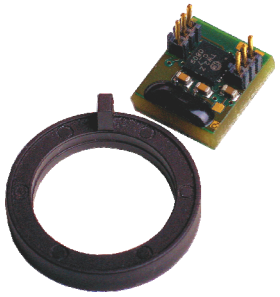
EWS16-1024I-1075
Incremental Sensor Kit

The incremental sensor kit EWS16-1024I-1075 consists of the module EBR7001AxA-KA and the magnetic pole ring MWR0032KAC-KH magnetized with 32 poles. The pole ring has a mechanical nose which is necessary for the reference pulse.

The sensor module EBR7001AxA-KA contains an Anisotropic MagnetoResistive (AMR) sensor LK16 or AL796 with 2 mm magnetic pitch and a Giant MagnetoResistive (GMR) sensor GF705 for the reference signal. There are two different variants of the sensor module available. One with the pins on the top (EBR7001AAA-KA) and one with the pins on the bottom (EBR7001ABA-KA).

When used with the magnetic scale MWR0032KAC-KH with 2 mm pitch, the module delivers two rectangular signals (A and B) and a reference pulse (Z) per revolution. The flank-to-flank resolution of the incremental signal is 0.088 deg.



EWS16-1024I-1075

Product overview (kit elements)

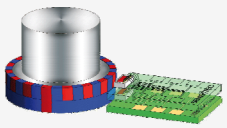
Article description	Article number
EBR7001AAA-KA incremental sensor module [1)]	5112.2007.0
EBR7001ABA-KA incremental sensor module [1)]	5112.2017.0
MWR0032KAC-KH incremental pole ring with reference	5109.6001.1

1) Two different product variants available (for details see Page 5 and 6)

Quick reference guide

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	3.0	3.3 5.0	5.5	V
I_C	Current consumption (V_{CC} = 5 V)	-	11	12	mA
A	Resolution (flank to flank)	-	0.088	-	deg
F	Flanks per revolution	-	4096	-	-
f_{out}	Output frequency	-	145	-	kHz
T_{amb}	Ambient temperature	-40	-	+105	° C

Measurement setup

Depiction	Configuration	Application
	Magnetic pole ring with fixed pole pitch; sensor positioned radially; sensor face in the plane of rotation	Incremental angle measurement

Features

- Resolution 4096 flanks per revolution
- A/B output signal (TTL)
- Reference output signal (Z) once per revolution
- Ambient temperature range from -40 to +105 °C
- Supply voltage 5.0 V or 3.3 V

Advantages

- Easy to mount
- Integrated reference signal
- Very small size

Applications

Incremental encoder for rotating movements in various applications, for example:

- Motor feedback system

Absolute maximum ratings

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	+105	°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 °C; H_{ext} = 25 kA/m; V_{CC} = 5 V; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage		3.0	3.3 5.0	5.5	V
I_C	Current consumption	5.0 V, no load	-	11	12	mA
I_C	Current consumption	3.3 V, no load	-	8	9	mA
A	Resolution (flank to flank)		-	0.088	-	deg
F	Flanks per revolution		-	4096	-	-
f_{out}	Output frequency	N = 8500 min^{-1}	-	145	-	kHz
T_{amb}	Ambient temperature		-40	-	+105	°C
$I_{out,pin}$	Permissible load current (source and sink)		-10	-	+10	mA
V_{outH}	Output high level	V_{CC} = 5 V, I_{source}= 6 mA	4.6	-	5.0	V
V_{outL}	Output low level	V_{CC} = 5 V, I_{sink}= 6 mA	0.0	-	0.25	V
V_{outH}	Output high level	V_{CC} = 3.3 V, I_{source}= 6 mA	2.8	-	3.3	V
V_{outL}	Output low level	V_{CC} = 3.3 V, I_{sink}= 6 mA	0.0	-	0.3	V
t_{Lat}	Latency		-	-	<1	µs

Accuracy

T_{amb} = -40…+105 °C; H_{ext} = 25 kA/m; V_{CC} = 5 V; unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Δα	Absolute accuracy		-	-	±1	deg
R	Repeatability		-	-	±1	deg
Δп	Deviation of pulse width	See Fig. 3	-	±9	±40	deg
Δφ	Deviation of phase shift	See Fig. 3	-	±6	±43	deg

Mechanical Data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
N	Rotational speed	V_{CC} ≥ 3.3 V	-	-	8500	min^{-1}
Δradial	Working distance (scale surface ↔ sensor)	See Fig. 7	100	400	700	µm
Δaxial	Axial tolerance	See Fig. 7	-500	-	+900	µm

Typical performance graphs

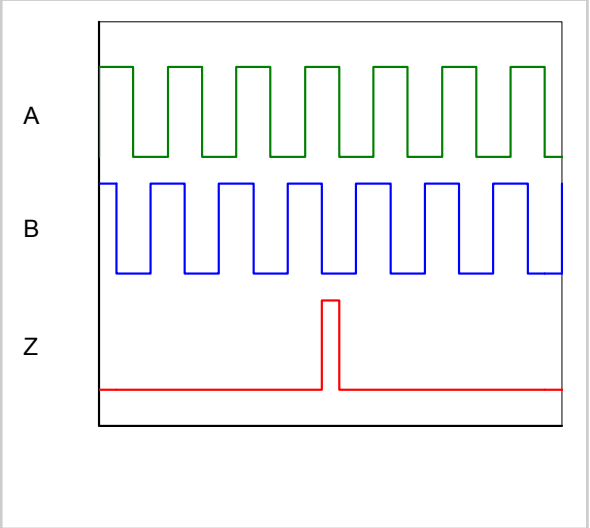


Fig. 1: Typical output signals depend on rotational direction.

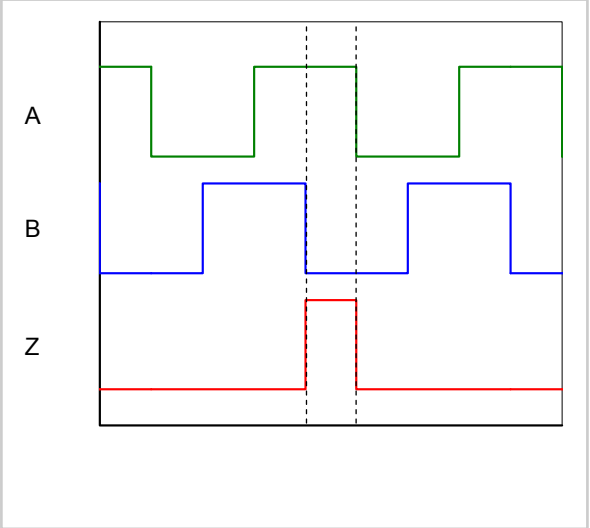


Fig. 2: Association between the signals A, B and Z.

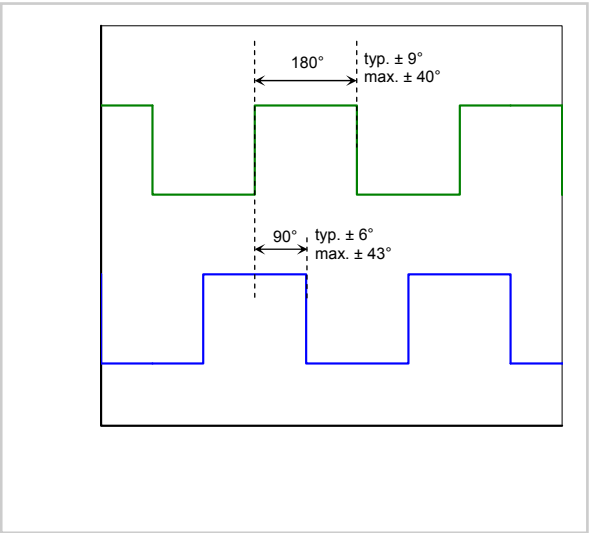


Fig. 3: Pulse width deviation and phase shift.

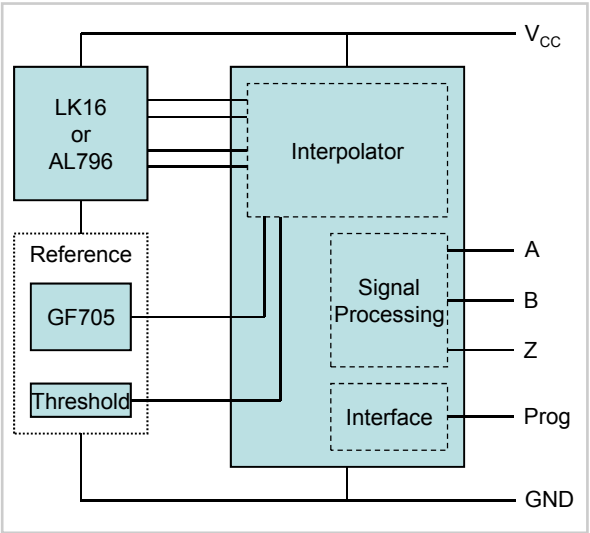


Fig. 4: Functional block diagram.

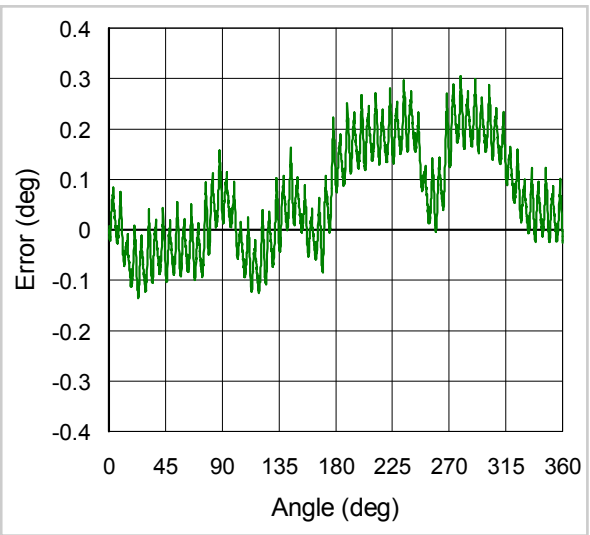


Fig. 5: Typical error per revolution.

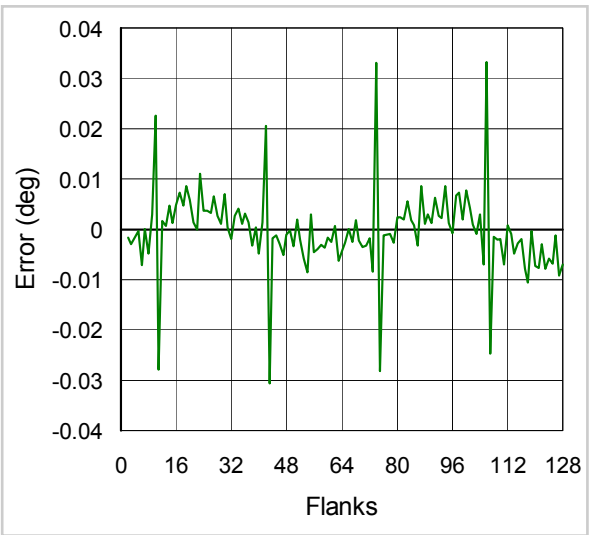


Fig. 6: Typical error per pole.

Dimensions of EWS16-1024I-1075

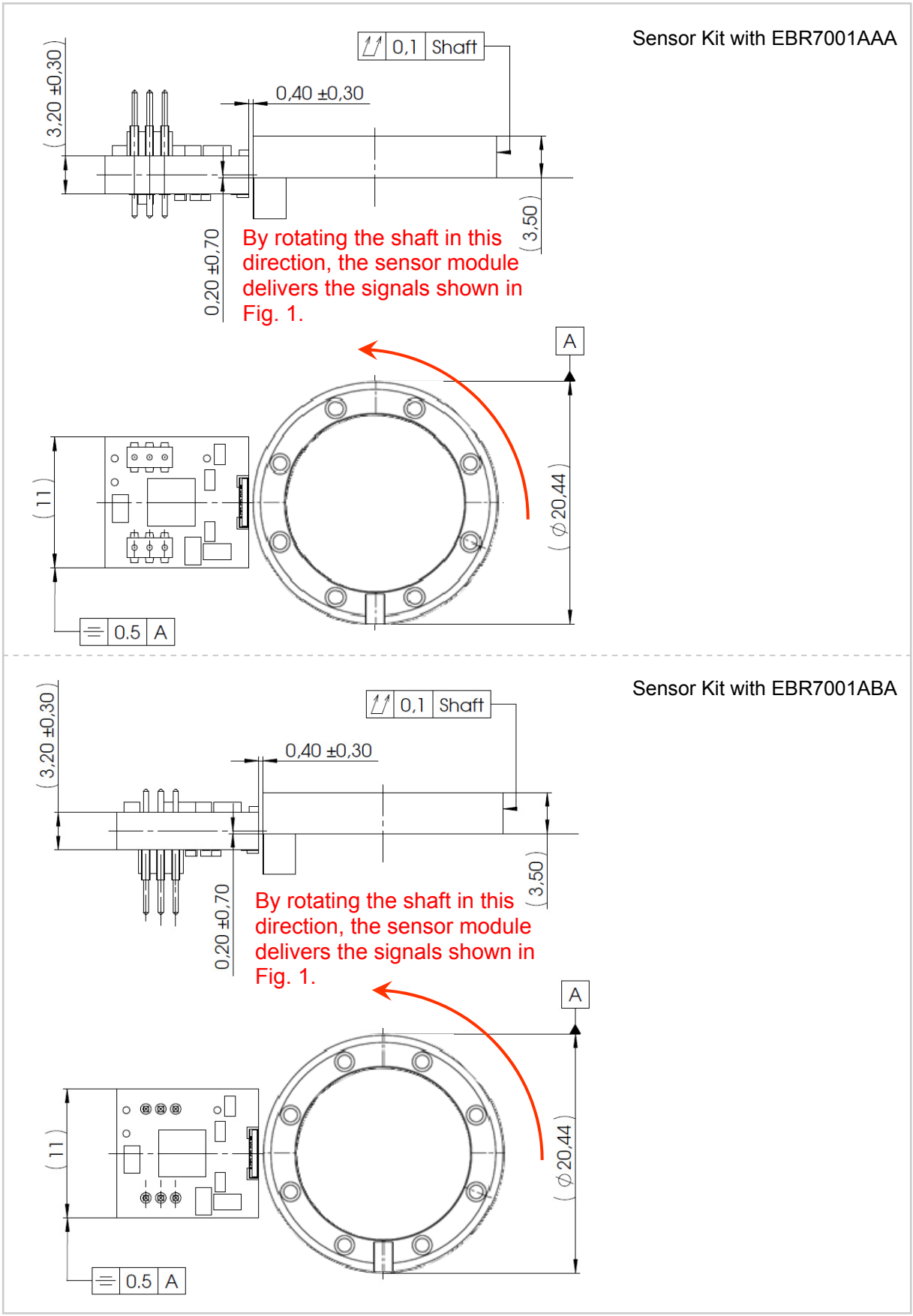


Fig. 7: PCB adjustment to the magnetic pole ring (all dimensions in mm unless otherwise specified).

Pinning and dimensions of the module EBR7001AAA-KA

Pinning

Pin	Symbol	Parameter
1	Prog	Programming input [1]
2	GND	Ground
3	V_{CC}	Supply voltage
4	B	Output signal B
5	A	Output signal A
6	Z	Reference output signal Z

[1] Internal pull-up

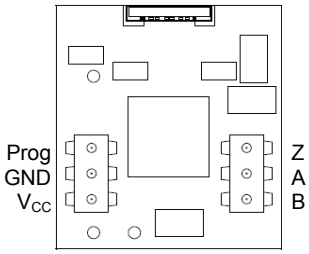


Fig. 8: Pinning of EBR7001AAA-KA

Dimensions

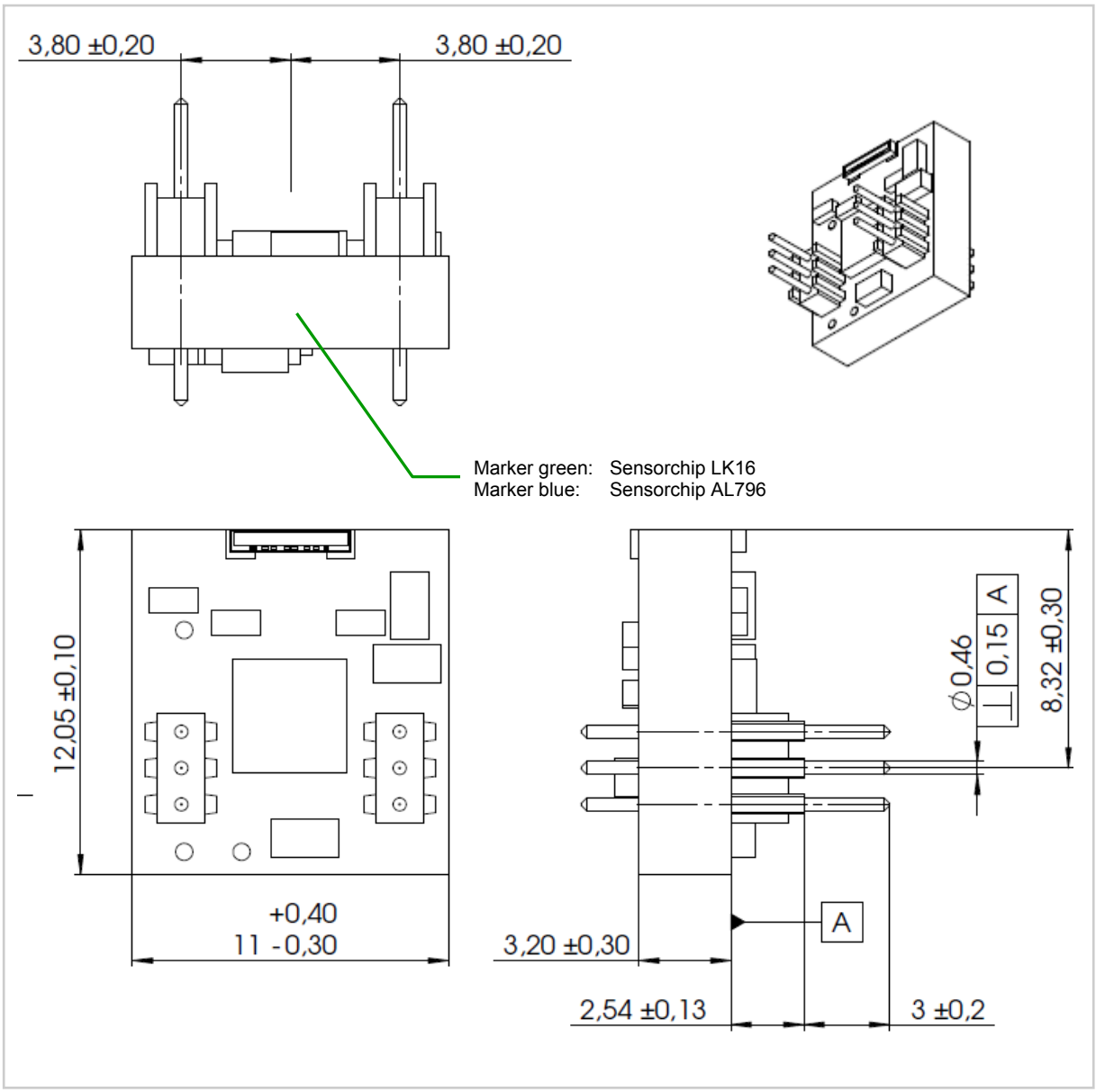


Fig. 9: PCB outline (all dimensions in mm unless otherwise specified).

Pinning and dimensions of the module EBR7001ABA-KA

Pinning

Pin	Symbol	Parameter
1	Prog	Programming input [1]
2	GND	Ground
3	V_{CC}	Supply voltage
4	B	Output signal B
5	A	Output signal A
6	Z	Reference output signal Z

[1] Internal pull-up

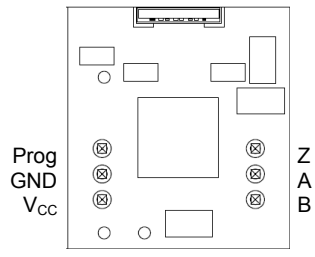


Fig. 10: Pinning of EBR7001ABA-KA

Dimensions

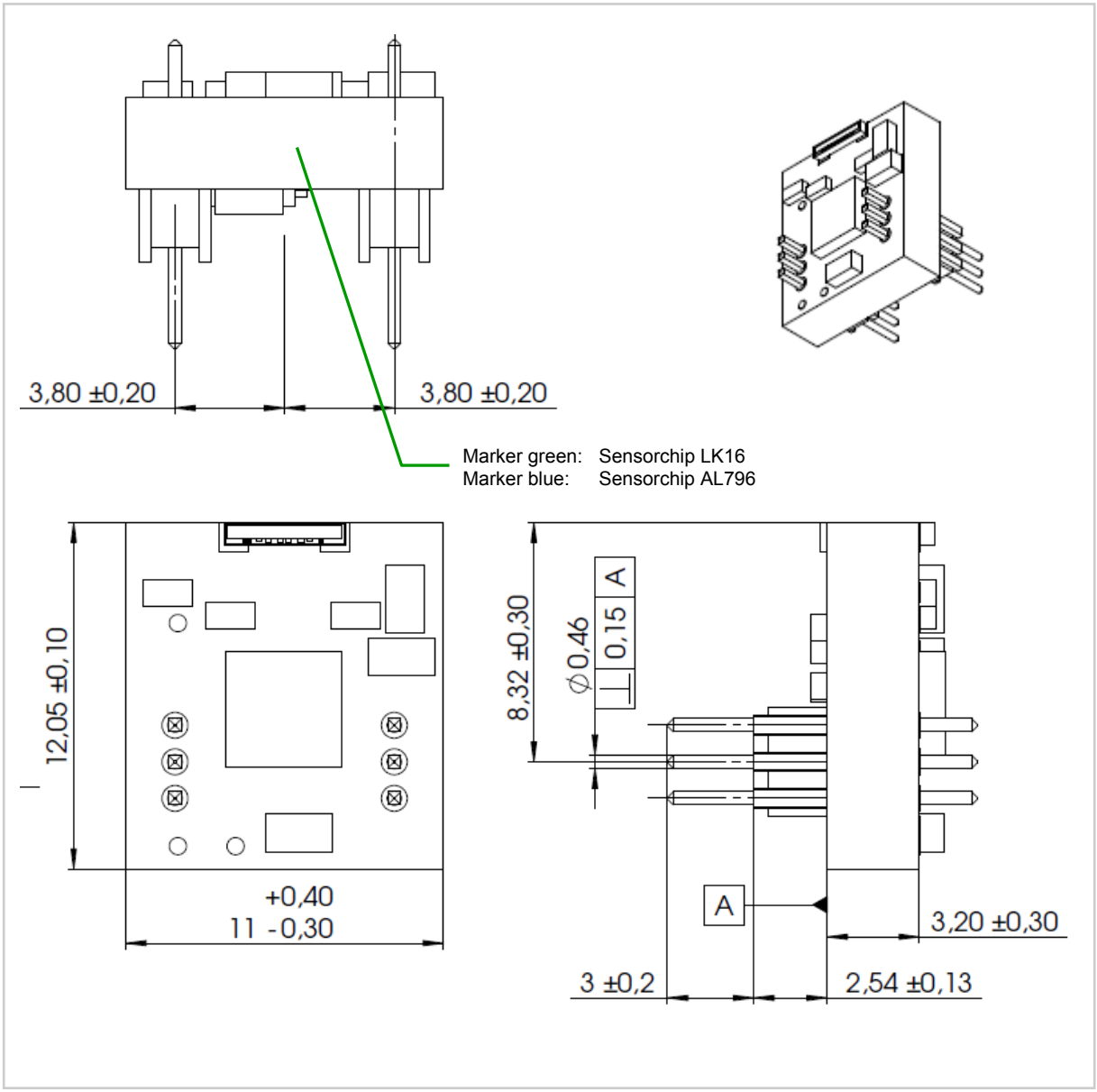


Fig. 11: PCB outline (all dimensions in mm unless otherwise specified).

Magnetic data

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
H_{ext}	Magnetic field strength [1]		-	30	-	kA/m

[1] Typical magnetic field strength of the pole ring MWR0032KAC-KH.

Dimensions of the magnetic pole ring MWR0032KAC-KH

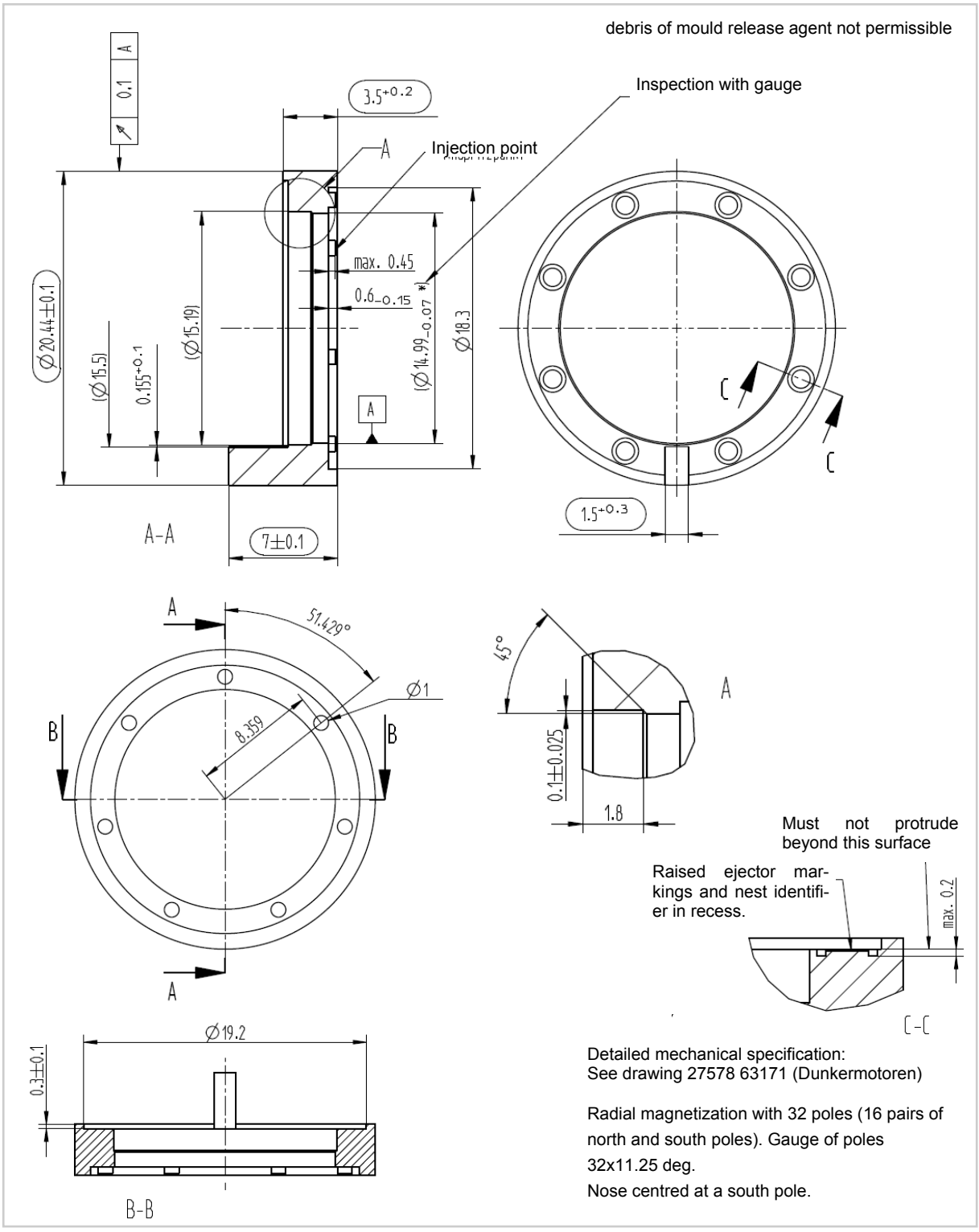


Fig. 12: Pole ring (all dimensions in mm unless otherwise specified).

General information

Product status

Article	Status
EBR7001AAA-KA incremental sensor module	The product is in series production.
EBR7001ABA-KA incremental sensor module	The product is in series production.
MWR0032KAC-KH incremental pole ring with reference	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 up on request.

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MagnetoResistive Sensors

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