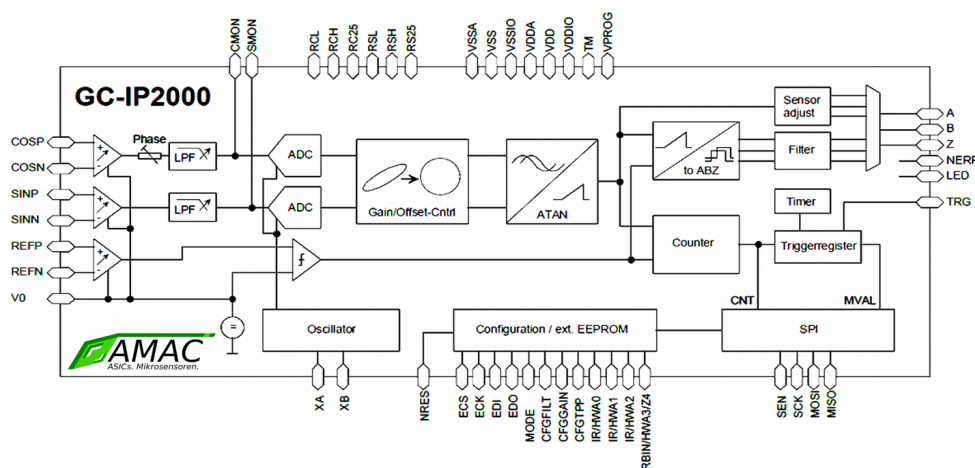# Interpolation Circuit GC-IP2000

Features:

- **Interpolation rate up to 2,048**
- **Input frequency max. 260 kHz for all resolutions**
- **Highest dynamic with highest precision of measurement**
- **Constant delay of 5 μs for all resolutions**
- **Up to 500000 measurement values per second**
- **AMAC-specific internal gain and offset control**

GC-IP2000

The interpolation circuit GC-IP2000 serves to increase the resolution for incremental position and angular measuring systems with sinusoidal output signals offset by 90°. The IC divides the signal period up to 2,048 times.

The GC-IP2000 comprises three instrument amplifiers with adjustable gain factors. Incremental encoders which possess a voltage interface and measuring bridges can be connected directly. Sensors with current interface and photodiode-arrays are adapted by a simple external circuit. The IC may operate with both single-ended and 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. Thus, in case of a short-time disturbance of the input signals, a subsequent interpolation counter will operate without errors. The input signals are subjected to an AMAC-specific internal gain and offset control. The amplitude is controlled in the range between 60 % and 120 % of the nominal amplitude. The control range for the offset of the two input signals is ±10 % of the nominal amplitude. The phase displacement of the input signals can be corrected statically between -10° and +10° using a digital potentiometer. The quality of the signals issued by the sensors is monitored in the IC. For that purpose it is possible to activate separately 9 sources producing an error signal.

The propagation delay of the IC is only 5μs. A fast serial interface (SPI) is implemented. This interface operates at a clock frequency of up to 25 MHz and is compatible to all important micro-controller and DSP families. In addition, a timer and a multi-stage trigger are implemented. This features make the GC-IP2000 an ideal choice for use in fast controllers or control systems.

Technical Specifications*:

Analog Part	
Analog input	Sinusoidal / cosinusoidal / reference (index) signals
	Adjustable amplification for 1 Vpp / 500 mVpp / 250 mVpp / 75 mVpp
	Input frequency max. 260 kHz for all resolutions

Digital Part	
Interpolation rate	100 / 128 / 200 / 256 / 400 / 500 / 512 / 800 / 1,000 / 1,024 / 1,600 / 2,000 / 2,048
Output signals	30-bit counter value via serial interface (SPI)
	Up to 500,000 measurement values per second
	90° square-wave sequences (A/B/Z)
	Error signal, interrupt signal to the µC
	Auxiliary signals for sensor adjustment
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 factor 0.5 ... 1.5
	Potentiometer with 40 steps for phase correction; selectable range ±5° or ±10° resp.
	LED control signal
Possibilities of configuration	Either:
	Via configuration pins, the serial interface (SPI) or EEPROM
SPI	Compatible to the standard SPI: 16-bit, MSB first
	SPI clock up to 25 MHz
	For configuration and measuring value output; not required for trivial systems

Miscellaneous	
Supression of disturbances	Switching analog noise filter
	Digital hysteresis for suppression of the edge noise at the output
Adaptation of IC to subsequent devices	Adjustable minimum edge interval at the output
	Behaviour of IC in case of sensor error can be programmed
	Adjustable width zero signal Z ¼ or 1 period A/B
Data logging	2-stage measured-value trigger
	Programmable timer
	Constant delay between sampling and measurement value of 5 µs for all resolutions

Important Characteristics	
Operating voltage	5 V DC
I/O voltage, digital:	3.3 V DC or 5 V DC
Temperature range:	- 40 °C ... 125 °C

Package	
QFN56	Pitch 0.5mm, 8mm x 8mm package

* A complete and more detailed description of the technical specifications is available at the data sheet at www.amac-chemnitz.de.

Ordering Information:

Product Type	Description	Item No.
GC-IP2000	Interpolation IC GC-IP2000, QFN56	PR-44000-50
GP2000	Evaluationboard of Interpolation IC GC-IP2000	PR-44010-00
USB-SPI-GCIP2000	USB adapter to SPI interface of GC-IP2000	PR-44025-00