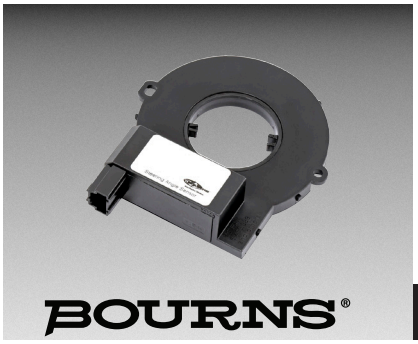


Features

- True power-on system
- Right angled or straight line connector
- Output over CAN bus
- Various column mounting proposals

Non-Contacting Multiturn Angle Sensor Type 6000

Introduction

Bourns® Type 6000 Non-Contacting Multiturn Angle Sensor is based on two magneto-resistive (AMR) sensor chips. Each sensor chip converts an angle position of a permanent magnet into two analog signals (one sine and one cosine signal). A highly efficient algorithm enables estimating the absolute angular position of a drive shaft that is connected to the device.

Specifications

Angular Position
- Range ..... -780 ° to +780 °
- Resolution ..... 0.1 °
- Absolute Linearity ..... ±1.4 °

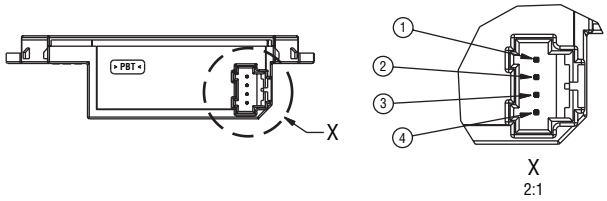
Angular Speed
- Range ..... -1016 to +1016 °/s
- Resolution ..... *4 °/s

Data and Control Interface
- CAN 2.0A (Optional CAN 2.0B) ..... See CAN Protocol
- Baud Rate ..... 500 kbit/s
- Data Rate ..... 10 ms

Measure Data Delay ..... < 10 ms
Adjusting a Zero Position ..... via CAN bus
Calibration Control ..... via CAN bus
"On Board" Software Update ..... via CAN bus
Automatic Self-Test ..... See CAN Protocol
Power Supply Voltage ..... +8 V to +16 V
Supply Current ..... 50 mA
Ambient Temperature ..... -40 °C to +85 °C

* The sensor measures positive and negative speed, but only the absolute value is output in the CAN message

Electrical Connection



Mating Connector: AMP 0-936119-1 (064 MQS 4P PLUG Assembly)	
Pin No.	**Pin Assignment**
1	GND
2	Supply
3	CAN HIGH
4	CAN LOW

CAN Protocol

The device sends a CAN message with the measurement data every 10 msec. The layout of the transmitted message is shown below.

CAN Transmit Message

CAN-ID Kind of Message	Byte	Bits	Signal Destination	Unit	Measure Range	Measure Range (Digit)	Offset	Resolution (Unit/Digit)	Comments
0 x 2B0 transmit	0-1 (0-LB 1-HB)	00-15	Absolute angle position	Degree	-780...+780	57735...7800	0	0,1	Fault/not calibrated/ default: 0x7FFF
	2	16-23	Angle speed	Degree/s	0...+1016	0...254	0	4	Fault default: 0xFF
	3	24-27	Internal status: 111 = Calibrated and OK 101 = Not calibrated 110 = Fault 100 = Fault and not calibrated 000 = Not trimmed		0...3	0...3	0	1	
	3	28-31	Free		0	0			Internal use only
	4	32-35	Message counter		0...15	0...15		1	Should be incremented by each message
	4	36-39	Check sum		0...15	0...15		1	Check sum: see below

Absolute Angle Position:
- *Signed (integer)*
- *Angle position [degree] = N · 0.1, for 0 < N ≤ 32767 (N - digital value of the message) = (N-65536) · 0.1, for N > 32767*

Angle Speed:
- *Unsigned (char)*
- *Rotation speed [degree/s] = S · 4, for 0 < S ≤ 254 (S - digital value of the message) = 0xFF, for S > 254*

CAN Protocol (Continued)

Rule to build the check sum:

Temp_result = lower byte (Angle position) XOR higher byte

(Angle position) XOR (Angle speed) XOR (Internal status)

Check sum = higher nibble (Temp_result) XOR lower nibble

(Temp_result) XOR (Message counter)

The device is also able to receive messages. They are shown below.

CAN Receive Message

CAN-ID Kind of Message	Byte	Bits	Signal Destination	Unit	Measure Range	Measure Range (Digit)	Offset	Resolution (Unit/Digit)	Comments
0x7C0 receive	0	0-3	Command word						
	0	4-7	SAS transmit identifier (SAS ID) bits 0-3						
	1	8-14	SAS transmit identifier (SAS ID) bits 4-10						
	1	15	Free						

Command Word (CW)

CW bit3	CW bit2	CW bit1	CW bit0	Instruction
0	0	1	1	Set up the zero position
0	1	0	1	Clear the old zero position
Other combinations				Only for internal use

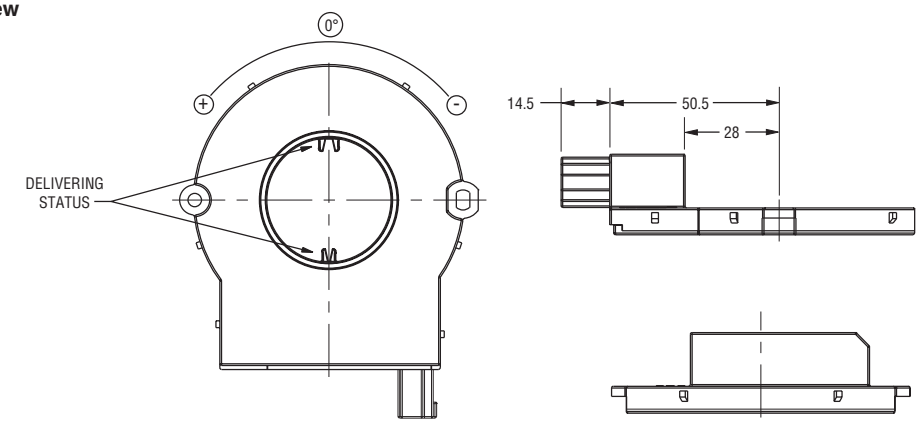
Note:
To set up a new zero position, first it is necessary to delete the old zero position.

Automatic Self-Test

The device checks the angular speed value, which is limited to 1016 degrees per second. If this limit exceeded, the device sends an error message according to the CAN Transmit Message (page 1).

Design and Mechanical Interface

Housing - Device View

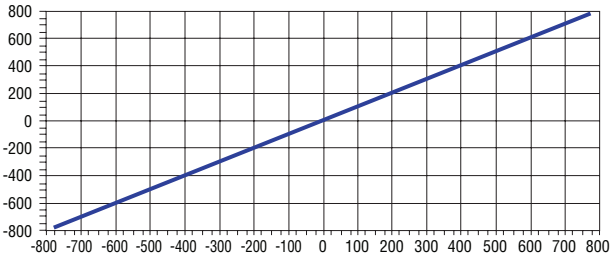


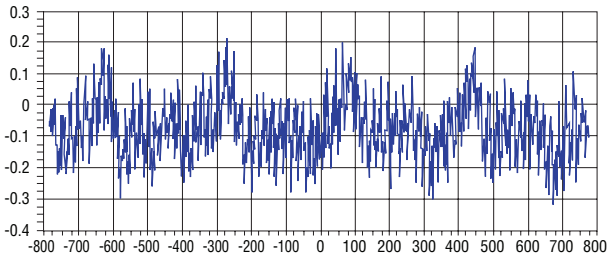
DIMENSIONS: MM

Typical Test Results @ R.T.

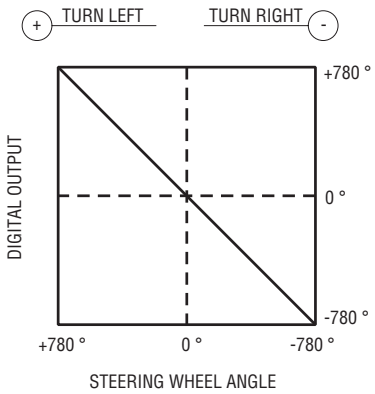
The first graph shows a typical linearity measurement curve taken at room temperature. The second graph shows the deviation (absolute non-linearity) over four turns of the steering wheel.

Output Code and Absolute Linearity





Definition of Output Signal According to Rotation of Steering Wheel



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