Magnescale®

Specifications

Robust type High Accuracy Magnescale

SR67A-xxxSAZY

SR67A-xxxAAZY

(SIEMENS Protocol Model)

Specialized Cables

CH22 Series

Magnescale Co., Ltd.

Content

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1. Product overview

1-1. Overview

This product is a position detection system for machine tools. The shielded high-precision absolute magnescale and the connection cable support the SIEMENS DRIVE-CLiQ serial communication.
This product adopts the magnetic detection system for superior environmental resistance from condensation and other effects.

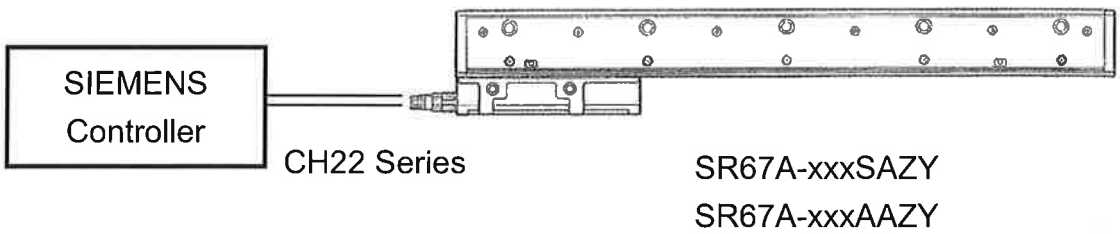
1-2. Scale

• It makes high resistance to vibration and shock by using stiff steel bar for scale frame.
• The scale unit and connecting cable are separated by connectors. This simplifies installing the scale unit and connecting the cable.
• The scale unit includes a built-in function for correcting variations in scale signal levels for enabling high-precision positioning. High-precision correction function developed exclusively by Magnescale Co., Ltd. is used to realize high precision and high resolution.
• The connection cable is designed to allow connection to either end of the detecting head. The cable can therefore be routed from the left or right depending on the installation location.

1-3. Connection cable

•The standard cables are 3, 5, 10, 15m respectively. However, special order cables are available in 0.5 m units up to 30m.

1-4. System configuration



1-5. Model name

Standard model name	Description	Function	Remark
SR67A-***SAZY	Magnescale (Absolute)	Precision grade 3+3L/1000 µmp-p	***: Effective length Expressed in cm units
SR67A-***AAZY		Precision grade 5+5L/1000 µmp-p	
CH22-***NSMY	Connection Cable	6-wire twisted pair Non armored PU sheath	***: Cable length Expressed in 0.5m units

1-6. Details of SR67A and CH22 model names

SR67A–xxxSAZY

- **Reference point position**
  Y: SIEMENS model
- **Communication protocol**
  Z: SIEMENS model
- **Resolution and polarity**
  A: SIEMENS model
- **Precision grade**
  A: 5 + 5L/1000 µm p-p
  S: 3 + 3L/1000 µm p-p
- **Fffective length**
  Expressed in cm units

CH22–xxxNSMY

Cable length
(Example)
010 1.0 m
105 10.5 m

- **Terminal A specification**
  Y: RJ45 connector
- **Terminal B specification**
  M: Magnescale connector
- **Cable specification**
  S: SIEMENS Motion Connect 800 pulus
- **Cable armor**
  N: Not including conduit

Please ask the model name of a special-order to the business charge of our company.

1-7 Machinery Directive

This product is a functional safety magnescale which is compliant with the Machinery Directive 2006/42/EC.

1-8. Functional Safety

This product is a functional safety magnescale which is compliant with EN 61800-5-2:2007 / IEC61508:2010 / IEC 62061:2005 SC3 SIL 2 and EN ISO 13849-1:2008 Cat.3 PL d.

Behavior of the product when anomalies arise : The product shift s to a safe state within 5 ms when dangerous faults are detected.

Dangerous fault : The position information has an error(*1) of more than ±1 mm.

Safe state : The product shuts down position information communication with a controller and shift s to a safe state.

(*1) : The error position information described here is a threshold value which is considered as a dangerous fault value in terms of functional safety and is not the accuracy of the product. As for the accuracy of the product, see Section 2. "Specifications."

The product is maintenance-free and it is not necessary to replace the parts periodically.

Functional safety specifications

Item \ Mode of operation		High demand / continuous mode
Probability of dangerous failure	Operating temperature : +50°C	PFH = 26.0 × 10-9 (1/h)
	Operating temperature : +25°C	PFH = 8.7 × 10-9(1/h)
	Operating temperature : 0°C	PFH = 3.8 × 10-9(1/h)
MTTFd		100 years (High)
DCavg		64.07% (Low)
Hardware fault tolerance		1
Product type		Type B
SIL		2

Normative references

Standard	Applied specification
IEC 61508:2010	Functional safety
IEC 62061:2005	Functional safety
EN ISO 13849-1:2008	Functional safety
IEC 60664-1:2007	Clearances (between PWB (Printed wiring board) patterns)specification
EN 61800-5-2:2007	Requirements related to Table D.16 Motion and position feedback sensors
IEC 62061:2005	Table D.1 Failure Mode
IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-6, IEC 60068-2-14, IEC 60068-2-27, IEC 60068-2-30 IEC 60068-2-32	Environmental Tests
IEC 61000-6-4:2006 +A1:2010 CISPR 16-1-1:2010, clause 4 CISPR 16-1-4:2010, clause 4.4 and 5 CISPR 16-2-3:2010, clause 7.2	Emission
IEC61000-6-2:2005 IEC 61326-3-1:2008 IEC 61000-4-2:2008 IEC61000-4-3:2006 +A1:2007 +A2:2010 IEC 61000-4-4:2004 +A1:2010 IEC 61000-4-6:2008	Immunity

For details about functional safety, contact our functional safety department.
45 Suzukawa, Isehara-shi, Kanagawa 259-1146, Japan
TEL: +81 (0)463 92 1011 FAX: +81 (0)463 92 1012

2. Specifications

2-1. SR67A

Item	SR67A-xxxSAZY, SR67A-xxxAAZY
Effective length (L)	140 to 3640 mm (27 types) 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540,1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040, 3240, 3440, 3640
Thermal expansion coefficient	12±1 × 10^{-6}/ °C
Output signal	Absolute serial two directional signal, equivalent to EIA-485
Data format	Absolute
Accuracy (at 20 °C) L: Effective length (mm)	3 + 3L/1000 µm p-p or 5 + 5L/1000 µm p-p selectable upon order
Resolution	0.01µm
Maximum response speed	200 m/min
Safety standard & compliance	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2 Less than 60VDC internal voltage, Safety standard not applicable
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	DC 24 V (DC 17 to 30.8 V , at the end of cable)
Maximum power consumption	Max. 1.7W@17V, Less than 1.9W@30.8V
Current consumption	Max. 75mA@5V (at normal operation)
Inrush current	Max. 2 A (When the power supply rise time is 10 ms)
Power supply protection	In the case of errors such as a reverse-connected power supply or overvoltage, the internal fuse is cut to protect the power being supplied and wiring.
Dimensions	See section 5, "Dimensional Diagrams."
Scale head sliding resistance	Max. 1 N
Mass	Approx. 0.9kg + 5.2kg/m

The information here is subject to change without notice.

2-2. CH22 Connection cable of scale

Item	CH22-***NSMY
Cable armor	None(standard) Cables with armor or resin tube are available as special order products.
Cable sheath	PU(Polyurethane) (MOTION CONNECT 800+ made by SIEMENS)
Cable length	3, 5, 10, 15 m (standard product), Supports only 0.5 m units from 1 to 30 m (special-order product)
Connector	Scale head side : 10 pin circular connector (Magnescale exclusive) Controller side : 6FX2003-0DC20(RJ45)made by SIEMENS
Connection connector	RJ45 connectors (waterproof) or M12 connectors are available as special order products.
Protective design grade	IP65 (when scale head and connector are connected)
Safety standard Safety regulation	Not applicable
Operating temperature range	0 ~ +50 ℃
Storage temperature range	-20 ~ +55 ℃
Mass	Approx. 0.02 kg + 0.157 kg/m
Recommended minimum bending radius (when there is repeated bending)	75 mm
Recommended minimum bending radius (when there is no repeated bending)	35 mm
Dimensions	See section 5, "Dimensional Diagrams."

The information here is subject to change without notice.

2-3. Standard accessories of scale

Item	Quantity
Instruction Manual	1
Accuracy chart	1
M4 × 20 Hex. socket-head cap screws	2
M4 × 25 Hex. socket-head cap screws	2
M6 × 35 Hex. socket-head cap screws	3 – 38
M4 Hex. Nuts	2
Spacer: t = 0.1 mm	2
Spacer: t = 0.2 mm	2
Spacer: t = 1.0 mm	1

The information here is subject to change without notice.

2-4. Alarms

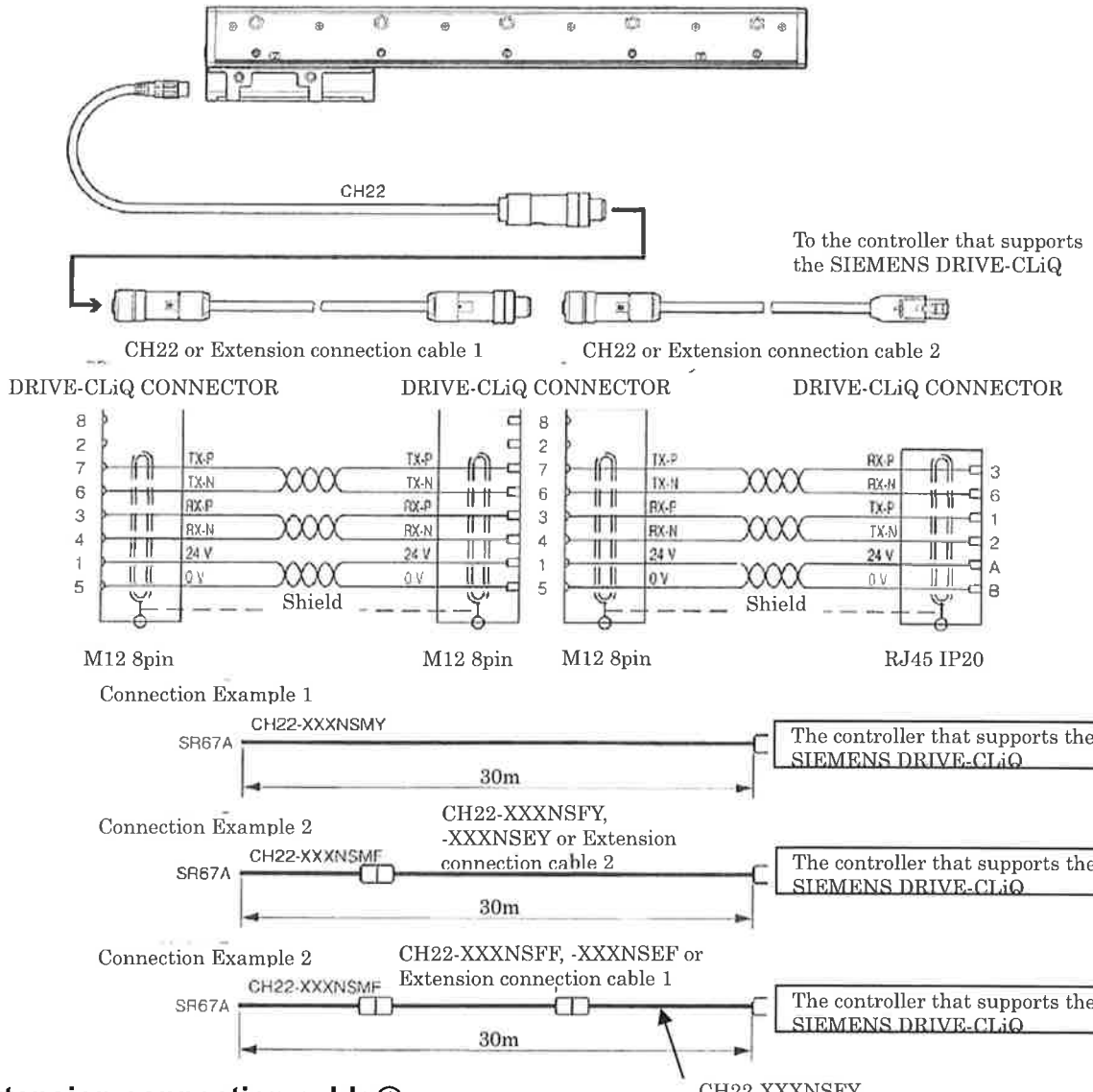
This product outputs alarm information to the controller based on the errors detected and the results of self-diagnosis.
Contained in the alarms is the bit information which indicates the causes of the alarms referred to as “fault causes,” and these are defined for this product as below. If you suspect a fault in this product, please contact our sales or service department with all available alarm data.

Bit	Name		Details
31	Functional safety redundant system statuses	Reserved	Normally 1
30		Reserved	Normally 0
29		Service code 2 [3]	Service information 2 [3] Normal 0
28		F2	alarm fl ag: 1 no alarm: 0
27		Service code 2 [2]	Service information 2 [2] Normal 0
26		Service code 2 [1]	Service information 2 [1] Normal 0
25		Service code 2 [0]	Service information 2 [0] Normal 0
24		PDV	Position data valid: 1 invalid: 0
23		Hardware Fault	Hardware system fault
22		Wrong Pos detected	FS position fault
21		Reserved	Normally 0
20		Reserved	Normally 0
19		INC Level Fault	Incremental sensor fault
18		Other Fault	Other faults
17		Self Test Fault	P-on diagnostic fault
16		Mutual Diag Fault	FS monitoring fault
15	Status of precision measurement system	Reserved	Normally 0
14		Reserved	Normally 0
13		Service code 1 [3]	Service information 1 [3] Normal 0
12		F1	alarm fl ag: 1 no alarm: 0
11		Service code 1 [2]	Service information 1 [2] Normal 0
10		Service code 1 [1]	Service information 1 [1] Normal 0
9		Service code 1 [0]	Service information 1 [0] Normal 0
8		PDV	Position data valid: 1 invalid: 0
7		Hardware Fault	Hardware system fault
6		Wrong Pos detected	FS position fault
5		INC Speed Fault	Over speed fault
4		ABS Sensor Fault	Absolute sensor fault
3		INC Level Fault	Incremental sensor fault
2		Other Fault	Other faults
1		Self Test Fault	P-on diagnosis fault
0		Mutual Diag Fault	FS monitoring fault

3. Wiring Connections with a Controller

3-1. Wiring Connections with a Controller

This product and the controller that supports the SIEMENS DRIVE-CLiQ can be connected with a cable made by SIEMENS. Both of the power and signal can be connected with a cable made by SIEMENS.



Extension connection cable①
SIEMENS model no. 6FX8002-2DC34-□□□□
Extension connection cable②
SIEMENS model no. 6FX8002-2DC30 □□□□

AS for the specifications of extension connection cables and purchasing of the cables, contact SIEMENS.

3-2. Version Numbers of a Controller

Be sure to use the following combination of the controller version numbers when using the magnescale that supports the SIEMENS DRIVE-CLiQ.

SINUMERIK soft ware version : 4.4SP2 or later

SINAMICS firmware version : 4.4SP1 or later

The functions of the controller may be restricted with any combinations other than the above.

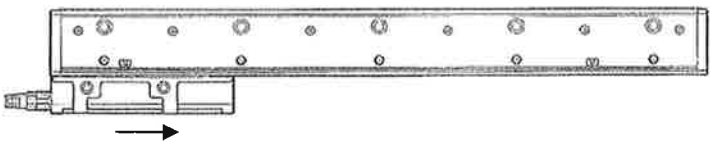
As for details of the versions and functions of the controller, contact SIEMENS.

4. Others

4-1. Details of output signal

(1) Measurement direction

When the detecting head is moved in the direction of the arrow, the signal is addition when the polarity is “+”.



(2) Color of cable wiring

The following describes colors of wiring cables and signals.

Color of cable	Signal
Red	POWER
Black	POWER GND
Pink	RX_P
Blue	RX_N
Green	TX_P
Yellow	TX_N

4-2. Air Purge

In the standard configuration, an M5 tap hole for air purging is provided in the end cap section of the scale.

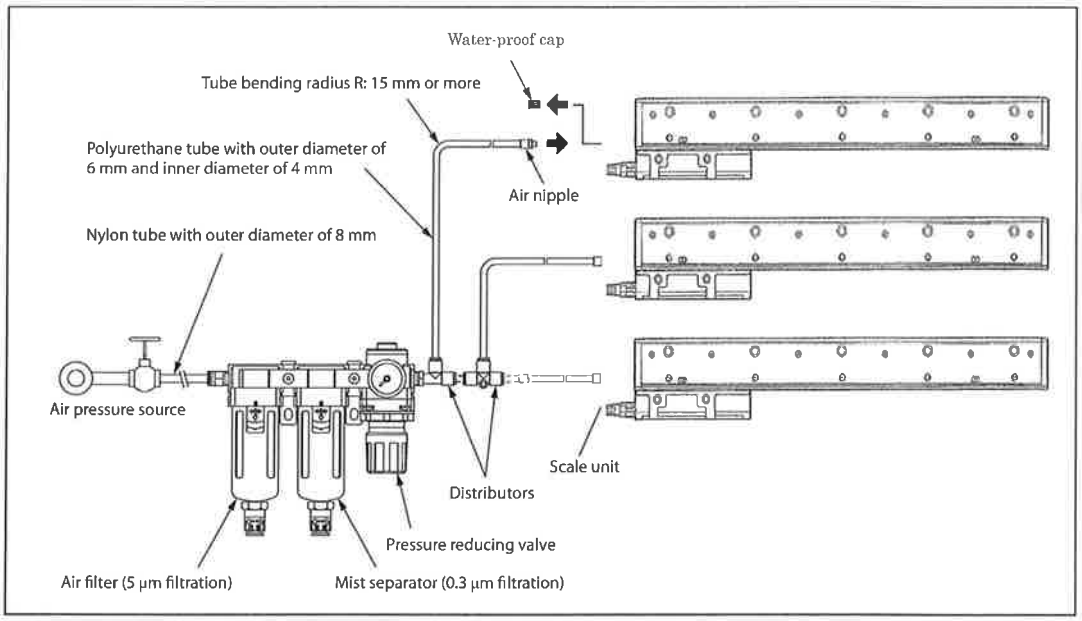
Air can be injected into the scale unit to reduce the effects of the environments shown below.

The actual effects, however, will vary depending on operating conditions. Therefore, be sure to fully check the effects before using air purge.

- Use in dusty area
- Use in locations close to coolants

Air Tube Route and Device Configuration

Prepare the devices as shown in the figure below, and air is injected into the scale by connecting the air tubes.



The customer must obtain the air supply unit and input/output air tube. The recommended main air supply components are shown in the table below.

Manufacturer	Model	Name	Quantity
SMC Corporation	AF40-A	Air filter: Filtration 5 µm	1
SMC Corporation	AFM40-A	Mist separator: Filtration 0.3 µm	1
SMC Corporation	AR40-A	Regulator with 200 kPa pressure gauge	1
SMC Corporation	Y400T-A	Spacer assembly with L-type bracket	2
SMC Corporation	KQ2S04-M5	Air nipple	1

Tube Layout Notes

Tube arrangement

Use tubes with a bending radius of at least 15 mm and make sure that there are no sharp bends. Also, if the tubes are laid parallel within the ducts for the electrical wiring or hydraulic tubes, be careful that the tubes are not crushed by the movement of the ducts.

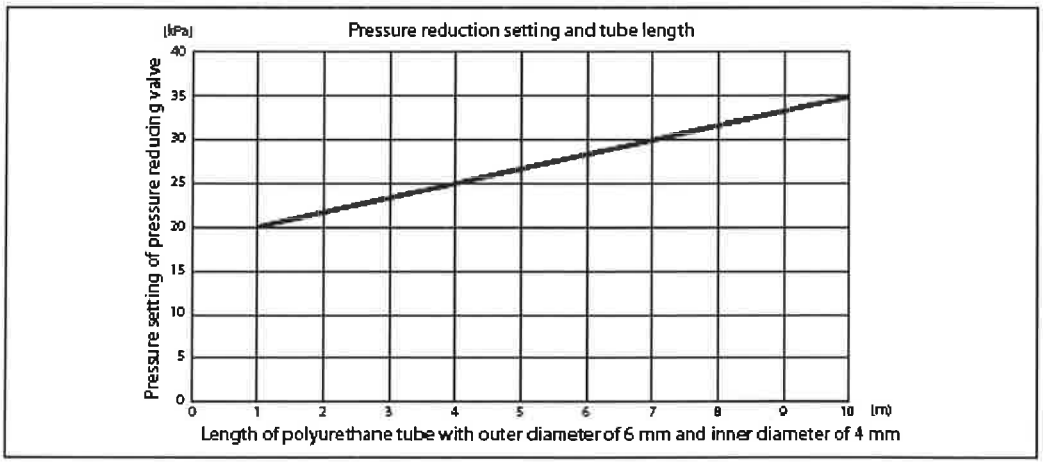
Tube length

To inject air simultaneously into multiple scales, make the tubes the same length from the distributor of the air supply unit to each scale so that the injection air pressure is uniform for each scale.

Pressure setting and tube length for pressure reducing valve

If the air injection pressure for each scale is around 20 ±10 kPa, the air in the scale can be maintained at a low humidity. However, setting the air injection pressure only via the pressure reducing valve will not result in an air injection pressure of 20 ±10 kPa due to pressure losses stemming from the tube length.

Refer to graph below to determine the pressure setting of the pressure reducing valve.



This graph illustrates the relationship between the regulator pressure setting and tube length when the air injection pressure is 20 kPa. The tube length here is considered to be the length from the distributor of the air supply unit to the scale. The air consumption amount per scale unit must be approximately 10 - 20 Nℓ /min.

Tube flushing

Flush the tube from the air pressure source to the air supply unit connectors and each scale connector.

Flushing cleans the tubes, prevents the embedding of foreign objects in the equipment, and is also useful to check the tubes.

4-3. Installing the scale unit

• Install the scale unit so that the scale is on the upper side of the detecting head.
If the upper side is not available, set it to face horizontally.

• Remove off the coating around the tap hole to ground the scale unit using the installation surface contact with the scale.

• The scale head will be damaged if the detecting head is moved outside the effective length (L). The detecting head must always be moved within the effective length.

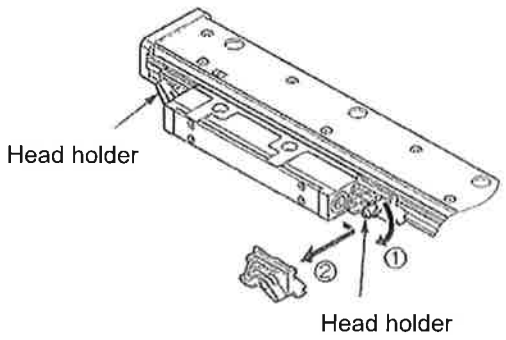
• In environments where coolant can splash directly on the scale unit, be sure to mount a cover on the scale unit to protect the scale unit from splashing.

• In order to protect from external noises,

- Locate relays, solenoids and motors to be used in conjunction with the scale far from the scale unit and signal output cable.
- Do not place the power line of the equipment to be used with the scale close to the scale output cable. Keep at least 20 cm distance between them.
- If the power line of the equipment crosses the scale output cable, place them at right-angle intersection.

• Do not turn on the power before installing the scale unit.

• Do not take off the head holders, if possible, until immediately before securing the scale head. Even if the head holders are removed, the approximate positional relationship of the scale and scale head will be maintained.

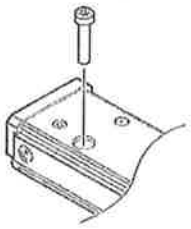


• Check that the alignment of the installation surface (or installation brackets) is within the standards.

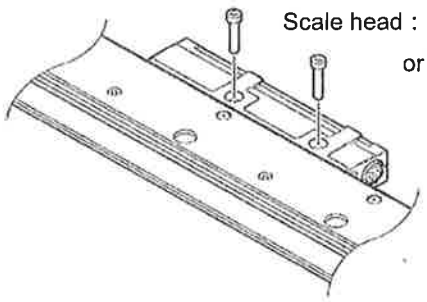
• Use a scale installation bracket, where applicable, having length covering the entire scale length. The parallelism of the scale may be harmed if only using a bracket divided for the installation section.

• Loosely turn the mounting screws first. Determine the alignment and then tighten the screws to fasten the scale.

Scale : M6 × 35 (9 N·m)



Scale head : M4 × 20 (2.7 N·m)
or M6 × 20 (9 N·m)



4-4. Trouble shooting

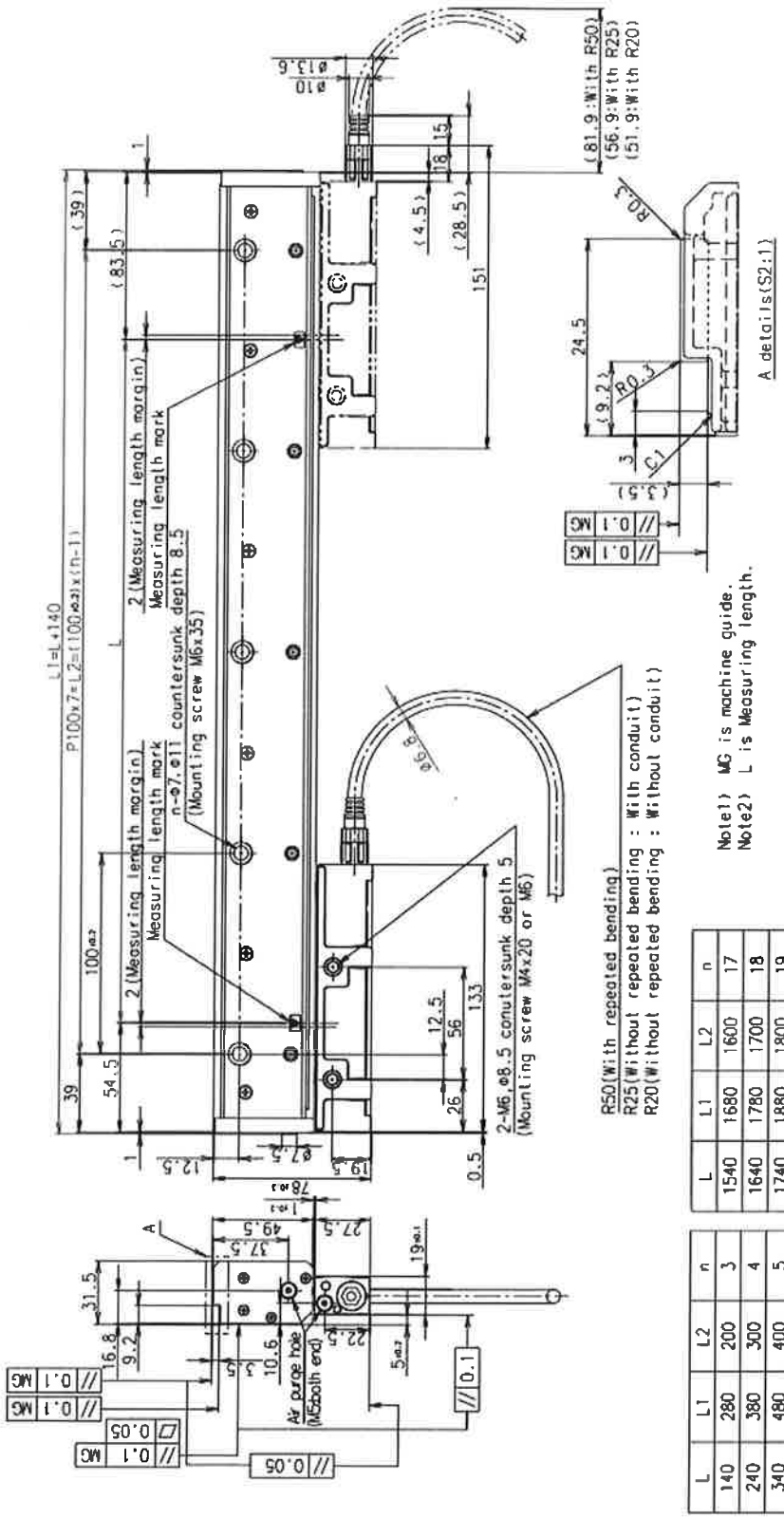
If a problem with magnescale is suspected, make sure below items.

- Check the cable connection between scale and controller.
- Check the installation of the scale whether within tolerance or not.

Please contact sales or service department of Magnescale, if you could not find any problems.

5. Dimensional diagrams

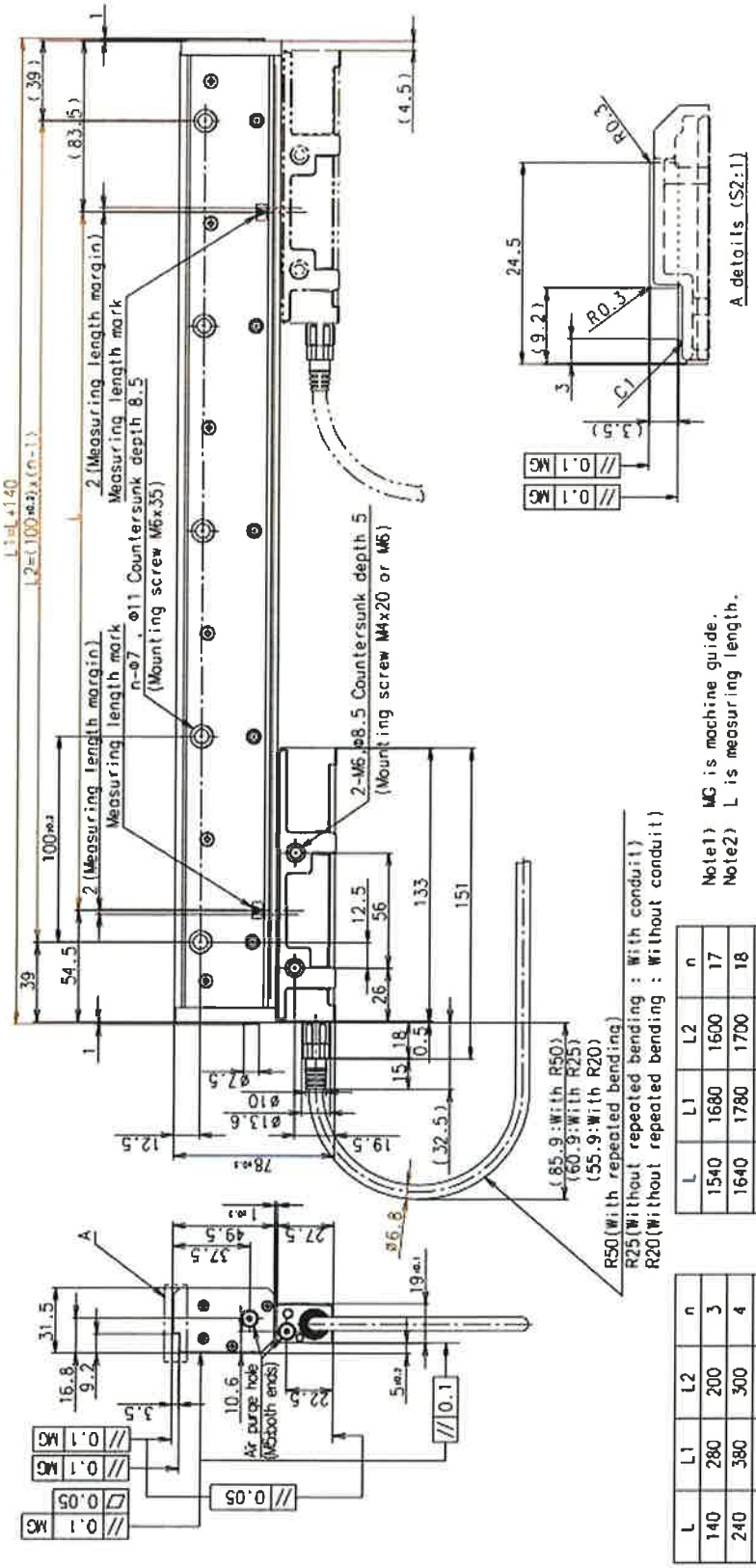
5-1. SR67A (cable outlet to right)



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	1080	1000	11
1040	1180	1100	12
1140	1280	1200	13
1240	1380	1300	14
1340	1480	1400	15
1440	1580	1500	16

L	L1	L2	n
1540	1680	1600	17
1640	1780	1700	18
1740	1880	1800	19
1840	1980	1900	20
2040	2180	2100	22
2240	2380	2300	24
2440	2580	2500	26
2640	2780	2700	28
2840	2980	2900	30
3040	3180	3100	32
3240	3380	3300	34
3440	3580	3500	36
3640	3780	3700	38

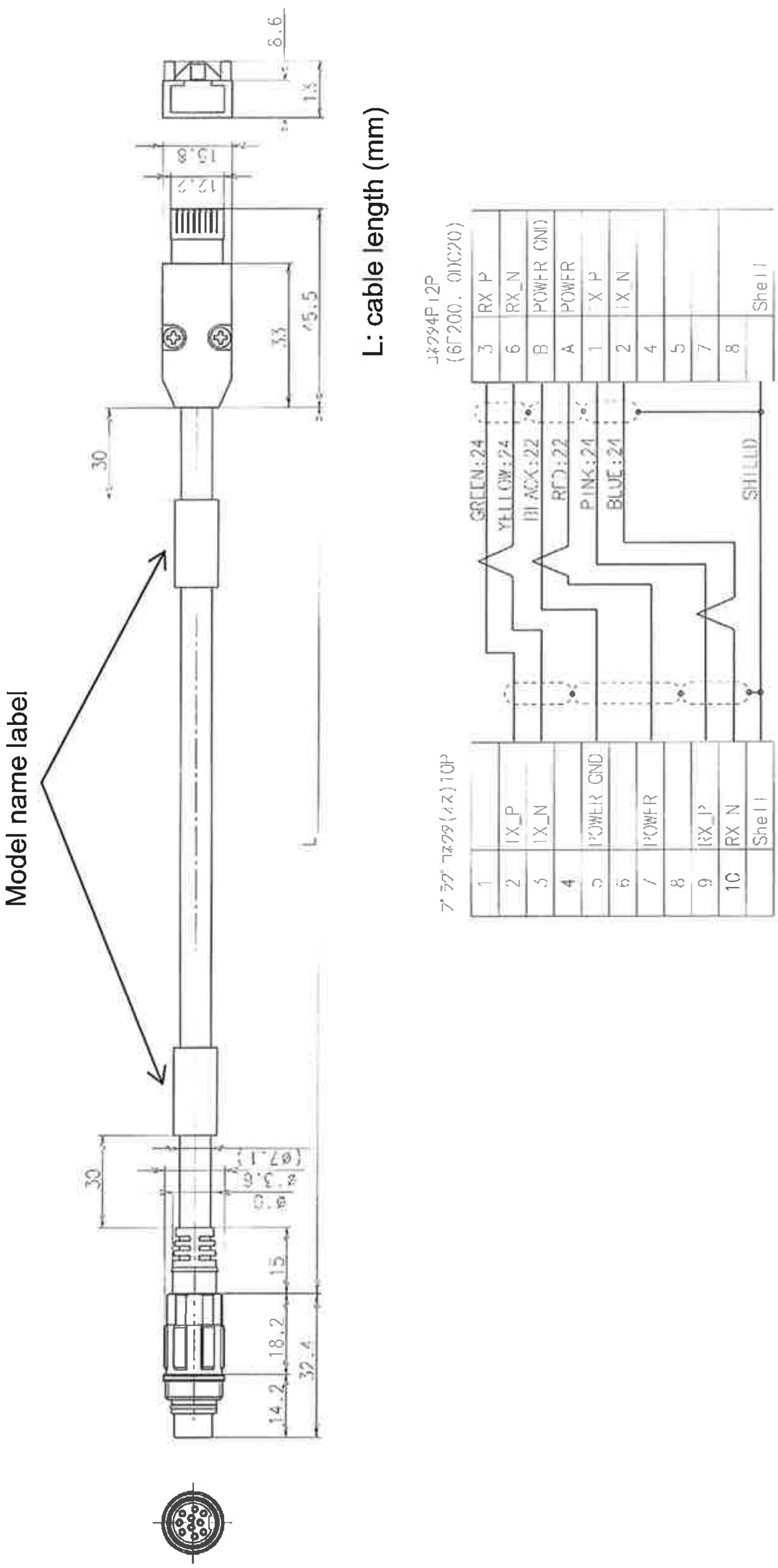
5-2. SR67A (cable outlet to left)



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	1080	1000	11
1040	1180	1100	12
1140	1280	1200	13
1240	1380	1300	14
1340	1480	1400	15
1440	1580	1500	16

L	L1	L2	n
1540	1680	1600	17
1640	1780	1700	18
1740	1880	1800	19
1840	1980	1900	20
2040	2180	2100	22
2240	2380	2300	24
2440	2580	2500	26
2640	2780	2700	28
2840	2980	2900	30
3040	3180	3100	32
3240	3380	3300	34
3440	3580	3500	36
3640	3780	3700	38

5-3. CH22


Model name label
L: cable length (mm)
GREEN:24
YELLOW:24
BLACK:22
RED:22
PINK:24
BLUE:24
SHIELD
RX_P
RX_N
POWER GND
POWER
TX_P
TX_N
Shell