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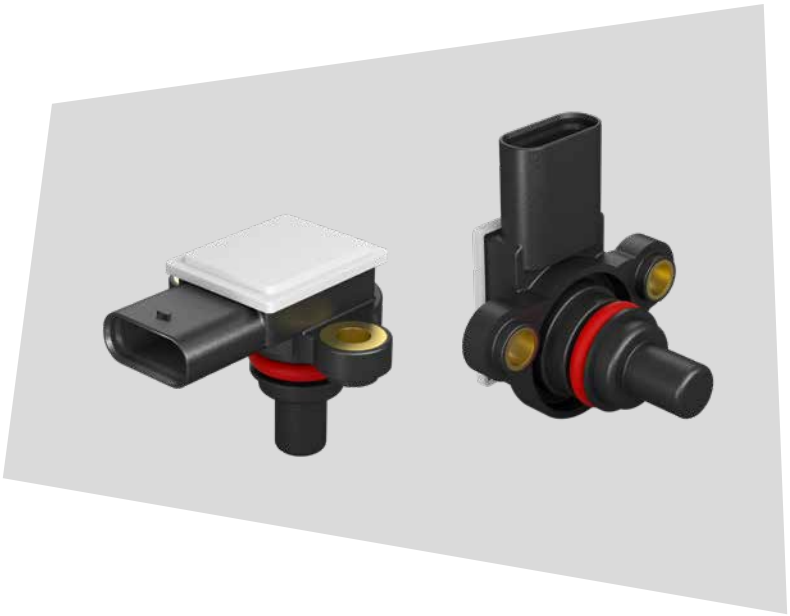
SWOBODA DIGITAL HIGH-SPEED ANGLE SENSOR
FOR AUTOMOTIVE APPLICATIONS



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INTRODUCTION

Angular position sensors are used in a wide variety of commercial, industrial and automotive applications. They help to control different comfort & safety relevant applications.
The Swoboda digital high-speed angular position sensor sets a new standard of rotary position sensing for demanding applications.
The sensor is capable of measuring the 360° end of shaft angle with a high accuracy and converts this information to a digital bus signal with low latency. At the same time the sensor features a compact size and robust design which is required for high-performance applications like camshaft sensing.

ADVANTAGES

- Digital true power on 360° absolute angle output signal
- Reduced wiring effort with up to 4 slave sensors on one single bus
- High resolution & accuracy @ high rotating speed of up to 4,000 rpm
- Extremely low signal drift over temperature and lifetime

FEATURES & BENEFITS

- Contactless high-speed true power on absolute angle measurement
- Magneto resistive (AMR/GMR) technology
- Digital high-speed UART over CAN output
- 4 wire single master multiple slave bus operation with up to 4 sensors
- Mechanical design for end of shaft assembly
- Angle accuracy up to ±0.6 ° @ 13 bits over lifetime
- Rotation speed up to 4,000 rpm
- Latency: 35.75 µs (1 sensor), 100.625 µs (4 sensors)
- Functional safety (ISO 26262): ASIL-A (B)
- Power supply V_{DD}: 5 V ± 5 %
- Current consumption: < 150 mA per sensor, < 500 mA for 4 sensors on one single bus
- Diagnosis: internal failure detection and notification
- Built-in calibration interface for EOL zero angle calibration & auto calibration during operation
- Optional: Software update
- Operating temperature: -40°C – +150°C
- Designed for use in harsh environment
- Fully automotive qualified
- Test and repair shop equipment available

APPLICATION AREAS

- Camshaft sensor for combustion engines
- Electric motor drives
- General rotary position sensing applications

Any questions about this product?
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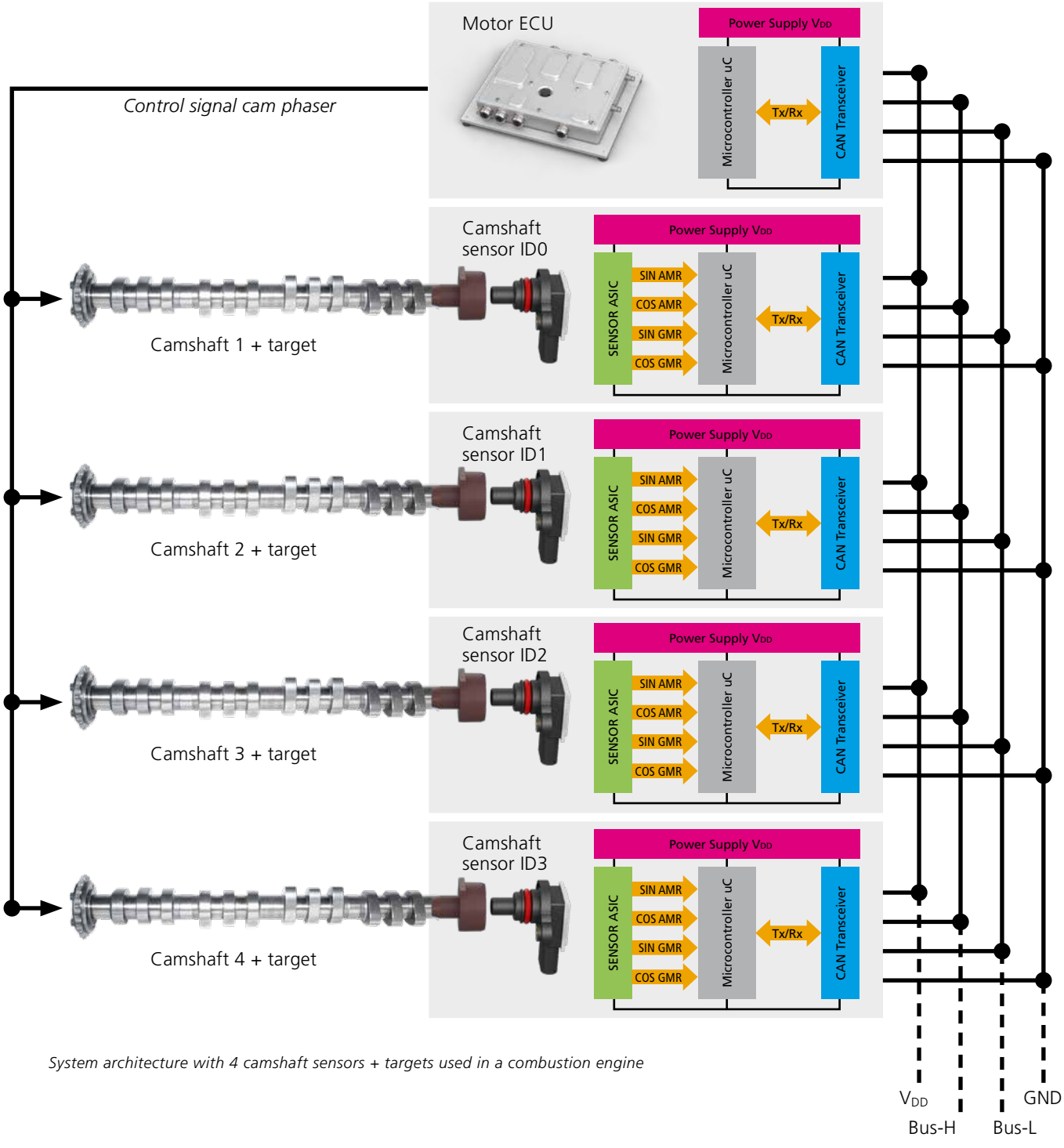
TYPICAL SENSOR APPLICATION

The Swoboda digital high-speed angle sensor is typically used for reducing emissions of the combustion engine by optimizing fuel injection, based on the best-in-class absolute angular position measurement. With this replacement of the standard incremental camshaft sensor, the motor ECU is discharged from the performance intensive task of calculating the angular position by itself. The sensor will handle this task and calculate the position of the camshaft based on analog AMR/GMR sensor IC signals. Now the motor ECU is empowered to optimize the combustion process with a more accurate digital angular position information.



System architecture with 4 camshaft sensors + targets used in a combustion engine

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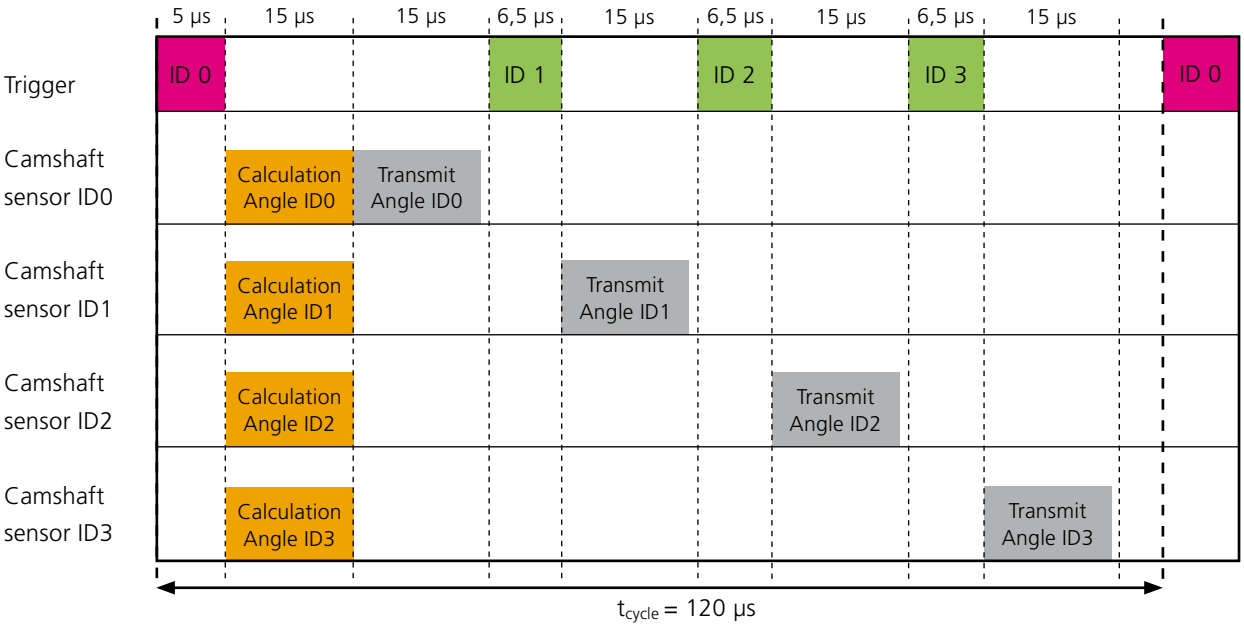
PRINCIPLE OF OPERATION

The system consists of two main components: a smart sensor and a ring magnet. The sensor is firmly mounted to the motor housing. The ring magnet is mounted at the end of the rotating shaft. During operation, the magnetic field of the magnet generates an electrical resistive change in the measurement cells of the sensor. This results in sine and cosine analog signals that are measured, filtered, and amplified. Based on these analog signals, a built-in µcontroller calculates an absolute digital angle information which is finally transmitted over an UART protocol on a CAN physical layer. In a typical system setup, four slave sensors can provide their individual angle information within one transmission cycle with a very low latency less than 120 µs (see timing table below). Additionally one sensor meets the demand for enhanced ASIL A level thanks to its built-in diagnostic functions. This typically enables ASIL B compliance on system level.



Timing table with the UART bus communication of 4 camshaft sensors

NOMINAL OPERATING CHARACTERISTICS

SIGNAL DESCRIPTION	UNITS	MIN.	NOM.	MAX.	REMARKS
Operating temperature	[°C]	-40	-	+150	
V_{DD}	[V]	4.75	5.0	5.25	Supply voltage
I_{DD}	[mA]	-	-	150	Max. 500 mA with 4 sensors attached to the bus
Resolution	[°]	-	-	0.044	Digital 13 bit angle information
Accuracy	[°]	-	-	±0.6	Over lifetime & temperature
Rotation speed	[rpm]	-	-	4,000	
Latency	[µs]	-	-	35.75	100.625 µs with 4 slave sensors attached to the bus
Weight	[g]	-	26	-	

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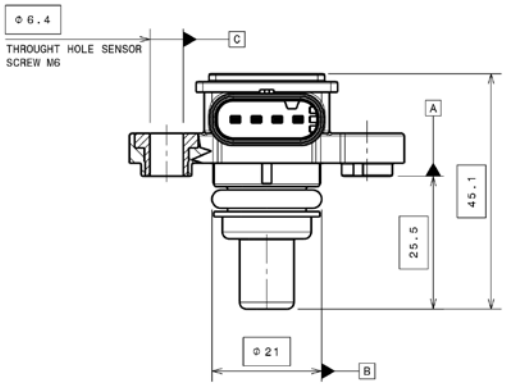
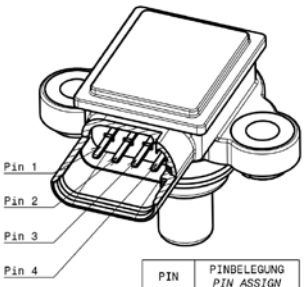
DRAWING

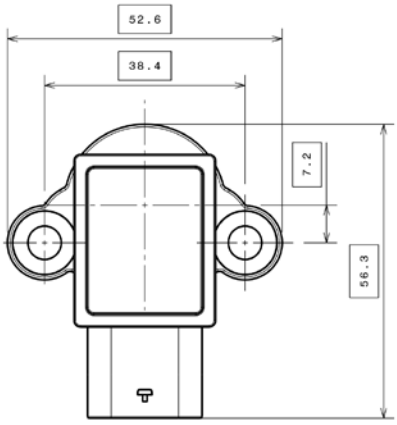
SENSOR

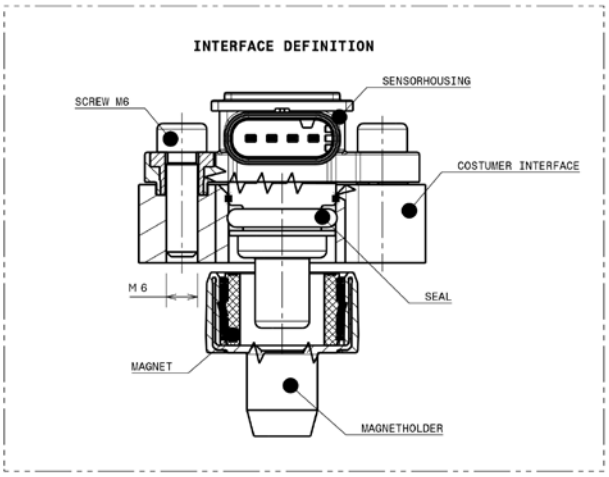




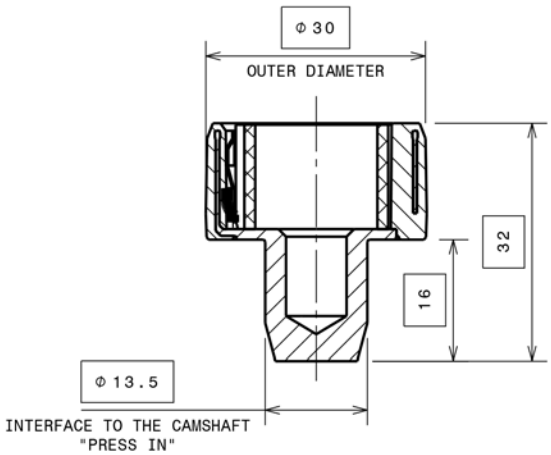
PARTNAME	MATERIAL	PLATING
HOUSING	>PA 6T/6I<	
COVER		
O-RING	FKM	
BUSHING	>AlCu6BiPb T8<	
PINS	>CuNi3Si1Mg<	Sn matte over Ni ductile

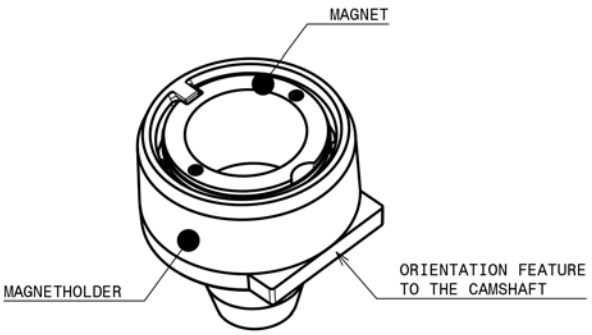
PIN	PINBELEGUNG *PIN ASSIGN*
1	VDD
2	CAN-H
3	CAN-L
4	GND





TARGET





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