SONY

Feedback scale for NC machine tools
General Catalog

Magnescale®

PRECISE IN PRECISION

SONY

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Contents

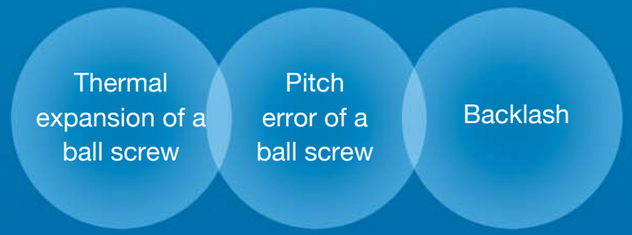
Magnescale®
PRECISE IN PRECISION

Magnescale technology essential for high-performance machine tools

Magnescale, which was developed based on Sony's advanced magnetic technology, adapts magnetism to the measurement principle, thus far less affected by the condensation or oil problems commonly found in machine tools and always making stable and precise position measurement possible.
Sony's Magnescale with high precision and high environmental resistance supports the front line of your manufacturing.

The advantage of scales

A scale is mainly used for machine tools and detects the position of a component such as the stage to which it is installed. Feeding back position information from the scale eliminates errors caused by the following and enables more precise machining to be accomplished.



In order to maximize the performance of the scale mounted on a machine tool, it is vitally important to keep a scale signal constant. Magnescale® possesses environmental resistance against contamination by condensation or oil, which makes the signal unstable causing signal errors. Thus, Magnescale® is suitable for high-precision position detection.

What is Magnescale?

Mounting allowance

Magnescale is constructed so that the sensor for signal detection slides along the guide in the scale with bearings to detect the position. Therefore, it can perform stable, high-precision detection even in the presence of a positional deviation of the scale or head caused by installation or disagreement in parallelism with the machine guides.

Vibration and impact resistance

Magnescale primarily uses ferrous members as the housing material to protect the detector section, thereby realizing the high vibration resistance and impact resistance characteristics. In the SR80 series, furthermore, it employs multi-point fixation construction in addition to the housing with high rigidity, achieving the industry's top class vibration resistance and impact resistance.

Thermal characteristics

Magnescale have the same linear expansion coefficient as that of cast iron used for the structure of general machine tools. Therefore, it exhibits the same behavior as the equipment in which it is installed even in environments where temperature changes, making very stable control possible. In particular, the SR80 series scales can be installed in close contact with the equipment; heat exchange with the equipment is effectively achieved, enabling them to attain consistent accuracy even in an environment in which temperature changes occur.

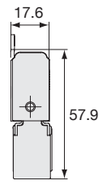
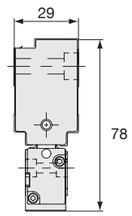
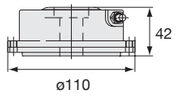
Resistant to condensation and oil

Magnescale employs the magnetic detection principle, thus far less affected by the condensation or oil problems inherent in machine tools and making stable and high precision operation possible in severe environments.

Scale construction

The magnetic signal detection sensor is supported by a bearing, maintaining a non-contact status with respect to the scale material. This bearing runs on the guide incorporated in the scale and detects the equipment's traveling distance. Therefore, the sensor has very small sliding resistance, enabling the scale to be used even for equipment with small driving force. Moreover, the use of a specially constructed sealing structure helps to prevent dust and dirt from entering inside the scale. In addition, air purging the scale provides further protection.

Selection Guide

	Measurement length (ML: mm)	Accuracy	Resolution	Output signal	Type	Cross section	Page	
Linear scale	70mm-2,040mm	3+3ML/1,000µmp-p 5+5ML/1,000µmp-p	0.01µm, 0.05µm, 0.1µm, 0.5µm, 1µm	Absolute serial bidirectional signal	SR77		30	
				Incremental serial bidirectional signal	SR75		34	
				A quad B signal Ref. point. Line driver signal	SR74		34	
	140mm-3,040mm	3+3ML/1,000µmp-p 5+5ML/1,000µmp-p	0.01µm, 0.05µm, 0.1µm, 0.5µm, 1µm	Absolute serial bidirectional signal	SR87		22	
				Incremental serial bidirectional signal	SR85		26	
				A quad B signal Ref. point. Line driver signal	SR84		26	
Rotary	360°	±2.5second	Maximum output pulse counts 2^{25}=33,554,432p.p.r	Absolute serial bidirectional signal	RU77		38	

Measurement Principle

Scale material

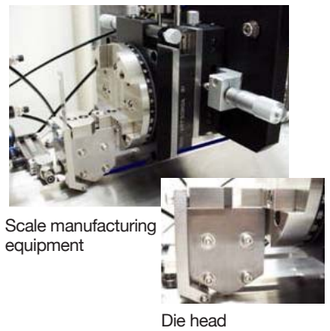
The magnetic recording media, or the raw material for scales, was developed as the scale material that realizes high-density recording at high precision, based on Sony's magnetic technology that has been cultivated for magnetic tapes and magnetic discs.
The scales adopt magnetic metal powder that is used for data storage systems because of its high density and reliability. Its magnetic characteristics are that Br: 0.2 to 0.25T and Hc: approximately 120 kA/m. The magnetic media form a strong coated surface resistant to cutting fluids and strong alkaline solutions through a hardening process after coating.

Magnetic powder

Magnetic metal powder used for data storage systems because of its high density and reliability
Br: 0.2 to 0.25T, Hc: Approx. 120 kA/m

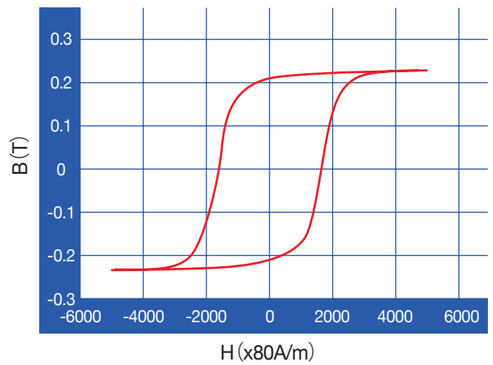
Coating

Resistant to cutting fluids and strong alkaline solutions



* Magnetic material is coated from the tip of the die head onto a scale.

Magnetic media's B - H curve



Signal detection sensor (MR sensor)

The MR sensor is a thin-film sensor patterned on a PWB. It obtains the signal output through the change in the resistance value according to the size of magnetic field leakage from the scale when it moves keeping a certain distance from the magnetic media (scale) to which magnetic signals have been recorded as shown in Figure 1. In this case, however, the signal obtained from the resistance change characteristics of the sensor and the status of magnetic field leakage from the scale also contains distortion components (such as harmonic components) in addition to the sine wave components of the signal pitch. Therefore, the sensor is positioned by shifting it in the operating direction by the distance of 1/6 of another signal pitch λ (Figure 2). In this case, when third-order harmonic components are observed, the following Equation "A" is established for three-fold periodic signal components because 1/6 of the signal pitch λ is π/3 in the periodic phase, and the phase is shifted by 180° with respect to the three-fold periodic signal components of the first sensor, resulting in a reverse signal.
The addition of this signal enables the third-order harmonic components to be cancelled out. That is, the combination of these sensors enables harmonic components of the 3n-th orders to be canceled out. In the same way, the combination of multiple units of the sensors also enables the harmonic components of other orders such as 5th and 7th orders to be cancelled out simultaneously.

In detection sensors, the circuit is generally formed in a bridge structure for stability of the temperature characteristics, etc. as well. In that case, distortion of odd numbered orders are cancelled out by the arrangement of sensors configuring a bridge. Therefore, the use of the bridge structure and the arrangement of the sensor configuration that cancels out harmonic components of the extent of the 3rd, 5th, and 7th orders enable a signal close to sine waves to be obtained. In this way, the scale achieves high precision and high resolution by digitization of electrical interpolation based on a distortion-less signal, coinciding with various electrical signal compensation.

A
$$e_3 = E_3 \sin(3(2\pi x / \lambda + \pi / 3)) = E_3 \sin(6\pi x / \lambda + \pi) = -E_3 \sin(6\pi x / \lambda)$$

Figure 1 Arrangement of MR element and magnetic media

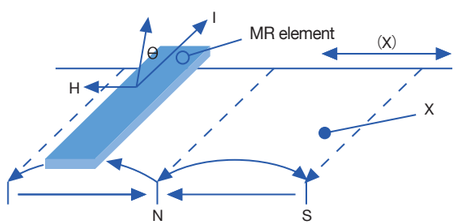
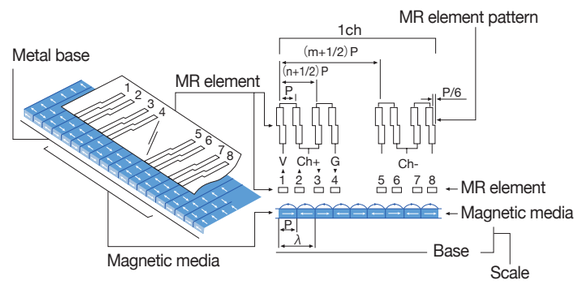


Figure 2 Structure of high-precision Magnescale



Incremental signal

An incremental signal is taken as the source of scale performance and does not have absolute positional information of length longer than the wavelength.
In magnetic scales, the S and N poles are regularly arranged at wavelength intervals.

Output signal
- Wavelength: 40, 80 μm, etc.
- Phase angle accuracy: Approx. 0.1 to 0.2 μm

▼

A sinusoidal signal of approx. 1/400 (52 dB) is required.

Factors that deteriorate the phase angle
- DC, gain, or phase variations
- Noise
- Harmonics

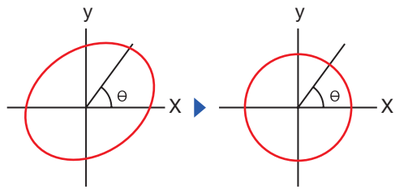
▼

Improved signal by the arrangement of MR-element patterns
Improved signal stability, etc. by harmonics and DC cancellation or averaging effects

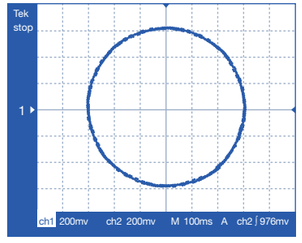
Compensation
Automatic consecutive compensation

Automatic consecutive compensation

Because signals are detected at a minimum resolution of 0.01 μm, consistent signal detection is achieved at high precision even in case of unmatched parallelism or in an environment in which the temperature varies.



Example of the measurement of Lissajous figure



Absolute signal

An M code is a code string consisting of two values (0 and 1) known as M sequence and is a cyclic code whose period is N = 2n-1. Where “n” is the order of a primitive polynomial that generates an M code. In the scales, it is the number of digits of M-code bits (value written as “18 bits” above). There is a primitive polynomial for each order, and a code string is serially created from any initial value. As the creation and features of codes, the following shows an example of the order “8” in the condition that the number of digits of a bit = the order of a primitive polynomial.
Assuming that a creating polynomial is F(x) = x0 + x2 + x3 + x4 and the 8-bit initial value is 00000001, x0 + x2 + x3 + x4 = 0 + 0 + 0 + 0 = 1 (“+” is exclusive OR and the order and bit are in reverse, so that a higher-level order corresponds to a lower-order bit) is established, making the initial value 8-bit’s next data “1.” The following performs the same logical calculation for data 00000011 in which the initial value is moved by one, to obtain code 00000001100111110101… In this case, when the code string created by the order “8” is observed as 8-bit data (a set of 8 pieces) one by one, the code strings of 8-bit data can be obtained as follows:
00000001,
00000011,
00000110,
00001100,
00011001, …
In this case, for M code = cyclic code, when the sequence is cyclically replaced in a period (N = 2n-1), the code word of that sequence always becomes different. That is, the same value of 8-bit data is never presented. Moreover, the code string is composed of apparently random code strings, which are not arranged in an ascending or descending order or in other rules as seen from the example above.

Configuration of absolute encoder detection

M codes are non-repetitive codes in which n-bit M codes are created by a generating polynomial of n bits and that there is no identical code among 2n-1 data. Because codes of 2n are required for a rotary encoder, it adopts the 2-track M-code system that adds 0 (all 0).
- Lamda: 40, 80 microns
- Number of M-code bits: Up to 18 bits

Figure 1 below: Example of 4-bit codes

Incremental/absolute signal record reproduction to signal composition

- Phase angle in λ is calculated from an incremental signal and taken as positional information in λ.
- An address in λ is calculated from each absolute signal and an M code is recognized by M-code sensors (multiple).

The M code is decoded into an address in λ.
- Both data are added.
- Data format conversion to communication protocol
- Communication (Figure 2 below)

Figure 1

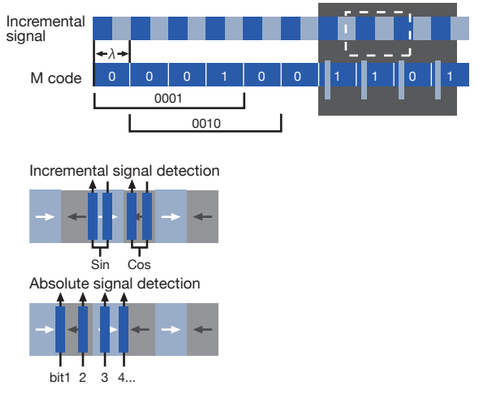
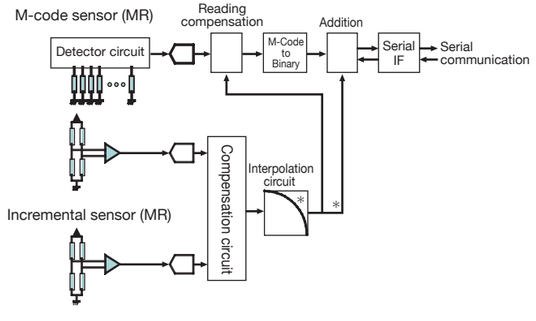


Figure 2



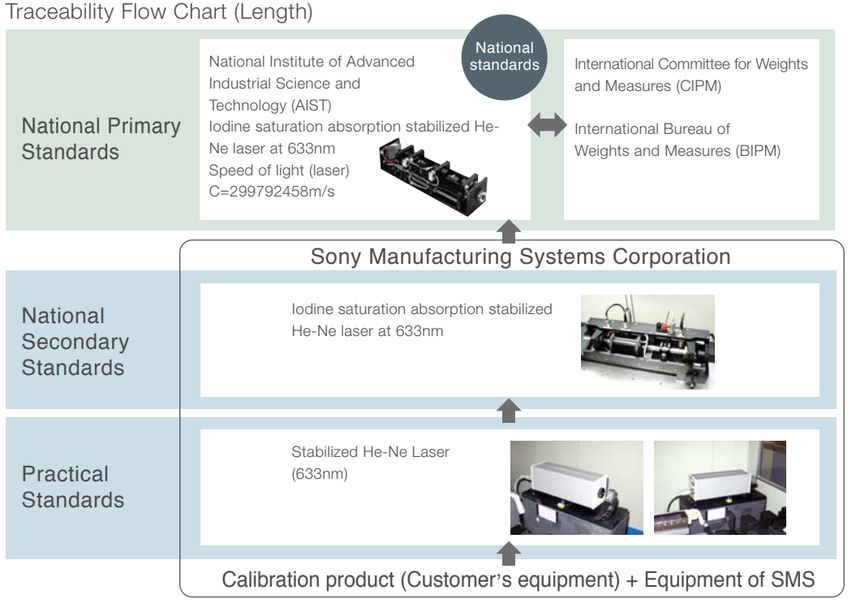
Accuracy

The grating of an incremental signal and the bit information of an absolute signal of the scale are written to a magnetic track using the recording head. For the recording head position during this write, the writing position of each signal is determined based on the position information of a light-wave interferometer using the He-Ne stabilized laser. Therefore, the position of each signal on the recording head (= accuracy) can be determined very accurately. The accuracy of the completed magnetic scale into which a detecting head is incorporated is also measured by comparing it with the positional information of the light-wave interferometer using the He-Ne stabilized laser, which becomes accuracy data.

Traceability

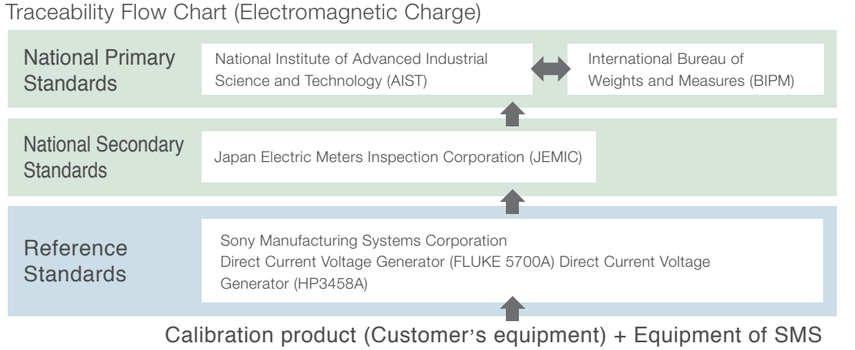
The He-Ne stabilized laser, the standard for accuracy measurement, is frequency calibrated in-house using the “633-nm iodine molecular absorption line wavelength stabilization Helium neon laser device for length,” which is the specified secondary standard of Sony Manufacturing Systems. This specified secondary standard is calibrated by the specified standard of the National Institute of Advanced Industrial Science and Technology (AIST), a national standard. In this way, Sony Manufacturing Systems has been qualified as the calibration approval operator of “length” and magnetic scales manufactured by Sony Manufacturing Systems are provided with traceability to the national standard.

Traceability Flow Chart (Length)



Certificate of Accreditation (JCSS)
Accreditation Number: 0046
Laser Wavelength
Wavelength of 633 nm
Line Standards
Standard scale: up to 500mm
End standard: up to 100mm

Traceability Flow Chart (Electromagnetic Charge)



Certificate of Accreditation (JAB)
Accreditation No.RCL00240
Electromagnetics
(DC/Low Frequency)

Installation method

Linear Scale SR87

Scale and slider installation notes

· Do not turn on the power before installing the scale.
· Install the scale with the opening on the scale unit facing downward. If the opening cannot be turned downward, it should face horizontally. Never install it facing upward. (Fig. 1)
· Remove off the coating around the tap hole to ground the scale unit using the installation surface contact with the scale.
· Be aware that the scale will be damaged if slider moved outside the measuring length (ML).
· In environments where coolant can splash directly on the scale, be sure to mount a cover on the scale to protect the scale from splashing. (Fig. 2)

Fig. 1

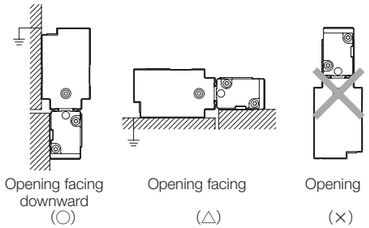
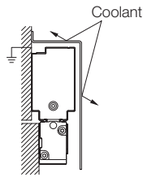


Fig. 2



· The slider holders are used to secure the slider in place during transport. They are not guides for installation.
· Do not take off the slider holders, if possible, until immediately before securing the slider.
· Even if the slider holders are removed, the plastic hook provided on the slider allows the slider to maintain an approximate positional relationship with the scale unit.
· The plastic hook can come off if the slider is forcibly twisted or other excessive force is applied. If the plastic hook comes off, return the plastic hook back to its original position before performing the installation. (See Fig. 4.)
· After removing the slider holder, be sure to take off the clamp nuts remaining on the scale.

Fig. 3

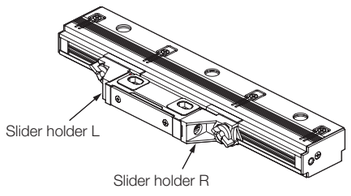
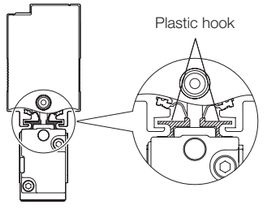
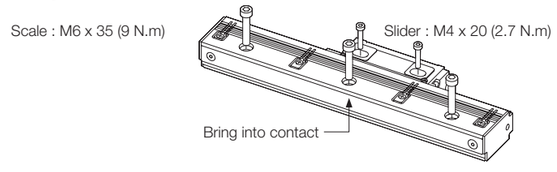


Fig. 4



· Before installing the scale, check that the alignment of the installation surface (or installation brackets) is within the standards.
· Use a scale installation bracket, where applicable, having a length covering the entire scale length. The parallelism of the scale may be harmed if only using a bracket divided for the installation section.
· The foot plates on both ends and intermediate foot plate installed on the scale unit are used as the installation guides.
· Loosely turn the mounting screws first. Determine the alignment and then tighten the screws to fasten the scale. (See Fig. 5.)

Fig. 5



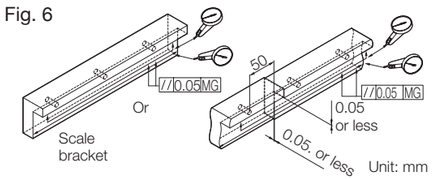
Installation example

Example 1 (recommended):Installation when a stop surface of the scale and slider is made with the bracket

Scale installation accuracy is improved when a stop surface is made. This also simplifies reinstallation of the scale.

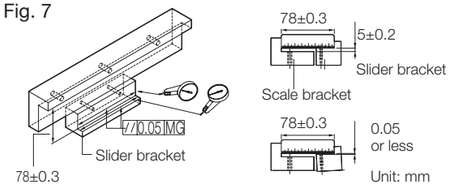
1. Check and adjust the scale bracket's parallelism with respect to the machine guide, and then secure in place. Even when using divided brackets, adjust the parallelism over the entire bracket length as shown in the figure.

Fig. 6



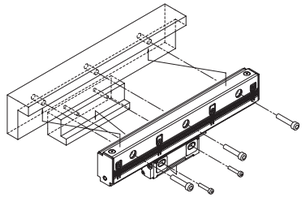
2. Check and adjust the height and parallelism of the slider bracket, and then secure in place.

Fig. 7



3. Bring the scale into contact with the stop surfaces and install.

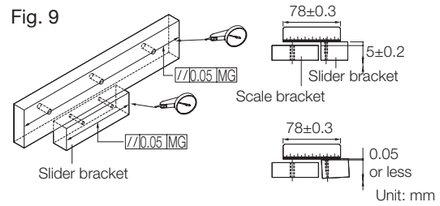
Fig. 8



Example 2: Installation when a stop surface of the scale and slider is not made with the bracket

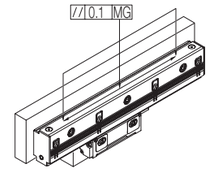
1. Adjust the parallelism of the scale bracket and slider bracket with respect to the machine guide, and then secure in place. Adjust the height and parallelism of the slider bracket with respect to the scale bracket, and then secure in place.

Fig. 9



2. Adjust the parallelism with respect to the machine guide of the scale rear while measuring the scale rear with a dial gauge. Tighten the set screws.
<Measurement method>
Measure near the installation hole positions at the scale unit rear.

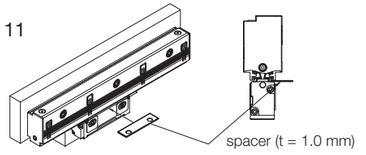
Fig. 10



Unit: mm

3. Insert the supplied spacer (t = 1.0 mm) in the space between the scale and slider, and then adjust the slider position while bringing the slider into contact with the scale.

Fig. 11



Please measure attachment bore position neighborhood of the main body of measurement method scale back.

■Air injection and oil lubrication

In the standard configuration, the end cap section is provided with an M5 tap hole for air injection and oil lubrication. For more detailed information, please refer to the Instruction Manual (sold separately).

Linear Scale SR77

Scale and slider installation notes

· Do not turn on the power before installing the scale.
· Install the scale with the opening on the scale unit facing downward. If the opening cannot be turned downward, it should face horizontally. Never install it facing upward. (Fig. 1)
· Remove off the coating around the tap hole to ground the scale unit using the installation surface contact with the scale.
· Be aware that the scale will be damaged if slider moved outside the measuring length (ML).
· In environments where coolant can splash directly on the scale, be sure to mount a cover on the scale to protect the scale from splashing. (Fig. 2)

Fig. 1

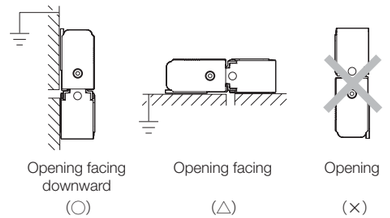
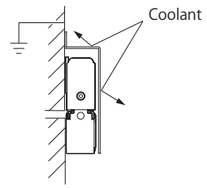


Fig. 2



· The slider holders are used to secure the slider in place during transport. They are not guides for installation.
· Do not take off the slider holders, if possible, until immediately before securing the slider.
· Even if the slider holders are removed, the plastic hook provided on the slider allows the slider to maintain an approximate positional relationship with the scale unit.
· The plastic hook can come off if the slider is forcibly twisted or other excessive force is applied. If the plastic hook comes off, return the plastic hook back to its original position before performing the installation. (See Fig. 4.)
· After removing the slider holder, be sure to take off the clamp nuts remaining on the scale.

Fig. 3

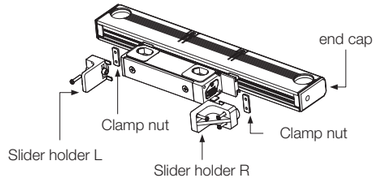
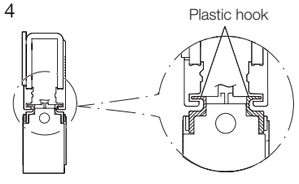
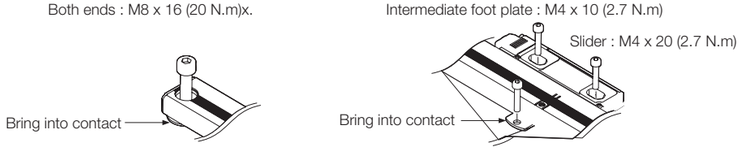


Fig. 4



· Before installing the scale, check that the alignment of the installation surface (or installation brackets) is within the standards.
· Use a scale installation bracket, where applicable, having a length covering the entire scale length. The parallelism of the scale may be harmed if only using a bracket divided for the installation section.
· The foot plates on both ends and intermediate foot plate installed on the scale unit are used as the installation guides.
· Loosely turn the mounting screws first. Determine the alignment and then tighten the screws to fasten the scale. (See Fig. 5.)

Fig. 5



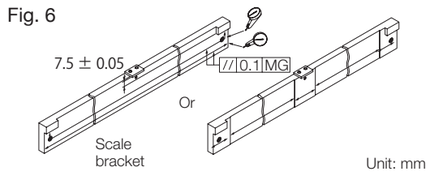
Installation example

Example 1 (recommended):Installation when a stop surface of the scale and slider is made with the bracket

Scale installation accuracy is improved when a stop surface is made. This also simplifies reinstallation of the scale.

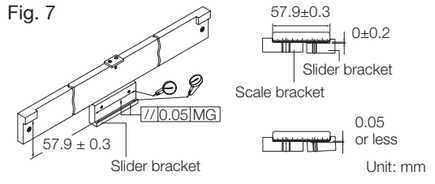
1. Check and adjust the scale bracket's parallelism with respect to the machine guide, and then secure in place. As shown in the figure, adjust the parallelism over the entire bracket length even when making a difference in levels on the scale installation surface.

Fig. 6



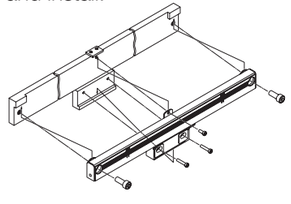
2. Check and adjust the height and parallelism of the slider bracket, and then secure in place.

Fig. 7



3. Bring the scale into contact with the stop surfaces and install.

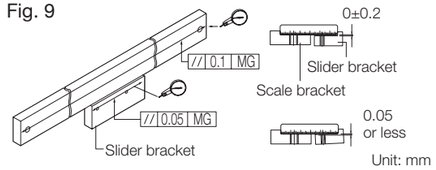
Fig. 8



Example 2: Installation when a stop surface of the scale and slider is not made with the bracket

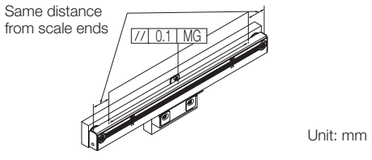
1. Adjust the parallelism of the scale bracket and slider bracket with respect to the machine guide, and then secure in place. Adjust the height and parallelism of the slider bracket with respect to the scale bracket, and then secure in place.

Fig. 9



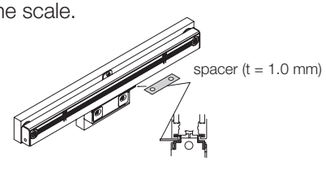
2. Adjust the parallelism with respect to the machine guide of the scale rear while measuring the scale rear with a dial gauge. Tighten the set screws.
<Measurement method>
Measure at two points where the measurement distance is as wide as possible and at the same distance from the right and left scale ends. If using a scale with intermediate foot plate, be sure to also measure the intermediate foot plate.

Fig. 10



3. Insert the supplied spacer (t = 1.0 mm) in the space between the scale and slider, and then adjust the slider position while bringing the slider into contact with the scale.

Fig. 11



* Please measure it with two points that took the measurement interval widely as much as possible at a place of the same distance from the measurement method right and left scale both ends. In the case of the intermediate foot scale with, please measure the intermediate foot part.

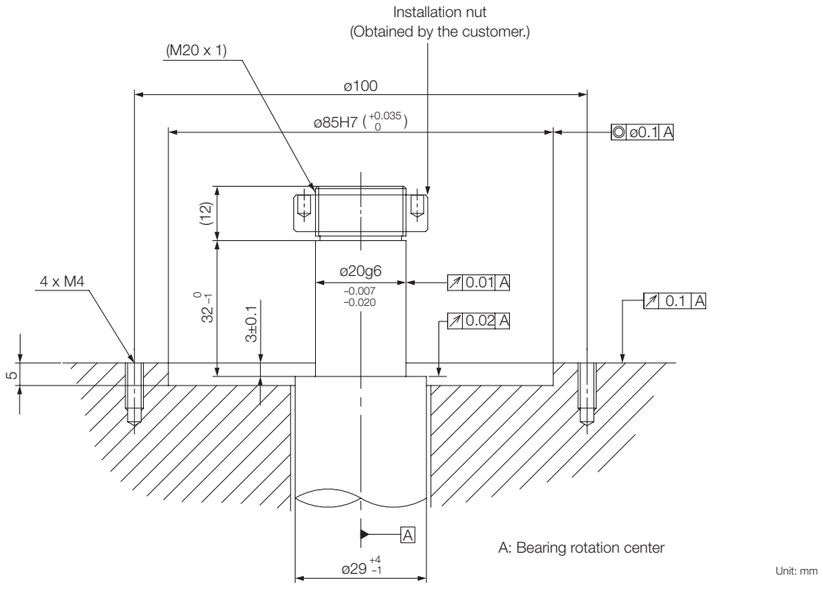
■Air injection and oil lubrication

In the standard configuration, the end cap section is provided with an M5 tap hole for air injection and oil lubrication. For more detailed information, please refer to the Instruction Manual (sold separately).

Rotary Magnescale Installation

Installation Dimensions and Tolerance

Make preparations so that the rotary magnescale installation surface dimensions and tolerance have the values shown in the figure below.

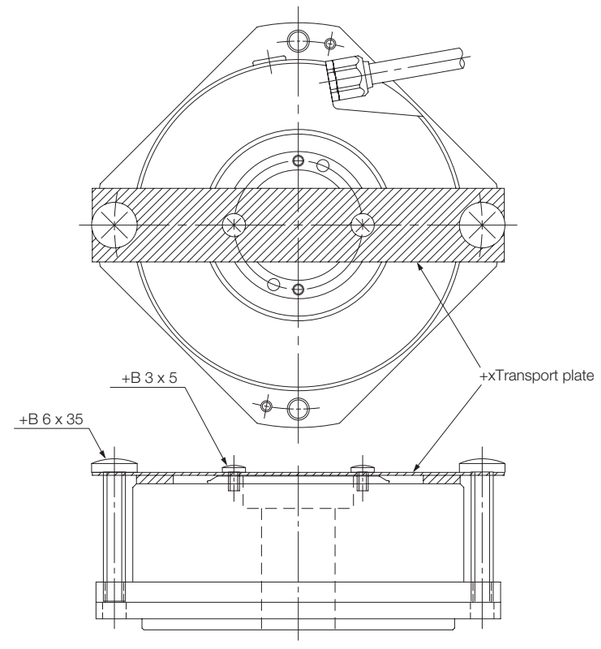


Installation Precaution

·If the surface of the rotary side or stationary side where the rotary magnescale will be installed has paint or other coating, remove the paint or coating in order to obtain conductivity between the rotary magnescale
and the machine.
·Before installing the rotary magnescale, be sure to check that the dimensional tolerance of the installation surface and machine shaft are within the standards. If the installation dimensional tolerance is not within the standards, the required accuracy will not be obtained, and the rotary magnescale can even be damaged.
·In environments where coolant can splash directly on the rotary magnescale, be sure to mount a cover on the rotary magnescale to protect the rotary magnescale from splashing.
·The installation nut and other installation tools must be obtained by the customer.
·The absolute position becomes 0 at the reference point mark ±2 degrees. Be sure to check its location when securing the scale shaft. (See section 6, “Outside Dimensions.”)
·In its standard configuration, the rotary magnescale has an M5 tap hole for air injection.

Installation Preparation

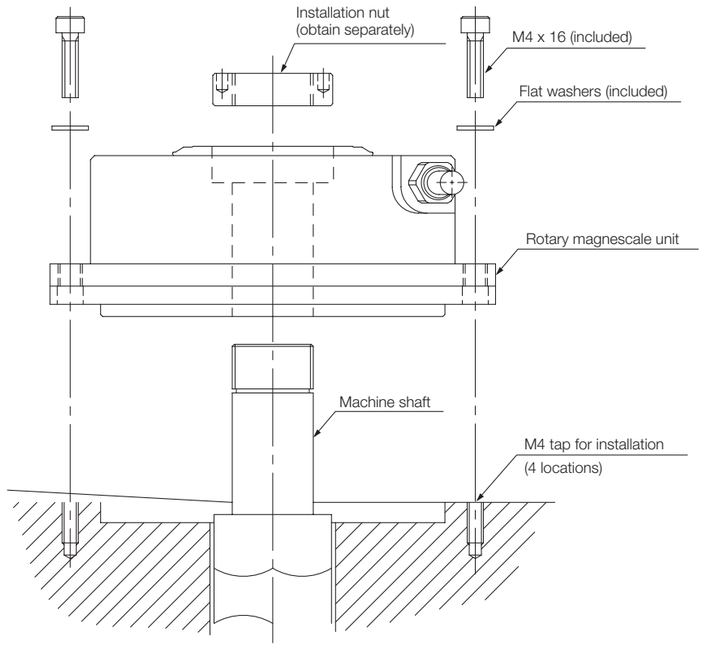
Transport plate is used to secure the scale unit and scale shaft so that excess vibrations are not applied to the scale shaft during transportation. Before installing the rotary magnescale, be sure to remove the transport plate.



Note The transport plate does not set the installation standard for the rotary magnescale. Perform the installation by following section 5-1, “Installation Dimensions and Tolerance.”

Installation Procedure

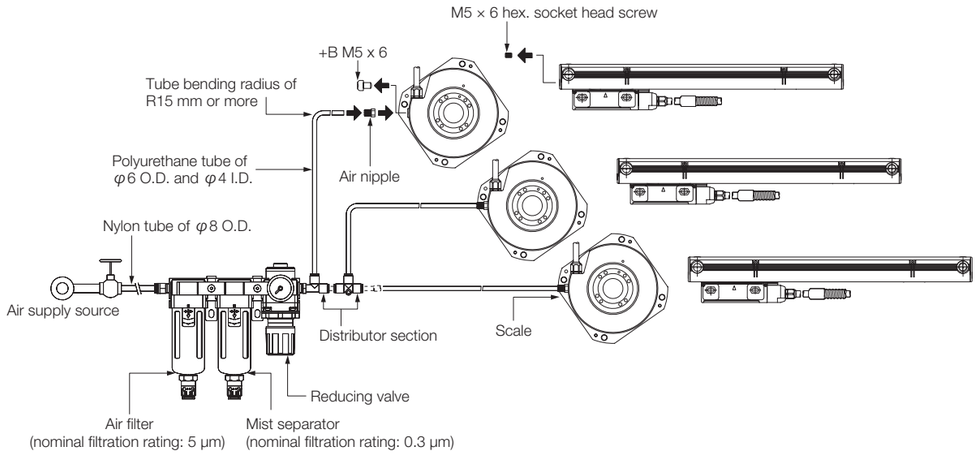
1. Check that there is no dust or scratches on the rotary magnescale installation surface.
   Check that there are no indentations, rust, or scratches on the machine shaft where the rotary magnescale will be installed. Completely wipe off any dust and dirt on the machine shaft.
2. Insert the rotary magnescale gently into the machine shaft.
   The machine shaft and scale shaft are designed for a precise fit, and so do not try to force insertion of the rotary magnescale into the machine shaft.
3. Secure the rotary magnescale.
   Use M4 screws to install from the rotary magnescale top, and use M6 screws to install from the rotary magnescale bottom. (M4 tightening torque: 2.5 N.m)
4. Use the installation nut to secure the scale shaft to the machine shaft.
   (M20 x 1 tightening torque: 20 N.m)
   The securing operation can be performed more smoothly by using a tightening wrench and fastening wrench as shown in the “7. Appendix.”



Mechanical Specifications

Air purging

If Magnescale is used in a dusty or misty environment, it is recommended that air is introduced into the scale to alleviate any unwanted effects. Attach air nipples to M5 holes for air introduction that are provided at both ends of the scale to supply air into the scale.
When introducing air into the scale, supply air via an air filter (nominal filtration rating: 5 µm), mist separator (nominal filtration rating: 0.3 µm), and a regulator to remove dust, dirt, and mist. As a guide, the amount of air supplied to the scale is 30 NL/min.



SR87

This robust type magnetic absolute scale system that outputs position signals for machine tools and other equipment that require high-precision positioning.

- Measuring Length(ML) : 140-3,040mm
- Accuracy : 3+3ML/1,000 µm p-p, 5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC, Mitsubishi, Panasonic

ABS | Robust type | Maximum resolution 0.01 µm

Magnescale PRECISE IN PRECISION

Specifications

Model	SR87
Measuring length (ML)	140~3040mm 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃
Output signal	Absolute serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 mm p-p or 5+5ML/1,000 mm p-p
Resolution	Selectable from 0.01,0.05,0.1,0.5 and 1.0 mm(Set at factory shipping)
Zero count position	Center mark
Power supply voltage	DC4.75 - 5.25V(At cable connection end)
Consumption current	200 mA (at 120 W terminal) max.
Imrush current	2A max. (When the power supply rise time is 10 ms)
Maximum response speed	200m/min (User-selected resolution setting)
Vibration resistance	250m/s^2 (50Hz~2kHz)
Impact resistance	450m/s^2 (11ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Other protections	Oil lubricant can also be used under severe environmental conditions.
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).
Operating temperature range(℃)	0 ~ +50 ℃
Storage temperature range(℃)	-20 ~ +55 ℃
Mass	Approx.1.24kg + 4kg/m
Slider sliding resistance	1N or less

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR87-× × × ★ ○ △ ■ □ □ □

- Absolute zero point shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm A	1,400~1,499mm E	1,800~1,899mm J
1,100~1,199mm B	1,500~1,599mm F	1,900~1,999mm K
1,200~1,299mm C	1,600~1,699mm G	2,000~2,040mm L
1,300~1,399mm D	1,700~1,799mm H	Ex:1,050mm → A50

- Communication protocol

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D
Panasonic	2	H

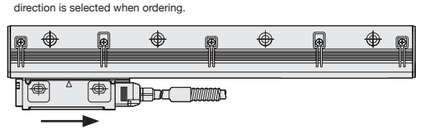
- Resolution & Direction*

Resolution (mm)	Direction +	Direction −
0.01	A	F
0.05	B	G
0.1	C	H
0.5	D	J
1.0	E	K

Note:Mitsubishi controler is only A

- Accuracy grade A:5+5ML/1000 S:3+3ML/1000µm ML:Measuring length by mm
- Cable out direction: R= Right, L= Left
- Measuring length by cm

* When the slider is moved in the direction of the arrow, the signal is addition when the direction is “positive,”and it is subtraction when the direction is “negative.” The direction is selected when ordering.

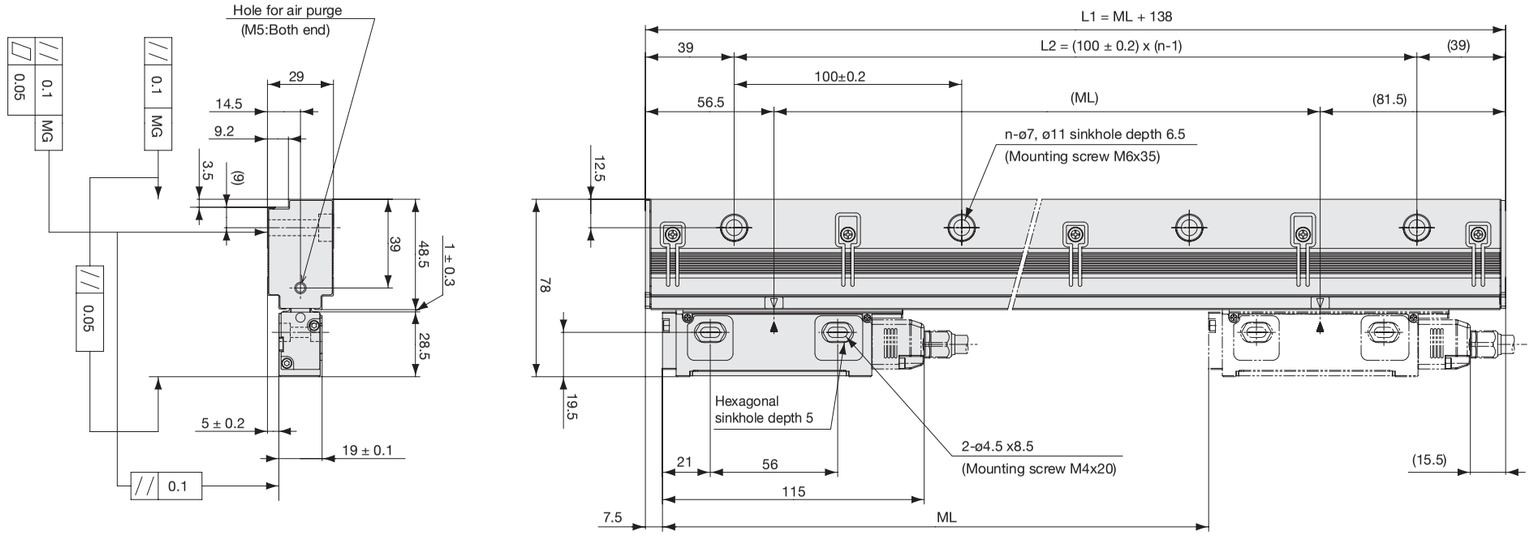


Dimensions SR87
Cable Direction Right

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm



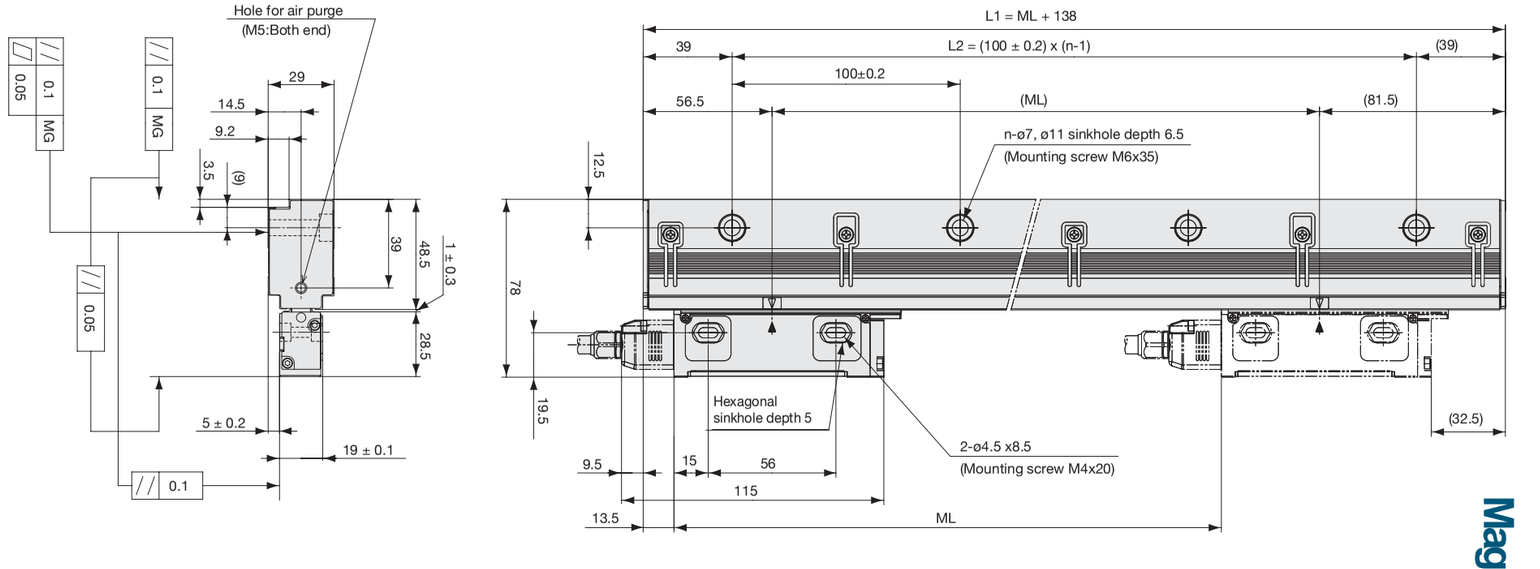
Unit : mm

Dimensions SR87
Cable Direction Left

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm



Unit : mm

SR84/85

This robust medium type magnetic scale system that outputs position signals for machine tools and other equipment that require high-precision positioning.

- Measuring Length(ML) : 140-3,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC (only SR84),
  Mitsubishi

Robust type

Maximum resolution 0.01 µm
(SR85 only)

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR84	SR85
Measuring length (ML)	140~3040mm 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040	
Thermal expansion coefficient (/ ˚C)	12 ± 1 x 10^{-6}/ ˚C	
Output signal	A/B, Reference point line driver signal (compliant with EIA-422)	Incremental serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ˚C) ML:mm	3+3ML/1,000 mm p-p or 5+5ML/1,000 mm p-p	
Resolution	Selectable from 0.05,0.1,0.5 and 1.0 mm (Set at factory shipping)	Selectable from 0.01,0.05,0.1,0.5 and 1.0 mm (Set at factory shipping)
Reference point	None, Center point, Multi-point (40 mm pitch), Reference mark (standard pitch: 20 mm), User-selected point (1 mm pitch)	None, Center point, User-selected point (1 mm pitch)
Power supply voltage	DC4.75 - 5.25V(At cable connection end)	
Consumption current	200 mA (at 120 W terminal) max.	
Imrush current	2A max. (When the power supply rise time is 10 ms)	
Maximum response speed	50m/min(Resolution: 0.1 um, Minimum phase difference: at 50 ns)	200m/min (User-selected resolution setting)
Vibration resistance	250m/s² (50Hz~2kHz)	
Impact resistance	450m/s² (11ms)	
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)	
Other protections	Oil lubricant can also be used under severe environmental conditions.	
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.	
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).	
Operating temperature range(˚C)	0 ~ +50 ˚C	
Storage temperature range(˚C)	-20 ~ +55 ˚C	
Mass	Approx.1.24kg + 4kg/m	
Slider sliding resistance	1N or less	

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR84-× × × ★ ○ △ ◆ □ □ □
SR85-× × × ★ ○ △ ■ □ □ □

Minimum phase difference

Phase difference (ns)

50	A	500	H
100	B	650	J
150	C	1000	K
200	D	1250	L
250	E	2500	M
300	F	3000	N
400	G		

Single reference mark shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm A	1,400~1,499mm E	1,800~1,899mm J
1,100~1,199mm B	1,500~1,599mm F	1,900~1,999mm K
1,200~1,299mm C	1,600~1,699mm G	2,000~2,040mm L
1,300~1,399mm D	1,700~1,799mm H	Ex :1,050mm → A50

Specific mark : X=center, SR85 is only single reference mark.

Communication protocol

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D

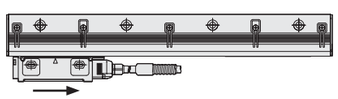
Resolution & Direction*

Resolution (µm)	SR84 +	SR84 −	SR85 +	SR85 −
0.01	-	-	A	F
0.05	B	G	B	G
0.1	C	H	C	H
0.5	D	J	D	J
1.0	E	K	E	K

Accuracy grade A : 5+5ML/1000 S : 3+3ML/1000µm
ML:Measuring length by mm

Cable out direction: R= Right, L= Left

Measuring length by cm



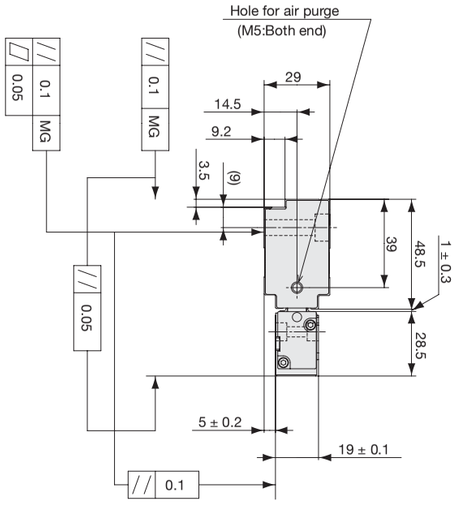
When the slider is moved in the direction of the arrow, the A signal is ahead when the direction is “positive,”and B signal is ahead when the direction is “negative.”

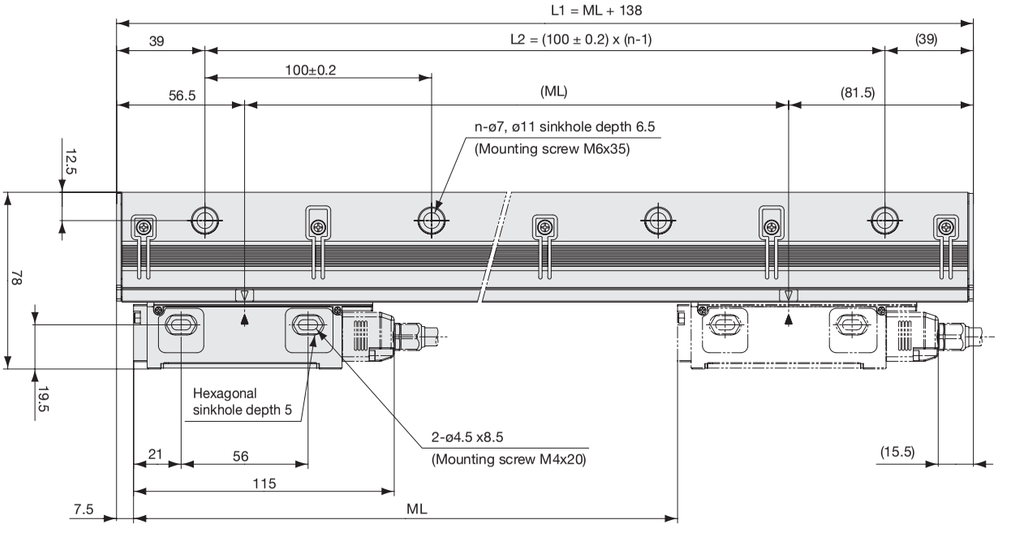
Dimensions SR84/85
Cable Direction Right

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





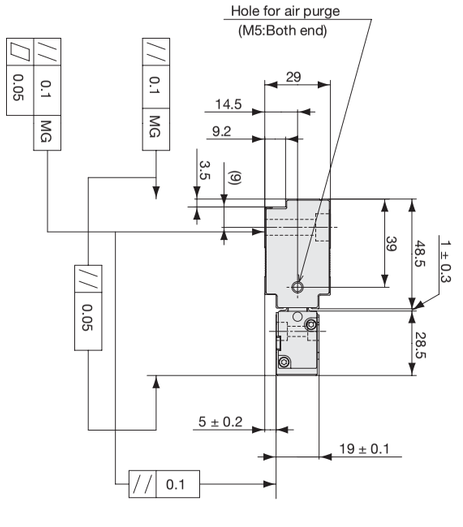
Unit : mm

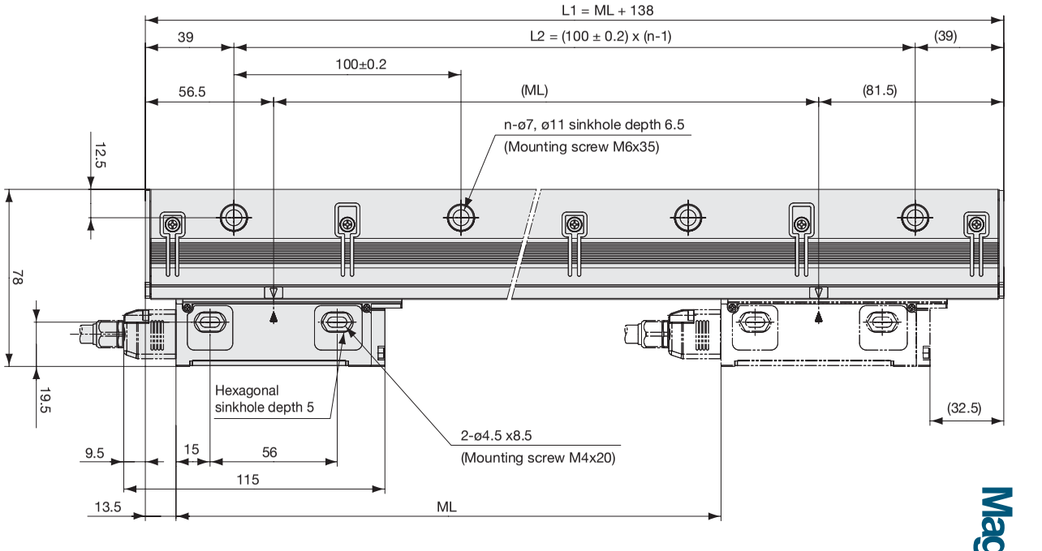
Dimensions SR84/85
Cable Direction Left

ML	L1	L2	n
140	278	200	3
240	378	300	4
340	478	400	5
440	578	500	6
540	678	600	7
640	778	700	8
740	878	800	9
840	978	900	10
940	1078	1000	11
1040	1178	1100	12
1140	1278	1200	13
1240	1378	1300	14

ML	L1	L2	n
1340	1478	1400	15
1440	1578	1500	16
1540	1678	1600	17
1640	1778	1700	18
1740	1878	1800	19
1840	1978	1900	20
2040	2178	2100	22
2240	2378	2300	24
2440	2578	2500	26
2640	2778	2700	28
2840	2978	2900	30
3040	3178	3100	32

ML : Measuring length CL : Cable length MG: Machine guide Unit : mm





Unit : mm

SR77

This slim type magnetic scale system
that outputs position signals for machine tools
and other equipment that require
high-precision positioning.

- Measuring Length(ML) : 70-2,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC, Mitsubishi,
  Panasonic, YASKAWA

ABS | Slim type | Maximum resolution 0.01 µm

Specifications

Model	SR77
Measuring length (ML)	70~2040mm 70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 720, 770, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040
Thermal expansion coefficient (/ ˚C)	12 ± 1 x 10^{-6}/ ˚C
Output signal	Absolute serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ˚C) ML:mm	3+3ML/1,000 mm p-p or 5+5ML/1,000 mm p-p
Resolution	Selectable from 0.01,0.05,0.1,0.5 and 1.0 mm(Set at factory shipping)
Zero count position	Center mark
Power supply voltage	DC4.75 - 5.25V(At cable connection end)
Consumption current	200 mA (at 120 W terminal) max.
Imrush current	2A max. (When the power supply rise time is 10 ms)
Maximum response speed	200m/min (User-selected resolution setting)
Vibration resistance	150m/s^2 (50Hz~3kHz)
Impact resistance	350m/s^2 (11ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Other protections	Oil lubricant can also be used under severe environmental conditions.
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).
Operating temperature range(˚C)	0 ~ +50 ˚C
Storage temperature range(˚C)	-20 ~ +55 ˚C
Mass	Approx.0.27kg + 1.36kg/m
Slider sliding resistance	1N or less

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR77-× × × ★ ○ △ ■ □ □ □

Absolute zero point shown by mm from left end of ML e.g.
850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm	A	1,400~1,499mm	E	1,800~1,899mm	J
1,100~1,199mm	B	1,500~1,599mm	F	1,900~1,999mm	K
1,200~1,299mm	C	1,600~1,699mm	G	2,000~2,040mm	L
1,300~1,399mm	D	1,700~1,799mm	H	Ex:1,050mm → A50	

Communication protocol

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D
YASKAWA	2	F
Panasonic	2	H

Resolution & Direction*

FANUC, Mitsubishi, Panasonic		
Resolution (µm)	Direction +	Direction −
0.01	A	F
0.05	B	G
0.1	C	H
0.5	D	J
1.0	E	K
YASKAWA		
Number of Divisions	Direction +	Direction −
1/8192	L	-
1/1024	M	-

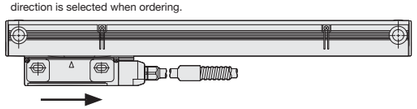
Note:Mitsubishi controler is only A

Accuracy grade A:5+5ML/1000 S:3+3ML/1000µm
ML:Measuring length by mm

Cable out direction: R= Right, L= Left

Measuring length by cm

* When the slider is moved in the direction of the arrow, the signal is addition when the direction is “positive,”and it is subtraction when the direction is “negative.” The direction is selected when ordering.



Dimensions SR77
Cable Direction Right

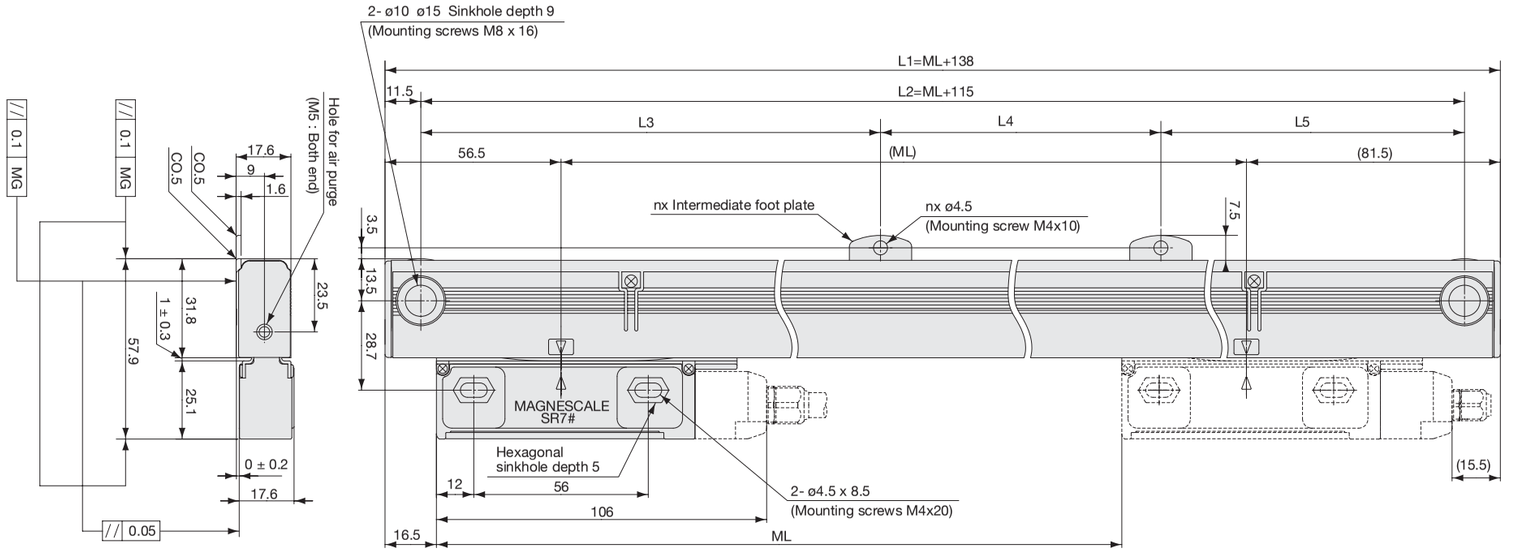
ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
920	1058	1035	517.5	–	517.5	1
1020	1158	1135	567.5	–	567.5	1
1140	1278	1255	627.5	–	627.5	1
1240	1378	1355	677.5	–	677.5	1
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

ML : Measuring length CL : Cable length MG: Machine guide

Unit : mm

* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm



Unit : mm

Dimensions SR77
Cable Direction Left

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
820	958	935	467.5	–	467.5	1
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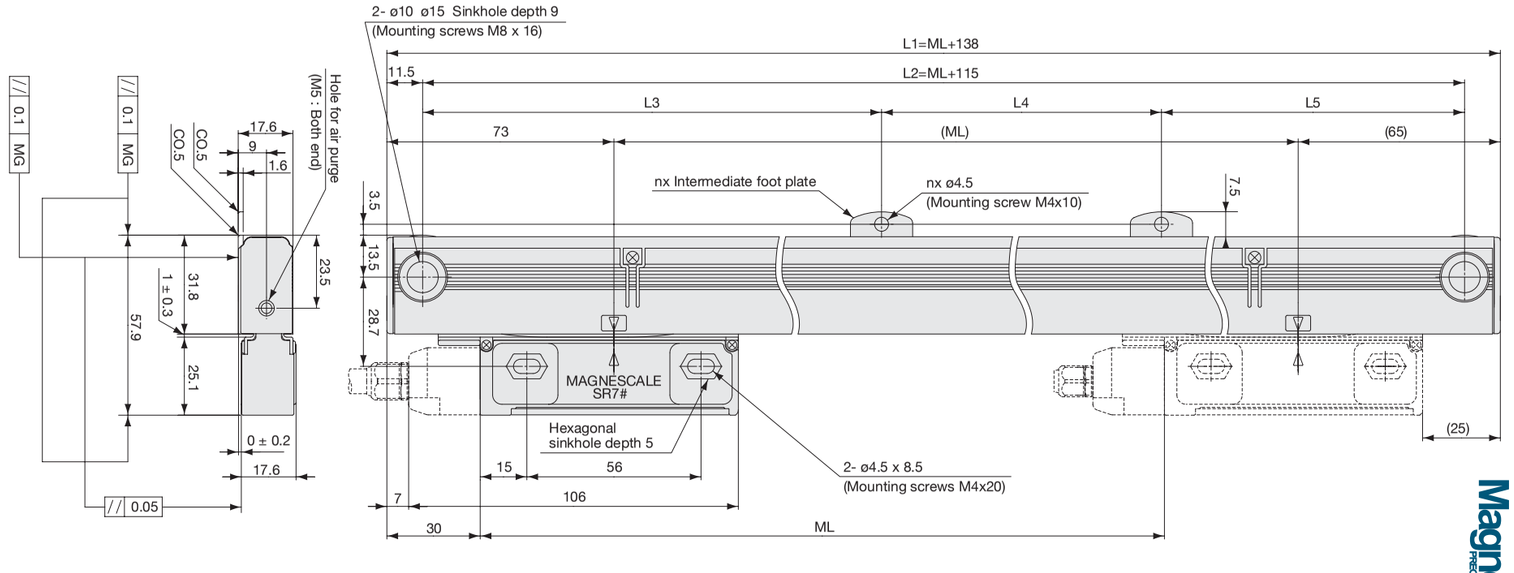
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

ML : Measuring length CL : Cable length MG: Machine guide

Unit : mm

* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm



Unit : mm

SR74/75

This slim type magnetic scale system
that outputs position signals for machine tools
and other equipment that require
high-precision positioning.

- Measuring Length(ML) : 70-2,040mm
- Accuracy : 3+3ML/1,000 µm p-p,
  5+5ML/1,000 µm p-p
- Maximum resolution : 0.01 µm
- Maximum response speed : 200m/min.
- Protocol : FANUC (only SR74),
  Mitsubishi

Slim type

Maximum resolution 0.01 µm
(SR75 only)

Magnescale
PRECISE IN PRECISION

Specifications

Model	SR74	SR75
Measuring length (ML)	70~2040mm 70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 720, 770, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040	
Thermal expansion coefficient (/ ℃)	12 ± 1 x 10^{-6}/ ℃	
Output signal	A/B, Reference point line driver signal (compliant with EIA-422)	Incremental serial bidirectional signal, compliant with EIA-485
Accuracy (at 20 ℃) ML:mm	3+3ML/1,000 mm p-p or 5+5ML/1,000 mm p-p	
Resolution	Selectable from 0.05,0.1,0.5 and 1.0 mm (Set at factory shipping)	Selectable from 0.01,0.05,0.1,0.5 and 1.0 mm (Set at factory shipping)
Reference point	None, Center point, Multi-point (40 mm pitch), Reference mark (standard pitch: 20 mm), User-selected point (1 mm pitch)	None, Center point, User-selected point (1 mm pitch)
Power supply voltage	DC4.75 - 5.25V(At cable connection end)	
Consumption current	200 mA (at 120 W terminal) max.	
Imrush current	2A max. (When the power supply rise time is 10 ms)	
Maximum response speed	50m/min(Resolution: 0.1 um, Minimum phase difference: at 100 ns)	200m/min (User-selected resolution setting)
Vibration resistance	150m/s^2 (50Hz~3kHz)	
Impact resistance	350m/s^2 (11ms)	
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)	
Other protections	Oil lubricant can also be used under severe environmental conditions.	
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.	
Safety standards	FCC Part15 Subpart B Class A. ICES-003 Class A Digital Device. EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less).	
Operating temperature range(℃)	0 ~ +50 ℃	
Storage temperature range(℃)	-20 ~ +55 ℃	
Mass	Approx.0.27kg + 1.36kg/m	
Slider sliding resistance	1N or less	

Model	CH33-**CP	CH33-**CE
Description	Cable with open end	Cable with open end
Cable length	3,5,10,15m	
Material	PVC	PU
Armor	YES	YES

*Please consult with our sales for the cable length other than above.

Details of model designation

SR74-× × × ★ ○ △ ◆ □ □ □
SR75-× × × ★ ○ △ ■ □ □ □

Minimum phase difference

Single reference mark shown by mm from left end of ML e.g. 850mm = 850, in case of center then X For 1000mm or longer, 2 left digits shown by alphabet

1,000~1,099mm A　1,400~1,499mm E　1,800~1,899mm J
1,100~1,199mm B　1,500~1,599mm F　1,900~1,999mm K
1,200~1,299mm C　1,600~1,699mm G　2,000~2,040mm L
1,300~1,399mm D　1,700~1,799mm H　Ex :1,050mm→ A50

Specific mark : X=center, SR75 is only single reference mark.

Communication protocol

Resolution & Direction*

Accuracy grade A : 5+5ML/1000 S : 3+3ML/1000µm
ML : Measuring length by mm

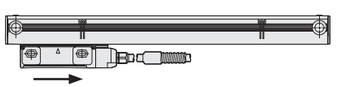
Cable out direction: R= Right, L= Left

Measuring length by cm

Phase difference (ns)			
50	A	500	H
100	B	650	J
150	C	1000	K
200	D	1250	L
250	E	2500	M
300	F	3000	N
400	G		

NC Maker	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D

Resolution (µm)	SR74 +	SR74 −	SR75 +	SR75 −
0.01	-	-	A	F
0.05	B	G	B	G
0.1	C	H	C	H
0.5	D	J	D	J
1.0	E	K	E	K



* When the slider is moved in the direction of the arrow, the A signal is ahead when the direction is “positive,”and B signal is ahead when the direction is “negative.”

Dimensions SR74/75
Cable Direction Right

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
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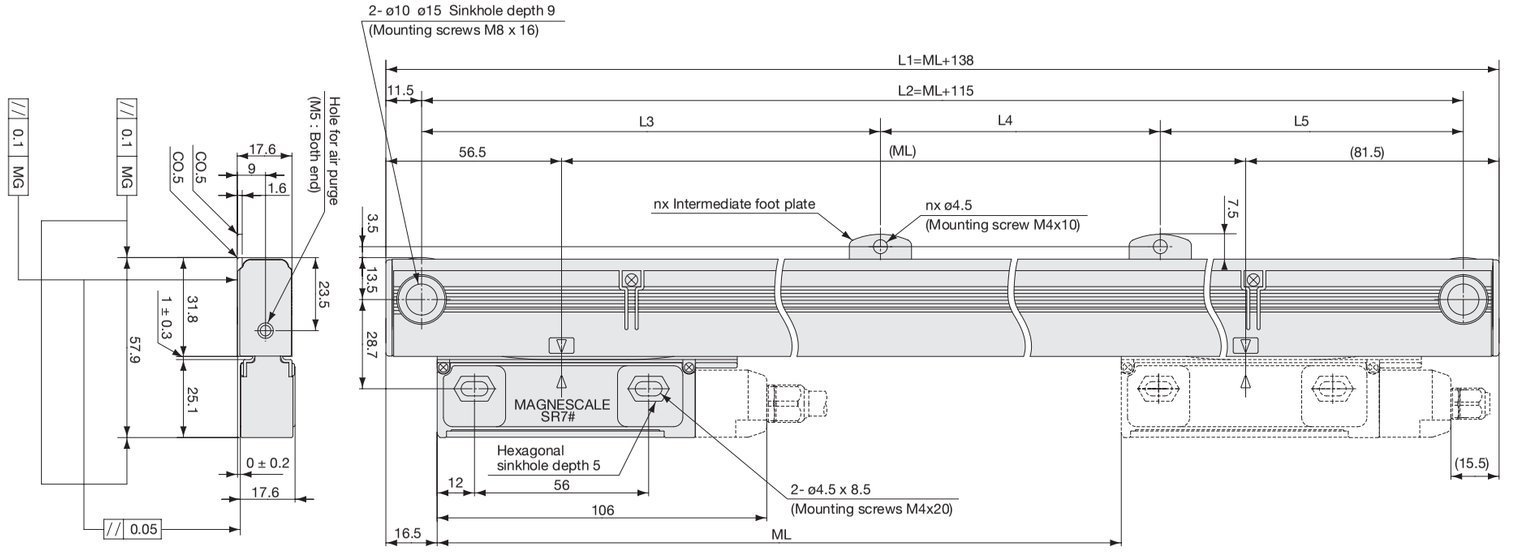
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

ML : Measuring length CL : Cable length MG: Machine guide

Unit : mm

* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm



Unit : mm

Dimensions SR74/75
Cable Direction Left

ML	L1	L2	L3	L4	L5	n
70	208	185	–	–	–	0
120	258	235	–	–	–	0
170	308	285	–	–	–	0
220	358	335	–	–	–	0
270	408	385	–	–	–	0
320	458	435	–	–	–	0
370	508	485	–	–	–	0
420	558	535	–	–	–	0
470	608	585	–	–	–	0
520	658	635	–	–	–	0
570	708	685	–	–	–	0
620	758	735	–	–	–	0
720	858	835	417.5	–	417.5	1

ML	L1	L2	L3	L4	L5	n
770	908	885	442.5	–	442.5	1
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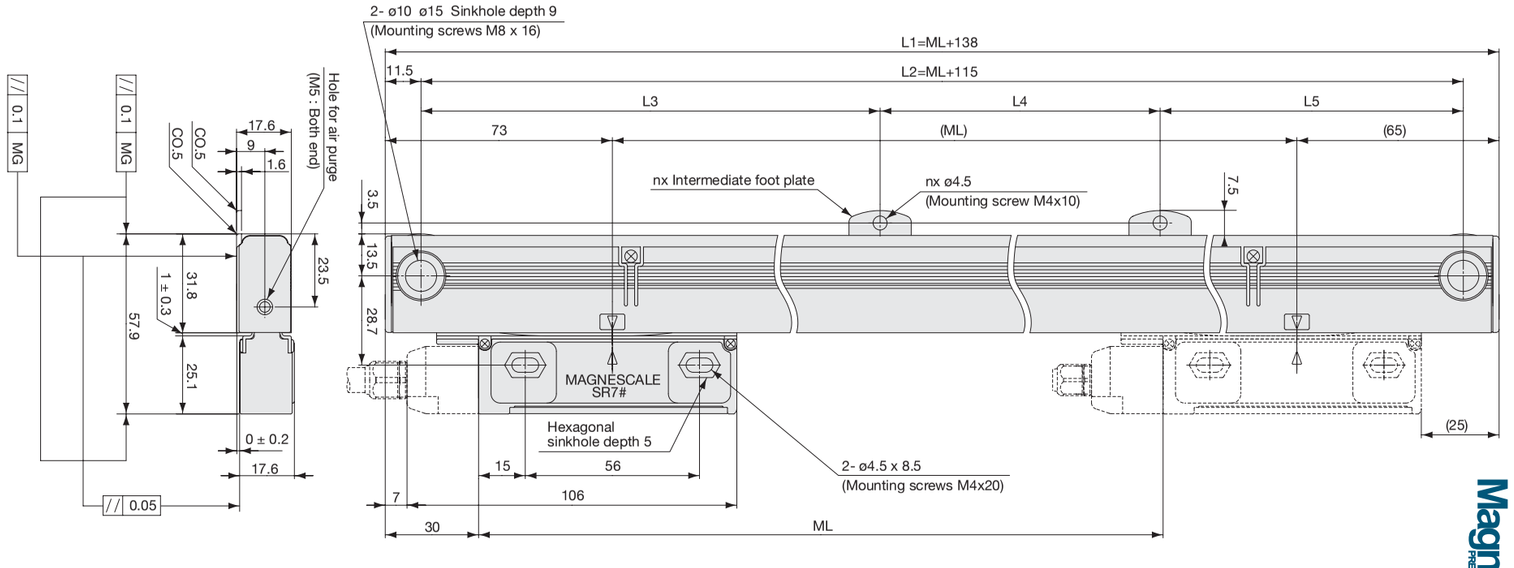
1340	1478	1455	727.5	–	727.5	1
1440	1578	1555	520	520	515	2
1540	1678	1655	550	550	555	2
1640	1778	1755	585	585	585	2
1740	1878	1855	620	620	615	2
1840	1978	1955	650	650	655	2
2040	2178	2155	720	720	715	2

ML : Measuring length CL : Cable length MG: Machine guide

Unit : mm

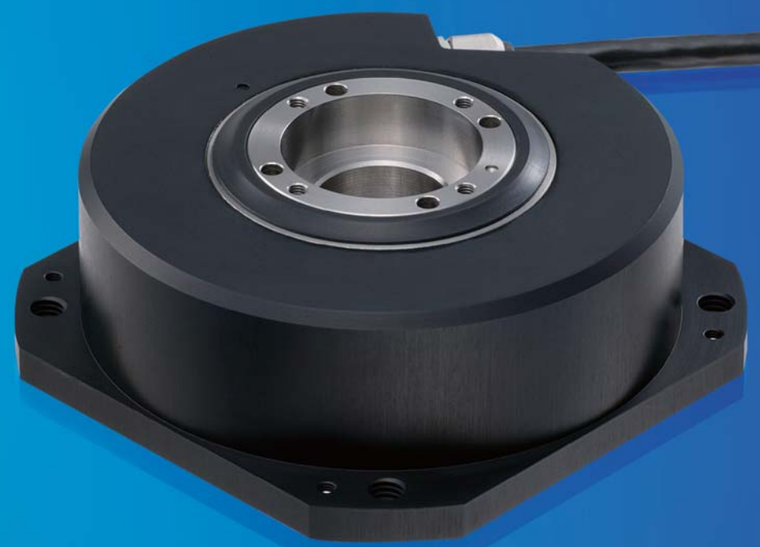
* Intermediate foot plate: Installed in one location when ML > 720 mm and two locations when ML > 1440 mm



Unit : mm

RU77

High precision absolute rotary type with exellent resistance to environments.



- System accuracy : ± 2.5sec
- Output wave number : 2^{12} = 4,096
- Output pulse number : 2^{25} = 33,554,432 p.p.r.
- Low-profile shape : 42mm
- Protocol : FANUC,Mitsubishi

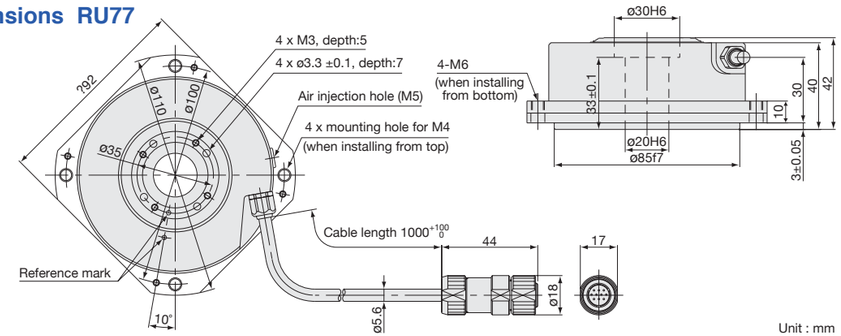
ABS | Rotary type | Maximum resolution 25 bit

Magnescale PRECISE IN PRECISION

Specifications

Model	RU77-4096AXX
Output signal	Absolute serial (2/4 duplex: Compliant with EIA-422)
Detection system	Magnetic system (MR sensor)
System accuracy (at 20 ˚C)	±2.5"
Resolution	Approx.2.5°/1,000 - Approx.1°/10,000 (131,072pulse/rotation - 33,554,432pulse/rotation)
Output wavelength	40 mm (λ)
Output wave number	4,096 waves/rotation
Number of divisions	4,096
Electrical allowable revolution	2,000min^{-1}
Mechanical allowable revolution	3,000min^{-1}
Operating temperature range	0 ~ +60 ˚C
Storage temperature range	-10 ~ +60 ˚C
Vibration resistance	150m/s^2(50Hz ~ 2,000Hz)
Shock resistance	1,000m/s^2(11ms)
Protective design grade	IP65
Power supply voltage	DC 4.75 - 5.25 V (At cable connection end)
Current consumption	200mA (at 120 Ω terminal) or less
Inrush current	2 A max. (When the power supply rising time is 10 ms)
Power supply protection	In the case of errors such as a reverse-connected power supply or over-voltage, the internal fuse is cut to protect the power being supplied and wiring.
Safety standards	FCC Part15 Subpart B Class A, ICES-003 Class A Digital Device and EN55011 Gp1 Class A, EN61000-6-2. Safety standards not applicable (60 V DC or less)
Dimensions	ø110 x 42mm
Cable length	Standard 1 m (maximum length of 15 m with extension cables)
Output connector	Male, round waterproof connector NJB1DB 10PL2 by Japan Aviation Electronics Industry
Compliant connector	Female, round waterproof connector NJB1HB 10SL2 by Japan Aviation Electronics Industry
Moment of inertia	9.4 x 10^{-5} kgm^2
Starting torque (at 20 ˚C)	0.1 N.m or less
Mass	Approx.1.3kg

Dimensions RU77



Unit : mm

Details of model designation

RU77-4096A○■

Protocol

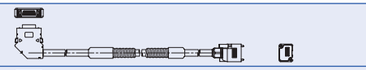
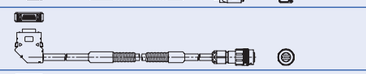
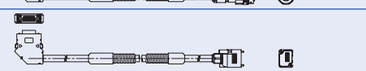
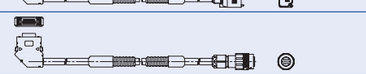
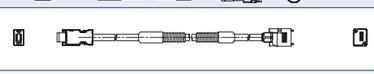
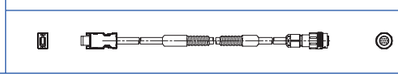
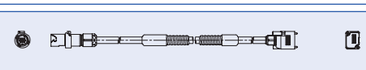
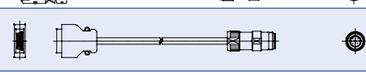
NC Manufacturer	Wire	
FANUC	4	A
Mitsubishi	2	B
	4	D

Resolution and Polarity

Resolution	Pulse number/ Revolution	Number of partitions	Type
2.5°/1,000	131,072	1/32	A
1°/1,000	262,144	1/64	B
7°/10,000	524,288	1/128	C
3.5°/10,000	1,048,576	1/256	D
2°/10,000	2,097,152	1/512	E
1°/10,000	4,194,304	1/1024	F
4.5°/100,000	8,388,608	1/2048	G
2°/100,000	16,777,216	1/4096	H
1°/100,000	33,554,432	1/8192	J

*Polarity is CCW

List of Adopter Cables

Protocol		Output	Connector type on controller side	Provision of grounding wire		Contour	Connection connector on scale side*	Model
				Not provided	Provided			
Straight line scale use	Standard	Spread-out end	Spread-out end	Not provided	–		Standard	CH33-＊＊○▽
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽ZA
	Mitsubishi	A quad B signal	3M 10P Model: Receptacle: 36210-0100PL Shell kit: 36310-3200-008	L	–		Standard	CH33-＊＊○▽L
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽LA
		ABS and INC serial		M	–		Standard	CH33-＊＊○▽M
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽MA
	Fanuc	A quad B signal	Honda Tsushin Kogyo 20P Straight case Model: PCR-S20-FS+	E	P		Standard	CH33-＊＊○▽E/P
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽EA/PA
		ABS and INC serial		F	Q		Standard	CH33-＊＊○▽F/Q
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽FA/QA
		A quad B signal	Hirose Electric 20P Horizontal drawing case Model: FI40B-20C-CVS5(50)	H	R		Standard	CH33-＊＊○▽H/R
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽HA/RA
		ABS and INC serial		J	S		Standard	CH33-＊＊○▽J/S
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽JA/SA
	Matsushita, Yaskawa	ABS and INC serial	Molex 6P Model: 55100-0670	G	–		Standard	CH33-＊＊○▽G
							For relaying (JN2DS10SL2-R)	CH33-＊＊○▽GA
	Connection cable for relaying	–	Japan Aviation Electronics 10P Model: JNIHS10PLS	K	–		Standard	CH33-＊＊○▽K
Rotary scale use	Cable with its end spread out	Spread-out end	Spread-out end	–	–		JAE JB1 (female) JB1HB 10SL2	JAE JB1 (female)
	Extension cable	Compatible with all RU77 models	JAE JB1 (male) JB1DB 10PL2	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○J
	Mitsubishi Electric	ABS serial	3M Receptacle: 36210-0100PL Shell kit: 36310-3200-008	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○M
	Fanuc	ABS serial	Honda Tsushin Kogyo Plug: PCR-S20FS+ Plug case: PCR-LS20LA	–	–		JAE JB1 (female) JB1HB 10SL2	CE28-＊＊＊○F

CH33-＊＊○▽※#

- Scale-side connector
  A: Circular connector
- Controller-side connector
- Cable sheath
  P: PVC（Polyvinyl chloride）
  E: PU(Polyurethane)
- Conduit
  C: With conduit (standard)
  N: Without conduit
- Cable length
  Written by flush right
  Indication in “m”
  Up to 30 m
  1m pitch
  Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

CE28-＊＊＊○#

- Scale-side connector
- Conduit
  C: With conduit
  N: Without conduit
- Cable length
  Written by flush right
  Indication in “10 cm”
  Up to 14 m
  1m pitch

* If the scale-side connection connector for relaying uses a relaying connector, please use this cable.

* The standard cable is not A quad B signal. Please consult our local sale office for detail.

Safety

No compromise for high-accuracy products

The total quality control system that operates throughout the entire design and production process ensures products with enhanced safety, high quality, and high reliability that match our customers' requirements. The company is certified for length calibration in compliance with the traceability system required by the "Weights and Measures Act," and has been granted ISO 9001 certification, which is the international standard for quality assurance.

Isehara plant is registered to ISO 9001 (Quality)

Our products comply with CE Marking requirements, have acquired UL certifications and meet other regulations, ensuring safe use the world over.

We have met:

- EMC Directives(CE)
  EMI: EN 55011 Group 1 Class A / 91
  EMS: EN 61000-6-2
- FCC regulation
  FCC Part 15 Subpart B Class A

for Products with built-in AC power supply:
- UL 61010-1

for Products with Laser:
- DHHS Class 1 (21CFR1040.10)

* When using our devices with machines to which the European Machinery Drirective applies, please make sure that the devices when installed on the machines fulfil the applicable requirements of the Directive.
* Standards or regulations to be complied with may vary by product.

Support

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