Further information on IEH2 and IEH3

Summary

Supplementary information on the encoders of the IEH2 and IEH3 series.

Applies to

IEH2; IEH3

Differences between IEH2 and IEH3

The IEH3 encoders differ primarily from the IEH2 by the additional index pulse (channel I). By default, this is 1 LSB long (90°e or 1 step) and is synchronised with A and B (if A and B = HIGH or rising edge of channel B).

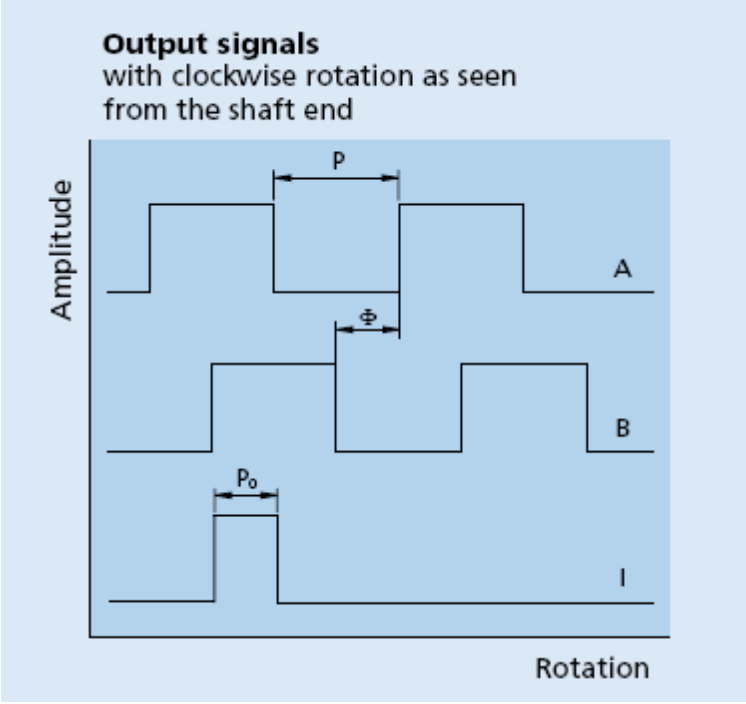

Figure 1: Output signals with IEH3

Other differences in the data sheet are the available resolutions. The IEH2 is available from 16 pulses in all binary resolutions up to 4096 pulses. No other resolutions are possible (not less than 16 pulses; the base resolution without interpolation is 16 pulses). The IEH3 is available with a resolution from 256 pulses.

Due to the additional index function, the IEH3 has a higher current consumption (typ. 25, max. 40 mA) than the IEH2 (typ. 15, max. 25 mA).

Also due to the additional index channel, the IEH3 is delivered with an 8-pin PVC ribbon cable (RM 1.00 mm) with Molex PicoBlade connector (51021-0800) while the IEH2 is equipped with a 6-pin PVC ribbon cable (RM 1.27 mm) together with a Pancon DIN-41651 connector.

Possible special programming

The following special programming options are available with the IEH2 and IEH3 (via PMR):

Direction of rotation:
The standard programming is A before B with clockwise rotation of the motor (when looking at the output drive). Alternatively, B before A with clockwise rotation can also be selected.

Hysteresis:
Hysteresis is selected so that no interference pulses are output. This setting is useful particularly for speed control by means of Speed Controller (no four-edge evaluation). For positioning applications (with four-edge evaluation, e.g., with MC), on the other hand, it may be advantageous to have a hysteresis that is as small as possible to keep the dead time to a minimum (among other things, less noise while at a standstill).

Possible settings:

Hysteresis based on an electrical period (1/16 rotation)	Hysteresis based on 1 rotation	Used for
0.35°e	0.022°	
0.70°e	0.044°	
1.40°e	0.088°	
2.80°e	0.175°	IEH2-16..2048
5.60°e	0.35°	IEH2-4096; IEH3-256..4096
11.2°e	0.70°	
22.4°e	1.40°	

Table 1: Hysteresis settings

Index length (for IEH3):
The default index length is 1 LSB (90°e or 1 step). If desired, the index length can be increased to 3 LSB (270°e, 3 steps).

Minimum edge spacing:
The minimum edge spacing is determined from the set tracking rate (Maximum Transition Delay MTD) of the sine/digital converter. At a minimum, the downstream drive electronics must be able to process this maximum frequency in order to detect all pulses (also with lower speeds!). If desired, a different minimum edge spacing can therefore be programmed. The minimum edge spacing for IEH3 is always 250ns for all resolutions.

Minimum edge spacing (english "edge spacing")	Max. tracking rate (maximum output frequency A XOR B)	Used with
166 ns	6 MHz	-
250 ns	4 MHz	4096 pulses
333 ns	3 MHz	2048 pulses
500 ns	2 MHz	16 to 1024 pulses

Table 2: Example hysteresis settings for IEH2

Note:
With 4096 pulses, the minimum edge spacing of 250 ns is programmed by default. The reason for this is that many drive electronics (the MC2 among others) cannot process shorter pulses. This limits the maximum speed to an output frequency of 875 kHz (speed 12,800 rpm). If necessary, the setting of 166 ns for minimum edge spacing can be selected with speeds of up to 18,750 rpm.

Power saving mode:
The chip features a power saving mode that can be used to reduce the power consumption for the IEH2 from a maximum of 25 mA to a maximum of 15 mA. The downside, however, is that the quality of the output signals (e.g., phase errors) is affected. If interested, contact Support or Development for further information.

Recommended installation

Due to the magnetic functional principal both encoders are sensitive against external magnetic fields. The detection of the signals for channel A and B is based on a differential method (A based on sine/non-sine; B based on cosine/non-cosine) which results in a low magnetic field sensitivity. The index function is not based on a differential method. Therefore it is more likely to be influenced by external magnetic fields. These effect can be reduced by using a shielding cap out of ferromagnetic material.

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