Angle encoder with Drive-CliQ Interface

Product overview

RU97 Series

Absolute angle encoder Rotary enclosed type with Drive-CliQ interface and Functional Safety

Magnetic functional principle
Inner diameter : 20mm / 22mm
Resolution : 25 bit
Accuracy : ±2,5s
Max. response revolutions : 2000 min^{-1}
Max. mechanical revolutions : 3000 min^{-1}
Interface : Siemens Drive-CliQ,

RS97-1024NGZ

Absolute angle encoder Exposed rotary type with Drive-CliQ Interface and Functional Safety

Magnetic functional principle
Inner diameter : 180mm
Resolution : 23 bit
Accuracy : ±2,5s
Max. response revolutions : 5000U/min^{-1}
Interface : Siemens Drive-CLiQ, Fanuc

RS97-1024EGZ

Absolute angle encoder Exposed rotary type with Drive-CliQ Interface and Functional Safety

Magnetic functional principle
Inner diameter : 96mm
Resolution : 23 bit
Accuracy : ±2,5s
Max. response revolutions : 5000U/min^{-1}
Interface : Siemens Drive-CLiQ, Fanuc

Product overview

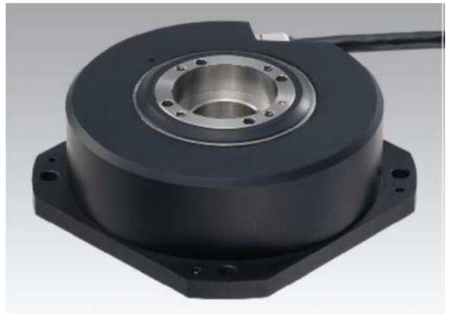
RU77 Series

Absolute angle encoder Rotary enclosed type with Fanuc, Mitsubishi and Yaskawa Interface

Magnetic functional principle

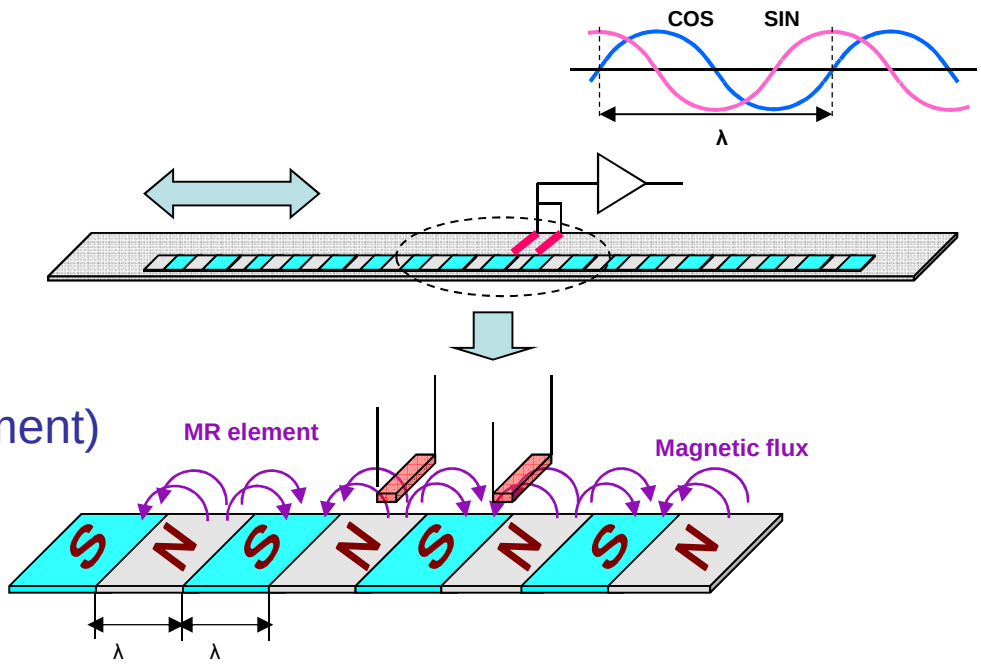
Inner diameter	: 20mm / 22mm
Resolution	: 25 bit
Accuracy	: ±2,5s
Max. response revolutions	: 2000 min^{-1}
Max. mechanical revolutions	: 3000 min^{-1}
Interface	: Fanuc, Mitsubishi, Yaskawa und TTL

RU97 with Fanuc Interface is planed for 2014

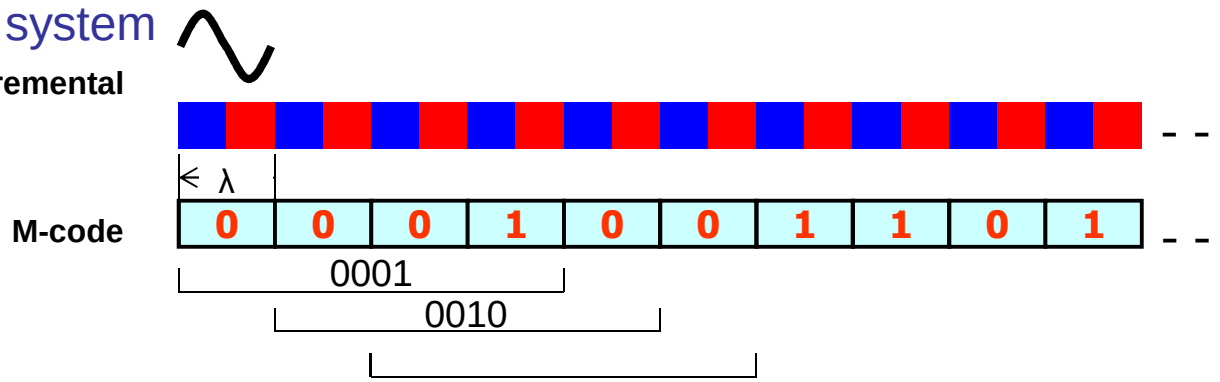


Absolute magnetic functional principle

Magnetic Scale technology with
the detection principle (MR Element)

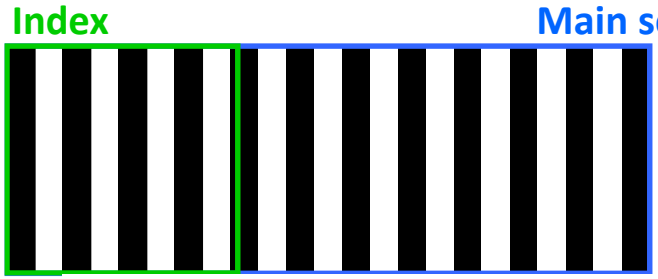


Absolute position detection system
by M-code system

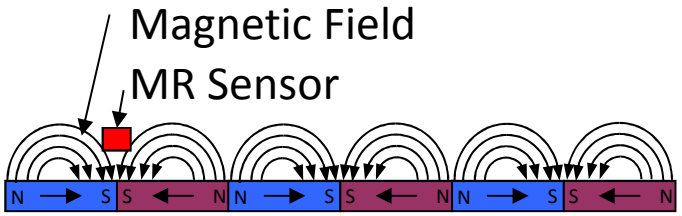


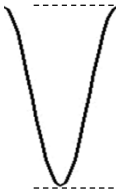
Compare Optical / Magnetic Detection

Optical scales



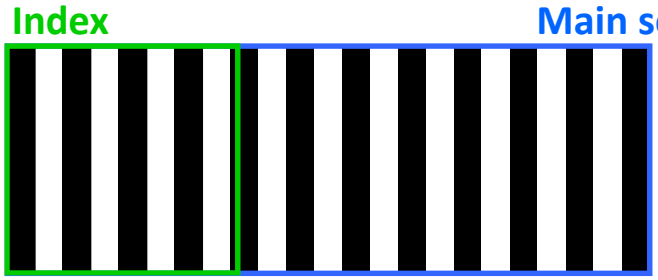
Magnescale SR27A/67A

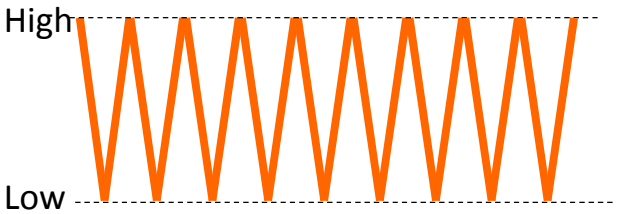




Compare Optical / Magnetic Detection

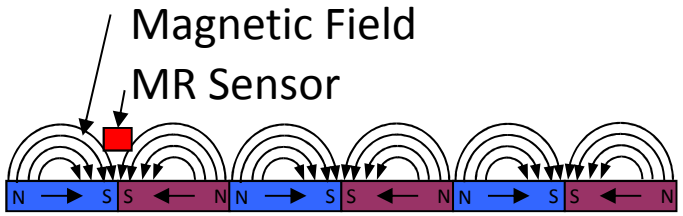
Optical scales

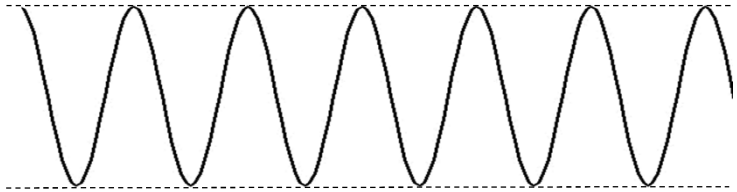




Triangle wave

Magnescale
SR27A/67A

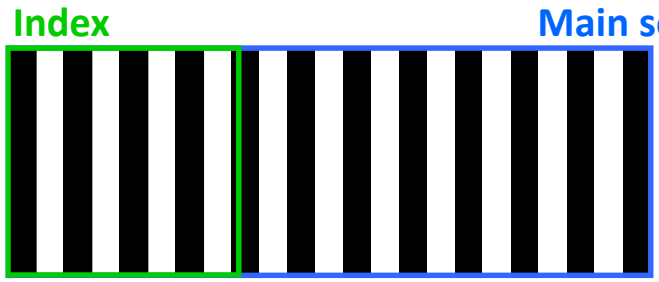


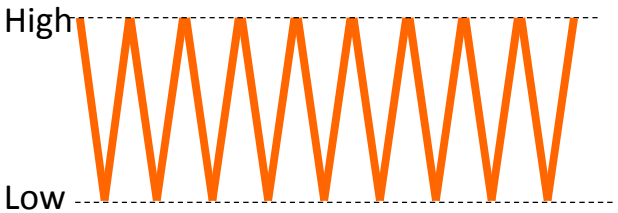


Sinusoidal wave **Advantage to achieve high accuracy**

Compare Optical / Magnetic Detection

Optical scales

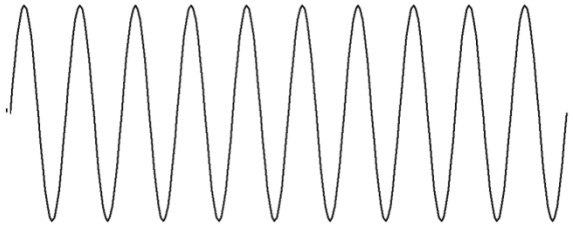




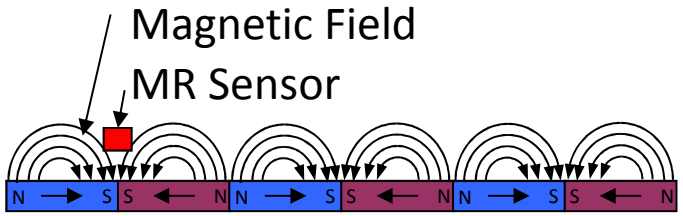
Triangle wave

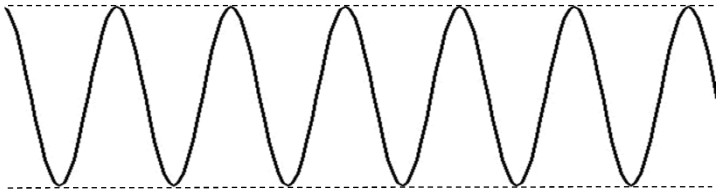
Signal Processing

Produce Sinusoidal wave



Magnescale SR27A/67A

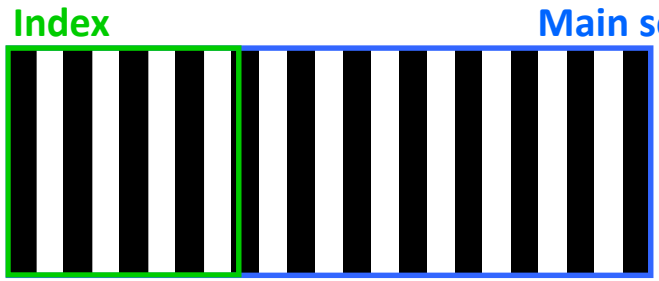


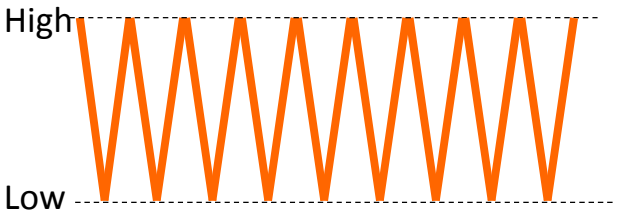


Sinusoidal wave **Advantage to achieve high accuracy**

Compare Optical / Magnetic Detection

Optical scales

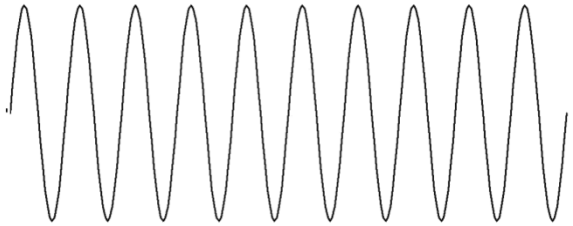




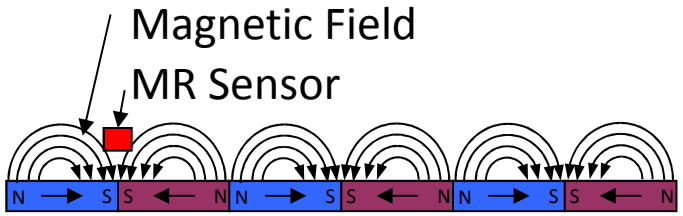
Triangle wave

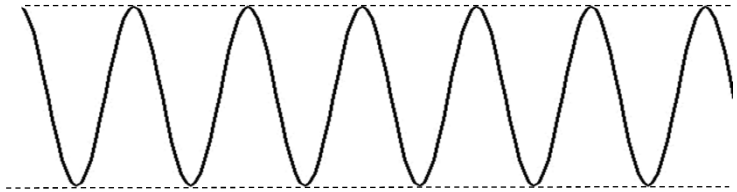
Signal Processing

Produce Sinusoidal wave



Magnescale SR27A/67A





Sinusoidal wave

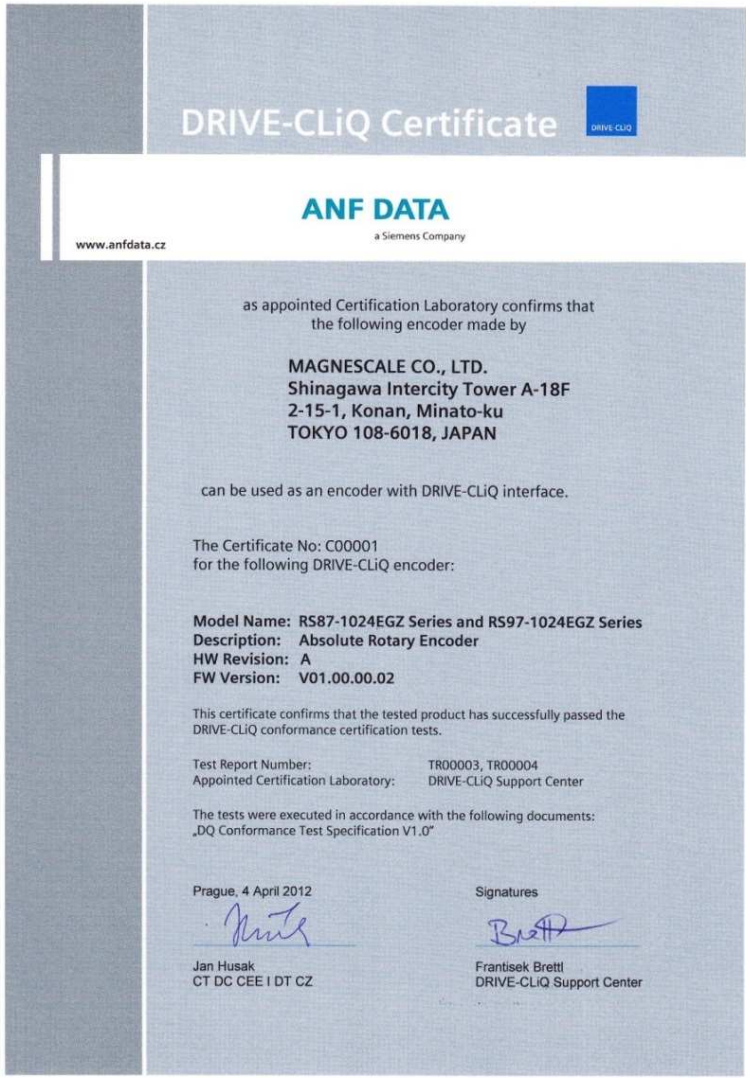
Advantage to achieve high accuracy

Directly

Signal Processing (Interpolation, Compensation)

NC

Drive-CliQ and Functional Safety Certification



DRIVE-CLiQ Certificate

ANF DATA
a Siemens Company
www.anfdata.cz

as appointed Certification Laboratory confirms that
the following encoder made by

MAGNESCALE CO., LTD.
Shinagawa Intercity Tower A-18F
2-15-1, Konan, Minato-ku
TOKYO 108-6018, JAPAN

can be used as an encoder with DRIVE-CLiQ interface.

The Certificate No: C00001
for the following DRIVE-CLiQ encoder:

Model Name: RS87-1024EGZ Series and RS97-1024EGZ Series
Description: Absolute Rotary Encoder
HW Revision: A
FW Version: V01.00.00.02

This certificate confirms that the tested product has successfully passed the DRIVE-CLiQ conformance certification tests.

Test Report Number: TR00003, TR00004
Appointed Certification Laboratory: DRIVE-CLiQ Support Center

The tests were executed in accordance with the following documents:
„DQ Conformance Test Specification V1.0"

Prague, 4 April 2012

Signatures

Jan Husak
CT DC CEE I DT CZ

Frantisek Brettl
DRIVE-CLiQ Support Center

TÜVRheinland®

ZERTIFIKAT
CERTIFICATE

EC Type-Examination Certificate

Reg.-No.: 01/205/5224/12

Product tested	Safety Absolute Rotary Encoder	**Certificate holder**	Magnescale Co., Ltd. 45 Suzukawa Isehara-shi Kanagawa 259-1146 Japan
Type designation	RS87-1024EGZ series, RS97-1024EGZ series	**Manufacturer**	see certificate holder
Codes and standards forming the basis of testing	EN 61800-5-2:2007 EN ISO 13849-1:2008 + AC:2009 EN 62061:2005 + AC:2010		IEC 61508 Parts 1-7:2010 EN 60664-1:2007
Intended application	The device complies with the requirements of the relevant standards (Cat. 3 / PL d acc. to EN ISO 13849-1, SIL CL 2 acc. to EN 61800-5-2 / EN 62061 / IEC 61508) and can be used in applications up to Cat. 3 / PL d acc. to EN ISO 13849-1 and SIL 2 acc. to EN 62061 / IEC 61508.		
Specific requirements	The instructions of the associated Installation and Operating Manual shall be considered.		
It is confirmed, that the product under test complies with the requirements for machines defined in Annex I of the EC Directive 2006/42/EC.			
This certificate is valid until 2017-05-25.			

Functional Safety Type Approved
TÜVRheinland FS

The test report-no.: 968/M 354.00/12 dated 2012-05-25 is an integral part of this certificate.

The holder of a valid licence certificate for the product tested is authorized to affix the test mark shown opposite to products, which are identical with the product tested.

TÜVRheinland 0035 Notified Body

Berlin, 2012-05-25

Certification Body for Machinery, NB 0035

Dipl.-Ing. Eberhard Frejno

TÜV Rheinland Industrie Service GmbH, Alboinstr. 56, 12103 Berlin / Germany
Tel. +49 30 7562-1307 / Fax +49 30 7562-1370, E-Mail: kundigte-ku.com

Technical data RU97
with Drive-CliQ Interface

Key specification

- **Absolute magnetic functional principle**

  => highly resistant against Oil, Water (humidity) and Dust

- Air purging : **Only under extreme condition necessary**

- High resolution : **25 bit (1° /10000)**
- System accuracy : **±2,5``**

- High response speed
  - Mechanically : **3000U/min**
  - Electrically : **2000U/min**

- Impact resistance : **1000m/s²**

- Vibration resistance : **150m/s²**

- Protection class : **IP65**

- Output signal : **Direct Drive-CLiQ** (without Signal converter)

Specification RU97

Specifications	RU97-2048 Z Series
Output signal / Method	Drive-CLiQ Interface
System accuracy	±2.5s （at 20℃）
Resolution Pulse / revolution	1˚/100,000 33,554,432 p/rev.
Direction	Additional count when unit is fixed and drum is rotating counter-clockwise
Electrical allowable revolution	2,000min^{-1}
Mechanical allowable revolution	3,000min^{-1}
Operating / Storage temperature	0 to 60℃ / -10 to 60℃
Cable length	1m/2m/3m (Up to 30m with extension cable)
Vibration	150m/s^2（50 to 2,000Hz）
Shock	1,000m/s^2（11ms）
Protective design grade	IP65
Power supply	DC24V (DC17 -30.8V Compliant with Siemens Drive-CLiQ
Power consumption	65 mA (at 24V without load)
Power supply protection	Reverse-connected power supply protection. Over-voltage and over current protection by an internal fuse
Output connector	SACC-M12MS-8Q SH by Phoenix Contact Inc.
Compliant connector	SACC-M12MS-8Q SH by Phoenix Contact Inc.
Inertia moment	9.4×10^{-5} kgm^2
Starting torque	0.08Nm or less (at 20 ℃)
Mass	1.2kg or less

Functional Safety Specifications

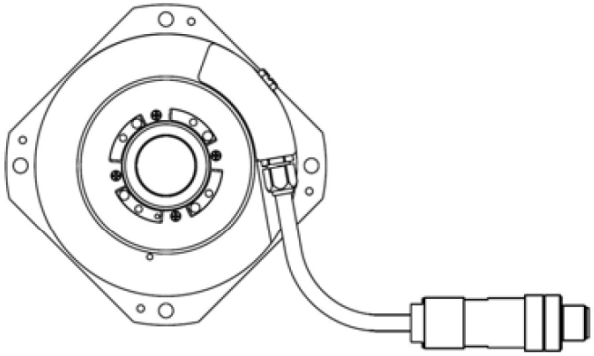
Functional safety specifications

Item \ Mode of operation		High demand / continuous mode
Probability of dangerous failure	Operating Temperature 60℃	PFH = 81.0 × 10^{-9} [1/h]
	Operating Temperature 40℃	PFH = 32.0 × 10^{-9} [1/h]
	Operating Temperature 25℃	PFH = 16.0 × 10^{-9} [1/h]
MTTFd		80.5 years (High)
DCavg		64.30% (Low)
Hardware fault tolerance		1
Product type		Type B
SIL		2

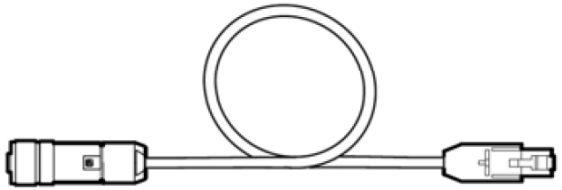
Normative references

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

RU97 Systemkonfiguration



RU97-2048 Z Series



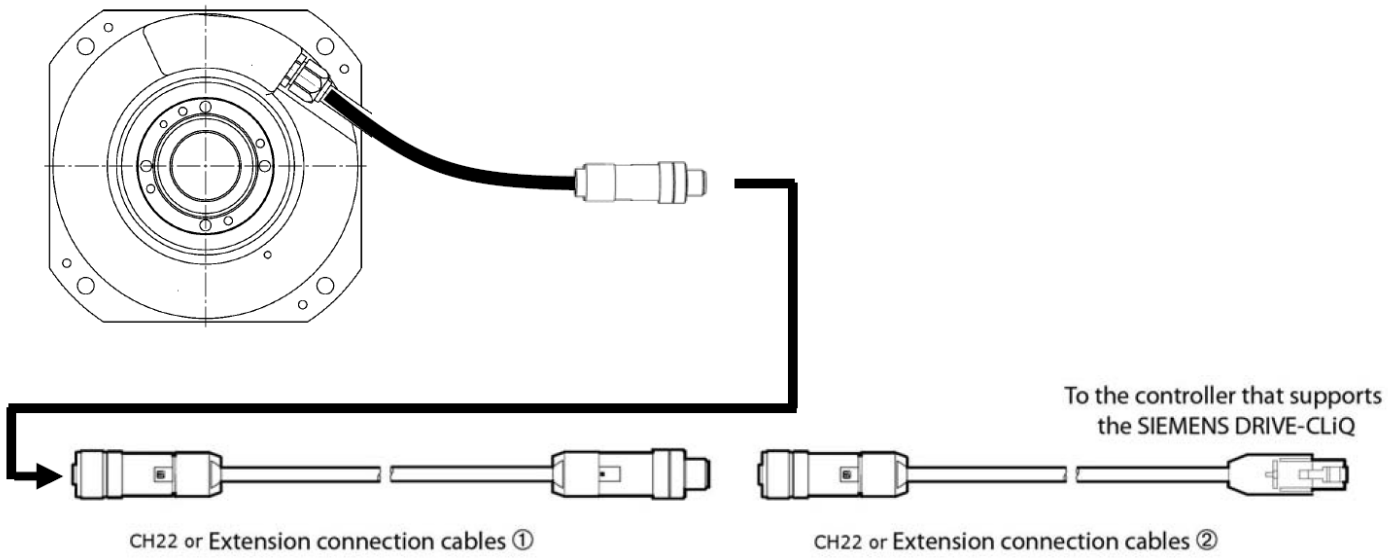
Extension connection cable

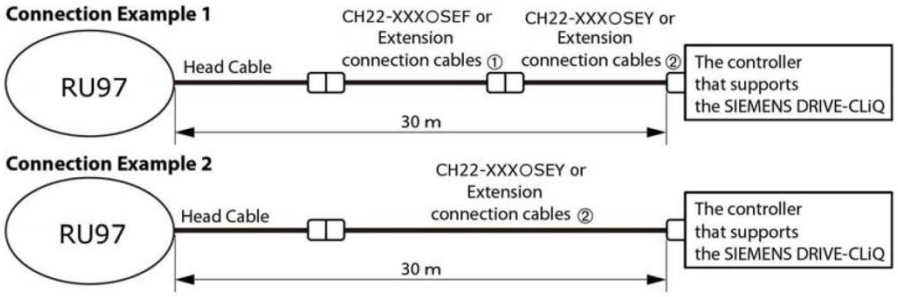
The controller
that supports the
SIEMENS DRIVE-CLiQ

RU 97 - 2048 □ J Z □ □

- Cable length (01: 1m, 02: 2m, 03: 3m)
- SIEMENS DRIVE-CLiQ protocol
- Resolution : 25bit
- Drum inside diameter (A : ϕ20mm, B: ϕ22mm)

Connection cable

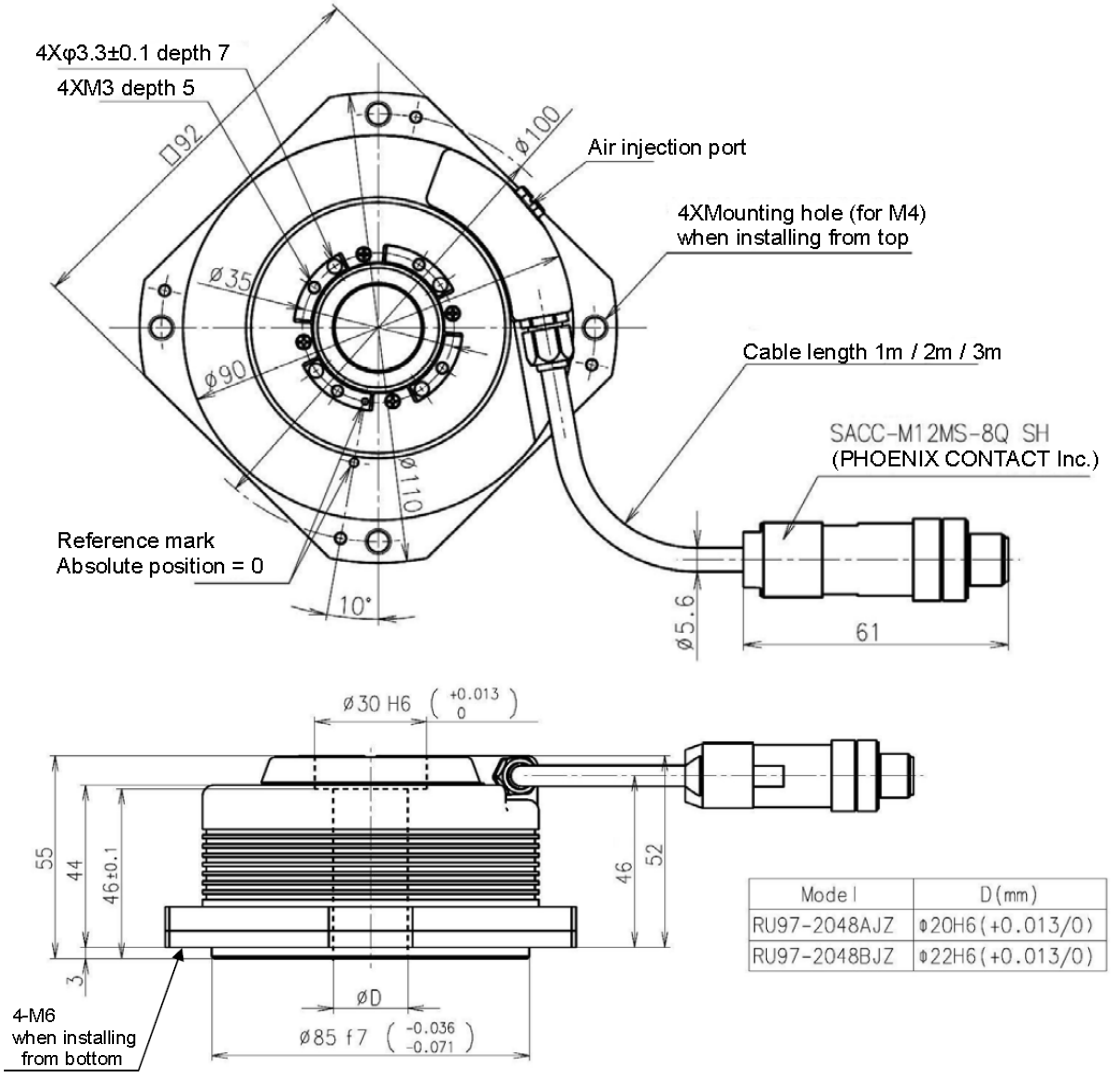




RU97 is available with 1m /2m /3m head cable

Extension cable CH22 Series up to 30m

Outside Dimensions



Model	D(mm)
RU97-2048AJZ	φ20H6(+0.013/0)
RU97-2048BJZ	φ22H6(+0.013/0)

Unit : mm

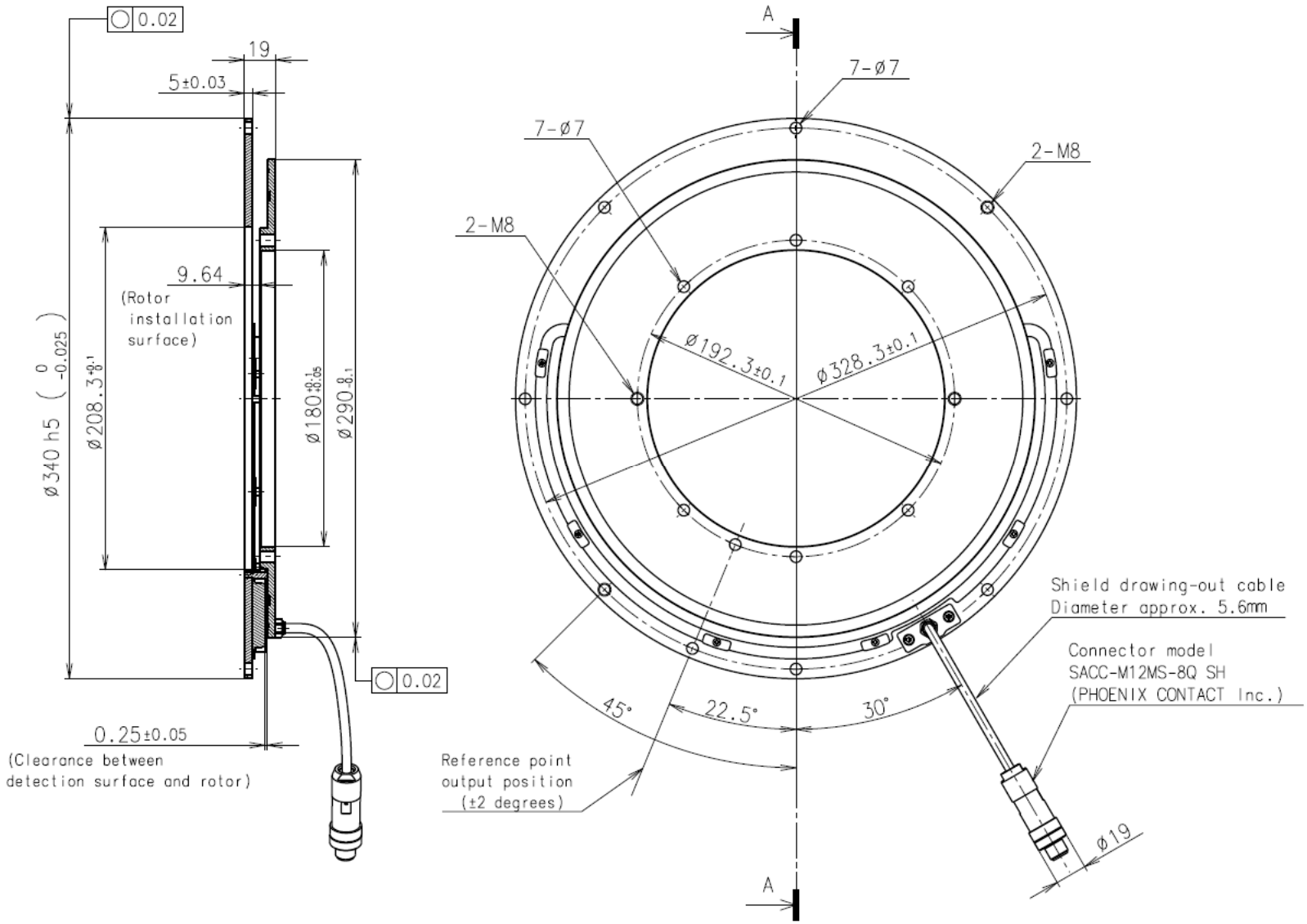
Absolute angle encoder Exposed rotary type

RS97 Series

Absolute magnetic functional principle
highly resistant against Oil, Water (humidity) and Dust

Large inner diameter	: 180mm or 96mm
High revolution speed	: 5000U/min^{-1}
High accuracy	: ±2,5sec
High resolution	: 23 bit
Interface	: absolute Protocols for Fanuc and DriveCLiQ

Dimension RS97-1024NGZ



Specification RS97-1024NGZ with Drive-CLiQ

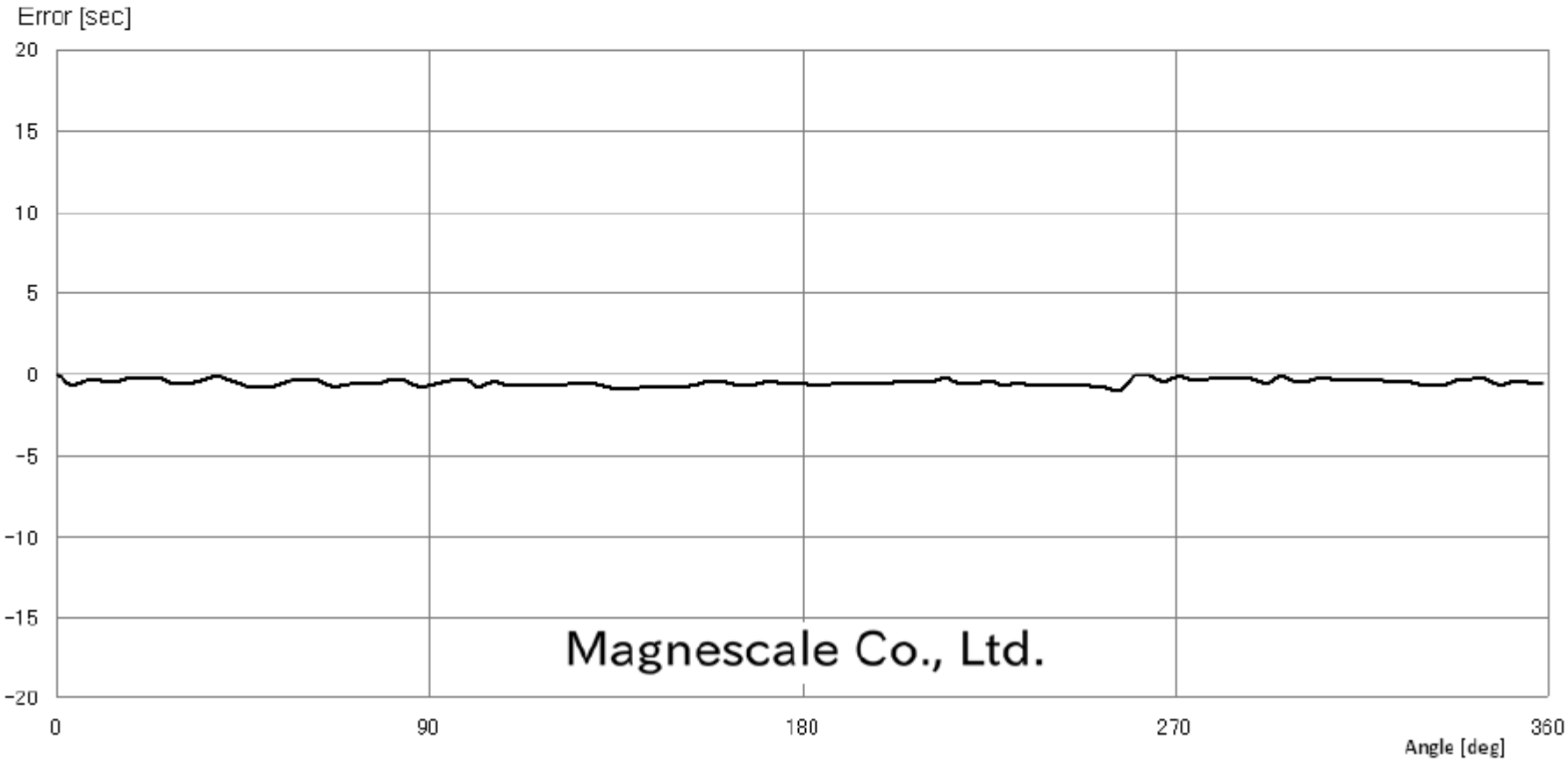
Item	RS97-1024NGZ Series
Output signal	Compliant with SIEMENS DRIVE-CLiQ
Data format	DRIVE-CLiQ single-turn absolute format
Motor temperature detection	Not available
Detecting method	Magnetic (MR sensor)
Accuracy (at 20 °C)	±2,5 s
Resolution	23 bit
Count direction	Addition count when stator is fixed and rotor is rotating clockwise (Given along with the reference point output position on outside dimensions)
Response revolution	5000 min^{-1}
Operating temperature range	0 °C to +60 °C
Storage temperature range	–10 °C to +60 °C
Vibration resistance	150 m/s^2 (50 Hz to 2000 Hz)
Shock resistance	1000 m/s^2 (11 ms)
Degree of protection	IP65
Power supply voltage	DC 24 V (DC 17 - 30,8 V) (Compliant with SIEMENS DRIVE-CLiQ)
Current consumption	150 mA or less
Inrush current	4 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.
Dimensions	180 mm (inner diameter) × 19 mm (thickness) (For details, see section 10, “Outside Dimensions.”)
Cable length	1 m / 2 m / 3 m (max. total length of 30 m using extension connection cables)
Output connector	SACC-M12MS-8Q SH by PHOENIX CONTACT Inc.
Compliant connector	SACC-M12FS-8Q SH by PHOENIX CONTACT Inc.
Moment of inertia	8,8 × 10–3 kg m^2 or less
Mass	3,5 kg or less (rotor: 0,6 kg, stator: 2,8 kg)

Specification RS97-1024NGA with Fanuc and Mitsubishi

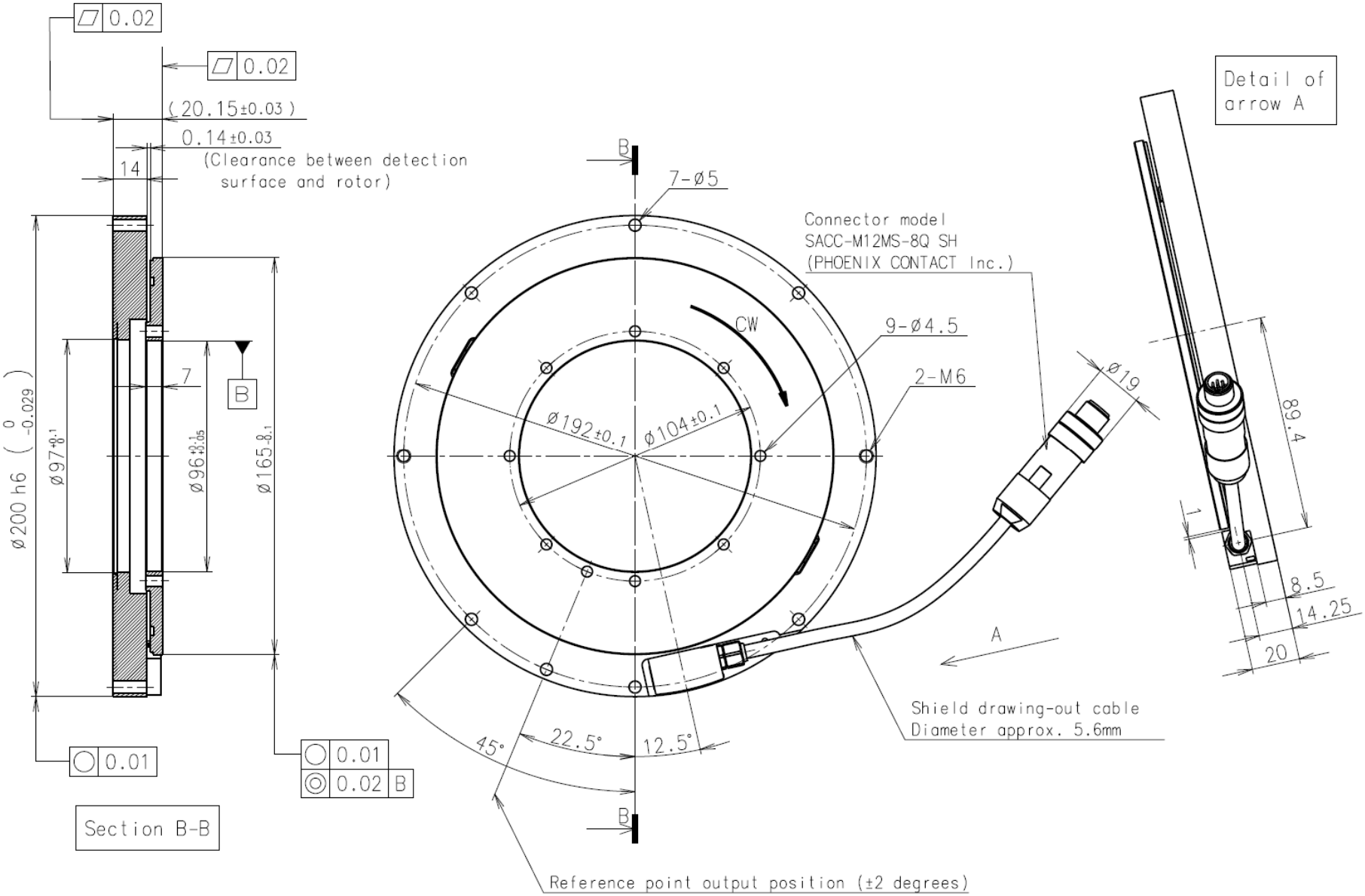
Item	RS97-1024EGD Series	RS97-1024EGA Series	RS97-1024NGA Series
Output signal	Absolute serial (Full duplex: Compliant with EIA-422)		
Data format	Mitsubishi Electric specii cations	FANUC specii cations	
Motor temperature detection	Not available		
Detecting method	Magnetic (MR sensor)		
Accuracy (at 20 °C)	±2,5 s		
Resolution	23 bit output		
Revolution direction	Clockwise (Addition direction given along with absolute “0” position on outside dimensions)		
Response revolution	5000 min^{-1}		
Operating temperature range	0 °C to +60 °C		
Storage temperature range	–10 °C to +60 °C		
Vibration resistance	150 m/s^2 (50 Hz to 2000 Hz)		
Shock resistance	1000 m/s^2 (11 ms)		
Degree of protection	IP65		
Power supply voltage	DC 4,75 - 5,25 V (at cable connection end)		
Current consumption (at 120 Ω terminal)	330 mA or less		300 mA
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.		
Dimensions	96 mm (inner diameter) × 21 mm (thickness)		180 mm (inner diameter) × 19 mm (thickness)
Cable length	1 m / 2 m / 3m (max. total length of 30 m using extension connection cables)		
Output connector	Male connector JN1HS10PL2 by Japan Aviation Electronics Industry		
Compliant connector	Female connector JN2DS10SL2-R by Japan Aviation Electronics Industry (compatible connector)		
Moment of inertia	9 × 10–4 kg m^2 or less		8,8 × 10–3 kg m^2 or less
Mass	2 kg or less (rotor: 0,2 kg, stator: 1,7 kg)		Approx. 3,4 kg (rotor: 0,6 kg, stator: 2,8 kg)

回転マグネスケール精度表
ACCURACY CHART OF ROTARY MAGNESCALE

型名 Model	RS87-1024NGA	精度 Accuracy	±0.49 sec	検査日 Date	2010/7/23
製造番号 Serial No.	000110	測定温度 Measured at	20 ℃	検査員 Inspector	S.Kawamoto



Dimension RS97-1024EGZ



Specification RS97-1024EGZ with Drive-CLiQ

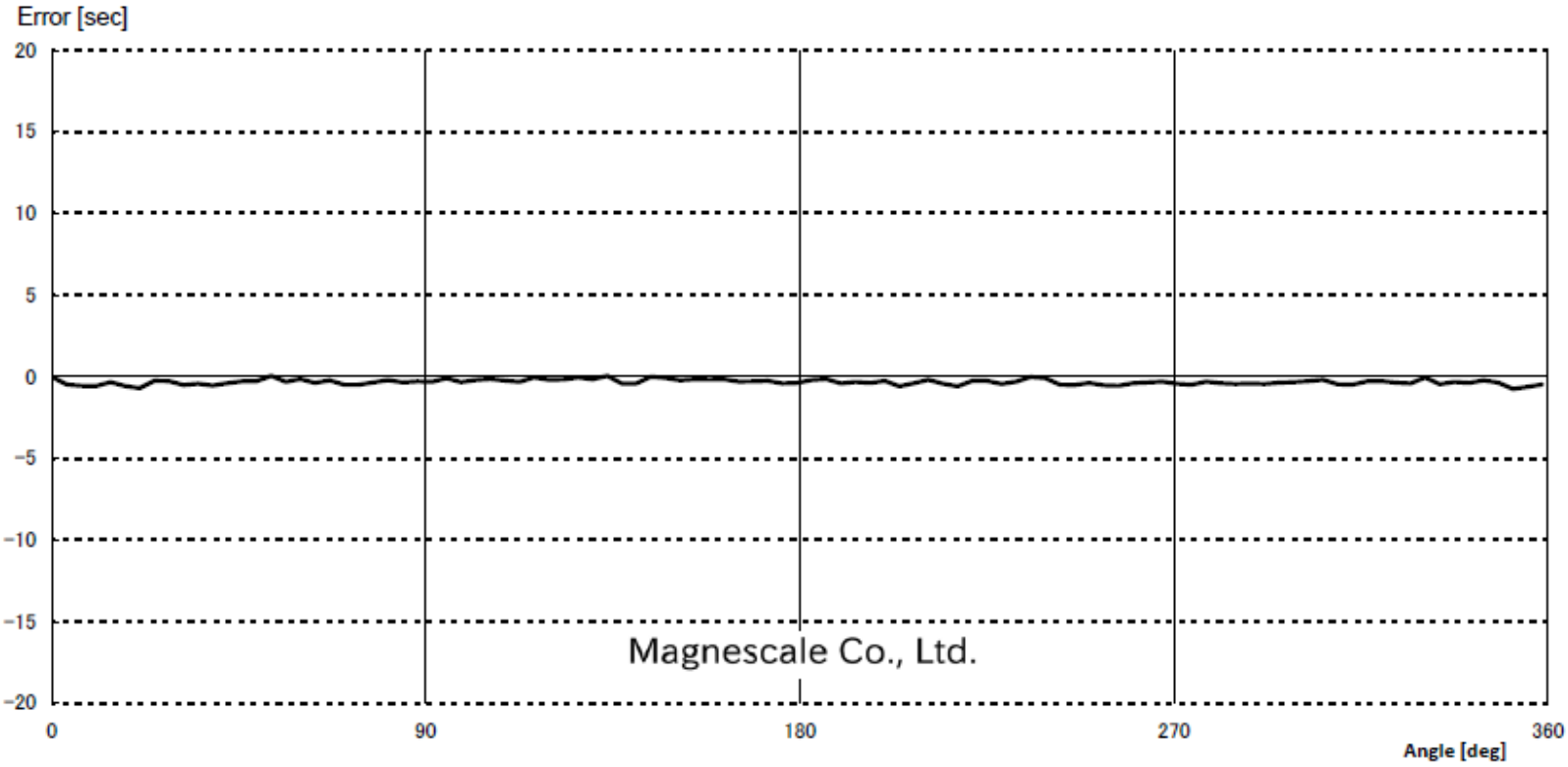
Item	RS97-1024EGZ Series
Output signal	Compliant with SIEMENS DRIVE-CLiQ
Data format	DRIVE-CLiQ single-turn absolute format
Motor temperature detection	Not available
Detecting method	Magnetic (MR sensor)
Accuracy (at 20 °C)	±2,5 s
Resolution	23 bit
Count direction	Addition count when stator is fixed and rotor is rotating clockwise (Given along with the reference point output position on outside dimensions)
Response revolution	5000 min^{-1}
Operating temperature range	0 °C to +60 °C
Storage temperature range	–10 °C to +60 °C
Vibration resistance	150 m/s^2 (50 Hz to 2000 Hz)
Shock resistance	1000 m/s^2 (11 ms)
Degree of protection	IP65
Power supply voltage	DC 24 V (DC 17 - 30,8 V) (Compliant with SIEMENS DRIVE-CLiQ)
Current consumption	150 mA or less
Inrush current	4 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.
Dimensions	96 mm (inner diameter) × 20.15 mm (thickness) (For details, see section 10, “Outside Dimensions.”)
Cable length	1 m / 2 m / 3 m (max. total length of 30 m using extension connection cables)
Output connector	SACC-M12MS-8Q SH by PHOENIX CONTACT Inc.
Compliant connector	SACC-M12FS-8Q SH by PHOENIX CONTACT Inc.
Moment of inertia	9 × 10-4 kg m^2 or less
Mass	2 kg or less (rotor: 0,2 kg, stator: 1,7 kg)

Specification RS97-1024EGA with Fanuc

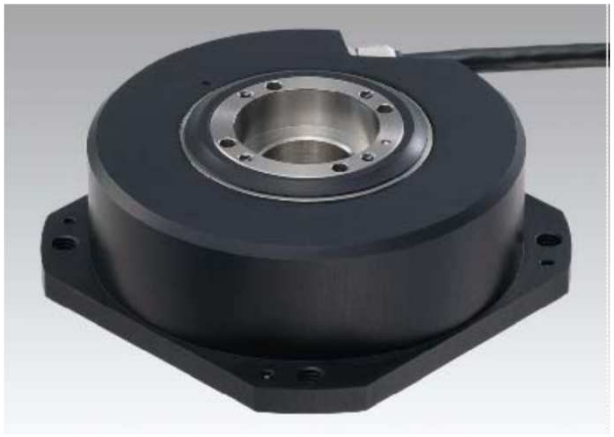
Item	RS97-1024EGA
Output signal	Output signal
Detecting method	Magnetic (M R sensor)
Output wavelength	500 µm (λ)
Output wave number	1,024 λ/revolution
Accuracy (at 20°C)	±2,5s
Number of divisions	1/8192 divisions (23 bit output)
Revolution direction	Clockwise (addition direction)
Response revolution	5,000 min^{-1}
Operating temperature range	0 °C to +60 °C
Storage temperature range	-10°C to +60 °C
Vibration resistance	150 m/s^2 (50 Hz to 2,000 Hz)
Shock resistance	1,000 m/s^2 (11 ms)
Protective design grade	IP65
Power supply voltage	DC 4,75 -5,25 V (at cable connection end)
Current consumption (at 120 Ω terminal)	330 mA 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 and laws and regulations	FCC Part15 Subpart B Class A ICES-003 Class A Digital Device EN55011 Gp1 Class A, EN61000-6-2 Safety standards not applicable (60V DC or less)
Dimensions	96 mm (inner diameter) x 20,15 mm (thickness) (For details, see section 7, Outside Dimensions)
Cable length	Cable length (01: 1m, 02:2m) (maximum length of 30 m with extension cables)
Output connector	Male connector JN1 HS10PL2 by Japan Aviation Electronics Industry
Compliant connector	Female connector JN2DS10SL2 by Japan Aviation Electronics Industry
Moment of inertia	9 x 10-4 $kg.m^2$ or less
Mass	2kg or less (rotor: 0,2kg, stator: 1,7kg)

回転マグネスケール精度表
ACCURACY CHART OF ROTARY MAGNESCALE

型名 Model	RS87-1024EGA	精度 Accuracy	±0.4 sec	検査日 Date	2010/11/9
製造番号 Serial No.	000007	測定温度 Measured at	20 ℃	検査員 Inspector	G.Nakamura



Technical data RU77
with Fanuc Interface



Specification RU77

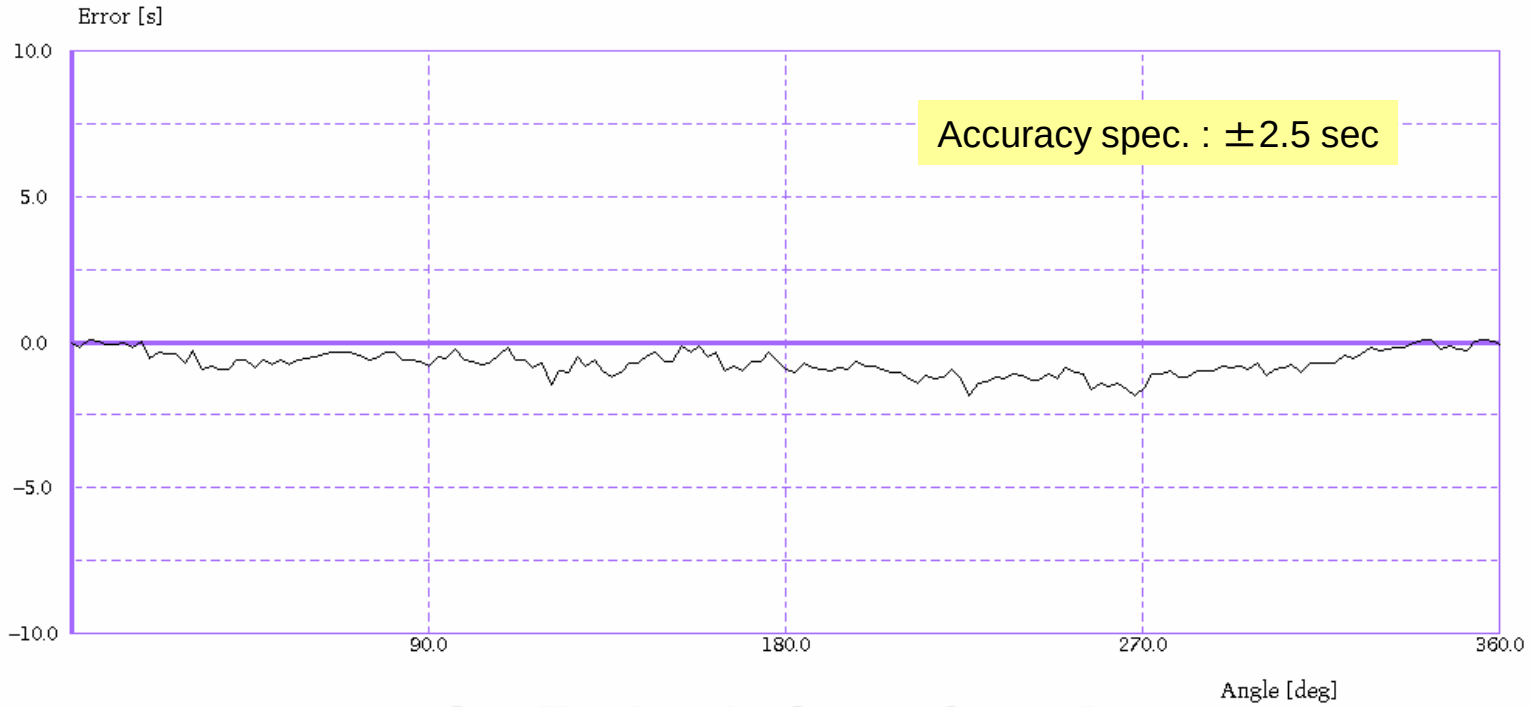
Specifications	RU77-4096A□■
Output signal / Method	FANUC Absolute signal / Magnetic (MR sensor)
Signal period	40μm (λ)
Number of recorded signal	4,096λ/ rev.
System accuracy	**±2.5s （at 20℃）**
Resolution Pulse / revolution	**2.5˚/1000 to 1˚/100,000** **131,072 p/rev. to 33,554,432 p/rev.**
Direction	Plus count at CCW
Electrical allowable revolution	**2,000min^{-1}**
Mechanical allowable revolution	**3,000min^{-1}**
Operating / Storage temperature	0 to 60℃ / -10 to 60℃
Cable length	1m (Up to 15m with extension cable)
Vibration	**150m/s^2 （50 to 2,000Hz）**
Shock	**1,000m/s^2 （11ms）**
Protective design grade	**IP65**
Power supply	DC4.75－5.25V（at the edge of cable connector）
Power consumption	200mA or less (120Ωtermination)
Inrush current	2A or less (At the rise time of power supply voltage : 10ms)
Output connector	JAE water proof type Male N　JB1DB 10PL2
Inertia moment	9.4×10^{-5} kgm^2
Starting torque	0.1Nm or less (at 20 ℃)
Mass	Approx. 1.3kg

RU77 Accuracy chart

回転マグネスケール精度表

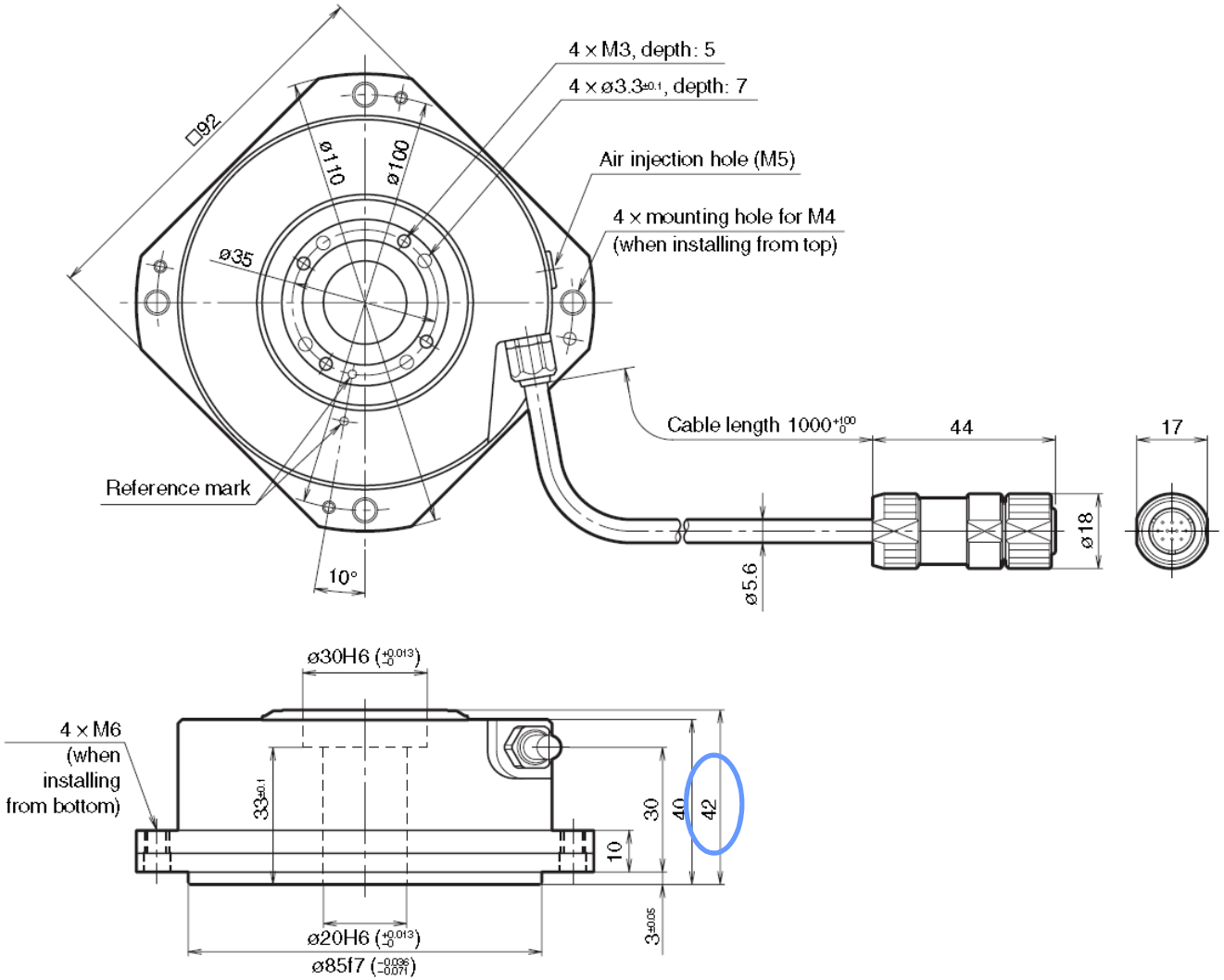
ACCURACY CHART OF ROTARY MAGNESCALE

型名 Model	RU77-4096AGA	精度 Accuracy	± 1.02 sec	検査日 Date	2007/04/18
製造番号 Serial No.	000005	測定温度 Measured at	20℃	検査員 Inspector	



Sony Manufacturing Systems Corporation

Dimension RU77



Unit: mm

RU77–4096A□A

	NC Type
A	FANUC
B	MITSUBISHI 2wires
D	MITSUBISHI 4wires
F	YASKAWA

Resolution

Resolution	Pulse / rev.	No. of div.	
Approx.2.5˚ /1,000	131,072	1/32	A
Approx.1˚ /,1,000	262,144	1/64	B
Approx.7˚ /10,000	524,288	1/128	C
Approx.3.5˚ /10,000	1,048,576	1/256	D
Approx.2˚ /10,000	2,097,152	1/512	E
Approx.1˚ /10,000	4,194,304	1/1024	F
Approx.4.5˚ /100,000	8,388,608	1/2048	G
Approx.2˚ /100,000	16,777,216	1/4096	H
Approx.1˚ /100,000	33,554,432	1/8192	J

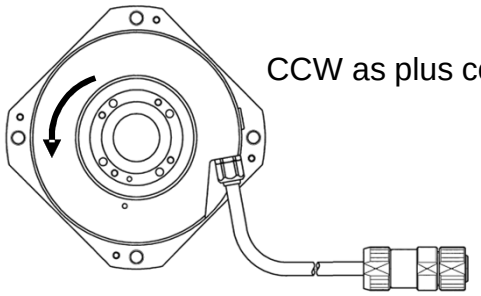
Number of recorded waves/rev.

Output type 7: Absolute serial out

Same as RCN223➔

Dimension 7: Compact size(Ø110)
Accuracy ±2.5s

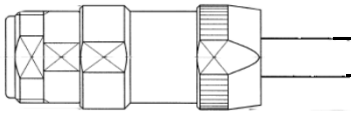
Model: Rotary Magnescale



CCW as plus count

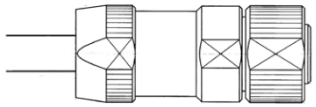
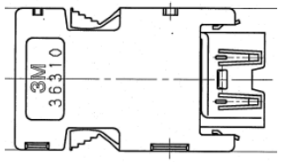
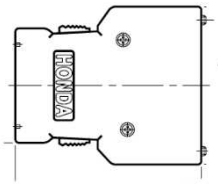
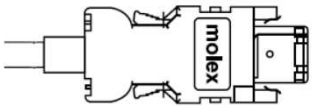
Note: For Yaskawa, they only have D and E type。

Connection cable CE28 Series



Output connector

Japan Aviation Electronics Industry, Ltd.（JAE）
Circular waterproof type　Female N
JB1HB 10SL2

Model name	Connect to	Cable end	Note
CE28-**J**	**Extension cable for M,F,G Series**		**JAE** **Circular waterproof type** **Male N　JB1DB 10PL2**
CE28-**M**	**Mitsubishi J3 Series (Serial, ABS)**		**3M** **Receptacle: 36210-0100PL** **Shell kit: 36310-3200-008** **(For J2 series, ask SMSE)**
CE28-**F**	**FANUC　i Series (Seiral, ABS)**		**HONDA** **Plug: PCR-S20FS+** **Plug case: PCR-LS20LA**
CE28-**G**	**Yaskawa, Matsushita** **(Serial, ABS)**		**Molex** **Connector kit: 55100-670**

Magnescale

SPEED X PRECISION

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