Features
- Multiturn
- True power-on system
- Output over CAN bus

Non-Contacting Steering Angle Sensor Type 6004-007

Specifications

Angular Position
- Range: ±780 °
- Resolution: 0.1 °
- Accuracy: ±2 °

Angular Speed
- Range: ±1016 °/s

Data and Control Interface
- CAN 2.0B: 500 kbit/s
- Data Rate: 10 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: 7-18 V
- Current Consumption: 50 mA (no idle current required)
- Temperature Range: -40 °C to +85 °C
- Rel. Humidity: 85 % max.

Specifications

Angular 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

Angular Speed
- Signed (integer)
- Rotation speed [degree/s] = N • 8

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

<table>
<thead>
<tr>
<th>CAN-ID Kind of Message</th>
<th>Byte</th>
<th>Bits</th>
<th>Signal Destination</th>
<th>Unit</th>
<th>Measure Range</th>
<th>Measure Range (Digit)</th>
<th>Offset</th>
<th>Resolution (Unit/Digit)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 x 321 transmit</td>
<td>1</td>
<td>0-1</td>
<td>Absolute angle position</td>
<td>Degree</td>
<td>-780...+780</td>
<td>57735...7800</td>
<td>0</td>
<td>0,1</td>
<td>Error = 0x8000 (Motorola format)</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>16-23</td>
<td>Angle speed</td>
<td>Degree/s</td>
<td>-1016...+1016</td>
<td>0...254</td>
<td>0</td>
<td>8</td>
<td>Error = 0x80</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0-1</td>
<td>SAS_failure status</td>
<td>0 - Failure 1 - Not failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0-1</td>
<td>SAS_calibration status</td>
<td>0 - Not calibrated 1 - Calibrated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0-1</td>
<td>SAS_trimming status</td>
<td>0 - Not trimmed 1 - Trimmed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>27-31</td>
<td>Reserved</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Internal use only</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>32-35</td>
<td>Message counter</td>
<td>0...15</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>Should be incremented by each message</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>36-39</td>
<td>Check sum</td>
<td>0...15</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td>Check sum: see below</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>40-63</td>
<td>Reserved</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

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:
- Signed (integer)
- Rotation speed [degree/s] = N • 8

Specifications are subject to change without notice.
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.
Users should verify actual device performance in their specific applications.
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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.

<table>
<thead>
<tr>
<th>CAN-ID Kind of Message</th>
<th>Byte</th>
<th>Bits</th>
<th>Size</th>
<th>Signal Destination</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 0x03                   | 0    | 4-7  | 4    | Command code word  | 0x03: Set up the zero position
|                        |      |      |      |                    | 0x05: Clear the old zero position
|                        |      |      |      |                    | Others: For internal use only |

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

Interface Recommendation

Dimensions: MM

Typical Part Marking

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Signal Characteristics

![Graph showing the relationship between Measured Angle and Steering Angle](image)

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