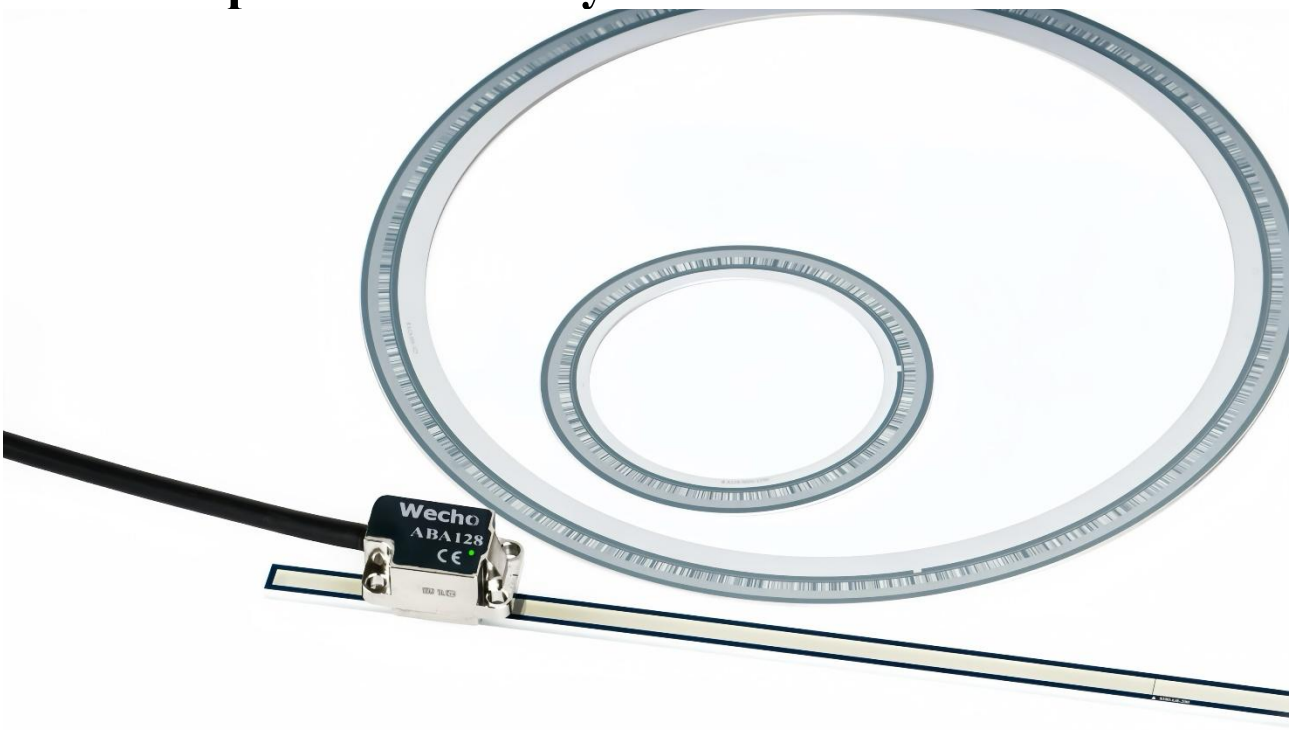
Datasheet

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 + SinCos 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**	Stainless Steel : 0.2 µm | 0.1 µm | 50 nm Soda-lime : 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	**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:

1. 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

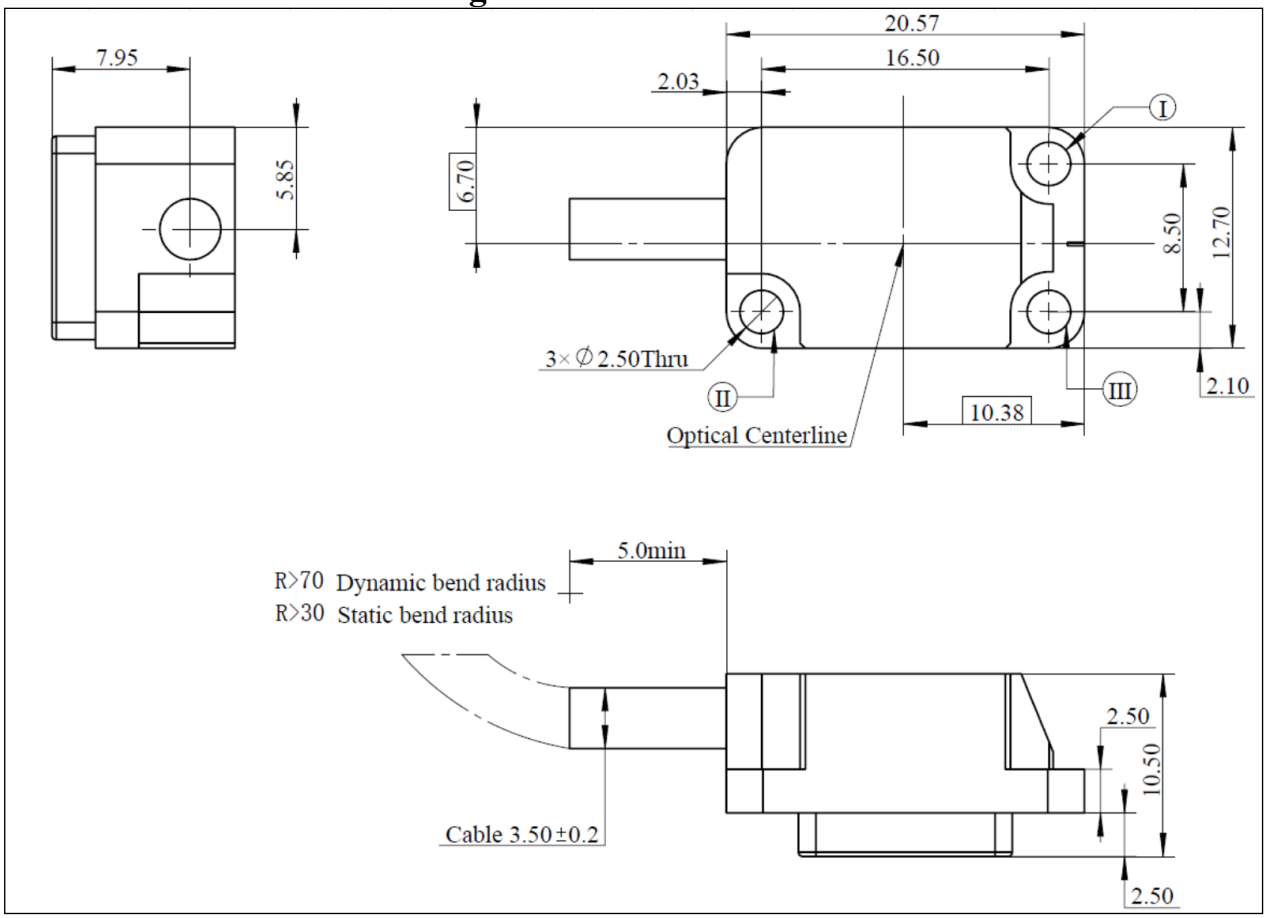
2.2 Rotary Motion

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

4. Readhead Dimension Drawing

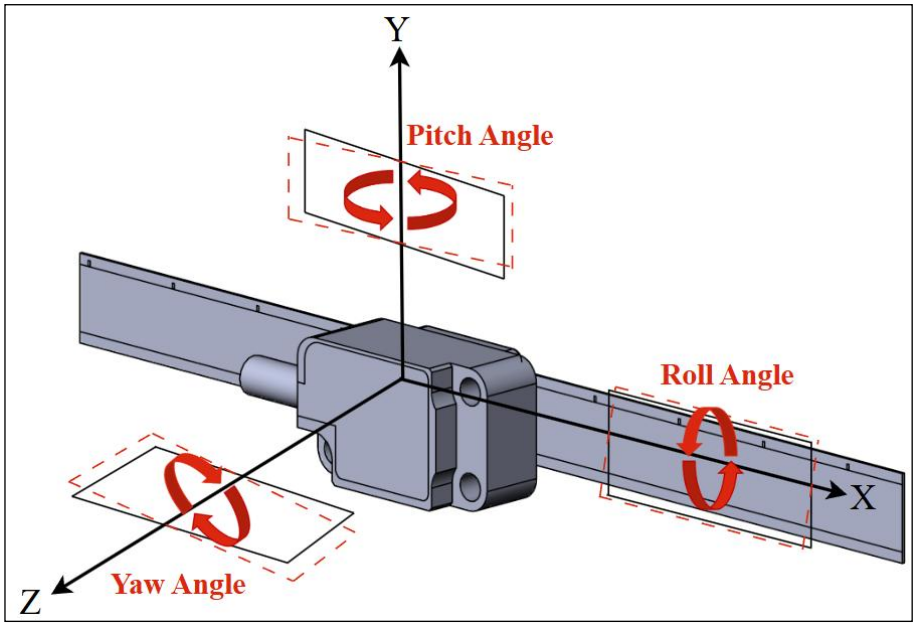


Note:

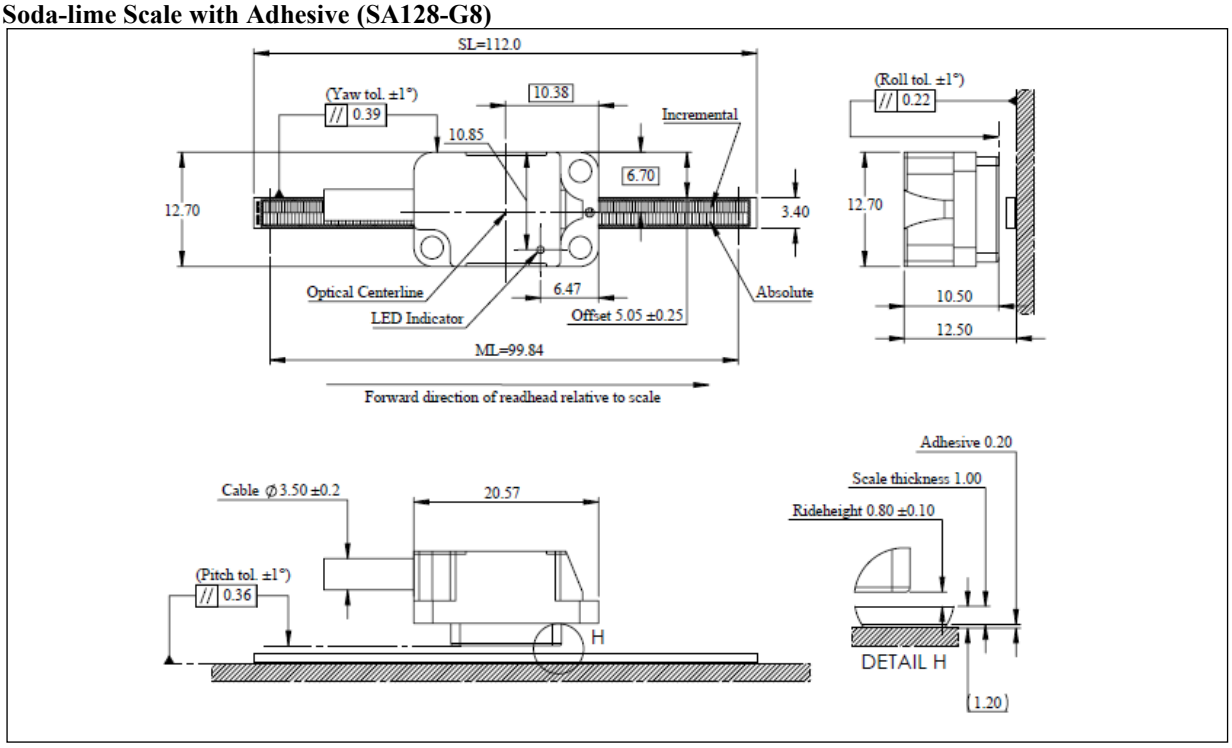
1. All dimensions are in mm.
2. Mount the readhead using two holes, such as (I)(II) or (II)(III).

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.

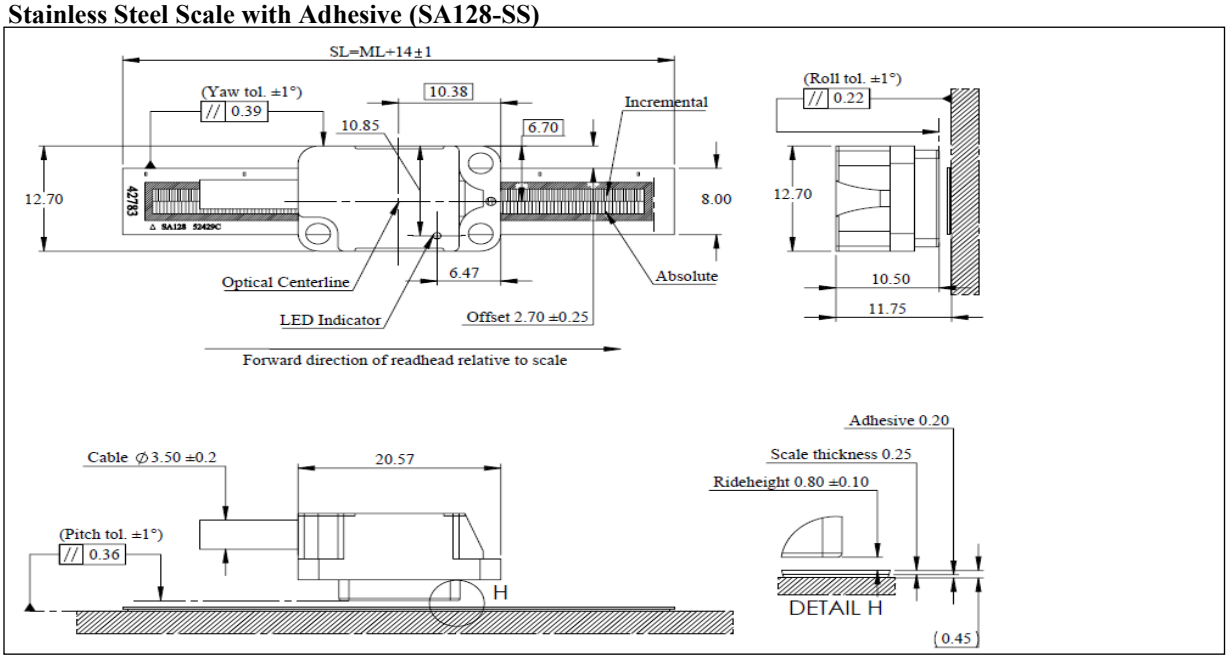


5.1 Soda-lime Scale with Adhesive (SA128-G8)



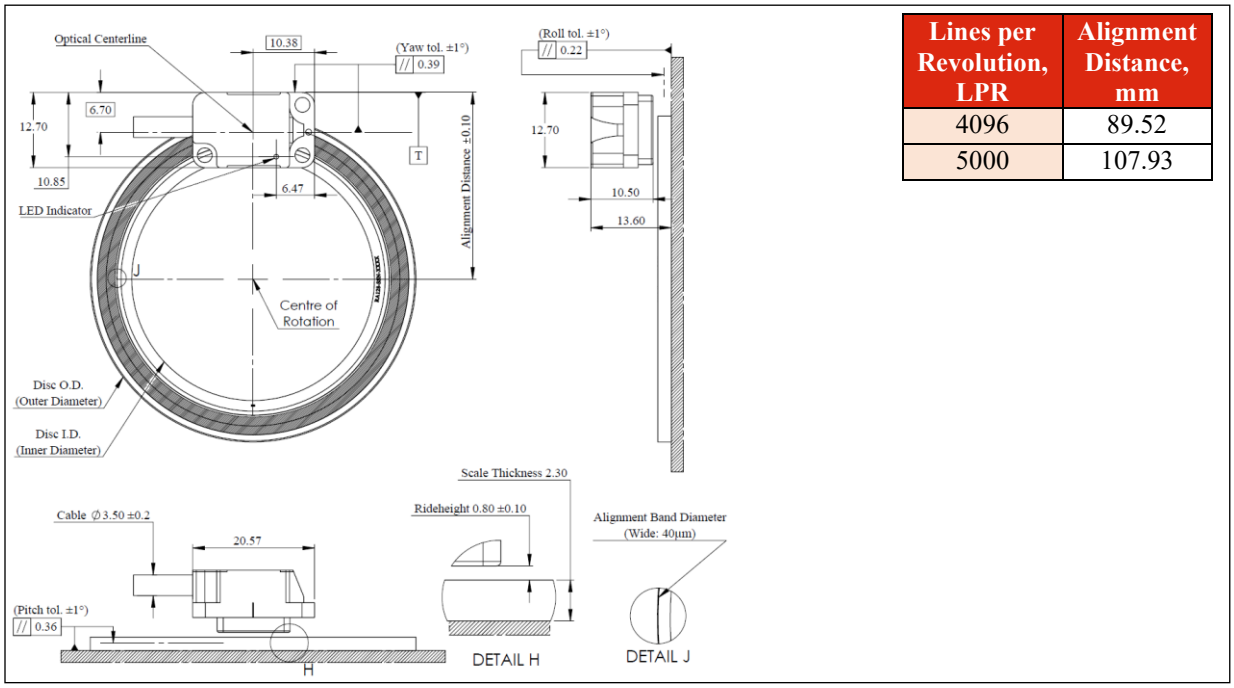
Note:
1. All dimensions are in mm.
2. SL = Scale length
3. ML = Measuring length

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. (T) = Beginning of the measuring length

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

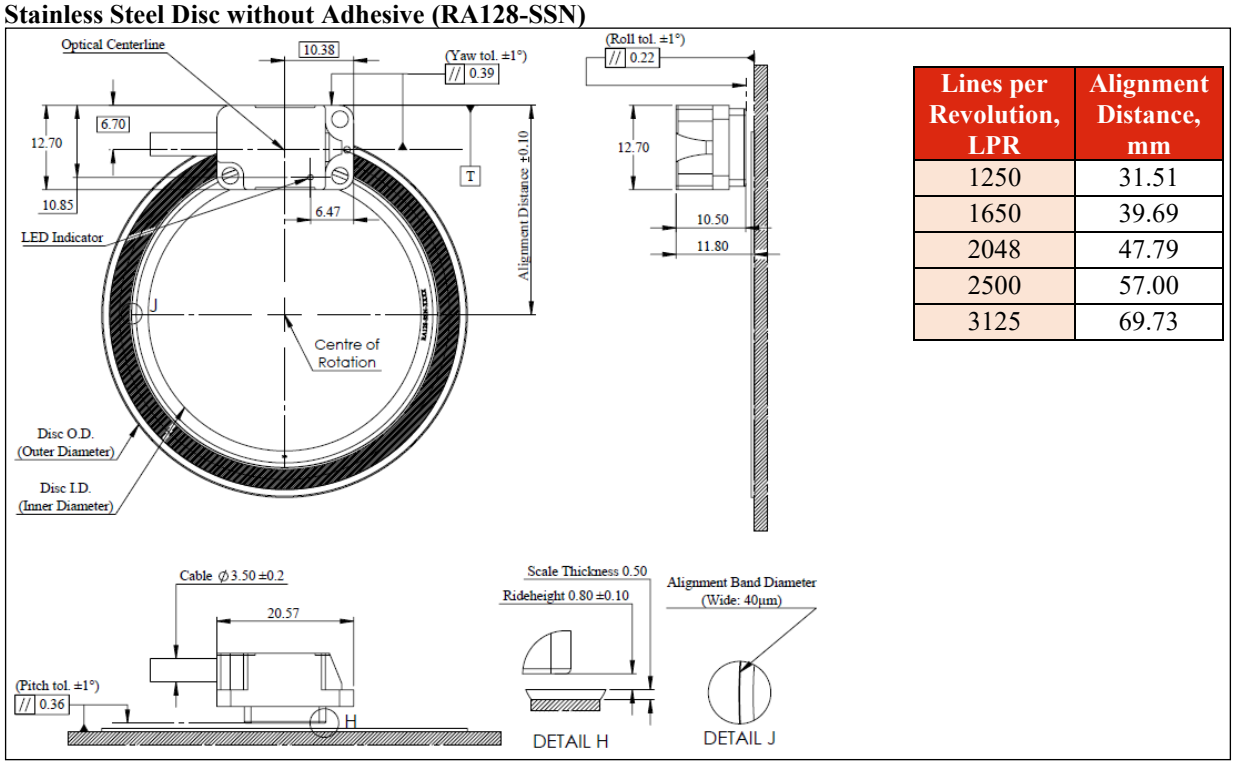


Lines per Revolution, LPR	Alignment Distance, mm
4096	89.52
5000	107.93

Note:

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

5.4 Stainless Steel Disc without Adhesive (RA128-SSN)

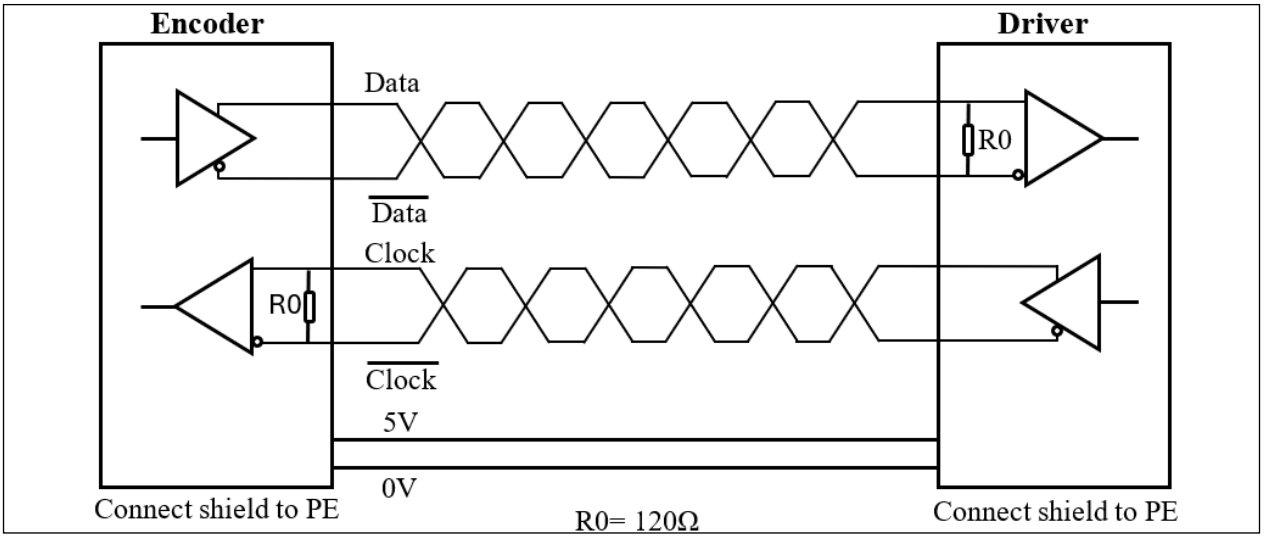


Lines per Revolution, LPR	Alignment Distance, mm
1250	31.51
1650	39.69
2048	47.79
2500	57.00
3125	69.73

Note:

4. All dimensions are in mm.
5. T = Datum T
6. Use UV glue for installation, do not use 502 glue.

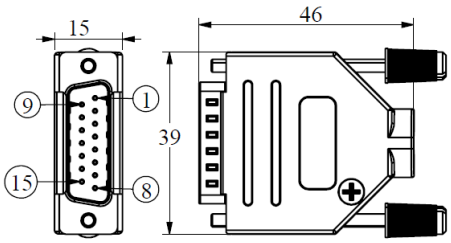
6. Electrical Connection



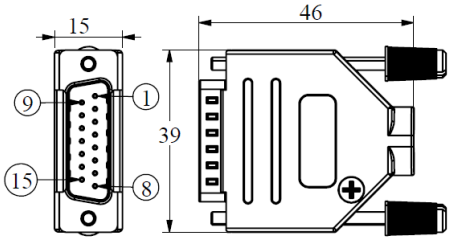
IMPORTANT: Readhead shield must be connected to the driver earth (Field ground).
Maximum readhead cable length: 5 m

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	-

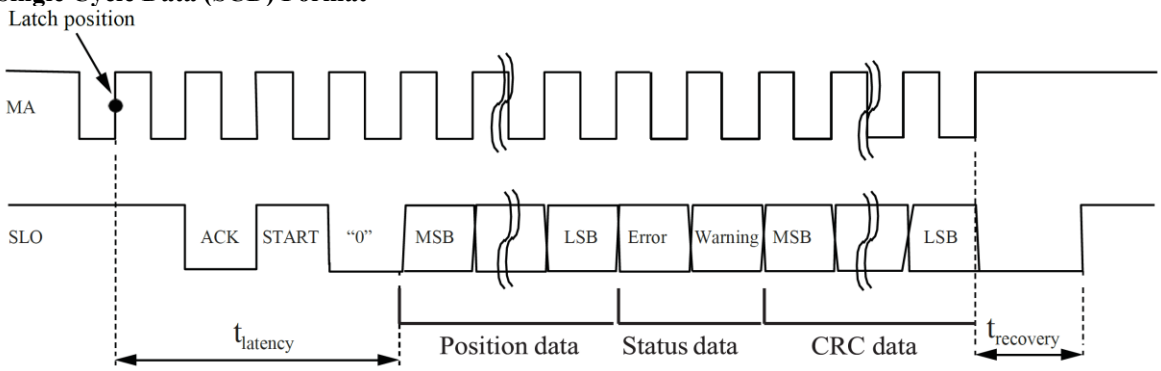
7.2 BiSS C + SinCos 1Vpp Output Signal

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

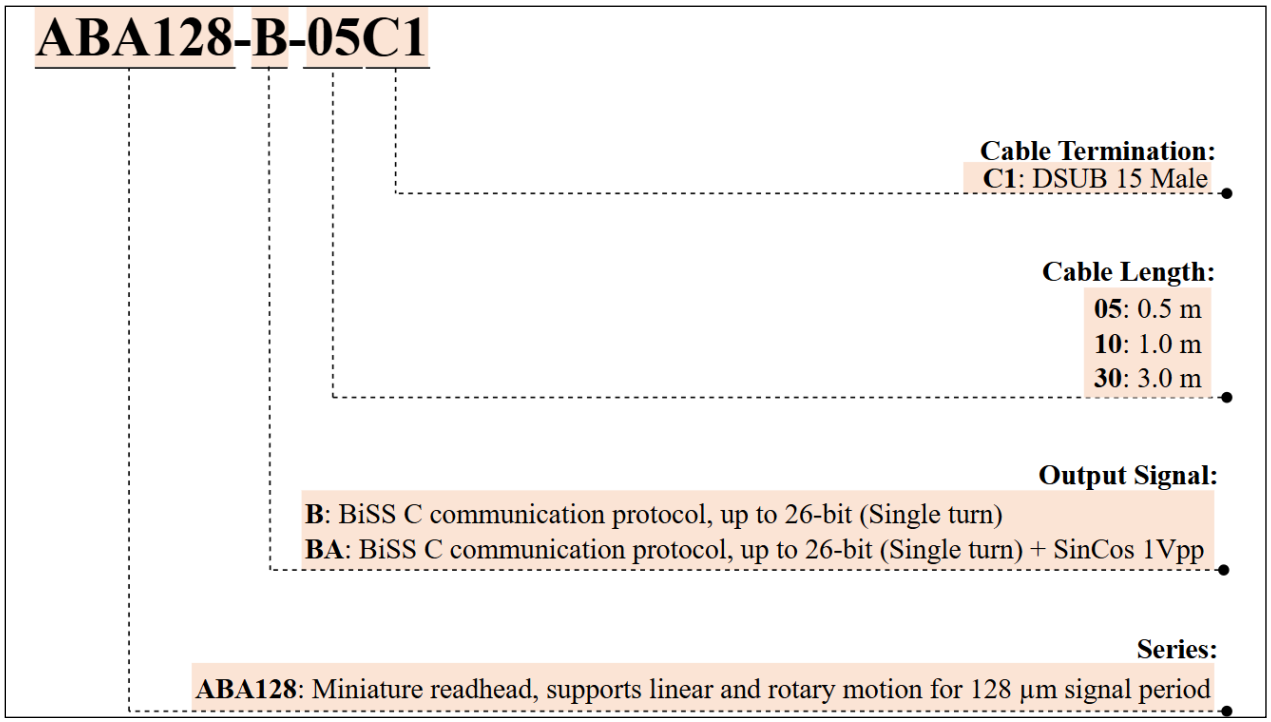
Communication Protocol	
Type of interface	BiSS C，point to point
Signal level	RS485
Master clock (MA) frequency	See table below
Length of position data	27-bit
Length of status data	2-bit (Error and warning, active LOW)
Length of cyclic redundancy check (CRC)	6-bit (Polynomial 0×43, transmitted inverted)
Position data encoding	Binary
Latency time	5.5μs (at 10MHz)
Recovery time	≥ 300ns
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 ≤ 0.2 m)

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

9. Model Name



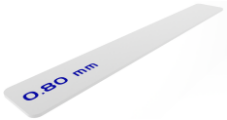
Note:

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

10. Compatible Scale/Disc

Type	Model	Description
Scale	SA128-G8	Linear absolute 128 µm grating period, soda-lime glass with adhesive
	SA128-SS	Linear absolute 128 µm grating period, stainless steel with adhesive
Disc	RA128-G8N	Rotary absolute 128 µm grating period, soda-lime glass without adhesive
	RA128-SSN	Rotary absolute 128 µm 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. **** Included in every readhead***