

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 26-bit resolution** for different precision requirements
- **Real-time signal monitoring and debugging** via the Encoder Test Box (**ETB**)
- **BiSS C** or **BiSS C + 1 Vpp** dual output options
- High-speed performance: up to **10 m/s** linear, **3800 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	0.2 μm 0.1 μm 0.05 μm
		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	BiSS C		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)
10

2.2 Rotary Motion

Lines per Revolution, LPR	Outer Diameter (mm)	Inner Diameter (mm)	Max Speed (RPM)
1250	55.00	41.00	3800
1650	70.00	56.00	2890
2048	86.20	70.00	2300
2500	106.00	90.00	1890
3125	131.40	113.00	1500
4096	171.20	153.20	1150
5000	206.40	188.40	940

3. LED Definition

Model	ABA128
LED Location	On readhead body 
LED Colour	Green
	Powered on

Technical drawing of a cable bracket, showing three views: front, top, and side.

Front View (Left): Shows a bracket with a central hole. Dimensions: 7.95 (width), 5.85 (height).

Top View (Right): Shows the bracket's footprint. Dimensions: 20.57 (total width), 16.50 (width to centerline), 2.03 (offset), 6.70 (height to centerline), 10.38 (width to centerline), 8.50 (height to centerline), 12.70 (total height), 2.10 (height to centerline), and 7.95 (width). Features include three holes labeled $3 \times \varnothing 2.50 \text{ Thru}$ and an Optical Centerline. Callouts I, II, and III are present.

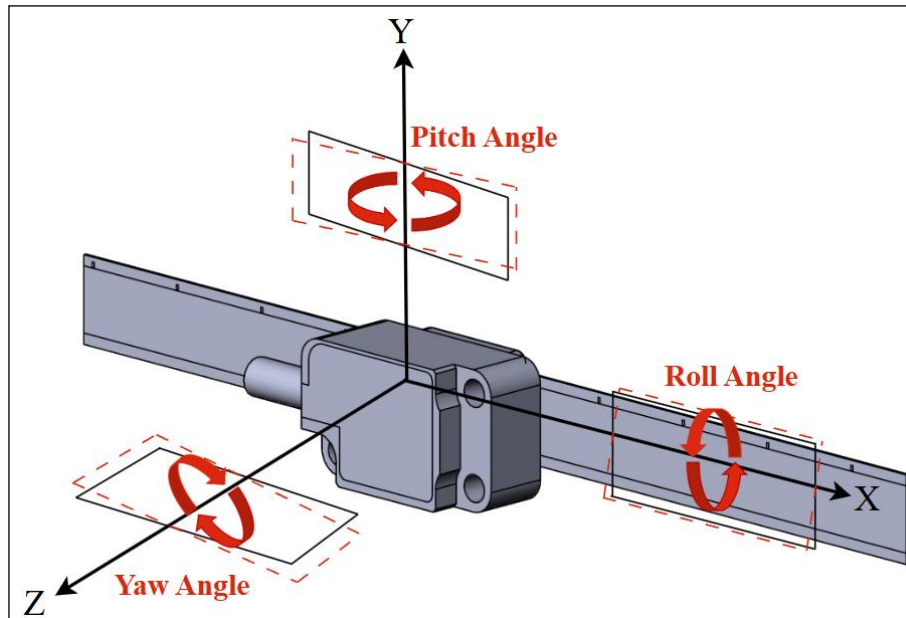
Side View (Bottom): Shows the bracket's profile. Dimensions: 5.0min (width), 2.50 (height), 10.50 (height), and 2.50 (height). Features include a bend radius specification: $R > 70$ Dynamic bend radius, $R > 30$ Static bend radius, and a cable dimension: Cable 3.50 ± 0.2 .

1. All dimensions are in mm.

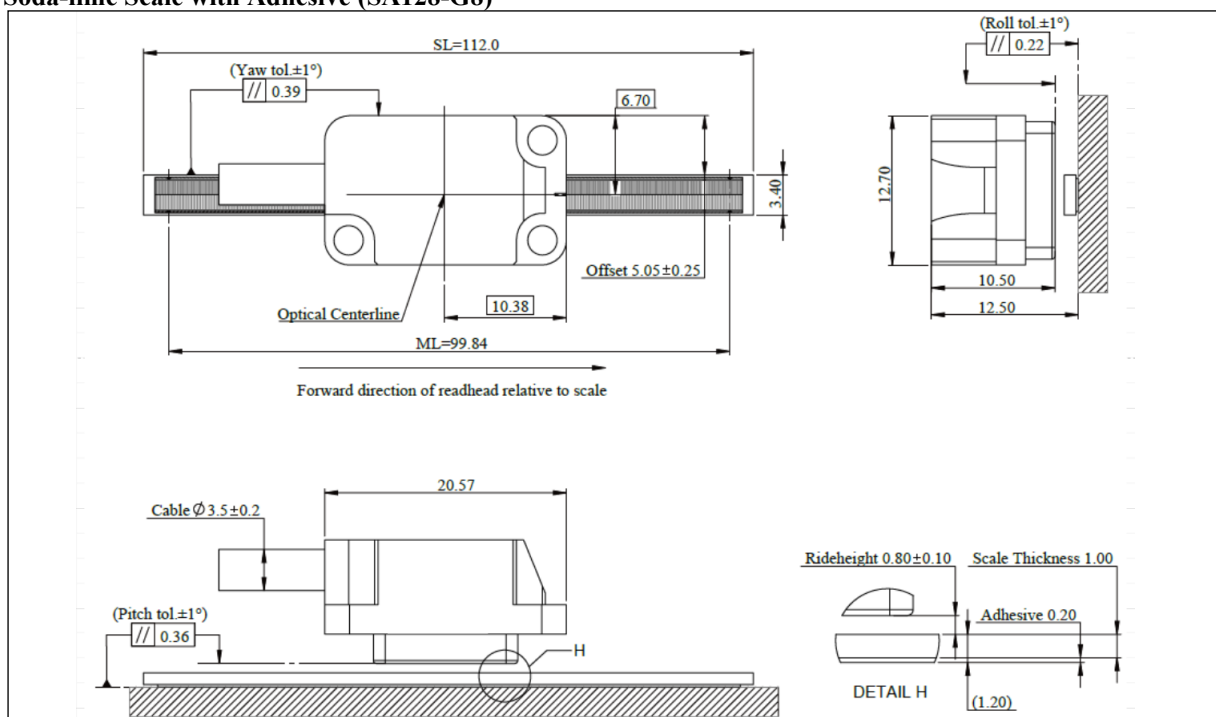
1. All dimensions are in mm.
2. Mount the readhead using two holes, such as  or .

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.



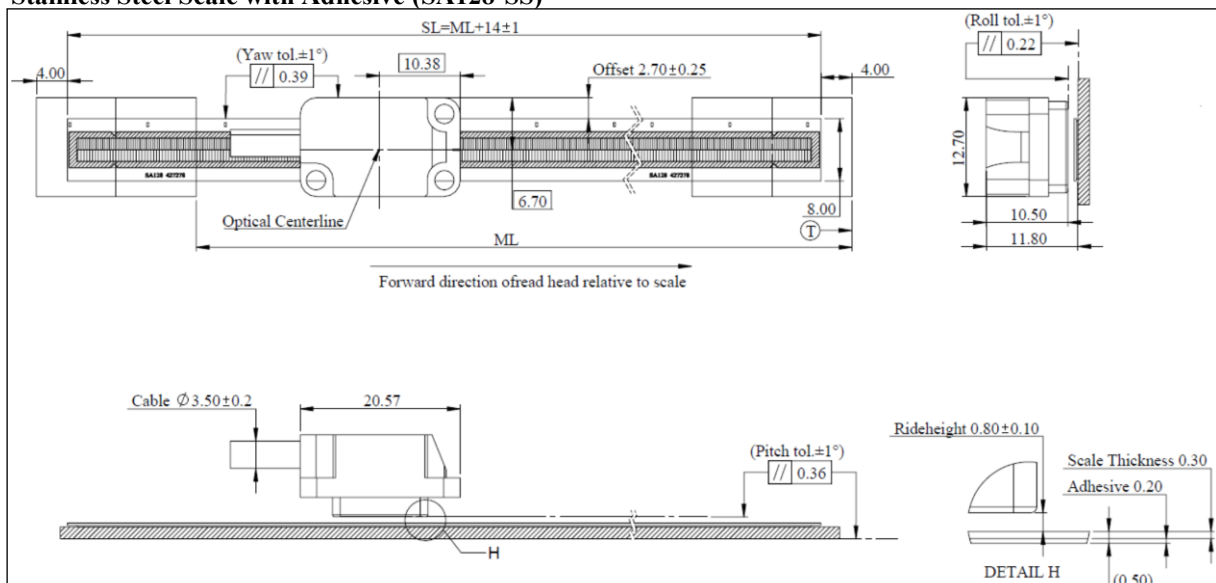
5.1 Soda-lime Scale with Adhesive (SA128-G8)



Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length

5.2 Stainless Steel Scale with Adhesive (SA128-SS)



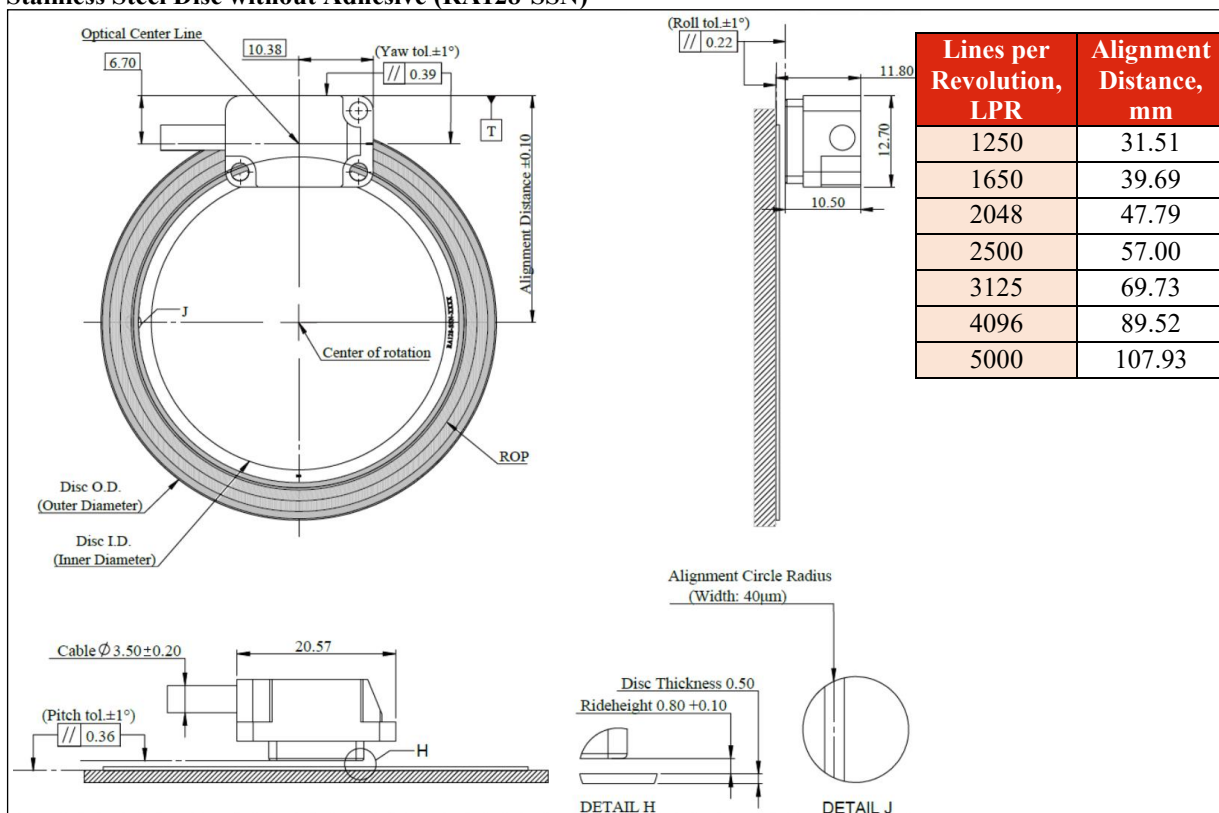
Note:

1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length
4. $\textcircled{T}$ = Beginning of the measuring length

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

For customization of glass discs, please contact our sales team for more information.

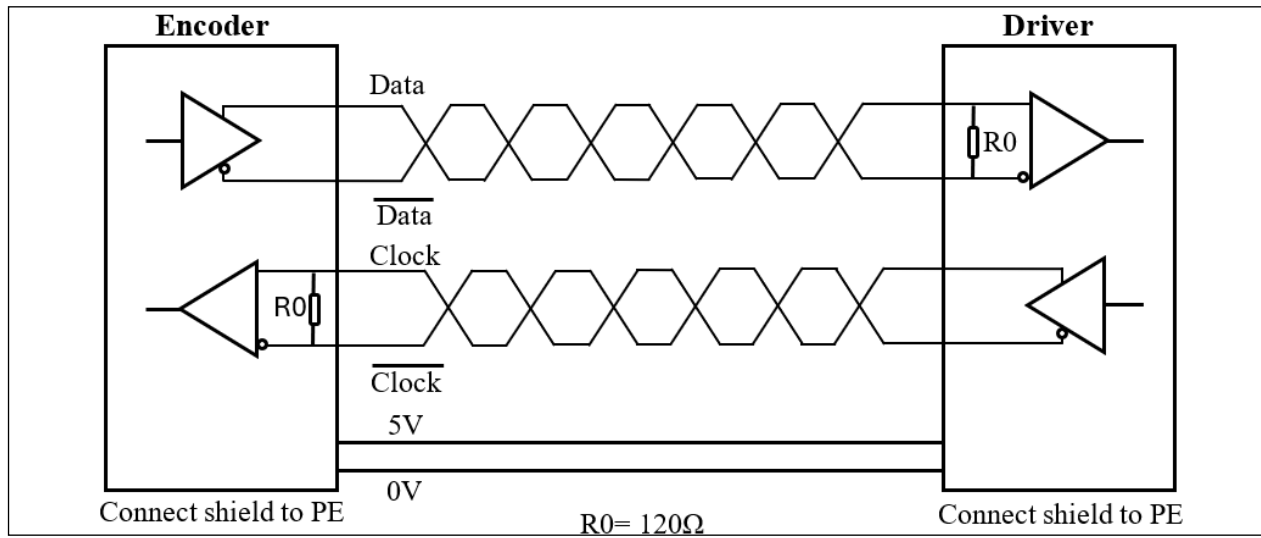
5.4 Stainless Steel Disc without Adhesive (RA128-SSN)



Note:

1. All dimensions are in mm.
2. $\boxed{T}$ = Datum T
3. Use UV glue for installation, do not use 502 glue.

6. Electrical Connection

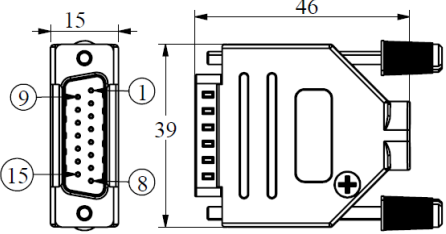


IMPORTANT: Readhead shield must be connected to the driver earth (Field ground).

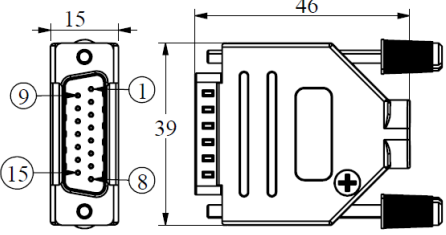
Maximum readhead cable length: 5 m

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	-

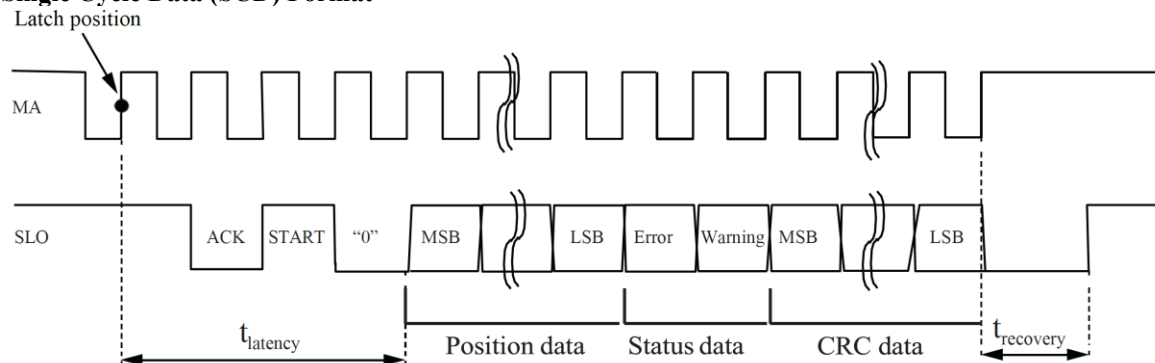
7.2 BiSS C + SinCos 1Vpp Output Signal

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	✓
2.5	(Typical)
5.0	✓
10.0	✓
	(For cable length ≤ 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 26-bit (Single turn) BA: BiSS C communication protocol, up to 26-bit (Single turn) + SinCos 1Vpp
	Series: ABA128: Miniature readhead, supports linear and rotary motion for 128 μm signal period

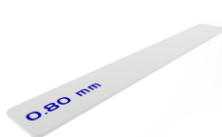
Note:

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

10. Compatible Scale/Disc

Type	Model	Description
Scale	SA128-G8	Linear absolute 128 μ m grating period, soda-lime glass with adhesive
	SA128-SS	Linear absolute 128 μ m grating period, stainless steel with adhesive
Disc	RA128-G8N	For customization, please contact our sales team for more information
	RA128-SSN	Rotary absolute 128 μ m grating period, stainless steel without adhesive

11. 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>