Mitutoyo

Assembly Type ABSOLUTE Linear Scale

ABS AT1320 Series

DRIVE-CLiQ

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. 99MBE210B1
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Product names and model numbers covered in this document

Product name	Model number
Assembly Type ABSOLUTE Linear Scale	ABS AT1320 Series

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 affix 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 a Mitutoyo sales office.
- Read this document thoroughly before operating the product. In particular, be sure to fully understand "Safety Precautions" on page 5 and "Precautions for Use" on page 5.
- The contents of this document are based on information current as of May 2025.
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Contents

* ▶ indicates the link to a video.

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About This Document

■ Positioning of this document, document map

The position of this document and its relationship to the other subsections are as follows.

ABS AT1320 Series ABSOLUTE Linear Scale User's Manual (This document)	Describes the specifications and installation of the ABS AT1320 Series .
ABS AT1300 Series Signal Verification Program User's Manual	Describes the procedure for using program that performs initial diagnostics on the ABS AT1300 Series .

■ Intended readers and purpose of this document

● Intended readers

This product is attached for use to a variety of equipment, including NC machine tools and semiconductor manufacturing equipment. This document is intended for those who will be performing the installation.

The readers are assumed to be capable of reading the drawings and understanding the directions.

● Purpose

The purpose of this document is to help you understand the specifications of this product and how to properly install it.

Conventions Used in This Document

■ Safety reminder conventions warning against potential hazards

⚠CAUTION	Indicates a hazard with a low level of risk which, if not avoided, **could result in minor or moderate injury**.
NOTICE	Indicates a situation which, if not avoided, **may result in property damage**.

■ 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 indicating referential information or reference location

IMPORTANT	Indicates information that must be known when using the product.
Tips	Indicates further information and details relevant for the operating methods and procedures that are explained in that section.
	Indicates reference location if there is information that should be referred to in this document or an extraneous User's Manual. Example: For details about XX, see  "1.2 Part Names and Features" on page 12 in "1 Overview".

■ Conventions indicating video content

	A QR code that can be read with a smartphone or other device to view a video.
	A button that can perform in PDF format User's Manuals. Click the button to view a video.

*Video content does not include audio. Video size is 1280 x 720.

■ Other conventions

( ): Round brackets	Represent a paraphrase of an immediately preceding phrase or a supplementary explanation.
" ": Double quotation marks	Represent a highlighted phrase. They also indicate an index where information to be referenced is described.
1, 2, 3…	Indicates the order and the contents of tasks.
»	Indicates the action resulted from some operation(s).

■ Example of conventions use

3.4.2 Fastening the Cables and Precautions

When fastening cables, carefully follow the procedure given below.

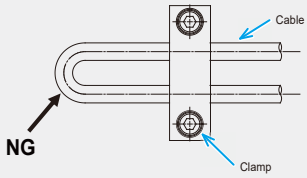
1 **Arrange cables so as to avoid kinking, bending, and sources of electrical noise.**

IMPORTANT
Noise carried by signal and the DRIVE-CLiQ connection cables can cause malfunctions if they are bundled with other cables that are a source of electrical noise or placed near relays that turn high currents on and off.

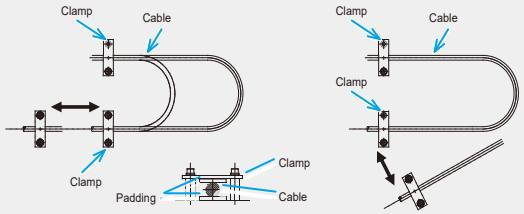
2 **Secure each cable by cable clamps, etc.**

NOTICE
Non-compliance may result in cable damage or disconnection.

- Never bend cables.
  The cable bending radius R should be within the range shown in "2.3.3 Signal Cable Bending Radius R Tolerance Range" on page 19.



- If a cable is subject to repeated bending, allow it to move freely without fastening it, and take care to prevent application of stress at the point where the cable is clamped near its end.



Indicates an operating procedure to be performed or its outline.

Indicates important information that must be known when using the product.

Indicates safety information.

Safety Precautions

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

⚠CAUTION

Improper installation and mishandling carries a risk of injury.

	• Read this document thoroughly before operating the system to use it properly. • Before installing this product on the machine body, make sure that the power to the control unit is turned off. There is a risk of injury or damage to the machine due to unintended machine operation.
	Screws on the connectors of each connecting cable should be firmly tightened to ensure dustproofing, waterproofing, and noise suppression. Also, to prevent defective contacts, do not touch the connecting terminals of the connectors with bare hands.

Precautions for Use

■ Use and handling of the product

● This product is attached for use to compatible equipment such as NC machine tools and semiconductor manufacturing equipment.

This product cannot be used with NC machine tools and semiconductor manufacturing equipment that are not compatible with this product.
For NC machine tools and semiconductor manufacturing equipment that are compatible with this product, contact the agent where you purchased the product or Mitutoyo sales representative (📖 "SERVICE NETWORK" on page App-1).

● This product is for industrial usage.

Do not use this product for purposes other than for industrial usage.

● The product is a precision instrument.

- Do not subject the product to drastic shocks such as dropping it, or exert excessive force upon it.
- Do not disassemble or modify the product. Also, such actions are not covered by warranty.

If the product is used beyond the conditions indicated in the specifications (📖 "5 Specifications" on page 47), be aware that the functions and performance cannot be guaranteed.

Environment for placement

■ Vibration

When installing this product on the machine body, do so in a location that is subject to as little vibration as possible.

Prolonged use in areas that are subject to high vibration may result in malfunction of internal precision components and affect performance.

■ Protection against shock, dust, and water

To prevent this product from being subjected to a strong shock due to impact by a workpiece or other object being measured and to protect the scale main body from direct exposure to cutting oil or chips, please provide a cover that covers the entire scale main body.

■ Ambient temperature and humidity

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

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 product is an industrial product, and is not intended to be used in residential environment. If this product is used in residential environment, this product may cause electromagnetic interference with other instruments. In such a case, it is required to take appropriate measures for preventing such electromagnetic interference.

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-providing of the technology (including Programs), you shall observe the regulations of your country. Please contact Mitutoyo prior to such re-export, re-sale or re-providing.

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, List-Control Technology (including Programs) under Category 1 - 15 of Appended Table 1 of Export Trade Control Order or under Category 1 - 15 of 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-providing of the technology (including Programs), you shall 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 a 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 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (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 (DBP)	邻苯二甲酸二异丁酯 (DIBP)	邻苯二甲酸丁基苄酯 (BBP)	邻苯二甲酸二 (2-乙基已) 酯 (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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电器电子产品只要按照安全及使用说明内容在正常使用情况下,从生产日期算起,在此期限内产品中含有的有毒有害物质不致发生外泄或突变,不致对环境造成严重污染或对其人身、财产造成严重损害。

产品使用后,要废弃在环保使用年限内或者刚到年限的产品,请根据国家标准采取适当的方法进行处置。

另外,此期限不同于质量/功能的保证期限。

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 (📖 "SERVICE NETWORK" on page App-1).

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 product 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 designated or permitted by Mitutoyo
- Failure or damage owing to use in ultra-hazardous activities

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

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1 Overview

This chapter describes the features of this product and the names and functions of its parts.

1.1 Features

See an example of a sliding device with ABS AT1300H attached.

See an example of a sliding device with ABS AT1300S attached.

The linear scale outputs the amount of movement and displacement as a digital quantity based on a scale with fixed-pitch graduations.

It can accurately capture the travel of a wide variety of equipment, including electronic/semiconductor manufacturing units and machine tools.

This product adopts an imaging method based on the double-sided telecentric optical system to detect the amount of moving of the scale. With this a focal depth and a wide imaging range, this method is less susceptible to scale undulation and dirt, and it has excellent environmental resistance.

In addition, this product does not require a return to origin at the start of work or in the event of power failure, and does not require a backup battery, resulting in a significant labor savings.

Moreover, this product can be used in harsh environments where cutting oil or chips occur.

This product has the following two types and specifications with different effective measuring lengths.

Item	High precision specification	High rigidity specification
Features	Since the aluminum frame that fixes the scale main body is not in contact with the mounting surface of the machine, it has excellent stability in the origin position with respect to temperature change	Since the aluminum frame that fixes the scale main body is in contact with the mounting surface of the machine, it has excellent vibration resistance or impact resistance
Effective scale length	100 mm–1000 mm (15 types)	100 mm–2200 mm (19 types)

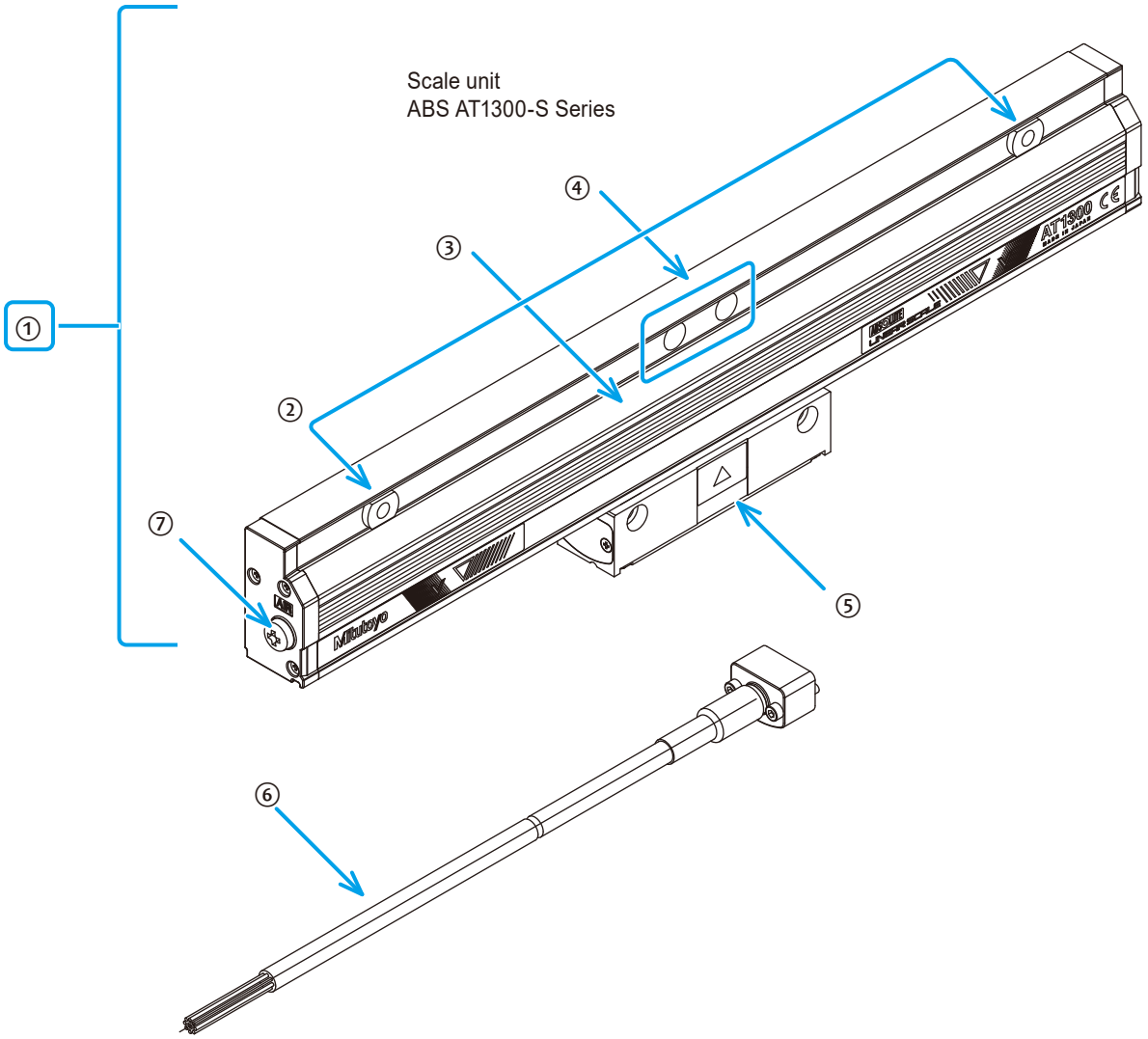
1.2 Part Names and Features

■ Part names

This section describes the names and features of each part.

This product is generally referred to as the "scale unit". The scale unit consists of the scale main body and the detector.

Here, the high rigidity specification is used as an example.



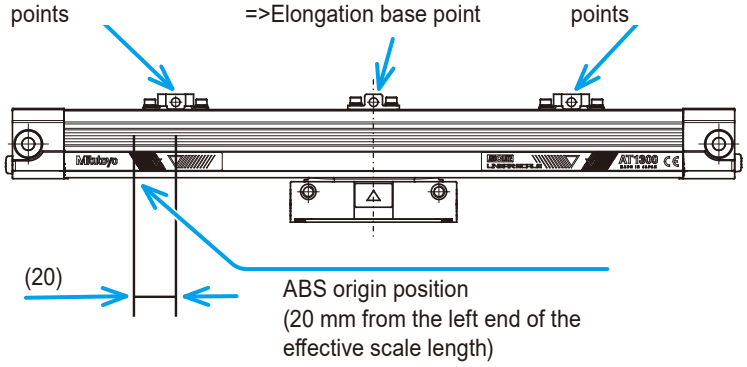
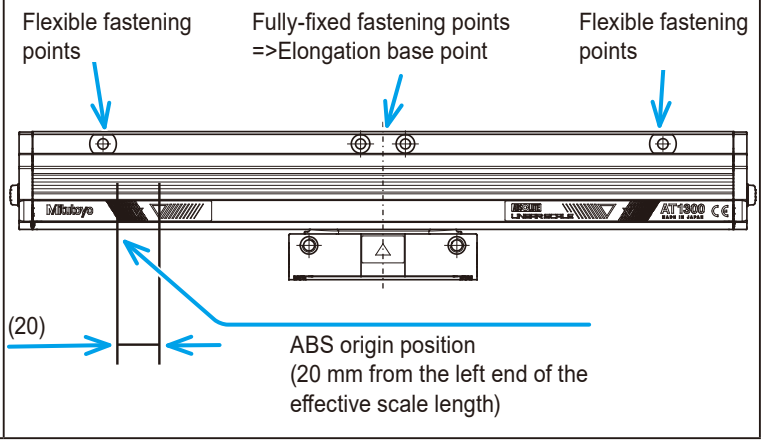
No.	Name	Description
①	Scale unit	The generic name of this product. It indicates the state that the detector has been installed together with the scale main body.
②	Flexible fastening points	This is the part to be fixed afterwards when attaching to the machine body.
③	Scale main body	This name indicates the linear scale's main unit.
④	Fully-fixed fastening points	This is the base point for elongation with respect to change in temperature (the base point of mechanical expansion and contraction of the scale due to temperature change). This is the part to be fastened first upon attachment to the machine body.
⑤	Detector	The part to detect a measurement point.

No.	Name	Description
⑥	Signal cable (optional accessory)	The cable to connect this product and the connection destination controller. The signal cable can be connected on either the left or right side of the detector.
⑦	Air supply ports (both sides, M5 screws)	To improve environmental robustness (coolant and dust resistance) of this product, clean compressed air can be supplied to the interior of the scale main body through these ports.

■ ABS origin and elongation base point

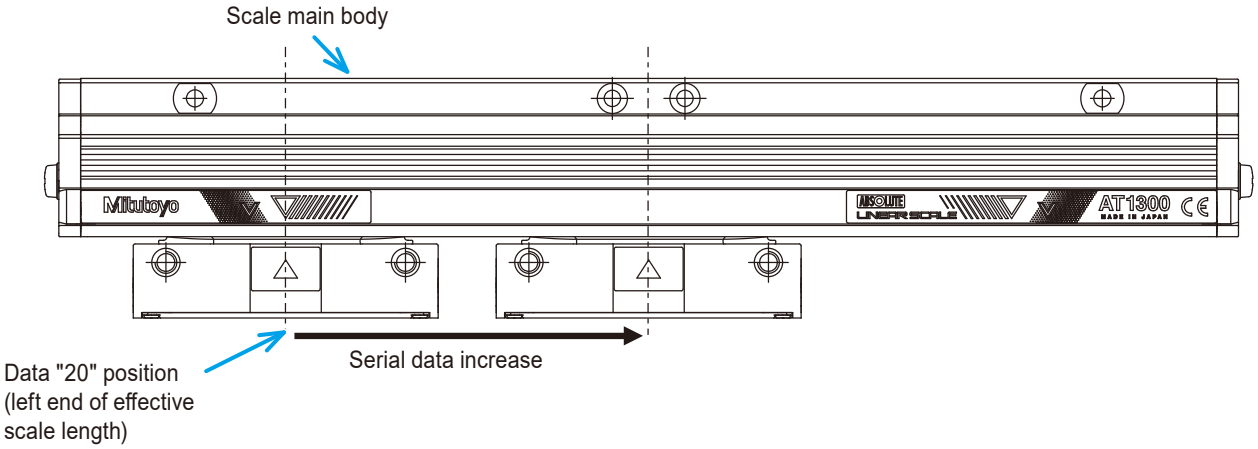
The fastening points of the scale main body are divided into the fully-fixed fastening point (one in vertical direction) and the flexible fastening points. The position of this fully-fixed fastening point becomes "elongation base point for length variation of the scale main body", which is the reference point for the scale's mechanical expansions and contractions due to changes in temperature change. Note with caution that users are not able to change this elongation base point.

The position of the electrical "ABS origin" inside the scale is set at "20 mm" from the left end of the effective scale length.

Scale main body specifications			External view
Specifications	Elongation base point	ABS origin position	
High precision	Center of effective scale length	"20 mm" from the left end of the effective scale length	
High rigidity	Center of effective scale length	"20 mm" from the left end of the effective scale length	

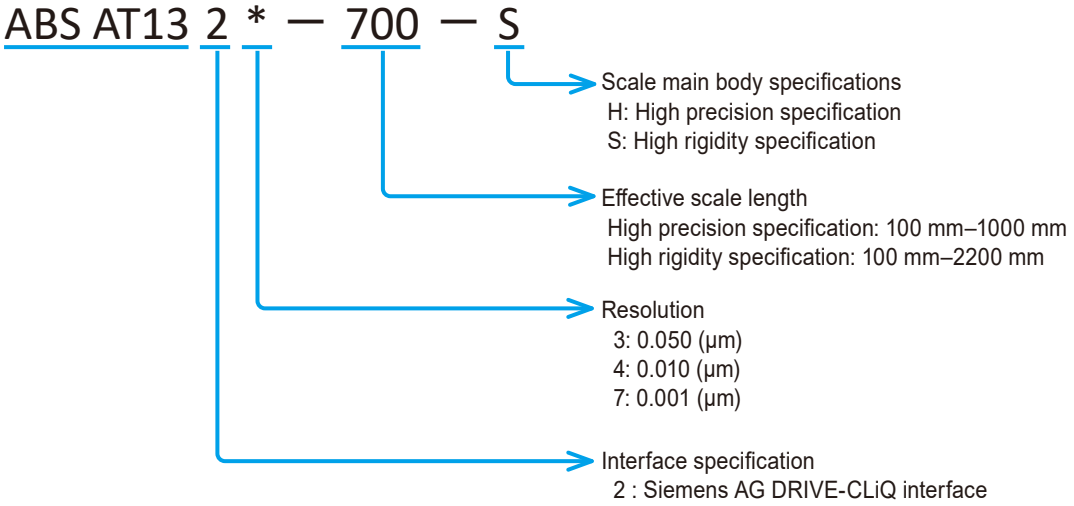
■ Counter direction

Output serial data increases (counting on the + side) when the direction of movement of the detector is to the right in the positional relationship shown in the figure below.



1.3 Scale Unit Model Numbers

This section describes scale unit specifications indicated by the model number.
Please confirm that the specifications match those of the equipment to be installed.



● Interface specifications and model name

Applicable system		Scale model name
Siemens AG	DRIVE-CLiQ Interface	ABS AT132*

- The DRIVE-CLiQ interface specification
  AT1320 is compatible with the Siemens SINAMICS/SINUMERIK/SINUMERIK ONE system.
  Software versions that can be connected are as follows.
  - SINAMICS S120, SINUMERIK and SINUMERIK ONE series:
  - SINAMICS S120 - V4.4 HF4 (04.40.23.15) or above for angular and linear encoders without "functional safety".
  - SINUMERIK 840D sl - V4.4 SP1 HF3 (04.04.01.03.005) or above for angular and linear encoders without "functional safety".
  - SINUMERIK ONE - V06.14 (06.14.00.00.030) or above for angular and linear encoders without "functional safety".
- Detailed information about DRIVE-CLiQ interface certification, connecting cables and so forth can be found at the following URL address.
  - S120 Commissioning Manual
    http://support.automation.siemens.com/WW/llisapi.dll/csfetch/68043633/IH1_012013_eng_en-US.pdf?func=cslib.csFetch&nodeid=68043641&forcedownload=true
  - MOTION-CONNECT DRIVE-CLiQ cables with M12 connector for direct measuring systems
    http://support.automation.siemens.com/WW/view/en/60179485
  - Encoders certified with DRIVE-CLiQ:
    http://support.automation.siemens.com/WW/view/en/65402168
- Effective scale length

  For details on effective scale length, see "5 Specifications" on page 47.

MEMO

2 Advance Preparation

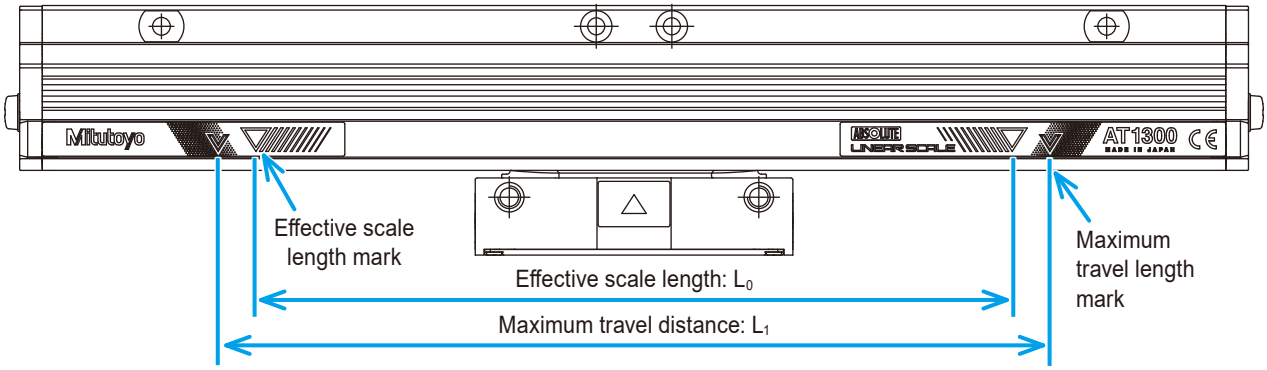
This chapter describes advance preparations for installing this product on the machine body.

2.1 Checking the Maximum Travel Distance and Effective Scale Length

Make sure that the maximum travel distance (L_1) of the scale main body is greater than the maximum travel distance of the machine.

For details on effective scale length (L_0) and maximum travel distance (L_1), see "5.2 Scale Unit Appearance and Installation Dimensions" on page 49.

Also, please note that the guaranteed accuracy range is the range covered by effective scale length.



Tips

- When checking the travel distance of the scale main body on the machine, make sure that the maximum travel distance of the machine body is less than or equal to L_1 above and that the required range of accuracy is less than or equal to L_0 above.
- If the maximum travel distance or effective scale length of the scale main body is insufficient, the size of the scale main body must be changed.

2.2 Confirmation of Included Items

Items included with this product are indicated below.

Make sure that none of the included items are missing.

Also make sure that no items have been damaged in transit.

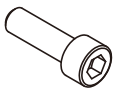
If you have any questions, please contact the agent where you purchased the product or Mitutoyo sales representative.

Name	Quantity	Note
Scale unit	1 unit	
Accessories	1 set	See "■ Accessories (mounting screws, etc.)" below.
User's Manual	1 each (this document)	
Warranty	1 each	
Inspection report (accuracy inspection table)	1 each	

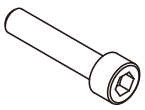
■ Accessories (mounting screws, etc.)

- For the details of the quantity of the accessories, see "7.1 Quantity of Accessories Used for Installation" on page 57.
- Signal cables are sold separately. They are not included as provided accessories. For details on length of signal cables, see "5.3 Optional Accessories" on page 53.

● ABS AT1300-H (high precision specification)

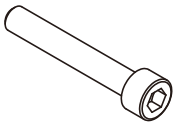


Hex socket head cap screw M4×10

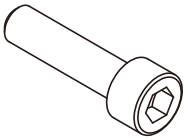


Hex socket head cap screw M4×16

Spring washer, nominal 4



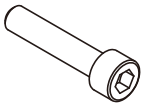
Hex socket head cap screw M4×25



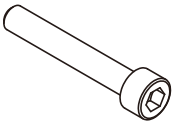
Hex socket head cap screw M6×25

Spring washer, nominal 6

● ABS AT1300-S (high rigidity specification)



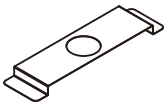
Hex socket head cap screw M4×16



Hex socket head cap screw M4×25

Spring washer, nominal 4 small round

Flat washer, nominal 4 small round



Frame retaining spring

2.3 Signal Cable Preparation

The signal cables used with this product are sold separately. Arrange the signal cable according to the direction of connection to the detector and the scale's intended use.

Tips

For signal cable specifications and part numbers, see "5.3 Optional Accessories" on page 53.

- Types of signal cables

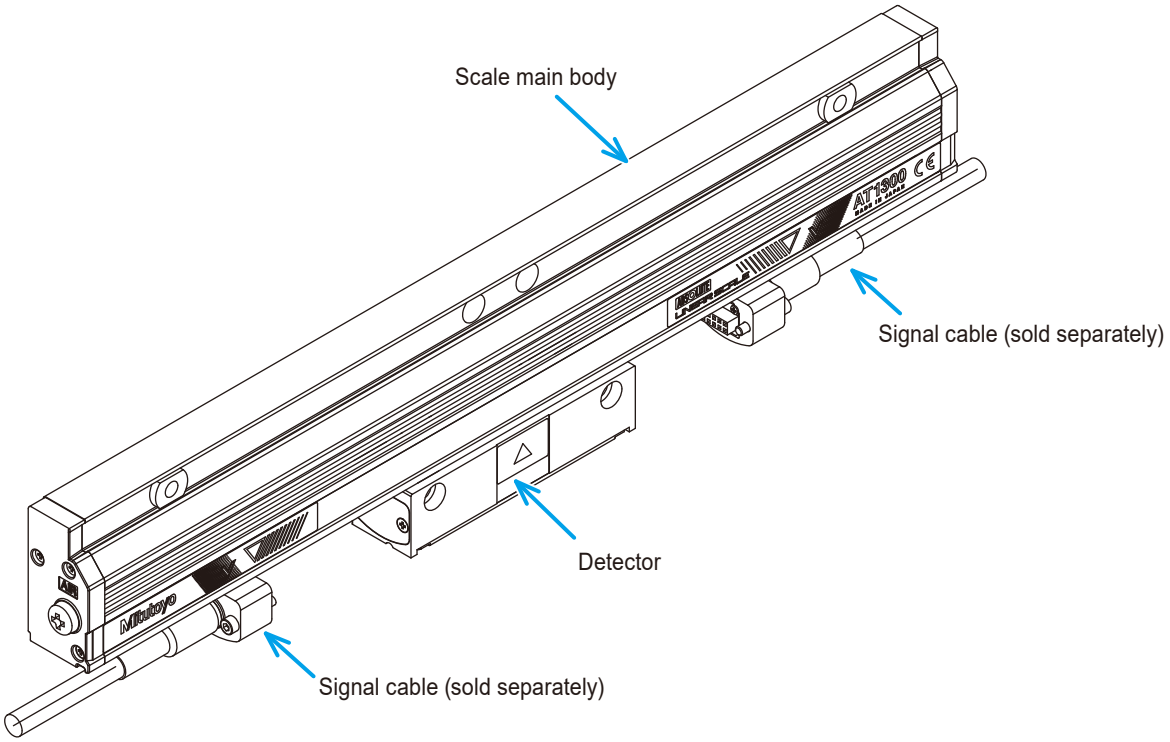
Item	Specifications
Cable length	1 m–9 m (in 1 m increments), 12 m
Cable material	PVC sheath ø6.5 without conduit
Output connector	• Unfinished cable specifications (for Siemens connection) • M12 connector specification

2.3.1 Signal Cable Connection Direction

The signal cable is connected to the electrical component using the connector on either side of the detector.

For details on the connection procedure, see "3.4 Connecting and Fastening the Signal Cable" on page 35.

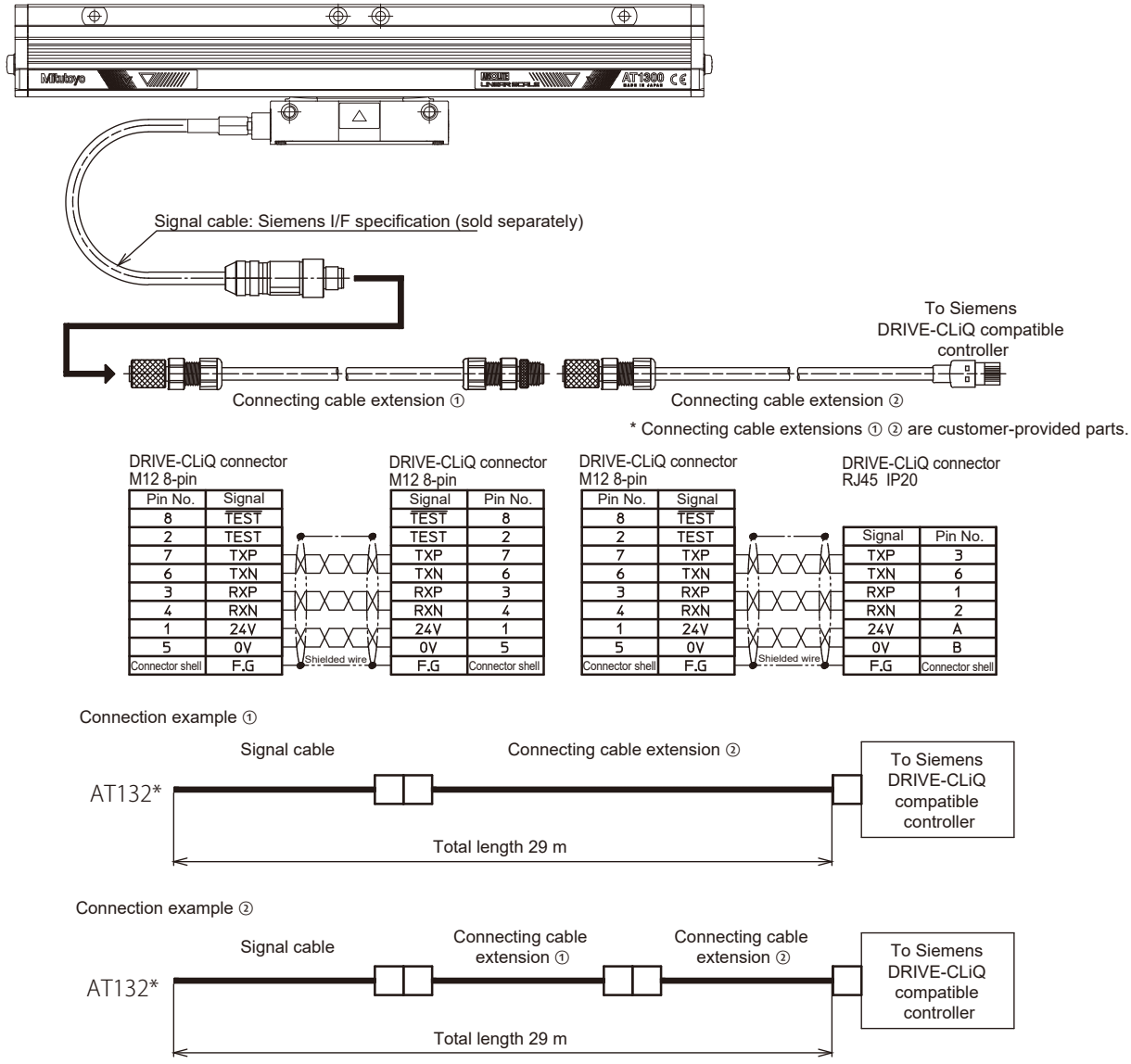
Select the signal cable specifications according to the required cable length and output connector.



2.3.2 Cable Connection Example

Examples of cable connection are shown below.

Please note that some parts must be obtained by the customer.



- Connecting cable extension ① Siemens Model No. 6FX8002-2DC34-□□□□
- Connecting cable extension ② Siemens Model No. 6FX8002-2DC30-□□□□

Tips

- Connecting cable extensions are customer-provided parts.
- The total length of the signal cable + connecting cable extensions should be less than 29 m.
- Contact Siemens for specifications and availability of connecting cable extensions.
- The test pins (TEST, $\overline{\text{TEST}}$) should be left unconnected.

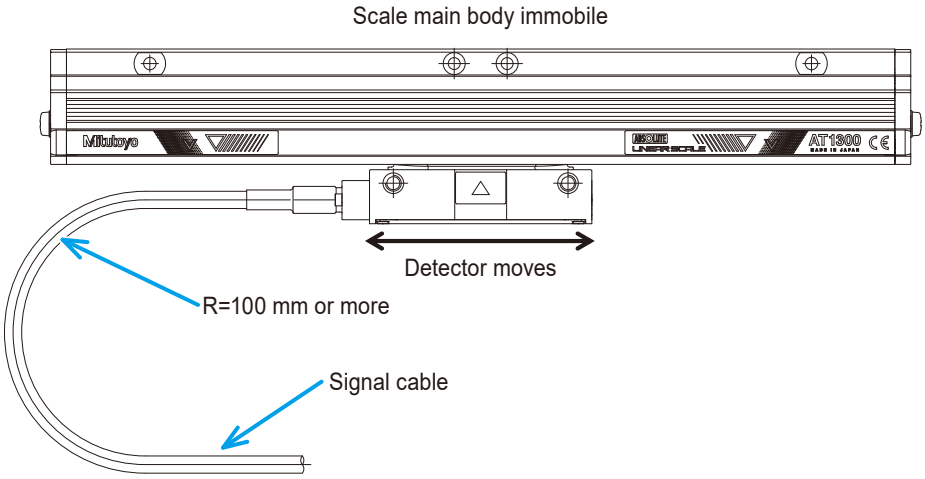
2.3.3 Signal Cable Bending Radius R Tolerance Range

Cable bending radius R should be within the tolerance range shown below.

The figure below shows the bending radius R of the signal cable, and the same should be applied to signal cable extensions.

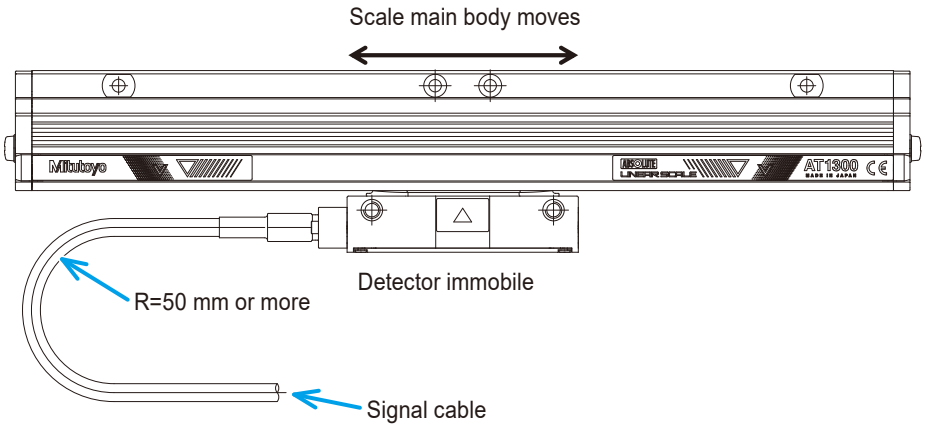
■ When the detector moves (when the cable is bent repeatedly)

→Cable bending radius R=100 mm or more



■ When the detector is fixed (when the cable is fixed)

→Cable bending radius R=50 mm or more



NOTICE

Do not exceed the tolerance range of the cable bending radius R. Doing so may result in wire breakage, etc. Furthermore, such breakage is not covered by the warranty.

Tips

- Signal cables are sold separately. Cable clamps and other cable fasteners are not included, and must be provided by the customer.
- For details on how to fasten the cable, see "3.4.2 Fastening the Cables and Precautions" on page 38.

2.4 Attaching the Cover

When using this product, be sure to attach a cover so that the scale main body is protected from direct exposure to cutting oil or chips.

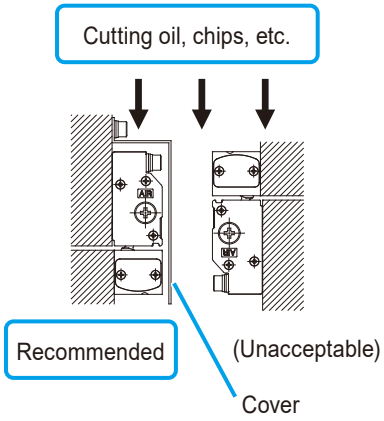
Check installation orientation of the scale main body.

■ Orientation of scale main body and cover

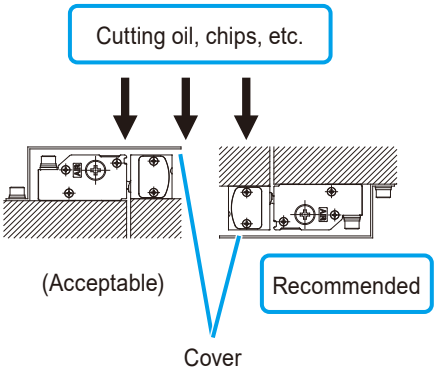
The opening of the scale main body is covered with dust-proof rubber to prevent entry of foreign matter, but it is more susceptible to entry of foreign matter to than other surfaces. Therefore, select the mounting location of the scale main body and the cover with consideration for the direction of dispersion of cutting fluid and chips.

The figures below show examples of both cover attachment orientations that are susceptible to ingress of foreign matter and those are resistant to ingress of foreign matter (recommended) with respect to the direction of dispersion of cutting oil, chips, etc.

● Vertical direction



● Horizontal direction



2.5 Precautions Regarding Mounting Surface Design

The following are design precautions to be observed with regard to the surface on which the scale main body is mounted on the machine body.

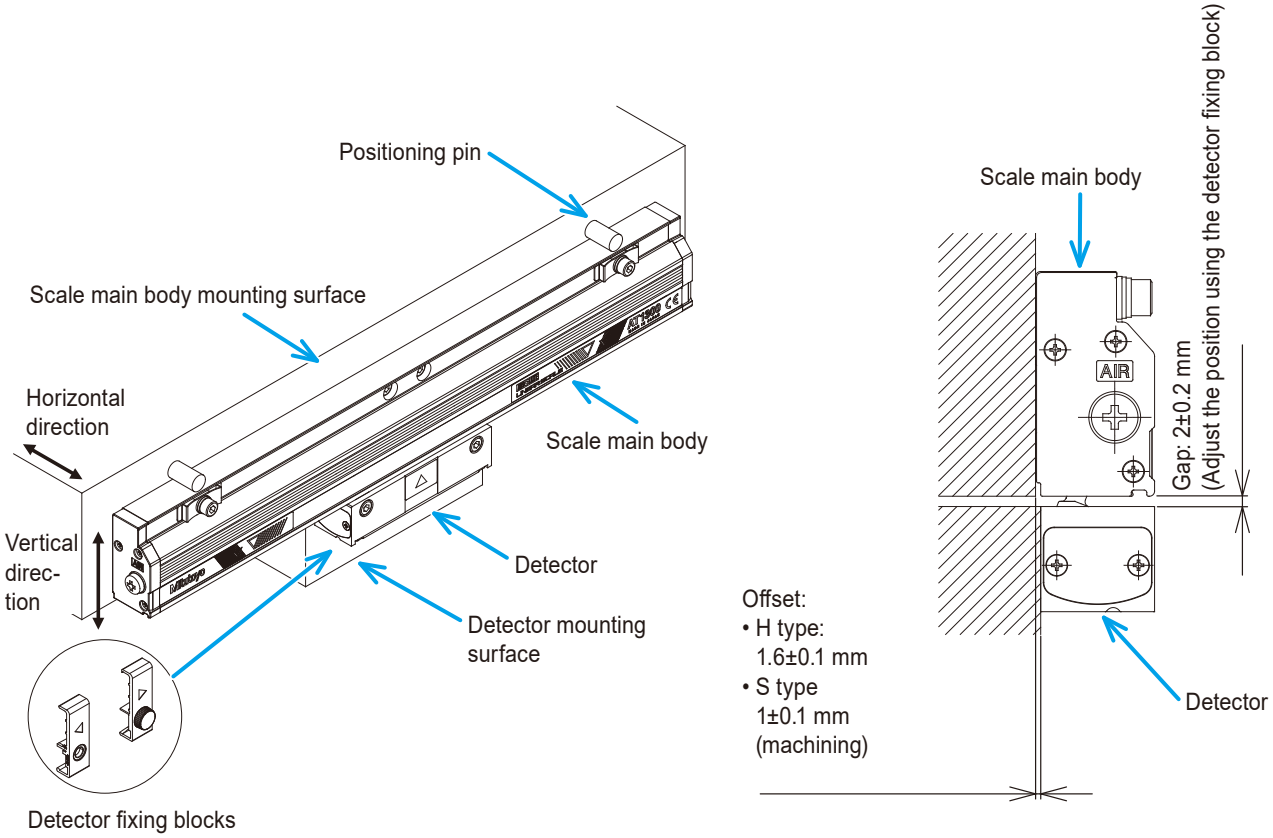
Check precautions for design of the installation surface.

- The mounting surfaces of the scale main body and the detector must be machined surfaces.

Tips

Position dimensions and surface precision required for the machined surface differ depending on the scale main body specification (H: high precision specification. S: high rigidity specification).

- The mounting surface of the detector is off set from that of the scale main body. Therefore, be sure to machine the mounting surface and maintain the offset dimension within the machining allowance. If positional adjustment is to be made by inserting spacers, etc., be sure to measure the offset prior to installation.
  - ABS AT1300-H (high precision specification): 1.6±0.1 mm
  - ABS AT1300-S (high rigidity specification): 1±0.1 mm
- When mounting the scale main body, adjustment in the vertical direction is required as shown below.
  To simplify positioning adjustment, it is recommended that a reference positioning pin or similar tools be used.
  Note that the vertical positioning reference for the scale main body is the surface of the aluminum frame.
- The horizontal mounting reference of the scale main body is as follows.
  - ABS AT1300-H (high precision specification): mounting block surface
  - ABS AT1300-S (high rigidity specification): aluminum frame surface
- The gap between the scale main body and the detector is adjusted using the detector fixing blocks.
- Here, a diagram of the ABS AT1300-S is used for explanation, but this diagram also pertains to the ABS AT1300-H.



Tips

For details on the installation specifications, see "5.2 Scale Unit Appearance and Installation Dimensions" on page 49.

For details on the installation procedures, see "3 Installation on the Machine Body" on page 25.

3 Installation on the Machine Body

This chapter describes procedures and precautions for installing this product on the machine body.

3.1 Procedure for Installation on the Machine Body

Installation of this product on the machine body is broadly divided into the following steps.

Installation and Positional Adjustment of the Scale Main Body

"3.2 Installation and Positional Adjustment of the Scale Main Body" on page 26

Attaching the Detector and Adjusting Its Position

"3.3 Attaching the Detector and Adjusting Its Position" on page 33

Connecting and Fastening the Signal Cable

"3.4 Connecting and Fastening the Signal Cable" on page 35

The following describes each procedure in detail.

Tips

Different installation procedures and methods are used for the ABS AT1300-H (high precision specification) and ABS AT1300-S (high rigidity specification). Please see the description for each.

3.2 Installation and Positional Adjustment of the Scale Main Body

3.2.1 Check the Mounting Surface, etc.

Referring to "2.5 Precautions Regarding Mounting Surface Design" on page 23 and "5.2 Scale Unit Appearance and Installation Dimensions" on page 49, verify that the positional and surface accuracy of the mounting surface for the scale main body and the mounting surface of the detector are within specified tolerances.

3.2.2 Installation of the Scale Main Body

■ ABS AT1300-H (high precision specification)

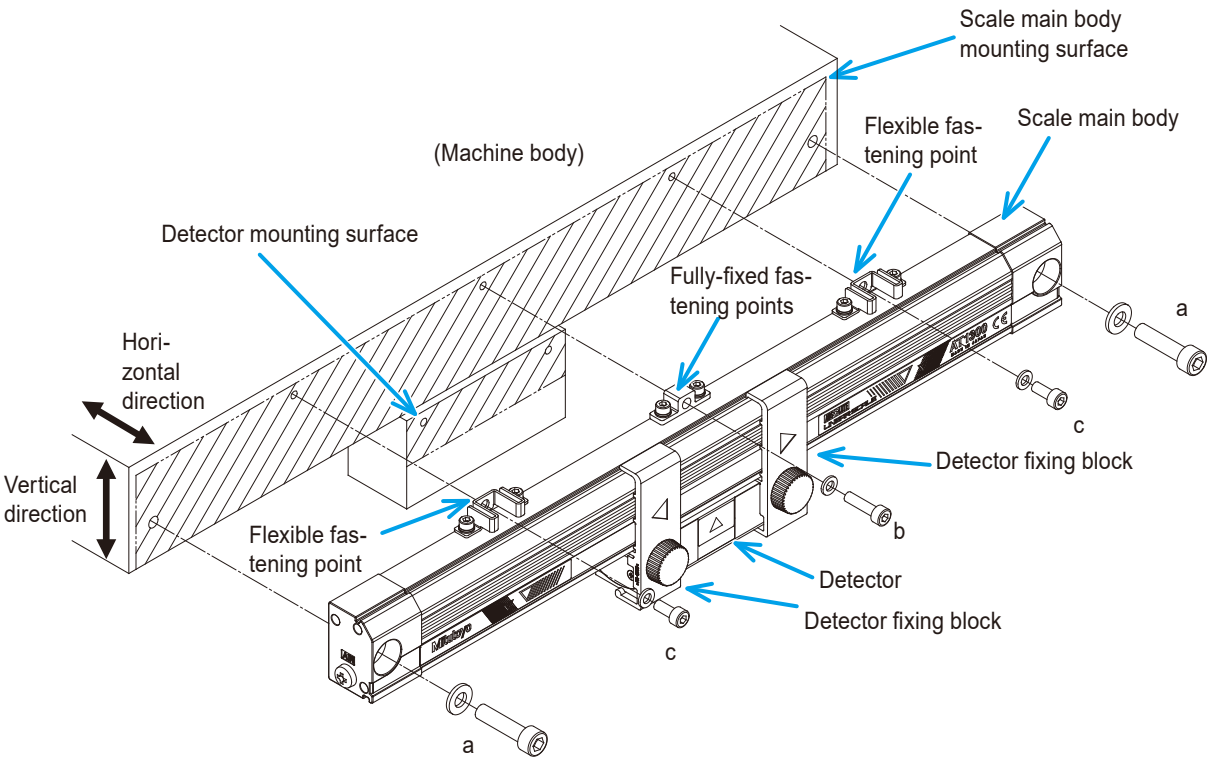
You can check the installation procedure for the scale main body.

1 Temporarily fix it to the scale main body mounting surface of the machine body with the supplied screws (to the extent that it does not move even if you release your hands from the scale main body).

NOTICE

When temporarily fixing the scale main body, do not fix the detector.

Target	Screw to use	Effective scale length	Quantity
Mounting block (both end parts of scale main body)	a: Hex socket head cap screw M6 x 25 + spring washer (M6) combined	100 mm–1000 mm	2 each
Fully-fixed fastening points (elongation base point position with respect to temperature change)	b: Hex socket head cap screw M4 x 16 + spring washer (M4) combined	100 mm–1000 mm	1 each
Flexible fastening points	c: Hex socket head cap screw M4 x 10 + spring washer (M4) combined	100 mm–500 mm	—
		600 mm–1000 mm	2 each



NOTICE

The detector fixing blocks determine the positional relationship between the scale main body and the detector.

When mounting the scale unit on the machine body, do not remove the detector fixing blocks in order to keep the positional relationship.

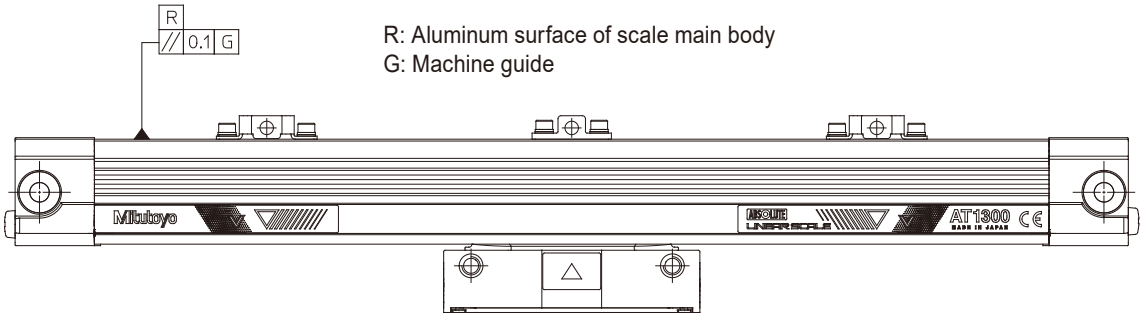
2 Adjust scale main body positioning in the vertical direction.

NOTICE

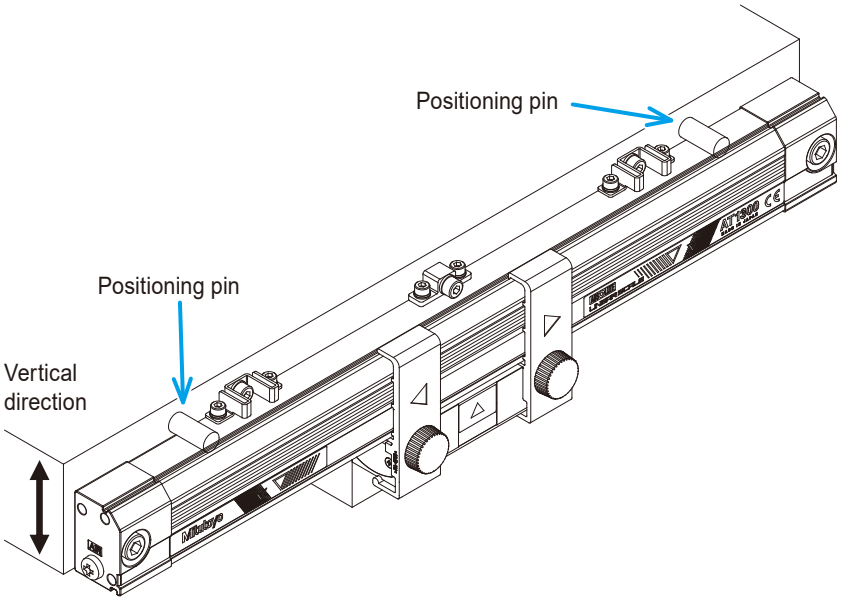
The scale main body of this product does not need to be adjusted in the horizontal direction (it relies on accuracy of the mounting surface on the machine body). However, the position and dimension in the vertical direction must be adjusted and checked.

Adjust and check the position and dimension of the scale main body R reference surface by referring to the external view and dimension drawings of the scale unit.

For details on the external appearance and installation dimension drawings, see "5.2 Scale Unit Appearance and Installation Dimensions" on page 49.



As described in "2.5 Precautions Regarding Mounting Surface Design" on page 23, this task can be simplified by using the positioning pins, etc. However, after mounting, the dimensions must be checked.



3 **After adjusting and checking the position and dimensions in the vertical direction of the scale main body, fully tighten the mounting screws.**

NOTICE

Note the following:

- Screw tightening torque
  M4: 3 N·m
  M6: 9 N·m
- Screw tightening procedure
  Be sure to tighten the fully-fixed fastening points (center part of scale main body) first, and then tighten the flexible fastening points.

■ ABS AT1300-S (high rigidity specification)

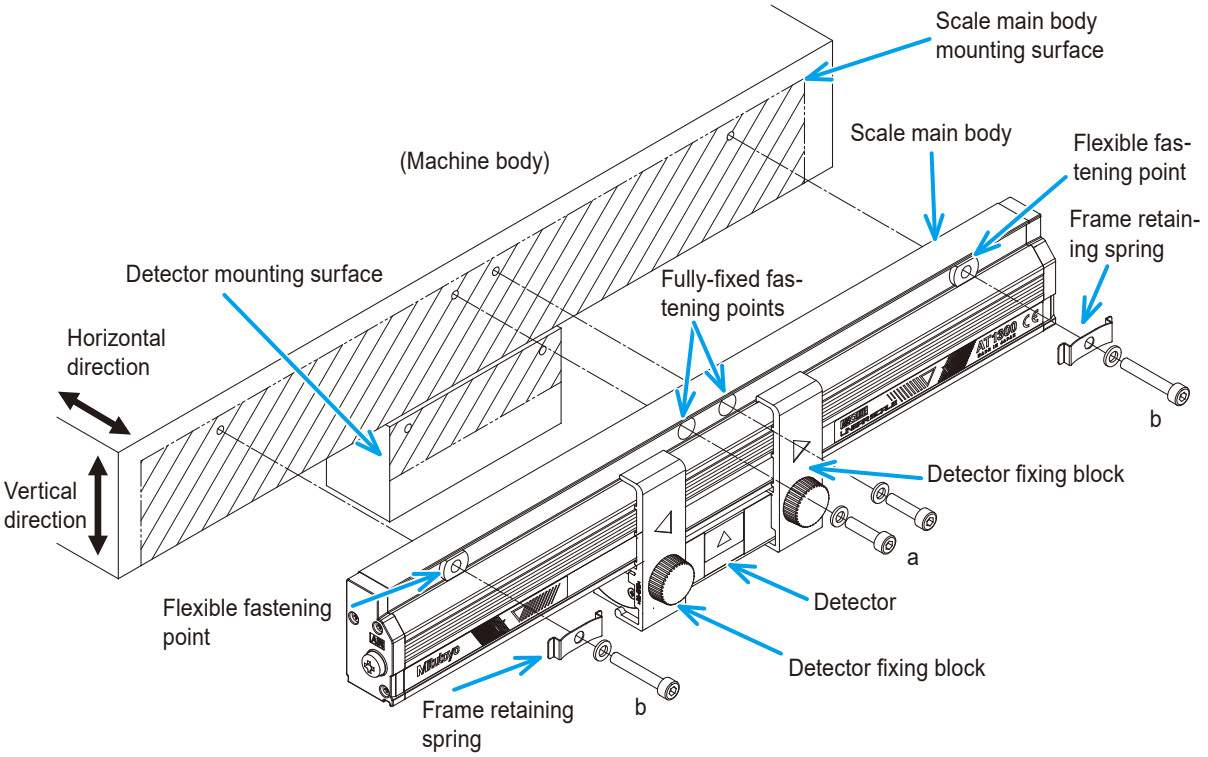
You can check the installation procedure for the scale main body.

1 Temporarily fix it to the scale main body mounting surface of the machine body with the supplied screws (to the extent that it does not move even if you release your hands from the scale main body).

NOTICE

When temporarily fixing the scale main body, do not fix the detector.

Target	Screw to use	Effective scale length	Quantity
Fully-fixed fastening points (two locations at the center of the scale main body)	a: Hex socket head cap screw M4 x 16 + spring washer (M4) combined	100 mm–2200 mm	2 each
Flexible fastening points	b: Hex socket head cap screw M4 x 25 + spring washer (M4) + frame retaining spring combined	100 mm–450 mm	2 each
		500 mm–800 mm	4 each
		900 mm–1200 mm	6 each
		1300 mm–1600 mm	8 each
		1800 mm–2000 mm	10 each
		2200 mm	12 each



NOTICE

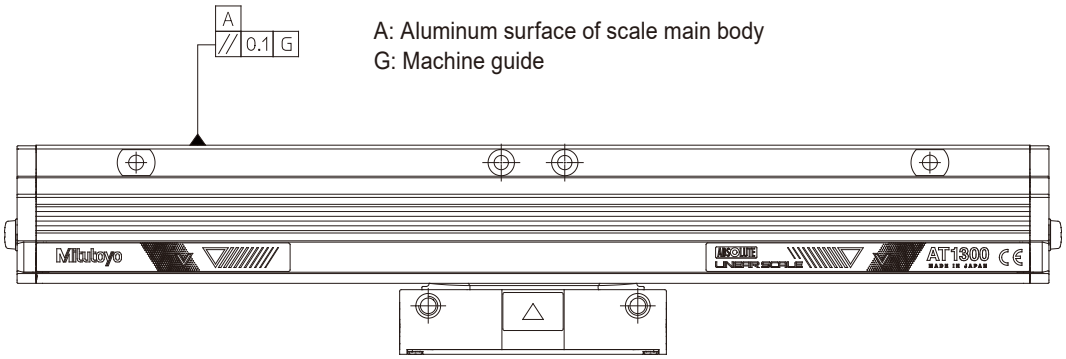
The detector fixing blocks determine the positional relationship between the scale main body and the detector.
When mounting the scale unit on the machine body, do not remove the detector fixing blocks in order to keep the positional relationship.

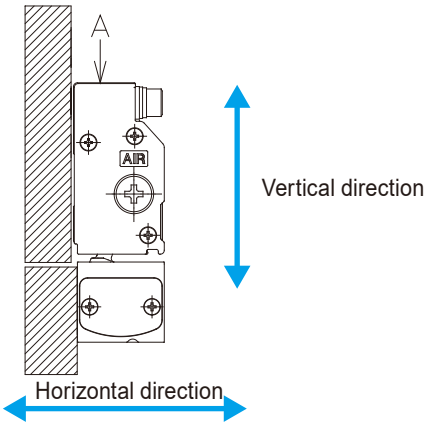
2 Adjust scale main body positioning in the vertical direction.

The scale main body of this product does not need to be positioned in the horizontal direction as shown in the figure below (it relies on accuracy of the mounting surface on the machine body), but it must be positionally adjusted in the vertical direction through parallelization.

For parallelization, refer to the external appearance and installation dimension drawings of the scale main body, and parallelize on the surface indicated in figure A below.

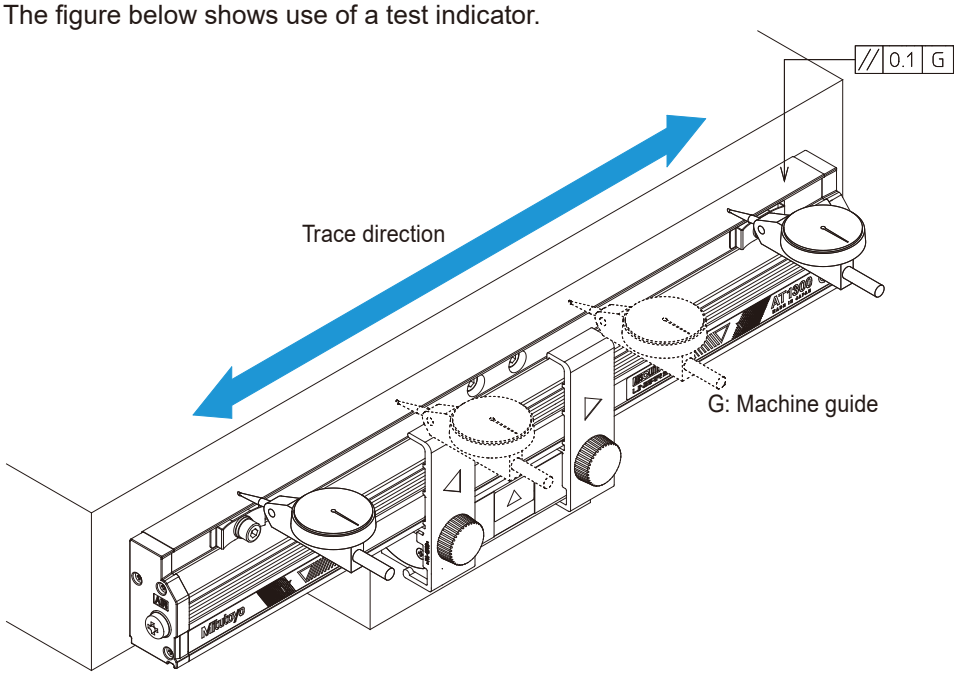
For details on the external appearance and installation dimension drawings, see "■ Appearance and installation dimensions" on page 49.



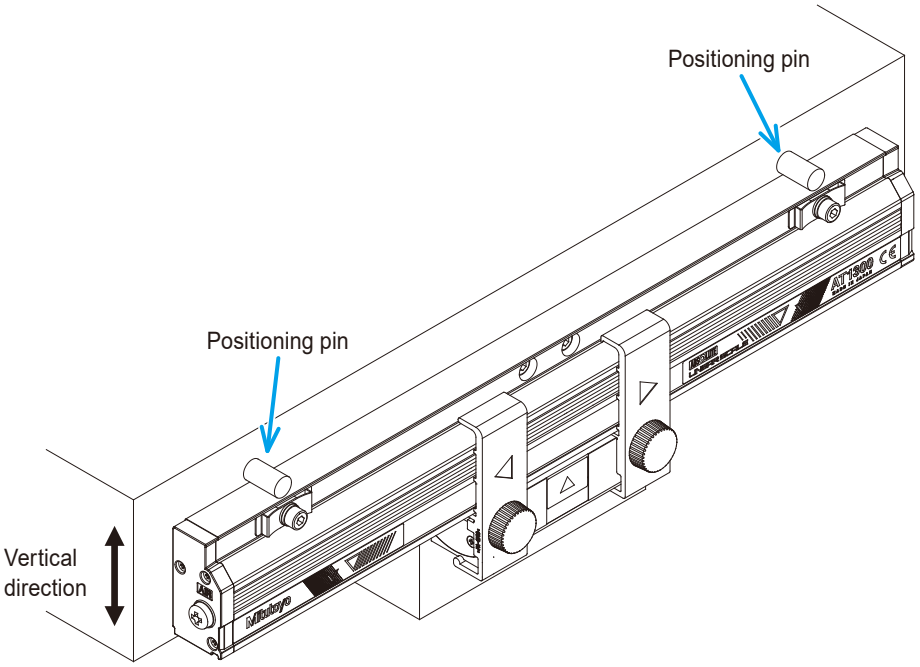


● Positional adjustment procedure

For parallelization by positional adjustment, use instruments such as a test indicator or a dial indicator. The figure below shows use of a test indicator.



Positioning can be simplified by using reference positioning pins, as shown in "2.5 Precautions Regarding Mounting Surface Design" on page 23, but verification of the mounting position is required.

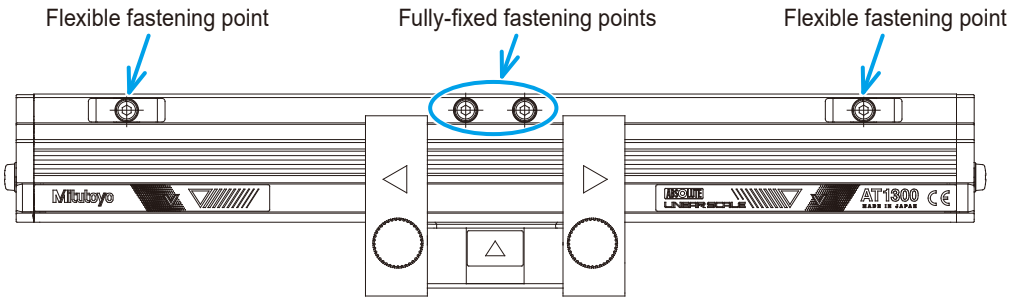


3 Securely fasten the scale main body to the scale mounting surface of the machine body.

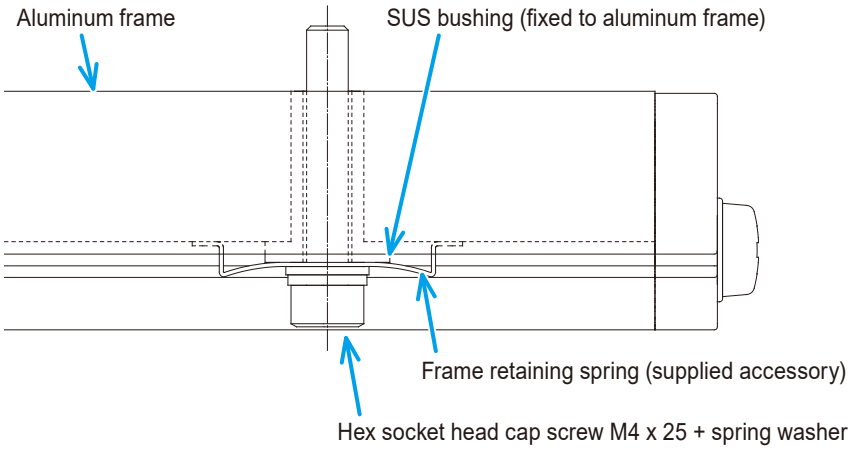
After adjusting vertical positioning of the scale main body, fully tighten all screws.

When doing so, please note the following.

- Screw tightening torque
  M4: 3 N•m
- Screw tightening procedure
  Be sure to tighten the fully-fixed fastening points (two locations at center part of scale main body) first, and then tighten the flexible fastening points.



- Flexible fastening points when fastened
  The fastened state of the flexible fastening points is shown below.



3.3 Attaching the Detector and Adjusting Its Position

After completing "3.2 Installation and Positional Adjustment of the Scale Main Body" on page 26, attach and position the detector according to the following procedure.

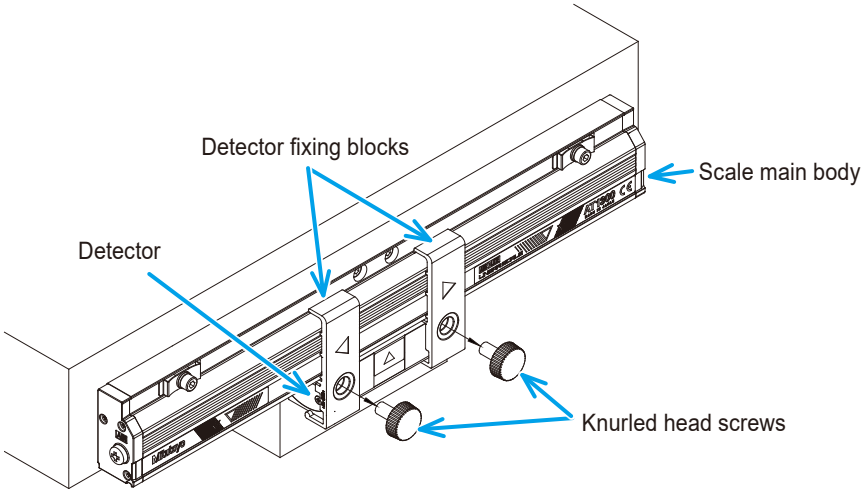
Check the head installation procedure.

The procedure for attaching the detector is the same for H specification (high precision specification) and S specification (high rigidity specification).

1 Check the parallelism of the detector mounting surface.

For details, see "5.2 Scale Unit Appearance and Installation Dimensions" on page 49.

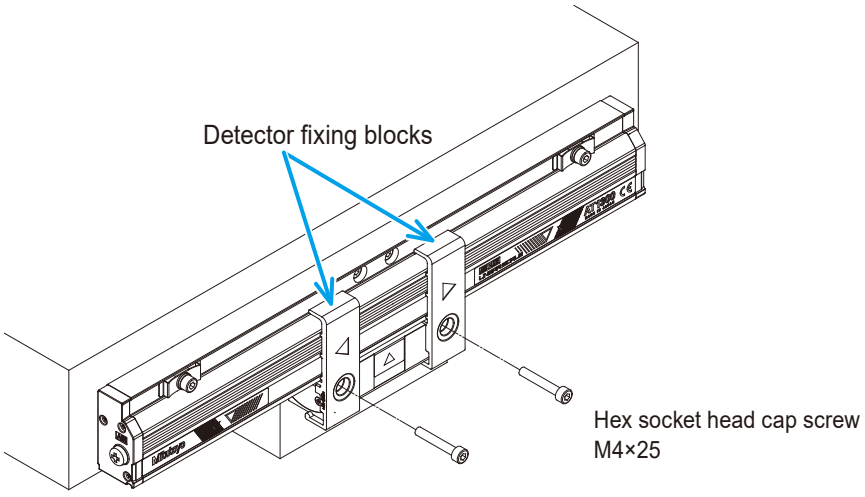
2 Remove the knurled head screws (two locations) of the detector fixing blocks.



3 Fix the detector with the supplied screws.

Screw to use	Quantity
Hex socket head cap screw M4 x 25	2

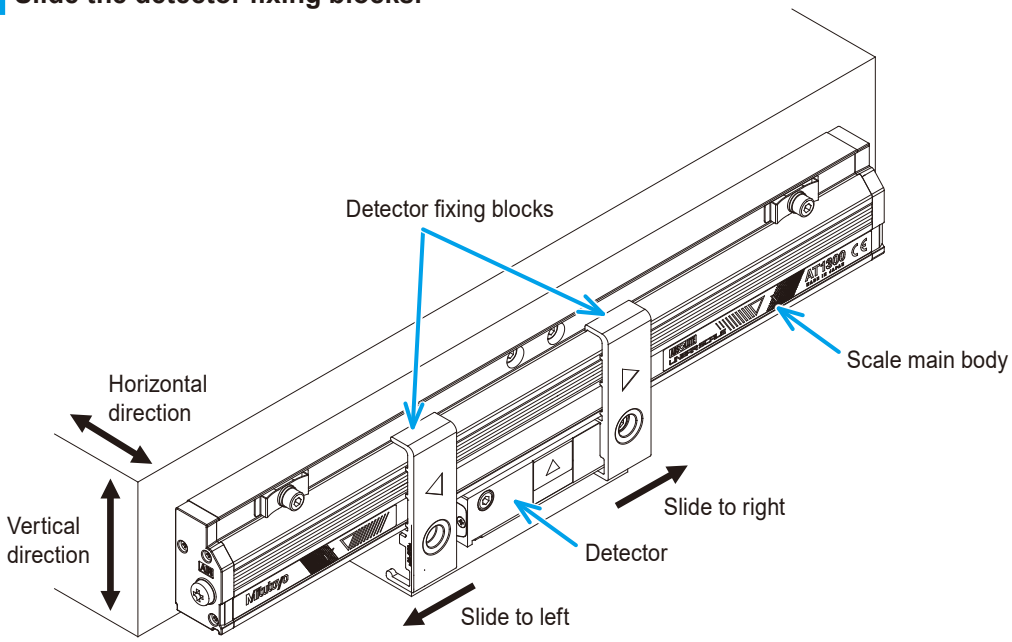
Screw tightening torque (M4): 3 N•m



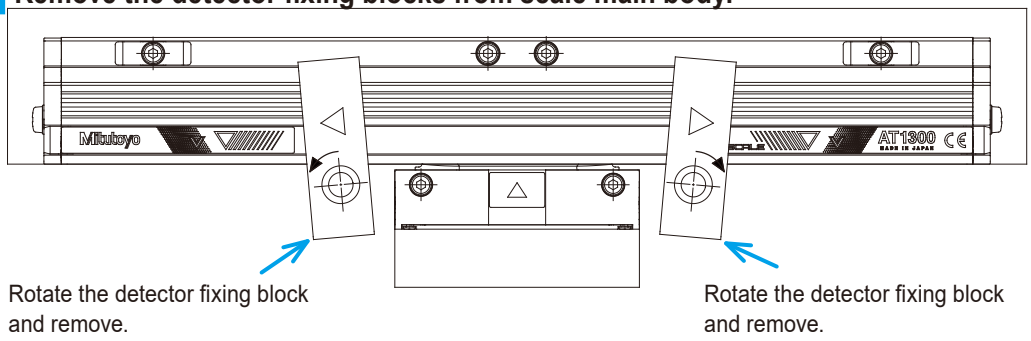
NOTICE

Do not remove the detector fixing blocks.

4 Slide the detector fixing blocks.



5 Remove the detector fixing blocks from scale main body.



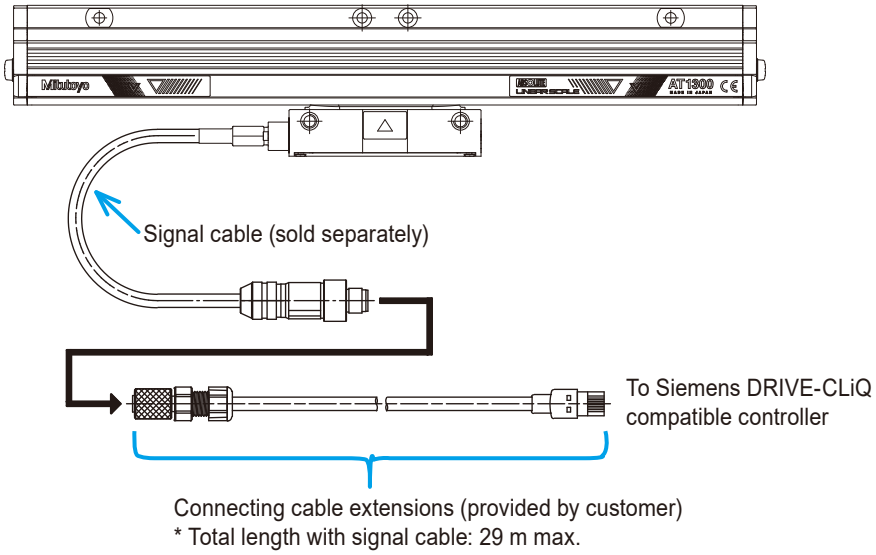
3.4 Connecting and Fastening the Signal Cable

3.4.1 Connecting Cables and Verifying Operation

The figure below shows an example system configuration.

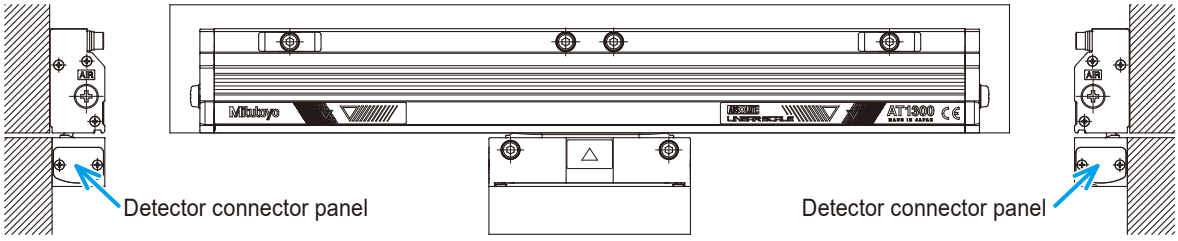
For details on cables, see "5 Specifications" on page 47.

Check the signal cable connection procedure.



■ Signal cable connection

1 Select the direction of signal cable attachment (left or right).



2 Remove the connector panel on the side where the signal cable is to be attached.

In the standard condition, connector panels are attached on both sides of the signal cable attachment ports of the detector.

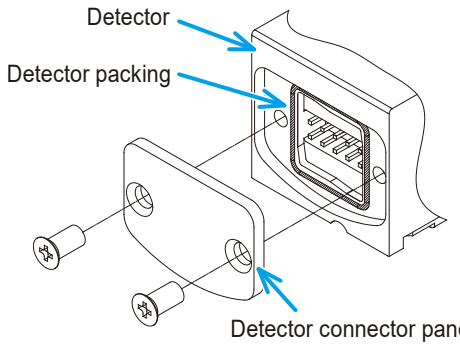
Remove the connector panel on the side of the detector where the cable is attached.

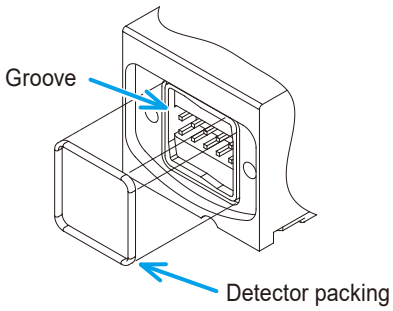
3 Check that the detector packing is attached to the detector side.

IMPORTANT

There is a packing between the detector connector panel and the detector.

When removing the detector connector panel, work carefully to prevent the packing from falling off. If it falls off, be sure to properly re-seat it in the groove of the detector.



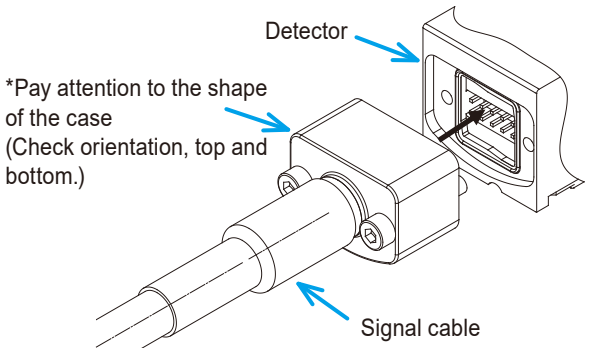


4 Connect the signal cable to the detector.

Align the key on the signal cable attachment port with the notch in the connector.

IMPORTANT

- To ensure waterproof performance, the detector packing is attached between the detector and the connector. When connecting the signal cable, be sure to check that the detector packing is properly seated in the groove of the signal cable attachment port.
- Although the detector is waterproof, waterproof performance is not assured if tightening torque of the countersunk screw is insufficient or the detector packing is not properly seated. To ensure waterproof performance, be sure to follow the procedure when connecting the cable.



Connector fixing screw tightening torque

Hex socket head cap screw (M2.6): 0.8 N·m

5 Connect the signal cable to a DRIVE-CLiQ compatible controller.

Connect the signal cable to the Siemens DRIVE-CLiQ compatible controller via the DRIVE-CLiQ cable. After connection, check that the connector screws are securely tightened.

IMPORTANT

When connecting the Mitutoyo signal cables and customer-supplied DRIVE-CLiQ connection cables, the total cable length should be limited to a maximum of 29 m.

6 After all cables are connected, supply power and check operation of the scale unit and its functions and performance.

NOTICE

- If the scale unit does not operate properly when power is supplied, first verify that connections are correct. If it does not operate properly after verifying connections and supplying power again, see "6 Trouble-shooting" on page 55.
- When checking operation of the scale unit, be very careful to prevent pinching of cables by the equipment.
- Also be careful to avoid ingress of chips or other debris into the scale unit during operation, as this could cause a malfunction.

3.4.2 Fastening the Cables and Precautions

When fastening cables, carefully follow the procedure given below.

Check the cable fastening procedure.

1 Arrange cables so as to avoid kinking, bending, and sources of electrical noise.

IMPORTANT

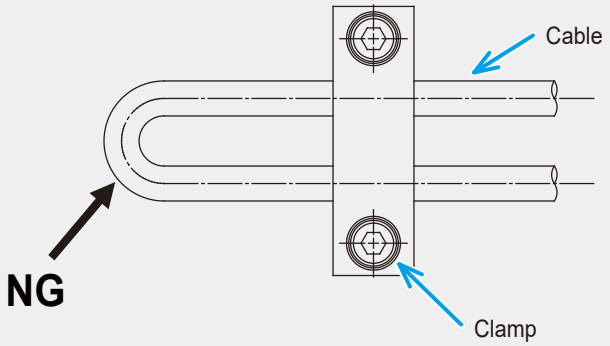
Noise carried by signal and the DRIVE-CLiQ connection cables can cause malfunctions if they are bundled with other cables that are a source of electrical noise or placed near relays that turn high currents on and off.

2 Secure each cable by cable clamps, etc.

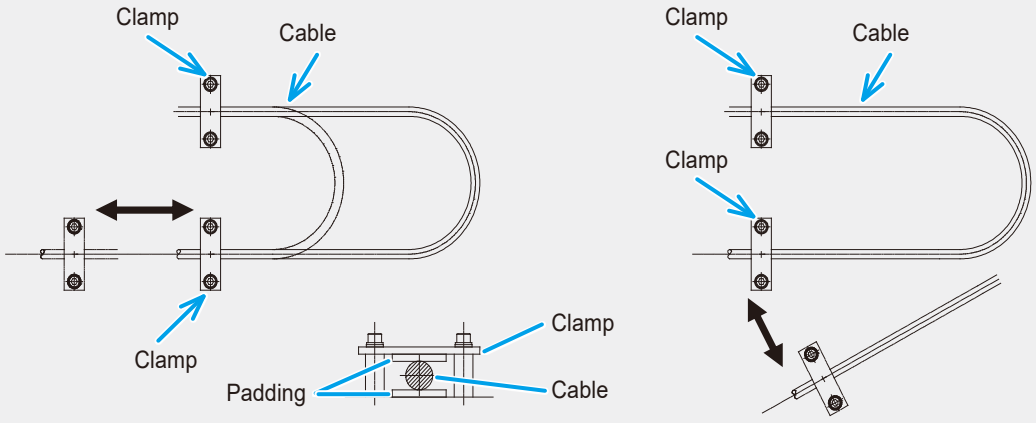
NOTICE

Non-compliance may result in cable damage or disconnection.

- Never bend cables.
  The cable bending radius R should be within the range shown in "2.3.3 Signal Cable Bending Radius R Tolerance Range" on page 21.



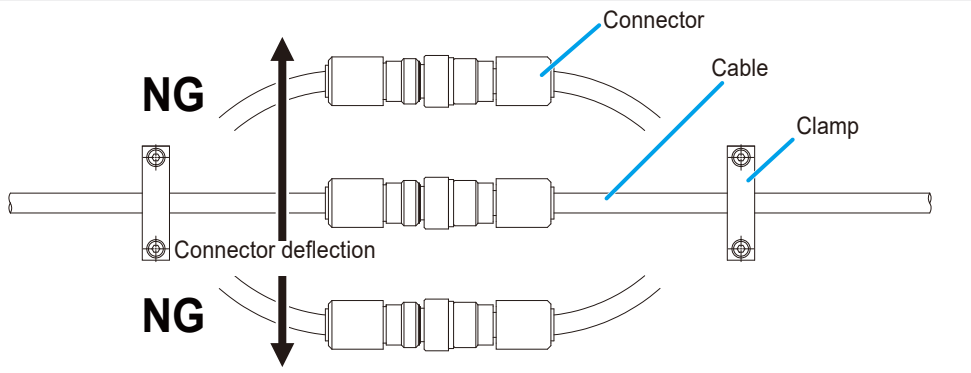
- If a cable is subject to repeated bending, allow it to move freely without fastening it, and take care to prevent application of stress at the point where the cable is clamped near its end.



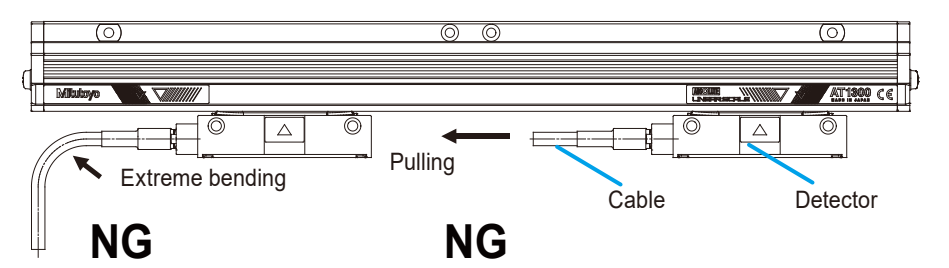
NOTICE

There is a risk of damage or disconnection of this product such as cables, connectors and the detector.

- Take into consideration shaking of the connectors due to vibration, etc.



- Care should be taken to avoid extreme bending or pulling at the base of the signal cable during the entire stroke range.



- Make sure that there is no interference with the cover, etc., over the full stroke range.

3.5 Air Purging

This product is equipped with a mechanism for air purging. This mechanism supplies clean compressed air to the inside of the scale main body, thereby improving environmental resistance (coolant and dust resistance) of the scale unit.

As shown in "3.5.3 Connection Method" on page 43, clean compressed air can be piped to either of the M5 threaded holes on both sides of the scale main body by air equipment of the specified specifications inside the scale main body.

IMPORTANT

- Air supply is an auxiliary method for cleaning inside the scale main body.
- For air supply, mounting posture is important. Follow the instructions in this manual.
- When supplying air, it is necessary to periodically replace the air filter due to the contamination of the air source. If you continue to use the dirty filter, dirt will enter the scale and cause trouble, so pay attention to this issue.
- The table below shows the input air specification.
  This specification corresponds to ISO8573-1 Class 1.4.1.

Item	Specifications
Maximum particle size (μm)	0.1
Lowest pressure dew point (°C)	+3
Oil concentration (mg/m^3)	0.01

3.5.1 Flow Rate of Air Supply to the Scale

Supply air of 10 L/min–20 L/min per scale axis.

Air should slightly come out from the closed part of the dust-proof rubber lips.

Adjust the air flow referring to the table below.

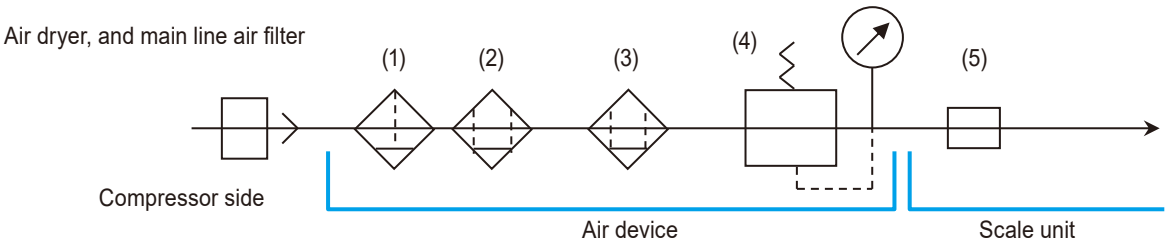
Conditions	Air flow rate
Using Mitutoyo's fixed diaphragm (ID: ø0.9)	Adjust the air pressure so that the air flow rate is 10 L/min–20 L/min per axis. Reference values when supplying air to one axis are as follows. • If air pressure is 0.1 MPa: approx. 12.7 L/min • If air pressure is 0.2 MPa: approx. 19 L/min
Using other fixed diaphragms	Adjust the air pressure so that the air flow rate is 10 L/min–20 L/min per axis. For the relationship between flow rate and air pressure, refer to the flow characteristics (fixed diaphragm diameter and flow rate-pressure relationship) provided by the manufacturer of the pneumatic equipment.
Using flow rate control valves	Adjust the air pressure so that the air flow rate is 10 L/min–20 L/min per axis. **NOTICE** Do not supply a large unadjusted air flow, as this may damage parts and cause malfunctions.

3.5.2 Recommended Air Equipment

The specifications for recommended air equipment and the manufacturer models are described in the following.

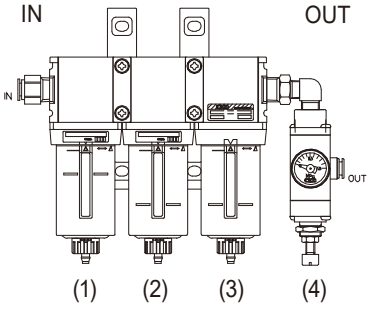
Other companies' air equipment may be used as long as they have the same specifications.

Estimated time of element replacement for each filter is one year.



No.	Component elements	External appearance	Specification	Item No.	
				Part No. (Mitutoyo)	Manufacturer model number
(1)	Air filter		• Fluid used: Compressed air • Maximum operating pressure: 1.0 MPa • Guaranteed pressure resistance: 1.5 MPa • Maximum particle size (degree of filtration): 5 µm • Oil concentration on outflow side: N/A	N/A	F1000-8-W (CKD)
(2)	Oil mist filter		• Fluid used: Compressed air • Maximum operating pressure: 1.0 MPa • Guaranteed pressure resistance: 1.5 MPa • Maximum particle size (degree of filtration): 0.01 µm • Oil concentration on outflow side: 0.01 mg/m^3 or less • Element replacement: one year (6000 hours) or pressure drop 0.1 MPa	N/A	M1000-8-W (CKD)
(3)	High performance oil mist filter		• Fluid used: Compressed air • Maximum operating pressure: 1.0 MPa • Guaranteed pressure resistance: 1.5 MPa • Maximum particle size (degree of filtration): 0.01 µm • Oil concentration on outflow side: 0.001 mg/m^3 or less • Element replacement: one year (6000 hours) or pressure drop 0.1 MPa	N/A	MX1000-8-W (CKD)

(4)	Regulator		• Fluid used: Compressed air • Maximum operating pressure: 1.0 MPa • Guaranteed pressure resistance: 1.5 MPa • Setting pressure range: 0.1 MPa–0.7 MPa • Oil proof treatment type	N/A	N/A
(5)	Fixed diaphragm		• Fluid used: Air • Operating pressure range: 0.1 MPa–0.9 MPa • Screw tightening torque: 1.0 N•m–1.5 N•m • Flow rate at 0.1 MPa pressure: Approx. 12.7 L/min (per axis) • Flow rate at 0.2 MPa pressure: Approx. 19 L/min (per axis)	06ACJ155	PC6-M5M-0.9 (Pisco special order product)
(1) to (4)	Air unit	See the next figure.	Equivalent to ISO-8573-1 Class 1.4.1 • Maximum particle size (degree of filtration): 0.01 µm • Lowest pressure dew point: - • Oil concentration (oil mist concentration): 0.001 mg/m^3 or less • Flow rate at 0.1 MPa pressure: 12.7 L/min (per axis) • Insertable flow rate (maximum): 75 L/min • When to replace each element: One year	N/A	N/A



(1) Air filter
(2) Oil mist filter
(3) High performance oil mist filter
(4) Regulator

Appearance of air unit

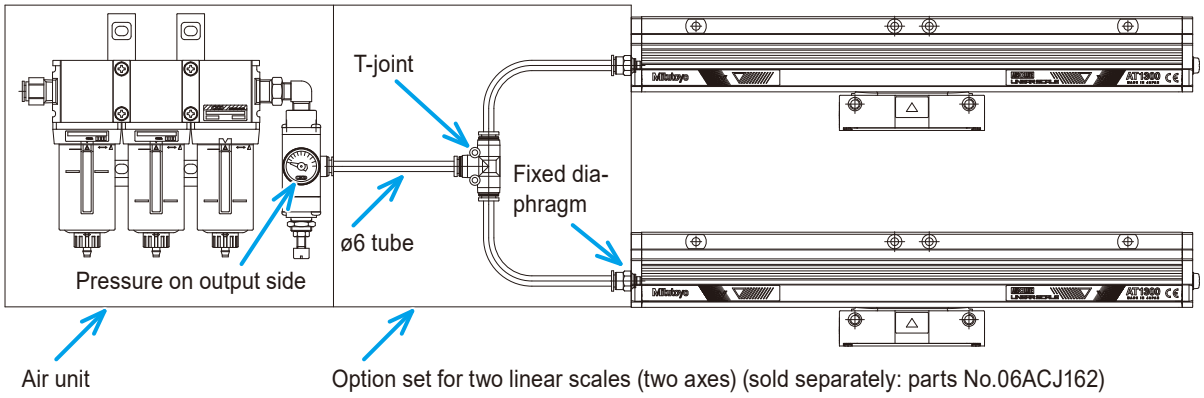
3.5.3 Connection Method

IMPORTANT

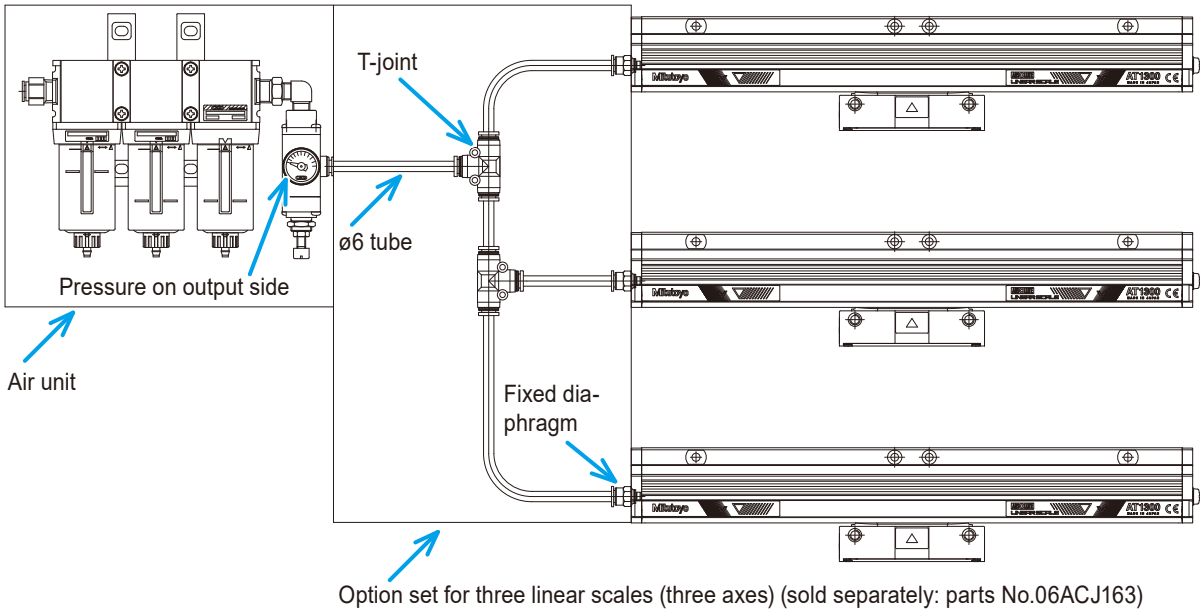
Use only dry compressed air that has been passed through an air dryer or main line air filter, rather than air supplied directly from the compressor to the air equipment.

When making connections, use ø6 air tubing and attach the fixed diaphragm on the scale unit side.

■ When air is supplied to two scale unit axes



■ When air is supplied to three scale unit axes



Tips

- For each air unit, air can be supplied up to five axes.
- You can connect up to four or five axes by combining option sets for two axes (No.06ACJ162) and three axes (No.06ACJ163).
  A ø6 air tube (length: 20 m) is included in each option set.
- An estimate of the element replacement period for parts No.06ACJ159, 06ACJ160, 06ACJ161 is one year. Replacement time depends on operating conditions and environment.
- Check the user's manual that is provided with the air unit for instructions on air unit maintenance.

MEMO

4 Alarm Detection Function

This product has various alarm detection functions inside the detector.

4.1 Alarm Detection Function

Alarm detection functions are broadly classified into two types: warning and abnormality.

The warning detection function detects conditions such as signal strength degradation of the product or abnormal detector temperature, and returns to normal when the cause is eliminated.

The abnormality detection function detects conditions such as signal strength and absolute value detection abnormalities in this product. Once an abnormality occurs, the abnormality detection status is maintained until a reset occurs or the power is turned on again.

<<Descriptions of alarm detections>>

Alarm type		Description
Warning	Signal intensity alarm	It is output when the signal strength of the scale is excessive or too small. * When the signal strength returns to the predetermined range, the alarm is canceled.
	Thermal alarm	It is output as a warning when the temperature inside the detector rises above 70 °C. * 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.
Abnormality	Signal strength error	It is output when the signal strength of the scale is excessive or too small and there is a possibility of abnormality in the output data.
	Absolute value detection error	It is output when absolute position cannot be detected.
	Absolute value combination error	It is output when an error occurs in the combination of absolute positions.
	Hardware error	It is output when abnormality occurs in self-diagnosis.
	Initialization error	It is output when an error cause occurs during initialization immediately after turning on the power.
	Overspeed error	It is output when the speed exceeding specification occurs.

4.2 Meaning of Alarm Codes

The table below shows the relationship between alarm codes output by the controller and alarms (scale internal errors) of this product, as well as the causes and countermeasures for each alarm.

Siemens alarm code*	Scale internal error	Cause and countermeasure
• F3x137	• Overspeed • Initialization error • Hardware error • Absolute value detection error • Transducer error • Signal strength error	**<<Cause>>** • Scale detected an abnormality. **<<Countermeasure>>** • Check mechanical installation of the scale. • Check power supplied to the scale for ripple noise and other electrical noise. • If there is nothing wrong with the installation condition, power supply, etc., the scale must be replaced.
• F3x405	• Temperature abnormality	**<<Cause>>** • The detector detected a warning. There is no error in the position data, but installation and use conditions require review. **<<Countermeasure>>** • Is the ambient temperature around the detector above 60 °C? →In case of high temperature, drive conditions (speed, acceleration) should be reviewed.

* Alarm code displayed in Siemens application (STARTER).

5 Specifications

This chapter describes the specifications of this product.

5.1 Scale Unit Specifications

Item	High precision specification ABS AT1300-H Series	High rigidity specification ABS AT1300-S Series
Installation specifications of scale main body	Flexible fastening at three or five points	Flexible fastening at multiple points
Elongation base point position with respect to temperature change	Center of effective scale length	
ABS origin position (output data is 0)	"20 mm" from the left end of the effective scale length	
Effective scale length (mm)	100, 150, 200, 250, 300 350, 400, 450, 500, 600 700, 750, 800, 900, 1000	100, 200, 300, 400, 500, 600 700, 800, 900, 1000, 1100 1200, 1300, 1400, 1500 1600, 1800, 2000, 2200
Detection method	Photoelectric type ABS linear encoder	
I/O method	High-speed serial interface	
Resolution (μm)	0.001 / 0.01 / 0.05	
Maximum response speed (mm/s)	3000	
Indication accuracy (μm) at 20 °C	$2+2L_0/1000$ L_0: Effective scale length (mm)	$3+3L_0/1000$ L_0: Effective scale length (mm)
Thermal expansion coefficient	$\approx 8\times10^{-6}$ / K	
Vibration resistance (55 Hz–2000 Hz)	≤ 147 m/s²	≤ 196 m/s²
Impact resistance (1/2 sin, 11 ms)	≤ 196 m/s²	≤ 343 m/s²
Power supply voltage/current consumption	DC 24 V (DRIVE-CLiQ standard: 19 V–30.8 V) / 150 mA (maximum value)	
Signal cable length	Up to 29 m (total of signal cable + DRIVE-CLiQ cable)	
Temperature/humidity range for operation and storage	0 °C–50 °C / -20 C–70 C, 20% RH–80% RH (without condensation)	
Interface	Siemens AG DRIVE-CLiQ specifications	
CE marking/ UKCA marking	EMC Directive/Electromagnetic Compatibility Regulations: EN 61326-1 Immunity test requirement: Clause6.2 Table 2 Emission limit: Class B RoHS Directive/The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations : EN IEC 63000	

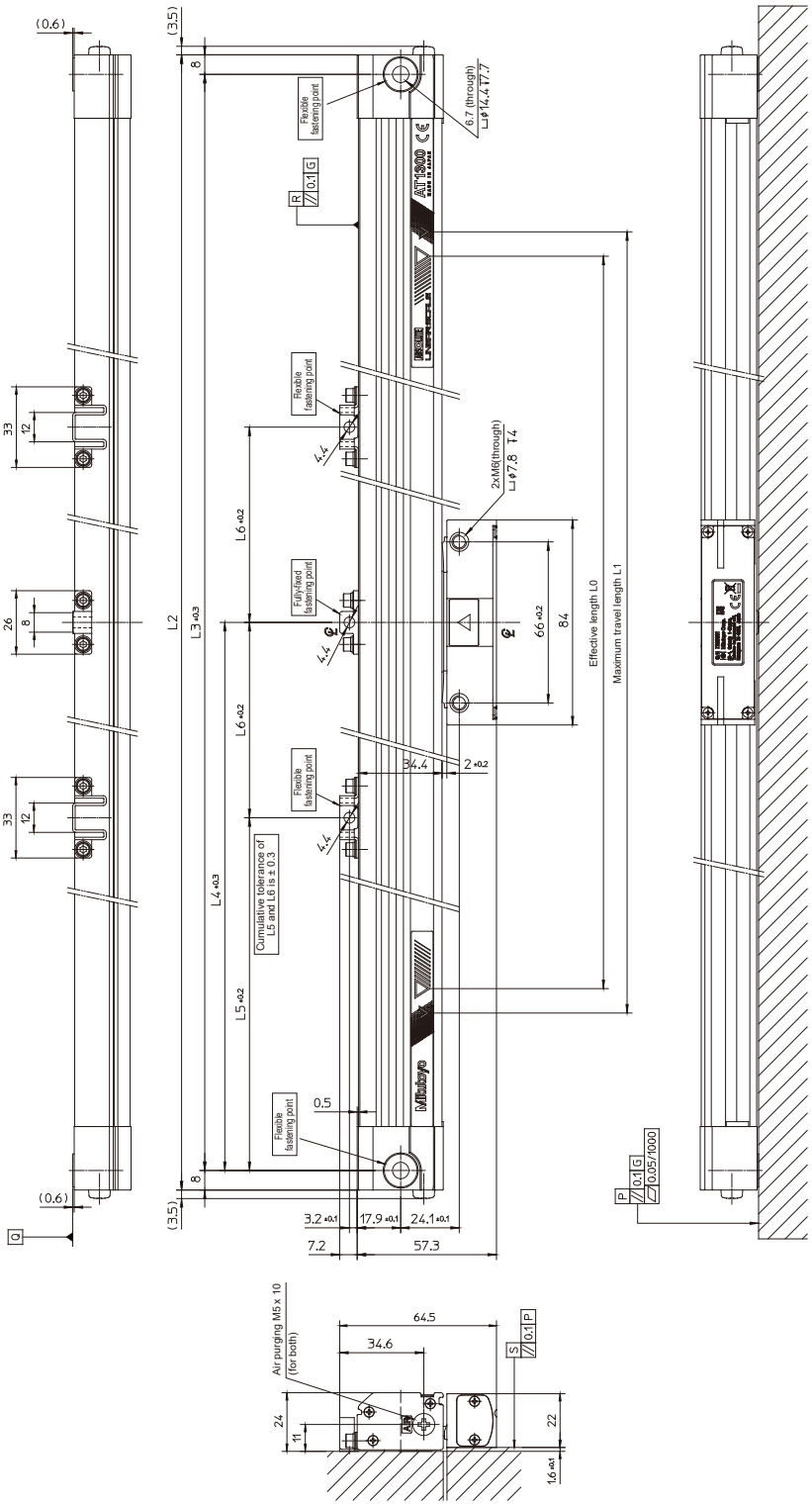
■ Relationship between resolution and maximum response speed

Interface	Maximum response speed (mm/s)	
	Resolution 0.001 µm	Resolution 0.01 µm/0.05 µm
Siemens AG DRIVE-CLiQ	3000	3000

5.2 Scale Unit Appearance and Installation Dimensions

5.2.1 ABS AT1300-H (High Precision Specification)

■ Appearance and installation dimensions



Tips

- G indicates the machine guide.
- P indicates the scale main body mounting surface. Also, S indicates the detector mounting surface.
- Q and R indicate the reference plane for mounting of the scale unit.
- For descriptions of L_0 to L_6 in the figure, see the next section.

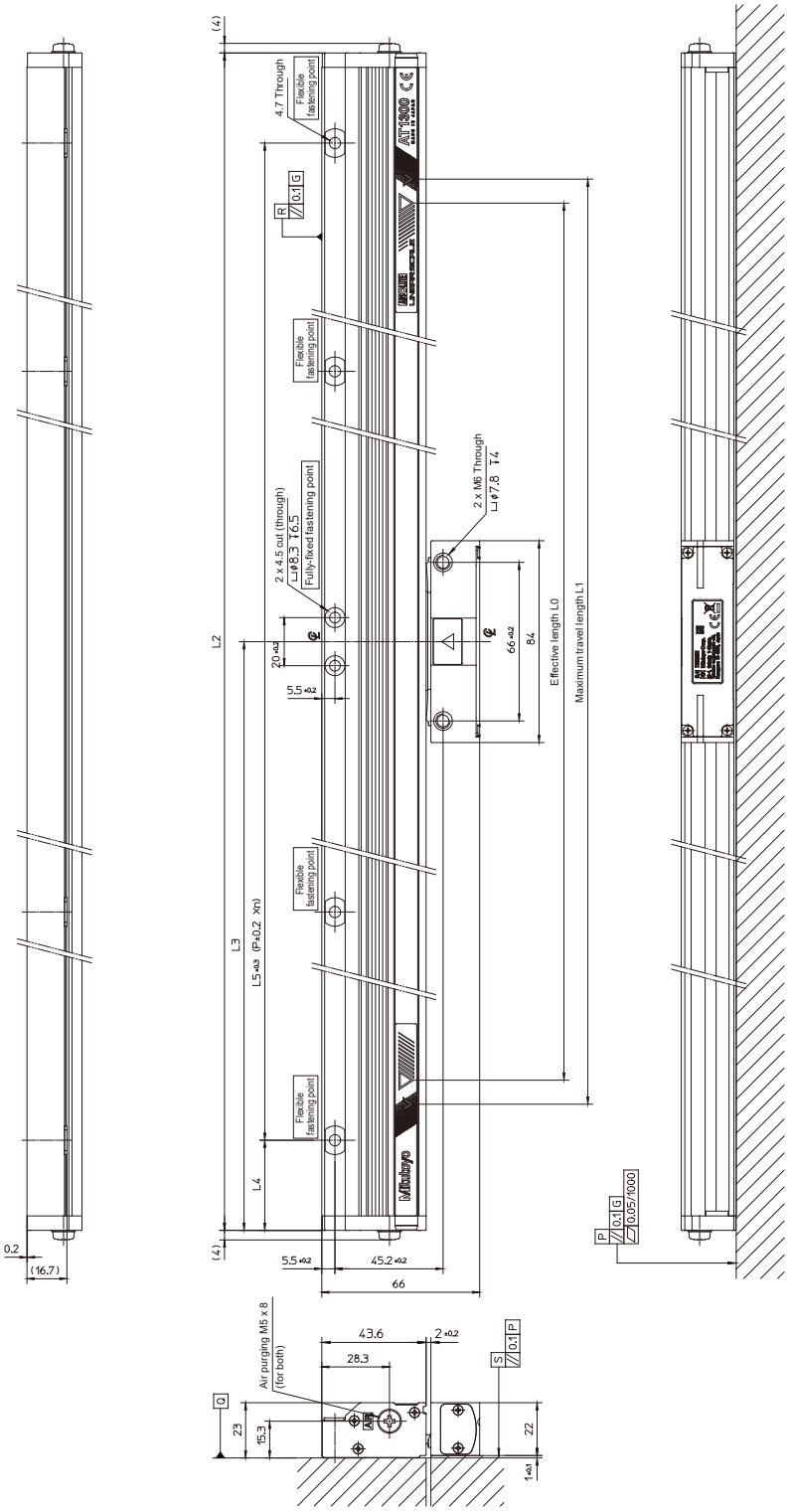
■ Installation dimensions table

Unit: mm

Effective scale length L_0	Maximum travel distance L_1	Full length L_2	Mounting pitch L_3	L_4	L_5	L_6
100	120	265	249	124.5		
150	170	315	299	149.5		
200	220	365	349	174.5		
250	270	415	399	199.5		
300	320	465	449	224.5		
350	370	515	499	249.5		
400	420	565	549	274.5		
450	470	615	599	299.5		
500	520	665	649	324.5		
600	620	765	749	(374.5)	204.5	170
700	720	865	849	(424.5)	224.5	200
750	770	915	899	(449.5)	224.5	225
800	820	965	949	(474.5)	244.5	230
900	920	1065	1049	(524.5)	264.5	260
1000	1020	1165	1149	(574.5)	284.5	290

5.2.2 ABS AT1300-S (High Rigidity Specification)

■ Appearance and installation dimensions



NOTICE

- G indicates the machine guide.
- P indicates the scale main body mounting surface. Also, S indicates the detector mounting surface.
- Q and R indicate the reference plane for mounting of the linear scale unit.
- For descriptions L0 to L5 in the figure, see the next section.

■ Installation dimensions table

Unit of L0 to L5 and P: mm

Effective scale length L_0	Maximum travel distance L_1	Full length L_2	L_3	L_4	L_5	P	n
100	120	225	112.5	37.5	150	75	2
200	220	325	162.5	37.5	250	125	2
300	320	425	212.5	37.5	350	175	2
400	420	525	262.5	62.5	400	200	2
500	520	625	312.5	62.5	500	125	4
600	620	725	362.5	62.5	600	150	4
700	720	825	412.5	62.5	700	175	4
800	820	925	462.5	62.5	800	200	4
900	920	1025	512.5	62.5	900	150	6
1000	1020	1125	562.5	37.5	1050	175	6
1100	1120	1225	612.5	87.5	1050	175	6
1200	1220	1325	616.5	62.5	1200	200	6
1300	1320	1425	712.5	112.5	1200	150	8
1400	1420	1525	762.5	62.5	1400	175	8
1500	1520	1625	812.5	112.5	1400	175	8
1600	1620	1725	862.5	62.5	1600	200	8
1800	1820	1925	962.5	87.5	1750	175	10
2000	2020	2125	1062.5	62.5	2000	200	10
2200	2220	2325	1162.5	112.5	2100	175	12

5.3 Optional Accessories

Note that the required signal cable (sold separately) depends on specifications of the interface to be connected.

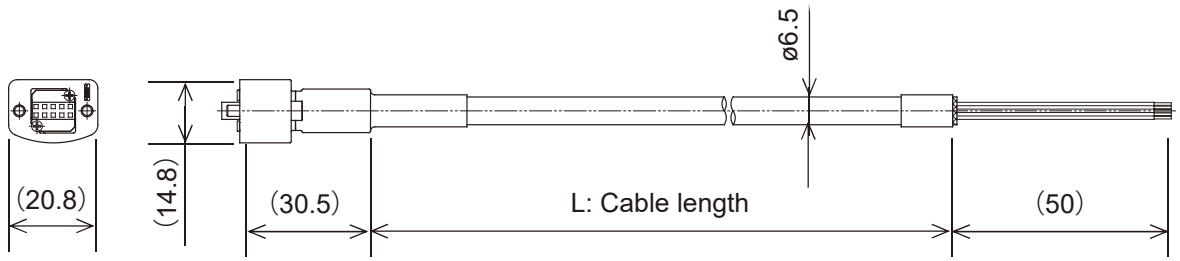
5.3.1 Signal Cable : Unfinished Cable Specifications (for Siemens Connection)

Wire color	Signal	Wire color	Signal
White/Brown	+24 V	White/Orange	TXP
Brown	GND	Orange	TXN
White/Blue	TEST	White/Green	RXP
Blue	$\overline{\text{TEST}}$	Green	RXN
		Shield wire	F.G

*The test pins (TEST, $\overline{\text{TEST}}$) should be left unconnected.

*Connect the shield to a ground bar.
Unfinished cable specification (for Siemens connection), cannot be used with other interfaces.

■ Unfinished cable specifications (for Siemens connection)



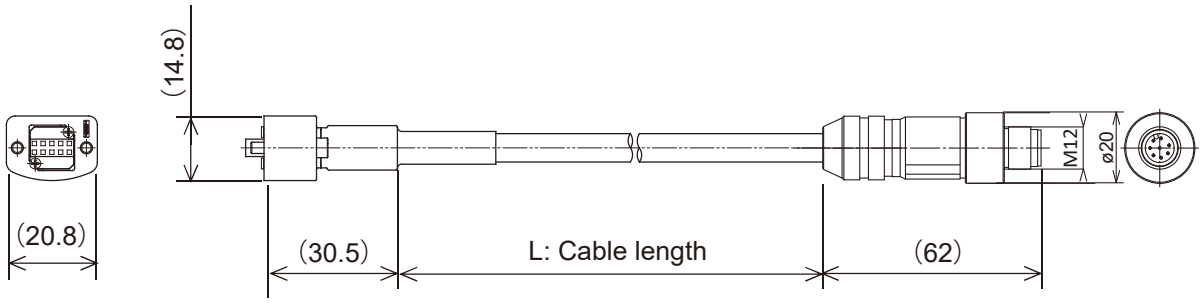
Part No.	Part name	Cable length (m)
06AHG652-1	AT1300 Signal cable assembly (Siemens, unfinished end) 1m	1
06AHG652-2	AT1300 Signal cable assembly (Siemens, unfinished end) 2m	2
06AHG652-3	AT1300 Signal cable assembly (Siemens, unfinished end) 3m	3
06AHG652-4	AT1300 Signal cable assembly (Siemens, unfinished end) 4m	4
06AHG652-5	AT1300 Signal cable assembly (Siemens, unfinished end) 5m	5
06AHG652-6	AT1300 Signal cable assembly (Siemens, unfinished end) 6m	6
06AHG652-7	AT1300 Signal cable assembly (Siemens, unfinished end) 7m	7
06AHG652-8	AT1300 Signal cable assembly (Siemens, unfinished end) 8m	8
06AHG652-9	AT1300 Signal cable assembly (Siemens, unfinished end) 9m	9
06AHG652-12	AT1300 Signal cable assembly (Siemens, unfinished end) 12m	12

5.3.2 Signal Cable: M12 Connector Specification

Pin No.	Signal	Pin No.	Signal
1	+24 V	5	GND
2	TEST	6	TXN
3	RXP	7	TXP
4	RXN	8	$\overline{\text{TEST}}$
		Shield sleeve	F.G

*The test pins (TEST, $\overline{\text{TEST}}$) should be left unconnected.

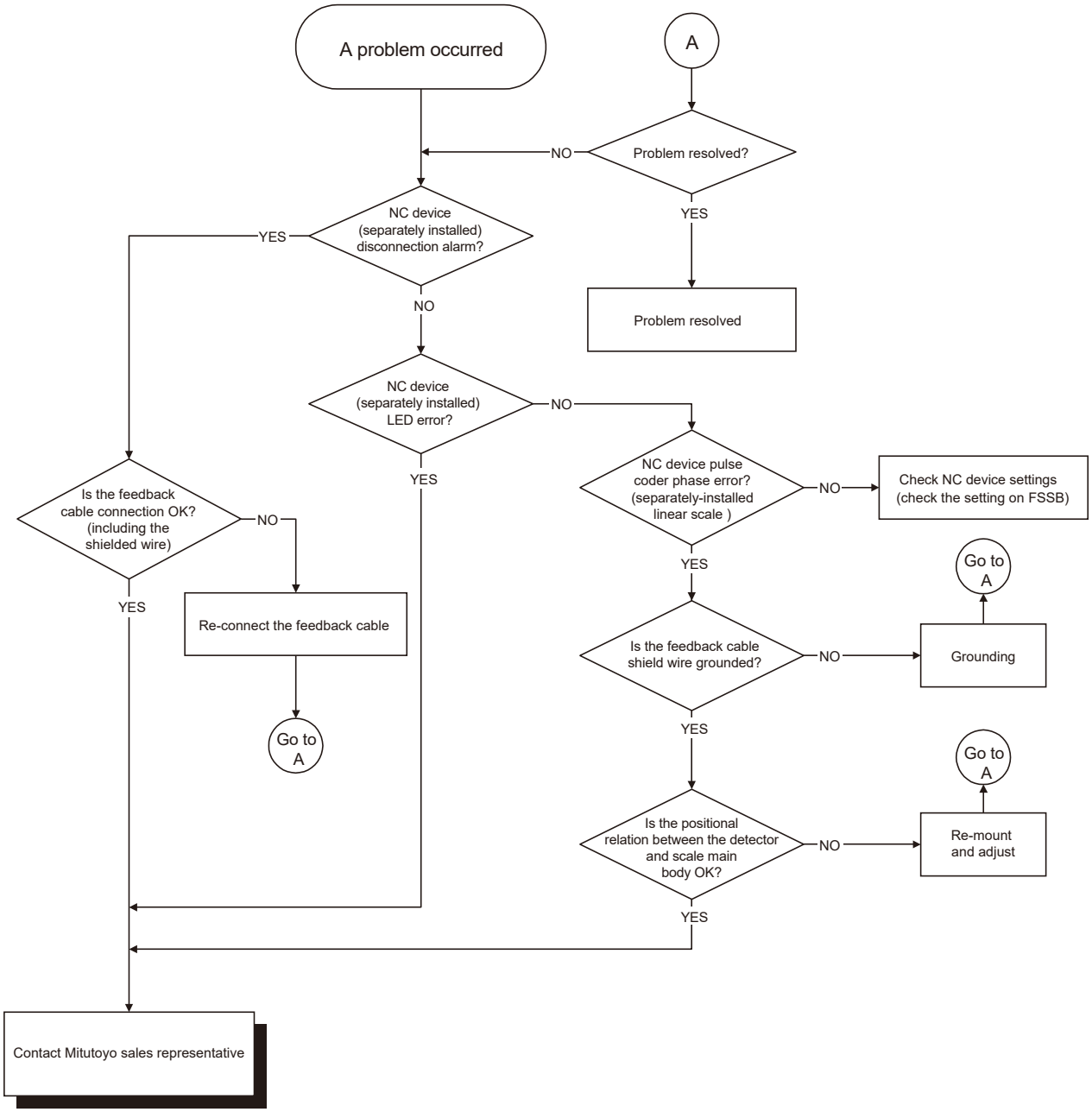
■ M12 connector specification



Part No.	Part name	Cable length (m)
06AHD391-1	AT1300 signal cable Ass'y (M12) 1 m	1
06AHD391-2	AT1300 signal cable Ass'y (M12) 2m	2
06AHD391-3	AT1300 signal cable Ass'y (M12) 3m	3
06AHD391-4	AT1300 signal cable Ass'y (M12) 4m	4
06AHD391-5	AT1300 signal cable Ass'y (M12) 5m	5
06AHD391-6	AT1300 signal cable Ass'y (M12) 6m	6
06AHD391-7	AT1300 signal cable Ass'y (M12) 7m	7
06AHD391-8	AT1300 signal cable Ass'y (M12) 8m	8
06AHD391-9	AT1300 signal cable Ass'y (M12) 9m	9
06AHD391-12	AT1300 signal cable Ass'y (M12) 12m	12

6 Troubleshooting

This chapter provides a flowchart showing how to check the cause of problems occurring when the power is first turned on or when an alarm occurs during operation, and how to remedy problems.



Tips

Software is available that makes it possible for the customer to make an initial determination regarding malfunctions or errors that occur with this product. Please contact the agent where you purchased the product or Mitutoyo sales representative ("SERVICE NETWORK" on page App-1).

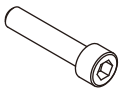
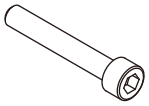
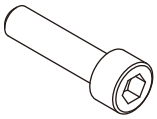
MEMO

7 Appendix

7.1 Quantity of Accessories Used for Installation

7.1.1 ABS AT1300-H (High Precision Specification)

(Unit: ea.)

Effective scale length (mm)	Hex socket head cap screw M4×10 	Hex socket head cap screw M4×16 	Spring washer, nominal 4 	Hex socket head cap screw M4×25 	Hex socket head cap screw M6×25 	Spring washer, nominal 6 
100	2	1	3	2	2	2
150	2	1	3	2	2	2
200	2	1	3	2	2	2
250	2	1	3	2	2	2
300	2	1	3	2	2	2
350	2	1	3	2	2	2
400	2	1	3	2	2	2
450	2	1	3	2	2	2
500	2	1	3	2	2	2
600	2	1	3	2	2	2
700	2	1	3	2	2	2
750	2	1	3	2	2	2
800	2	1	3	2	2	2
900	2	1	3	2	2	2
1000	2	1	3	2	2	2

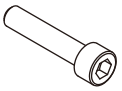
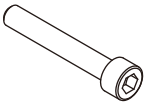
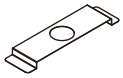
See below for details on quantities used.

"■ ABS AT1300-H (high precision specification)" on page 26 in "3.2.2 Installation of the Scale Main Body"

"3.3 Attaching the Detector and Adjusting Its Position" on page 33

7.1.2 ABS AT1300-S (High Rigidity Specification)

(Unit: ea.)

Effective scale length (mm)	Hex socket head cap screw M4×16 	Hex socket head cap screw M4×25 	Spring washer, nominal 4 Small round 	Flat washer, nominal 4 Small round 	Frame retaining spring 
100	4	8	12	12	6
200	4	8	12	12	6
300	4	8	12	12	6
400	4	8	12	12	6
500	4	8	12	12	6
600	4	8	12	12	6
700	4	8	12	12	6
800	4	8	12	12	6
900	4	8	12	12	6
1000	4	8	12	12	6
1100	4	8	12	12	6
1200	4	8	12	12	6
1300	4	14	18	18	12
1400	4	14	18	18	12
1500	4	14	18	18	12
1600	4	14	18	18	12
1800	4	14	18	18	12
2000	4	14	18	18	12
2200	4	14	18	18	12

See below for details on quantities used.

"■ ABS AT1300-S (high rigidity specification)" on page 29 in "3.2.2 Installation of the Scale Main Body"

"3.3 Attaching the Detector and Adjusting Its Position" on page 33

SERVICE NETWORK

*As of May 2025

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