

Magnescale

SPEED X PRECISION



Feedback Scale

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Magnescale Co., Ltd.

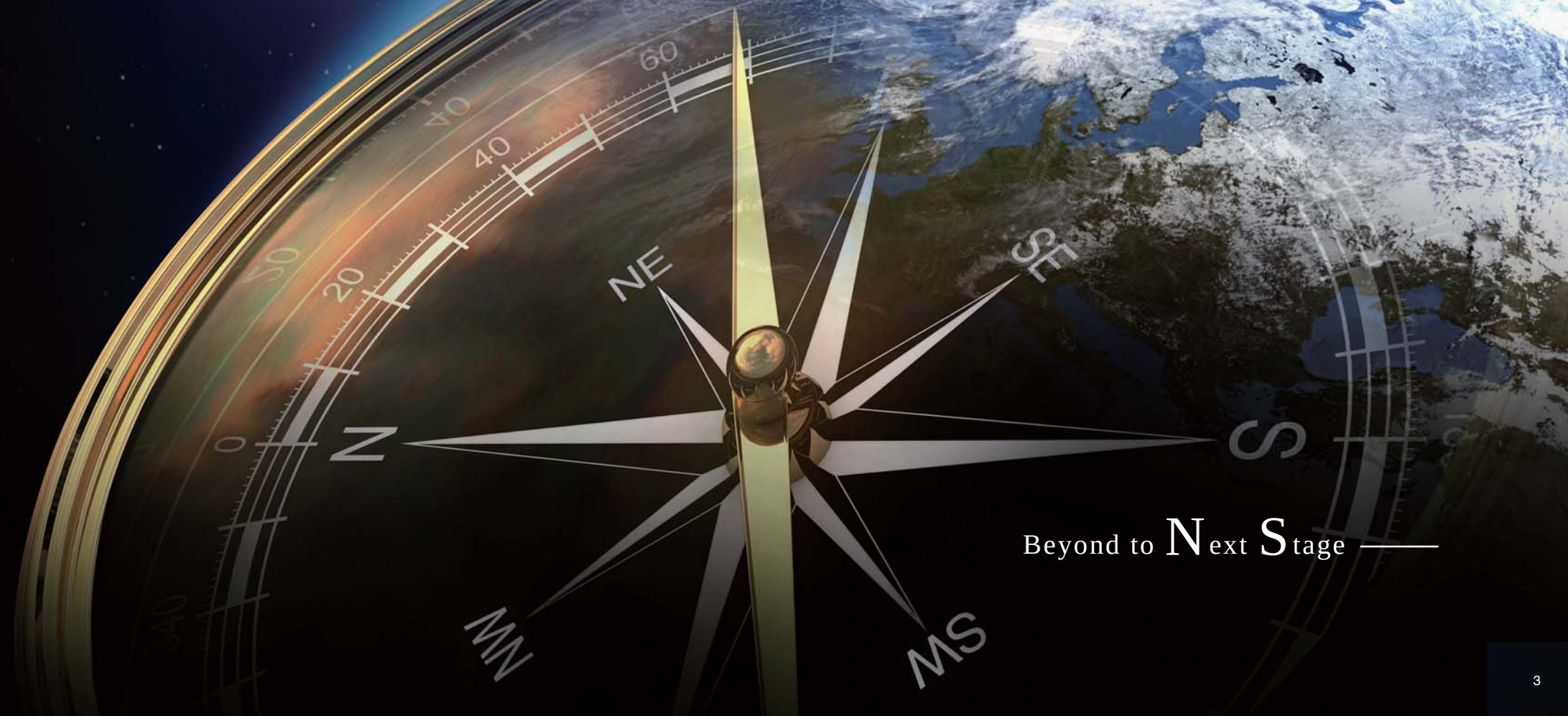
Blessing of the Earth



Absolute Magnescale



A compass using geomagnetism will guide you across the sea even during conditions of zero visibility in dense fog or in a storm with giant waves. Similarly, Magnescale uses magnetic technology to provide precise positioning even in severely harsh environments such as oil, coolant, and condensation in machine tools. Magnescale is jam-packed with state-of-the-art technologies, from precise magnetic recording and detection technology to advanced arithmetic processing technology and beyond. And, it's these cutting-edge technologies that are supporting the next generation of global manufacturing.



Beyond to **N**ext **S**tage

Advanced technology supports the evolution of high precision and resistance to harsh environments. Magnescale continues its endless evolution to develop scales with the high precision and durability demanded by machine tool applications.

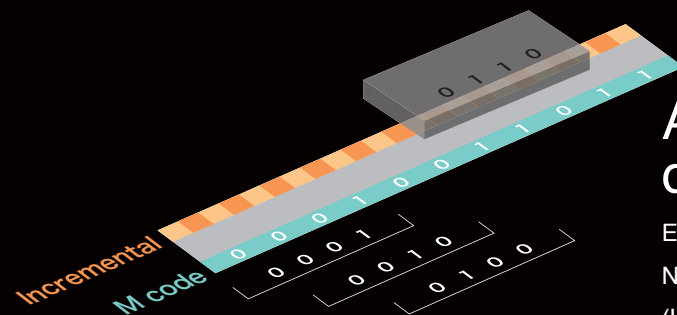
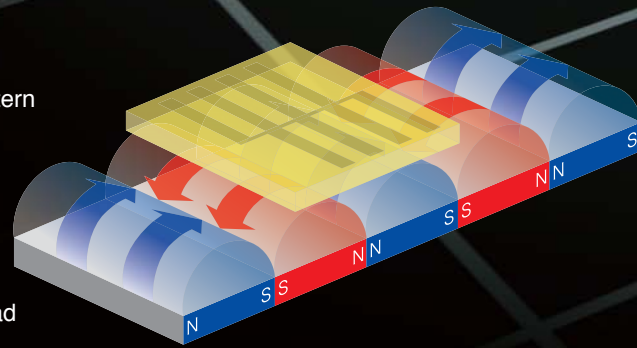
Magnescales born from advanced magnetic technology apply magnetism as the measurement principle, which makes them resistant to the oil and condensation inherent to machine tools, and enables consistently stable and precise position detection.

Principle

Detection principle

A thin-film MR element with a high-precision, low-distortion pattern arrangement is used as the detecting element.

The resistance value of the MR element changes when the magnetic field acting on the element changes due to an alteration in the relative positions between the element and the magnetic media. This change in resistance value is read electronically to detect the amount of positional change.

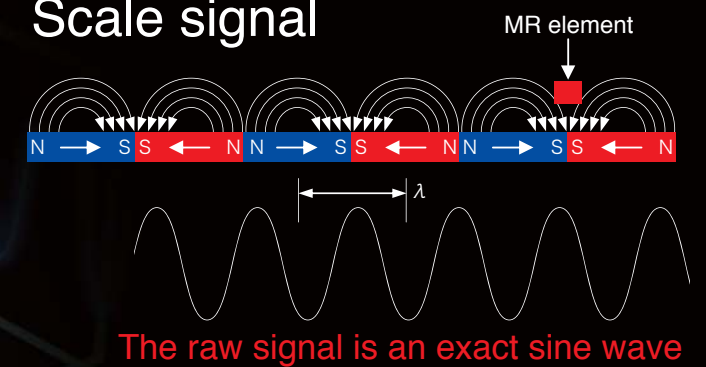


Absolute position detection system

Employs the 2-track M-code system.
Number of M-code bits: Up to 18 bits
(Left figure: Example of 4-bit codes)

Stability

Scale signal



MR element

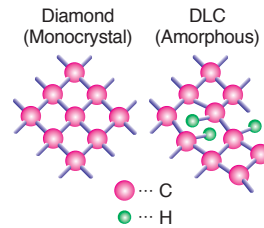
The MR element uses a special pattern to enable stable signal detection with high precision.

The patented detecting head pattern incorporates various technologies that help to achieve a high-precision signal, such as the following:

- 1) Harmonic distortion components are removed from the detected signal.
- 2) Stable signal output can be obtained over the entire effective length.
- 3) Stable signal output can be obtained with respect to temperature variation.



Environmental resistance

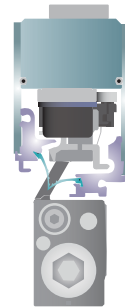


Protective structure

A diamond-like carbon (DLC) film is formed on the surface of the detecting head (the surface facing the magnetic scale) as a protective film. The detecting head is securely protected against both mechanical and environmental factors by multiple layers of protective film, which includes the DLC film (the world's first patent pending protective DLC film to be used on a MR element surface).

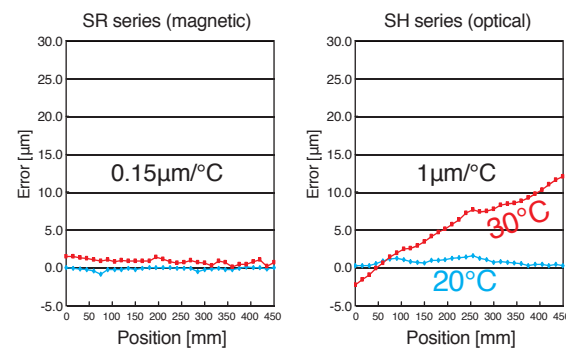
Impact resistance of 450 m/s², vibration resistance of 250 m/s²

Magnescale primarily uses ferrous members as the case material to protect the detector section, thereby realizing high vibration resistance and impact resistance characteristics. Furthermore, the SR67A series employs multi-point fixation construction in addition to the highly rigid case, achieving the industry's top-class vibration resistance and impact resistance.



Thermal expansion

Magnescales have the same linear expansion coefficient as that of iron used for the structure of general machine tools. Therefore, the scales exhibit the same behavior as the equipment in which they are installed, even in environments where the temperature changes, allowing extremely stable control. In particular, the SR67A series scales can be installed in close contact with the equipment, so heat is exchanged effectively with the equipment, making it possible to obtain stable accuracy even in environments where the temperature changes.



Resistance to condensation and oil

Magnescale employs a magnetic detection principle that is resistant to the effects of condensation and oil inherent to machine tools. This principle allows for the achievement of high positioning accuracy even in severe environments.

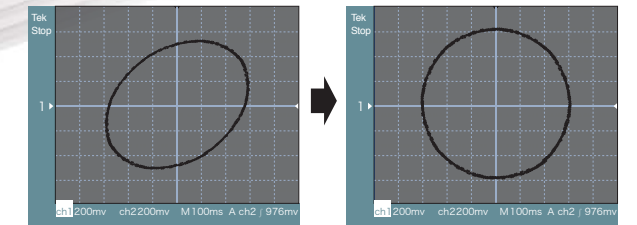


High Precision

Advanced arithmetic processing technology

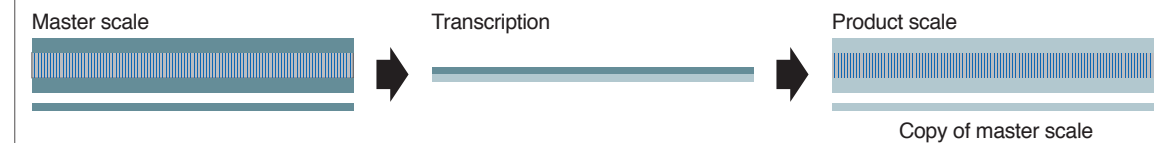
Use of an arithmetic processing circuit, based on original technology, achieves a higher interpolation accuracy.

Example of multi-arithmetic processing circuit.

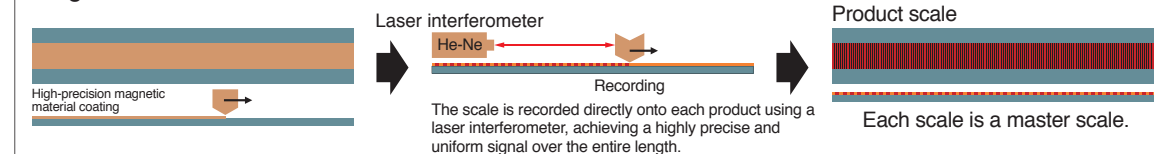


Scale recording method

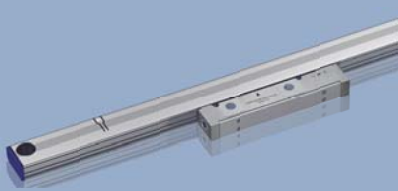
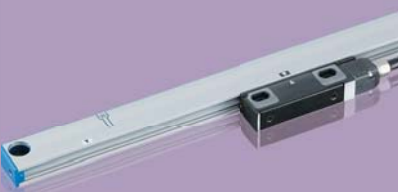
Optical scale

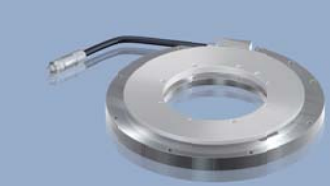
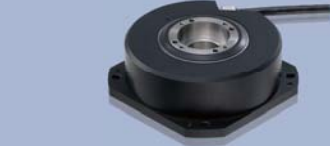


Magnescale



Lineup

	Communication system	Type/model name		Output signal	Compatible controllers	Effective length	Maximum resolution	Accuracy	Maximum response speed	Protective design grade	Page
Linear scale	ABS (Absolute)	Linear Slim type SR27A		Absolute serial bidirectional signal Compliant with EIA-485 / DRIVE-CLiQ	FANUC Mitsubishi Electric SIEMENS	70 to 2,040 mm	0.01μm	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p	200m/min	IP54 (Air purge not included) IP65 (Air purge included)	SR27A P10・11
		Linear Robust type SR67A		Absolute serial bidirectional signal Compliant with EIA-485 / DRIVE-CLiQ	FANUC Mitsubishi Electric SIEMENS	140 to 3,640 mm	0.01μm	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p	200m/min	IP54 (Air purge not included) IP65 (Air purge included)	SR67A P12・13
	INC (Incremental)	Linear Slim type SR74		A/B Reference point Line driver signal Compliant with EIA-422	-	70 to 2,040 mm	0.05μm	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p	50m/min (Resolution: 0.1 μm, Minimum phase difference: at 50 ns)	IP54 (Air purge not included) IP65 (Air purge included)	SR74 P14・15
		Linear Robust type SR84		A/B Reference point Line driver signal Compliant with EIA-422	-	140 to 3,040 mm	0.05μm	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p	50m/min (Resolution: 0.1 μm, Minimum phase difference: at 50 ns)	IP54 (Air purge not included) IP65 (Air purge included)	SR84 P16・17

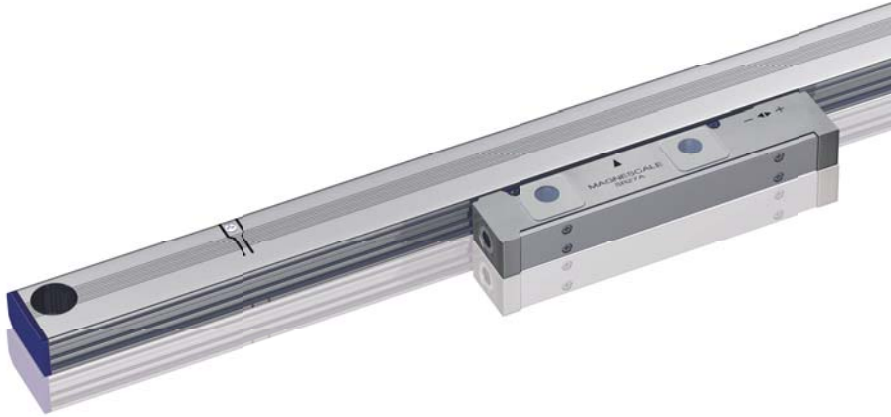
	Communication system	Type/model name		Output signal	Compatible controllers	Through hole diameter	Maximum resolution	Accuracy	Maximum response speed	Protective design grade	Page
Rotary scale	ABS (Absolute)	Rotary Exposed type RS97-1024E		Absolute serial bidirectional signal Compliant with EIA-485 / DRIVE-CLiQ	FANUC Mitsubishi Electric SIEMENS	φ96mm	23 bit (8,388,608 pulse/revolution)	±2.5"	5,000min ⁻¹	IP65	RS97-1024E P18・19
		Rotary Exposed type RS97-1024N		Absolute serial bidirectional signal Compliant with EIA-485 / DRIVE-CLiQ	FANUC Mitsubishi Electric SIEMENS	φ180mm	23 bit (8,388,608 pulse/revolution)	±2.5"	5,000min ⁻¹	IP65	RS97-1024N P20・21
		Rotary Enclosed type RU97-2048		Compliant with DRIVE-CLiQ	SIEMENS	A: φ20mm B: φ22mm	25 bit (33,554,432 pulse/revolution)	±2.5"	2,000min ⁻¹ (Maximum mechanical revolutions: 3,000min ⁻¹)	IP65	RU97-2048 P22・23
		Rotary Enclosed type RU77-4096		Absolute serial bidirectional signal Compliant with EIA-485	FANUC Mitsubishi Electric Yaskawa Electric	φ20mm	25 bit (33,554,432 pulse/revolution)	±2.5"	2,000min ⁻¹ (Maximum mechanical revolutions: 3,000min ⁻¹)	IP65	RU77-4096 P24・25

Absolute magnescale

Linear slim type

SR27A

- Slim type allows installation in narrow spaces
- Magnetic system enables use even in environments with condensation, oil, and other adverse conditions
- Supports the communication protocol of each supporting manufacturer
- Same thermal expansion as iron

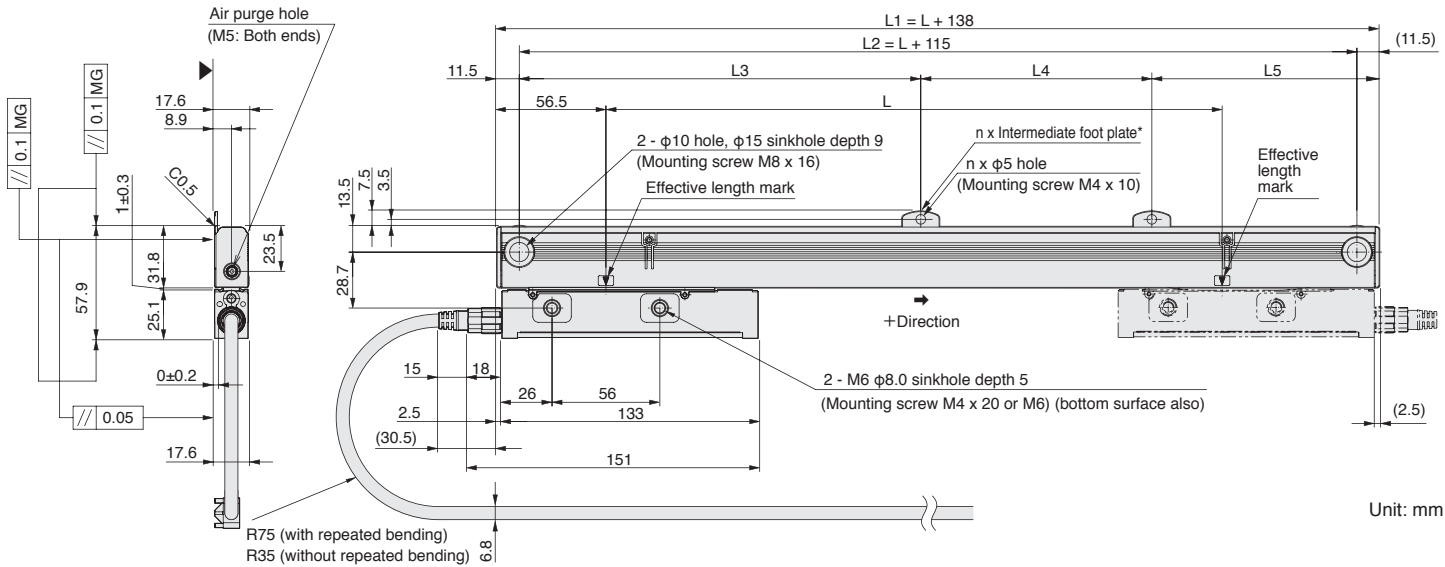


FANUC

Mitsubishi Electric

SIEMENS

Dimensions



Effective length	Total length	Mounting pitch					Number of intermediate foot plates
L	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	
670	808	785	392.5	—	392.5	1	
720	858	835	417.5	—	417.5	1	

Effective length	Total length	Mounting pitch					Number of intermediate foot plates
L	L1	L2	L3	L4	L5	n	
770	908	885	442.5	—	442.5	1	
820	958	935	467.5	—	467.5	1	
920	1,058	1,035	517.5	—	517.5	1	
1,020	1,158	1,135	567.5	—	567.5	1	
1,140	1,278	1,255	627.5	—	627.5	1	
1,240	1,378	1,355	677.5	—	677.5	1	
1,340	1,478	1,455	727.5	—	727.5	1	
1,440	1,578	1,555	520	520	515	2	
1,540	1,678	1,655	550	550	555	2	
1,640	1,778	1,755	585	585	585	2	
1,740	1,878	1,855	620	620	615	2	
1,840	1,978	1,955	650	650	655	2	
2,040	2,178	2,155	720	720	715	2	

MG: Machine guide * Intermediate foot plate: One location when L ≥ 670 mm, two locations when L ≥ 1440 mm

- Notes
- The surface indicated by the ▲ marks is the installation surface.
 - Screws indicated in the diagram are supplied as standard accessories.
 - Movement outside the effective length (L) will damage the scale head. It is recommended that the mechanical movable length (stroke) be set to 10 mm or more to the inside of both ends of the effective length (L).

Specifications

Model name	SR27A - xxx□□A #	SR27A - xxx□□B # SR27A - xxx□□D #	SR27A - xxx□AZY
Effective length (L: mm)	70 - 2,040		
Thermal expansion coefficient	12±1 × 10 ⁻⁶ /°C		
Accuracy(at 20°C)	3+3L/1,000 μm-p or 5+5L/1,000 μm-p, L: Effective length (mm)		
Reference point	Center, or user-selected position (Set at factory shipping)	Fixed to center	Fixed to 10 mm from left end of effective length
Output signal	Absolute serial bidirectional signal, compliant with EIA-485		Compliant with DRIVE-CLiQ
Compatible controllers	FANUC ai interface compatible	Mitsubishi Electric	SIEMENS AG
Resolution	Selectable from 0.01, 0.05, 0.1, 0.5 and 1 μm (Set at factory shipping)	Selectable from 0.01, 0.05 and 0.1 μm (Set at factory shipping)	0.01 μm
Maximum response speed	200 m/min		
Functional safety	Please consult with each controller manufacturer regarding support for functional safety.		EN ISO13849-1:2008 Cat.3 EN 62061:2005 / IEC 61508:2010 EN61800-5-2:2007
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2		
Operating temperature range	0 to +50°C		
Storage temperature range	-20 to +55°C		
Vibration resistance	150 m/s ² (50 Hz to 3,000 Hz)		
Impact resistance	350 m/s ² (11 ms)		
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)		
Power supply voltage range	DC+4.75 to +5.25 V		DC+17 to +30.8 V
Maximum power consumption	1.3W or less (4.75V or 5.25V)		1.75W or less (17V) 1.9W or less (30.8V)
Power consumption	250mA (5V) (when the controller is connected)		75mA (24V) (when the controller is connected)
Mass	Approx. 0.39kg+ 1.53kg/m or less		
Compatible cables (types without relay connectors) Maximum cable length	CH23-***NVF 13 m	CH23-***NVM 13 m	CH22-***NSMY 30 m
Compatible cables (types with relay connectors) Maximum cable length	CH23-***NVK + CH23-***NPFA 30 m	CH23-***NVK + CH23-***NPMA 30 m	CH22-***NSMF + CH22-*** NSFY 30 m

Details of model designation

Scale

SR27A - xxx□□A #

Reference point position					
Type	Reference point position				
X	Center				
Y	Zero position				
SIEMENS AG: Y only Mitsubishi Electric, FANUC: X only * Please consult our representative separately for arbitrary positions.					
Communication protocol					
Type	NC manufacturer	Remarks			
A	FANUC	ai series			
B	Mitsubishi Electric	2-wire			
D	Mitsubishi Electric	4-wire			
Z	SIEMENS AG	DRIVE-CLiQ			
Resolution and direction (μm)					
Type	Direction	Resolution	Type	Direction	Resolution
A	+ (plus)	0.01	F	- (minus)	0.01
B		0.05	G		0.05
C		0.1	H		0.1
D		0.5	J		0.5
E		1	K		1
SIEMENS AG: A only Mitsubishi Electric: A, B, C FANUC: A, B, C, D, E, F, G, H, J, K					
Accuracy grade					
Type	Accuracy grade				
A	5+5L/1,000 μm-p				
S	3+3L/1,000 μm-p				
L: Effective length(mm)					
Effective length (cm)					

Cables

CH22 - xxx□□A #

Control side connector	
Type	
Y	RJ45 connector made by Yamaichi Electric
Z	RJ45 connector (water-proof) made by Yamaichi Electric
F	M12 connector (male) made by Phoenix Contact
Scale side connector	
Type	
M	Scale head connector
F	M12 connector (male) made by Phoenix Contact
E	M12 connector (female) with panel mount relay made by Phoenix Contact
Cable specification	
Type	Cable specification
S	SIEMENS Motion Connect 800Plus (green)
Conduit specification	
Type	Conduit specification
C	With conduit
N	Without conduit
Cable length (Example)	
Type	Cable length
010	1.0 m
105	10.5 m
CH23 - xxx□□A #	
Scale side connector	
Type	
None	Original of Magnescale
A	10P JN2 (female) made by Japan Aviation Electronics Industry
C	12P R04-9125J12F8.5 (flange, female) made by Tajimi Electronics
Control side connector	
Type	
None	Untermated end
K	10P JN1 (male) made by Japan Aviation Electronics Industry
M	10P made by Sumitomo 3M
N	12P R04 (male) made by Tajimi Electronics
Cable specification	
Type	Cable specification
E	Polyurethane φ8 made by Yoshinogawa Electric Wire & Cable
P	PVC φ8 made by Hirakawa Hewtech
Z	PVC φ6.8 made by Hirakawa Hewtech
Conduit specification	
Type	Conduit specification
C	With conduit
N	Without conduit
R	With plastic tube
Cable length (Example)	
Type	Cable length
010	1.0 m
105	10.5 m

SR27A

SR67A

SR74

SR84

RS97-024E

RS97-024N

RU97-2048

RU77-4096

Absolute magnescale

Linear robust type

SR67A

- High rigidity provides resistance to shock and vibration
- Magnetic system allows use even in environments with condensation, oil, and other adverse conditions
- Supports the communication protocol of each supporting manufacturer
- Same thermal expansion as iron

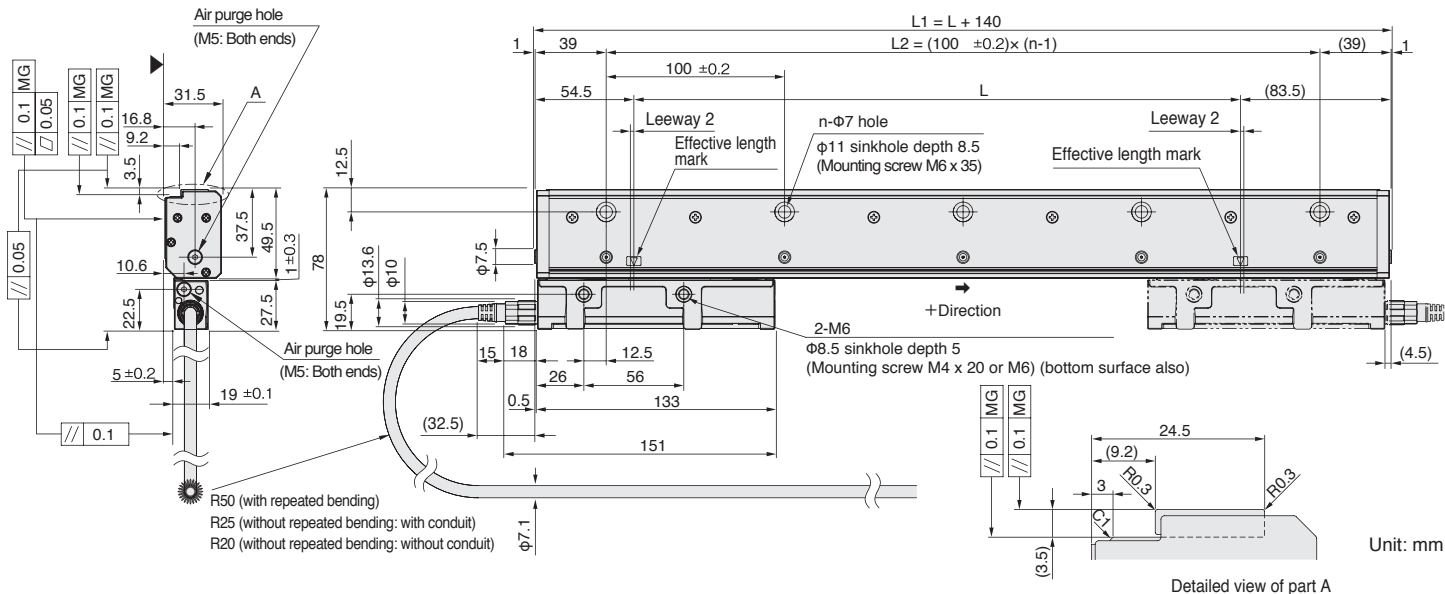


FANUC

Mitsubishi Electric

SIEMENS

Dimensions



Effective length	Total length	Mounting pitch	Number of intermediate foot plates
L	L1	L2	n
140	280	200	3
240	380	300	4
340	480	400	5
440	580	500	6
540	680	600	7
640	780	700	8
740	880	800	9
840	980	900	10
940	1,080	1,000	11
1,040	1,180	1,100	12
1,140	1,280	1,200	13
1,240	1,380	1,300	14
1,340	1,480	1,400	15
1,440	1,580	1,500	16

MG: Machine guide

- Notes
- The surface indicated by the ▲ marks is the installation surface.
 - Screws indicated in the diagram are supplied as standard accessories.
 - Movement outside the effective length (L) will damage the scale head. It is recommended that the mechanical movable length (stroke) be set to 10 mm or more to the inside of both ends of the effective length (L).

Effective length	Total length	Mounting pitch	Number of intermediate foot plates
L	L1	L2	n
1,540	1,680	1,600	17
1,640	1,780	1,700	18
1,740	1,880	1,800	19
1,840	1,980	1,900	20
2,040	2,180	2,100	22
2,240	2,380	2,300	24
2,440	2,580	2,500	26
2,640	2,780	2,700	28
2,840	2,980	2,900	30
3,040	3,180	3,100	32
3,240	3,380	3,300	34
3,440	3,580	3,500	36
3,640	3,780	3,700	38

Unit: mm

Specifications

Model name	SR67A - xxx○□A #	SR67A - xxx○□BX SR67A - xxx○□DX	SR67A - xxx○AZY
Effective length (L: mm)	140 - 3,640		
Thermal expansion coefficient	12±1 × 10 ⁻⁶ /°C		
Accuracy (at 20°C)	3+3L/1,000 μm-p (effective length 140 to 3,040 mm) or 5+5L/1,000 μm-p (effective length 140 to 3,640 mm), L: Effective length (mm)		
Reference point	Center, or user-selected position (Set at factory shipping)	Fixed to center	Fixed to 10 mm from left end of effective length
Output signal	Absolute serial bidirectional signal, compliant with EIA-485		Compliant with DRIVE-CLiQ
Compatible controllers	FANUC ai interface compatible	Mitsubishi Electric	SIEMENS AG
Resolution	Selectable from 0.01, 0.05, 0.1, 0.5 and 1 μm (Set at factory shipping)	Selectable from 0.01, 0.05 and 0.1 μm (Set at factory shipping)	0.01 μm
Maximum response speed	200 m/min		
Functional safety	Please consult with each controller manufacturer regarding support for functional safety.		EN ISO13849-1:2008 Cat.3 EN 62061:2005 / IEC 61508:2010 EN61800-5-2:2007
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2		
Operating temperature range	0 to +50°C		
Storage temperature range	-20 to +55°C		
Vibration resistance	250 m/s ² (50 Hz to 3,000 Hz)		
Impact resistance	450 m/s ² (11 ms)		
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)		
Power supply voltage range	DC+4.75 to +5.25 V		DC+17 to +30.8 V
Maximum power consumption	1.3W or less (4.75V or 5.25V)		1.75W or less (17V) 1.9W or less (30.8V)
Power consumption	250mA (5V) (when the controller is connected)		75mA (24V) (when the controller is connected)
Mass	Approx. 0.9kg+ 5.2kg/m or less		
Compatible cables (types without relay connectors) Maximum cable length	CH23-***NVF 13 m	CH23-***NVM 13 m	CH22-***NSMY 30 m
Compatible cables (types with relay connectors) Maximum cable length	CH23-***NVK + CH23-***NPFA 30 m	CH23-***NVK + CH23-***NPMA 30 m	CH22-***NSMF + CH22-*** NSFY 30 m

Details of model designation

Scale

SR67A - xxx○□A #

Reference point position					
Type	Reference point position				
X	Center				
Y	Zero position				
SIEMENS AG: Y only Mitsubishi Electric, FANUC: X only * Please consult our representative separately for arbitrary positions.					
Communication protocol					
Type	NC manufacture	Remarks			
A	FANUC				
B	Mitsubishi Electric	2-wire			
D	Mitsubishi Electric	4-wire			
Z	SIEMENS AG	DRIVE-CLiQ			
Resolution and direction (μm)					
Type	Direction	Resolution	Type	Direction	Resolution
A	+ (plus)	0.01	F	- (minus)	0.01
B		0.05	G		0.05
C		0.1	H		0.1
D		0.5	J		0.5
E		1	K		1
SIEMENS AG: A only Mitsubishi Electric: A, B, C FANUC: A, B, C, D, E, F, G, H, J, K					
Accuracy grade					
Type	Accuracy grade				
A	5+5L/1,000 μm-p				
S	3+3L/1,000 μm-p				
L: Effective length (mm)					
Effective length (cm)					

Cables

CH22 - xxx○□A #

Control side connector	
Type	
Y	RJ45 connector made by Yamaichi Electric
Z	RJ45 connector (water-proof) made by Yamaichi Electric
F	M12 connector (male) made by Phoenix Contact
Scale side connector	
Type	
M	Scale head connector
F	M12 connector (male) made by Phoenix Contact
E	M12 connector (female) with panel mount relay made by Phoenix Contact
Cable specification	
Type	Cable specification
S	SIEMENS Motion Connect 800Plus (green)
Conduit specification	
Type	Conduit specification
C	With conduit
N	Without conduit

Cable length (Example)	
Type	Cable length
010	1.0 m
105	10.5 m

CH23 - xxx○□A #

Scale side connector	
Type	
None	Original of Magnescale
A	10P JN2 (female) made by Japan Aviation Electronics Industry
C	12P R04-9125J12F8.5 (flange, female) made by Tajimi Electronics
Control side connector	
Type	
None	Unterminated end
K	10P JN1 (male) made by Japan Aviation Electronics Industry
M	10P made by Sumitomo 3M
N	12P R04 (male) made by Tajimi Electronics
Cable specification	
Type	Cable specification
E	Polyurethane φ8 made by Yoshinogawa Electric Wire & Cable
P	PVC φ8 made by Hirakawa Hewtech
Z	PVC φ6.8 made by Hirakawa Hewtech
Conduit specification	
Type	Conduit specification
C	With conduit
N	Without conduit
R	With plastic tube

Cable length (Example)	
Type	Cable length
010	1.0 m
105	10.5 m

SR27

SR67A

SR74

SR84

RS97-024E

RS97-024N

RU97-2048

RU77-4096

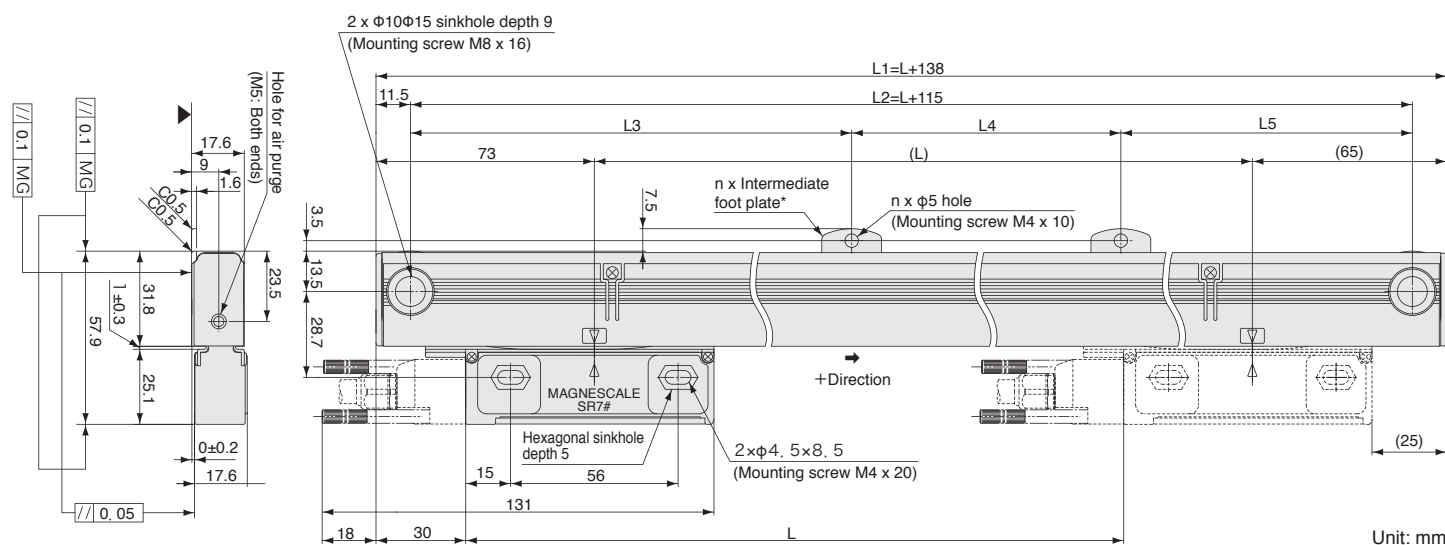
Incremental magnescale
Linear slim type
SR74

- Slim type allows installation in narrow spaces
- Magnetic system allows use even in environments with condensation, oil, and other adverse conditions
- Same thermal expansion coefficient as iron



A/B/Reference point

Dimensions (cable left-lead out direction)



Effective length	Total length	Mounting pitch				Number of intermediate foot plates
L	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

Effective length	Total length	Mounting pitch				Number of intermediate foot plates
L	L1	L2	L3	L4	L5	n
770	908	885	442.5	—	442.5	1
820	958	935	467.5	—	467.5	1
920	1,058	1,035	517.5	—	517.5	1
1,020	1,158	1,135	567.5	—	567.5	1
1,140	1,278	1,255	627.5	—	627.5	1
1,240	1,378	1,355	677.5	—	677.5	1
1,340	1,478	1,455	727.5	—	727.5	1
1,440	1,578	1,555	520	520	515	2
1,540	1,678	1,655	550	550	555	2
1,640	1,778	1,755	585	585	585	2
1,740	1,878	1,855	620	620	615	2
1,840	1,978	1,955	650	650	655	2
2,040	2,178	2,155	720	720	715	2

MG: Machine guide * Intermediate foot plate: One location when $L \geq 720$ mm, two locations when $L \geq 1440$ mm

Unit: mm

Notes • The surface indicated by the ▲ marks is the installation surface.

Specifications

Model name	SR74
Effective length (L: mm)	70-2,040
Thermal expansion coefficient	12±1 × 10 ⁻⁶ /°C
Accuracy(at 20°C)	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p L: Effective length (mm)
Reference point	Center point, Multi point (40 mm pitch), Signed-type (standard pitch 20 mm), User-selected point (1 mm pitch)
Output signal	A/B/Reference point line driver signal, compliant with EIA-422
Resolution	Selectable from 0.05, 0.1, 0.5, and 1 μm (Set at factory shipping)
Maximum response speed	50m/ min (Resolution: 0.1 μm, Minimum phase difference: at 50 ns)
Functional safety	—
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2(60 V DC or less)
Operating temperature range	0 to +50°C
Storage temperature range	-20 to +55°C
Vibration resistance	150 m/s ² (50 Hz to 3 kHz)
Impact resistance	350 m/s ² (11 ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Power supply voltage range	DC+4.75 to +5.25 V
Maximum power consumption	1.0W or less (4.75V or 5.25V)
Power consumption	190 mA (5V) (when the controller is connected)
Mass	Approx. 0.27kg+ 1.36kg/m or less
Standard compatible cable	CH33-***CP/CE
Maximum cable length	15 m

Details of model designation

Scale

SR74-xxx★○□◆###

Reference point position (Distance from left end of effective length)			
Reference point position	Indication method	Reference point position	Indication method
Less than 1,000	Number (850 mm → 850)	1,700—1,799 mm	H + lower 2 digits
1,000—1,099 mm	A + lower 2 digits (1,050 mm → A50)	1,800—1,899 mm	J + lower 2 digits
1,100—1,199 mm	B + lower 2 digits	1,900—1,999 mm	K + lower 2 digits
1,200—1,299 mm	C + lower 2 digits	2,000—2,040 mm	L + lower 2 digits
1,300—1,399 mm	D + lower 2 digits		
1,400—1,499 mm	E + lower 2 digits		
1,500—1,599 mm	F + lower 2 digits		
1,600—1,699 mm	G + lower 2 digits		

Type	Phase difference (ns)	Type	Phase difference (ns)	Type	Phase difference (ns)
A	50	F	300	L	1,250
B	100	G	400	M	2,500
C	150	H	500	N	3,000
D	200	J	650		
E	250	K	1,000		

Resolution and direction (μm)					
Type	Direction	Resolution	Type	Direction	Resolution
B	+ (plus)	0.05	G	- (minus)	0.05
C		0.1	H		0.1
D		0.5	J		0.5
E		1.0	K		1.0

Type	Accuracy grade
A	5+5L/1,000 μm
S	3+3L/1,000 μm

Type	Lead-out direction
R	Right
L	Left

— Effective length (L): cm units

Cable

CH33 - **○▽*#

Scale side connector	
Type	
A	Circular connector
Controller side connector	
Cable sheath (covering)	
Type	
P	PVC (Polyvinyl chloride)
E	PU (Polyurethane)
Conduit	
Type	Conduit
C	With conduit (standard)
N	Without conduit

— Cable length
Written by flush right, indication in "m" units, up to 30 m, 1 m pitch
Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Incremental magnescale

Linear robust type

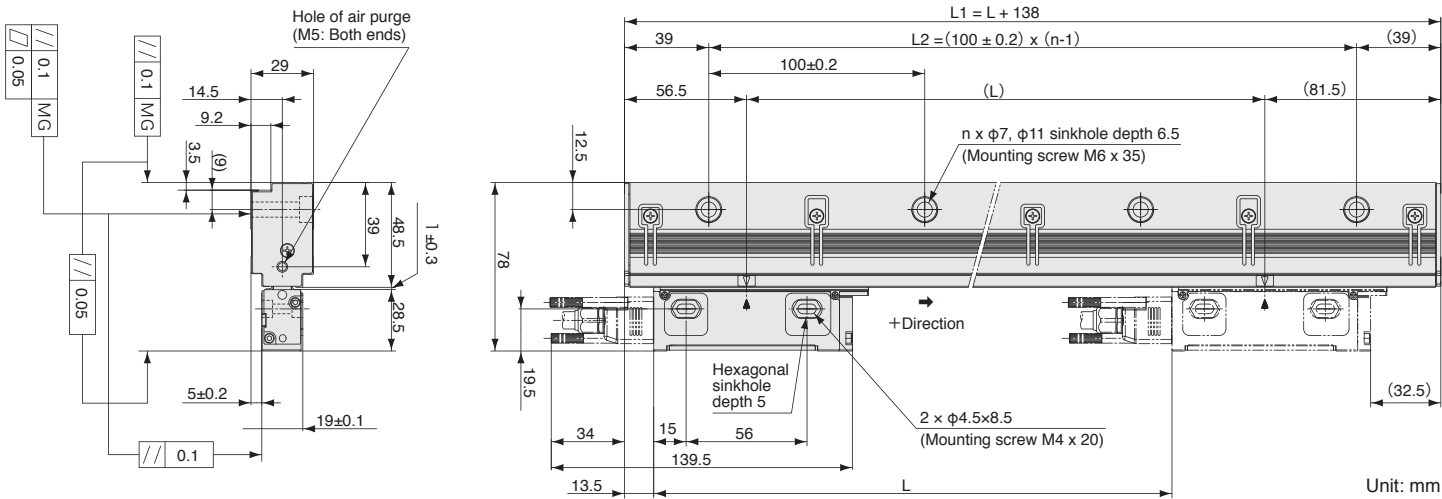
SR84

- High rigidity provides resistance to shock and vibration
- Magnetic system allows use even in environments with condensation, oil, and other adverse conditions
- Same thermal expansion as iron



A/B/Reference point

Dimensions (cable left-lend out direction)



Effective length	Total length	Mounting pitch	Number of intermediate foot plates
L	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	1,078	1,000	11
1,040	1,178	1,100	12
1,140	1,278	1,200	13
1,240	1,378	1,300	14

MG: Machine guide

Effective length	Total length	Mounting pitch	Number of intermediate foot plates
L	L1	L2	n
1,340	1,478	1,400	15
1,440	1,578	1,500	16
1,540	1,678	1,600	17
1,640	1,778	1,700	18
1,740	1,878	1,800	19
1,840	1,978	1,900	20
2,040	2,178	2,100	22
2,240	2,378	2,300	24
2,440	2,578	2,500	26
2,640	2,778	2,700	28
2,840	2,978	2,900	30
3,040	3,178	3,100	32

Unit: mm

Specifications

Model name	SR84
Effective length (L: mm)	140-3,040
Thermal expansion coefficient	12±1 × 10 ⁻⁶ /°C
Accuracy(at 20°C)	3+3L/1,000 μmp-p or 5+5L/1,000 μmp-p L: Effective length (mm)
Reference point	None, Center point, Multi point, Signed-type, User-selected point (1 mm pitch)
Output signal	A/B/Reference point line driver signal, compliant with EIA-422
Resolution	Selectable from 0.05, 0.1, 0.5, and 1 μm (Set at factory shipping)
Maximum response speed	50m/ min (Resolution: 0.1 μm, Minimum phase difference: at 50 ns)
Functional safety	—
Legal compliance	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 to +50°C
Storage temperature range	-20 to +55°C
Vibration resistance	250 m/s ² (50 Hz to 2 kHz)
Impact resistance	450 m/s ² (11 ms)
Protective design grade	IP54 (Air purge not included), IP65 (Air purge included)
Power supply voltage range	DC+4.75 to +5.25 V
Maximum power consumption	1.0W or less (4.75V or 5.25V)
Power consumption	190 mA (5V) (when the controller is connected)
Mass	Approx. 1.24kg+ 4kg/m or less
Standard compatible cable	CH33-***CP/CE
Maximum cable length	15 m

Details of model designation

Scale

SR84 - x x x ★ ○ □ ◆ # # #

Reference point position	Indication method	Reference point position	Indication method	Reference point position	Indication method
Less than 1,000	Number (850 mm → 850)	1,700—1,799 mm	H + lower 2 digits	2,500—2,599 mm	R + lower 2 digits
1,000—1,099 mm	A + lower 2 digits (1,050 mm → A50)	1,800—1,899 mm	J + lower 2 digits	2,600—2,699 mm	S + lower 2 digits
1,100—1,199 mm	B + lower 2 digits	1,900—1,999 mm	K + lower 2 digits	2,700—2,799 mm	T + lower 2 digits
1,200—1,299 mm	C + lower 2 digits	2,000—2,099 mm	L + lower 2 digits	2,800—2,899 mm	U + lower 2 digits
1,300—1,399 mm	D + lower 2 digits	2,100—2,199 mm	M + lower 2 digits	2,900—2,999 mm	V + lower 2 digits
1,400—1,499 mm	E + lower 2 digits	2,200—2,299 mm	N + lower 2 digits	3,000—3,040 mm	W + lower 2 digits
1,500—1,599 mm	F + lower 2 digits	2,300—2,399 mm	P + lower 2 digits		
1,600—1,699 mm	G + lower 2 digits	2,400—2,499 mm	Q + lower 2 digits		

Type	Phase difference (ns)	Type	Phase difference (ns)	Type	Phase difference (ns)
A	50	F	300	L	1,250
B	100	G	400	M	2,500
C	150	H	500	N	3,000
D	200	J	650		
E	250	K	1,000		

Type	Direction	Resolution	Type	Direction	Resolution
B		0.05	G		0.05
C		0.1	H		0.1
D		0.5	J		0.5
E		1.0	K		1

Type	Accuracy grade
A	5+5L/1,000 μm
S	3+3L/1,000 μm

Type	Lead-out direction
R	Right
L	Left

Effective length (L): cm units

Cable

CH33 - * * * ○ ▽ * #

Type	Scale side connector
A	Circular connector
Type	Controller side connector
P	PVC (Polyvinyl chloride)
E	PU (Polyurethane)
Type	Conduit
C	With conduit (standard)
N	Without conduit

Cable length
Written by flush right, indication in "m" units, up to 30 m, 1 m pitch
Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Absolute rotary magnescale
Rotary exposed type

RS97-1024E

- Amp-less design enables direct communication using the protocol of each supporting manufacturer
- Magnetic system enables use even in environments with condensation and oil and other adverse conditions
- 96mm diameter through-hole allows for design and mounting flexibility
- Use of two heads provides resistance to axial runout

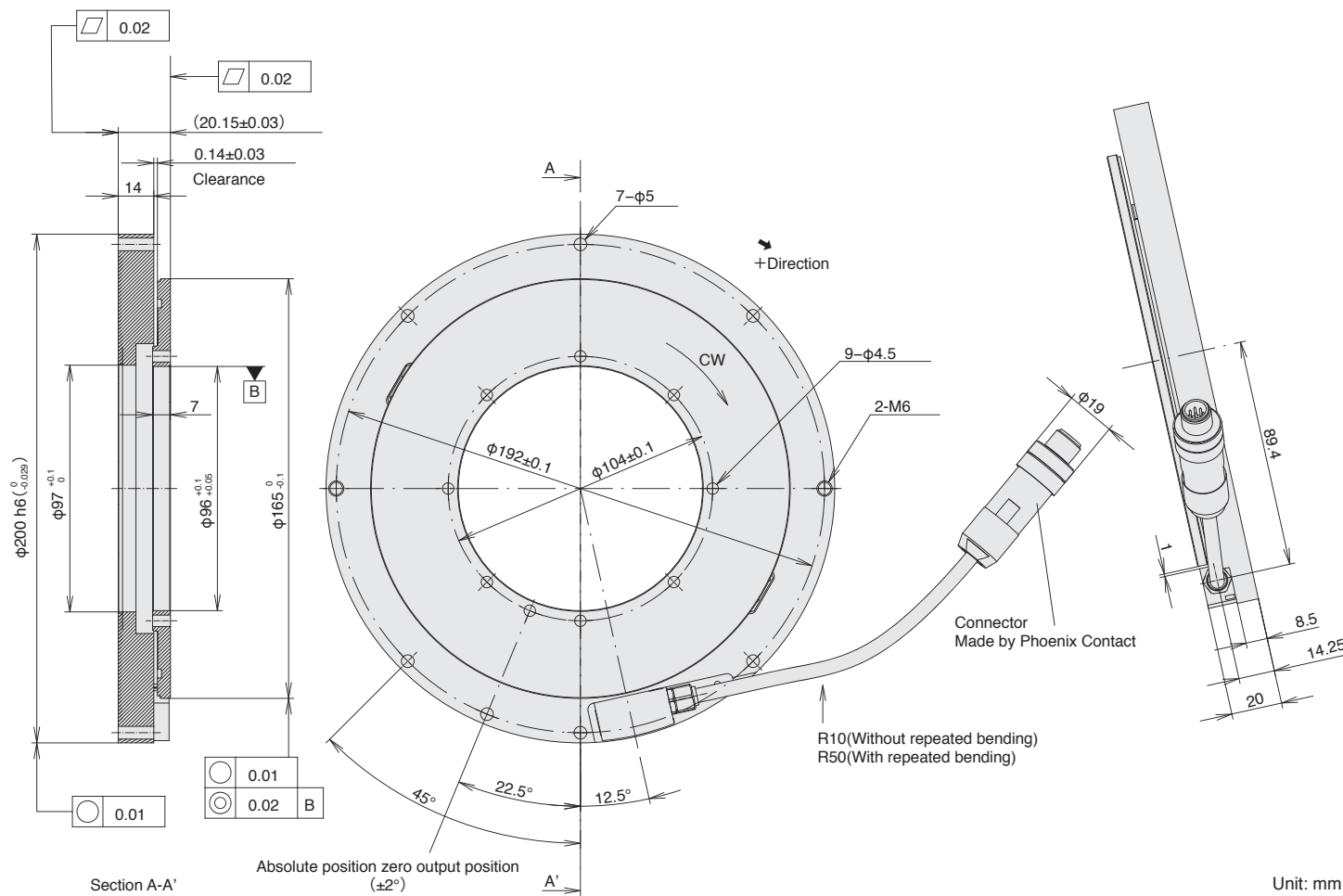
FANUC

Mitsubishi Electric

SIEMENS



Dimensions



Specifications

Model name	RS97-1024EGA	RS97-1024EGD	RS97-1024EGZ
Output wave number	1,024 waves/revolution		
Through hole diameter	φ96 mm		
Accuracy(at 20°C)	±2.5"		
Output signal	Absolute serial bidirectional signal, compliant with EIA-485		Compliant with DRIVE-CLiQ
Compatible controllers	FANUC	Mitsubishi Electric	SIEMENS AG
Resolution	23 bits (8,388,608 pulses/revolution)		
Maximum response revolutions	5,000 min ⁻¹		
Functional safety	Please consult with each controller manufacturer regarding support for functional safety.		
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2		
Operating temperature range	0 to +60°C		
Storage temperature range	-10 to +60°C		
Vibration resistance	150 m/s ² (50 Hz to 2,000 Hz)		
Impact resistance	1,000 m/s ² (11 ms)		
Protective design grade	IP65		
Power supply voltage range	DC+4.75 to +5.25 V		DC+17 to +30.8 V
Maximum power consumption	1.25W or less (4.75V) 1.2W or less (5.25V)		2.3W or less (17V) 3.1W or less (30.8V)
Power consumption	240mA (5V) (when the controller is connected)		120mA (24V) (when the controller is connected)
Moment of inertia	9×10 ⁻⁴ kgm ² or less		
Starting torque (at 20°C)	—		
Mass	Approx. 2kg (rotor: 0.2kg/ stator: 1.7kg) or less		
Compatible cables (types without relay connectors) Maximum cable length	CH23-***NPFA 30 m	CH23-***NPMA 30 m	CH22-***NSFY 30 m
Compatible cables (types with relay connectors) Maximum cable length	CH23-***NPKA + CH23-***NPFA 30 m	CH23-***NPKA + CH23-***NPMA 30 m	CH22-***NSFF + CH22-***NSFY 30 m

Details of model designation

Scale

RS97-1024EG△■

Type	Head cable length
01	1 m
02	2 m

Type	NC manufacturer	Remarks
A	FANUC	qi series
D	Mitsubishi Electric	4-wire
Z	SIEMENS AG	DRIVE-CLiQ

Resolution 23 bit

Rotor inner diameter 96 mm

Cables

CH22-xxx○□△#

Type	Control side connector
Y	RJ45 connector made by Yamaichi Electric
Z	RJ45 connector (water-proof) made by Yamaichi Electric
F	M12 connector (male) made by Phoenix Contact

Type	Scale side connector
M	Scale head connector
F	M12 connector (male) made by Phoenix Contact
E	M12 connector (female) with panel mount relay made by Phoenix Contact

Type	Cable specification
S	SIEMENS Motion Connect 800Plus (green)

Type	Conduit specification
C	With conduit
N	Without conduit

Cable length (Example)

Type	Cable length
010	1.0 m
105	10.5 m

CH23-xxx○□△#

Type	Scale side connector
None	Original of Magnescale
A	10P JN2 (female) made by Japan Aviation Electronics Industry
C	12P R04-9125J12F8.5 (flange, female) made by Tajimi Electronics

Type	Control side connector
None	Unterminated end
K	10P JN1 (male) made by Japan Aviation Electronics Industry
M	10P made by Sumitomo 3M
N	12P R04 (male) made by Tajimi Electronics

Type	Cable specification
E	Urethane φ8 made by Yoshinogawa Electric Wire & Cable
P	PVC φ8 made by Hirakawa Hewtech
Z	PVC φ6.8 made by Hirakawa Hewtech

Type	Conduit specification
C	With conduit
N	Without conduit
R	With plastic tube

Cable length (Example)

Type	Cable length
010	1.0 m
105	10.5 m

Absolute rotary magnescale

Rotary exposed type

RS97-1024N

- Amp-less design enables direct communication using the protocol of each supporting manufacturer
- Magnetic system enables use even in environments with condensation and oil and other adverse conditions
- 180mm diameter through-hole allows for design and mounting flexibility
- Use of two heads provides resistance to axial runout

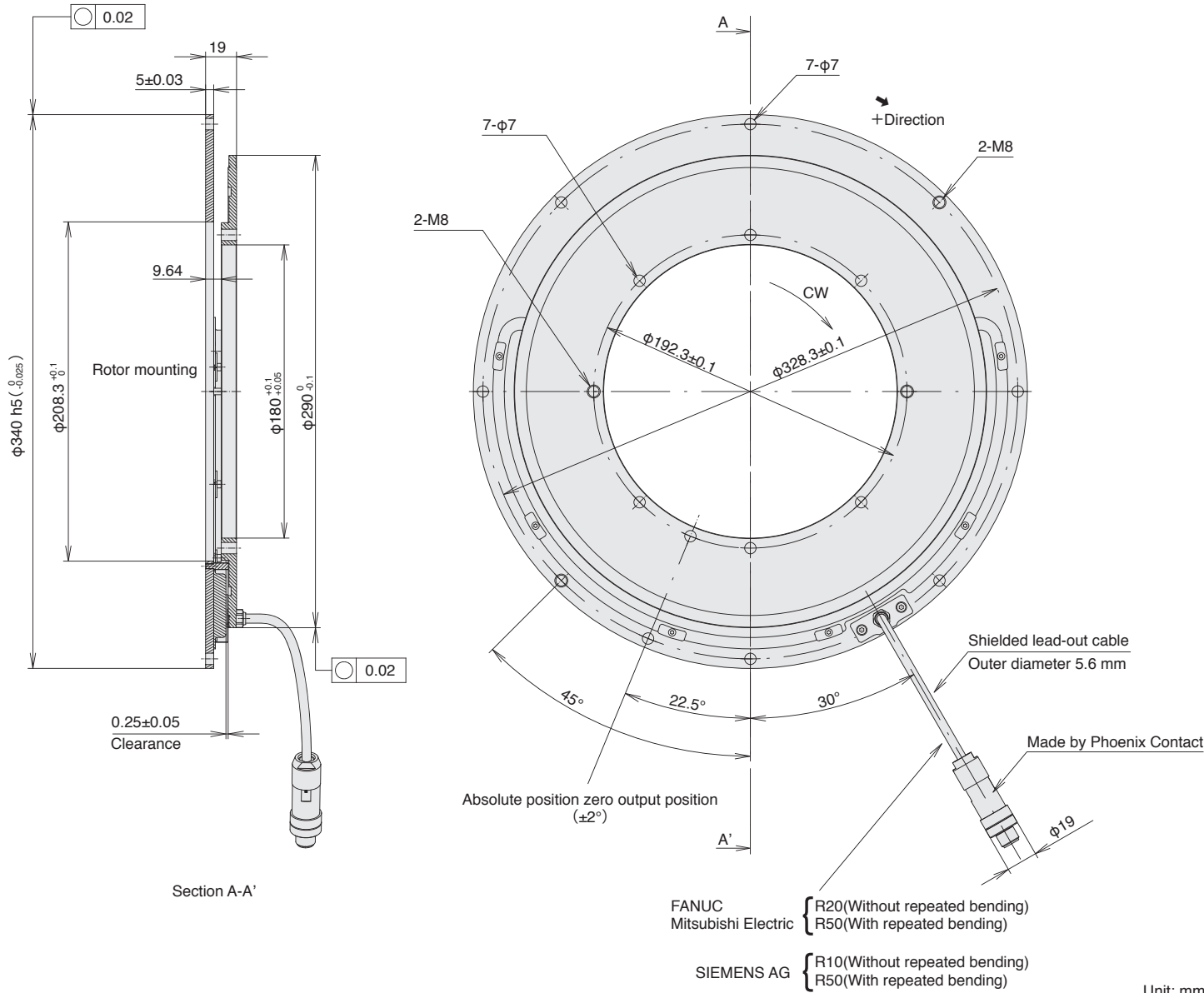
FANUC

Mitsubishi Electric

SIEMENS



Dimensions



Unit: mm

Specifications			
Model name	RS97-1024NGA	RS97-1024NGD	RS97-1024NGZ
Output wave number	1,024 waves/revolution		
Through hole diameter	φ180 mm		
Accuracy(at 20°C)	±2.5"		
Output signal	Absolute serial bidirectional signal, compliant with EIA-485		Compliant with DRIVE-CLiQ
Compatible controllers	FANUC	Mitsubishi Electric	SIEMENS AG
Resolution	23 bits (8,388,608 pulses/revolution)		
Maximum response revolutions	5,000 min ⁻¹		
Functional Safety	Please consult with each controller manufacturer regarding support for functional safety.		
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2		
Operating temperature range	0 to +60°C		
Storage temperature range	-10 to +60°C		
Vibration resistance	150 m/s ² (50 Hz to 2,000 Hz)		
Impact resistance	1,000 m/s ² (11 ms)		
Protective design grade	IP65		
Power supply voltage range	DC+4.75 to +5.25 V		DC+17 to +30.8 V
Maximum power consumption	1.35W or less (4.75V) 1.3W or less (5.25V)		2.5W or less (17V) 3.2W or less (30.8V)
Power consumption	260mA (5V) (when the controller is connected)		120mA (24V) (when the controller is connected)
Moment of inertia	8.8× 10 ⁻³ kg ² or less		
Mass	Approx. 3.4kg (rotor: 0.6kg/ stator: 2.8kg) or less		
Compatible cables (types without relay connectors) Maximum cable length	CH23-***NPFA 30 m	CH23-***NPMA 30 m	CH22-***NSFY 30 m
Compatible cables (types with relay connectors) Maximum cable length	CH23-***NPKA + CH23-***NPFA 30 m	CH23-***NPKA + CH23-***NPMA 30 m	CH22-***NSFF + CH22-***NSFY 30 m

Details of model designation

Scale

RS97-1024NG△■

Type	Head cable length
01	1 m
02	2 m
03	3 m

Type	NC manufacturer	Remarks
A	FANUC	qi series
D	Mitsubishi Electric	4-wire
Z	SIEMENS AG	DRIVE-CLiQ

Resolution 23 bit

Rotor inner diameter 180 mm

Cables

CH22-xxx○△#

Type	Control side connector
Y	RJ45 connector made by Yamaichi Electric
Z	RJ45 connector (water-proof) made by Yamaichi Electric
F	M12 connector (male) made by Phoenix Contact

Type	Scale side connector
M	Scale head connector
F	M12 connector (male) made by Phoenix Contact
E	M12 connector (female) with panel mount relay made by Phoenix Contact

Type	Cable specification
S	SIEMENS Motion Connect 800Plus (green)

Type	Conduit specification
C	With conduit
N	Without conduit

Cable length (Example)

Type	Cable length
010	1.0 m
105	10.5 m

CH23-xxx○△#

Type	Scale side connector
None	Original of Magnescale
A	10P JN2 (female) made by Japan Aviation Electronics Industry
C	12P R04-9125J12F8.5 (flange, female) made by Tajimi Electronics

Type	Control side connector
None	Unterminated end
K	10P JN1 (male) made by Japan Aviation Electronics Industry
M	10P made by Sumitomo 3M
N	12P R04 (male) made by Tajimi Electronics

Type	Cable specification
E	Urethane φ8 made by Yoshinogawa Electric Wire & Cable
P	PVC φ8 made by Hirakawa Hewtech
Z	PVC φ6.8 made by Hirakawa Hewtech

Type	Conduit specification
C	With conduit
N	Without conduit
R	With plastic tube

Cable length (Example)

Type	Cable length
010	1.0 m
105	10.5 m

Absolute rotary magnescale

Rotary enclosed type

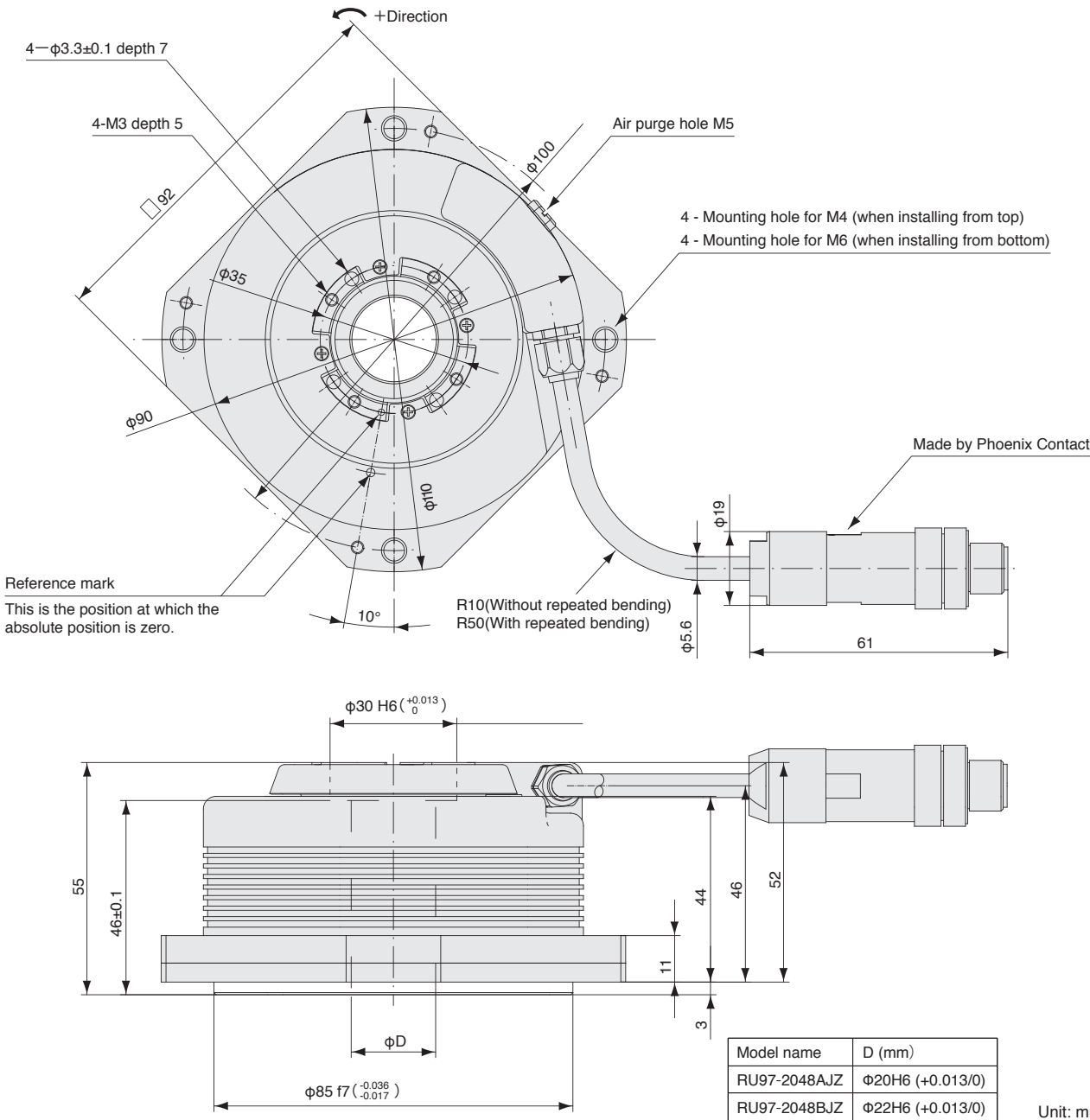
RU97-2048

- Amp-less design enables direct communication using the SIEMENS AG DRIVE-CLiQ protocol
- Magnetic system enables use even in environments with condensation and oil and other adverse conditions
- Use of two heads provides resistance to axial runout
- Internal coupling increases degree of mounting freedom

SIEMENS



Dimensions



Unit: mm

Specifications

Model name	RU97-2048AJZ RU97-2048BJZ
Output wave number	2,048 waves/revolution
Through hole diameter	A: $\phi 20$ mm, B: $\phi 22$ mm
Accuracy(at 20°C)	$\pm 2.5''$
Output signal	Compliant with DRIVE-CLiQ, single turn absolute type
Compatible controllers	SIEMENS AG
Resolution	25 bits (33,554,432 pulses/revolution)
Maximum response revolutions	2,000 min ⁻¹
Maximum mechanical revolutions	3,000 min ⁻¹
Functional safety	EN ISO13849-1:2008 Cat.3 EN 62061:2005 / IEC 61508:2010 / EN61800-5-2:2007
Legal compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2
Operating temperature range	0 to +60°C
Storage temperature range	-10 to +60°C
Vibration resistance	150 m/s ² (50 Hz to 2,000 Hz)
Impact resistance	1,000 m/s ² (11 ms)
Protective design grade	IP65
Power supply voltage range	DC+17 to +30.8 V
Maximum power consumption	1.6 W or less (17 V or 30.8 V)
Power consumption	65 mA (24 V) (when the controller is connected)
Moment of inertia	9.4×10 ⁻⁵ kgm ² or less
Starting torque (at 20°C)	0.08 Nm or less
Mass	Approx. 1.2kg or less
Compatible cables (types without relay connectors) Maximum cable length	CH22-***NSFY 30 m
Compatible cables (types with relay connectors) Maximum cable length	CH22-***NSFF + CH22-***NSFY 30 m

Details of model designation

Scale

RU97-2048☆JZ■

Head cable length	Type Head cable length
01	1 m
02	2 m
03	3 m
SIEMENS AG DRIVE-CLiQ	Resolution 23 bit
Drum inner diameter	Type Drum inner diameter
A	$\phi 20$ mm
B	$\phi 22$ mm

Cable

CH22-xxx○□△#

Control side connector	Type
Y	RJ45 connector made by Yamaichi Electric
Z	RJ45 connector (water-proof) made by Yamaichi Electric
F	M12 connector (male) made by Phoenix Contact
Scale side connector	Type
M	Scale head connector
F	M12 connector (male) made by Phoenix Contact
E	M12 connector (female) with panel mount relay made by Phoenix Contact
Cable specification	Type Cable specification
S	SIEMENS Motion Connect 800Plus (green)
Conduit specification	Type Conduit specification
C	With conduit
N	Without conduit
Cable length (Example)	Type Cable length
010	1.0 m
105	10.5 m

Absolute rotary magnescale

Rotary enclosed type

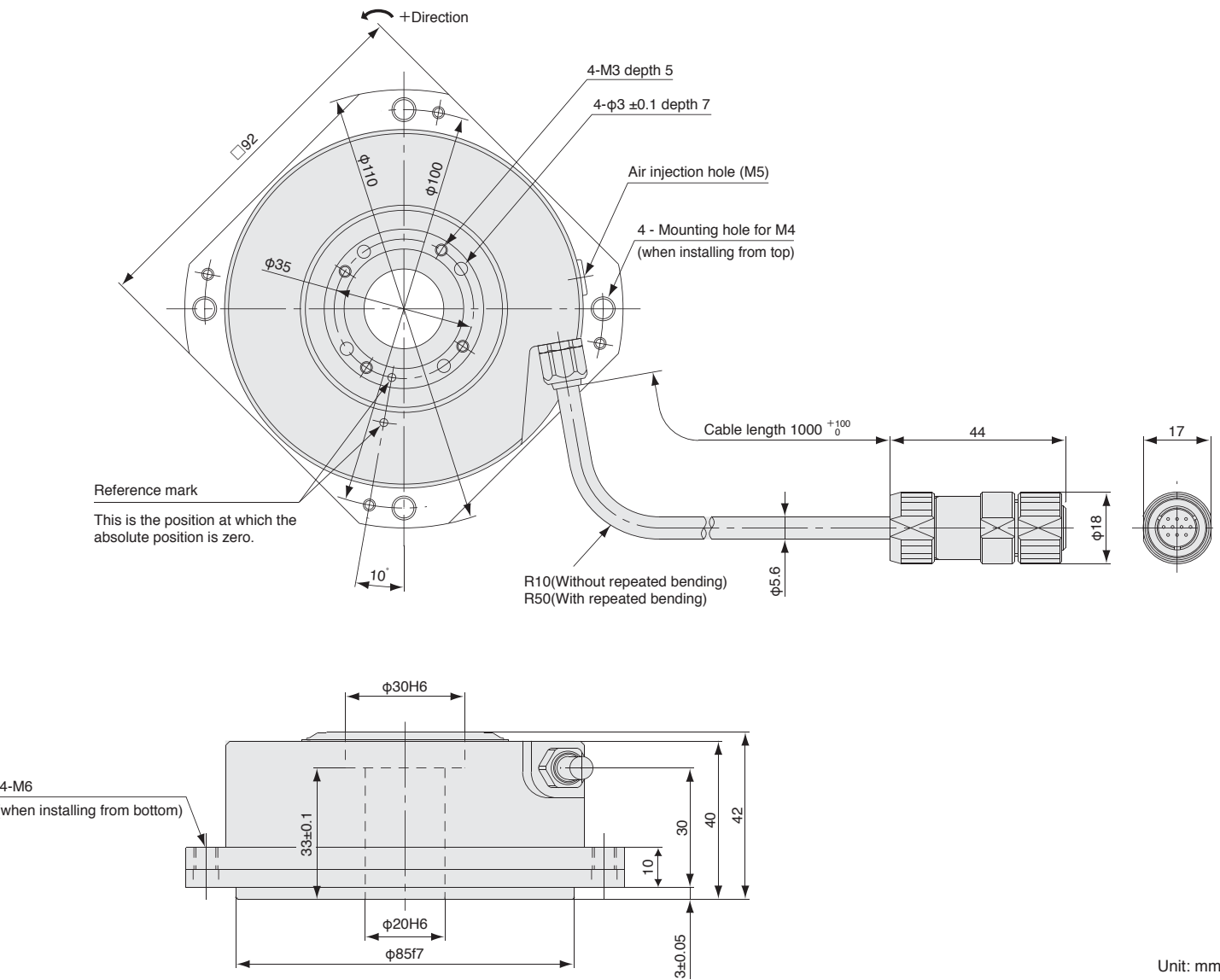
RU77-4096

- Magnetic system enables use even in environments with condensation and oil and other adverse conditions
- Use of two heads provides resistance to axial runout
- Amp-less design enables direct communication using the protocol of each supporting manufacturer
- Internal coupling increases degree of mounting freedom

FANUC Mitsubishi Electric Yaskawa Electric



Dimensions



Unit: mm

Specifications

Model name	RU77 - 4096A□△
Output wave number	4,096 waves/revolution
Through hole diameter	φ20 mm
Accuracy(at 20°C)	±2.5"
Output signal	Absolute serial bidirectional signal, compliant with EIA-485
Compatible controllers	FANUC Mitsubishi Electric Yaskawa Electric
Resolution	1/8,192 (Max. 25 bits output)
Maximum response revolutions	2,000 min ⁻¹
Maximum mechanical revolutions	3,000 min ⁻¹
Functional safety	—
Legal compliance	FCC Part15 Subpart B Class A and ICES-003 Class A Digital Device and EN55011 Gp 1 Class A, EN 61000-6-2 Safety standards not applicable (60 V DC or less)
Operating temperature range	0 to +60°C
Storage temperature range	-10 to +60°C
Vibration resistance	150 m/s ² (50 Hz to 2000 Hz)
Impact resistance	1,000 m/s ² (11 ms)
Protective design grade	IP65
Power supply voltage range	DC4.75-5.25 V (with connecting terminal)
Power consumption	200mA (at 120Ω termination)
Moment of inertia	9.4×10 ⁻⁵ kgm ² or less
Starting torque (at 20°C)	0.1 Nm or less
Mass	Approx. 1.2kg or less
Standard compatible cable	CE28-***J
Maximum cable length	15 m

Details of model designation

Scale

RU77 - 4096A□△

Communication protocol

Type	Number of wires	NC manufacturer
A	4-wire	FANUC
B	2-wire	Mitsubishi Electric
D	4-wire	Mitsubishi Electric
F	2-wire	Yaskawa Electric

Resolution

Type	Resolution	Number of pulses/revolution	Number of partitions	Type	Resolution	Number of pulses/revolution	Number of partitions
A	Approx. 2.5°/1,000	131,072	1/32	F	Approx. 1°/10,000	4,194,304	1/1,024
B	Approx. 1°/1,000	262,144	1/64	G	Approx. 4.5°/100,000	8,388,608	1/2,048
C	Approx. 7°/10,000	524,288	1/128	H	Approx. 2°/100,000	16,777,216	1/4,096
D	Approx. 3.5°/10,000	1,048,576	1/256	J	Approx. 1°/100,000	33,554,432	1/8,192
E	Approx. 2°/10,000	2,097,152	1/512				

Cable

CE28 - *** #

Scale side connector

Conduit

Type	Conduit
C	With conduit (standard)
N	Without conduit

Cable length

Written by flush right, indication in "10 cm" units, up to 14 m, 1 m pitch
Note: 15 m or less including RU77 main unit head cable length

Other Models

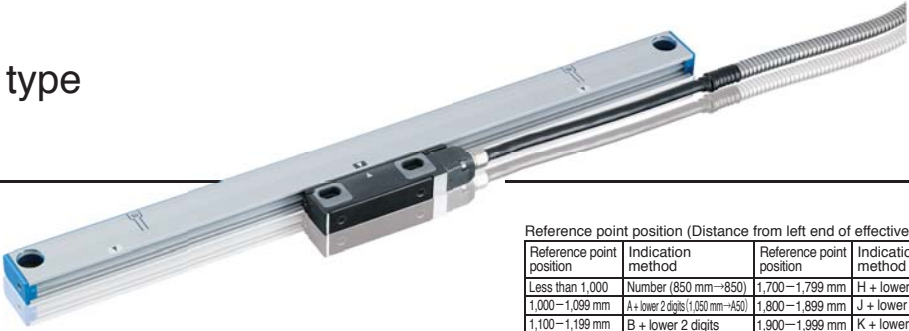
Linear slim type
SR77

FANUC

Mitsubishi Electric

Panasonic

Yaskawa Electric



Effective length: 70mm~2,040mm

Resolution: 0.01μm

Accuracy: 3+3L/1,000μmp-p

Maximum response speed: 200m/min

Protective design grade: IP65

SR77-xxx★○△◆□□□

Scale side connector
Type | A | Circular connector

Controller side connector

Cable sheath (covering)
Type | P | PVC (Polyvinyl chloride) | E | PU (Polyurethane)

Cable length
Written by flush right, indication in "m" units,
up to 30 m, 1 m pitch
Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Conduit
Type | Conduit
C | With conduit (standard)
N | Without conduit

Reference point position (Distance from left end of effective length)

Reference point position	Indication method	Reference point position	Indication method	Reference point position	Indication method
Less than 1,000	Number (850 mm→850)	1,700~1,799 mm	H + lower 2 digits	Center	X
1,000~1,099 mm	A + lower 2 digits (1,050 mm→450)	1,800~1,899 mm	J + lower 2 digits		
1,100~1,199 mm	B + lower 2 digits	1,900~1,999 mm	K + lower 2 digits		
1,200~1,299 mm	C + lower 2 digits	2,000~2,040 mm	L + lower 2 digits		
1,300~1,399 mm	D + lower 2 digits				
1,400~1,499 mm	E + lower 2 digits				
1,500~1,599 mm	F + lower 2 digits				
1,600~1,699 mm	G + lower 2 digits				

Communication protocol

Type	NC manufacturer	Number of wires
A	FANUC	4-wire
B	Mitsubishi Electric	2-wire
D	Mitsubishi Electric	4-wire
H	Panasonic	2-wire
F	Yaskawa Electric	2-wire

Resolution and direction (μm)

FANUC, Mitsubishi Electric, Panasonic

Type	Direction	Resolution	Type	Direction	Resolution
A		0.01	F		0.01
B		0.05	G		0.05
C	+	0.1	H	- (minus)	0.1
D		0.5	J		0.5
E		1	K		1

Yaskawa Electric

Type	Direction	Number of partitions
L	+	1/8,192
M	+	1/1,024

Mitsubishi Electric is only A, B, C
Panasonic is only B, C, D, E

Accuracy grade

Type	Accuracy grade
A	5+5L/1,000 μm
S	3+3L/1,000 μm

Cable lead-out direction

Type	Lead-out direction
R	Right
L	Left

Effective length (L): cm units
L: Effective length(mm)

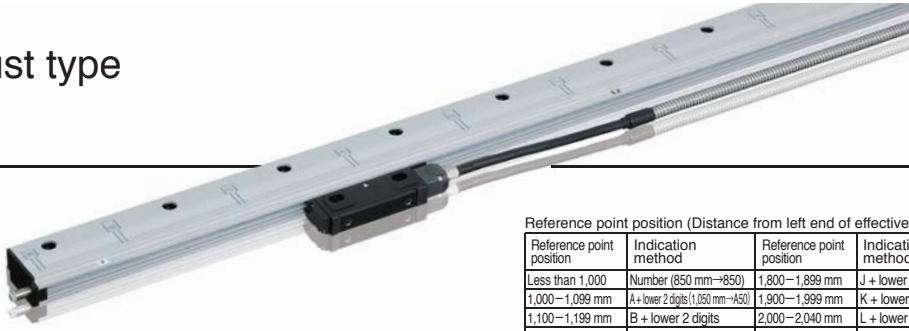
Linear robust type
SR87

FANUC

Mitsubishi Electric

Panasonic

Yaskawa Electric



Effective length: 140mm~3,040mm

Resolution: 0.01μm

Accuracy: 3+3L/1,000μmp-p

Maximum response speed: 200m/min

Protective design grade: IP65

SR87-xxx★○△◆□□□

Scale side connector
Type | A | Circular connector

Controller side connector

Cable sheath (covering)
Type | P | PVC (Polyvinyl chloride) | E | PU (Polyurethane)

Cable length
Written by flush right, indication in "m" units,
up to 30 m, 1 m pitch
Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Conduit
Type | Conduit
C | With conduit (standard)
N | Without conduit

Reference point position (Distance from left end of effective length)

Reference point position	Indication method	Reference point position	Indication method	Reference point position	Indication method
Less than 1,000	Number (850 mm→850)	1,800~1,899 mm	J + lower 2 digits	2,700~2,799 mm	T + lower 2 digits
1,000~1,099 mm	A + lower 2 digits (1,050 mm→450)	1,900~1,999 mm	K + lower 2 digits	2,800~2,899 mm	U + lower 2 digits
1,100~1,199 mm	B + lower 2 digits	2,000~2,040 mm	L + lower 2 digits	2,900~2,999 mm	V + lower 2 digits
1,200~1,299 mm	C + lower 2 digits	2,100~2,199 mm	M + lower 2 digits	3,000~3,040 mm	W + lower 2 digits
1,300~1,399 mm	D + lower 2 digits	2,200~2,299 mm	N + lower 2 digits	Center	X
1,400~1,499 mm	E + lower 2 digits	2,300~2,399 mm	P + lower 2 digits	Multi	Y
1,500~1,599 mm	F + lower 2 digits	2,400~2,499 mm	Q + lower 2 digits	Signed-type	Z
1,600~1,699 mm	G + lower 2 digits	2,500~2,599 mm	R + lower 2 digits		
1,700~1,799 mm	H + lower 2 digits	2,600~2,699 mm	S + lower 2 digits		

Communication protocol

Type	NC manufacturer	Number of wires
A	FANUC	4-wire
B	Mitsubishi Electric	2-wire
D	Mitsubishi Electric	4-wire
H	Panasonic	2-wire
F	Yaskawa Electric	2-wire

Resolution and direction (μm)

FANUC, Mitsubishi Electric, Panasonic

Type	Direction	Resolution	Type	Direction	Resolution
A		0.01	F		0.01
B		0.05	G		0.05
C	+	0.1	H	- (minus)	0.1
D		0.5	J		0.5
E		1	K		1

Yaskawa Electric

Type	Direction	Number of partitions
L	+	1/8,192
M	+	1/1,024

Mitsubishi Electric is only A, B, C
Panasonic is only B, C, D, E

Accuracy grade

Type	Accuracy grade
A	5+5L/1,000 μm
S	3+3L/1,000 μm

Cable lead-out direction

Type	Lead-out direction
R	Right
L	Left

Effective length (L): cm units
L: Effective length(mm)

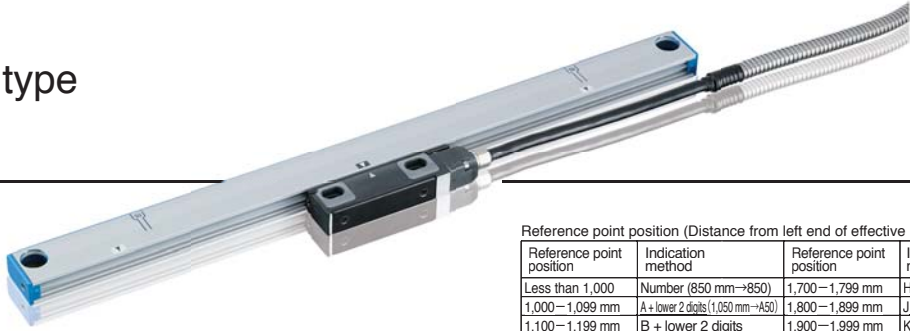
Linear slim type
SR75

FANUC

Mitsubishi Electric

Panasonic

Yaskawa Electric



Effective length: 70mm~2,040mm

Resolution: 0.01μm

Accuracy: 3+3L/1,000μmp-p

Maximum response speed: 200m/min

Protective design grade: IP65

SR75-xxx★○△◆□□□

Scale side connector
Type | A | Circular connector

Controller side connector

Cable sheath (covering)
Type | P | PVC (Polyvinyl chloride) | E | PU (Polyurethane)

Cable length
Written by flush right, indication in "m" units,
up to 30 m, 1 m pitch
Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Conduit
Type | Conduit
C | With conduit (standard)
N | Without conduit

Reference point position (Distance from left end of effective length)

Reference point position	Indication method	Reference point position	Indication method	Reference point position	Indication method
Less than 1,000	Number (850 mm→850)	1,700~1,799 mm	H + lower 2 digits	Center	X
1,000~1,099 mm	A + lower 2 digits (1,050 mm→450)	1,800~1,899 mm	J + lower 2 digits		
1,100~1,199 mm	B + lower 2 digits	1,900~1,999 mm	K + lower 2 digits		
1,200~1,299 mm	C + lower 2 digits	2,000~2,040 mm	L + lower 2 digits		
1,300~1,399 mm	D + lower 2 digits				
1,400~1,499 mm	E + lower 2 digits				
1,500~1,599 mm	F + lower 2 digits				
1,600~1,699 mm	G + lower 2 digits				

Communication protocol

Type	NC manufacturer	Number of wires
A	FANUC	4-wire
B	Mitsubishi Electric	2-wire
D	Mitsubishi Electric	4-wire
H	Panasonic	2-wire
F	Yaskawa Electric	2-wire

Resolution and direction (μm)

FANUC, Mitsubishi Electric, Panasonic

Type	Direction	Resolution	Type	Direction	Resolution
A		0.01	F		0.01
B		0.05	G		0.05
C	+	0.1	H	- (minus)	0.1
D		0.5	J		0.5
E		1	K		1

Yaskawa Electric

Type	Direction	Number of partitions
L	+	1/8,192
M	+	1/1,024

Mitsubishi Electric is only A, B, C
Panasonic is only B, C, D, E

Accuracy grade

Type	Accuracy grade
A	5+5L/1,000 μm
S	3+3L/1,000 μm

Cable lead-out direction

Type	Lead-out direction
R	Right
L	Left

Effective length (L): cm units
L: Effective length(mm)

Rotary enclosed type
RU74

A/B/Reference point



Hollow diameter: φ20

Resolution: Approx. 1/1,000°

Accuracy: ±2.5"

Maximum response revolution: 300min-1

Protective design grade: IP65

RU74-4096A□■

Scale side connector

Conduit
Type | Conduit
C | With conduit (standard)
N | Without conduit

Cable length
Written by flush right, indication in "10 cm" units, up to 14 m, 1 m pitch
Note: 15 m or less including RU77 main unit head cable length

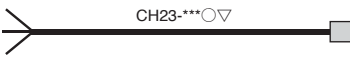
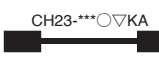
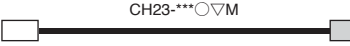
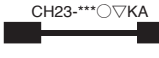
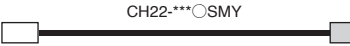
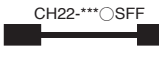
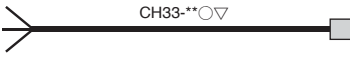
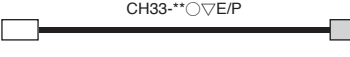
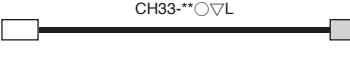
Minimum phase difference

Type	Minimum phase difference	Response revolutions (min.) Approx. 1°/1,000	Approx. 1°/10,000	Type	Minimum phase difference	Response revolutions (min.) Approx. 1°/1,000	Approx. 1°/10,000
A	50	2,000	267	H	500	266	27
B	100	1,332	133	J	650	205	21
C	150	888	89	K	1,000	133	13
D	200	666	67	L	1,250	107	11
E	250	533	53	M	2,500	53	5
F	300	444	44	N	3,000	44	4
G	400	333	33				

Resolution, rotation direction and polarity

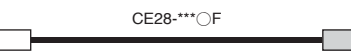
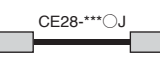
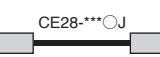
Type	Resolution	Rotation direction and polarity	Number of pulses/revolution
A	Approx. 1°/1,000	CW/ +	360,448
B	Approx. 1°/1,000	CCW/ +	360,448
C	Approx. 7°/10,000	CW/ +	3,600,384
D	Approx. 3.5°/10,000	CCW/ +	3,600,384

List of Adapter Cables

Scale	Connected equipment	Connector	List of Adapter Cables	Connector	Maximum cable length	Cable bending radius
SR27A SR67A	General-purpose cable	Unterminated end		Scale side Original of Magnescale	13 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
	FANUC	Controller side Honda Tsushin Kogyo PCR-S20FS+	 	Scale side Original of Magnescale	13 m Combined total 30 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
		Relay connector JAE JN1HS10PL2		Relay connector JAE JN2DS10SL-R	Combined total 30 m	
	Mitsubishi Electric	Controller side 3M 36210-0100PL	 	Scale side Original of Magnescale	13 m Combined total 30 m	
		Relay connector JAE JN1HS10PL2		Relay connector JAE JN2DS10SL-R	Combined total 30 m	
	SIEMENS	Controller side Yamaichi Electric CN078P-061-0001	 	Scale side Original of Magnescale	30 m Combined total 30 m	35 mm(Fixed) 75 mm(Elbow-shaped bend)
		Relay connector Phoenix Contact SACC-M12MS-8Q SH		Relay connector Phoenix Contact SACC-M12MS-8Q SH	Combined total 30 m	
SR74 SR84	General-purpose cable	Unterminated end		Scale side Original of Magnescale	30 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
	FANUC	Controller side Honda Tsushin Kogyo PCR-S20FS+		Scale side Original of Magnescale	30 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
	Mitsubishi Electric	Controller side 3M 36210-0100PL		Scale side Original of Magnescale	30 m	

Cables

CH22 - xxx○□△#	CH23 - xxx○□△#
Control side connector	Scale side connector
Type	Type
Y RJ45 connector made by Yamaichi Electric	None Original of Magnescale
Z RJ45 connector (water-proof) made by Yamaichi Electric	A 10P JN2 (female) made by Japan Aviation Electronics Industry
F M12 connector (male) made by Phoenix Contact	C 12P R04-9125J12F8.5 (flange, female) made by Tajimi Electronics
Scale side connector	Control side connector
Type	Type
M Scale head connector	None Unterminated end
F M12 connector (male) made by Phoenix Contact	K 10P JN1 (male) made by Japan Aviation Electronics Industry
E M12 connector (female) with panel mount relay made by Phoenix Contact	M 10P made by Sumitomo 3M
Cable specification	N 12P R04 (male) made by Tajimi Electronics
Type Cable specification	Cable specification
S SIEMENS Motion Connect 800Plus (green)	Type Cable specification
Conduit specification	Type Cable specification
Type Conduit specification	E Polyurethane φ8 made by Yoshinogawa Electric Wire & Cable
C With conduit	P PVC φ8 made by Hirakawa Hewtech
N Without conduit	Z PVC φ6.8 made by Hirakawa Hewtech
Cable length (Example)	Conduit specification
Type Cable length	Type Conduit specification
010 1.0 m	C With conduit
105 10.5 m	N Without conduit
	R With plastic tube

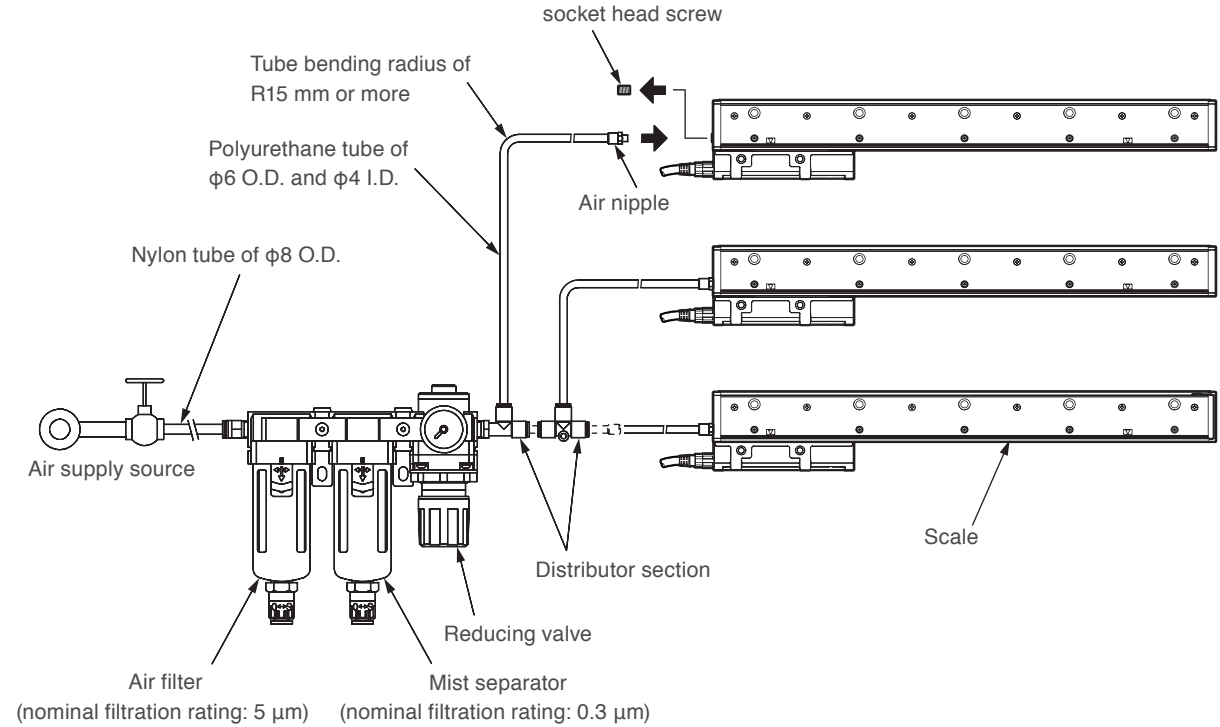
Scale	Connected equipment	Connector	List of Adapter Cables	Connector	Maximum cable length	Cable bending radius
RU97	SIEMENS	Controller side Yamaichi Electric CN078P-061-0001		Relay connector Phoenix Contact SACC-M12MS-8Q SH	30 m	35 mm(Fixed) 75 mm(Elbow-shaped bend)
		Relay connector Phoenix Contact SACC-M12MS-8Q SH		Relay connector Phoenix Contact SACC-M12MS-8Q SH	Combined total 30 m	
RU77	FANUC	Controller side Honda Tsushin Kogyo PCR-S20FS+		Scale side JAE JB1HB10SL2	29 m	10 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
		Relay connector JAE JB1D10PL2		Relay connector JAE JB1HB10SL2	Combined total 29 m	
	Mitsubishi Electric	Controller side 3M 36210-0100PL		Scale side JAE JB1HB10SL2	29 m	
		Relay connector JAE JB1D10PL2		Relay connector JAE JB1HB10SL2	Combined total 29 m	
	Yaskawa Electric	Controller side Molex 6P 55100-0670		Scale side JAE JB1HB10SL2	29 m	
		Relay connector JAE JB1D10PL2		Relay connector JAE JB1HB10SL2	Combined total 29 m	
RS97	FANUC	Controller side Honda Tsushin Kogyo PCR-S20FS+		Scale side JAE JN2DS10SL-R	30 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
		Relay connector JAE JN1HS10PL2		Relay connector JAE JN2DS10SL-R	Combined total 30 m	
	Mitsubishi Electric	Controller side 3M 36210-0100PL		Scale side JAE JN2DS10SL-R	30 m	20 mm(Fixed, without conduit) 25 mm(Fixed, with conduit) 50 mm(Elbow-shaped bend)
		Relay connector JAE JN1HS10PL2		Relay connector JAE JN2DS10SL-R	Combined total 30 m	
	SIEMENS	Controller side Yamaichi Electric CN078P-061-0001		Scale side Phoenix Contact SACC-M12FS-8Q SH	30 m	35 mm(Fixed) 75 mm(Elbow-shaped bend)
		Relay connector Phoenix Contact SACC-M12MS-8Q SH		Relay connector Phoenix Contact SACC-M12MS-8Q SH	Combined total 30 m	

CE28 - ***○#	CH33 - **○▽※#
Scale side connector	Scale side connector
Conduit	Type
Type Conduit	A Circular connector
C With conduit (standard)	Controller side connector
N Without conduit	Cable sheath (covering)
Cable length	Type
Written by flush right, indication in "10 cm" units, up to 14 m, 1 m pitch	P PVC (Polyvinyl chloride)
Note: 15 m or less including RU77 main unit head cable length	E PU (Polyurethane)
	Conduit
	Type Conduit
	C With conduit (standard)
	N Without conduit
	Cable length
	Written by flush right, indication in "m" units, up to 30 m, 1 m pitch
	Note: CH33 for Yaskawa Electric is up to a cable length of 20 m.

Technology

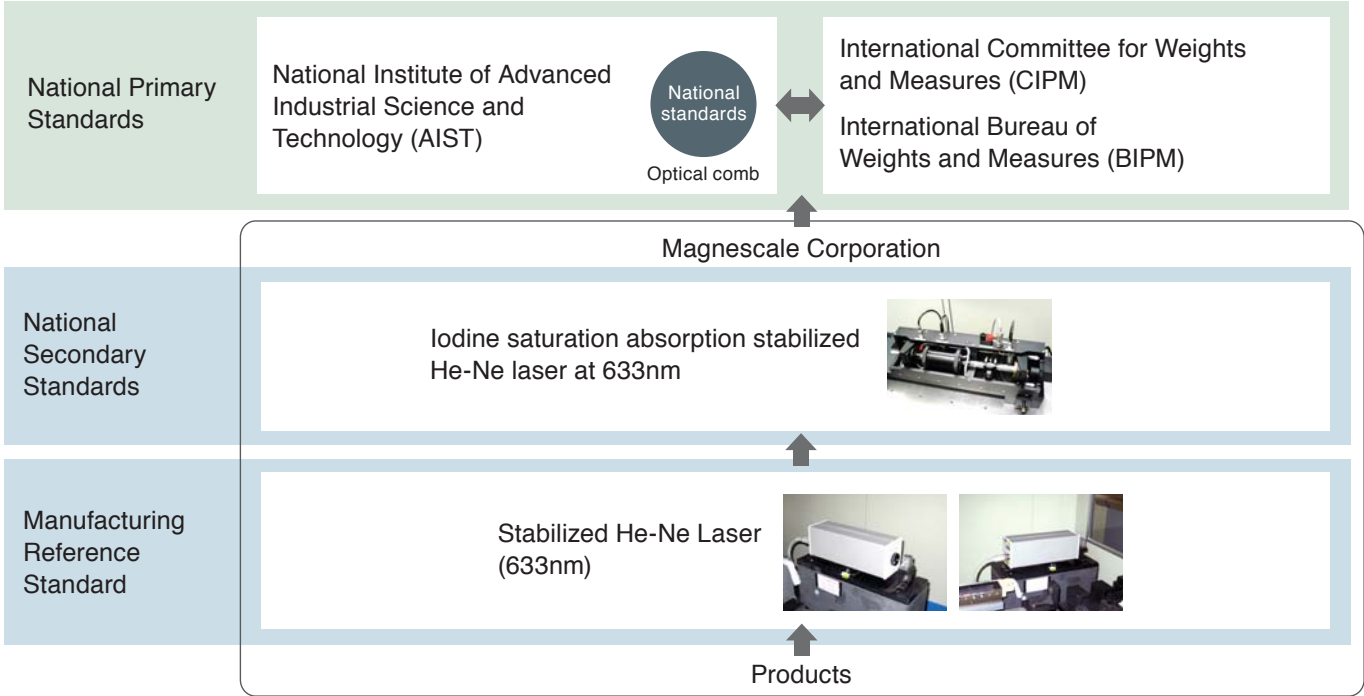
Air purging

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 10-20N ℓ /min.



Traceability

Traceability Flow Chart (Length)



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.



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:

- UL61010-1 • EN61010-1

for Products with Laser:

- DHHS (21CFR1040.10) • IEC60825-1

* When using our devices with machines to which the European Machinery Directive 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.

Functional Safety

Recently, great importance has been placed on human safety around industrial machines and machine tools. In 2010, the European Machinery Directive mandated compliance with functional safety for electrical equipment used in the safety systems of machines subject to the Machinery Directory. These safety demands are anticipated to spread across many additional regions and industries in the future. Magnescale leads the competition with its lineup of feedback scales that have acquired third-party functional safety certification in order to meet global demands for safety.



* Consult our sales representative for details.