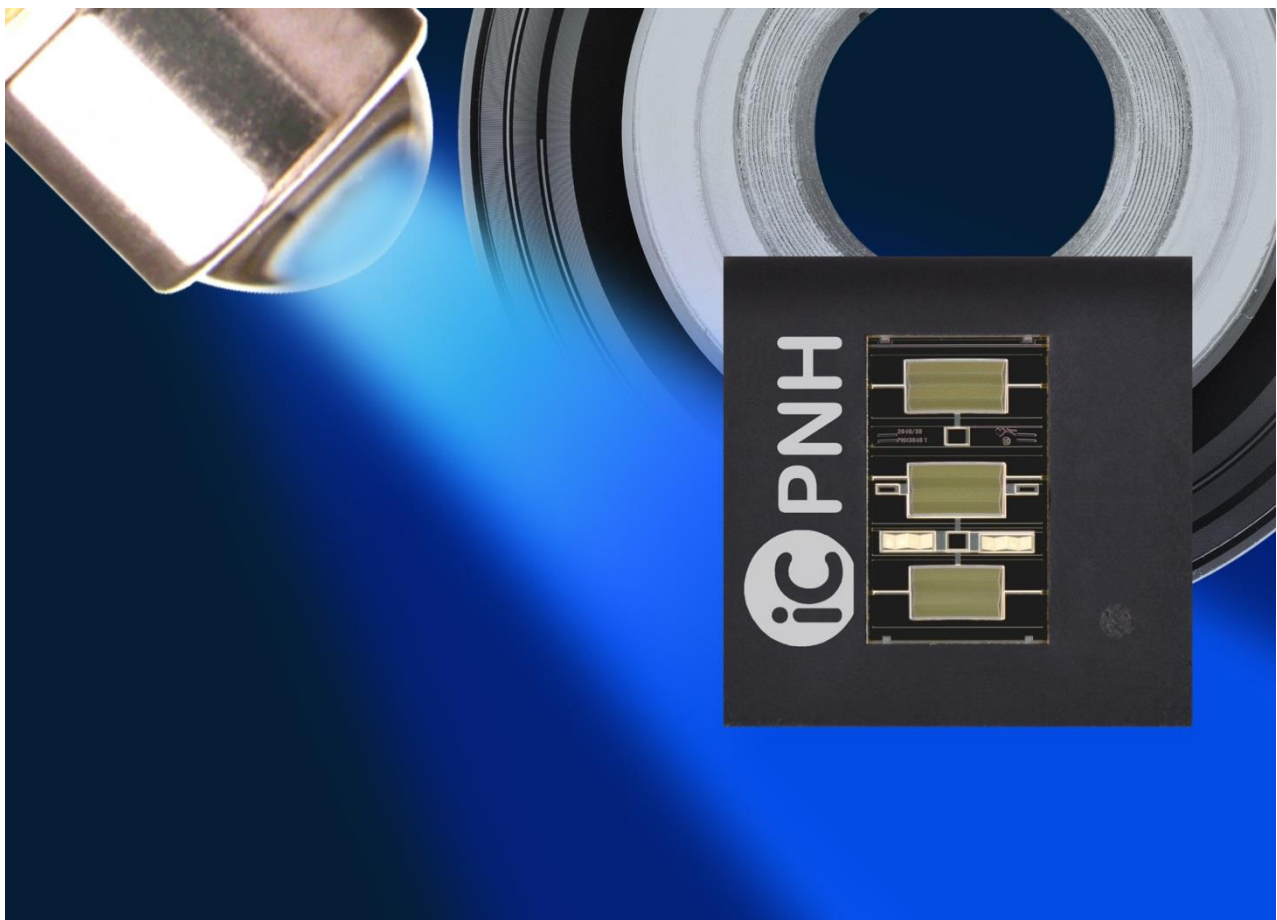


## **iC-PNH: New "EncoderBlue®" Phased Array Scanners for High-Resolution Absolute Encoders**

### **High-Resolution Absolute Encoder iCs for Nonius Interpolation**

A minimal sensor area of only 1.9 x 3.3 mm is sufficient for the optical sensors in the iC-PNH series to scan encoder code discs and generate sine signals in top hi-fi quality. Evaluation is executed by interpolation ICs using a Nonius calculation, e.g. iC-MN and iC-MNF, permitting a very high angle resolution of more than 21 bits, even with code disc diameters of only 26 mm. All devices of this series can be used with short-wave blue LED lighting for an high accuracy due to a sharper projection.

Product photo of iC-PNH packaged in an optoQFN 5 x 5 mm.



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Compared with conventional absolute encoder sensors, iC-PNH sensors do only scan three incremental Nonius tracks and one 2-bit Gray code, saving on assembly space and simplifying illumination. The smaller scanning surface and the high sensitivity of the sensors help to reduce the amount of power needed for the obligatory LED, what is proving beneficial to the LED's expected lifetime. The phased arrays can be used with a blue LED, e.g. iC-TL46, which minimizes distortion and increases the signal contrast. The encoder-typical IR-LED (e.g. iC-TL85) can also be used.

The photocurrent signals are converted into low-impedance and interference-resistant output voltages by low-noise amplifiers. Depending on the selected chip, a high transimpedance gain of typical 1 M $\Omega$  means that at an illumination level between 3 to 6 mW/cm<sup>2</sup> signal voltages of several hundred millivolts are available at the outputs for the subsequent interpolation device.

iC-PNH devices are available for code discs of 26 mm, 33 mm, and 39 mm diameters and operate with a supply voltage of 4.1 V within a temperature range of -40 to +125 °C. With a maximum thickness of 0.9 mm, its flat optoQFN package is saving on valuable board space due to the edge length of only 5 x 5 mm.

iC-PNH is typically deployed as Nonius-based absolute position encoders. As with a Vernier caliper which scale was introduced by the French mathematician Pierre Vernier in the 17th century, the accuracy of reading is increased due to multiple scales, with the absolute position information contained in the relative phase shift between the signals. With an interpolation resolution of 14 bit, the new encoder interpolator **iC-MNF** is capable of this special kind of evaluation. This 2-chip system not only reduces system costs but also presents a small form factor alternative to position encoders, opening up new areas in the field of applications.

In each channel, iC-MNF has a separately adjustable signal conditioning unit with a sample-and-hold stage that captures the conditioned analog signal for the ensuing sequential digitization process. For this, a high-precision SAR A/D converter is provided which has an adjustable interpolation resolution of up to 14 bits. The non-linear A/D

converter makes use of the tangent function and analyzes the sine and cosine simultaneously.

In order to compute the high-resolution angle positions, 2- and 3-track-Nonius calculations can be configured which enable resolutions of up to 25 bits (0.04 arc seconds from 360 degrees).

The converter IC which measures only 7 x 7 mm in QFN48, is protected at the cable end against reverse polarity and incorrect connections and contains the RS422 transceiver for the serial data interface. Data is output in a SSI or BiSS protocol at clock rates of up to 10 Mbit/s.

All of the main functions of the chip are monitored and can be configured for alarm indication. Typical sensor errors, such as loss of signal due to wire breakage, short circuiting, dirt, or aging, for example, are recognized and signaled to the controller.

Further information is provided at [www.ichaus.de/PNH](http://www.ichaus.de/PNH) and [www.ichaus.de/MNF](http://www.ichaus.de/MNF).

### Introducing iC-Haus

iC-Haus GmbH is a leading independent German manufacturer of standard iCs (ASSP) and customized ASiC semiconductor solutions. The company has been active in design, production, and sales of application-specific iCs for industrial, automotive, and medical technology for more than 30 years now and is represented worldwide. The iC-Haus cell libraries in CMOS, bipolar, and BCD technologies are fully equipped to realize the design of sensor, laser/opto, and actuator ASiCs, among others.

The iCs are assembled in standard plastic packages or using iC-Haus chip-on-board technology to manufacture complete microsystems, multichip modules, and sensors housed in optoBGA or optoQFN packages.

Further information is provided at <http://www.ichaus.com>.

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