

SONY®

スケールユニット / Scale Unit / Skaleneinheit

SR118 Series

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マグネスケール® / Magnescale®

取扱説明書 / Instruction Manual / Bedienungsanleitung
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[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.

■ 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、本取扱説明書に記載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。
- 仕様に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。
- 当社製品をほかの機器と組み合わせてご使用になる場合は、使用条件、環境などにより、その機能および性能が満足されない場合がありますので、十分ご検討の上ご使用ください。

■ General precautions

When using Sony Precision Technology Inc. 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 Precision Technology Inc. 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.

[For EU and EFTA countries]

CE Notice

Marking 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.

- EN55011(CISPR11 Group 1 Class A) : "Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment"
- EN50082-2 : "Electromagnetic compatibility-Generic immunity standard Part 2 : Industry"

IEC1000-4-2 : "Electromagnetic compatibility for industrial-process measurement and control equipment Parts2:Electrostatic discharge requirements"

Test level 2 : contact discharge,indirect discharge

Test level 3 : air discharge

Severity level: Temporary degradation or loss of function or performance which requires operator intervention or system reset.

ENV 50140 : "Electromagnetic compatibility,Basic immunity standard,Radiated radio-frequency electromagnetic field,Immunity test"

Test level 2 : test field strength

Severity level : Temporary degradation or loss of function or performance which requires operator intervention or system reset.

IEC1000-4-4 : "Electromagnetic compatibility for industrial-process measurement and control equipment Parts4:Electrostatic fast transient/burst requirements"

Test level 3

Severity level : Temporary degradation or loss of function or performance which requires operator intervention or system reset.

Warning

When using this device with equipment governed by Machine Directives EN60204-1, measures should be taken to ensure conformance with those directives.

Safety Precautions

Sony Magnescale 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.

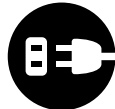


- Do not disassemble or modify the unit as this may result in injury or damage the internal circuits.

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.

Note

- 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. The scale unit should be used within an ambient temperature range of 0 to 40°C. Avoid use in places exposed to direct sunlight or hot winds or near heating equipment.
2. The scale unit does not have a oil-proof or waterproof structure. Therefore, avoid use in places exposed to cutting scraps, cutting oil or machine oil.
3. Avoid use in places subject to strong vibrations or impacts.
4. If there is the chance that the scale unit may come into contact with cut or measured objects, tools or jigs, be sure to protect the unit with a sufficiently strong cover.

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1. Outline

1-1. Introduction

The SR118 series are linear magnescale units with the scale detector built into an extremely small housing. The cross sectional area of the unit in the sliding direction is only 8.2×12.7 mm (0.322×0.5 in) including the mounting head and slider. This allows the unit to be mounted on compact stages, microscopes, precision actuators and other objects which have extremely limited mounting space.

1-2. Major Features

Compact scale unit

- Compact cross sectional shape
- Short total length

High precision

The following precisions can be obtained depending on the effective length.

- When the effective length is 15 (0.591) to 60 (2.36) mm (in) : 4 μ m
- When the effective length is 100 (3.93) to 160 (6.30) mm (in) : 5 μ m
- When the effective length is 210 (8.27) to 260 (10.24) mm (in) : 6 μ m

Note

The above precision assurances are based on a traceability system. (Measuring temperature)

Easy installation

The scale unit is easily mounted with four screws.

Note

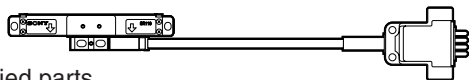
The allowable parallelism for the mounted surface is 0.1 mm (0.004 in) or less.

Lightweight

The SR118-015 (effective length 15 mm [0.59 in]) achieves the lightest weight possible of only 40 g (0.088 lb).

1-3. Parts Configuration

Scale unit 1



Supplied parts

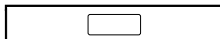
+PS 2×4 2



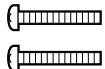
+PS 2×8 2



Blindfold label 1



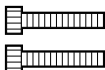
+P3×16 2



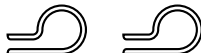
Wiring clamps (small) .. 2



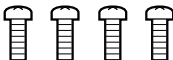
HSB4×16 2



Wiring clamps (large) .. 2

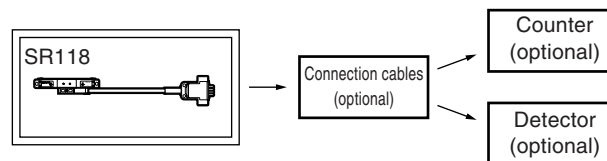


+B4×8 4



1-4. System Configuration

System connections

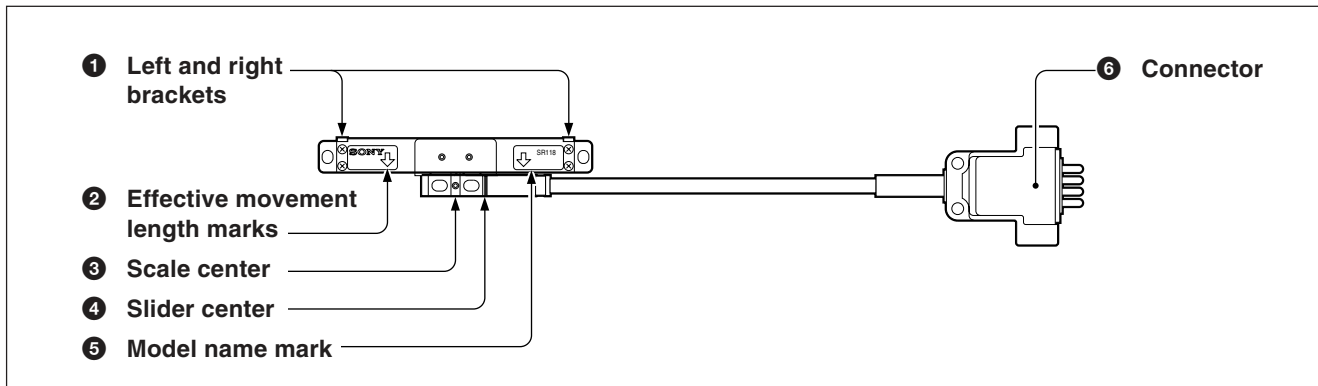


Model lineup

Model name	Effective length	Lead cable length
SR118-015	15 mm (0.591 in)	300 mm (11.81 in)
SR118-030	30 mm (1.18 in)	300 mm (11.81 in)
SR118-060	60 mm (2.36 in)	300 mm (11.81 in)
SR118-100	100 mm (3.93 in)	300 mm (11.81 in)
SR118-130	130 mm (5.12 in)	300 mm (11.81 in)
SR118-160	160 mm (6.30 in)	300 mm (11.81 in)
SR118-210	210 mm (8.27 in)	300 mm (11.81 in)
SR118-260	260 mm (10.24 in)	300 mm (11.81 in)

2. Part Names and Functions

2-1. Flat Surface



1 Left and right brackets

These parts support the scale rods and comprise the scale. The positions indicated in the figure serve as the reference surfaces when mounting the unit.

2 Effective movement length marks

These marks indicate the effective movement range standards for the slider with respect to the scale center. Care should be taken to mount the scale unit properly so that it is not able to move outside of this range.

Note

Using the scale unit in excess of the effective movement range may damage the unit.

3 Scale center

This indicates the center of the slider with respect to the scale.

4 Slider center

This indicates the mechanical center of the slider. It is also the position for viewing the relationship with the effective movement length marks of the slider.

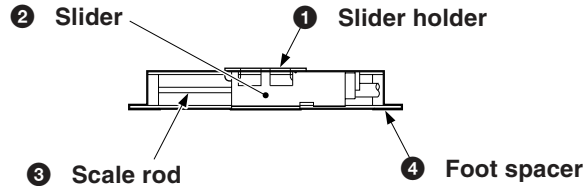
5 Model name mark

The model name for this series is inscribed on the scale unit. See “1-4. System Configuration” for the model lineup.

6 Connector

This is used to connect the scale unit with a counter unit. The connector should be a M2-7P connector (Hirose Co.) or equivalent connector.

2-2. Side Surface



1 Slider holder

This secures the scale and slider. Save this holder for future use after mounting.

2 Slider

The slider is comprised of a detection head and lead cables. Take care not to place excessive force or tension on the slider when mounting the unit as this may damage the slider.

3 Scale rod

This rod is made from a special magnetic alloy and serves as the magnescale reference.

Note

Take care not to touch or scratch the scale rod with tools or other objects when mounting the unit. Also, be sure to keep the scale rod away from magnets and sources of electromagnetic waves.

4 Foot spacer

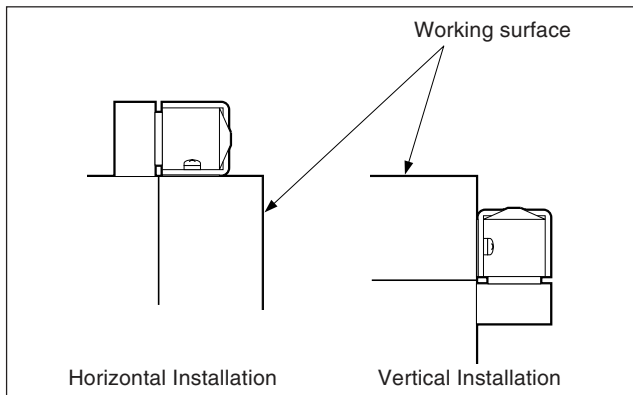
This serves as the mounting and mounted surfaces when mounting the scale. The mounting surfaces should have a parallelism of 0.1 mm (0.004 in) or less.

3. Mounting Method

3-1. Mounting Precautions

3-1-1. Checking the mounting method

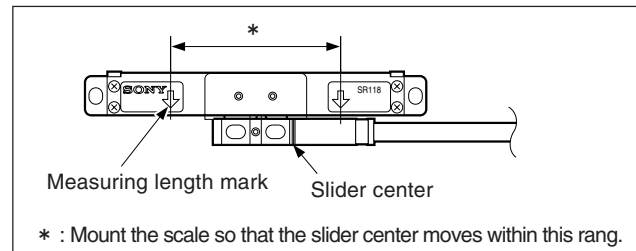
Check that the scale unit can be mounted in the relative position shown in the figure.



Note

When mounting the scale unit to a machine tool or other device, mount the unit so that the slider reaches the side opposite the cut object (work side).

3-1-2. Setting the operating range



1. The effective movement length marks ↓ on both ends of the top of the scale indicate the effective length.
2. Check the service length (maximum movement length) of the device (X-Y stage, etc.) to which the scale unit is to be mounted.

Note

Care should be taken as the service length (maximum movement length) of the X-Y stage or other device may be greater than the operating range indicated in the catalog.

3. Set the scale unit position so that the slider center is inside the effective movement marks.

4. The scale unit has the following movement margins

Model name	Effective length	Left side movement margin	Right side movement margin
SR118-015 to 060	15 to 60 mm (0.59 to 2.36 in)	0.3 mm (0.011 in)	0.3 mm (0.011 in)
SR118-100 to 130	100 to 130 mm (3.93 to 5.12 in)	2 mm (0.098 in)	5 mm (0.197 in)
SR118-160 to 260	160 to 260 mm (6.30 to 10.24 in)	4.5 mm (0.177 in)	7.5 mm (0.295 in)

Note

Moving the slider in excess of the above moving margins may damage the scale unit. Therefore, be sure to use the slider within the range indicated by the effective movement marks on the unit.

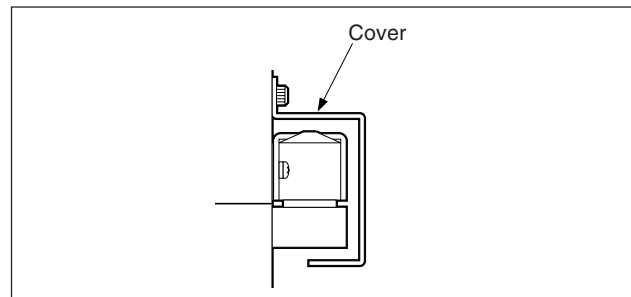
5. Items exceeding the effective movement length of the scale unit require mechanical limiting mechanisms (stoppers, etc.). In these cases, be sure to implement the necessary measures before mounting the scale unit.

3-1-3. Protecting the cable connectors

1. Lead cables with connectors are attached to the slider of the scale unit.
2. Do not pull strongly on or repeatedly bend these lead cables as this may sever the cables and result in malfunctions.
3. The lead cables should be supported in accordance with the movement conditions in order to avoid damaging the cables or connectors.

3-1-4. Mounting the scale cover

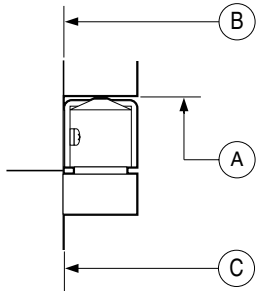
If there is the chance that the scale unit may come into contact with cut or measured objects, tools or jigs, the unit should be protected with a sufficiently strong cover as shown in the figure below in order to maintain the scale unit's performance.



3-2. Mounting Preparations

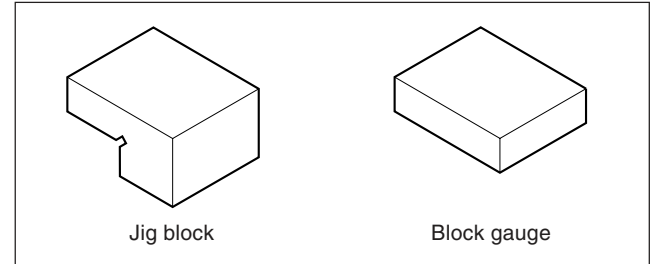
3-2-1. Before designing the mounts

If the mounting surfaces of the scale unit are machined surfaces which satisfy the parallelism requirement noted below, the scale unit may be mounted as is.



The parallelism of surfaces A, B and C with respect to the linear movement axis (the slide reference axis of the linear guide, etc.) should be 0.1 mm (0.004 in) or less.

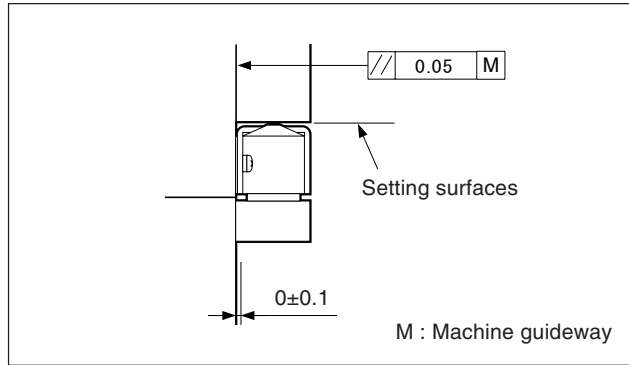
Surface A in the figure above is the setting surface. If a surface A cannot be secured, a special jig or block should be prepared beforehand in accordance with the mounting conditions. (See the figure below.)



Mounting the scale unit improperly may shorten the service life or result in poor performance. The mounting surfaces and mounting tools should be designed according to the following procedures.

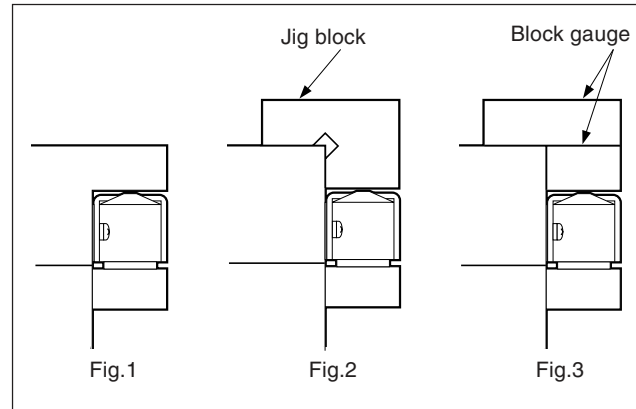
3-2-2. Designing the flatness and parallelism of the mounting surfaces

1. The mounting surfaces of the scale unit should be machined surfaces with a roughness of 25 S or less.

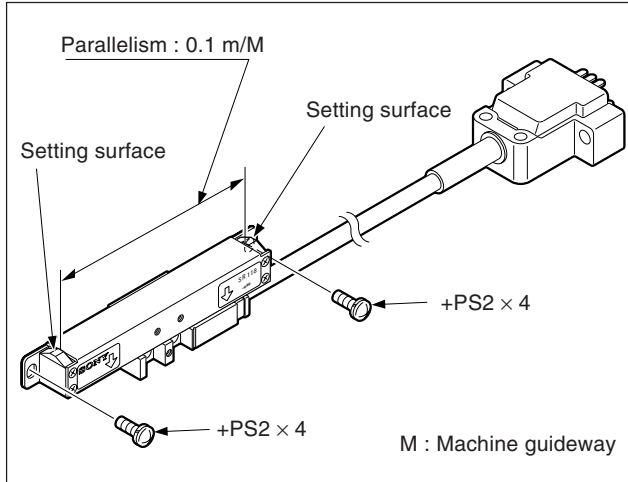


2. The setting surfaces on the machine side should be set so that both the straightness of the linear guides of the machine's sliding stage and the parallelism with the setting surfaces provided on the brackets at both ends of the scale unit are 0.1 mm (0.004 in) or less.

3. The setting surfaces can be provided as follows.
 - Machining a setting surface on the machine side beforehand
 - Preparing a jig or block as shown in the figure
 - Using a standard block gauge
 - Using a dial gauge or other measuring instrument(See the figures below.)

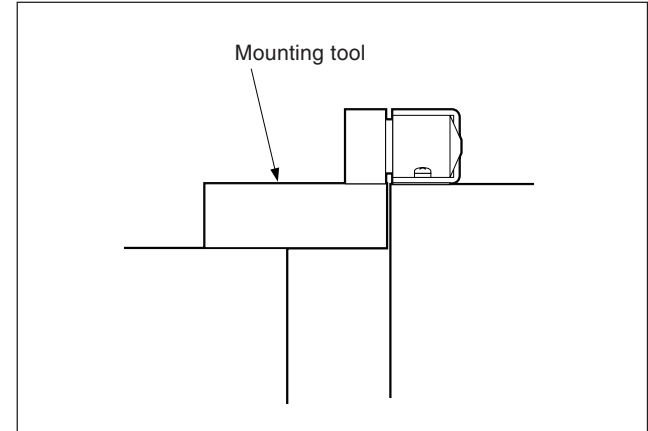


4. When using a dial gauge or other measuring instrument, measure the setting surfaces provided on the brackets at both ends of the scale unit as shown in the figure and mount the scale unit so that the parallelism is 0.1 mm (0.004 in) or less when the sliding stage and other parts are moved.



3-2-3. Designing the mounting tool

Except for when the slider side of the scale unit is designed for direct mounting, a mounting tool must be prepared. Design a mounting tool with sufficient rigidity to prevent deformation as shown in the figure below.



Like the scale unit, the mounting surfaces of the mounting tool should be designed with a roughness of 25 S or less and a parallelism of 0.1 mm (0.004 in) or less.

3-2-4. Preparing the parts and tools

The following parts should be prepared when mounting the scale unit.

Supplied parts

- Screw 1 +PS2 × 4 2
- Screw 2 +PS2 × 8 2
- Screw 3 +P3 × 16 2
- Screw 4 HSB4 × 16 2
- Screw 5 +B4 × 8 4
- Blindfold label 1
- Wiring clamp (small) 2
- Wiring clamp (large) 2

Items to be provided by the customer

- Phillips screwdriver No. 2
- Drill rod $\varnothing 1.6$ (for M2 prepared holes)
- Drill rod $\varnothing 3.4$ (for M4 prepared holes)
- Tap For M2 and M4
- Drill press or electric drill
- Liner spacer t 0.05 to 0.2 mm (t 0.002 to 0.008 in)
- “L” wrench Opposite side 3 mm (0.118 in) (for M4)

3-3. Mounting Procedures

Note

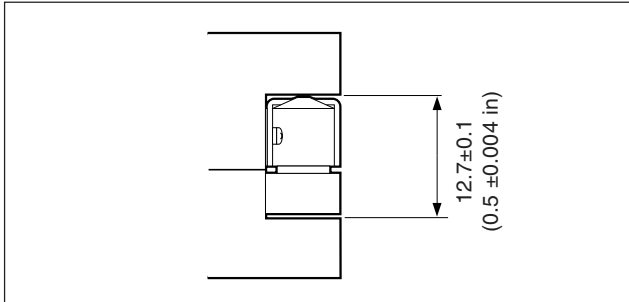
- This section describes the procedures for mounting the scale unit.
- Absolutely do not disassemble the following parts while mounting the scale unit as this may result in malfunction.

(Locations where disassembly is prohibited)

- Slider components and electrical parts
- Connectors
- Scale unit (scale and brackets)

- The scale unit is comprised of precision instruments, so applying excessive force will adversely affect the unit's precision and service life. Care should be taken not to apply excessive force to the scale unit while mounting the unit.
- Be sure to support the scale unit and slider when carrying the scale unit. Do not carry the scale unit by the cables or connectors, etc.

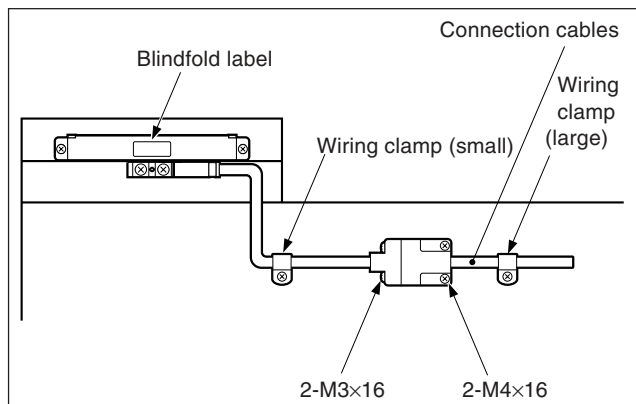
1. Check the mounting surfaces of the scale unit and slider.
 - Check that the mounting surfaces are machined surfaces with a roughness of 25 S or more.
 - The mounting surfaces of the scale unit and slider should be planar (maximum difference 0.1 mm [0.004 in]).
 - When providing the setting surfaces on the machine, check that the parallelism between the machine guide M and the setting surfaces is 0.1 mm (0.004 in)/M or less. Also check that the gap between the scale unit and slider setting surfaces is 12.7 ± 0.1 mm (0.5 ± 0.004 in).



2. Provisionally secure the scale unit and slider.
 - Move the operating parts of the machine so that the mounting surface of the slider comes roughly below the center of the stroke. Then provisionally secure the scale unit using the supplied +PS2 \times 4 screws and the slider using the +PS2 \times 8 screws.
 - Next, loosen the three mounting screws attached to the scale unit.

3. Lock the scale unit.
 - When setting surfaces are provided, press the scale unit against the setting surfaces of the machine and then tighten the screws with a tightening torque of 0.15 N•m (1.5 kgf•cm).
 - If there are no setting surfaces, position the setting surfaces on both ends of the scale unit so that they are parallel to within 0.1 mm using a dial gauge and then tighten the screws in the same manner. Check that the gap between the surfaces is 12.7 ± 0.1 mm (0.5 ± 0.004 in).
4. Lock the slider
 - When setting surfaces are provided, press the slider against the setting surfaces of the machine and then tighten the screws with a tightening torque of 0.15 N•m (1.5 kgf•cm).
 - If there are no setting surfaces, set the slider in the slider holder, press it against the scale unit, and then tighten the screws in the same manner.
5. Remove the slider holder
 - Remove the three M1.4 screws securing the slider holder and remove the slider holder.
 - Save the removed slider holder and screws for future use.
6. Affix the blindfold label
 - Affix the blindfold label so that it covers the two M1.4 screw holes.

7. Check the operating range
 - After mounting the scale unit and slider, be sure to move the machine over its entire operating length to check that the effective length of the scale and the machine movement fall within the effective length.
8. Connect the lead cable wiring and connectors
 - Secure the lead cables with the wiring clamps as shown in the figure. Care should be taken when securing the cables as it may be necessary to provide the lead cables with some slack in accordance with the scale movement.



Note

- Operate the machine carefully so that the mounting surfaces of the slider and the machine do not contact each other.
- Care should be taken as the scale will be damaged if the machine movement exceeds the effective length of the scale.

4. Major Specifications

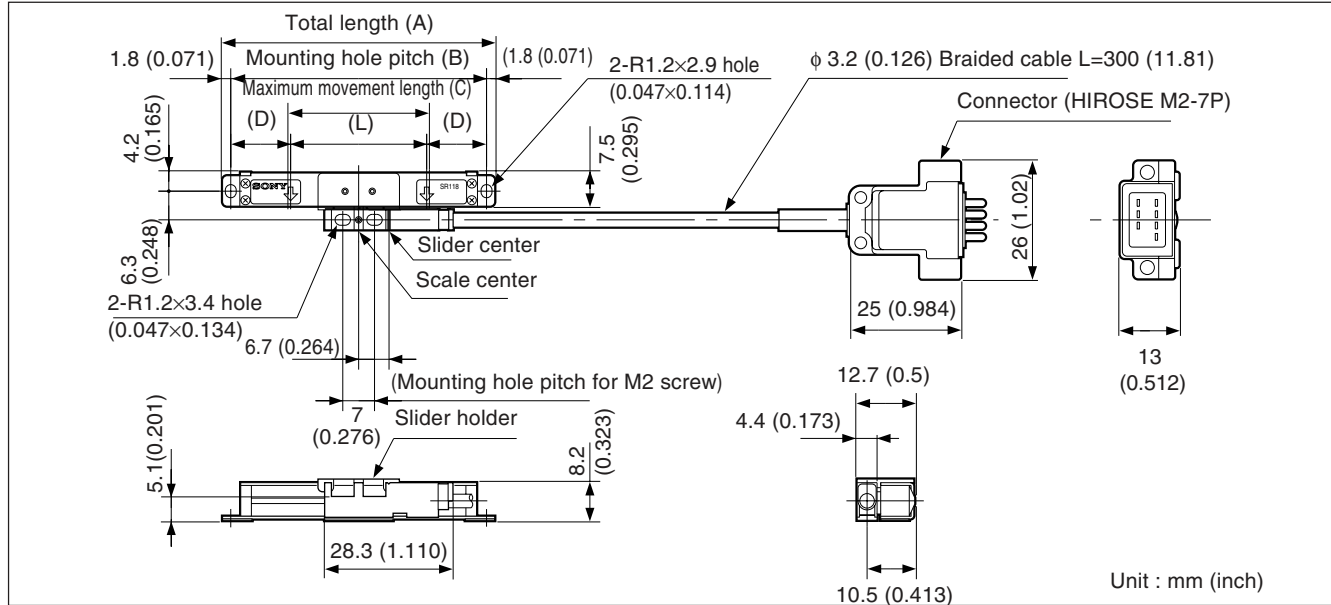
4-1. General Specifications

Note

Sony Magnescale reserves the right to alter product appearances and specifications without notice.

Item	Standards and specifications							
Model name	SR118							
	-015 to -260							
Effective length [mm (inch)]	15 (0.591)	30 (1.18)	60 (2.36)	100 (3.93)	130 (5.12)	160 (6.30)	210 (8.27)	260 (10.24)
Total scale length [mm (inch)]	L+30 (+1.18)			L+40 (+1.57)		L+45 (+1.77)		
Maximum movement length [mm (inch)]	L+0.6 (+0.024) Left/Right: 0.3 (0.011)			L+7 (+0.276) Left: 2 (0.078), Right: 5 (0.197)		L+12 (+0.472) Left: 4.5 (0.177), Right: 7.5 (0.295)		
Precision (20°C)	4 μm p-p			5 μm p-p			6 μm p-p	
Allowable mounting parallelism	0.1 mm (0.004 in)							
Temperature coefficient	$(14 \pm 1) \times 10^{-6} / ^\circ\text{C}$							
Operating temperature range	0°C to 40°C							
Storage temperature range	-10°C to 50°C							
Head cable length	300 mm (11.81 in)							
Weight [g (lb)]	40 (0.088)	42 (0.093)	45 (0.099)	50 (0.110)	53 (0.117)	57 (0.126)	63 (0.139)	68 (0.150)
Recommended resolution	1 μm							

4-2. Outer Dimensions



Model name	Effective length (L)	Overall length (A)	Mounting hole pitch (B)	Maximum movement length (C)	Travel outside measuring length		(D)
					Left	Right	
SR118-015	015 (0.591)	045 (1.77)	041.4 (1.63)	015.6 (0.614)	0.3 (0.011)	0.3 (0.011)	13.2 (0.520)
SR118-030	030 (1.18)	060 (2.36)	056.4 (2.22)	030.6 (1.20)	0.3 (0.011)	0.3 (0.011)	13.2 (0.520)
SR118-060	060 (2.36)	090 (3.54)	086.4 (3.40)	060.6 (2.39)	0.3 (0.011)	0.3 (0.011)	13.2 (0.520)
SR118-100	100 (3.93)	140 (5.51)	136.4 (5.37)	107.0 (4.21)	2 (0.098).0	5 (0.197).0	18.2 (0.717)
SR118-130	130 (5.12)	170 (6.69)	166.4 (6.55)	137.0 (5.39)	2 (0.098).0	5 (0.197).0	18.2 (0.717)
SR118-160	160 (6.30)	205 (8.07)	201.4 (7.93)	172.0 (6.77)	4.5 (0.177)	7.5 (0.295)	20.7 (0.815)
SR118-210	210 (8.27)	255 (10.04)	251.4 (9.90)	222.0 (8.74)	4.5 (0.177)	7.5 (0.295)	20.7 (0.815)
SR118-260	260 (10.24)	305 (12.01)	301.4 (11.87)	272.0 (10.71)	4.5 (0.177)	7.5 (0.295)	20.7 (0.815)

5. Maintenance

- A thin coat of lubricating oil should be applied to the scale rods inside the scale unit every one to three months to ensure a long service life. When applying this oil, be sure to inspect the mounting conditions of the scale unit and slider.
- When storing the scale, secure the scale unit and slider with the slider holder.
- Avoid storing the scale in the following environments.
 - Places exposed to direct sunlight or hot winds or near heaters, etc.
 - Places exposed to dust, oil, corrosive gases or high temperature and humidity.

6. Trouble Information

If the scale does not move smoothly

- Apply a thin coat of lubricating oil to the scale rods.
- Check again that the scale is mounted correctly.

If the scale rods are bent

- The scale assembly must be replaced. Send the scale to your Sony Magnescale representative for repair.

If the lead cables become damaged

- The slider assembly must be replaced. Send the slider to your Sony Magnescale representative for repair.

If the scale overruns

- Send the scale to your Sony Magnescale representative for repair and inspection. Note that repair may be impossible depending on the type of damage.

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