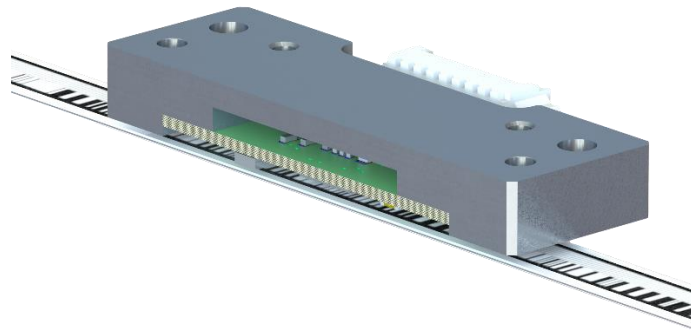


# Absolute Encoder Kit

## Linear - 0.8 $\mu$ m Resolution

### optical reflective



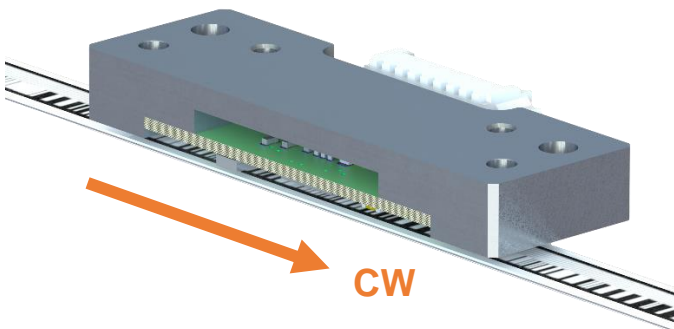
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## Description

The ABG-encoder is an optical absolute encoder system. It's a reflective kit encoder that can be fixed quickly and easily on different kinds of linear code strips and on different mounting situations. The encoder is developed for absolute positioning and linear speed control. There are different sizes of code strips are possible.

## Direction of movement



## Features

- Absolute encoder
- Absolute interface: BiSS/SSI/SPI
- Absolute resolution 0.8µm
- Power supply: 5 VDC
- Small size: 40.0 mm x 17.0 mm x 5.5mm
- Operating temperature: -25°C to +85°C
- Compliant EU-directive 2011/65/EU (RoHS)
- Various code strip lengths on request

## Applications

- Motor feedback, Positioning
- Multi-axis measurements systems

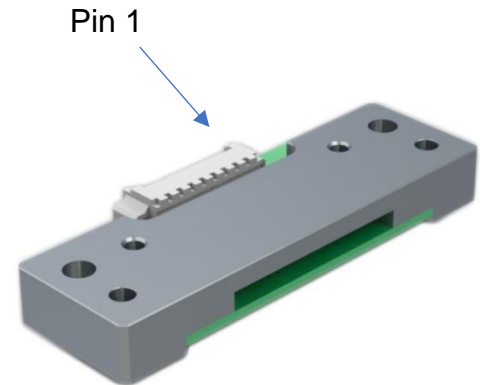
## Recommended operating conditions

Parameter	Symbol	Min.	Typ	Max.	Unit	Notes
Supply voltage	U <sub>B</sub>	4.75	5.0	5.25	V <sub>DC</sub>	
Supply current	I <sub>UB</sub>	30	50	80	mA	no Load
Startup time	t <sub>T</sub>		20		ms	
<b>SSI / BiSS / SPI</b>						
Clock frequency	f	80		10,000	kHz	
Scan ratio of T		40	50	60	%	
Time lag	t <sub>v</sub>		150		ns	
Monoflop time	t <sub>m</sub>		2x1/f		µs	
<b>BiSS</b>						
CRC Polynomial			0x43		hex	x <sup>6</sup> + x <sup>1</sup> + x <sup>0</sup>
CRC Start Value			0x0000		hex	
CRC Bits			6			
CDM						inverted
<b>Err / Warn</b>						
High level output voltage	V <sub>oH</sub>	2.5			V <sub>DC</sub>	R <sub>L</sub> =510Ω
Low level output voltage	V <sub>oL</sub>			0.5	V <sub>DC</sub>	R <sub>L</sub> =510Ω
Output current	I <sub>out</sub>	-1.0		5.0	mA	
<b>Mechanic</b>						
Linear speed	V			45	m/s	
Radial misalignment				0.1	mm	
Air gap		1.5	1.75	2.0	mm	
<b>Environment</b>						
Operating temperature	T <sub>A</sub>	-20	25	85	°C	
Storage temperature	T <sub>S</sub>	-30		85	°C	
Humidity exposure				90	%RH	not condensing
<b>System</b>						
Relative Accuracy				+/- 0.2	µm	
Absolute Accuracy				+/- 1	µm	
Acceleration	a <sub>max</sub>			1,000	m/s <sup>2</sup>	

**ESD Warning: Normal handling precautions should be taken to avoid static discharge damage to the sensor.**

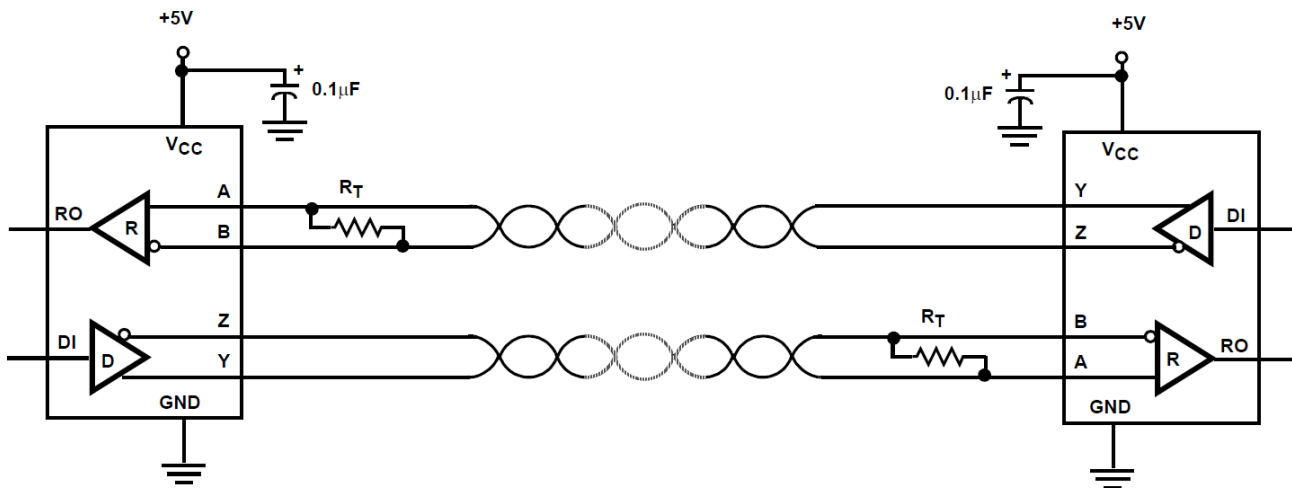
## Pin Description

Pin	Signal (BiSS)	Signal (SSI)	Signal (SPI)	Cable color
1	VCC	VCC	VCC	Red
2	Clock+	Clock+	Clock	Green
3	GND	GND	GND	Blue
4	Data-	Data-	MOSI	Purple
5	NC	Warn	NC	Brown
6	Clock-	Clock-	NCS	Yellow
7	NC	Err	NC	Orange
8	Data+	Data+	MISO	Black



(Housing connector for customer cable: Molex 51021-0800  
With terminals 50079-800)

## Typical operating circuit (for BiSS & SSI)



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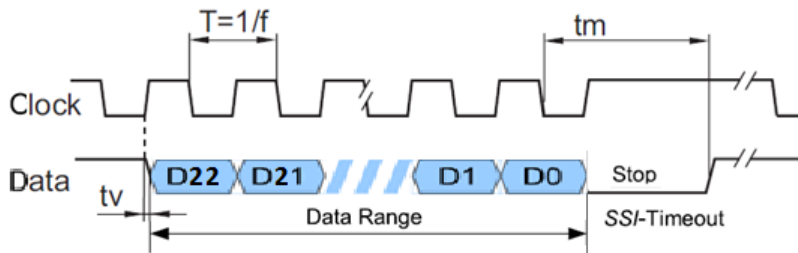
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## Interface

### Data transfer: SSI

### Gray-Code

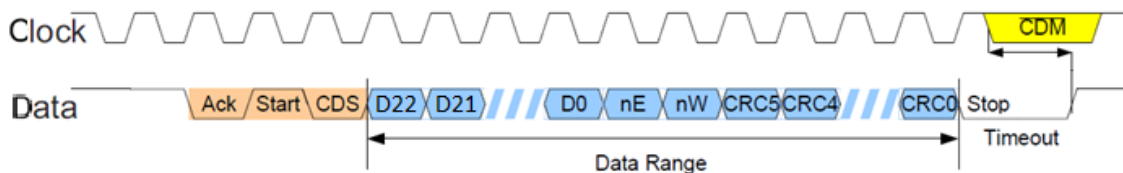


The position data increases when the encoder head moves in the direction of CW.

The resolution is 23 Bit.

### Data transfer: BiSS (C-Mode)

### Binary Code



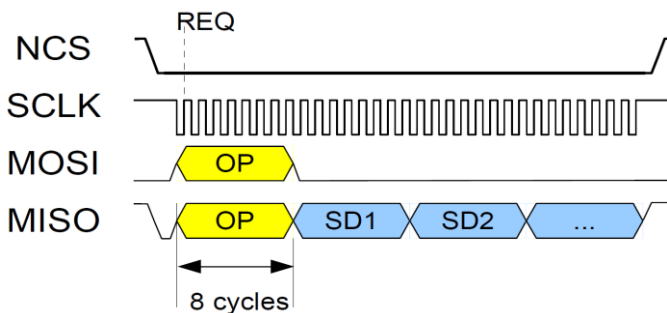
Serial interface protocol	Definition
Ack	Acknowledge-Bit
Start	Start-Bit
CDS	Control-Bit
D0 - D17	Position-Data
nE	Low activ error
nW	Low activ warning
CRC0 - CRC5	Cyclic redundancy code
Stop	Stop-Bit
CDM	Control data master

For a detailed description of the protocol, see separate interface specification.

The resolution is 23 Bit. The position data increases when the encoder head moves in the direction of CW.

## Data transfer: SPI

This interface is specially for the direct connection to the micro-controller from the customer. It is appropriately for short cable length



OPCODE	
Code	Description
0xA6	Position Read
0x97	Register Read
0xAD	Read Register Status/Data

Table: OPCODE

Figure: SPI transmission, READ SENSOR DATA

The Data is sent in packages of 8 Bits and with the MSB first. Each data transmission starts with the master sending an opcode to the slave.

Reading Sensor Data: The ABG-encoder latches the absolute position on the first rising edge at SCLK, when NCS is at zero. Because ABG-encoder can output the sensor data (SD) immediately, the master can transmit the SDAD Transmission command directly.

The sensor data in SPI are byte aligned. First comes three bytes for the position data and then one status byte including one error bit, one warning bit and six bits sign-of-life counter.

The data string for the position is 24 Bits (23 Bits resolution + LSB) (LSB = 0).

The position data increases when the encoder head moves in the direction of CW.

The zero position can be set free at every arbitrary position (Preset).

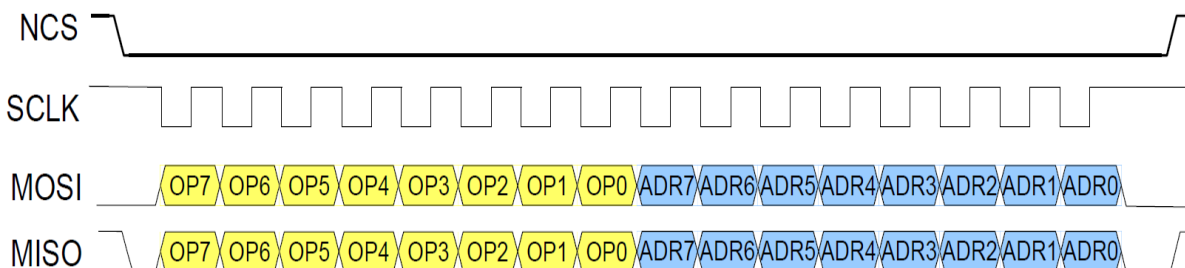
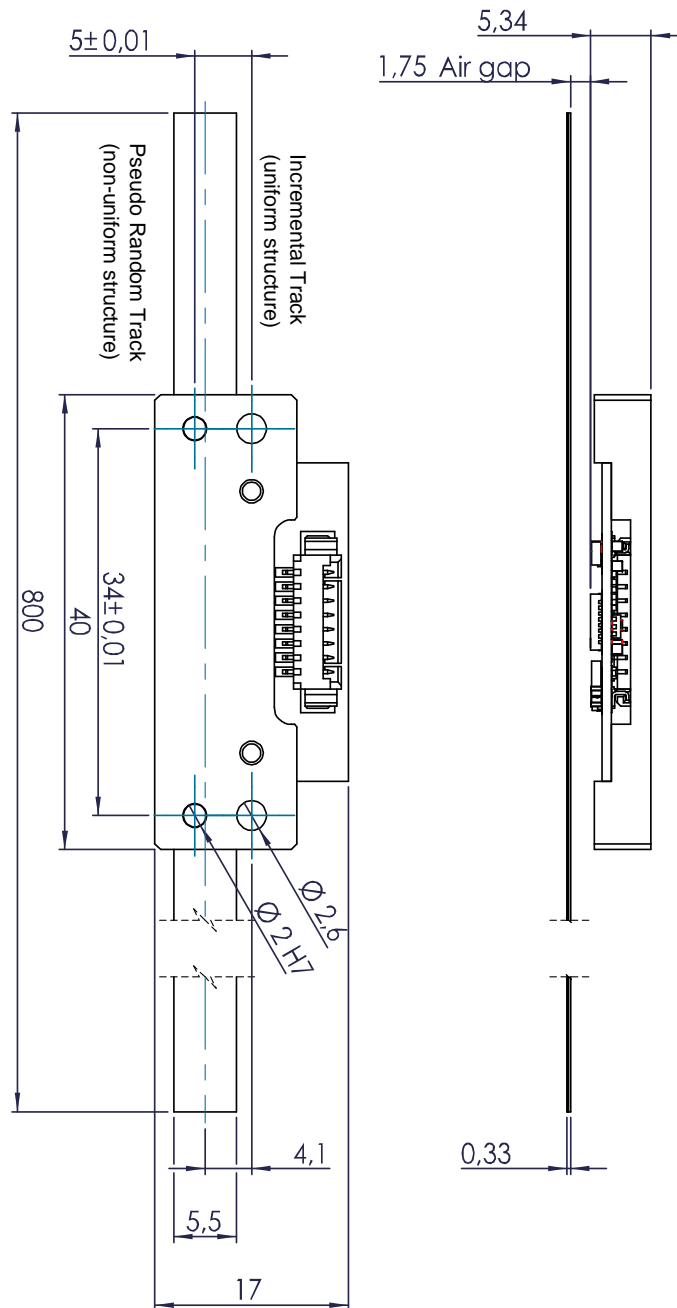


Figure: SPI transmission, using opcode READ REGISTER as an example

## Mechanical Dimensions: Type 800

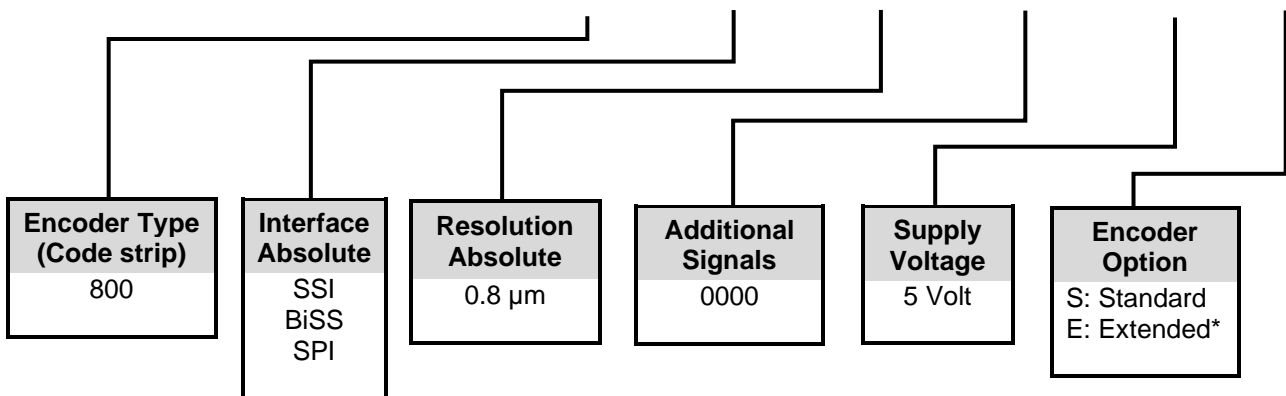
800 mm code strip



## Ordering Information

Ordering Code:

**ABG Linear 800 – SSI – 0.8 – 0000 – 05 – S**



\*Customer specific version – feel free to ask us for special solution.

### Calibration is mandatory for the initial commissioning.

Depending on the encoder interface, the corresponding programmer box is required for this. See last page under accessories.




The calibration software is available on the PWB homepage and can be downloaded for free.

### Safety advice

These encoder emit highly concentrated visible blue light which can be hazardous to the human eye. Please follow the safety precautions given in IEC 60825-1 and IEC 62471.



## Necessary accessories

Description	Picture	Item number
<p>Accessory-Set: Cable 300mm, 2 screws, 2 cylindrical pins 2x6 (DIN 6325)</p>		<p>108546</p>
<p>SSI/BiSS Calibration box PWB5C USB to SSI/BiSS Converter</p>		<p>104255</p>
<p>SPI Calibration box PWB3C USB to SPI Converter</p>		<p>104750</p>