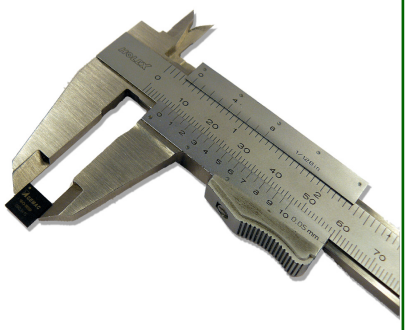
2-Channel Interpolation Circuit with Nonius Calculation GC-NIP

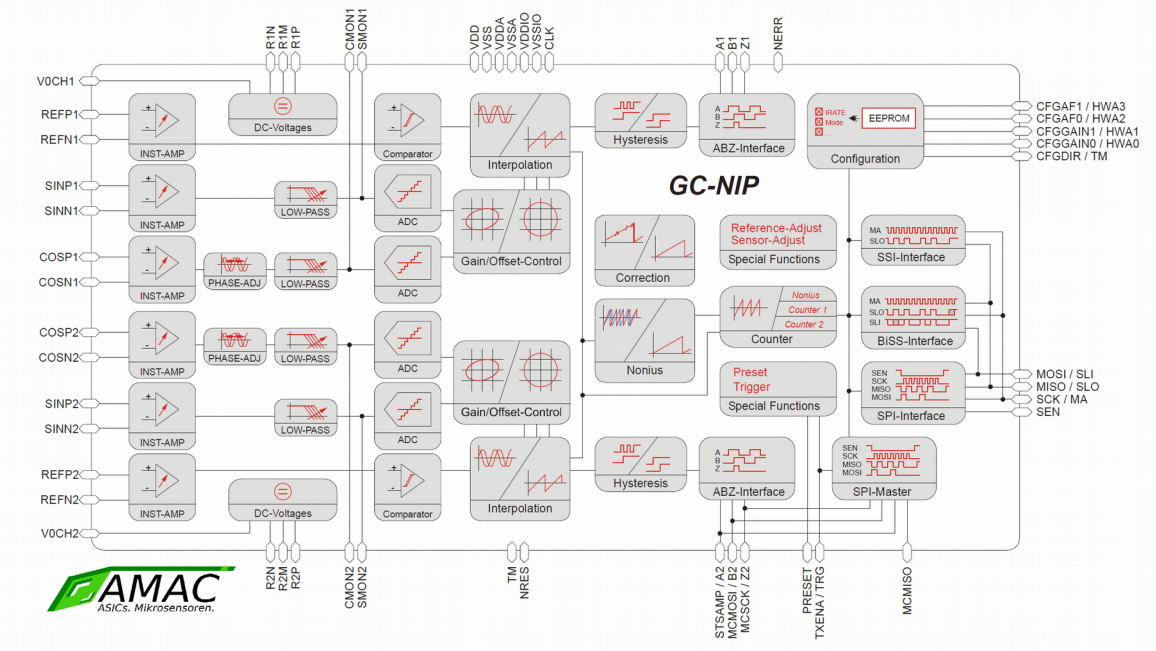
Characteristics:

- **Interpolation rate of up to 8 192**
- **Input frequency max. 130kHz**
- **Adjustable input low pass filter 10kHz … 150kHz**
- **Maximum propagation delay of 8µs at 26MHz clock**
- **AMAC-specific internal gain and offset control**
- **Output signals: ABZ, SPI, SSI, BiSS**
- **EEPROM, reference mark adjustment, preset function**
- **Power supply: 3.3V / 5V***
- **Package: QFN64 (9mm x 9mm)**



Nonius Interpolation Circuit GC-NIP

The 2-channel interpolation circuit ***GC-NIP*** serves to increase the resolution of absolute position and angular measuring systems with 2 sinusoidal output signals (nonius signal). Aside from the calculation of the absolute position, the ***GC-NIP*** may also operate as one- or two-channel incremental measuring system.



The input signals are subjected to an AMAC-specific internal gain and offset control and the signal period is divided up to 8192 times. For the absolute position of a two-channel nonius system, a resolution of up to 22 bit can be achieved.
Input and output of the *GC-NIP* are designed for 3.3V interfaces. The IC comprises six instrumentation amplifiers with adjustable gain factors. Encoders with voltage interface or measuring brigdes can be connected directly. Sensors with current interface and photodiode-arrays are adapted by a simple external circuit. The IC operates on both single-ended or differential input signals. The noise of the sensor signals is prevented by a switching analog filter. Additionally, a digital hysteresis can suppress the edge noise of the output signals at low input frequencies and at standstill.
The quality of the signals issued by the sensors is monitored in the IC. For that purpose it is possible to activate 9 sources separately producing an error signal. For the calculation of the absolute position a set of sensor- or scale-specific correction coefficients can be placed in the EEPROM of the IC. In that way, harmonics of the sinusoidal

ASIC- und Mikrosensoranwendung Chemnitz GmbH
Kopernikusstr. 16 D-09117 Chemnitz
Phone: +49 371 334204 - 0 Fax: +49 371 334204 - 69
E-Mail: info@amac-chemnitz.de Web: www.amac-chemnitz.de

signals or inaccuracies of the measuring scale do not lead to errors in the absolute position value. The determination of the correction coefficients is realized by a simple software-based calibration procedure.
Providing absolute position and incremental square-wave-signals (ABZ) in parallel, the *GC-NIP* is well-suited for the use in motor-feedback-systems. The four integrated output interfaces (ABZ/SPI/SSI/BiSS) and further features like the multi-stage trigger signal processing, the processing of distance coded reference marks, the possibility to adjust the reference mark as well as adjustment and storage of the zero position make the IC suitable for direct use in industrial controls or in fast absolute or multi-channel incremental position measuring systems. The *GC-NIP* can be configured according to specific applications using the integrated EEPROM, via configuration inputs or via the serial interface (SPI/BiSS).

Technical Data:

Interfaces	
Analog input	Sinusoidal / cosinusoidal / reference (index) signals, differential or single-ended
	Adjustable amplification for 660mV$_{PP}$ / 250mV$_{PP}$ / 120 mV$_{PP}$ / 60mV$_{PP}$
	Input frequency max. 130kHz for all resolutions
ABZ	90° square-wave sequences (A/B/Z)
	Adjustable width of zero signal Z to ¼ or 1 period A/B
	Service signals for sensor adjustment
SPI	30-bit counter value / 9-bit sensor state
	Up to 15MHz, compatible to standard-SPI 16 bit
	Up to 500 000 measurement values per second
	Signal filtering for suppression of disturbances
SSI and BiSS	30-bit counter value / 2-bit sensor state
	Gray code / binary code
	Adjustable timing, SSI ring operation
Interpolation / Signal Processing	
Interpolation rate	Nonius calculation: 256 ... 8 192
	Interpolation (ABZ): 32 ... 8 192
Signal correction	AMAC-specific digital controller for the offset, control range ±10% of the standard amplitude
	AMAC-specific digital controller for the amplitude, control range 60% … 120% of the standard amplitude
	Digital potentiometer with 64 steps for phase correction; selectable range ±5° or ±10°
Suppression of disturbances	Selectable low pass filter 10kHz, 75kHz, 150kHz, disabled
	Digital hysteresis for suppression of the edge noise at the output (configurable 0 … 7)
	Selectable minimum edge distance at the output
Reference mark adjustment	Selectable reference mark position
	Definition of the optimum reference position via SPI or service signals
	Processing of distance coded reference marks
	Measured-value trigger at the reference mark position
Miscellaneous	2-stage measured value trigger
	Preset signal for adjustment and storage of the zero position of the sensor
	Integrated EEPROM for configuration
Important Characteristics	
Package	QFN64 (9mm x 9mm)
Operating voltage	3.3VDC / 5VDC*
Temperature range	-40°C … 125°C

*Configuration of 5V-systems possible via Level-Shifter GC-LS

Ordering Information:

Product Type	Description	Article Number
GC-NIP	Interpolation circuit GC-NIP, QFN64	PR-44800-00
GC-LS	4-channel / analog Level-Shifter 5V to 3.3V, QFN32	PR-44500-00
GP-NIP	Demoboard for Interpolation circuit GC-NIP	PR-44810-00