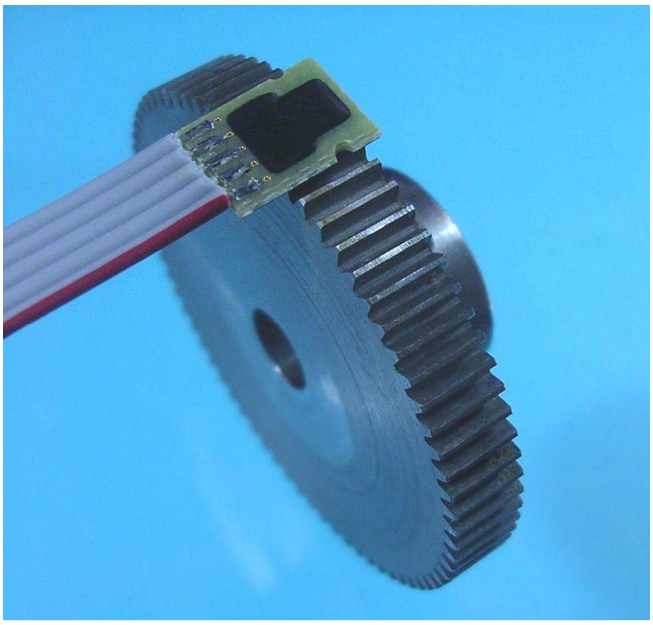
ID1101G
Dual Channel
Gearwheel Encoder Module



Product data

Features

- Differential inductive sensing principle
- Insensitive to magnetic interference fields
- Robust against oil, water, dust, particles
- Ultra-thin package, 0.9 mm thick
- Gear module 0.4 – 0.7
- Interpolation up to x64

Applications

- Speed and position control in high-speed spindles
- Milling, grinding and cutting spindles
- Rotating equipment
- Speed and position measurement in test stands

Key Specifications

Output format.....A and B in quadrature
Interpolation.....binary from x1 to x64
Input frequency.....0 - 40 kHz
Output frequency.....0 - 200 kHz
Airgap.....0.2 +/- 0.05 mm
Supply.....5 V, 12 mA
Temperature.....0 – 100℃
Gear material.....Ferromagnetic steel

Description

The dual-channel encoder module provides incremental A and B output signals in quadrature. The A quad B signal may be interpolated from x1 to x64. The target is a gear with module 0.4 to 0.7.

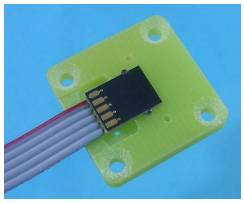
Gear material
The encoding characteristics depend on the tooth form as well as on the magnetic and electric properties of the gear material. For optimum performance, the gear should have a high magnetic permeability and a low electric conductivity. It is recommended to submit a gear to POSIC for optimum configuration and calibration of the encoder.

Input- and output-frequency
The input frequency F_{in} is the gear tooth frequency. The output frequency F_{out} is the frequency of A and B pulses at the encoder outputs. The ratio between the input and the output frequency is given by the interpolation factor. The maximum speed of the encoder is either be limited by the input frequency (encoder-internal low-pass filter, see Table 2) or by the output frequency (depends on the interpolation factor, see Table 3).

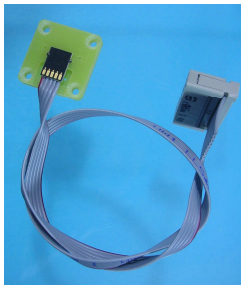
Mechanical assembly
The encoder has two half-holes that allow a precise alignment by means of two pins with diameter 1 mm. The drawing of the encoder in Fig. 3 shows the precise location of the two half-holes. The drawing of the encoder-holder in Fig. 5 shows the location of the holes for the alignment pins.
The encoder is typically glued in an encoder-holder. If the holder is ferromagnetic and/or electrically conducting, the surface behind the sensor-center (see Fig. 3) must be flat and homogeneous with a diameter of 5 mm. This is not required for an encoder-holder that is not ferromagnetic and not electrically conducting,

Accessories

Encoder-holder
The encoder-holder (optional) consists of 3.2 mm thick FR4-material and has 4 screwholes for easy mounting. The holder includes a strain-relief for the cable. Fig. 5 shows the technical drawing of the encoder-holder.



Cable and connector
The encoder is supplied with cable and connector. The cable is a standard flat cable with 5 wires at a pitch of 1.27 mm. Different connectors according to DIN41651 as well as a 6-pin MicroMaTch connector are available as standard options.



3D models of the encoder
3D models (STEP- and IGS) of the ID1101G encoder can be downloaded from POSIC's website.

Specifications

Recommended Operating Conditions

Parameter	Symbol	Remark	Min	Typ	Max	Unit
Supply voltage	VDD		4.5	5.0	5.5	V
Operating Temperature	T_A		0		100	℃
Input tooth frequency	F_{in}	See Table 2	0		40	kHz
Airgap	Z			0.2		mm
Radial play + eccentricity	ΔX, ΔZ				0.05	mm
Axial play	ΔY	Gear thickness ≥ 4 mm			0.5	mm

Electrical Characteristics

Electrical characteristics over recommended operating conditions, typical values at VDD = 5.0 V, T_A = 25℃.

Parameter	Symbol	Remark	Min	Typ	Max	Unit
Supply current	IDD	No load	8	12	20	mA
High level output voltage	V_{OH}	I_L = 2 mA	VDD–0.5			V
Low level output voltage	V_{OL}	I_L = 2 mA			0.5	V
Rise time	t_r	C_L = 47 pF			20	ns
Fall time	t_f	C_L = 47 pF			20	ns

Encoding Characteristics

The encoding characteristics depend on the tooth form as well as on the magnetic and electric properties of the gear material.

Encoding characteristics over recommended operating conditions, typical values at VDD = 5.0 V, T_A = 25℃, airgap = 0.2 mm, gear material ETG100 (NOZAG AG), module 0.5, 50 teeth, tooth frequency = 200 Hz.

Parameter	Symbol	Remark	Min	Typ	Max	Unit
Output frequency	F_{out}	See Table 3	0		200	kHz
Pulse width error	ΔP	Nominal value 180°		10	50	°
State width error	ΔS	Nominal value 90°		10	60	°
Phase shift error	ΔΦ	Nominal value 90°		10	45	°

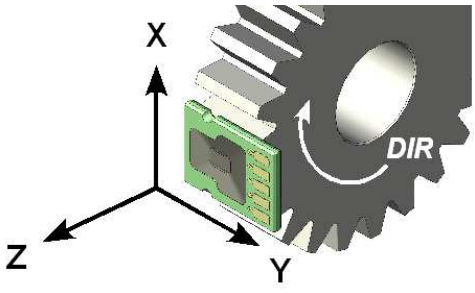


Fig. 1 Coordinate system of encoder.

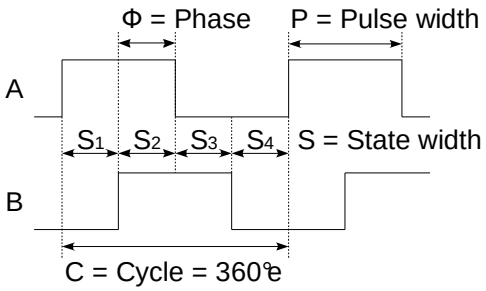


Fig. 2 Encoder output signals A and B in quadrature.

Technical drawings

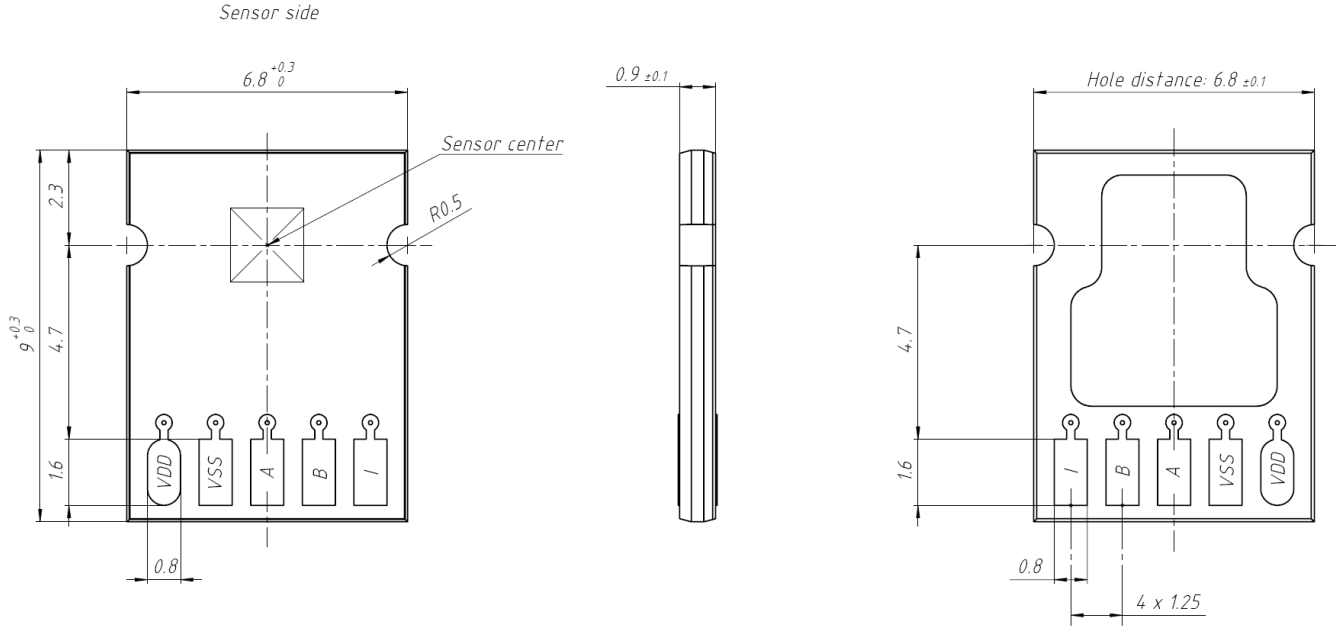


Fig. 3 Sensor dimensions and connections

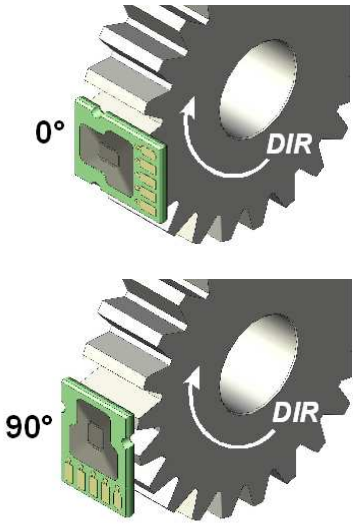


Fig. 4 Orientation of the encoder and direction of rotation.

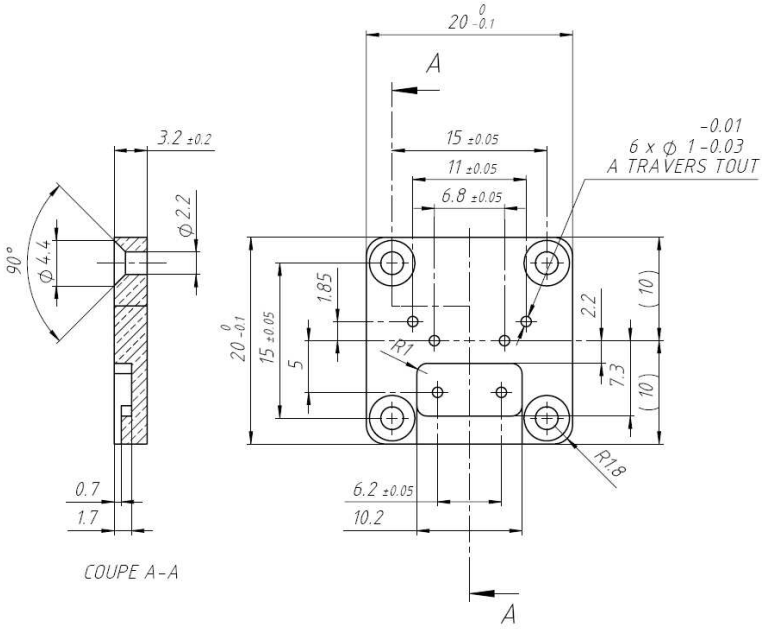
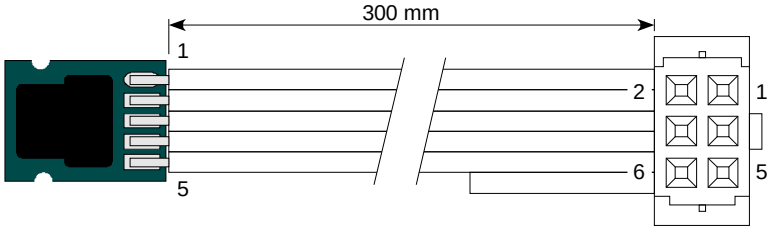


Fig. 5 Encoder Holder type A (see Table 5).



Connector pin	Name	Description
1	VDD	5V Supply
2	VSS	Ground
3	A	Output A
4	B	Output B
5	I	Output Index
6	NC	Not Connected

Fig. 6 Encoder with flat cable (pitch 1.27 mm) and 6-pin DIN 41651 connector.

Ordering information

Ordering code: ID1101G-ABBCC-DDEEFFFFGG

A	Orientation	Table 1
BB	Maximum input frequency	Table 2
CC	Resolution	Table 3
DD	Module	Table 4
EE	Number of teeth	Table 5
FFFF	Encoder holder and cable	Table 6
GG	Connector	Table 7

Table 1: Orientation (see Fig. 4)

A	Orientation	Direction of rotation *DIR*
0	0°	Rising edge A prior to B
1	90°	Rising edge A prior to B

Table 2: Maximum input frequency

BB	Max input freq. (Hz)	Interpolation range
00	10	x1 – x64
01	20	x1 – x64
02	39	x1 – x64
03	78	x1 – x64
04	156	x1 – x64
05	313	x1 – x64
06	625	x1 – x64
07	1’250	x1 – x64
08	2’500	x1 – x64
09	5’000	x1 – x64
10	10’000	x1 – x32
11	20’000	x2 – x16
12	40’000	x2 – x8

Lower Max input freq. leads to lower jitter of A/B outputs.

Table 3: Interpolation factor per tooth

CC	Interpolation		Max output freq. (Hz)	Max counting Airgap* (mm)
	Bits	Factor		
02	2	x1	10’000	0.7
03	3	x2	80’000	0.7
04	4	x4	160’000	0.6
05	5	x8	200’000	0.5
06	6	x16	200’000	0.4
07	7	x32	200’000	0.3
08	8	x64	200’000	0.3

* Encoder is calibrated at airgap = 0.2 mm, which is recommended as nominal value. Sequence of A and B transitions is correct up to Max counting Airgap, but encoding specifications may be out of range.

Table 4: Module

DD	Module	DD	Module
04	0.4	06	0.6
05	0.5	07	0.7

Encoders calibrated for other modules and tooth forms available upon request.

Table 5: Number of teeth

EE	Nr of teeth	EE	Nr of teeth
00	10 - 15	05	51 – 70
01	16 – 20	06	71 – 100
02	21 – 25	07	101 – 150
03	26 – 35	08	151 – 250
04	36 – 50	09	> 250

Table 6: Encoder holder and cable

FFFF	Encoder holder and cable
00xx	No holder, xx cm flat cable
A0xx	Holder type A (Fig. 5) and xx cm flat cable

Other encoder holders and cables available upon request.

Table 7: Connector

GG	Connector
01	6-pin conn. AMP MicroMaTch 7-215083-6
02	6-pin connector DIN 41651
03	14-pin connector DIN 41651

Other connectors available upon request.

Definitions

Airgap — Distance between sensor and gear in Z-direction. See Fig. 1.

Cycle — One A quad B period, see Fig. 2.

°e — Electrical degree (one Cycle is 360°e)

Phase shift Φ — Number of electrical degrees between the center of the high state of channel A and the center of the high state of channel B. Nominal values is 90°e. See Fig. 2.

Pulse width P — Number of electrical degrees that an output is high during one cycle. Nominal value is 180°e. See Fig. 2.

State width S — Number of electrical degrees between two neighboring A and B transitions. Nominal value is 90°e. See Fig 2.