ID1102C
Dual Channel
Rotary Encoder Kit

Product data

Features

- Highly miniaturized encoder
- Differential inductive sensing principle
- Insensitive to magnetic interference fields
- Robust against oil, water, dust, particles
- Programmable resolution and maximum speed
- Optional with cable, connector and holder

Applications

- Brushed and brushless motors
- Industrial and laboratory automation
- Rotary stages
- Robotics, assembly equipment
- High-speed motion control

Key Specifications

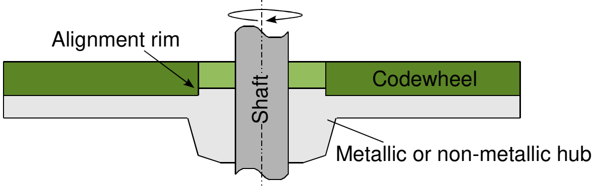
Output format....................A and B in quadrature
Resolution.........................128 up to >1’000’000 CPR
Maximum speed ....up to 23’000 RPM
Airgap ....up to 0.6 mm
Supply...............................5 V, 10 mA
Temperature ....-20 to 100°C

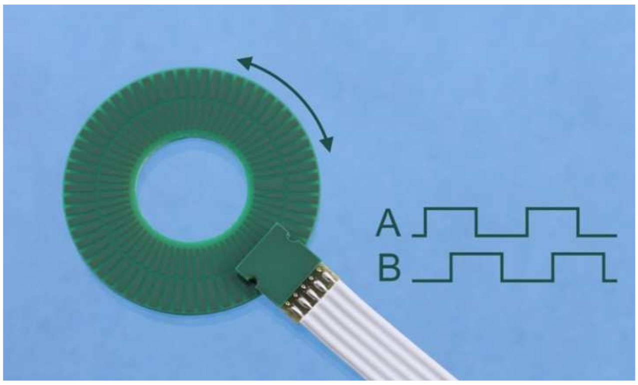
Description

The ID1101C incremental encoder kit consists of an encoder and a codewheel (Fig. 1). The encoder is an integrated circuit in a PCB housing. It provides incremental A and B output signals in quadrature (Fig. 2). The codewheel is a PCB with passive copper strips. The orientation of the encoder is selected in Table 1.

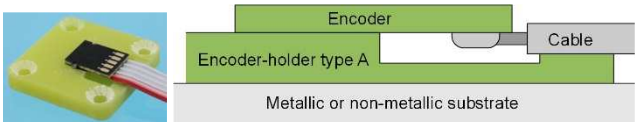
Resolution, maximum speed and airgap
The resolution and the maximum speed of the encoder are programmed ex-factory. The resolution depends on a filter setting that limits the maximum speed of the encoder vs. the codewheel. The resolution also depends on the maximum distance between the encoder and the codewheel. The resolution and maximum speed for a certain maximum air-gap are selected in Tables 2 and 3.

Codewheel
The codewheels are shown in Fig. 4 and are selected in Table 5. The codewheel may be mounted on a hub, using a rim for accurate positioning in front of the encoder.

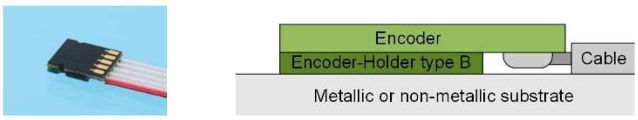




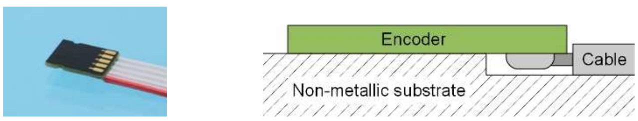
Encoder holders
Different encoder holder options are available and can be selected in Table 6.
The encoder holder **type A** (Fig. 5) may be mounted on any substrate using 4 screw-holes. It has a strain relief for the cable.



The encoder holder **type B** (Fig. 3) may be mounted on any substrate. Use half-holes on encoder PCB housing and alignment pins for accurate positioning.



The encoder without holder may be mounted on non-metallic substrates. Use half-holes on encoder housing and alignment pins for accurate positioning.



Encoder cable and connector
The encoder can be supplied with a flat cable of pitch 1.27 mm and a connector (Fig. 6). The cable length and the connector type are selected in Tables 7 and 8.

Encoder programming
The Evaluation and Programming Tool (EPT) including an interface board and the ASSIST software is available for the linearization and programming of the encoder.

3D models of encoder, holders and scales
STEP models available on www.posic.com.

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		-20		100	°C
Airgap	Z			0.2		mm
Radial play and eccentricity	ΔY				0.1	mm
Airgap tolerance	ΔZ				0.1	mm

Electrical Characteristics

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

Parameter	Symbol	Remark	Min	Typ	Max	Unit
Supply current	IDD	No load	8	10	15	mA
Maximum output frequency	F	A/B output signals	0.8	1	1.2	MHz
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, fall time	t_r, t_f	C_L = 47 pF			20	ns

If A is pulled up and B pulled down during power-up, the encoder enters into a test mode with a 50 kHz square wave on all outputs.

Encoding Characteristics

Encoding characteristics over recommended operating conditions, typical values at VDD = 5.0 V, T_A = 25°C, airgap = 0.2 mm, speed = max speed/10.

Parameter	Symbol	Remark	Min	Typ	Max	Unit
Pulse width error	ΔP	Nominal value 180°e		10	50	°e
State width error	ΔS	Nominal value 90°e		10	60	°e
Phase shift error	ΔΦ	Nominal value 90°e		10	45	°e

Linearity

For high-resolution high-precision applications, it is possible to linearize the encoder by means of a Look-Up Table (LUT) that is located inside the encoder. The LUT can be programmed in volatile or in non-volatile memory by means of the Evaluation and Programming Tool (EPT) or it can be pre-programmed by ex-factory. The LUT option is selected in Table 4.

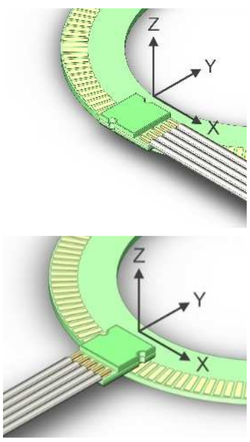


Fig. 1 Coordinate system XYZ.

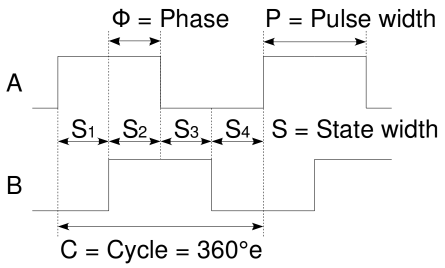


Fig. 2 Encoder output signals A and B in quadrature.

Definitions

Airgap	Distance between encoder and codewheel in Z-direction. See Fig. 1.
Cycle	One A quad B period, see Fig. 2.
CPR	Cycles Per Revolution.
°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 high state of channel B. Nominal 90°e. Fig. 2.
Pulse width P	Number of electrical degrees that an output is high during one cycle. Nominal 180°e. Fig. 2.
RPM	Revolutions Per Minute (of the Codewheel)
State width S	Number of electrical degrees between two neighboring A and B transitions. Nominal value is 90°e. See Fig 2.

Technical drawings

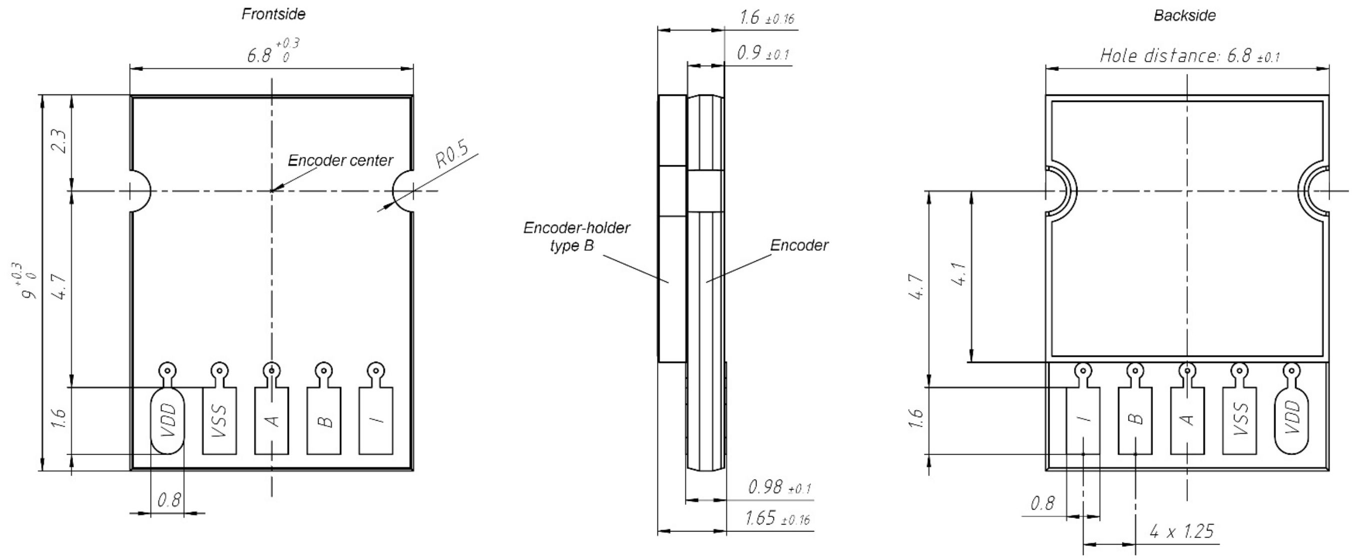
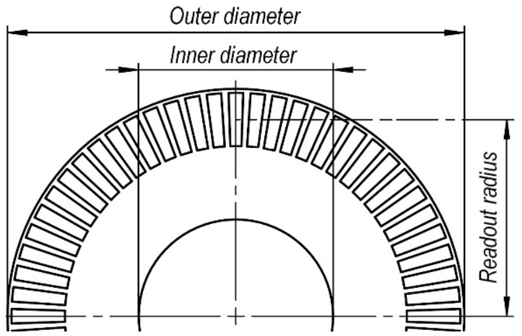


Fig. 3 Dimensions (mm) of ID1102 encoder on encoder-holder type B. The “Encoder center” must be centered with respect to the Readout Radius (Fig. 4).



Codewheel type	TPCS01	TPCS02	TPCS03
Number of periods	64	128	180
Inner diameter (mm)	12	36	56
Outer diameter (mm)	28.2	52.7	72.55
Readout radius* (mm)	12.2	24.45	34.38
Thickness** (mm)	0.73	0.73	0.73

* Readout Radius = position of encoder center
** Thickness tolerance +/- 10% of thickness

Fig. 4 Codewheel dimensions in mm.

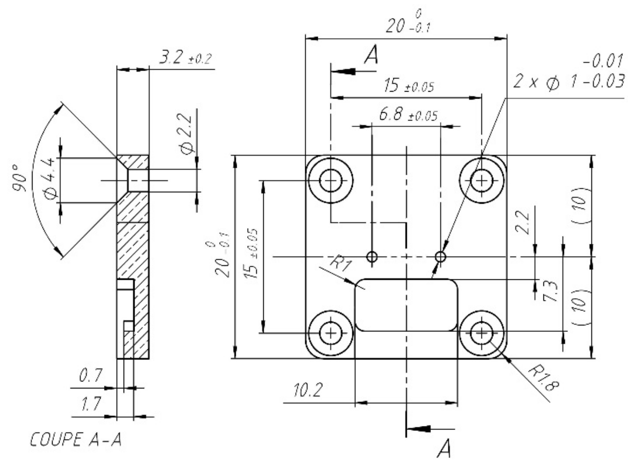
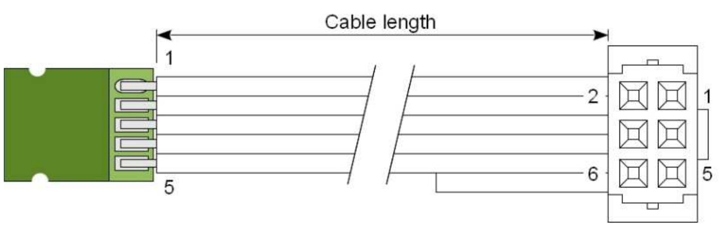


Fig. 5 Dimensions (mm) of encoder-holder type A.



Connector pin	Name	Description
1	VDD	5V Supply
2	VSS	Ground
3	A	A
4	B	B
5	I	Index (multiple)
6	NC	Not connected

Fig. 6 Encoder with flat cable (pitch 1.27 mm) and 6-pin connector DIN41651.

Ordering information

Ordering code: ID1102C-ABBCCD-EEEEE-F-GGG-HH

A	Orientation	Table 1
BB	Maximum speed	Table 2
CC	Resolution	Table 3
D	Look-Up Table	Table 4
EEEEE	Codewheel	Table 5
F	Encoder holder	Table 6
GGG	Cable	Table 7
HH	Connector	Table 8

Table 1: Orientation. Arrows indicate direction of movement of the scale with rising edge A prior to B.

A	Orientation
0	Not progr.
3	0°
4	90°
5	180°
6	270°

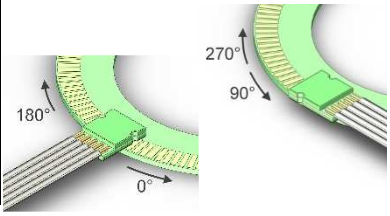


Table 2: Maximum speed

BB	Max speed (RPM) Nr. of periods on Codewheel 64	128	180	Max value CC
00	Not programmed			
01	11	5	4	16
02	22	11	8	16
03	45	22	16	16
04	91	45	32	15
05	183	91	65	14
06	366	183	130	13
07	732	366	260	12
08	1’465	732	521	11
09	2’930	1’465	1’042	10
21	5’859	2’930	2’083	09
22	11’719	5’859	4’167	08
23	23’438	11’719	8’333	07

Lower Max speed leads to a lower jitter of the A/B outputs.

Table 3: Resolution

CC	Resolution CPR Nr. of periods on Codewheel 64	128	180	Max value BB	Max Airgap* (mm)
00	Not programmed				
03	128	256	360	23	0.6
04	256	512	720	23	0.6
05	512	1’024	1’440	23	0.6
06	1’024	2’048	2’880	23	0.6
07	2’048	4’096	5’760	23	0.6
08	4’096	8’192	11’520	22	0.5
09	8’192	16’384	23’040	21	0.5
10	16’384	32’768	46’080	09	0.4
11	32’768	65’536	92’160	08	0.4
12	65’536	131’072	184’320	07	0.3
13	131’072	262’144	368’640	06	0.3
14	262’144	524’288	737’280	05	0.2
15	524’288	1’048’576	1’474’560	04	0.2
16	1’048’576	2’097’152	2’949’120	03	0.2

* Recommended airgap = 0.2 mm. Sequence of A and B transitions is correct up to Max Airgap, but encoding specifications may be out of range.

Table 4: Look-Up Table (LUT)

D	Look-Up Table programmed in OTP
0	Not programmed
1	LUT according to codewheel, to be specified
8	Custom LUT, to be specified
9	Default LUT, no codewheel specified

Table 5: Codewheel (see Fig. 4)

EEEEE	Codewheel	Description
00000	No codewheel	
01064	TPCS01	64 periods, OD 28.2 mm
02128	TPCS02	128 periods, OD 52.7 mm
03180	TPCS03	180 periods, OD 72.6 mm

Table 6: Encoder holder

F	Encoder holder
0	No holder
A	Holder type A (Fig. 5)
B	Holder type B (Fig. 3)

Table 7: Cable

GGG	Cable
000	No cable
0xx	Flat ribbon cable, length xx cm

Table 8: Connector

HH	Connector
00	No connector
02	6-pin connector DIN 41651 (Fig. 6)
04	8-pin connector DIN 41651