HAL 18xy

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HAL 1870, HAL 188x, HAL 1890
Entry-Level Linear Hall-Effect Sensors

HAL 18xy is a universal, value-optimized Hall-effect sensor family with three different output variants: ratiometric linear analog, pulse-width modulation (PWM), or SENT. The sensors can be used for magnetic-field measurements such as detection of mechanical movement, e.g. for small-angle or distance measurements. The sensors are robust and can be used in harsh electrical and mechanical environments.

Major characteristics of HAL 18xy like magnetic-field range, sensitivity, offset, and the temperature coefficients are programmable in a non-volatile memory. Several output signal clamping levels can be programmed to indicate various fault conditions such as under/overvoltage, under/overflow or thermal supervision.

HAL 18xy can be programmed by modulating the supply voltage with a serial telegram on the sensor's output pin. No additional programming pin is needed. The easy programmability allows a 2-point calibration by adjusting the output signal directly to the input signal (like mechanical angle, distance, or current). Individual adjustment of each sensor during the customer's manufacturing process is possible. With this calibration procedure, the tolerance of the sensor, the magnet and the mechanical positioning can be compensated in the final assembly.

HAL 1881, HAL 1882, and HAL 1883 are pre-programmed devices with analog output.

The HAL 18xy family is designed for industrial and automotive applications. It is AEC-Q100 qualified, and operates in the junction temperature range from −40 °C up to 170 °C. The sensors are available in the very small leaded package TO92UA.

HAL 18xy Family Overview

Type	Output	Sensitivity
HAL 1870	PWM	Programmable
HAL 1880	Analog	Programmable
HAL 1881		50 mV/mT
HAL 1882		31.25 mV/mT
HAL 1883		25 mV/mT
HAL 1890	SENT	Programmable

Features

◆ PWM output (HAL 1870)

◆ Ratiometric analog output proportional to the magnetic field (HAL 188x)

◆ SENT interface according to SAE J2716 Rev. 4 (HAL 1890)

◆ Continuous measurement ranges from ±20 mT to ±160 mT

◆ Selectable clamping levels with selectable diagnosis

◆ Comprehensive diagnostic feature set

◆ Programming via output pin or supply voltage modulation

◆ Overvoltage and reverse-voltage protection at VSUP pin

◆ Programmable temperature characteristics for matching all common magnetic materials

◆ On-chip temperature compensation

◆ Active offset compensation

◆ Operates from −40 °C up to 170 °C junction temperature

◆ Operates from 4.5 V up to 5.5 V supply voltage in specification

◆ Operates with static and dynamic magnetic fields up to 5 kHz

◆ Magnetic characteristics extremely robust against mechanical stress

◆ Short-circuit protected output

◆ EMC and ESD optimized design

◆ AEC-Q100 qualified

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Major Applications

Thanks to the sensors' robust and cost-effective design, HAL 18xy is the optimal system solution for applications such as:

◆ Small-angle or linear measurements
◆ Current sensing
◆ Rotary selector

Development Tools for HAL 18xy

For engineering purpose, TDK-Micronas offers an easy-to-use application kit:

◆ Magnetic Sensor Programmer (TDK-MSP V1.2)
◆ LabVIEW[TM] programming software for Windows[®]
◆ LabVIEW Sub VIs
◆ HAL USB-Kit V1.01

System Architecture

Sensors of the HAL 18xy family are monolithic integrated circuits produced in a proven submicron CMOS technology.

They provide an output proportional to the magnetic flux through the Hall plate and proportional to the supply voltage (ratiometric behavior). Selectable clamping levels for the output voltage as well as diagnostic features are available. The sensors include a temperature-compensated Hall plate with spinning-current offset compensation, an A/D converter, digital signal processing, an EEPROM memory with redundancy and lock function for the calibration data and the data register information, a serial interface for programming the EEPROM, and protection devices on all pins. HAL 18xy can be programmed via supply or output pin voltage modulation.
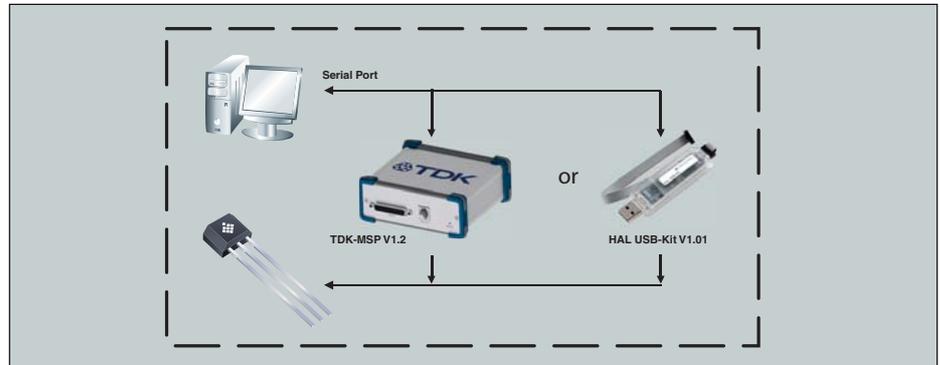

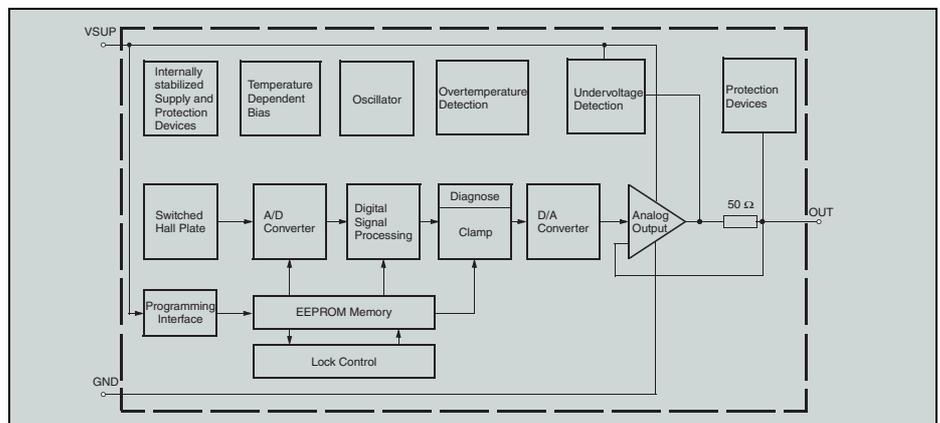**Fig. 1:** Development tool setup for HAL 18xy
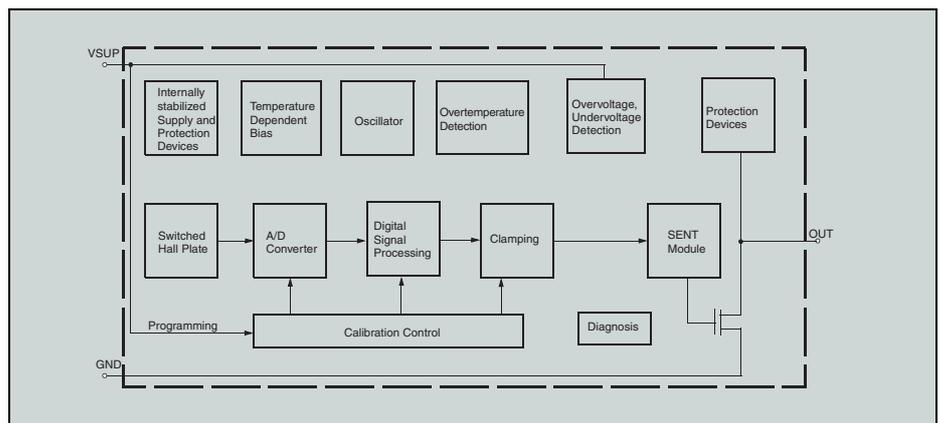

Fig. 2: Block diagram of HAL 1880

Fig. 3: Block diagram of HAL 1890