![SENSITEC MAGNETORESISTIVE SENSORS]

EMI 7913

Incremental Sensor Module for Linear Motors

The EMI7913 sensor module is based on the Multi FixPitch concept and combines an AMR sensor array with an interpolation ASIC for digital output or a signal conditioning ASIC for analog output.

The sensor array is aligned to the stator of an electric motor (e.g. a linear motor); i.e. the magnets of the stator act as magnetic scale, and no additional scale is required. The arrangement of the sensors ensures good and stable signal quality.

The sensor module is customizable to the individual pitches of the stator magnets.
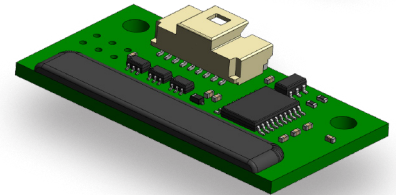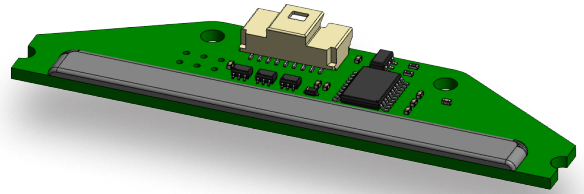
Quick Reference Guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	4.5	5.0	5.5	V
I_C	Current consumption	-	25	-	mA
F [1]	Flanks per pitch	4	512	4096	-

[1] programmable feature

Measurement Setup

Depiction	Configuration	Application
	EMI7913 with motor magnets used as magnetic scale	Incremental length measurement

Features

– Available in two PCB sizes (33 and 62 mm)

– Analog (1 V_{SS}) and Digital (TTL) Output signal

– Robust signal quality

– Using AMR technology with negligible hysteresis

– Temperature range from -25 °C to +100 °C

Advantages

– Compact design - easy to integrate

– No additional magnetic scale required

– Stator magnets of the application represent the magnetic scale

Applications

– Linear motors

– Tubular motors

– Versatile industrial transport systems

ESD

EMI7913.DSE.02

Preliminary data sheet
Page 1 of 9

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June 23th 2022

EMI7913
Incremental Sensor Module for Linear Motors

Product Overview

Article	Output Type	Description
EMI7913xxDx-JF	analog	Sensor module with 1 V_{SS} analog output type
EMI7913xxBx-JF	digital	Sensor module with digital (AB-signal) output type and configurable resolution up to 13bit

Article	Distance between magnets	Working distance	PCB-Size (length)	Unit	Adaption to no. of poles	Connector Layout
EMI7913BCxx-KF	12		33	mm	2 [3]	vertical
EMI7913BExx-KF	12		33	mm	2 [3]	horizontal
EMI7913CBxx-KF	20		33	mm	1 [3]	vertical
EMI7913CDxx-KF	20		33	mm	1 [3]	horizontal
EMI7913DBxx-KF	32	~0.5 x distance between magnets [2]	33	mm	1 [3]	vertical
EMI7913DDxx-KF	32		33	mm	1 [3]	horizontal
EMI7913EFxx-KF	48		62	mm	1 [4]	vertical
EMI7913EHxx-KF	48		62	mm	1 [4]	horizontal
EMI7913FFxx-KF	60		62	mm	1 [4]	vertical
EMI7913FHxx-KF	60		62	mm	1 [4]	horizontal

Notice: These are just predefined articles. Please contact us to realize your customized Sensor Module.

[2] magnetic field strength ≥25 kA/m

[3] minimum distance between poles 13 mm maximum distance between poles 30 mm

[4] minimum distance between poles 9 mm maximum distance between poles 60 mm

Two variants of the sensormodule are available

Adaption to two magnetic poles

+ Higher accuracy

+ Suppression of errors due to magnetic inhomogeneities

Adaption to one magnetic pole

+ Higher robustness against interfering fields

+ Compact axial design

Fig. 1: Sensormodule variants

Absolute Maximum Ratings

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

Symbol	Parameter	Min.	Max.	Unit
V_{CC}	Supply voltage	-0.3	6	V
T_{stg}	Storage temperature	-40	+105	°C
T_{op}	Operating temperature	-25	+100	°C

Stresses beyond those listed under "Absolute maximum ratings" may cause permanent damage of 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

Digital Output Type, T_{amb} = 25 °C; V_{CC} = 5 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	-	25	50	mA
F [5]	Flanks per pitch		4	512	4096	-
f_{in}	Maximum input frequency				500	kHz
Hys [6]	Hysteresis		-	2.7	-	deg
$I_{out,pin}$	Current per output		-50	-	+50	mA
V_{outH}	Output high level		4.6	-	5.0	V
V_{outL}	Output low level		0	-	0.4	V

[5]+[6] programmable feature

Analog Output Type, T_{amb} = 25 °C; V_{CC} = 5 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	-	25	50	mA
f_g	Cut-off frequency	C_{IL} = 250 pF	-	-	500	kHz
R_{load}	Load on output	differential	100	-	-	Ohm
V_{out}	Output Voltage		0.8	1.0	1.2	V

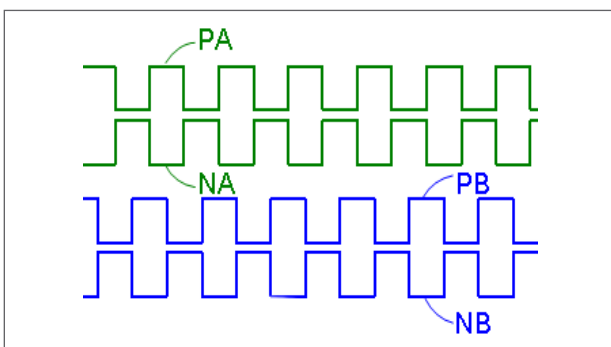## Typical Performance Graphs

Digital Output Type

Fig. 2: The typical output signals of the digital output module depend on direction of movement.
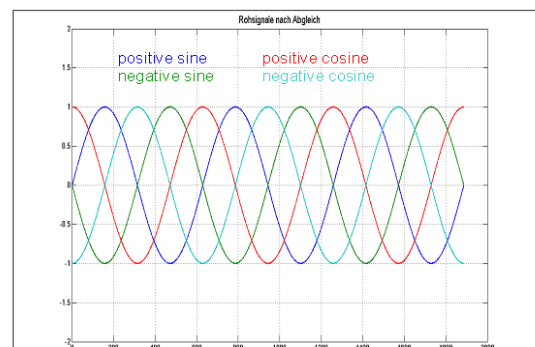
Analog Output Type

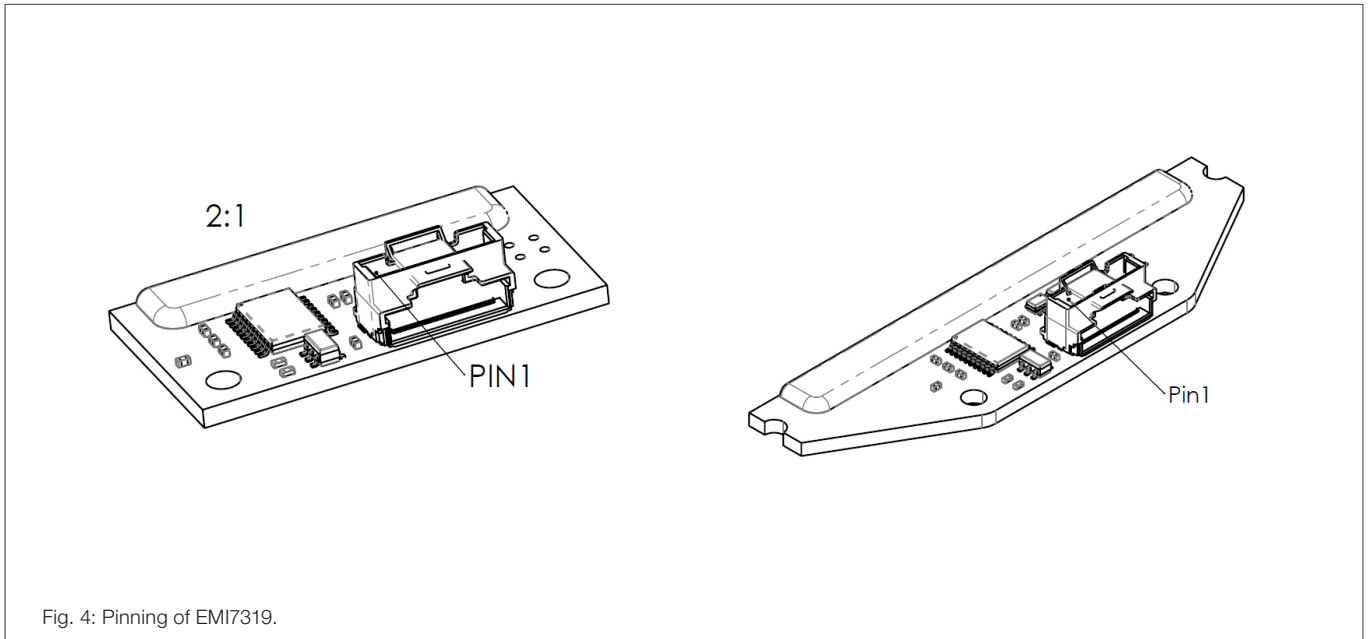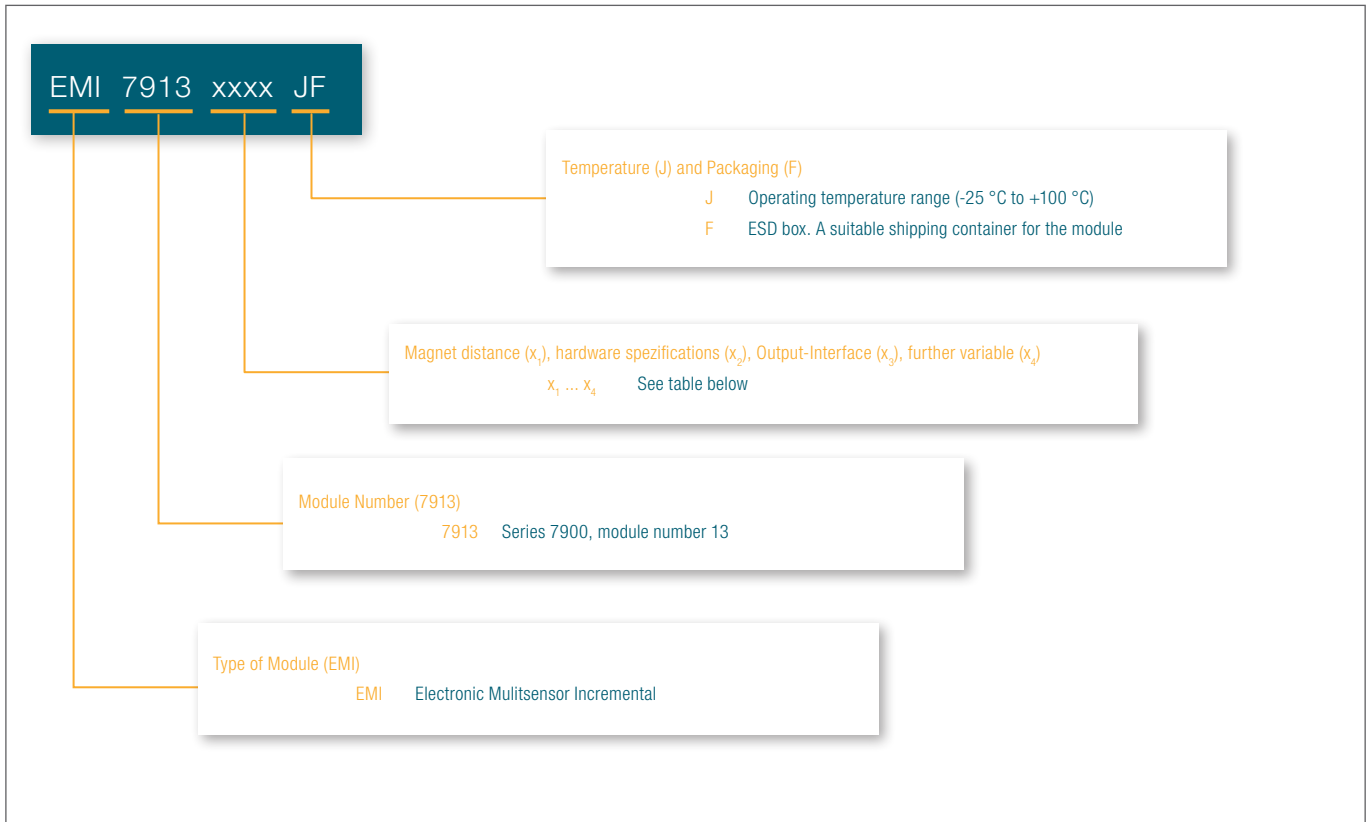Fig. 3: Pulse width deviation and phase shift.

EMI7913.DSE.02

Preliminary data sheet
Page 3 of 9

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June 23th 2022

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EMI7913
Incremental Sensor Module for Linear Motors

Fig. 4: Pinning of EMI7319.

Electrical Data and Pinning EMI7913

Pin	Color [4]	Symbol	Parameter	Additional information
1	white	Err	Error Signal	Error Signal
2	violett	SDA	I²C data line	Serial Configuraton Interface, data line
3	black	SCL	I²C clock line	Serial Configuration Interface, clock line
4	blue	GND	Ground	Ground
5	red	VSS	Supply Voltage +5 V	Typically 5 V (4.5 V to 5.5 V)
6	pink	NB	Output Cos- / B-	Differential signal output with push-pull driver. For optimal signal transmission. Signal B 90 degree phase shifted to signal A for direction detection.
7	grey	PB	Output Cos+ / B+	
8	yellow	NA	Output Sin- / A-	Differential signal output with push-pull driver. For optimal signal transmission. Signal A 90 degree phase shifted to signal B for direction detection.
9	green	PA	Output Sin+ / A+	

[4] Color of standard cable

EMI7913.DSE.02

Preliminary data sheet
Page 4 of 9

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June 23th 2022

Additional Information on Ordering Code

EMI 7913 xxxx JF

Temperature (J) and Packaging (F)

J Operating temperature range (-25 °C to +100 °C)

F ESD box. A suitable shipping container for the module

Magnet distance (x_1), hardware spezifications (x_2), Output-Interface (x_3), further variable (x_4)

$x_1 \ldots x_4$ See table below

Module Number (7913)

7913 Series 7900, module number 13

Type of Module (EMI)

EMI Electronic Mulitsensor Incremental

Distance between magnets

Variable	Distance
B	12 mm
C	20 mm
D	32 mm
E	48 mm
F	60 mm

PCB Hardware spezifications

Variant	PCB Size	Connector Layout	adaption to no. of poles
B	33 mm	vertical	1
C	33 mm	vertical	2
D	33 mm	horizontal	1
E	33 mm	horizontal	2
F	62 mm	vertical	1
G	62 mm	vertical	2
H	62 mm	horizontal	1
I	62 mm	horizontal	2

Output Interface

Variant	Output type
B	AB, NANB
D	1 V_{ss}

EMI7913.DSE.02

Preliminary data sheet
Page 5 of 9

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June 23th 2022

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Dimensions EMI7913 - 33 mm

Fig. 5: Dimensions of the sensor module (all dimensions in mm).

EMI7913.DSE.02

Preliminary data sheet
Page 6 of 9

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June 23th 2022
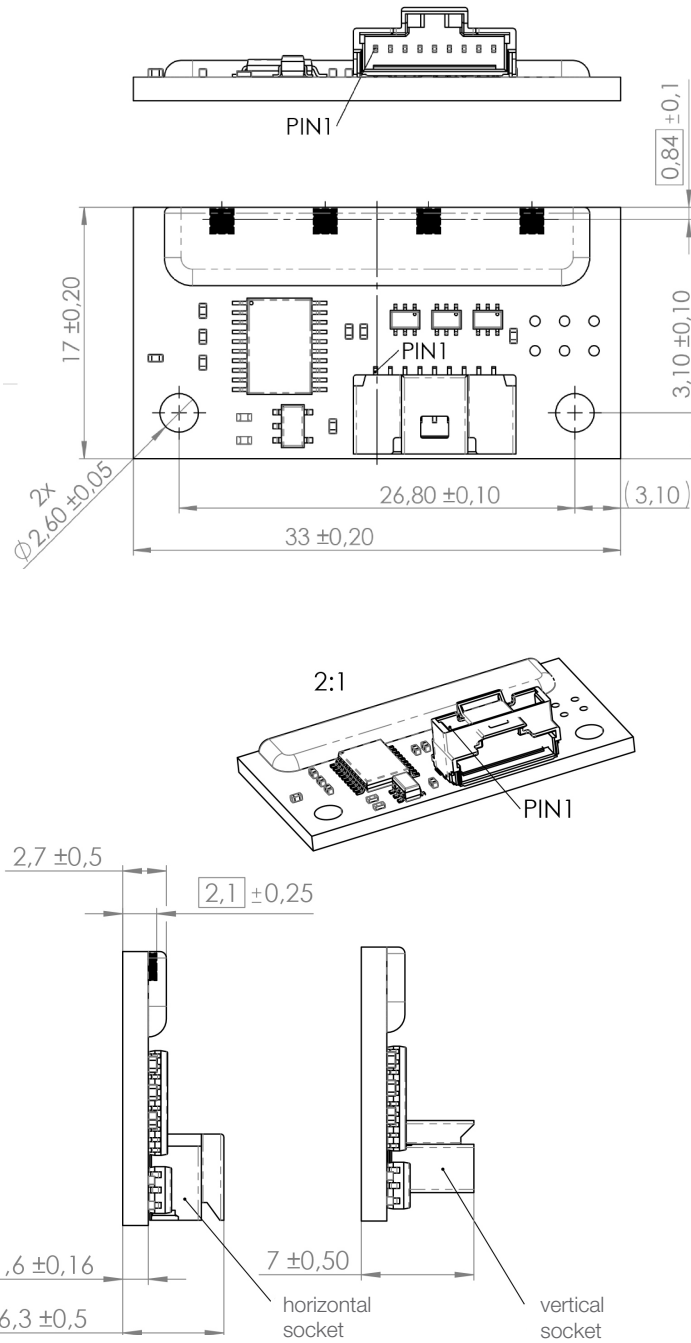
EMI7913
Incremental Sensor Module for Linear Motors

Dimensions EMI7913 - 62 mm

Fig. 6: Dimensions of the sensor module (all dimensions in mm).

EMI7913.DSE.02

Preliminary data sheet
Page 7 of 9

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Subject to technical changes
June 23th 2022
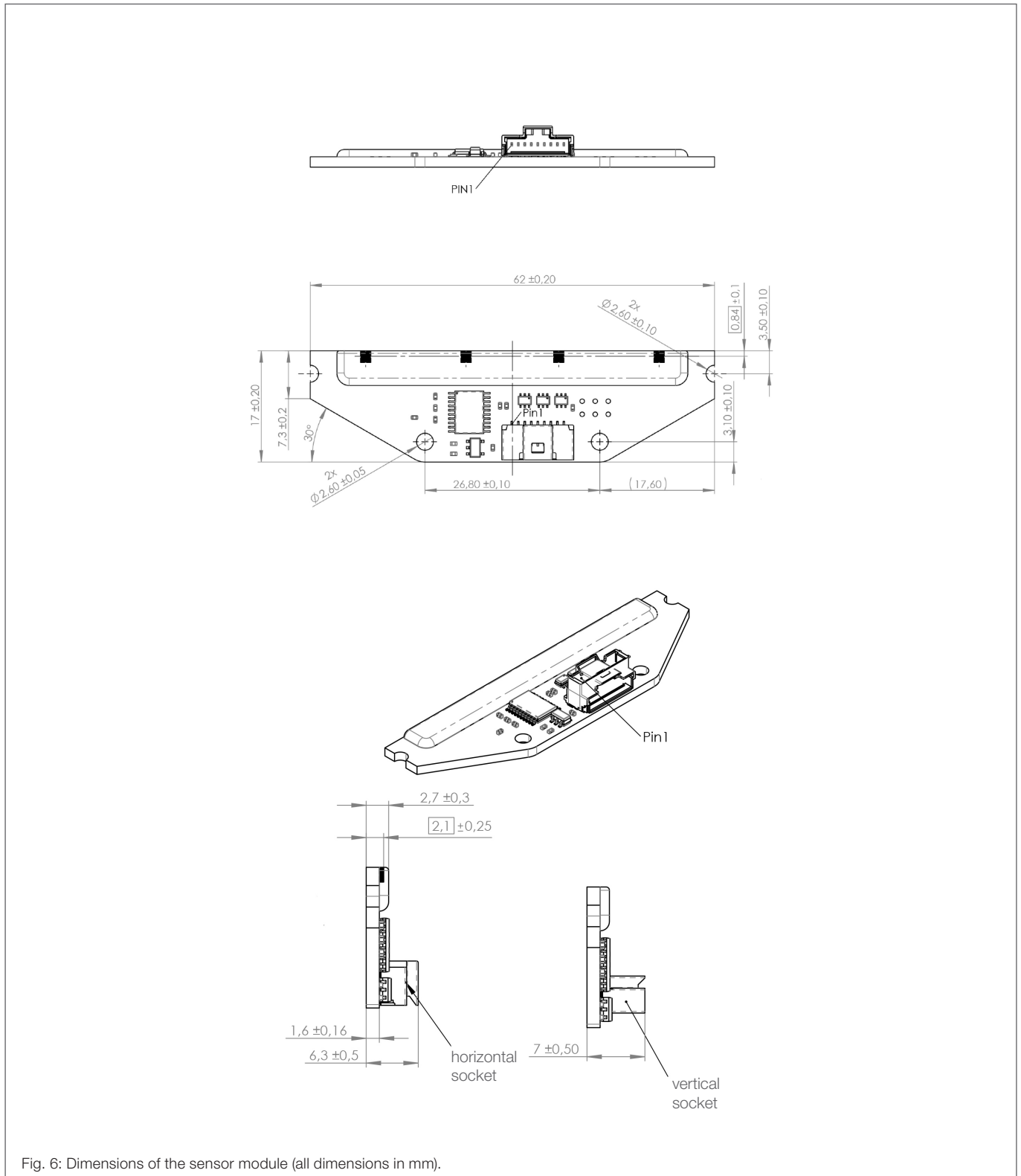
General Information

Product Status

Phase	Status
EMI7913	The product is under development, qualification is on going. Deliverables have a sample status. The datasheet is preliminary.
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
EMI7913.DSE.02	Disclaimer supplement	06/2022
EMI7913.DSE.01	Change of corporate design (pp. 1-9)	01/2022
EMI7913.DSE.00	Original (pp. 1-x)	10/2021

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