

SONY®

スケールセット / Scale Set / Maßstab-Satz

GB-A/SR127/SR128 Series

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マグネスケール® / Magnescale®

取扱説明書 / Instruction Manual / Bedienungsanleitung

[For the customers in U. S. A.]

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

[For EU and EFTA countries]



Making by the symbol CE indicates compliance of the EMC directive of the European Community. Such marking is indicative meets or exceeds the following technical standards.

EN 55 011 Group 1 Class A / 91 :

"Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment"

EN 50 082-2 / 95:

"Electromagnetic compatibility - Generic immunity standard Part 2 : Industrial environment"

警告

本装置を機械指令 (EN 60 204-1) の適合を受ける機器にご使用の場合は、その規格に適合するように方策を講じてから、ご使用ください。

Warning

When using this device with equipment governed by Machine Directives EN 60 204-1, measures should be taken to ensure conformance with those directives.

Warnung

Wenn dieses Gerät mit Ausrüstungsteilen verwendet wird, die von den Maschinenrichtlinien EN 60 204-1 geregelt werden, müssen Maßnahmen ergriffen werden, um eine Übereinstimmung mit diesen Normen zu gewährleisten.

■ 一般的な注意事項

以下は当社製品を正しくお使いいただくための一般的な注意事項です。個々の詳細な取扱上の注意は、本取扱説明書に記述された諸事項および注意をうながしている説明事項に従ってください。

- 始業または操作時には、当社製品の機能および性能が正常に作動していることを確認してからご使用ください。
- 当社製品が万一故障した場合、各種の損害を防止するための十分な保全対策を施してご使用ください。
- 仕様を示された規格以外でのご使用、または改造を施された製品については、機能および性能の保証はできませんのでご留意ください。
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■ General precautions

When using Sony Manufacturing Systems Corporation products, observe the following general precautions along with those given specifically in this manual to ensure proper use of the products.

- Before and during operations, be sure to check that our products function properly.
- Provide adequate safety measures to prevent damage in case our products should develop a malfunction.
- Use outside indicated specifications or purposes and modification of our products will void any warranty of the functions and performance as specified for our products.
- When using our products in combination with other equipment, the functions and performance as noted in this manual may not be attained, depending upon the operating environmental conditions. Make a thorough study of the compatibility in advance.

■ Allgemeine Vorsichtsmaßnahmen

Beim Einsatz von Geräten von Sony Manufacturing Systems Corporation sind die folgenden allgemeinen Vorsichtsmaßnahmen zusätzlich zu den in der vorliegenden Anleitung jeweils speziell angegebenen Warnhinweisen zu beachten, um einen korrekten Einsatz des Geräts zu gewährleisten.

- Vor und während des Betriebs sicherstellen, daß das Gerät korrekt funktioniert.
- Geeignete Sicherheitsvorkehrungen zur Vermeidung von Schäden für den Fall ergreifen, daß am Gerät eine Störung auftritt.
- Wird das Gerät außerhalb der angegebenen Spezifikationen und Einsatzzwecke verwendet oder werden am Gerät Änderungen vorgenommen, kann keine Garantie für Funktion und Leistung übernommen werden.
- Beim Einsatz des Geräts mit einem anderen nicht empfohlenen Gerät werden u.U. je nach Betriebsbedingungen die in der vorliegenden Anleitung aufgeführten optimalen Funktionen und Leistungen nicht erreicht. Daher die Kompatibilität im voraus gründlich prüfen.

Safety Precautions

Sony Manufacturing Systems Corporation products are designed in full consideration of safety. However, improper handling during operation or installation is dangerous and may lead to fire, electric shock or other accidents resulting in serious injury or death. In addition, these actions may also worsen machine performance.

Therefore, be sure to observe the following safety precautions in order to prevent these types of accidents, and to read these "Safety Precautions" before operating, installing, maintaining, inspecting, repairing or otherwise working on this unit.

Warning indication meanings

The following indications are used throughout this manual, and their contents should be understood before reading the text.

Warning

Failure to observe these precautions may lead to fire, electric shock or other accidents resulting in serious injury or death.

Caution

Failure to observe these precautions may lead to electric shock or other accidents resulting in injury or damage to surrounding objects.

Note

This indicates precautions which should be observed to ensure proper handling of the equipment.

Warning



- Do not use this unit with voltages other than the specified supply voltage as this may result in fire or electric shock.

- Do not perform installation work with wet hands as this may result in electric shock.

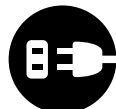


- Do not disassemble or modify the unit as this may result in injury or damage the internal circuits.

Caution



- Be sure to check the machine and device conditions to ensure work safety before working on the machine.



- Be sure to cut off the power supply, air and other sources of drive power before working on the machine. Failure to do so may result in fire or accidents.



- When turning on the power supply, etc. to operate the machine, take care not to catch your fingers in peripheral machines and devices.

Handling Precautions

Installation precautions

When installing this unit, care should be given to the following points to prevent noise and electromagnetic wave interference from other equipment.

1. Do not pass lead and connection cables through the same ducts as power lines.
2. Be sure to install the unit at least 0.5 m or more away from high voltage or large current sources or high-power relays.
3. Absolutely do not bring the unit near magnets or sources of electromagnetic waves.
 - Magnet chucks and other sources of magnetic force of approx. 600 G should be kept at least 50 mm or more away from the side surfaces and 100 mm or more away from the opening surfaces of the scale's steel chassis.
 - If the unit must be installed close to sources of magnetic force, be sure to implement adequate electromagnetic shielding countermeasures.

Installation place precautions

1. Mount the scale for more precise positioning as closely as possible to the workpiece or to the object being measured.
(The farther the scale is mounted from workpiece, the greater the mechanical errors grow.)
2. The scale unit should be used within an ambient temperature range of 0 to 40°C. Avoid locations where the scale is exposed to direct sunlight and heat sources such as motors.
3. Do not place anything on the mounted scale, or step on it: excessive force to the scale causes trouble.

■ Precautions for use under the following environments

- ① When using water-miscible cutting fluid or when cutting non-metal (ceramic, glass fiber, etc.) objects.
 - Mount the scale so that it is not directly exposed to water-miscible cutting fluid or cutting scraps.
 - Attach a scale cover to prevent water-miscible cutting fluid mist or powder from entering the inside of the scale.
- ② When mounted on a forming machine or other machine that slides at high speed for long periods within a specific area.
 - Regularly apply oil or spray lubricant (CRC, WD40, etc.).

Be sure to implement the above measures when using the scale under the environments noted in ① and ② above. Otherwise, quality cannot be assured.

** Scales with felt attached and oil-injection type scales are available as special order products for cases where the above measures cannot be implemented. Consult your Sony Manufacturing Systems Corporation representative for details.

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1. Outline

1-1. Introduction

The SR127, SR128 and GB-A series of linear scales are semi-modular types that incorporate the detector inside the scale, and the relative positions of their scale and head are adjusted and secured using a slider holder.

The GB-A series includes an electrically adjusted connection cable (CH01 series), allowing it to be used as well with Sony Manufacturing Systems Corporation display units (LG10, LH51/52, LH61/62, LY51/52 series, etc.)

Note

Electrical adjustment is not necessary when the serial No. on the scale side matches the combination No. on the connection cable side.

The SR127/SR128 series can be used with Sony Manufacturing Systems Corporation display units by connecting an optional connection cable (CH series). The SR127/SR128 series can also be used with Sony Manufacturing Systems Corporation detectors by connecting an optional connection cable (CE series).

Note

In these cases, electrical adjustment (PM signal adjustment) is required. However, when the scale unit and display unit connection cable (CH series) are ordered together, they are shipped in the adjusted condition. Like the GB-A series, the scale and cable should be connected so that the serial No. on the scale side matches the combination No. on the connection cable side.

When extending the SR127/SR128 series cable length, use an extension cable suited to the used optional connection cable.

When extending the GB-A series cable length, use an optional extension cable (CE10 series).

Note

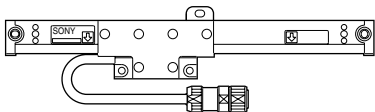
The maximum total cable length is 30 m.

1-2. Major Features

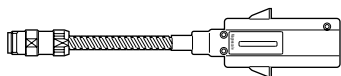
- Compact size and light weight
- Easy to install
- Same coefficient of expansion as that of machine tools
- Highly accurate position detection
- Highly resistant to oils and dirt

1-3. Parts Configuration

Scale unit Scale 1



Connection cable (CH01: included only with the GB-A series) 1



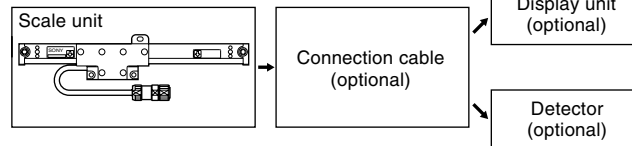
Accessories

Clamp	1	
Cable clamps	(small 2, large 4)	
Spacers	5	
Screening label	1	
Plain washers (S)	2	
Plain washers (M)	3	
+B4×10	2	
+P4×10	6	
HSB M4×10	3	
HSB M4×12	2	
HSB M5×25	2	
Nuts (for M5)	2	

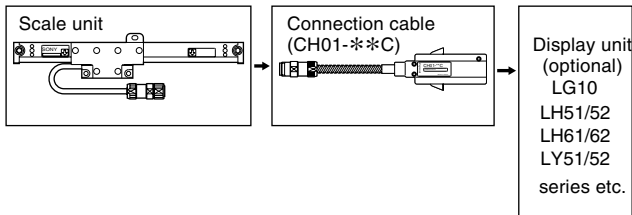
1-4. System Configuration

System connections

• SR127/SR128 series



• GB-A Series



Model lineup (SR127/SR128 series)

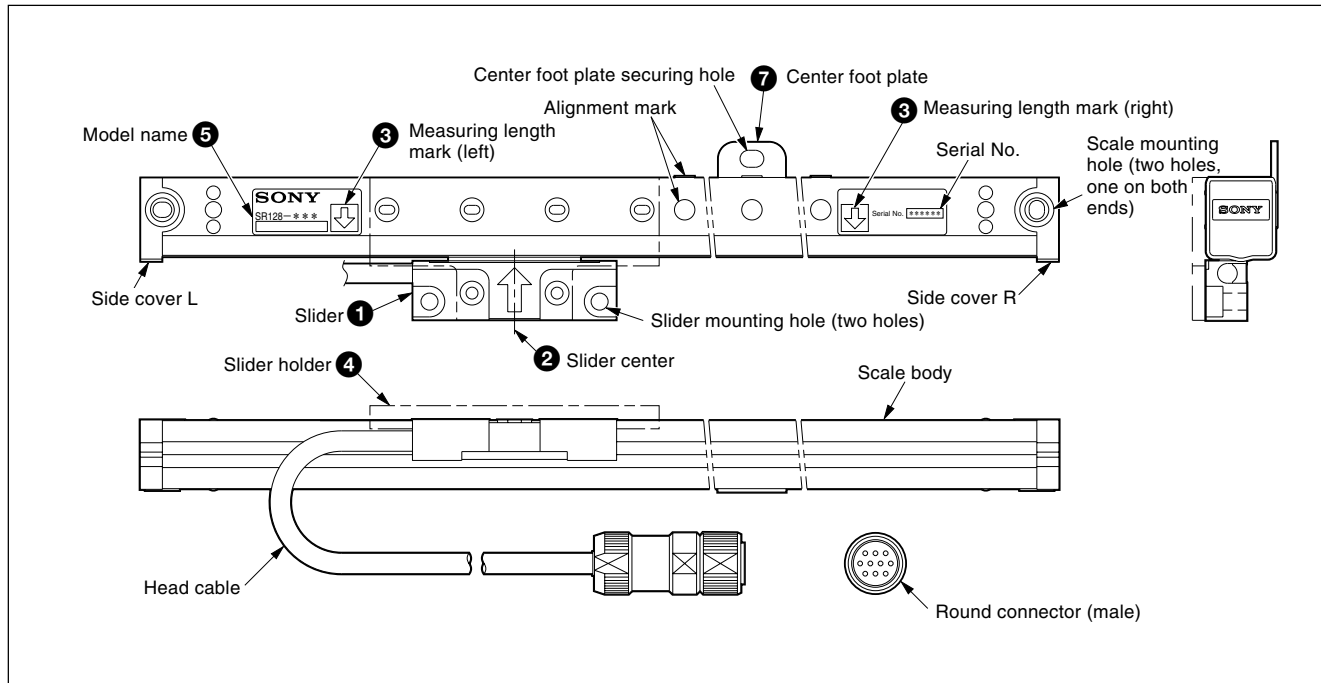
Model name		Measuring length (L)
SR127-005	SR128-005	50 mm/1.9"
SR127-010	SR128-010	100 mm/3.9"
SR127-015	SR128-015	150 mm/5.9"
SR127-020	SR128-020	200 mm/7.8"
SR127-025	SR128-025	250 mm/9.8"
SR127-030	SR128-030	300 mm/11.8"
SR127-035	SR128-035	350 mm/13.7"
SR127-040	SR128-040	400 mm/15.7"
SR127-045	SR128-045	450 mm/17.7"
SR127-050	SR128-050	500 mm/19.6"
SR127-055	SR128-055	550 mm/21.6"
SR127-060	SR128-060	600 mm/23.6"
SR127-065	SR128-065	650 mm/25.5"
SR127-075	SR128-075	750 mm/29.5"
SR127-085	SR128-085	850 mm/33.4"
SR127-095	SR128-095	950 mm/37.4"
SR127-105	SR128-105	1050 mm/41.3"
SR127-125	SR128-125	1250 mm/49.2"
	SR128-140	1400 mm/55.1"
	SR128-160	1600 mm/62.9"
	SR128-185	1850 mm/72.8"
	SR128-205	2050 mm/80.7"
	SR128-220	2200 mm/88.6"

Model lineup (GB-A series)

Model name		Measuring length (L)	Connection cable length model	Cable length
GB-5A	SR128-005	50 mm/1.9"	CH01-03C	3 m/ 9.8 ft
GB-10A	SR128-010	100 mm/3.9"		
GB-15A	SR128-015	150 mm/5.9"		
GB-20A	SR128-020	200 mm/7.8"		
GB-25A	SR128-025	250 mm/11.8"		
GB-30A	SR128-030	300 mm/9.8"		
GB-35A	SR128-035	350 mm/13.7"		
GB-40A	SR128-040	400 mm/15.7"		
GB-45A	SR128-045	450 mm/17.7"		
GB-50A	SR128-050	500 mm/19.6"		
GB-55A	SR128-055	550 mm/21.6"		
GB-60A	SR128-060	600 mm/23.6"		
GB-65A	SR128-065	650 mm/25.5"		
GB-75A	SR128-075	750 mm/29.5"		
GB-85A	SR128-085	850 mm/33.4"		
GB-95A	SR128-095	950 mm/37.4"		
GB-105A	SR128-105	1050 mm/41.3"		
GB-125A	SR128-125	1250 mm/49.2"		
GB-140A	SR128-140	1400 mm/55.1"		
GB-160A	SR128-160	1600 mm/62.9"		
GB-185A	SR128-185	1850 mm/72.8"		
GB-205A	SR128-205	2050 mm/80.7"		
GB-220A	SR128-220	2200 mm/88.6"		
			CH01-05C	5 m/ 16.4 ft
			CH01-10C	10 m/ 32.8 ft

2. Name and Function of Each Part

2-1. Scale Unit



1 Slider

This holds the detection head. When shipped, it is secured by the slider holder.

2 Slider center

This indicates the mechanical center of the slider. It serves as a reference when viewing the relative position with the measuring length marks.

3 Measuring length marks

These indicate the effective movement range over which accuracy is assured with respect to the slider center. The measuring length represents the length of the effective movement range.



When mounting and using the scale unit, be sure to operate the unit within this range. Using the scale unit in excess of the effective movement range may damage the unit.

4 Slider holder

This secures the scale body and slider, and should be stored after removal.

5 Model name

This indicates the scale unit model name.

6 Serial No.

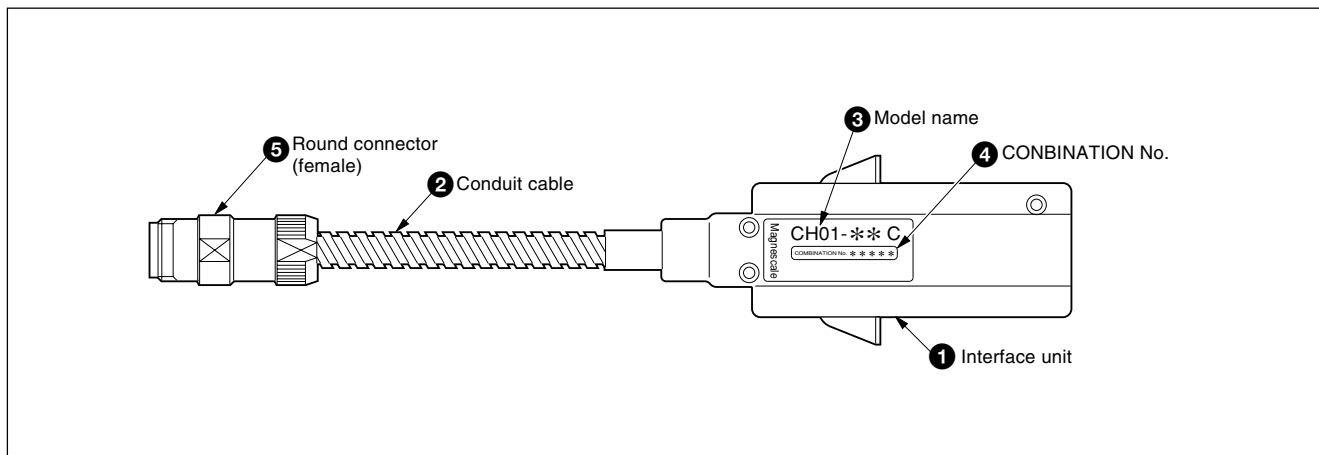
This indicates the scale unit serial No.
For the GB-A series, it is the same as the combination No. of the matching connection cable.

7 Center foot plate

This is mounted when the measuring length is 1050 mm or more, and should be secured when mounting the scale unit.

2-2. Connection Cable

CH01 : included only with the GB-A series



1 Interface unit

This is inserted into the rear panel of the display unit. The interface unit has an internal circuit which is electrically adjusted to the optimal setting.

Note

When procured separately, electrical adjustment is necessary.

2 Conduit cable

This protects the internal cables.

3 Model name

This indicates the cable model name.

4 COMBINATION No.

For the GB-A series, this is the same as the serial No. of the matching scale unit.

5 Round connector (female)

This connects with the round connector (male) on the scale side.

3. Mounting Method

3-1. Mounting Precautions

Be sure to ground the scale unit and the slider to prevent trouble to noise.

3-1-1. Checking the mounting method

Check that the scale unit can be mounted in the relative position shown in the Fig. 3-1.

* Do not mount the scale in any other direction since difficulties with servicing and maintenance may arise. (The mounting position **A** in particular is recommended: cutting oil and chips may be effectively kept out.)

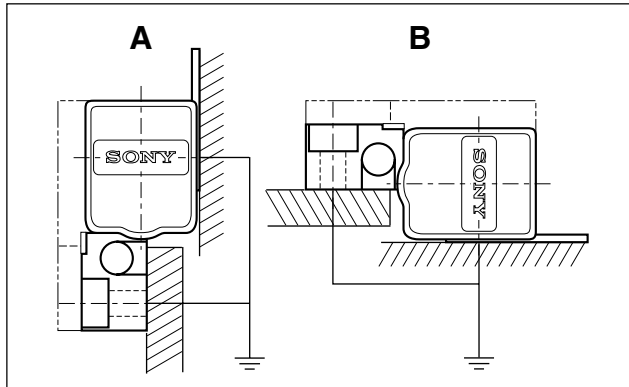


Fig. 3-1 Scale mounting direction

When mounting the scale vertically, be sure to mount the scale slider on the opposite side of a workpiece or cutting tool.

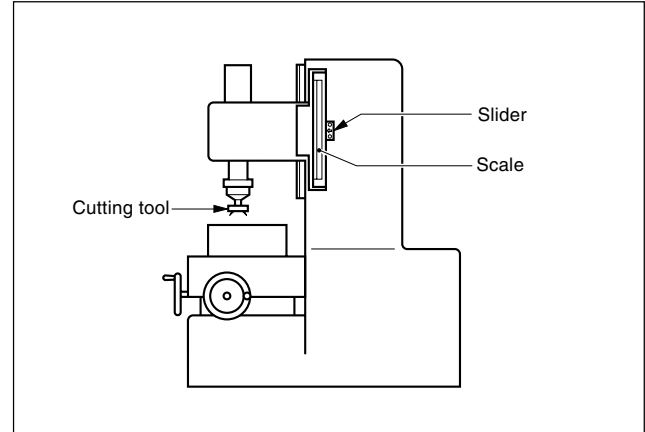


Fig. 3-2 Mounting the scale vertically

3-1-2. Setting the operating range

- The measuring length of the scale is the distance between the measuring length marks (↓) at both ends of the scale.
- Mount the scale in such a position that the slider center moves within these measuring length marks.
- A leeway (equivalent to 7 mm/0.28" at the left and right ends of the scale for a measuring length of up to 200 mm/7.8" and 15 mm/0.59" for a measuring length of up to 250 mm/9.8") is provided for the slider movement. Take special care not to move the slider beyond this limit or the scale may be damaged.

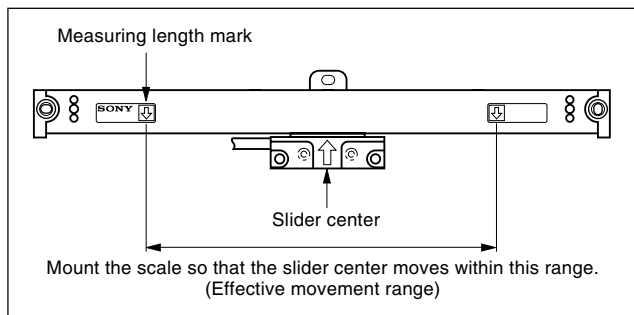


Fig. 3-3 Operating range

- Mechanical limiting devices (stoppers, etc.) are required for sliders which move in excess of the effective movement range of the scale unit. In these cases, be sure to take the appropriate measures before mounting the scale unit.

3-1-3. Protection of the head cable

The head cable and scale come as a single integrated unit. Take care not to pull the head cable forcefully or bend it repeatedly or the cable may break.

3-1-4. Mounting a protective cover

Where the scale is exposed to chips and cutting oil, it is recommended a protective cover be provided to maintain the scale's high performance.

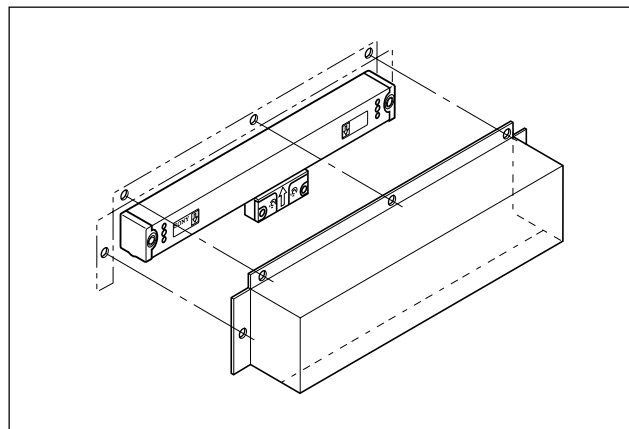


Fig. 3-4 Example of protective cover

3-2. Required Items for Mounting

Accessories (supplied)

Hex socket head cap screw	3
M4×10 for mounting scale (2 pcs. for scale of L<1000 mm/39")	
Hex socket head cap screw	2
M4×12 for mounting slider	
Pan head screw	6
M4×10 for cable clamp	
Plain washer (large)	3
with 4 mm dia. hole (2 pcs. for scale of L<1000 mm/39")	
Plain washer (small)	2
with 4 mm dia. hole for mounting slider	
Cable clamp for mounting conduit cable	4
Screening label	1
for concealing the screw holes after the slider holder has been removed	
Hex socket head cap screw	2
M5×25 for mounting slider	
Hex nut	2
M5 for mounting slider	
Spacer	5
t=0.1 for mounting slider	
Clamp for mounting round connectors	2
(when mounting connector cable)	
Binding pan head screw	2
M4×10 for mounting clamp	2
Cable clamp for securing head cable (small)	1

Tools you need other than the supplied accessories.

Bracket for mounting scale (for A B surfaces)	1 to 2
Bracket for mounting slider (for C surface)	1
Dial indicator with magnetic base capable of reading 0.01 mm/0.0005"	1 to 2
Allen wrench for M2.6 (2 mm) type	1
Allen wrench for M4 (3 mm) type	1
Allen wrench for M5 (4 mm) type	1
Phillips head screwdriver for M2.6	1
Tap M4	1
Drill ø3.2/0.126" dia	1
Electrical drill	1
Liner, spacer t=0.05 to 0.2 mm/0.002 to 0.08"	Some
Adjustable spanner (small)	2

Note: L = measuring length
t = thickness

3-3. Mounting Procedure

Precautions

The procedures for mounting the scale unit are described below.

For the scale unit, the only disassembly process during the mounting work is removing the slider holder. (See <4>.) Do not disassemble other locations.

For the connection cable, the only disassembly process is removing and mounting the case to perform the electrical adjustments when the connection cable is procured separately from the SR127/SR128 series. Do not disassemble other locations. However, when the connection cable is ordered together with the scale unit (including the GB-A series), electrical adjustment is not necessary. In these cases, be sure never to disassemble the connection cable.

The scale unit is comprised of precision mechanical and electromagnetic parts, so applying excessive force will have a large effect on the unit's performance and service life. Therefore, take care not to apply excessive force when mounting the scale unit.

In addition, when carrying the unit, the scale body and slider should be held together. Take care not to carry the scale unit by the head cable or round connectors.

3-4. Mounting Dimensions

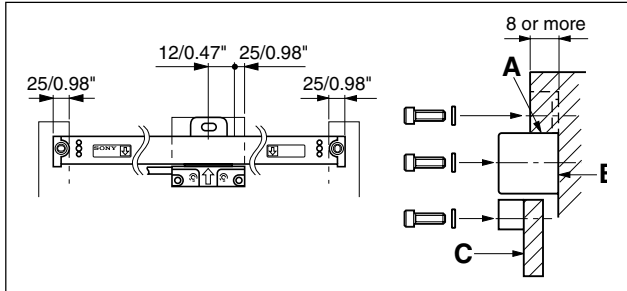


Fig. 3-5 Mounting dimensions

⟨1⟩ When the mounting surface already meets parallelism and flatness requirements

When the scale mounting surface is finished and meets the parallelism and flatness specifications below, just mount the scale. (For scales of $L < 1050$ mm/41.34", use two M4×10 hex socket head cap screws and two plain washers (large); for scales of $L \geq 1050$ mm/41.34", use three M4×10 hex socket head cap screws and three plain washers (large). Tightening torque: 350 N·cm/35 kgf·cm)

Flatness of A , B surfaces	within 0.1 mm/0.004"
Parallelism of A , B surfaces to machine table movement	

Provide the range shown in Fig. 3-5 for surface **A**. The above tolerances suppose no quick change in the surfaces and no obstacle in the way between the right and left mounting surfaces.

⟨2⟩ When the scale mounting surface is a casting surface

Mount the scale using mounting brackets

(1) When the scale mounting surface is a casting surface and parallelism is not satisfied

Use mounting brackets and adjust so that the parallelism specified in ⟨1⟩ may be satisfied. The mounting brackets need only cover the length of at least the scale feet. However, the brackets must be long enough for the parallelism of the right and left feet of the scale to be measurable.

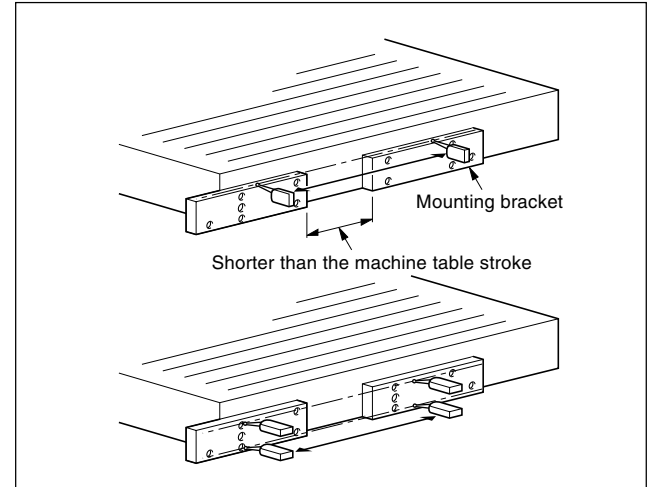


Fig. 3-6 Length of mounting brackets and measurement of their parallelism

(2) Checking of mounting position and tapping

Check that the parallelism for mounting scale meets the specifications, and then tap for M4 screws of 10 mm/0.39" depth referring to the outline drawing on page 45.

(3) Mounting of scale

Mount the scale loosely with M4×10 hex socket head cap screws and plain washers (large), and leave it for 30 minutes for the scale to reach ambient temperature. Then firmly mount the scale.

(4) Measuring parallelism of scale with machine table movement

Place a dial gauge directly where the alignment mark (Fig. 3-7 ① in the figure below) is positioned on the side of the scale, and check that the scale is surely mounted parallel to the machine table movement.

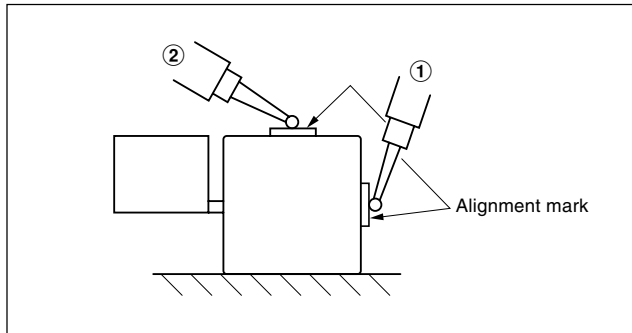


Fig. 3-7 Parallelness check of scale and machine table movement

Adjust the parallelism of the length between the two alignment marks to within 0.08 mm/0.003" and tighten the setscrews. For the scale with a measuring length of 1050 mm/41.3" or more, adjust the parallelisms of the lengths between the alignment mark and those on both sides of it to within 0.08 mm/0.003".



Since alignment marks are not provided on scales with a measuring length of 150 mm/5.9" or less, place the dial gauge on the scale unit and ensure that the allowance at the two ends of the machine travel is within 0.08 mm/0.003".

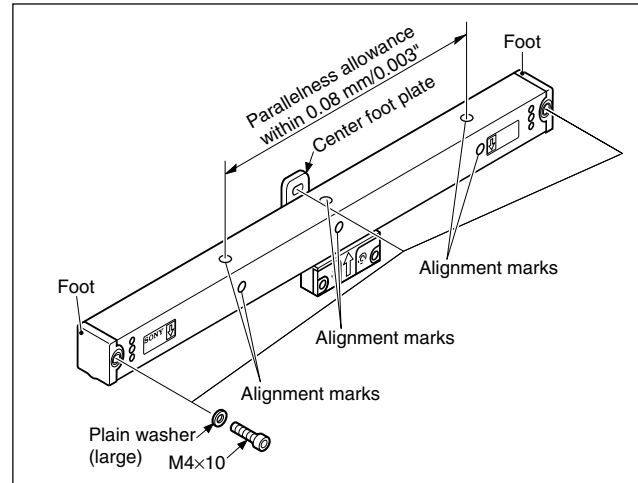


Fig. 3-8 Parallelism check by alignment marks

(5) When the specified parallelism for the scale mounting bracket is not obtained

When parallelism and flatness of the mounting surface are already satisfied

Insert spacers below the feet and make adjustment by placing a dial gauge at ② in Fig. 3-7 to adjust the parallelism to within 0.08 mm/0.03" throughout the length between may be obtained at the alignment marks.

For the scale with a measuring length of more than 1050 mm/41.3", make sure, that the parallelism near the center foot plate is also within 0.08 mm/0.003".

③ Mounting of the slider

(1) When parallelism and flatness of the mounting surface are already satisfied

When the mounting surface is finished and its parallelism and flatness satisfy the specifications below, just mount the slider using two M4×12 hex socket head cap screws and two plain washers (small).

Flatness of C surface	within 0.05 mm/0.02"
Parallelism of C surface to machine table movemen	0.05 mm/60mm (0.002"/2.36")
Parallelism between B and C surfaces	
Clearance between B and C surface	8.7 to 8.8 mm/0.343" to 0.346"

Move the machine table till the mounting surface comes just at the slider. First use the spacers provided to fill the gap between the mounting surface and slider, and then secure the slider. Then remove the screws which fix

slider holder. In this process, be careful not to make the slider and the mounting bracket contact with each other.

【 When the supplied spacers ($t=0.1 \times 5$) are unable to fill the gaps between the mounting surface and the slider 】

Loosen the screws securing the slider portion of the slider holder, press the slider against the scale body, and tighten the bolts in this condition.

(2) When the gap between the B and C surfaces is set to exactly 9 mm

Loosen the screws securing the slider holder and move the slider by hand to align it with the brackets. Then secure the slider at the position of 42 ± 0.2 as shown in Fig. 3-9. Spacers are not required.

Do not attempt to move the bracket side with the slider holder secured, as the brackets may strike the slider.

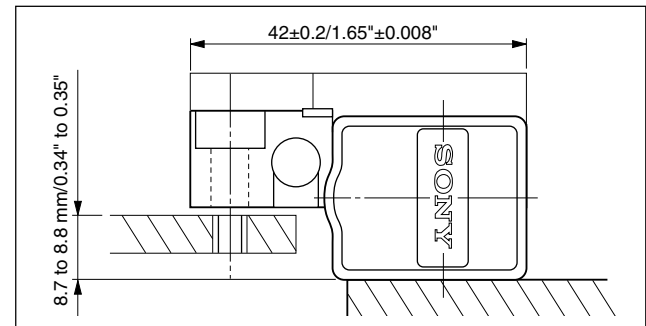


Fig. 3-9

(3) When the slider mounting surface has yet to meet the specifications

When the mounting surface of the machine is a casting surface, use a bracket. Place the bracket on the underside of the slider without loosening the screws that hold the slider holder. Adjust the position of the bracket and mount it with the supplied M4×12 bolts.

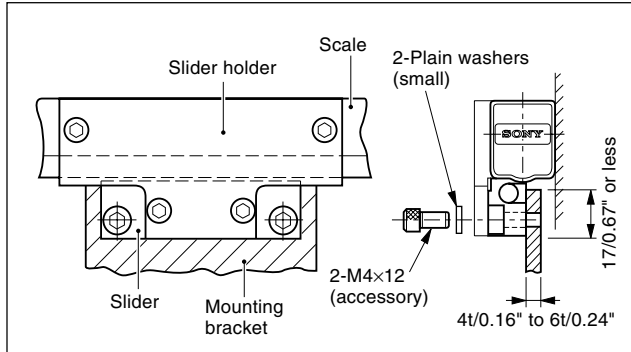


Fig. 3-10

(4) When the bracket is mounted on slider's outer side

Align the mounting bracket with the slider's top surface, and adjust the bracket so that the height from the scale mounting surface is brought to $21 \pm 0.1 \text{ mm}$ ($0.83 \pm 0.004 \text{\"}$). Ensure that the mounting bracket used comes in a shape that accommodates the projecting part of the slider holder. As shown in the figure, secure the slider using two cap screws ($M5 \times 25$ hexagon socket head cap screws) and two nuts (for the $M5$ cap screws).

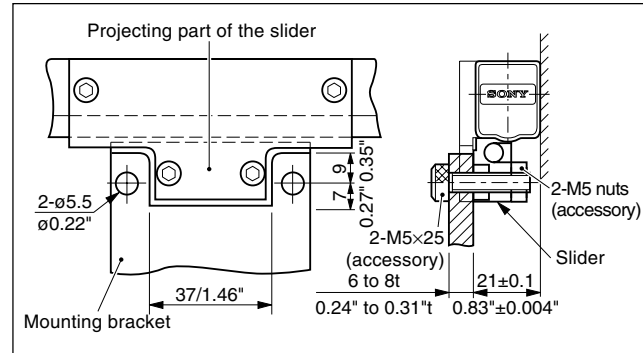


Fig. 3-11



〈4〉 Removal of the slider holder

Remove the four M2.6 mounting screws for the slider holder and then remove the slider holder itself.

- Be sure to adhere the screening label (accessory) to cover the screw holes after removing the slider holder. If these holes are not plugged, chips, cutting oil or dust may enter and the accuracy of the scale may be deteriorated. Use a ball-point pen to enter the mounting date and name of the person responsible on the label.

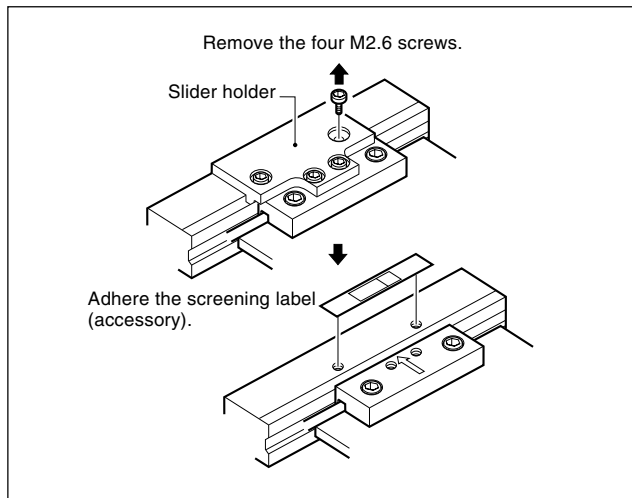


Fig. 3-12 Removal of slider holder

〈5〉 Checking of the operating range

After mounting the scale and slider, be sure to move the machine over the overall length of the scale to check that the machine moves within the measuring length. Remember that the scale may be damaged if the machine moves beyond the movable range of the slider (measuring length + leeway).

〈6〉 Mounting of the headcable

Fix the head cable with cable clamps so that they will not interfere with moving parts of the machine.

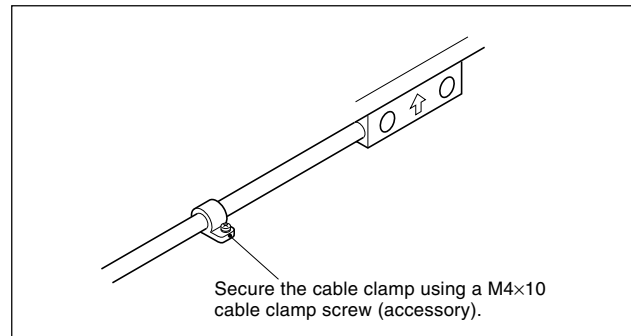


Fig. 3-13

Keep slider holder and four M2.6 screws after the installation.

〈7〉 When using an extension cable

When not using an extension cable, proceed to the next item. The distance between the SR127, SR128 and GB-A series and the connection cable can be extended by using an optional extension cable (CE10 series).

Note

The maximum total cable length when extended is 30 m / 98.4 ft.

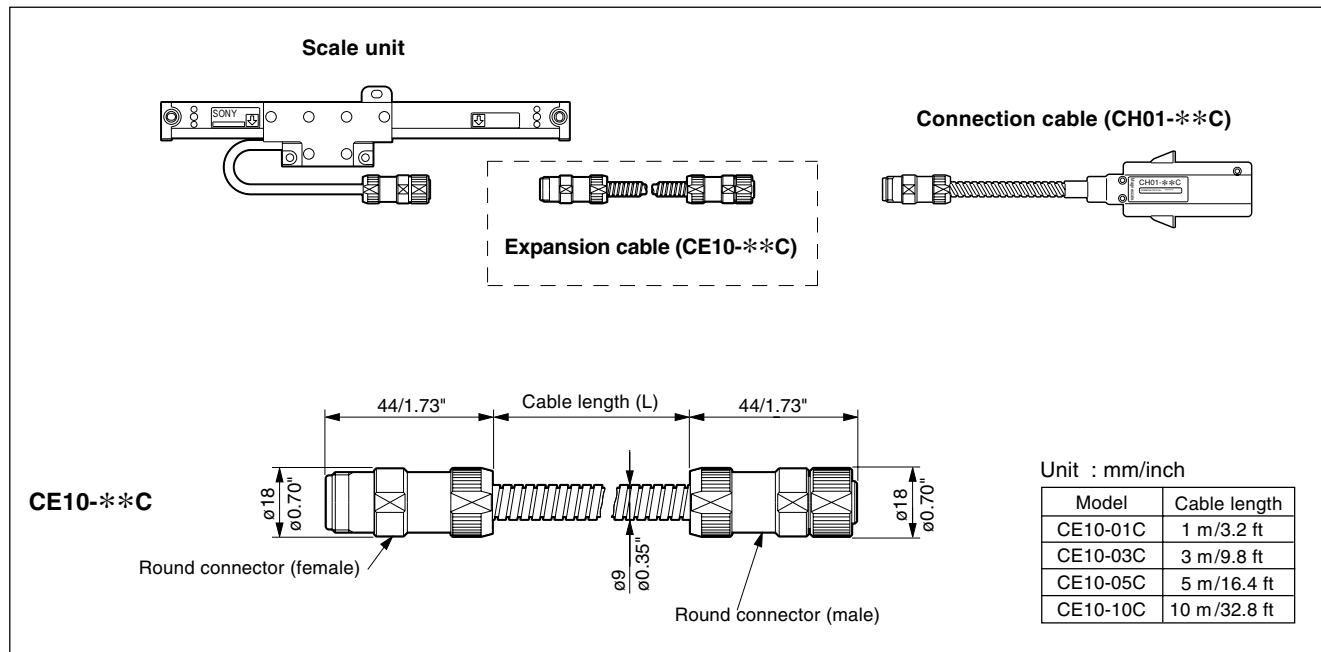


Fig. 3-14

- Connect the round connector (male) on the scale unit side with the round connector (female) on the extension cable side.
- Then connect the round connector (male) on the extension cable side with the round connector (female) on the connection cable side.
- Connect the connectors so that the notches on both ends match. Then rotate the tip (part A - coupling nut) of the round connector (male) on the scale unit side lightly by hand in the direction of arrow ① until it stops. Next, attach wrenches to part A and female connector part B and rotate the coupling nut an additional 3/4 of a revolution to screw it into the female side. The tightening torque at this time should be approximately 150 to 250 N•cm.

- Use a wrench or other tool to tighten the connectors to a torque of 150 to 250 N•cm.
- Do not tighten the connectors by attaching wrenches to parts A and C.
- To disconnect the connectors, attach wrenches to the male connector part A (coupling nut) and part C and rotate the coupling nut in the direction of arrow ②.
- Do not loosen the connectors by attaching wrenches to parts A and B.

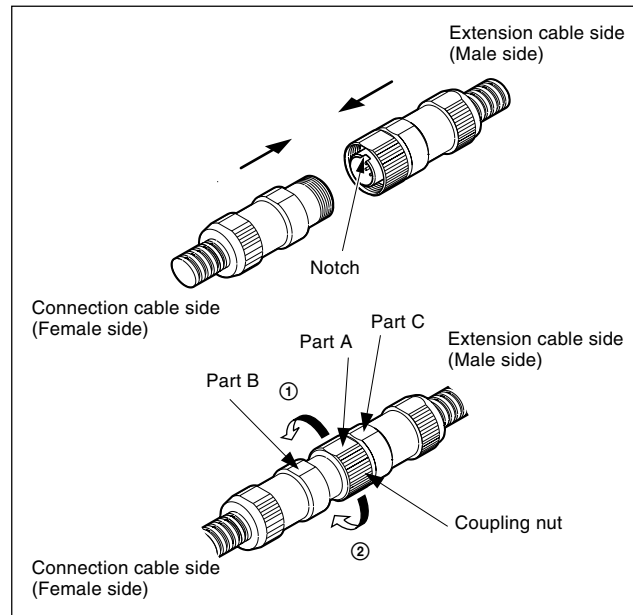


Fig. 3-15

⑧ Connecting the connection cable

- Connect the round connector (male) on the scale unit side with the round connector (female) on the connection cable side.
- For the GB-A series, connect the enclosed connection cable (CH01 series).
- For the SR127/SR128 series, connect an optional connection cable.

- For the GB-A series, be sure to connect the cable so that the serial No. of the scale unit matches the combination No. of the connection cable.
- When the SR127/SR128 series and optional connection cable (CH01 series) are procured together in the electrically adjusted condition, connect the cable so that the serial No. of the scale unit matches the combination No. of the connection cable in the same manner as for the GB-A series.
- When procuring the optional connection cable (CH01 series) separately, be sure to perform the electrical adjustments.

- Connect the connectors so that the notches on both ends match. Then rotate the tip (part A - coupling nut) of the round connector (male) on the scale unit side lightly by hand in the direction of arrow ① until it stops. Next, attach wrenches to part A and female connector part B and rotate the coupling nut an additional 3/4 of a revolution to screw it into the female side. The tightening torque at this time should be approximately 150 to 250 N•cm.

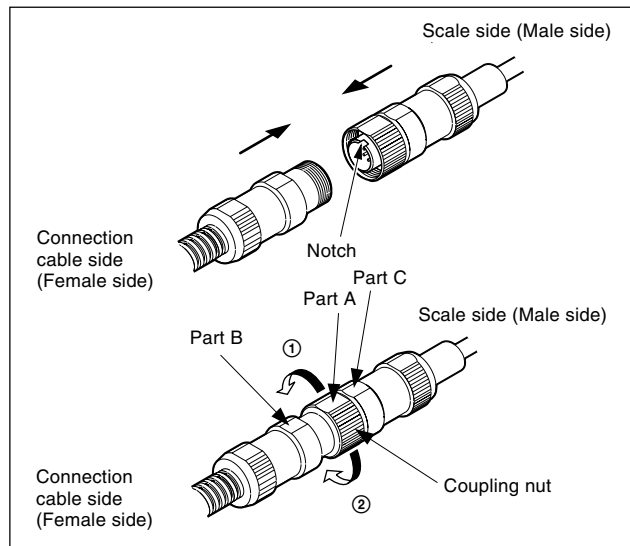


Fig. 3-16

- Use a wrench or other tool to tighten the connectors to a torque of 150 to 250 N•cm.
- Do not tighten the connectors by attaching wrenches to parts A and C.
- To disconnect the connectors, attach wrenches to the male connector part A (coupling nut) and part C and rotate the coupling nut in the direction of arrow ②.
- Do not loosen the connectors by attaching wrenches to parts A and B.

⟨9⟩ Mounting of the conduit cable

Fix the conduit cable with cable clamps so that they will not interfere with moving parts of the machine.



Care should be taken at this time as it may be necessary to provide the cable with some leeway with respect to the machine operation.

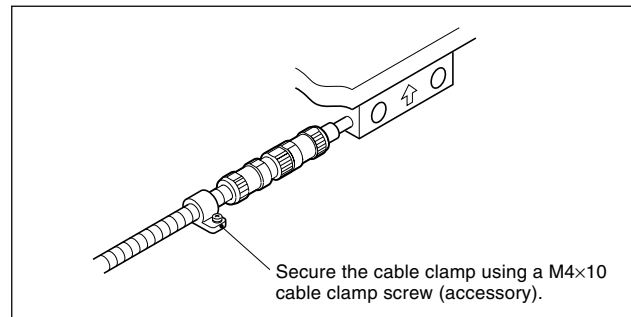
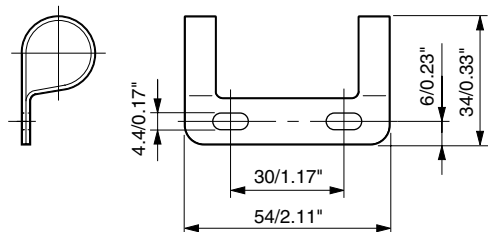


Fig. 3-17

〈10〉 Mounting the round connectors

- ① Secure the connected male and female round connectors with the accessory clamp. Be sure to secure the connectors, as they are dangerous if loose.
- ② Fit the connectors into the open side of the clamp as shown in the figure. Next, tighten the top and bottom edges of the clamp together using the two accessory screws (+B M4×10).
- ③ Tighten the screws firmly until the top and bottom edges of the clamp touch. Then check that the connectors are secured firmly.

Clamp mounting dimensions and outer dimensions



The height dimension after mounting should be the same as the outer diameter of the connectors.

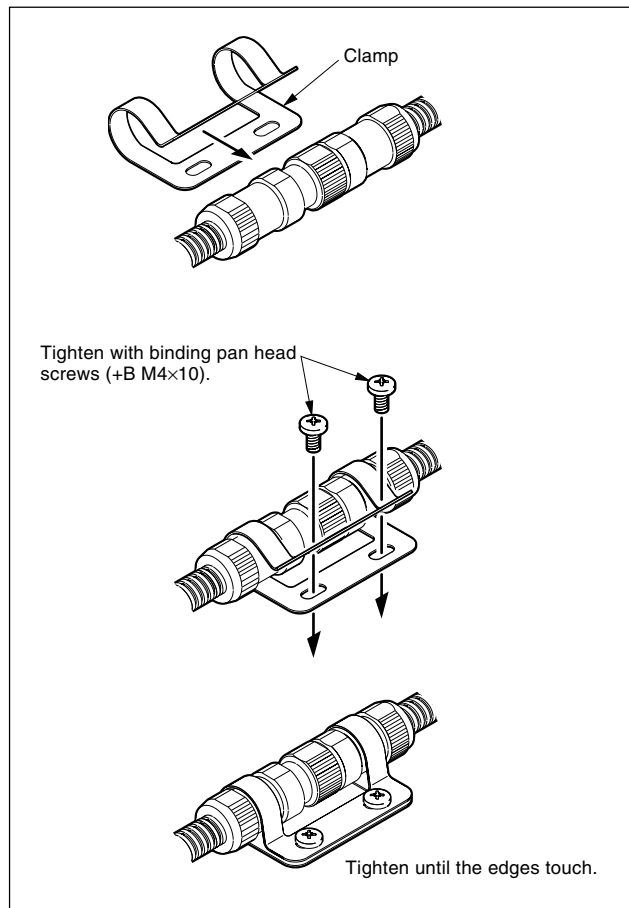


Fig. 3-18

〈11〉 Connection of the head cable and a display unit

When the connection cable must be electrically adjusted for the SR127/SR128 series, see “4. Electrical Adjustment of the Connection Cable Circuit”.

- ① First, remove the screws securing the screening plate and remove the screening plate. (These screws are used later.)
- ② Check that the display unit power is off. Then, making sure the interface unit of the connection cable is facing the proper direction, gently insert the interface unit as far as possible.

Check the scale unit mounting axis and display unit insertion.

Finally, secure the interface unit using the screws which secured the screening plate. (tightening torque: 60 N-cm)

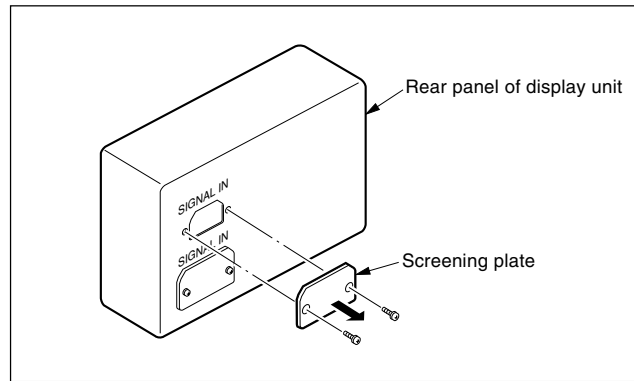


Fig. 3-19

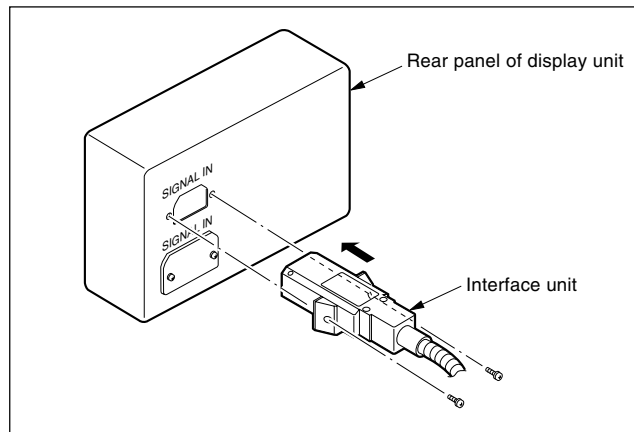


Fig. 3-20

<12> Removal of the scale

When removing a mounted scale from the machine, be sure to secure the slider to the scale with the slider holder. Follow the numerical sequence.

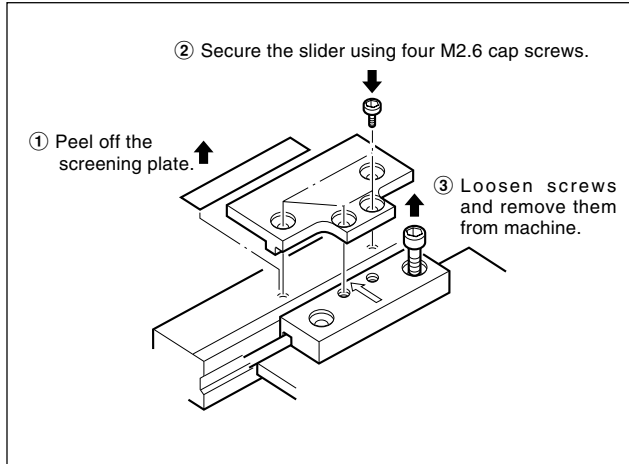


Fig. 3-21

Securing the slider to the scale keeps the alignment of the scale and head after removal from the machine and makes reinstallation easy.

4. Electrical Adjustment of the Connection Cable Circuit

(SR127/SR128 series only)

* The operations described in this section are not required for the GB-A series which are shipped together with the connection cable in the electrically adjusted condition.

When connecting the SR127/SR128 series with a display unit, use a CH01 series (option) connection cable. The connection cable must be electrically adjusted together with the used scale unit. Perform this adjustment according to the procedures outlined below. Electrical adjustment is performed in order to optimize the PM (Phase Modulation) signal from the scale. Therefore, if the adjustment is not performed as specified, the scale accuracy specifications will not be satisfied.

When the scale unit and display unit connection cable (CH01 series) are ordered together, they are shipped in the adjusted condition so no adjustment is necessary. Connect the scale and cable so that the serial No. on the scale side matches the combination No. on the connection cable side.

Required items

- Oscilloscope
(Sensitivity : 0.01 V or more,
frequency bandwidth : 1 MHz or more)
Input sensitivity : AC0.1 V/div (1 using a 10 : 1 probe)
Horizontal axis sweep : 50 ms/div to 0.5 ms/div
Trigger source : INT
Trigger mode : AUTO
- Standard screwdriver (for rotating the trimmer)
- Phillips screwdriver
(for removing and mounting the upper case)

⟨1⟩ Removing the upper case

Remove the three M2.6 screws mounting the upper case of the head amplifier unit and remove the upper case. Take care not to lose the nuts at this time.

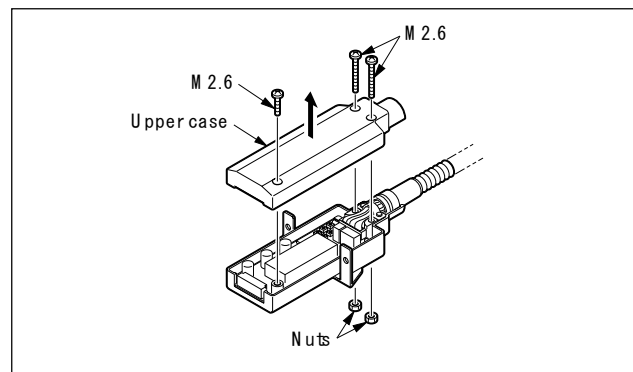


Fig. 4-1

(2) Circuit board

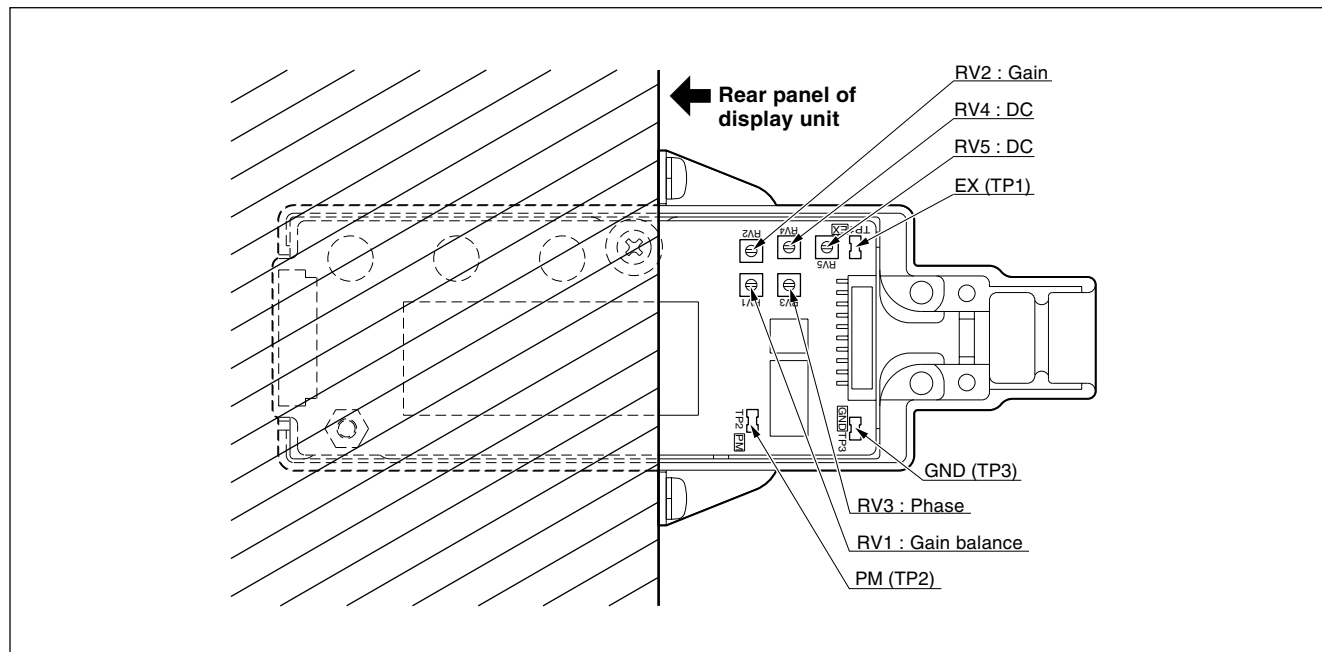


Fig. 4-2

〈3〉 Mounting the display unit

Remove the screws securing the screening plate on the rear panel of the display unit and remove the screening plate. (These screws are used later.) Check that the display unit power is off, then gently insert the interface unit of the connection cable as far as possible as shown in the figure. Next, secure the interface unit using the screws which secured the screening plate.

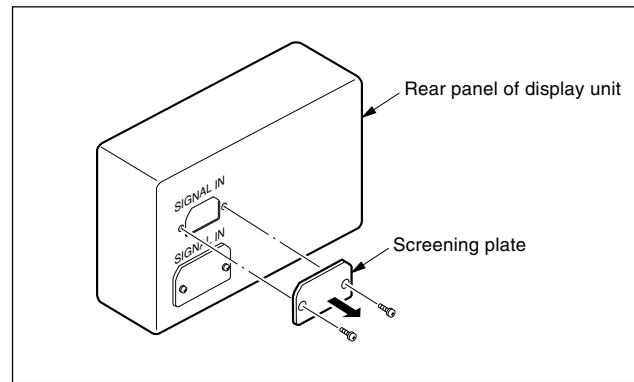


Fig. 4-3

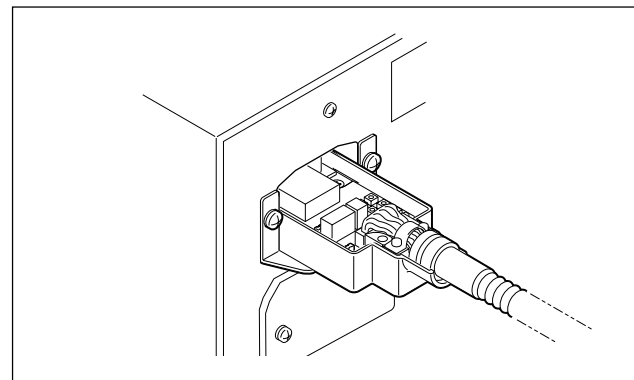


Fig. 4-4

⟨4⟩ Electrical adjustment

- ① Insert the preamplifier into the counter and turn on the counter.
- ② Connect an oscilloscope probe to the PM terminal on the preamplifier board and an earth clip to the connector receptacle screw. (Fig. 4-5)
- ③ Set the oscilloscope to 0.5 V/div, 5 ms/div and reset the (TIME/div) while moving the scale at a speed of 1 to 10 m/min so that the waveform shown in Fig. 4-6 can be observed.

* Adjust the PM waveform ripple (c/d) over the entire effective length of the scale.

Adjust so that $(c/d) \leq 0.04$ (SR127 series), $(c/d) \leq 0.05$ (SR128 series). Proceed to steps ① to ⑥.

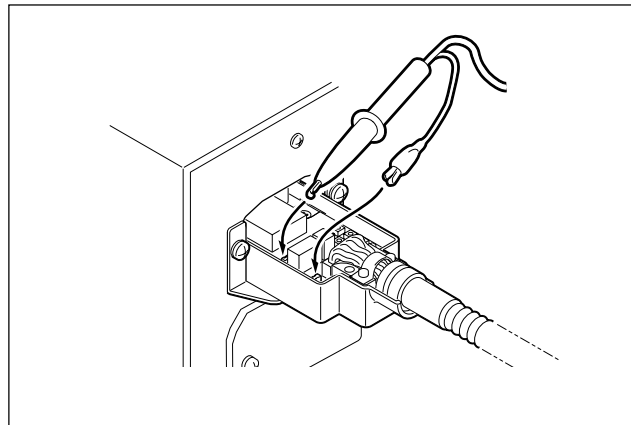


Fig. 4-5

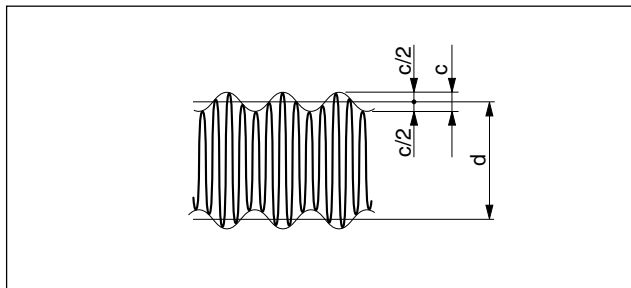


Fig. 4-6

Perform the electrical adjustment while moving the scale.

【Reference】 Trigger

When using a 2-channel oscilloscope with two probes, the trigger can be applied easily by connecting the open probe to the EX terminal on the board and the ground clip to the GND terminal. Therefore, this method is recommended.

- ① Prepare the oscilloscope by setting the input coupled switching to AC with a horizontal sweep axis of $10\ \mu\text{s}/\text{div}$ and a vertical axis of $0.5\ \text{V}/\text{div}$, and connecting CH1 to the PM terminal. At this time, the trigger source should be taken from INT CH1.
- ② A sine wave appears in CH1. The phase of this sine wave moves in accordance with the scale movement, allowing the envelope ripple to be observed. First rotate the RV2 volume to set the sine wave amplitude to approximately $2\ \text{V}_p\text{-p}$. (This is called the gain adjustment.)
- ③ When the RV1 volume is rotated completely to the right (clockwise) and the scale is moved, the waveform shown in Fig. 4-7 appears. At this point, adjust the RV4 volume so that neighboring peaks are of the same height as shown in Fig. 4-8 (This is called the DC balance adjustment.) If the minimum PM signal amplitude falls to $0.5\ \text{V}_p\text{-p}$ or less, the alarm function may operate.

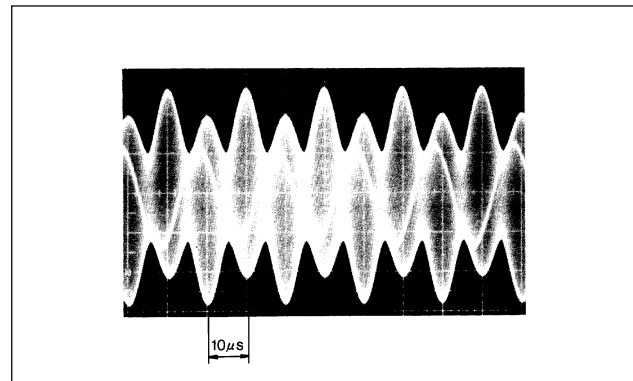


Fig. 4-7

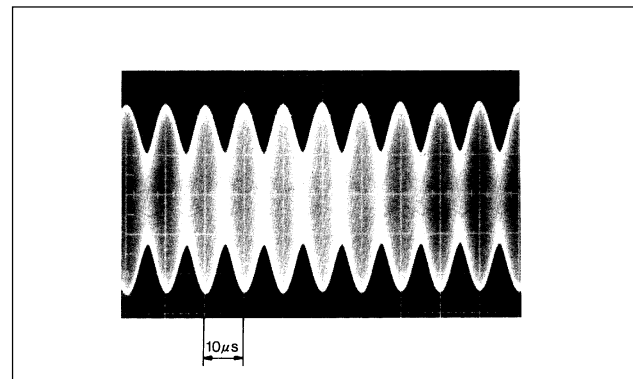


Fig. 4-8

- ④ When the RV1 volume is rotated completely to the left (counter-clockwise) and the scale is moved, the waveform shown in Fig. 4-7 appears as in step ③ above. At this point, adjust the RV5 volume so that neighboring peaks are of the same height as shown in Fig. 4-8.

Repeat the adjustments in steps ③ and ④ alternately until the height of neighboring peaks are not disturbed by rotating the RV1 volume.

- ⑤ When the RV1 volume is set near the center and the scale is moved, the waveform shown in Fig. 4-9 appears. At this point, adjust the RV3 volume to minimize the envelope ripple. Then, finely adjust the RV1 volume to minimize the envelope ripple.

Here, the fine adjustment can be facilitated by raising the oscilloscope sensitivity (50 to 100 mV/div), adjusting the vertical position, and enlarging the envelope ripple in the center of the screen before adjusting the volume.

- ⑥ Adjust the RV2 volume again so that the sine wave amplitude is between 1.9 Vp-p and 2.1 Vp-p as shown in Fig. 4-10. Fig. 4-10 shows the ideally adjusted condition.

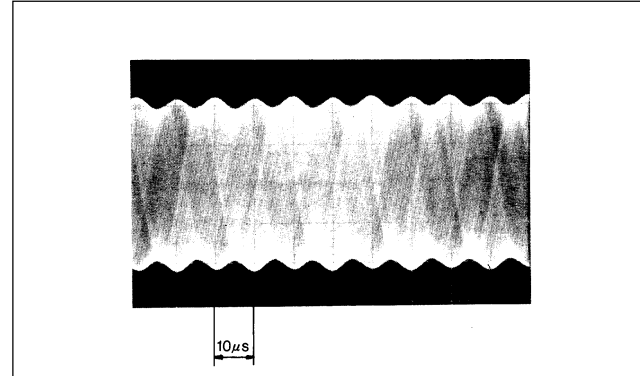


Fig. 4-9

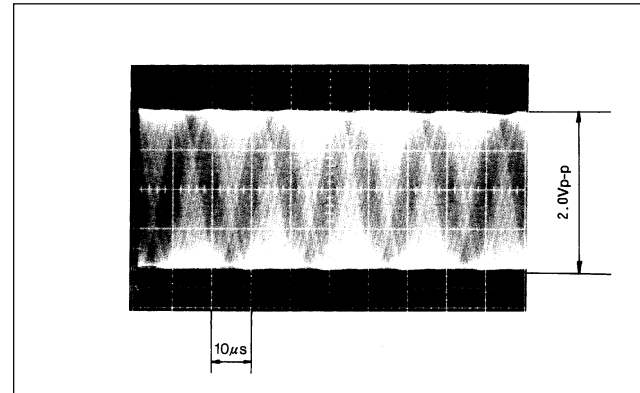


Fig. 4-10

〈5〉 Mounting the upper case

Remove the two screws mounting the head amplifier unit and remove the head amplifier unit from the display unit. Mount the previously removed upper case using the removed screws and nuts.

Check that there are no gaps between the upper and lower cases.

Return to “3. Mounting Method 〈11〉” and reconnect the head amplifier unit to the display unit.

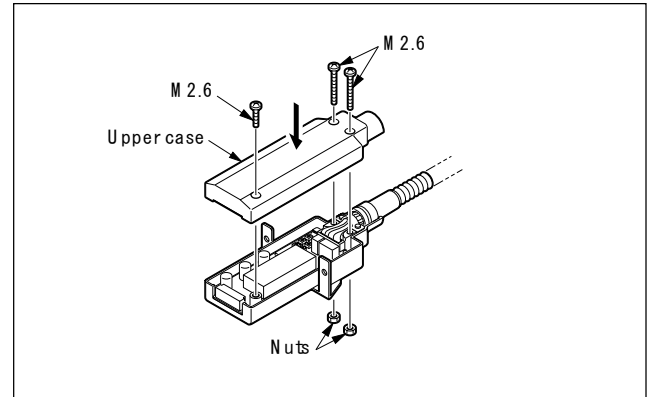


Fig. 4-11

5-1. General Specifications

Scale unit

Measuring length	: 50/1.9", 100/3.9", 150/5.9", 200/7.8", 250/9.8", 300/11.8", 350/13.7", 400/15.7", 450/17.7", 500/19.6", 550/21.6", 600/23.6", 650/25.5", 750/29.5", 850/33.4", 950/37.4", 1050/41.3", 1250/49.2", 1400/55.1", 1600/62.9", 1850/72.8", 2050/80.7", 2200/86.6" (SR127 series: up to 1250/49.2")
Overall length	: Measuring length+104 mm/4.1" (Measuring length 200 mm/7.8" or less) Measuring length+120 mm/4.72" (Measuring length 250 mm/9.8" or more)
Maximum travel	: Measuring length+14 mm/0.55" (Measuring length 200 mm/7.8" or less, 7 mm/0.275" each at right and left) Measuring length+30 mm/1.2" (Measuring length 250 mm/9.8" or more, 15 mm/0.6" each at right and left)

Scale accuracy (at 20 °C/68°F)	: (SR128 series) Metric : $\pm(0.0025+0.0025\times\text{measuring length in meters})$ mm Inch : $\pm(0.0001+0.0000025\times\text{measuring length in inches})$ inch (SR127 series) : Metric : $\pm(0.0015+0.0015\times\text{measuring length in meters})$ mm Inch : $\pm(0.00006+0.0000015\times\text{measuring length in inches})$ inch
--	---

Cable length : Max. 30 m/98.4 ft

Parallelism : 0.1 mm/0.004"

Thermal expansion coefficient :
(11 ± 1) $\times 10^{-6}/^{\circ}\text{C}$

Operating temperature :
0 to 40°C/32 to 104°F

Storage temperature :
-10 to +50°C/14 to 122°F

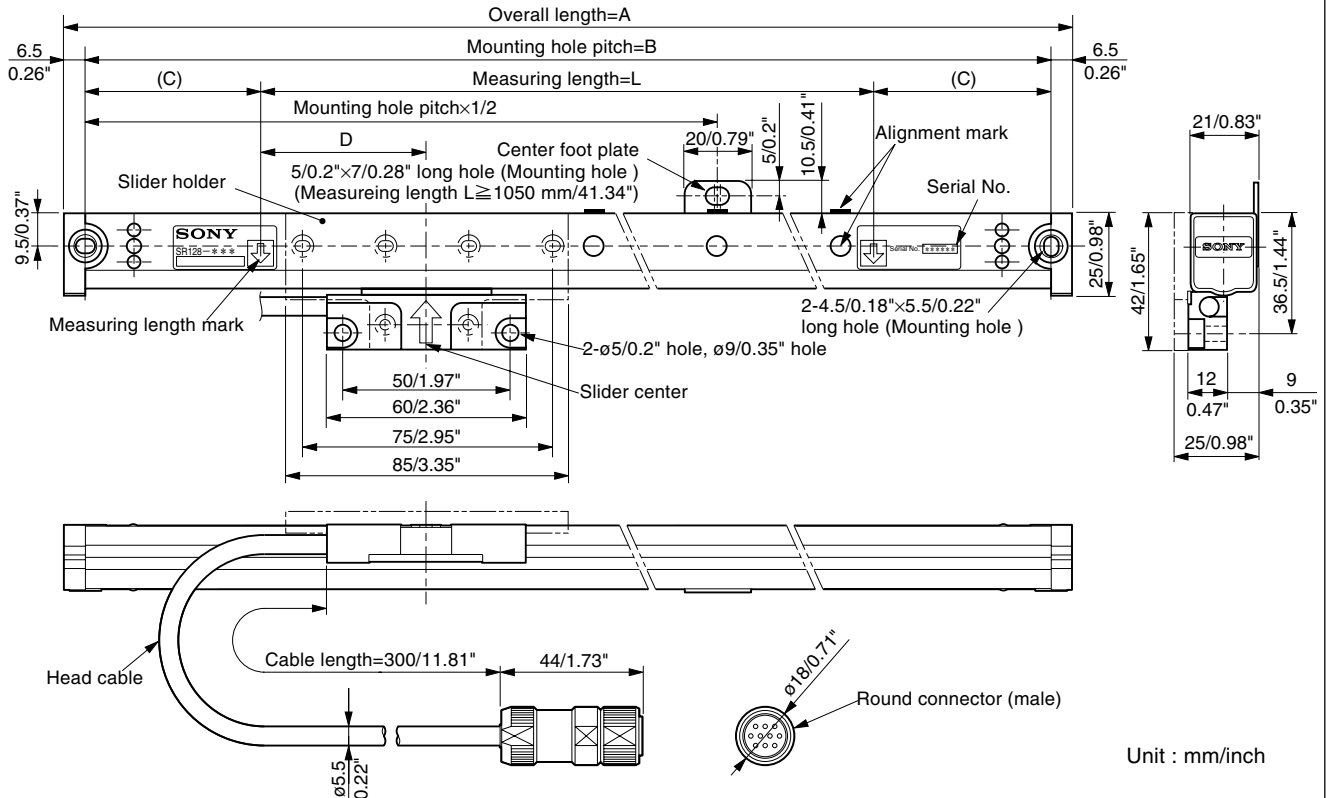
Connection cable (CH01: included only with the GB-A series)

Cable length	: 3 m/9.8 ft (GB-5A to GB-85A) 5 m/16.4 ft (GB-95A to GB-185A) 10 m/32.8 ft (GB-205A to GB-220A)
---------------------	--

Design and specifications are subject to change without notice.

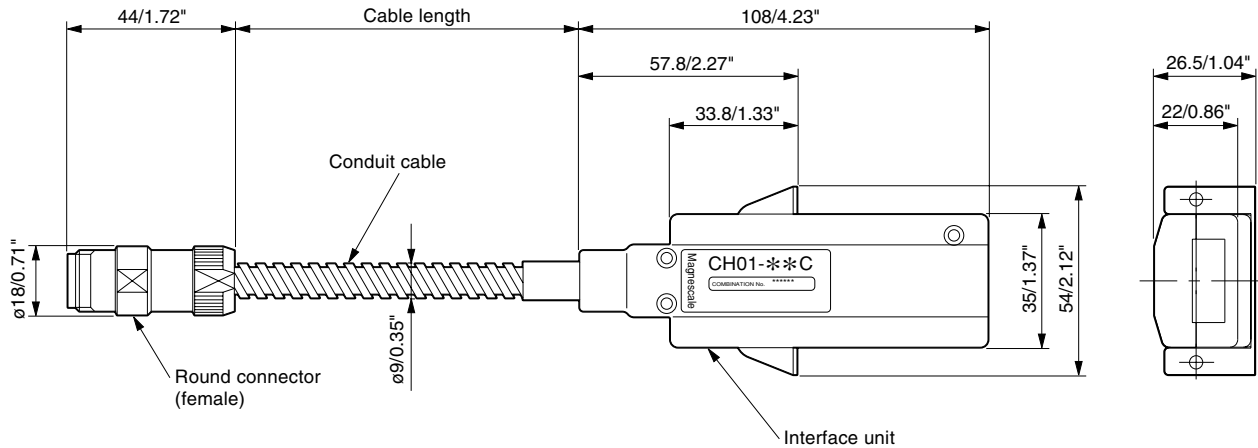
5-2. Dimensions

Scale unit



Unit : mm/inch

Connection cable (CH01 : included only with the GB-Aseries)



Unit : mm/inch

Model name		Measuring length (L)	Overall length (A)	Mounting hole pitch (B)	C	D
GB-5A / SR128-005	SR127-005	50 mm/1.9"	Measuring length + 104 mm/4.1"	Measuring length + 91 mm/3.6"	45.5 mm/1.8"	Measuring length×1/2
GB-10A / SR128-010	SR127-010	100 mm/3.9"				
GB-15A / SR128-015	SR127-015	150 mm/5.9"				
GB-20A / SR128-020	SR127-020	200 mm/7.8"				
GB-25A / SR128-025	SR127-025	250 mm/9.8"	Measuring length + 120 mm/4.7"	Measuring length + 107 mm/4.2"	53.5 mm/2.1"	50 mm/2"
GB-30A / SR128-030	SR127-030	300 mm/11.8"				
GB-35A / SR128-035	SR127-035	350 mm/13.7"				
GB-40A / SR128-040	SR127-040	400 mm/15.7"				
GB-45A / SR128-045	SR127-045	450 mm/17.7"				
GB-50A / SR128-050	SR127-050	500 mm/19.6"				
GB-55A / SR128-055	SR127-055	550 mm/21.6"				
GB-60A / SR128-060	SR127-060	600 mm/23.6"				
GB-65A / SR128-065	SR127-065	650 mm/25.5"				
GB-75A / SR128-075	SR127-075	750 mm/29.5"				
GB-85A / SR128-085	SR127-085	850 mm/33.4"				
GB-95A / SR128-095	SR127-095	950 mm/37.4"				
GB-105A / SR128-105	SR127-105	1050 mm/41.3"				
GB-125A / SR128-125	SR127-125	1250 mm/49.2"				
GB-140A / SR128-140		1400 mm/55.1"				
GB-160A / SR128-160		1600 mm/62.9"				
GB-185A / SR128-185		1850 mm/72.8"				
GB-205A / SR128-205		2050 mm/80.7"				
GB-220A / SR128-220		2200 mm/88.6"				

6. Trouble Information

- When the overrun cable becomes damaged, the scale unit becomes deformed or other situations arise which may affect scale performance, the unit must be repaired.
 - In these case, stop the machine immediately and consult your Sony Manufacturing Systems Corporation distributor.

- The scale unit may not be repairable, depending on the extent of the damage.

Regular cleaning is recommended in order to prevent these types of trouble beforehand.

- Clean away any cutting scraps at the start and finish of work each day to prevent cutting scraps from accumulating around the scale.
- Accumulated cutting scraps may impede the sliding motion of the scale and result in malfunction.
- Avoid using an air gun or similar device to clean away the cutting scraps. Although the running portions of the scale unit are sealed, the scale unit does not have a completely sealed structure. If an air gun or similar device is used, cutting scraps and other objects may enter the sealed portions of the scale and result in malfunction.

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