            | 800                             | 760                     |
| 579-416-□◇           | ST13□◇△-00800E               | 800                            | 900                             | 860                     |
| 579-417-□◇           | ST13□◇△-00900E               | 900                            | 1000                            | 960                     |
| 579-418-□◇           | ST13□◇△-01000E               | 1000                           | 1100                            | 1060                    |
| 579-419-□◇           | ST13□◇△-01100E               | 1100                           | 1200                            | 1160                    |
| 579-420-□◇           | ST13□◇△-01200E               | 1200                           | 1300                            | 1260                    |
| 579-421-□◇           | ST13□◇△-01300E               | 1300                           | 1400                            | 1360                    |
| 579-422-□◇           | ST13□◇△-01400E               | 1400                           | 1500                            | 1460                    |
| 579-423-□◇           | ST13□◇△-01500E               | 1500                           | 1600                            | 1560                    |
| 579-424-□◇           | ST13□◇△-01600E               | 1600                           | 1700                            | 1660                    |
| 579-425-□◇           | ST13□◇△-01700E               | 1700                           | 1800                            | 1760                    |
| 579-426-□◇           | ST13□◇△-01800E               | 1800                           | 1900                            | 1860                    |
| 579-427-□◇           | ST13□◇△-02000E               | 2000                           | 2100                            | 2060                    |
| 579-428-□◇           | ST13□◇△-02200E               | 2200                           | 2300                            | 2260                    |
| 579-429-□◇           | ST13□◇△-02400E               | 2400                           | 2500                            | 2460                    |
| 579-430-□◇           | ST13□◇△-02500E               | 2500                           | 2600                            | 2560                    |
| 579-431-□◇           | ST13□◇△-02600E               | 2600                           | 2700                            | 2660                    |
| 579-432-□◇           | ST13□◇△-02800E               | 2800                           | 2900                            | 2860                    |
| 579-433-□◇           | ST13□◇△-03000E               | 3000                           | 3100                            | 3060                    |

\*1: The □ mark in Code No. and Model number represents as follows:

0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface

4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface

5: FANUC Corporation specifications    Compatible with high-speed serial interface

7: Panasonic Corporation specifications    Compatible with high-speed serial interface

8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

## 4 Specifications

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\*2: The  $\diamond$  mark in Code No. and Model number represents as follows:

1: Resolution 0.01  $\mu\text{m}$

2: Resolution 0.001  $\mu\text{m}$

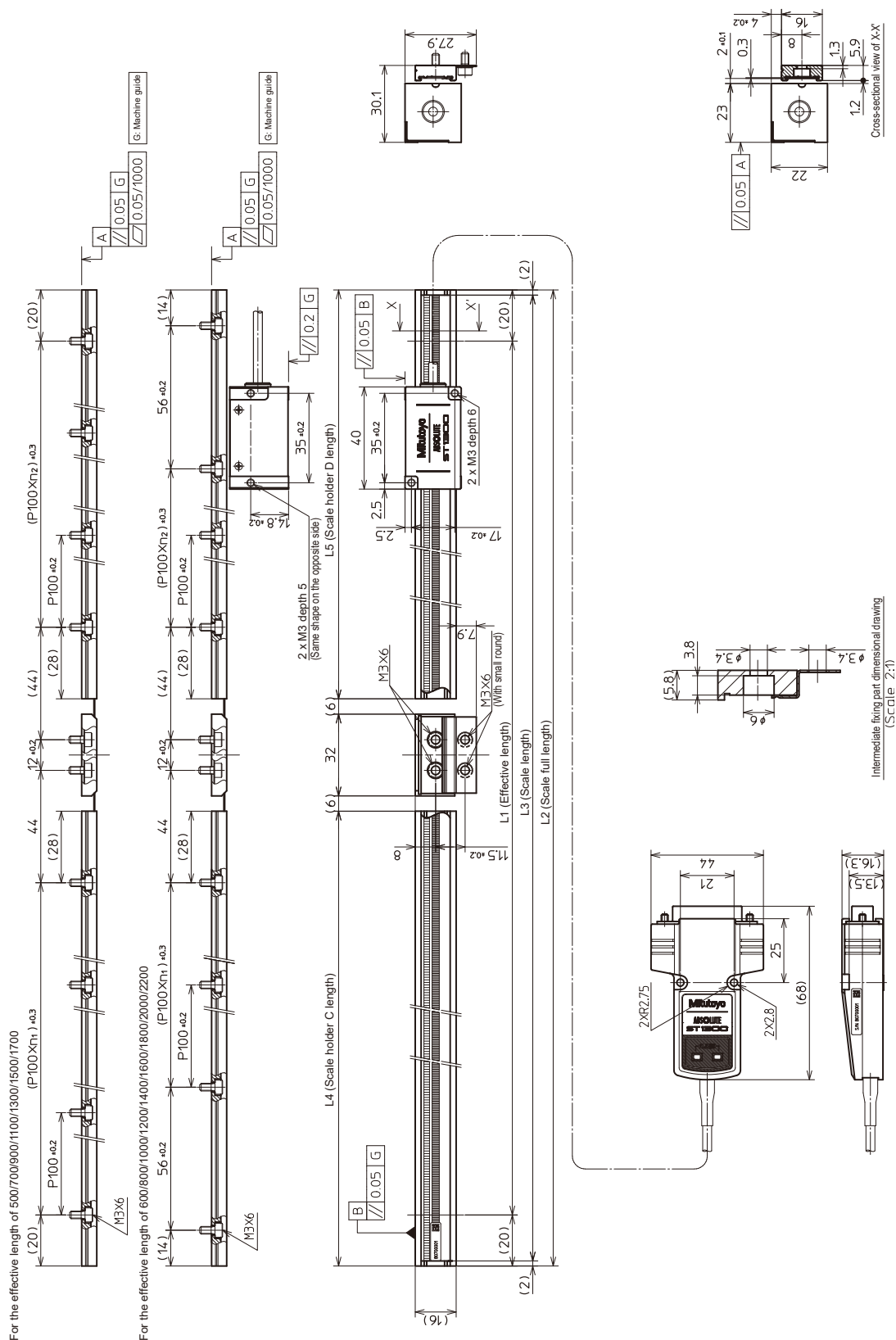
\*3: The  $\triangle$  mark in Model number represents as follows:

A: Half duplex system

None: Full duplex system or full duplex system/half duplex system

#### 4.7.4 Specifications for Fixing at the Center (Effective Length of 500 mm–2200 mm)

## ■ Dimensional drawings



## ■ Dimensional drawings table

| Code No.<br>(*1, *2) | Model number<br>(*1, *3, *4, *5) | Effective<br>length<br>L1 (mm) | Scale<br>full<br>length<br>L2 (mm) | Scale<br>length<br>L3 (mm) | Scale<br>holder<br>C length<br>L4 (mm) | Scale<br>holder D<br>length L5<br>(mm) | Number<br>of scale<br>holder C<br>mounting<br>holes n | Number<br>of scale<br>holder D<br>mounting<br>holes n | Total<br>number<br>of scale<br>holder<br>mounting<br>holes |
|----------------------|----------------------------------|--------------------------------|------------------------------------|----------------------------|----------------------------------------|----------------------------------------|-------------------------------------------------------|-------------------------------------------------------|------------------------------------------------------------|
| 579-434-□◇           | ST13□▽△-500☆                     | 500                            | 540                                | 536                        | 248                                    | 248                                    | 2                                                     | 2                                                     | 6                                                          |
| 579-435-□◇           | ST13□▽△-600☆                     | 600                            | 640                                | 636                        | 298                                    | 298                                    | 2                                                     | 2                                                     | 8                                                          |
| 579-436-□◇           | ST13□▽△-700☆                     | 700                            | 740                                | 736                        | 348                                    | 348                                    | 3                                                     | 3                                                     | 8                                                          |
| 579-437-□◇           | ST13□▽△-800☆                     | 800                            | 840                                | 836                        | 398                                    | 398                                    | 3                                                     | 3                                                     | 10                                                         |
| 579-438-□◇           | ST13□▽△-900☆                     | 900                            | 940                                | 936                        | 448                                    | 448                                    | 4                                                     | 4                                                     | 10                                                         |
| 579-439-□◇           | ST13□▽△-1000☆                    | 1000                           | 1040                               | 1036                       | 498                                    | 498                                    | 4                                                     | 4                                                     | 12                                                         |
| 579-440-□◇           | ST13□▽△-1100☆                    | 1100                           | 1140                               | 1136                       | 548                                    | 548                                    | 5                                                     | 5                                                     | 12                                                         |
| 579-441-□◇           | ST13□▽△-1200☆                    | 1200                           | 1240                               | 1236                       | 598                                    | 598                                    | 5                                                     | 5                                                     | 14                                                         |
| 579-442-□◇           | ST13□▽△-1300☆                    | 1300                           | 1340                               | 1336                       | 648                                    | 648                                    | 6                                                     | 6                                                     | 14                                                         |
| 579-443-□◇           | ST13□▽△-1400☆                    | 1400                           | 1440                               | 1436                       | 698                                    | 698                                    | 6                                                     | 6                                                     | 16                                                         |
| 579-444-□◇           | ST13□▽△-1500☆                    | 1500                           | 1540                               | 1536                       | 748                                    | 748                                    | 7                                                     | 7                                                     | 16                                                         |
| 579-445-□◇           | ST13□▽△-1600☆                    | 1600                           | 1640                               | 1636                       | 798                                    | 798                                    | 7                                                     | 7                                                     | 18                                                         |
| 579-446-□◇           | ST13□▽△-1700☆                    | 1700                           | 1740                               | 1736                       | 848                                    | 848                                    | 8                                                     | 8                                                     | 18                                                         |
| 579-447-□◇           | ST13□▽△-1800☆                    | 1800                           | 1840                               | 1836                       | 898                                    | 898                                    | 8                                                     | 8                                                     | 20                                                         |
| 579-448-□◇           | ST13□▽△-2000☆                    | 2000                           | 2040                               | 2036                       | 998                                    | 998                                    | 9                                                     | 9                                                     | 22                                                         |
| 579-449-□◇           | ST13□▽△-2200☆                    | 2200                           | 2240                               | 2236                       | 1098                                   | 1098                                   | 10                                                    | 10                                                    | 24                                                         |

\*1: The □ mark in Code No. and Model number represents as follows:

- 0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface
- 4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface
- 5: FANUC Corporation specifications    Compatible with high-speed serial interface
- 7: Panasonic Corporation specifications    Compatible with high-speed serial interface
- 8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

\*2: The ◇ mark in Code No. represents as follows:

- 3: 0.01 μm (without the system parameters)
- 4: 0.001 μm (without the system parameters)
- 5: 0.01 μm (with the system parameters)
- 6: 0.001 μm (with the system parameters)

\*3: The ▽ mark in Model number represents as follows:

- 1: Resolution 0.01 μm
- 2: Resolution 0.001 μm

\*4: The △ mark in Model number represents as follows:

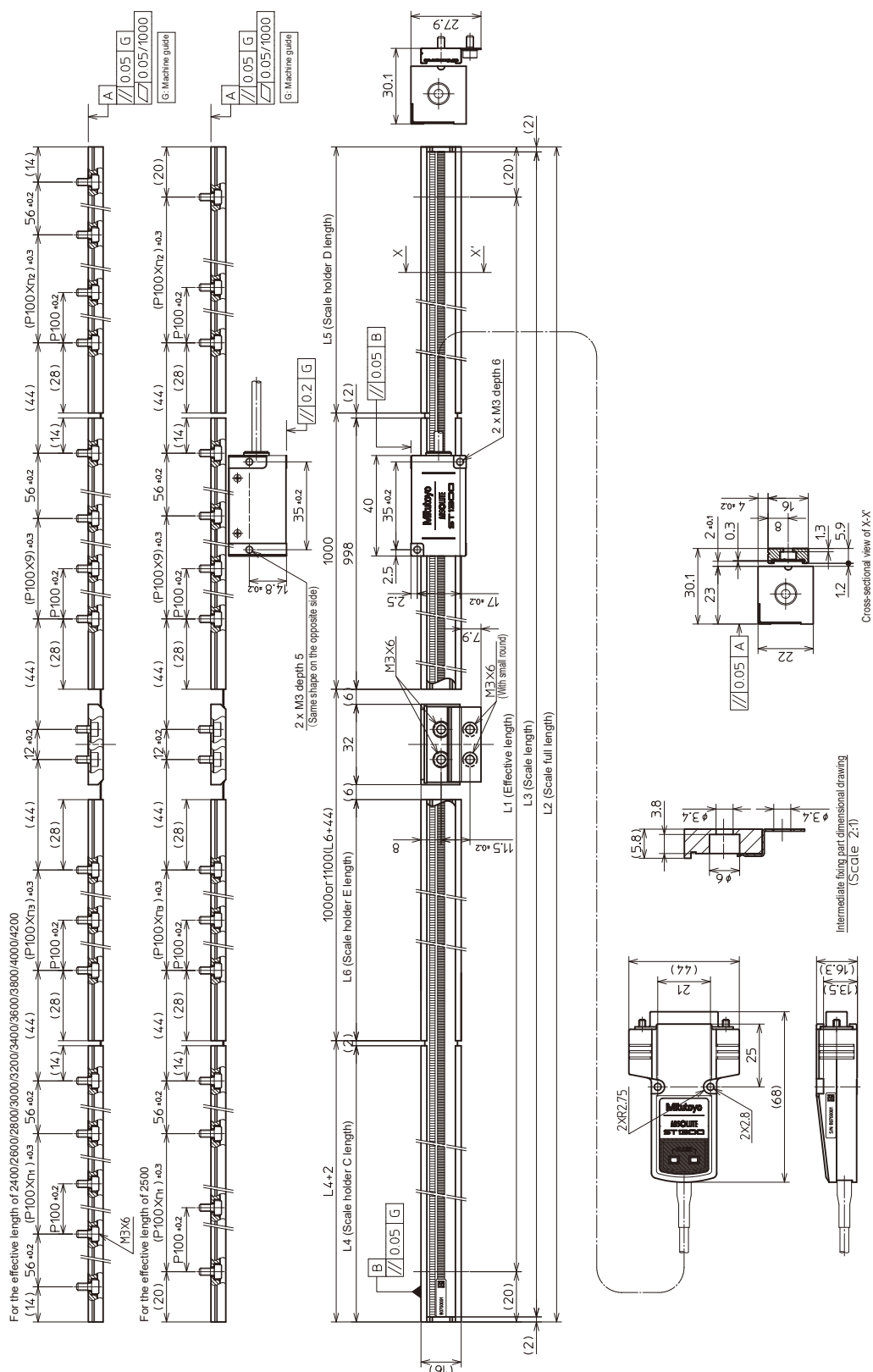
- A: Half duplex system
- None: Full duplex system or full duplex system/half duplex system

\*5: The ☆ mark in Model number represents as follows:

- F: Specifications for fixing at the center (without the system parameters)
- G: Specifications for fixing at the center (with the system parameters)

#### 4.7.5 Specifications for Fixing at the Center (Effective Length of 2400 mm–4200 mm)

## Dimensional drawings



## ■ Dimensional drawings table

| Code No. (*1, *2) | Model number (*1, *3, *4, *5) | Effective length L1 (mm) | Scale full length L2 (mm) | Scale length L3 (mm) | Scale holder C length L4 (mm) | Scale holder D length L5 (mm) | Scale holder E length L6 (mm) | Number of scale holder C mounting holes n | Number of scale holder D mounting holes n | Number of scale holder E mounting holes n | Total number of scale holder mounting holes |
|-------------------|-------------------------------|--------------------------|---------------------------|----------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|---------------------------------------------|
| 579-450-□◇        | ST13□▽△-2400☆                 | 2400                     | 2440                      | 2436                 | 240                           | 198                           | 956                           | 1                                         | 1                                         | 9                                         | 28                                          |
| 579-451-□◇        | ST13□▽△-2500☆                 | 2500                     | 2540                      | 2536                 | 290                           | 248                           | 956                           | 2                                         | 2                                         | 9                                         | 28                                          |
| 579-452-□◇        | ST13□▽△-2600☆                 | 2600                     | 2640                      | 2636                 | 240                           | 298                           | 1056                          | 1                                         | 2                                         | 10                                        | 30                                          |
| 579-453-□◇        | ST13□▽△-2800☆                 | 2800                     | 2840                      | 2836                 | 440                           | 398                           | 956                           | 3                                         | 3                                         | 9                                         | 32                                          |
| 579-454-□◇        | ST13□▽△-3000☆                 | 3000                     | 3040                      | 3036                 | 440                           | 498                           | 1056                          | 3                                         | 4                                         | 10                                        | 34                                          |
| 579-455-□◇        | ST13□▽△-3200☆                 | 3200                     | 3240                      | 3236                 | 640                           | 598                           | 956                           | 5                                         | 5                                         | 9                                         | 36                                          |
| 579-456-□◇        | ST13□▽△-3400☆                 | 3400                     | 3440                      | 3436                 | 640                           | 698                           | 1056                          | 5                                         | 6                                         | 10                                        | 38                                          |
| 579-457-□◇        | ST13□▽△-3600☆                 | 3600                     | 3640                      | 3636                 | 840                           | 798                           | 956                           | 7                                         | 7                                         | 9                                         | 40                                          |
| 579-458-□◇        | ST13□▽△-3800☆                 | 3800                     | 3840                      | 3836                 | 840                           | 898                           | 1056                          | 7                                         | 8                                         | 10                                        | 42                                          |
| 579-459-□◇        | ST13□▽△-4000☆                 | 4000                     | 4040                      | 4036                 | 1040                          | 998                           | 956                           | 9                                         | 9                                         | 9                                         | 44                                          |
| 579-460-□◇        | ST13□▽△-4200☆                 | 4200                     | 4240                      | 4236                 | 1040                          | 1098                          | 1056                          | 9                                         | 10                                        | 10                                        | 46                                          |

\*1: The □ mark in Code No. and Model number represents as follows:

0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface

4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface

5: FANUC Corporation specifications    Compatible with high-speed serial interface

7: Panasonic Corporation specifications    Compatible with high-speed serial interface

8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

\*2: The ◇ mark in Code No. represents as follows:

3: 0.01 μm (without the system parameters)

4: 0.001 μm (without the system parameters)

5: 0.01 μm (with the system parameters)

6: 0.001 μm (with the system parameters)

\*3: The ▽ mark in Model number represents as follows:

1: Resolution 0.01 μm

2: Resolution 0.001 μm

\*4: The △ mark in Model number represents as follows:

A: Half duplex system

None: Full duplex system or full duplex system/half duplex system

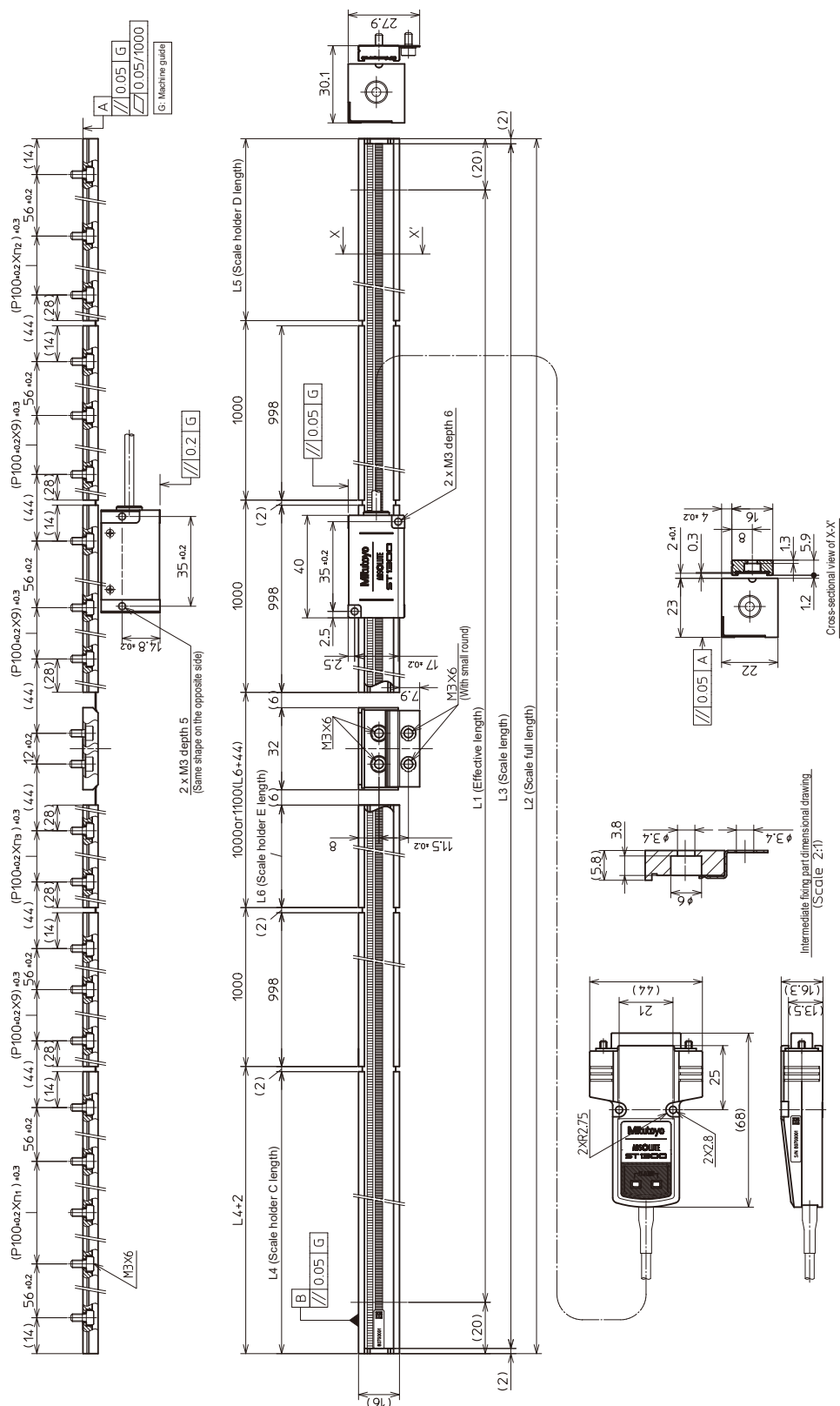
\*5: The ☆ mark in Model number represents as follows:

F: Specifications for fixing at the center (without the system parameters)

G: Specifications for fixing at the center (with the system parameters)

#### 4.7.6 Specifications for Fixing at the Center (Effective Length of 4400 mm–6000 mm)

## ■ Dimensional drawings



## ■ Dimensional drawings table

| Code No. (*1, *2) | Model number (*1, *3, *4, *5) | Effective length L1 (mm) | Scale full length L2 (mm) | Scale length L3 (mm) | Scale holder C length L4 (mm) | Scale holder D length L5 (mm) | Scale holder E length L6 (mm) | Number of scale holder C mounting holes n | Number of scale holder D mounting holes n | Number of scale holder E mounting holes n | Total number of scale holder mounting holes |
|-------------------|-------------------------------|--------------------------|---------------------------|----------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|---------------------------------------------|
| 579-461-□◇        | ST13□▽△-4400☆                 | 4400                     | 4440                      | 4436                 | 240                           | 198                           | 956                           | 1                                         | 1                                         | 9                                         | 50                                          |
| 579-462-□◇        | ST13□▽△-4600☆                 | 4600                     | 4640                      | 4636                 | 240                           | 298                           | 1056                          | 1                                         | 2                                         | 10                                        | 52                                          |
| 579-463-□◇        | ST13□▽△-4800☆                 | 4800                     | 4840                      | 4836                 | 440                           | 398                           | 956                           | 3                                         | 3                                         | 9                                         | 54                                          |
| 579-464-□◇        | ST13□▽△-5000☆                 | 5000                     | 5040                      | 5036                 | 440                           | 498                           | 1056                          | 3                                         | 4                                         | 10                                        | 56                                          |
| 579-465-□◇        | ST13□▽△-5200☆                 | 5200                     | 5240                      | 5236                 | 640                           | 598                           | 956                           | 5                                         | 5                                         | 9                                         | 58                                          |
| 579-466-□◇        | ST13□▽△-5400☆                 | 5400                     | 5440                      | 5436                 | 640                           | 698                           | 1056                          | 5                                         | 6                                         | 10                                        | 60                                          |
| 579-467-□◇        | ST13□▽△-5600☆                 | 5600                     | 5640                      | 5636                 | 840                           | 798                           | 956                           | 7                                         | 7                                         | 9                                         | 62                                          |
| 579-468-□◇        | ST13□▽△-5800☆                 | 5800                     | 5840                      | 5836                 | 840                           | 898                           | 1056                          | 7                                         | 8                                         | 10                                        | 64                                          |
| 579-469-□◇        | ST13□▽△-6000☆                 | 6000                     | 6040                      | 6036                 | 1040                          | 998                           | 956                           | 9                                         | 9                                         | 9                                         | 66                                          |

\*1: The □ mark in Code No. and Model number represents as follows:

0: Mitutoyo ENSIS® specifications    Compatible with high-speed serial interface

4: Mitsubishi Electric Corporation specifications    Compatible with high-speed serial interface

5: FANUC Corporation specifications    Compatible with high-speed serial interface

7: Panasonic Corporation specifications    Compatible with high-speed serial interface

8: Yaskawa Electric Corporation specifications    Compatible with high-speed serial interface

\*2: The ◇ mark in Code No. represents as follows:

3: 0.01 μm (without the system parameters)

4: 0.001 μm (without the system parameters)

5: 0.01 μm (with the system parameters)

6: 0.001 μm (with the system parameters)

\*3: The ▽ mark in Model number represents as follows:

1: Resolution 0.01 μm

2: Resolution 0.001 μm

\*4: The △ mark in Model number represents as follows:

A: Half duplex system

None: Full duplex system or full duplex system/half duplex system

\*5: The ☆ mark in Model number represents as follows:

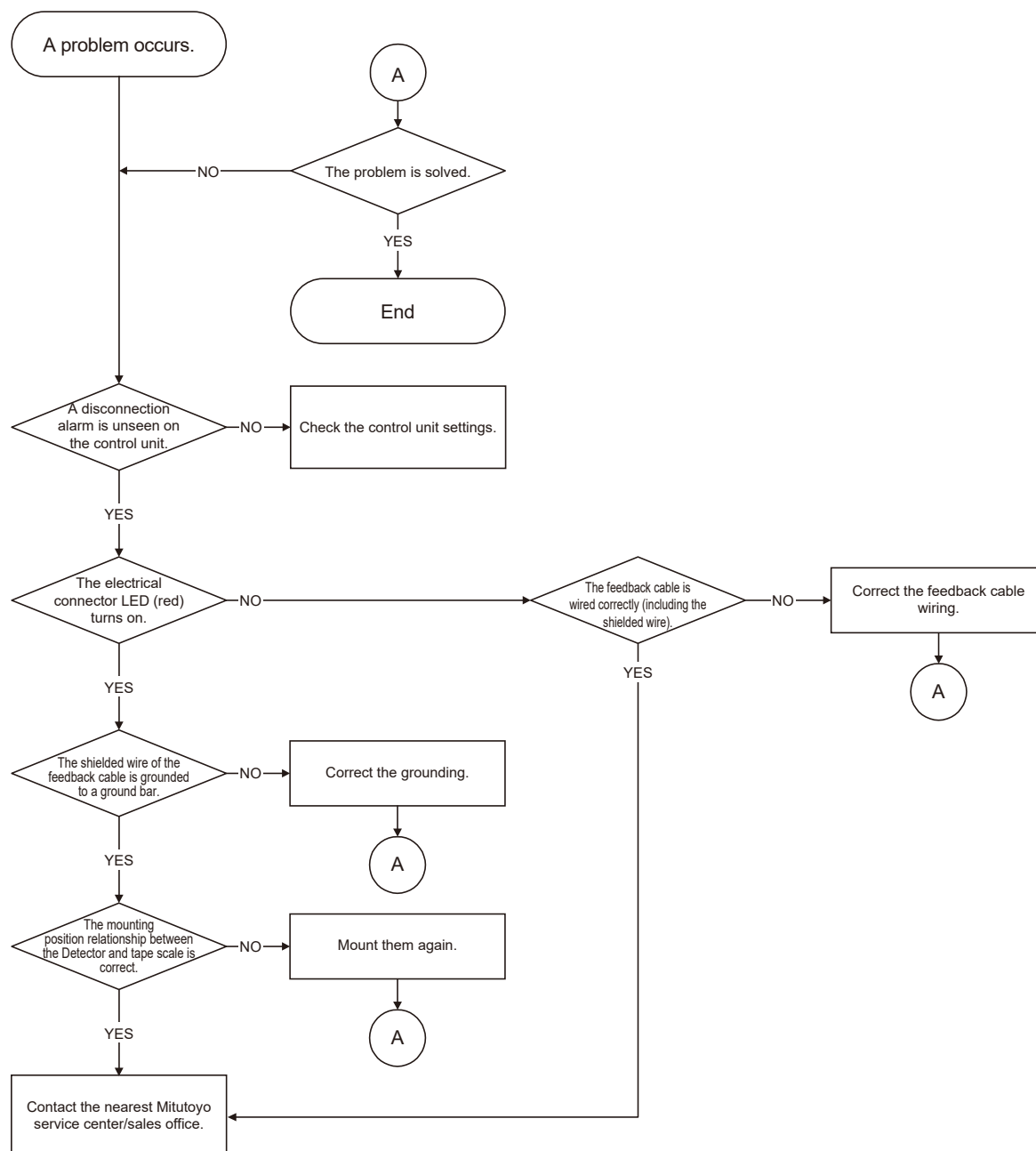
F: Specifications for fixing at the center (without the system parameters)

G: Specifications for fixing at the center (with the system parameters)

MEMO

# 5 Troubleshooting

This chapter describes how to check the causes for the trouble at the initial power-on, or for the alarm sounded during operation.



MEMO

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# SERVICE NETWORK

\*As of May 2025

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### **KOMEG Industrielle Messtechnik GmbH**

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## Germany

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Hamburg, GERMANY  
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### **M³ Solution Center Berlin**

Ernst-Lau-Straße 6, 12489 Berlin, GERMANY  
TEL: 49(0)30 2611 267 FAX: 49 30 67988729

### **M³ Solution Center Eisenach**

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### **Mitutoyo Nederland B.V. / M³ Solution Center Eindhoven**

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### **Mitutoyo Research Center Europe B.V.**

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### **Mitutoyo Scandinavia AB / M³ Solution Center Alingsås**

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## Switzerland

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### **Mitutoyo (Suisse) SA**

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# Revision Record

| Date of publication | Revision status        | Details of revision                                                                 |
|---------------------|------------------------|-------------------------------------------------------------------------------------|
| August 1, 2019      | Revised third edition  | Completely revised and issued                                                       |
| January 1, 2021     | Revised fourth edition | Revision due to changes of the harmonized European standards, etc.                  |
| May 1, 2025         | Revised fifth edition  | Change of China RoHS compliance and Correction (Scale holder for maintenance parts) |

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