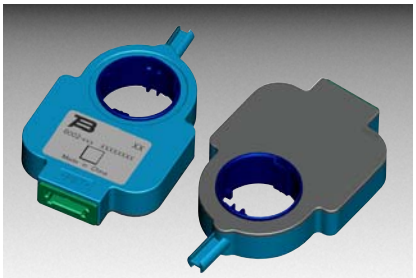


BOURNS®

Features

- True power-on system
- Straight line connector
- Output over CAN bus
- Various column mounting proposals

Non-Contacting Steering Angle Sensor Type 6002

Introduction

Bourns® Type 6002 Non-contacting Steering Angle Sensor is based on two magneto-resistive (AMR) sensor chips. Each of them converts an angle position of a permanent magnet into two analogue signals (one sine and one cosine signal). A highly efficient algorithm allows for estimating the absolute angular position of a drive shaft that is connected to the device.

Specifications

Angular Position
- Range ..... ±780 °
- Resolution ..... 0.1 ° (optional <0.1 °)
- Accuracy ..... ±2 °

Angular Speed
- Range ..... ±2000 °/s
- Resolution ..... 4 °/s

Data and Control Interface
- CAN 2.0A (Optional CAN 2.0B) ..... 500 kbit/s
- Data Rate ..... 10 ms (optional 5 ms)
- OEM Specific CAN Handlers ..... Optional

Zero Position
..... Adjustable at every position through CAN command

Diagnostic and Error Handling ..... Via CAN bus
Optional secure version with 2nd microcontroller)

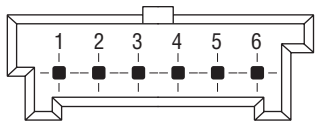
Firmware Upgrade ..... Via CAN bus
(Optional OBD programmable)

Power Supply
- Voltage Range ..... 8-18 V
- Current Consumption ..... 50 mA (no idle current required)

Temperature Range ..... -40 °C to +85 °C

Connector

Tyco-No. 1-1241370-3
The mating connector's pin layout is shown below:



PIN NO.	SIGNAL
1	CAN LOW
2	CAN LOW
3	CAN HIGH
4	CAN HIGH
5	12 V
6	GND

CAN Protocol

The device sends a CAN message with the measurement data every 10 msec. An example of a message layout is shown below. OEM-specific CAN handler is optional.

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 280 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	-2000...+2000	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	36-40	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 · 0.4*

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)

An example of the message layout for a receive message is 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
0 x 7C0 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

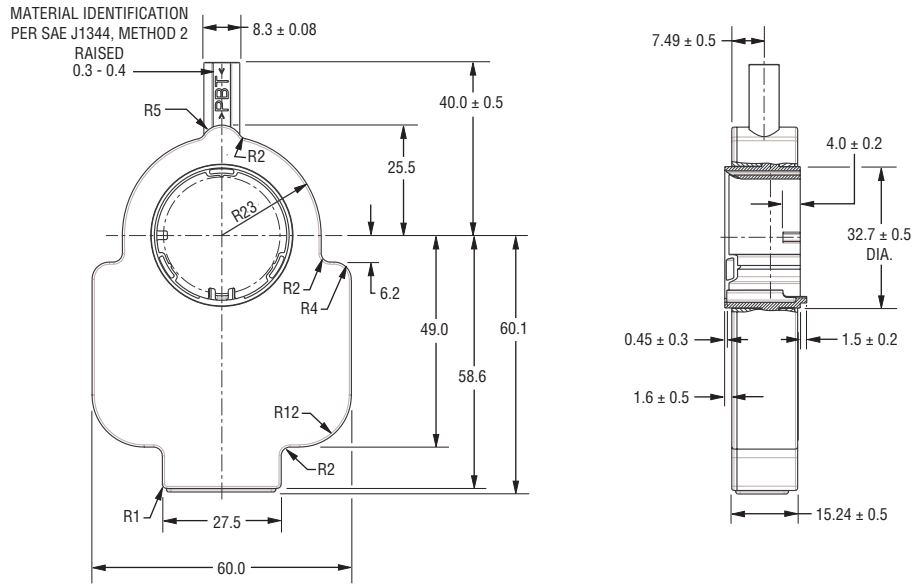
Note:
To set up a new zero position, first it is necessary to delete the old zero position.

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

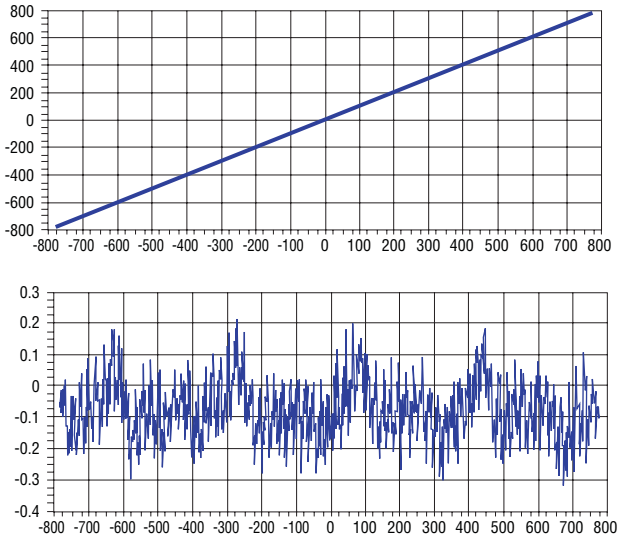


DIMENSIONS: MM

Linearity Data

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



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