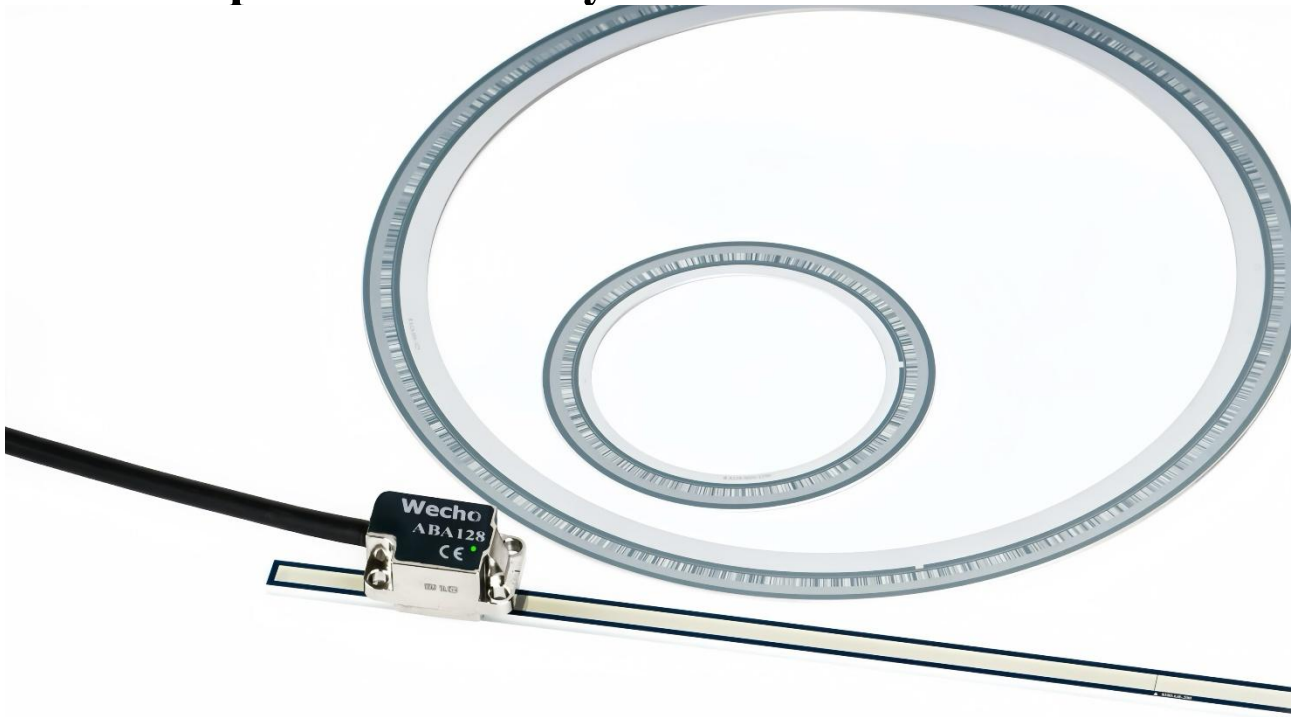


Datasheet

ABA128 Optical Encoder System



Highlights

Optical Readhead

- **Miniature** optical **absolute** encoder, suitable for confined spaces
- Compatible with **linear and rotary measurement, user-programmable 22-bit to 28-bit resolution** for different precision requirements
- **Real-time signal monitoring and debugging** via the Encoder Test Box (**ETB**)
- **BiSS C** or **BiSS C + SinCos 1 Vpp** dual output options
- High-speed performance: up to **18 m/s** linear, **6920 rpm** rotary
- **Auto Gain Control (AGC)** to maintain optimal signal quality
- **Auto Offset Calibration (AOC)** for easy position optimization
- **Auto Accuracy Calibration (AAC)** to enhance system accuracy
- Compatible with **soda-lime glass scales, steel tapes, and discs**
- Excellent electromagnetic interference (**EMI**) resistance
- Multi-color LED indicators for intuitive signal status display

1. Specifications

Optical Readhead			
Image			
Series		ABA128-B	ABA128-BA
Description		Miniature readhead, suitable for both linear and rotary motion, with absolute optical encoding	
Scanning Principle		Optical (Reflective)	
Scanning Type		Absolute	
Signal Period		128 μm	
Output Signal		BiSS C	BiSS C + SinCos 1Vpp
Resolution	BiSS C	Linear Motion	Steel Tape: 0.2 μm 0.1 μm 0.05 μm Glass Scale: 10 nm 5 nm
		Rotary Motion	22-bit to 26-bit (Single turn) ¹
	SinCos 1Vpp		Not Supported Depends on the driver's interpolation factor
Power Supply (Without Load)	4.5 VDC to 5.5 VDC		<80 mA (Typical)
Temperature	Storage		-20 °C to +70 °C @ RH < 80% (Non-condensing)
	Operating		0 °C to +70 °C @ RH < 80% (Non-condensing)
Acceleration	Operating		500 m/s ² , 3 Axes
Shock	Non-Operating		<1000 m/s ² , 6 ms, ½ Sine, 3 Axes
Vibration	Operating		<100 m/s ² Max @ 55 to 2000 Hz, 3 Axes
Mass	Readhead		5.5 g
	Cable		25 g/m
Cable Design		8 Cores, Double Shielded	10 Cores, Double Shielded
Cable Diameter		3.5±0.2 mm	
Cable Bend Radius	Static		30 mm
	Dynamic		70 mm
Cable Termination		DSUB 15 Male	
Readhead Dimension	Length		20.57 mm
	Width		12.70 mm
	Height		10.50 mm
IP Rating		IP40	

Note:

- For rotary motion applications requiring readheads with higher data resolution, please contact our sales team for more information.

2. Speed Performance

2.1 Linear Motion

Max Speed (m/s)
18

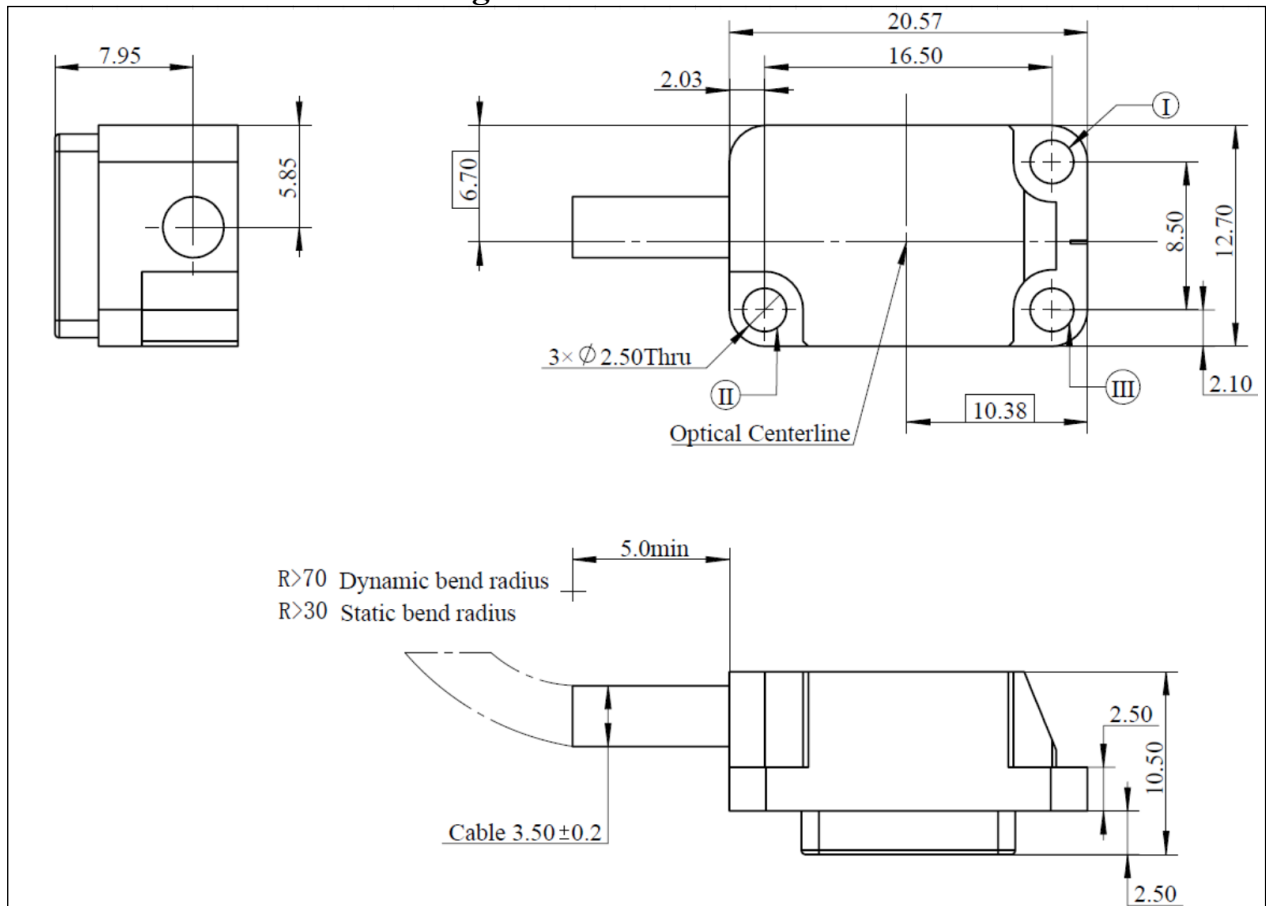
2.2 Rotary Motion

Lines per Revolution, LPR	Optical Center Diameter (mm)	Max Speed (RPM)
1250	49.62	6920
1650	65.98	5210
2048	82.19	4180
2500	100.60	3410
3125	126.07	2720
4096	165.63	2070
5000	202.46	1690

3. LED Definition

Model		ABA128
LED Location		On readhead body 
LED Colour	Green	Normal
	Red	Error
	Red (Blinking)	Auto calibration in progress

4. Readhead Dimension Drawing

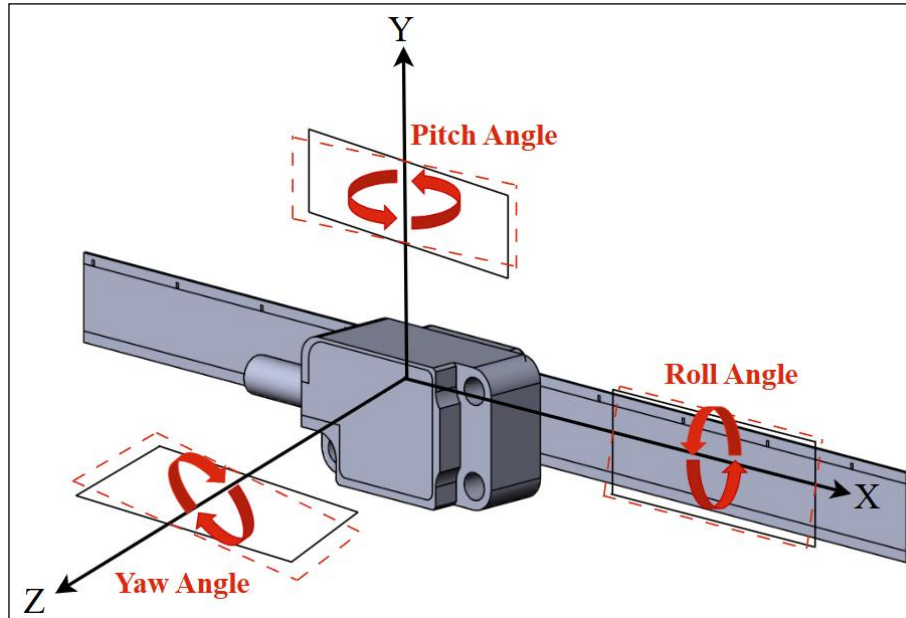


Note:

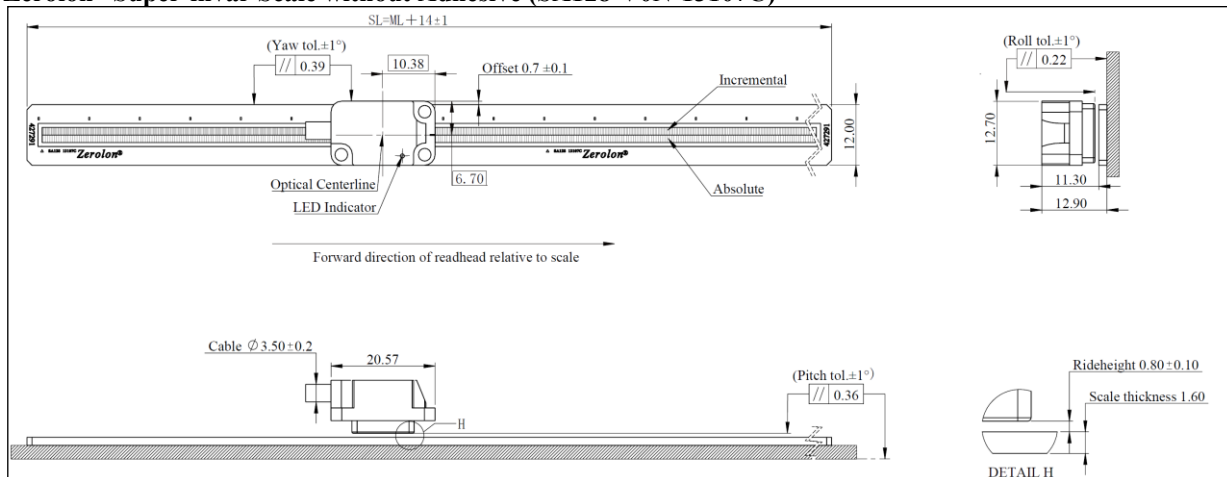
1. All dimensions are in mm.
2. Mount the readhead using two holes, such as (I II) or (II III) .

5. Readhead Installation Guide

During installation, please strictly follow or refer to the diagrams below to ensure accuracy and consistency. Pay close attention to the cable exit direction, as well as the definitions and labels of yaw, pitch, and roll. Proper understanding and application of these orientations are critical for precise assembly, calibration and future operation.



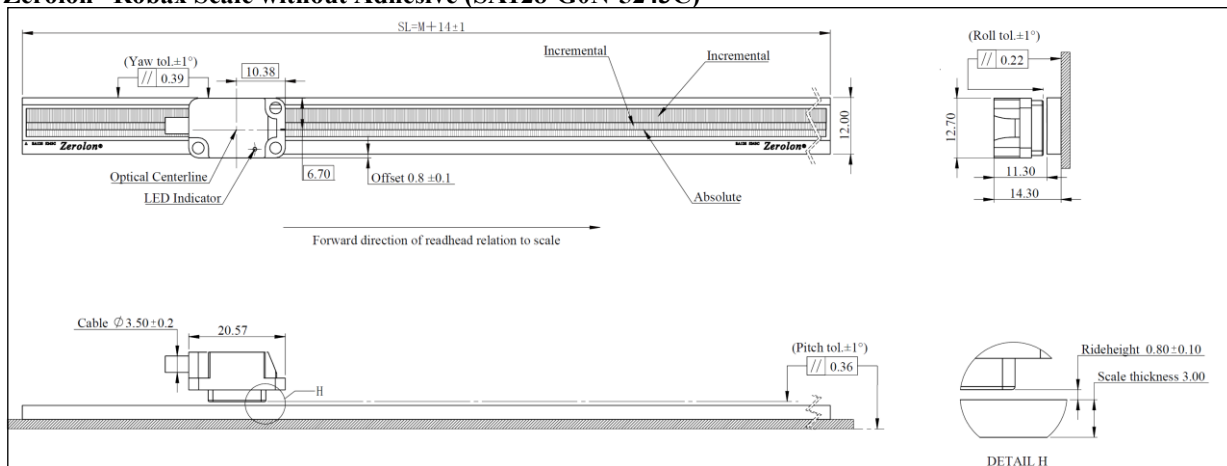
5.1 Zerolon® Super-invar Scale without Adhesive (SA128-V0N-13107C)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. Ensure the correct installation direction for the scale.
5. If adhesive fixing is required, apply adhesive at the center of the super-invar scale and avoid dispensing at both ends.

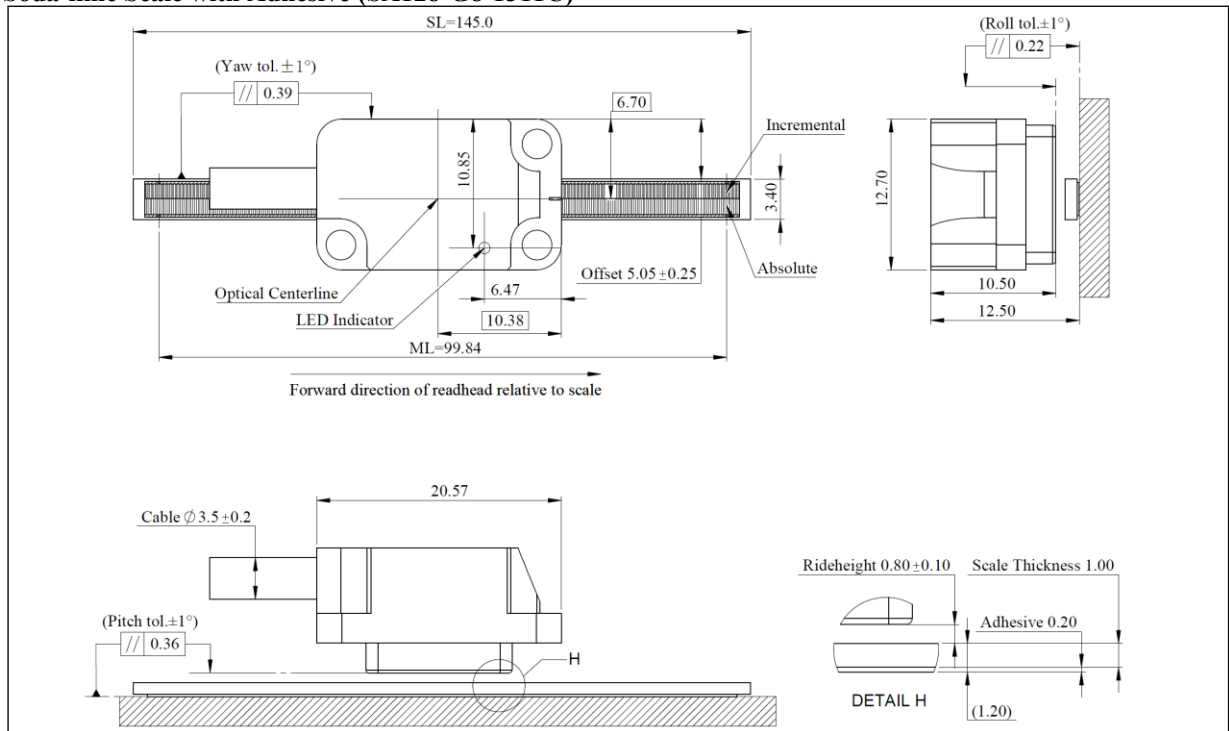
5.2 Zerolon® Robax Scale without Adhesive (SA128-G0N-5243C)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. Ensure the correct installation direction for the scale.
5. If adhesive fixing is required, apply adhesive at the center of the glass scale and avoid dispensing at both ends.

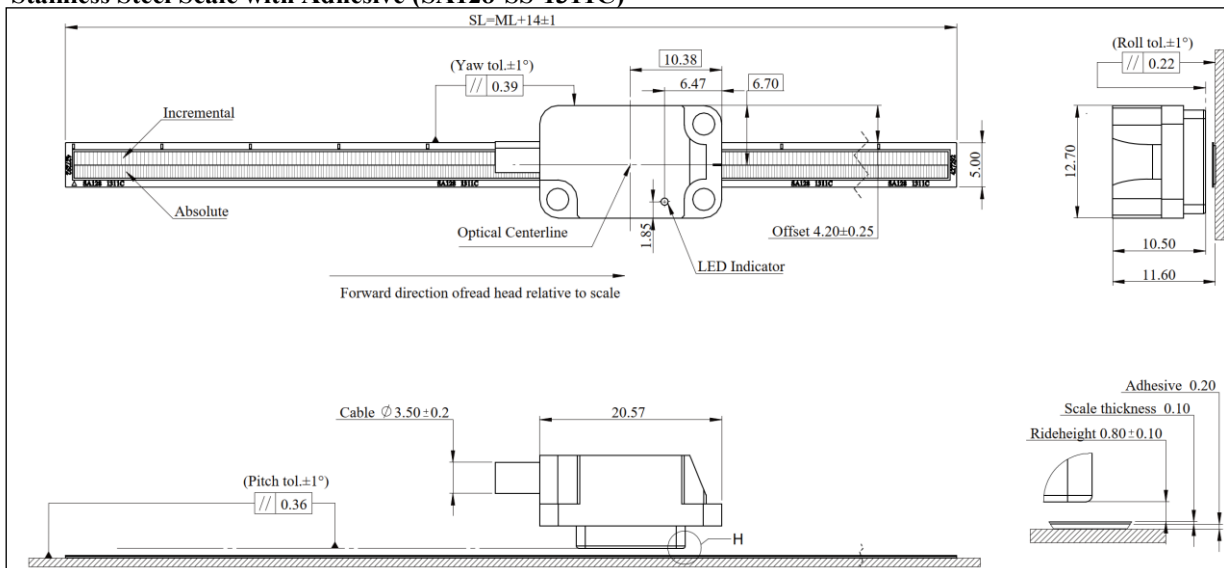
5.3 Soda-lime Scale with Adhesive (SA128-G8-1311C)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. Ensure the correct installation direction for the scale.

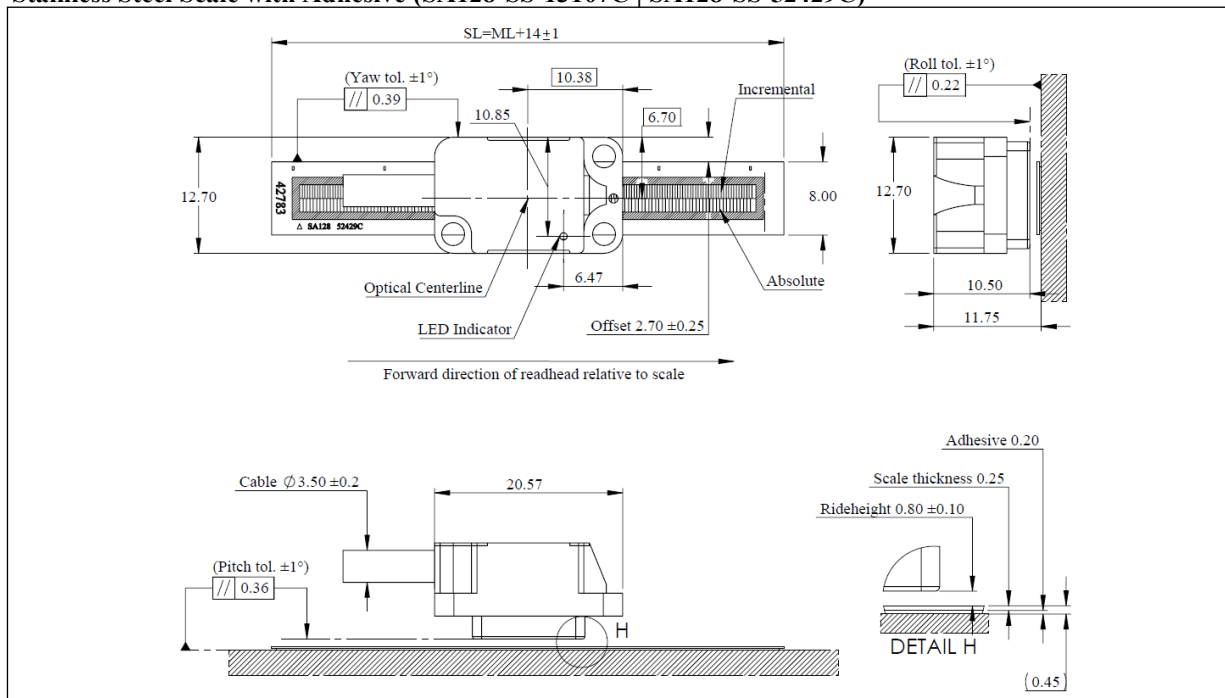
5.4 Stainless Steel Scale with Adhesive (SA128-SS-1311C)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. Ensure the correct installation direction for the scale.

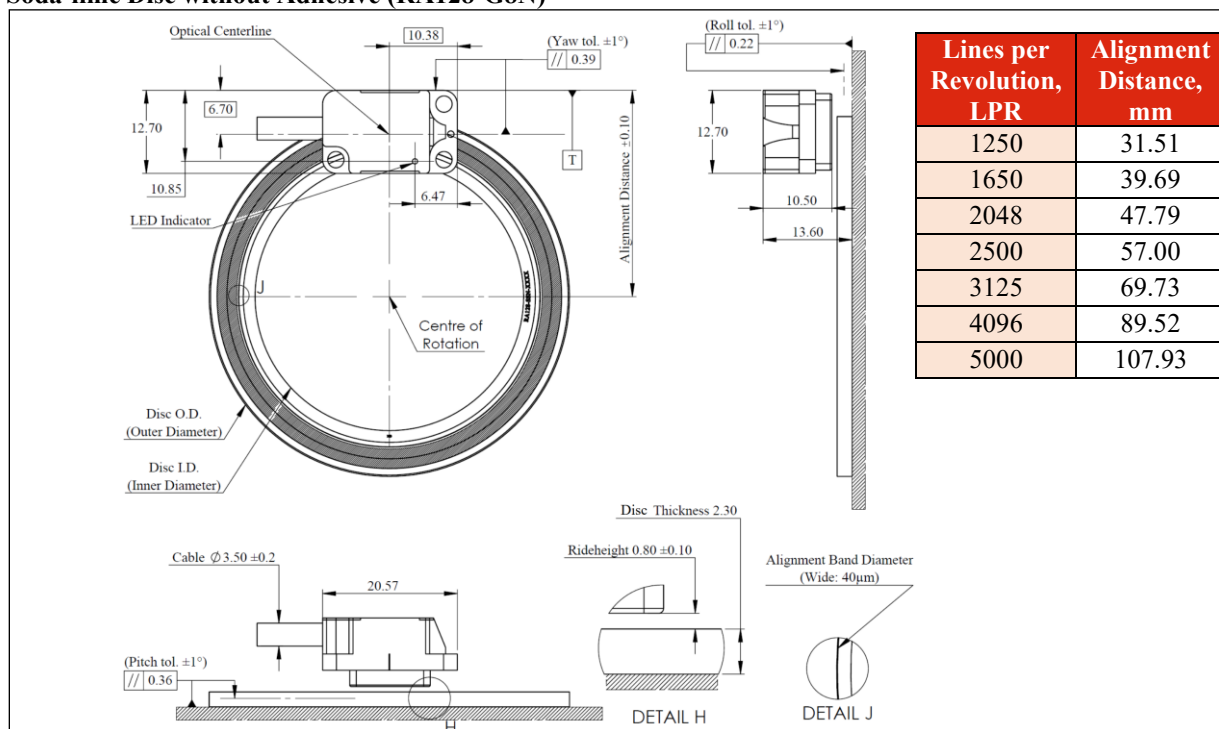
5.5 Stainless Steel Scale with Adhesive (SA128-SS-13107C | SA128-SS-52429C)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. Ensure the correct installation direction for the scale.

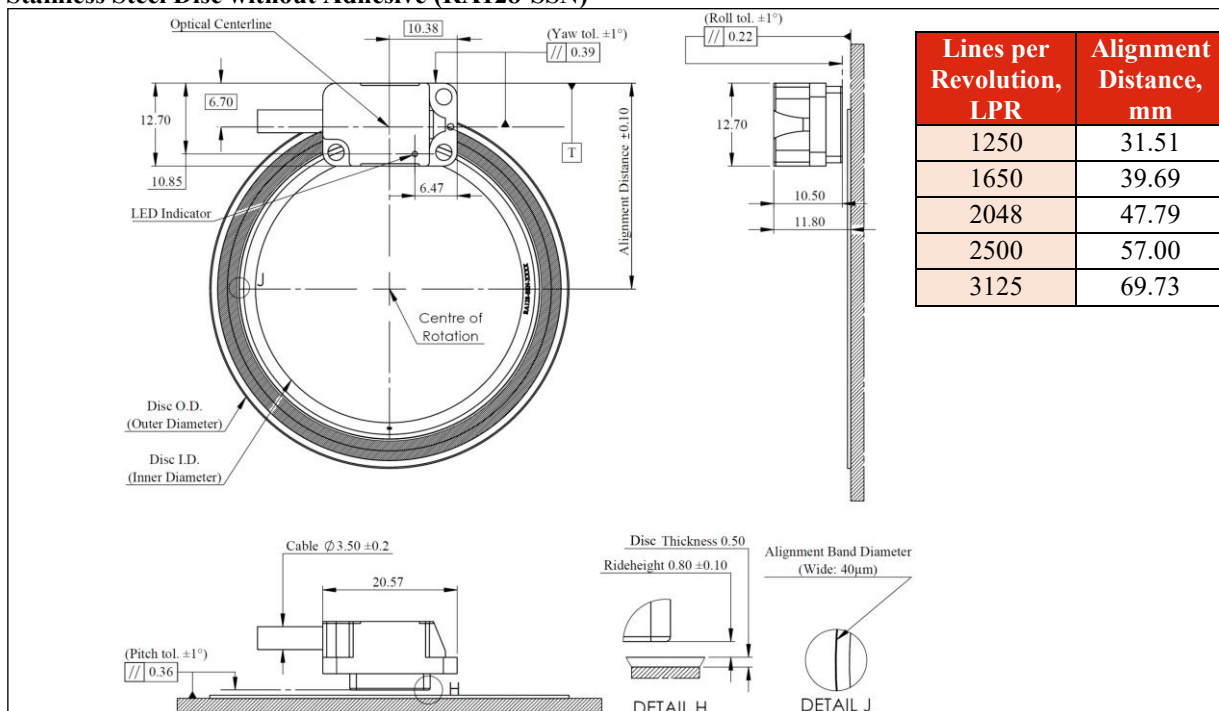
5.6 Soda-lime Disc without Adhesive (RA128-G8N)



Note:

1. All dimensions are in mm.
2. **T** = Datum T
3. Use UV glue for installation, do not use 502 glue.

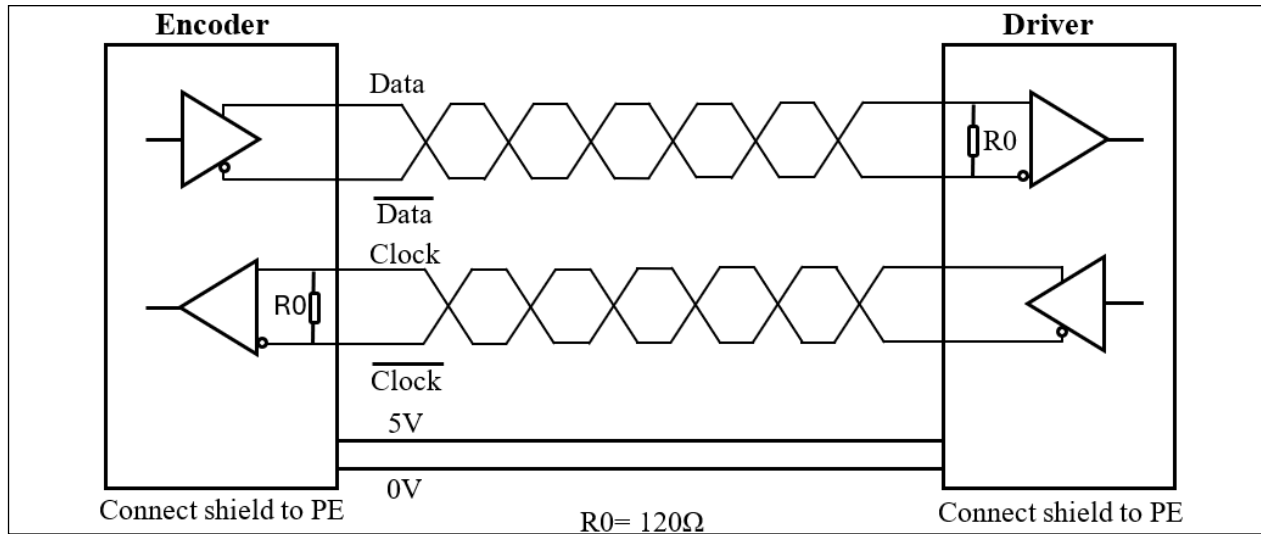
5.7 Stainless Steel Disc without Adhesive (RA128-SSN)



Note:

1. All dimensions are in mm.
2. **T** = Datum T
3. Use UV glue for installation, do not use 502 glue.

6. Electrical Connection

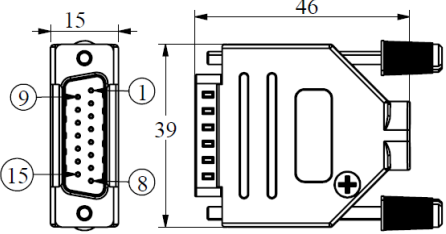


IMPORTANT: Readhead shield must be connected to the driver earth (Field ground).

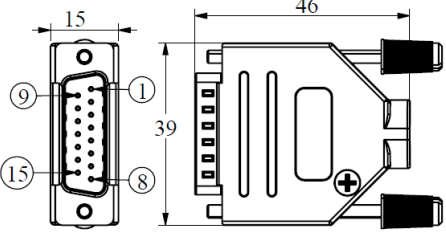
Maximum readhead cable length: 5 m

7. Pinout

7.1 BiSS C Output Signal

Connector	Pinout	Signal	Function	Colour
 Type: DSUB 15 Male Jack Screws: UNC 4-40 Mating Recommendation Type: DSUB 15 Female Hex Extender: UNC 4-40, 6 mm	Pin 1	NC	Not connected	-
	Pin 2	0 V	Encoder supply (0 V)	Black
	Pin 3	NC	Not connected	-
	Pin 4	VCC	Encoder supply (5 V)	Red
	Pin 5	SLO+	SLO+	Yellow
	Pin 6	NC	Not connected	-
	Pin 7	NC	Not connected	-
	Pin 8	MA+	MA+	Amber
	Pin 9	NC	Not connected	-
	Pin 10	0 V Sensor	Encoder supply (0 V)	Grey
	Pin 11	NC	Not connected	-
	Pin 12	VCC Sensor	Encoder supply (5 V)	White
	Pin 13	SLO-	SLO-	Green
	Pin 14	NC	Not connected	-
	Pin 15	MA-	MA-	Brown
	Case	Outer Shield	Outer Shield	-

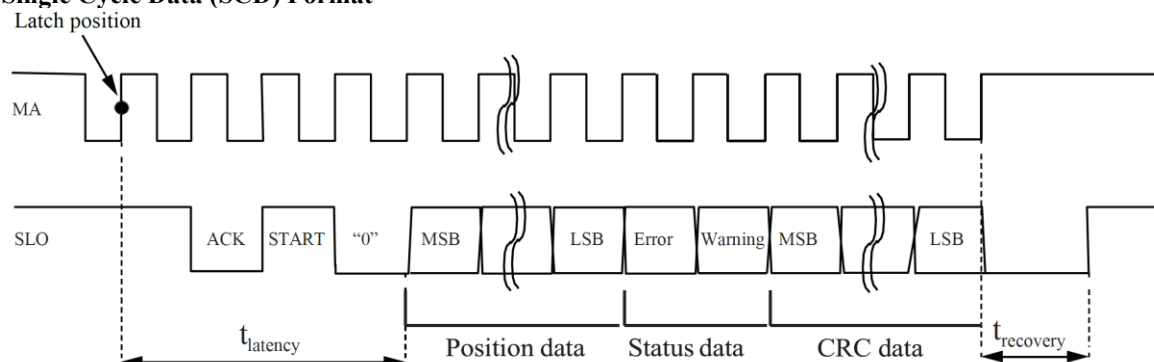
7.2 BiSS C + SinCos 1Vpp Output Signal

Connector	Pinout	Signal	Function	Colour
 Type: DSUB 15 Male Jack Screws: UNC 4-40 Mating Recommendation Type: DSUB 15 Female Hex Extender: UNC 4-40, 6 mm	Pin 1	A+	Sin+ signal	Blue
	Pin 2	0 V	Encoder supply (0 V)	Black
	Pin 3	B+	Cos+ signal	Grey
	Pin 4	VCC	Encoder supply (5 V)	Red
	Pin 5	SLO+	SLO+	Yellow
	Pin 6	NC	Not connected	-
	Pin 7	NC	Not connected	-
	Pin 8	MA+	MA+	Amber
	Pin 9	A-	Sin- signal	Violet
	Pin 10	0 V Sensor	Encoder supply (0 V) Shorted with Pin 2	Black
	Pin 11	B-	Cos- signal	White
	Pin 12	VCC Sensor	Encoder supply (5 V) Shorted with Pin 4	Red
	Pin 13	SLO-	SLO-	Green
	Pin 14	NC	Not connected	-
	Pin 15	MA-	MA-	Brown
	Case	Outer Shield	Outer Shield	-

8. Communication Protocol

8.1 BiSS C

8.1.1 Single Cycle Data (SCD) Format



8.1.2 Timing Specifications

Communication Protocol	
Type of interface	BiSS C, point to point
Signal level	RS485
Master clock (MA) frequency	See table below
Length of position data	27-bit
Length of status data	2-bit (Error and warning, active LOW)
Length of cyclic redundancy check (CRC)	6-bit (Polynomial 0×43 , transmitted inverted)
Position data encoding	Binary
Latency time	$5.5 \mu s$ (at 10MHz)
Recovery time	$\geq 300 ns$
Request cycle rate	90 kHz (at 10MHz)

8.1.3 Master Clock (MA) Frequency

Frequency, MHz*	OK
0.5	✓
1.0	✓
2.0	✓ (Typical)
2.5	✓ (Typical)
5.0	✓
10.0	✓ (For cable length $\leq 0.2 m$)

* BiSS is a trade mark of ic-Haus GmbH, who tested and specified all these frequencies

9. Model Name

ABA128-B-05C1

Cable Termination:

C1: DSUB 15 Male

Cable Length:

05: 0.5 m

10: 1.0 m

30: 3.0 m

Output Signal:

B: BiSS C communication protocol, up to 28-bit (Single turn)

BA: BiSS C communication protocol, up to 28-bit (Single turn) + SinCos 1Vpp

Series:

ABA128: Miniature readhead, supports linear and rotary motion for 128 μ m signal period

Note:

- For customization, please contact our sales team for more information.

10. Compatible Scale

Scale (With Adhesive ¹)						
Scanning Principle		Optical (Reflective)				
Grating Type		Linear Absolute				
Grating Period		128 μ m				
Temperature	Storage	-20 °C to +70 °C @ RH < 95% (Non-condensing)				
	Operating	0 °C to +70 °C @ RH < 95% (Non-condensing)				
Model Name	Substrate Material	Thermal Expansion Coefficient	Width	Scale Thickness	Adhesive Thickness	Total Length
		ppm/°C	mm	mm	mm	mm
SA128-V0N-13107C	Super-invar	0	12.0	1.60	-	1670
SA128-G0N-5243C	Robax glass	0	12.0	3.00	-	672
SA128-G8-1311C	Soda-lime glass	8	3.4	1.00	0.20	145
SA128-SS-1311C	Stainless steel	11	5.0	0.10	0.20	169
SA128-SS-13107C	Stainless steel	11	8.0	0.25	0.20	1683
SA128-SS-52429C	Stainless steel	11	8.0	0.25	0.20	6716

Note:

- All models are supplied with adhesive backing, except for SA128-V0N-13107C and SA128-G0N-5243C. For these two models, customers are required to prepare their own mounting method, such as adhesive or clamping elements.
- All models are dual track, except for SA128-G0N-5243C, which is triple track.
- For custom scale lengths, please contact the sales team. The required length will be calculated and purchased based on a proportion (%) of the total length of each model.
Example: For SA128-SS-52429C, if 2000 mm is required, it corresponds to 0.3 pcs (required length ÷ total length of the model).

11. Compatible Glass Disc

Glass Disc (Without Adhesive)						
Scanning Principle		Optical (Reflective)				
Grating Type		Rotary Absolute				
Grating Period		128 μm				
Temperature	Storage	-20 °C to +70 °C @ RH < 95% (Non-condensing)				
	Operating	0 °C to +70 °C @ RH < 95% (Non-condensing)				
Model Name	Line per Revolution	Substrate Material	Thermal Expansion Coefficient	Disc O.D (Outer Diameter)	Disc I.D (Inner Diameter)	Disc Thickness
			ppm/°C	mm	mm	mm
RA128-G8N-1250	1250	Soda-lime glass	8	55.00	37.00	2.30
RA128-G8N-1650	1650	Soda-lime glass	8	71.00	53.00	2.30
RA128-G8N-2048	2048	Soda-lime glass	8	87.20	67.00	2.30
RA128-G8N-2500	2500	Soda-lime glass	8	106.00	85.50	2.30
RA128-G8N-3125	3125	Soda-lime glass	8	131.40	111.00	2.30
RA128-G8N-4096	4096	Soda-lime glass	8	171.00	148.00	2.30
RA128-G8N-5000	5000	Soda-lime glass	8	207.90	184.00	2.30

Note:

1. All models are dual track.
2. For customization of the lines per revolution, please contact our sales team for more information.

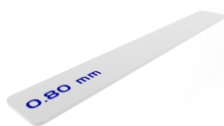
12. Compatible Stainless Steel Disc

Stainless Steel Disc (Without Adhesive)						
Scanning Principle		Optical (Reflective)				
Grating Type		Rotary Absolute				
Grating Period		128 μm				
Temperature	Storage	-20 °C to +70 °C @ RH < 95% (Non-condensing)				
	Operating	0 °C to +70 °C @ RH < 95% (Non-condensing)				
Model Name	Line per Revolution	Substrate Material	Thermal Expansion Coefficient	Disc O.D (Outer Diameter)	Disc I.D (Inner Diameter)	Disc Thickness
			ppm/°C	mm	mm	mm
RA128-SSN-1250	1250	Stainless steel	11	55.00	41.00	0.50
RA128-SSN-1650	1650	Stainless steel	11	70.00	56.00	0.50
RA128-SSN-2048	2048	Stainless steel	11	86.20	70.00	0.50
RA128-SSN-2500	2500	Stainless steel	11	106.00	90.00	0.50
RA128-SSN-3125	3125	Stainless steel	11	131.40	113.00	0.50

Note:

1. All models are dual track.
2. For customization of the lines per revolution, please contact our sales team for more information.

13. Accessories List

Part Number	Image	Description
N/A		0.80 mm Shim Kit is used during readhead assembly to precisely adjust the rideheight between the readhead and the scale, ensuring optimal signal quality. By using the appropriate shims, the required rideheight can be accurately achieved, preventing signal degradation and enhancing the overall performance of the readhead. <i>* Included in every readhead</i>
229001-01		ETB Encoder Signal Test Box is used during encoder installation and setup to assist engineers in achieving optimal signal performance. It allows on-site parameter adjustment, signal strength verification, and real-time oscilloscope-style visualization (such as Lissajous patterns) to directly assess signal quality. By providing clear and immediate feedback on encoder signals, the ETB enables precise alignment and fine tuning during installation, helping ensure stable operation and reliable system performance
428103-01		SA128-SS scale applicator tool is used to accurately and efficiently assemble scale to the readhead's measuring surface, ensuring they are properly aligned and securely attached, which is crucial for the encoder system to deliver precise and reliable motion measurements.