

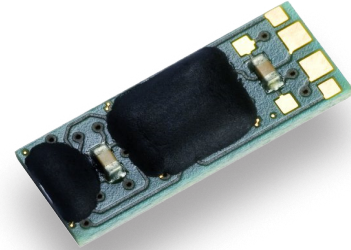
EBI7901ZAx-DA-UF

Incremental Sensor Module

The sensor module EBI7901ZAx-DA-UF contains an AMR (Anisotropic MagnetoResistive) FreePitch sensor with >2 mm magnetic pole pitch and an interpolation-IC with a resolution up to 80 flanks per magnetic pole.

The combination of the magnetic scale and the electronic module delivers two 90 degree phase shifted rectangular signals A and B (see Fig. 1).

Different preconfigured sensor modules are available (see page 6).



Product Overview

Article	Description
EBI7901ZAx-DA-UF	Incremental module for pitches above 2 mm with programmable resolution

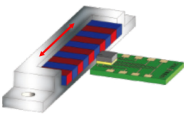
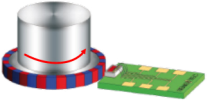
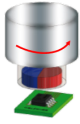
For order information see page 6.

Quick Reference Guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	4.5	5.0	5.5	V
I_C	Current consumption	-	8.0	-	mA
F	Flanks per pitch ¹⁾	4	-	80	-
T_{amb}	Ambient temperature	-40	-	+100	°C

¹⁾ The pitch means the subdivision of the scale (equals the pole pitch).

Measurement Setup

Depiction	Configuration	Application
	Linear scale with fixed pole division; sensor upright on magnetic track of scale.	Incremental length measurement.
	Magnet wheel with fixed pole division; sensor arranged radial; sensor face on rotation level.	Incremental angle measurement.
	Rotating magnet; sensor in rotation axis.	Incremental angle measurement at shaft end.

Features

- A/B output signal (TTL)
- FreePitch AMR sensor
- Temperature range from -40 °C to +100 °C

Advantages

- Small size
- Fast signal processing

Applications

Incremental encoder for linear or rotary movements in various industrial applications, for example:

- Motor integrated encoder
- Motor feedback system
- Micro positioning systems



ESD

Absolute Maximum Ratings Values

In accordance with the absolute maximum rating system (IEC60134).

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-0.3	+6.0	V
T_{amb}	Ambient temperature	-40	+100	°C
T_{stg}	Storage temperature	-40	+125	°C

Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Data

$T_{amb} = 25\text{ °C}$; $H_{ext} = 20\text{ kA/m}$; $V_{CC} = 5\text{ V}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		4.5	5.0	5.5	V
I_C	Current consumption	No load	-	8.0	-	mA
F	Flanks per pitch ^{1) 2)}		4.0	-	80.0	-
A	Resolution (flank to flank) ^{2) 3)}	2 mm pitch	500	-	25	µm
Hys	Hysteresis	Based on pitch	-0.1	-	0.1	%
T_{amb}	Ambient temperature		-40	-	+100	°C

¹⁾ The pitch means the subdivision of the scale (equals the pole pitch).

²⁾ Different resolutions are available, see page 6 for more information.

³⁾ Correlates to the preconfigured number of flanks per pitch in combination with pole pitch.

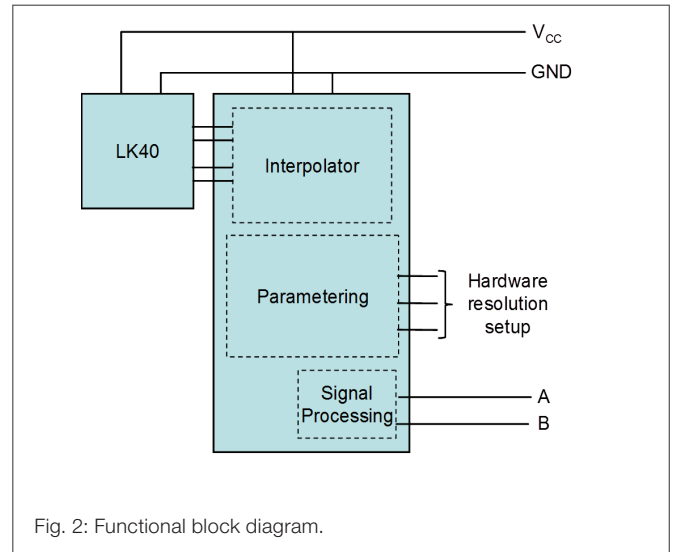
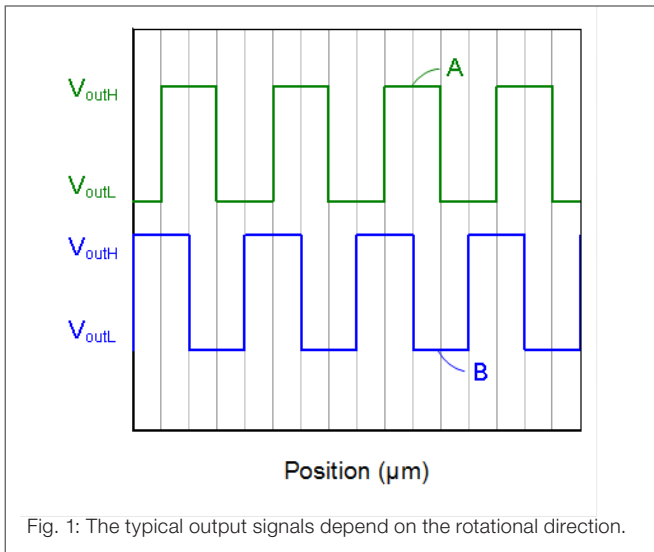
Operational Data

$T_{amb} = 25\text{ °C}$; $H_{ext} = 20\text{ kA/m}$; $V_{CC} = 5\text{ V}$; unless otherwise specified.

Article Description	Resolution Flanks per Pitch	Interpolation Factor IPF	Input Frequency ¹⁾
EBI7901ZAA-DA-UF	4	1	20 kHz
EBI7901ZAC-DA-UF	16	4	20 kHz
EBI7901ZAD-DA-UF	20	5	20 kHz
EBI7901ZAE-DA-UF	32	8	20 kHz
EBI7901ZAF-DA-UF	64	16	20 kHz
EBI7901ZAG-DA-UF	80	20	10 kHz

¹⁾ Maximum input frequency (see page 3 for more information).

Typical Performance Graphs



Input Frequency and Output Frequency on the Application

1. The input frequency depends on the number of poles and rotational speed respectively on the pole pitch and velocity.

a) pole ring

f_i - input frequency in Hz
 n - number of poles (per revolution)
 R - rotation speed in rpm

$$f_i = \frac{(n \times R)}{60}$$

Example: pole ring with 50 poles and rotating speed 1000 rpm

$$f_i = \frac{(50 \times 1000)}{60} = 833.3 \text{ Hz}$$

b) linear scale

f_i - input frequency in Hz
 p - pole pitch in mm
 v - velocity in m/s

$$f_i = \frac{v}{p} \times 1000$$

Example: linear scale with 1 mm pitch, velocity 2 meters per second

$$f_i = \frac{2}{1} \times 1000 = 2000 \text{ Hz}$$

2. The output frequency depends on the input frequency and the programmed resolution.

f_i - input frequency in Hz
 f_o - output frequency in Hz
 res - programmed resolution

$$f_o = f_i \times \frac{res}{4}$$

Pinning

Pad	Symbol	Parameter
1	V_{01}	Output voltage bridge 1
2	A	Output signal A
3	B	Output signal B
4	V_{02}	Output voltage bridge 2
5	GND	Ground
6	V_{CC}	Supply voltage

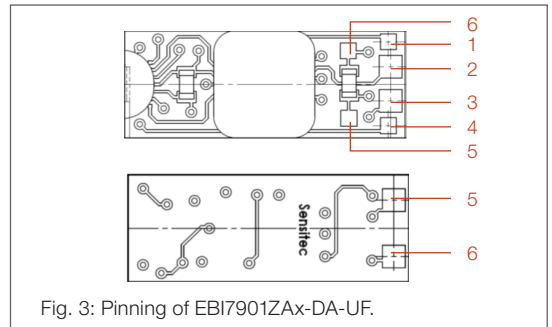


Fig. 3: Pinning of EBI7901ZAx-DA-UF.

Note: Do not connect a load to the pads 1 and 4 during operation.

Dimensions

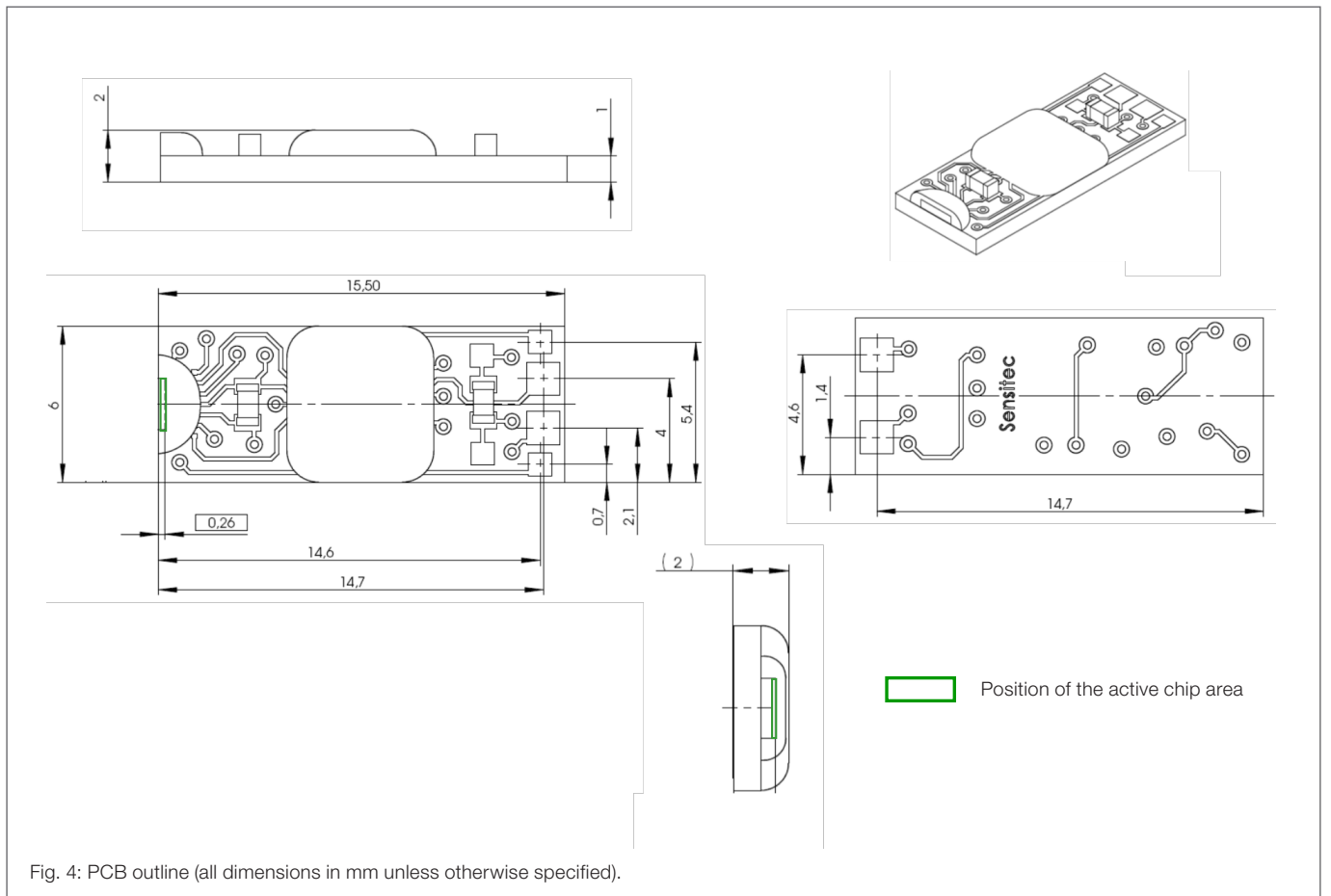
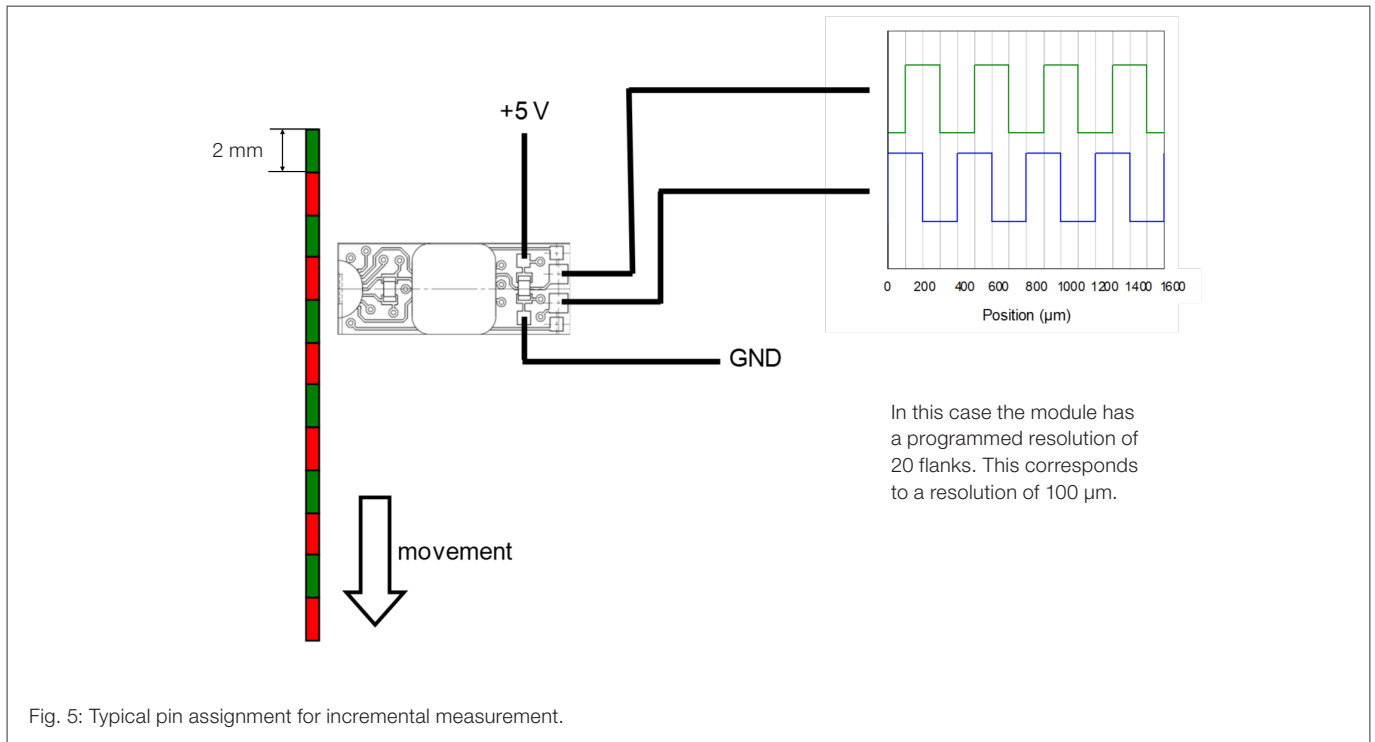


Fig. 4: PCB outline (all dimensions in mm unless otherwise specified).

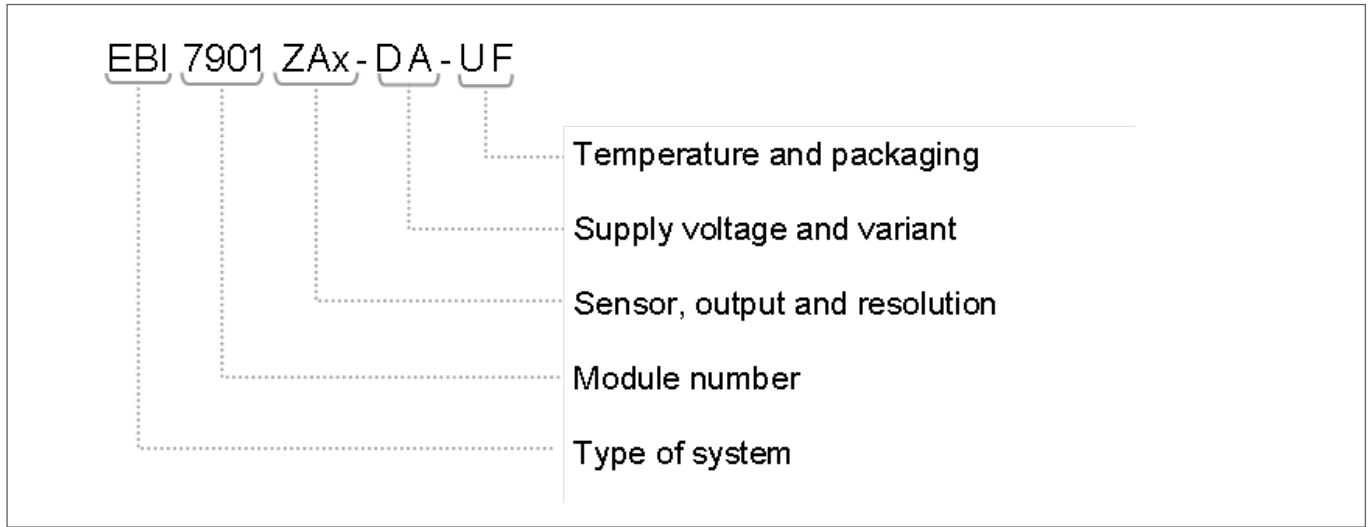
Detailed Pin Description

Pad	Symbol	Parameter	Description	Additional information
1	V ₀₁	Output voltage bridge 1	Amplified sensor signal sine	Do not connect a load to the pad during operation.
2	A	Output signal A	Rectangular TTL-Signal for quad-count	See page 3, Fig. 1 for signal and phase relationship. A change of the direction changes the phase between A and B.
3	B	Output signal B	Rectangular TTL-Signal for-quad-count	
4	V ₀₂	Output voltage bridge 2	Amplified sensor signal cosine	Do not connect a load to the pad during operation.
5	GND	Ground	Ground	
6	V _{CC}	Supply voltage	Supply voltage	Typically 5 V (4.5 V to 5.5 V)

Application Information to connect the Module



Order Code



Product Overview - Standard Products

Resolution Flanks per pitch	Interpolation factor	Article description	Article number
4	1	EBI7901ZAA-DA-UF	5112.2020.0
16	4	EBI7901ZAC-DA-UF	5112.2022.0
20	5	EBI7901ZAD-DA-UF	5112.2023.0
32	8	EBI7901ZAE-DA-UF	5112.2024.0
64	16	EBI7901ZAF-DA-UF	5112.2025.0
80	20	EBI7901ZAG-DA-UF	5112.2026.0

Product Overview - Special Products

Article description	Flanks per mm	Article number	Special feature
Currently not available	-	-	-

Additional Information on Ordering Code

EBI 7901 ZAF-DA-UF

Temperature (U) and Packaging (F)

U: -40 °C...+100 °C. Operating temperature range.
 F: ESD package. The primary shipping container for the module.

Supply voltage (D) and variant (A)

D: 5 V. Supply voltage of the module.
 A: Standard. The data sheet describes the standard variant of the module.
 All deviant variants are described separately.

Sensor (Z), Output-Interface (A) and Resolution (F):

Z: LK40, a FreePitch sensor.
 A digital interface with rectangular signals AB (TTL-level).
 F: 64 flanks. The resolution is indicated in flanks per pitch (magnetic pole).

Module number (7901)

7901: Series 7900, module number 1

Type of system (EBI)

Electronic length and angle measurement
 Measurement system including electronics (interpolator, amplifier or similar)
 and equipped with a FreePitch sensor. Usable for angular and length
 measurements.

Special Design Features

 **PerfectWave**

Sensors with PerfectWave design provide the best signal quality, highest accuracy and optimal sensor linearity by filtering out higher harmonics in the signal. The linearity of the sensor is assured, even for weak magnetic field measurement.

 **PurePitch**

In PurePitch sensors the FixPitch principle is extended over several poles in order to increase accuracy still further. This arrangement reduces the influence of errors in the measurement scale and improves the immunity to interference fields.

 **FreePitch**

FreePitch sensors are optimized so as to be independent of the pole length (pitch) of the measurement scale. FreePitch sensors are therefore particularly compact and come close to an idealized point-sensor.

 **SmartFit**

The sensor modules featuring SmartFit technologie offer additional comfort functions. One feature allows to re-parameterize a build-in sensor module (e. g. for changing the measurement resolution). Another feature is to indicate the operating status or error messages, to inform the user about the correct function or about operating disturbances. SmartFit technologie therefore offers comfort functions to make the sensor system safer, better and easier to use. Both functions are offered individually or in combination in SmartFit sensor modules.

General Information

Product Status

Article	Status
EBI7901ZAx-DA-UF	The product is in series production.
Note	The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com .

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Changelist

Version	Description of the Change	Date
EBI7901ZAx.DSE.06	Disclaimer supplement	06/2022
EBI7901ZAx.DSE.05	Change of corporate design (pp. 1-10)	01/2022
EBI7901ZAx.DSE.00	Original (pp. 1-10)	07/2011

Sensitec GmbH

Schanzenfeldstr. 2 · 35578 Wetzlar · Germany
 Tel. +49 6441 5291-0 · Fax +49 6441 5291-117
 www.sensitec.com · sensitec@sensitec.com